

Attachment 1

Natural Resources Defense Council Exhibits
to Comment Letter Submitted on the Draft
Supplemental EIS/EIR to the EWA Final
EIS/EIR December 10, 2007

EXHIBIT 1

Finding the Water



NEW WATER SUPPLY OPPORTUNITIES TO REVIVE
THE SAN FRANCISCO BAY-DELTA ECOSYSTEM

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ENVIRONMENTAL DEFENSE

finding the ways that work

Finding the Water

NEW WATER SUPPLY OPPORTUNITIES TO REVIVE
THE SAN FRANCISCO BAY-DELTA ECOSYSTEM

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ENVIRONMENTAL DEFENSE

finding the ways that work

Cover image: Thomas B. Dunklin (salmon), California Department of Water Resources (river)

Our mission

Environmental Defense is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

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The complete report is available online at www.environmentaldefense.org.

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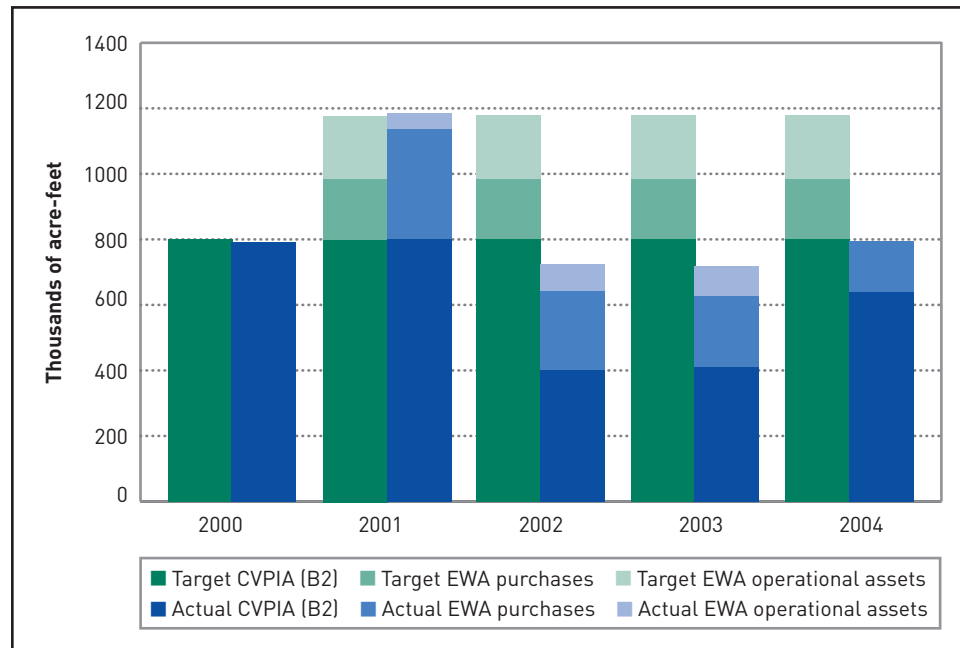
Executive summary

The San Francisco Bay-Delta is in crisis. Fish populations have dropped to record lows in the West Coast's largest estuary, which is a source of drinking water for 22 million California residents and supplies irrigation water for much of the state's agriculture industry. Now, new threats are on the horizon as the state of California plans to increase the capacity of its export pumps to divert even greater volumes of fresh water out of the Delta. At the same time, environmental water targets set forth in the CALFED Plan (specifically those of the Environmental Water Account [EWA] and the Central Valley Project Improvement Act [CVPIA]), intended to protect and restore the estuary and lessen the impacts of

water project operations, have not been met for the last three years and face an uncertain future. If the Bay-Delta is to be restored, it is imperative that managing agencies follow through on their commitments to provide environmental water. Meeting the environmental water objectives set forth in the CALFED Plan is an essential element in restoring not only the estuary but also in renewing public confidence in our water management agencies.

In this study, Environmental Defense concludes, based on analysis of water operations data, that in the past few years the environment has been under-endowed by approximately 420,000–460,000 acre-feet annually (Figure ES-1)

FIGURE ES-1
Unmet environmental water targets, 2000–2005



Since 2002, the EWA and CVPIA have been under endowed on average by 436,000 acre-feet. The EWA, which began in 2001, has seldom had adequate assets (i.e., water) available largely due to limited funding. CVPIA supplies began diminishing after the Interior Department's 2003 Decision (already in place in 2002), which offered far less protection than the previous policy. Current trends indicate that neither the EWA nor CVPIA water supplies are likely to be available in 2005 and beyond, as intended in the CALFED Plan, unless significant changes are made.

Source: California Department of Water Resources, U.S. Bureau of Reclamation



The San Francisco Bay-Delta is the hub of California's water supply system. In recent years, the health of this important estuary has significantly declined and populations of key fish species have dropped to record lows. Now additional threats are on the horizon as the State of California plans to increase the capacity of Delta freshwater exports.

The shortfalls in water dedicated to environmental protection are largely due to diminished state and federal funding, unavailable operational assets through the EWA and revised accounting rules for environmental water under the CVPIA. As a result, fishery agencies have been significantly constrained in their ability to dedicate water at key times of the year to protecting fisheries—particularly endangered species—as promised in the CALFED Plan.

Fortunately, as actions are taken to modify and modernize water management in California, there will be opportunities for obtaining the water necessary to provide environmental protection. In this report, Environmental Defense identifies key opportunities to acquire water to finally realize the protective

assurances promised in the CALFED Plan. These opportunities include:

- Increasing the usable storage in San Luis Reservoir
- Dedicating increased export capacity
- Integrating state and federal water projects
- Restoring the CVPIA's commitments to fisheries protection and restoration
- Implementing CALFED's Environmental Water Program (EWP) and Section B3 of the CVPIA
- Retiring drainage-impaired land in the San Joaquin Valley
- Implementing user fees

To ensure sustainable and reliable supplies, the water acquired through these opportunities could be required as part of the regulatory standards to which the water projects must adhere. As such, these regulatory standards could help protect fisheries by allowing pumping *only* when it is safe for fish, similar to both EWA and CVPIA protections.

With some creativity and foresight, it is possible to address the problems in the Bay-Delta. The health of the estuary largely depends on a reliable set of environmental safeguards, including dedicated water supplies. In order to ensure the availability of sustainable water supplies, a plan must be developed that identifies long-term supplies, provides assurances that water will be supplied and includes consequences for non-compliance. In light of the dire condition of the Bay-Delta and the looming threat of increased freshwater diversions, government agencies, water contractors and the interested public need immediately to develop a viable plan to assure adequate fresh water supplies for the long-term health of the San Francisco Bay-Delta.

FIGURE 1

The San Francisco Bay-Delta: the hub of California's water system



The San Francisco Bay-Delta is one of California's most valuable and unique ecological resources. The Bay-Delta also supplies drinking water for 22 million California residents and irrigation water for much of the state's agricultural industry via the state and federal pumping facilities, Harvey O. Banks and Tracy, respectively.

CHAPTER 1

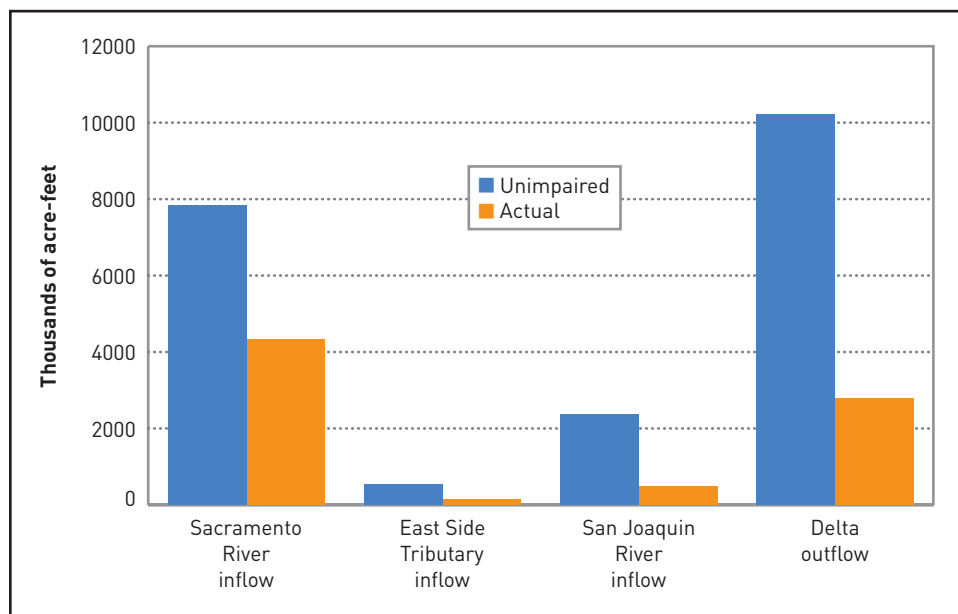
Introduction

The San Francisco Bay-Delta Estuary has been the hub of California's water supply system since the state's early days when farmers first diverted its freshwater inflows to grow food for hungry gold miners. As the state has grown, the Delta has become the center of a water system delivering supplies from the wetter northern region to the more populous and drier southern region. As Figure 2 shows, land conversion, water development and flood control projects throughout the Central Valley have drastically altered freshwater flows in the estuary.

Since the completion of Friant Dam in the 1940s, most years the entire flow of the upstream reaches of the San Joaquin River is diverted, leaving a dry riverbed upstream of its confluence with the Merced River. In 1956, the federal Central Valley Project (CVP) began to

export large volumes of water into the Delta Mendota canal to assist farmers along the San Joaquin River whose supplies had been diverted south by the Friant project, as well as to support expanded agriculture on the arid west side of the San Joaquin Valley. Figure 3 illustrates how Delta exports have grown over the last 50 years. Exports sharply increased in the late 1960s, when the California State Water Project (SWP) was completed, principally to provide additional water supplies to urban southern California and the agriculture industry in Kern County. At the same time, the CVP completed its San Luis Unit, including a contract for more than 1,000,000 acre-feet with the Westlands Water District. Exports of fresh water steadily increased until 1991, when a lengthy drought forced their reduction.

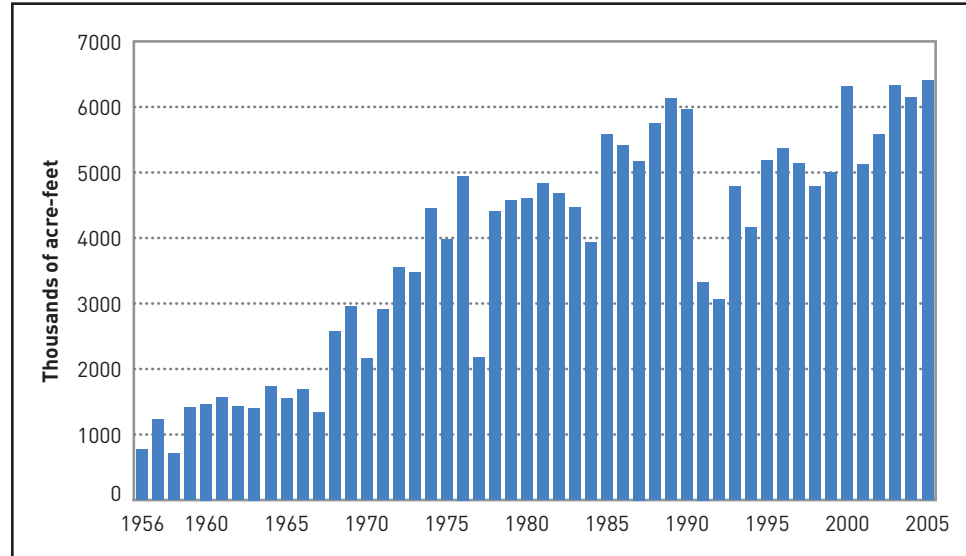
FIGURE 2
Changes to Delta flows, February–June, 1987–1992 drought



Land conversion, water development and flood control projects throughout the Central Valley have altered the volume and timing of flows into and out of the estuary. The changes are particularly noticeable in dry years such as the 1987–1992 drought.

Source: California Department of Water Resources, Interagency Ecological Project

FIGURE 3
Historic Delta exports, 1956–2005



In recent years, both state and federal exports have been steadily rising, with three out of the past five years reaching record highs, and an all-time high of 6.4 million acre-feet was reached in 2005.

Source: California Department of Water Resources

Exports are once again on the rise, reaching the highest levels ever in three out of the past five years, with an all-time high of 6.4 MAF at the export pumps in 2005.

Historical impacts on the estuary

As the physical and ecological processes in the Bay-Delta system have changed,

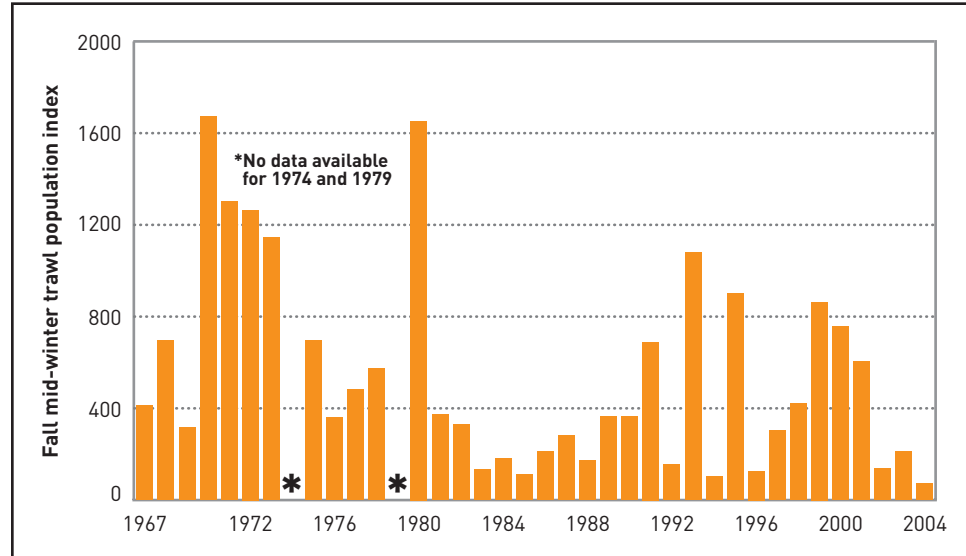
the estuary's fisheries have been devastated. By the late 20th century, the overall decline of the aquatic environments in the Central Valley and Bay-Delta was apparent. The winter-run Chinook salmon population had, until 1978, always been measured in the tens of thousands, but was down to 191 fish returning in 1994. Populations of

Human demands on the Bay-Delta system have strained the species dependent on it. Chinook salmon spend most of their lives in salt water, but they spawn and hatch in freshwater streams. The winter-run Chinook salmon population had, until 1978, always been measured in the tens of thousands, but was down to 191 returning fish in 1994.



BRANDON D. COLE/CORBIS

FIGURE 4
Historic Delta smelt abundance, 1967–2004



The protective mechanisms of the WQCP, the CVPIA and the EWA are in place to protect sensitive species such as Delta smelt, an estuarine fish found only in the Bay-Delta. Populations of Delta smelt, listed under the Endangered Species Act a decade ago, are at the lowest levels ever, down from a population index of 864 in 1999 to 74 in 2004. Source: California Department of Fish and Game fall mid-water trawl

both the Bay-Delta's resident fish and the salmon and steelhead that passed through the Delta en route to and from spawning grounds in Central Valley streams showed similar trends. Shortly after a severe drought from 1987–1992, a number of species were listed for protection under the state and federal Endangered Species Acts. The listing of Delta smelt is of special concern as its one-year life cycle makes it particularly vulnerable to extinction. One year of very low numbers could be devastating to the smelt population. Initial Endangered Species Act listings include:

- Winter-Run Chinook, Endangered, California ESA, September 22, 1989
- Delta Smelt, Threatened, Federal ESA, March 5, 1993
- Steelhead, Threatened, Federal ESA, May 18, 1998
- Spring-Run Chinook, Threatened, California ESA, February 6, 1999

- Splittail, Threatened, Federal ESA, March 10, 1999 (subsequently removed)

A declining resource

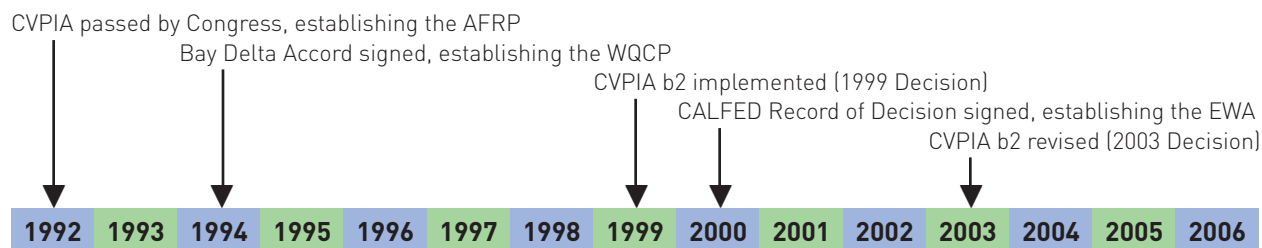
In recent years, the health of the Bay-Delta ecosystem has become increasingly precarious and new threats are on the horizon, in particular the proposed increase in capacity to export water from the Delta. As exports have continued to rise, recent surveys have shown a sharp decline in populations of estuarine fish. Delta smelt, listed under the Endangered Species Act a decade ago, are at their lowest level ever (Figure 4).¹ In addition, juvenile striped bass are at their lowest levels in four decades and both longfin smelt and threadfin shad populations are reaching near-record lows.² Contributing to these declines is a sharp reduction in the abundance of zooplankton, particularly a calanoid copepod, which is the primary food for young estuarine fish as

well as older life stages of Delta smelt. The Interagency Ecological Program, a collaboration of state and federal agencies focusing on the ecology of the Bay-Delta estuary, is currently conducting a comprehensive review of the

possible causes of this most recent decline in Delta fisheries. The program will specifically investigate the degree to which pollution, invasive species and water project operations are responsible for the decline.

Overview of environmental water requirements

Timeline of environmental water requirements



In response to the declining condition of the Bay-Delta in the 1990s, a number of environmental water requirements were developed to lessen the impacts of the water projects. These requirements were designed to provide increased instream flows or curtail export pumps at key times to protect fisheries. Today, three important requirements fall under the plan developed in 2000 by the state-federal CALFED Bay-Delta Authority.³ In particular, the CALFED Plan provides three tiers of protection which include the Environmental Water Account (EWA), the Central Valley Project Improvement Act (CVPIA) and the Water Quality Control Plan (WQCP). An overview of these three environmental water requirements follows.

CALFED and the EWA

In 1995, to address the conflict over competing human demands in the Delta and declining fisheries, state and federal agencies, water contractors, public interest and environmental groups and others went to work on a long-term plan. Many elements of the vast program under CALFED's purview were contentious, though perhaps none so much as the rules governing export pumping. Fishery agencies and environmentalists asserted that additional protections were needed to reduce exports,

especially when at-risk populations were in the vicinity of the pumps. Others agreed that some additional protection was necessary but pointed out that it was not always possible to identify in advance when export curtailments to protect fish from direct entrainment would be needed.

At the behest of then-Secretary of Interior Bruce Babbitt, CALFED agencies and stakeholders were tasked to find a mechanism for applying export reductions on a real-time basis, rather than on a fixed schedule. The idea was that the most efficient way to balance competing objectives for water export and environmental protection was not to determine in advance when exports ought to be curtailed to reduce fish mortality, but to provide a mechanism whereby fishery scientists with detailed monitoring capabilities could request reductions when fish would otherwise be entrained in large numbers at the export pumps.

After months of comprehensive "gaming" exercises, during which fishery scientists, project operators and others simulated how such real-time changes to project operations might be accomplished in response to monitoring data, a plan for the EWA emerged. Successfully negotiating the EWA was a key component that allowed the final CALFED Plan to be released in 2000.

The EWA was adopted as a water management tool intended to protect endangered fish from the harmful operational impacts of the federal and state water projects without reducing existing water supply or deliveries from the Delta. In general, U. S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and California Department of Fish and Game (DFG) would act as management agencies, using monitoring data, scientific understanding and professional judgment to decide which actions were required to protect and recover Delta fish populations and ecosystem function. The U.S. Bureau of Reclamation and California Department of Water Resources (DWR) would act as the project agencies that oversee the operation of the EWA and implement those actions deemed necessary by the fishery agencies. EWA water supplies would be acquired either through applying a set of different tools used to gain supplies during system operations (i.e., operational assets) or through purchases (i.e., purchased assets) (Table 1).

The EWA would protect fish from mortality due to entrainment in the pumps and ensure reliable supplies for the water contractors while providing them with near-absolution from additional compliance with the Endangered

CALFED’s three tiers of environmental protection

Tier 1: Consists of regulatory requirements including Delta smelt and winter-run Chinook salmon biological opinions, WQCP and 800,000 acre-feet of supplies pursuant to CVPIA Section 3406(b)(2).

Tier 2: Comprised of environmental benefits provided by the EWA and Ecosystem Restoration Program. Tier 2 is a mechanism to assure that water is provided for fish protection and recovery, without a reduction in deliveries to water users.

Tier 3: Founded on the commitment of state and federal agencies to make additional water available if the combined protections of Tier 1 and 2 were inadequate to protect ESA-listed species.⁴

Species Act. Without the EWA in place, additional pumping would increase the number of fish “taken” at the pumps, thereby increasing the likelihood of ESA non-compliance for water contractors. The EWA is thus effectively an insurance policy for water contractors—providing substantial economic benefits by assuring reliable supplies without fear that the

TABLE 1
Proposed sources of water for the EWA

Action description	Water available annually (average)
Operational assets	195,000 acre-feet
SWP pumping of (b)(2)/ERP upstream releases	40,000 acre-feet ²
EWA use of joint point	75,000 acre-feet
Export/inflow ratio flexibility	30,000 acre-feet
500 cfs SWP pumping increase	50,000 acre-feet
Purchased assets	185,000 acre-feet
Purchases—south of Delta	150,000 acre-feet
Purchases—north of Delta	35,000 acre-feet
Total	380,000 acre-feet

Source: CALFED Record of Decision

Endangered Species Act will diminish their supplies.

The CALFED Plan describes the EWA as the second of three “Tiers” of environmental water supplies (see sidebar). Tier 1 includes regulatory requirements that were already in place, including the WQCP, CVPIA supplies and rules for project operations, to protect Delta smelt and winter-run Chinook salmon under the Endangered Species Act. Given that the EWA would interact so closely with actions taken pursuant to the CVPIA, the CALFED Plan made clear that Tier 1 would include CVPIA supplies that were available under the federal policy for B2 supplies established in 1999 by the Department of the Interior.

During CALFED’s gaming process, agency staff projected that an annual average of 195,000 acre-feet would be available for the EWA in the normal course of CVP and SWP operations (Table 1). Additionally, agencies elected to commit to purchasing supplies amounting to 185,000 acre-feet per year. Together, these operational and purchased assets would total 380,000 acre-feet per year on average.

In exchange for CALFED’s three-tiered suite of protections, the fishery agencies agreed that they would require no further reductions beyond existing regulatory levels in CVP or SWP Delta exports for the protection of state and federally listed, threatened and endangered species. In essence, the water users were guaranteed a reliable supply of water, without unscheduled interruptions due to compliance with the Endangered Species Act. These ESA commitments were to be renewed annually and were contingent on full funding and availability of the three tiers of protections.

CVPIA and the Anadromous Fish Restoration Program

Prior to the EWA, Congress passed the CVPIA in 1992, largely in response to the ecosystem decline in the Bay-Delta and Central Valley watersheds. The Act made protection of fish and wildlife a priority and included a directive to achieve a reasonable balance between the requirements of fish and wildlife and other project purposes. The CVPIA contains a number of landmark provisions that substantially modify and

The Sacramento River and the San Joaquin River are the two main tributaries that flow into the Bay-Delta. Of the two, the Sacramento River provides the bulk of outflow to the Bay and is a critical spawning habitat for winter-run Chinook salmon.



modernize the CVP, including directives to provide additional water for the benefit of fisheries and wetlands in the Central Valley and Bay-Delta.⁵

The Act's most controversial element has been its Anadromous Fish Restoration Program (AFRP) and the subsequent authorization to modify water project operations to accomplish its goal of doubling anadromous fish populations by 2002.⁶ To implement the AFRP, the Act provides three water management tools. The authorized modifications are usually referred to as B1, B2 and B3 supplies, named after the sections of the law in which they appear. In short:

- Section B1 instructs the CVP to modify project operations for fish protection as long as the timing and volume of deliveries of the Project's contractors are not impaired.
- Section B2 annually dedicates 800,000 acre-feet of the Project's water supplies for fish protection.
- Section B3 provides funding for additional flow purchases by levying a surcharge on water users.⁷

Due to its controversial nature, Section B2 was not fully implemented until seven years after the CVPIA had passed. In October 1999, the U.S. Department of the Interior released a final decision for administering Sections B1 and B2 jointly. Its principal provisions included measuring reservoir releases that were increased to improve conditions for fisheries on four federally controlled streams (Sacramento River, Clear Creek, American River and Stanislaus River), as well as any curtailments that were made at the Delta export facilities to reduce entrainment of fish in the pumps. Under most circumstances, these flow increases and export reductions were based on the cumulative

net change to CVP operations during the course of a water year. The 1999 Decision also, in recognition of the Act's primary purpose of doubling anadromous fish populations, insisted that a significant portion of the CVPIA's B2 dedication be applied to protect salmon habitat on CVP-controlled streams for spawning and rearing, rather than simply providing safe passage through the Bay-Delta.

The Bay-Delta Accord and the WQCP

As the U.S. Department of the Interior struggled to implement the CVPIA, efforts to deal directly with the Bay-Delta's ecological problems continued. After the State of California withdrew from its own effort to develop alternative regulation for water project operations, the U.S. Environmental Protection Agency (EPA) threatened to promulgate water quality standards under the Clean Water Act.⁸ Responding to this warning, federal and state agencies, water contractors and environmentalists negotiated a package of environmental protections, operations protocols and funds for habitat restoration. On December 15, 1994, state and federal agencies, joined by ten "interested parties" including Environmental Defense, signed the Bay-Delta Accord. The Accord established interim standards for water project management and encouraged parties to work together on a long-term solution. As a result, the state and federal government initiated the CALFED program, with a mandate of developing long-term solutions that would address water supply, water quality, levee stability and ecosystem issues facing the Delta.

The SWP and CVP agreed to bear the full responsibility for meeting the Accord's flow objectives, with the

expectation that the State Water Resources Control Board (SWRCB) would consider whether other water agencies should also provide flows for the Delta.⁹ According to the agreement, the majority of this burden would be met by the CVP, using a portion of its B2 account. The SWP's contribution to the Accord's objectives was smaller on average, but significant in wet years. The Accord's objectives would be implemented as the newly-formed CALFED Program worked on a long-range plan.

The Bay-Delta Accord's standards were formally adopted in 1995 by the SWRCB as the WQCP for the San Francisco Bay and Sacramento-San Joaquin Delta Estuary. In particular, the WQCP limits state and federal export pumping to 35% of Delta inflow during February through June when estuarine fish breed, and to 65% of inflow during the rest of the year. The WQCP also

implemented the Accord's "X2" recommendations for Delta outflow through requirements for low-salinity habitat during the February through June period.¹⁰ In any given month during this period, Delta outflow requirements are determined based on the natural flows of the eight largest rivers in the Sacramento and San Joaquin Valleys.

Most elements of the WQCP have been incorporated by the SWRCB in its water rights orders. As a result, the WQCP's outflow requirements, export curtailments and Sacramento River inflow requirements are met annually through the operation of the CVP and SWP. The WQCP's inflow objectives for spring inflow to the Delta from the San Joaquin River, however, are only partially met by compensated contributions from local water agencies as part of the Vernalis Adaptive Management Plan.¹¹

Where are we today? Five years of CVPIA and EWA implementation

While some salmon populations have improved considerably, largely in response to improved instream flows in upstream tributaries and removal of upstream passage impediments, the Delta's estuarine fish are faring poorly. Populations of Delta fisheries have hit record lows at a time when project exports have reached record high levels. At the same time, the guarantees of environmental water envisioned in the CALFED Plan have fallen short of their objectives. As a consequence, the ability of fishery agencies to manage Delta exports through application of the CVPIA and EWA supplies has been significantly compromised. The following is an overview of the CVPIA's and EWA's performance and an estimate of how much the environment has been underendowed.

Diminished CVPIA fisheries commitments

Changes in the application of the CVPIA have significantly reduced its ability to protect fish both upstream and in the Delta. As a consequence, the EWA is now expected not only to do the job intended for it when the CALFED Plan was adopted but also to make up the water lost when the CVPIA's protections were weakened.

Though it was incorporated as a cornerstone of the CALFED Plan, the Interior Department's 1999 Decision for administering Sections B1 and B2 jointly was in force for only two years—2000 and 2001—after it was signed. During this period, only the annual increased use of CVP supplies for fishery enhancement, in terms of either additional reservoir releases for stream-

flow or export curtailment to reduce entrainment, was counted toward the CVPIA's 800,000 acre-feet of yield, as defined by Section 3406(b)(2). Occasions in which flow increases were subsequently "offset" by flow decreases, or vice versa, were attributed to the "reoperation" authorized by CVPIA Section B1, pursuant to the CVPIA, as they did not affect water contractors. Similarly if winter storms followed fishery actions and reservoir storage was "reset" as a result, the operational change was attributed as a reoperation and not charged to the B2 account. Also, in 2001, the 1999 Decision's provision that no more than 450,000 acre-feet of the 800,000 acre-feet B2 account would be charged to meet Delta obligations (i.e. WQCP standards), was applied. As a result, an additional 75,000 acre-feet of environmental water was purchased with CALFED funding.

The Interior Department's 1999 Decision was not to last, however. In 1997, CVP contractors initiated litigation against the United States challenging the Interior Department's initial interpretation of Section 3406(b)(2). Various environmental groups, including Environmental Defense, and fishing groups joined the suit soon thereafter. The U.S. District Court eventually ruled on a complex series of issues involving various Department of Interior decisions over a five-year period.

In January 2002, the court issued key rulings that forced Interior to revise its policies for "offset" and "reset." As a result, virtually all operational changes implemented to improve fisheries would be charged to the B2 account, even if the changes had no effect on con-

tractors. The ruling did not address how Interior should apply the fishery provisions in Section 3406(b)(1) which authorize the Secretary “to provide flows of suitable quality, quantity, and timing to protect all life stages of anadromous fish” as long as they “do not conflict with fulfillment of the Secretary’s remaining contractual obligations to provide Central Valley Project water for other authorized purposes”. In addition, the court ruled that the Interior Department had no discretion to limit how much of the B2 account could be used in meeting its share of WQCP obligations.¹² The effect of these rulings meant that, in many years, the entire B2 account might be applied to meet the WQCP obligations within the Delta, leaving no water to enhance spawning and outmigration of anadromous fish.

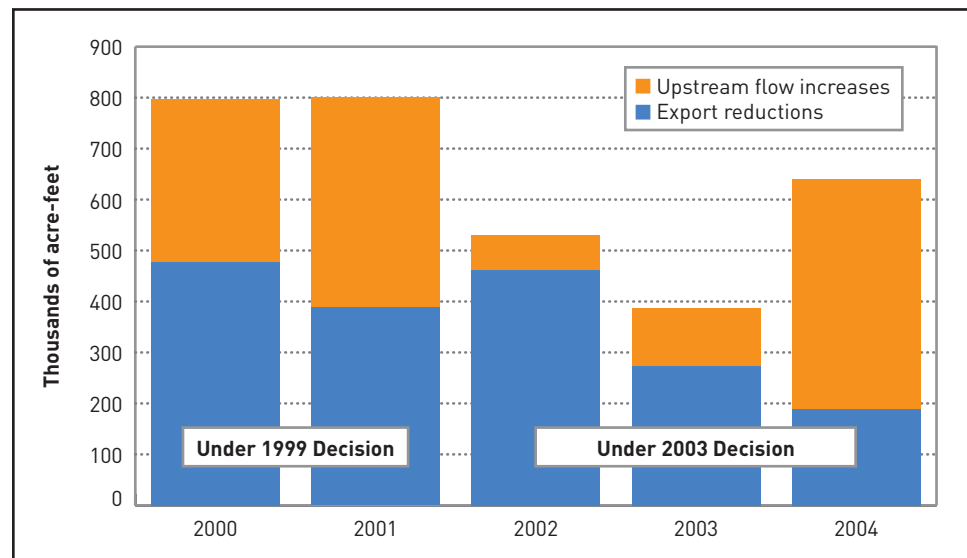
The Interior Department’s 1999 Decision for use of CVPIA supplies was

unofficially displaced in 2002 by a new policy incorporating the court’s rulings. In 2003, Interior formally adopted a new policy that included not only the ruling but also further diminished how much environmental water it would provide in dry years. The 2003 policy allows water delivered to CVP contractors to be counted as water dedicated to fisheries protection.

Under the 2003 policy, the Fish and Wildlife Service is forced to make difficult choices with its limited B2 supplies between taking upstream actions to protect anadromous fish, or in-Delta actions to reduce direct entrainment. In 2002, for example, approximately 331,000 acre-feet was charged to the B2 account that would not have been charged under the 1999 policy (Figure 5).

The court rulings and the Interior Department’s revised policy have

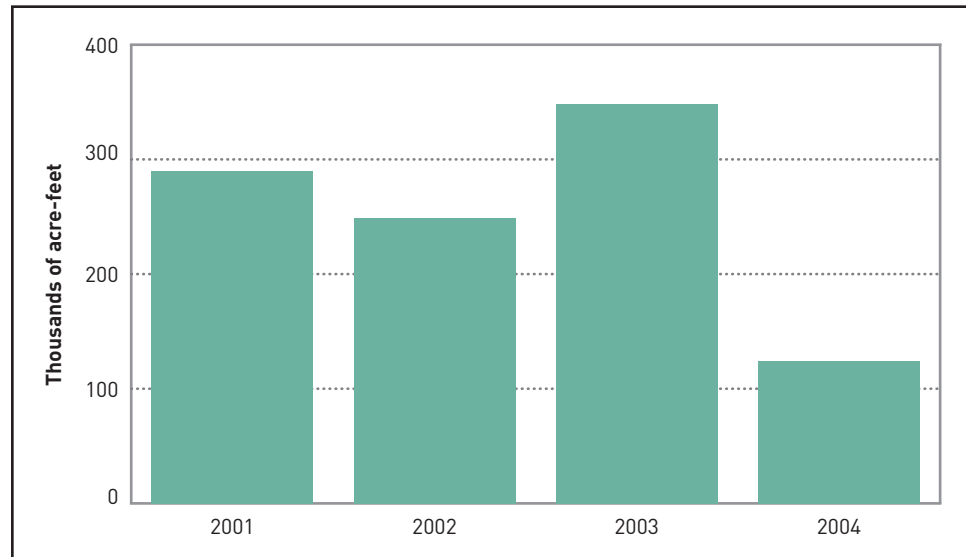
FIGURE 5
Changes in Central Valley Project Improvement Act environmental “b2” water supplies



The Interior Department’s 2003 change in policy for applying the CVPIA’s environmental water significantly reduced the amount of water provided to protect and restore fisheries. This change has undermined the protections provided in the CALFED Plan and has put additional pressure on the EWA. Source: U.S. Bureau of Reclamation provided daily operational data as well as the B2 accounting under its various policies. Environmental Defense applied the Bureau’s accounting policy under its 1999 Decision to the 2002–2004 project operations.

FIGURE 6

Environmental Water Account export reductions to protect fisheries, 2001–2004



The EWA is principally used to curtail exports for the benefit of threatened Delta fish species. Since 2001, the ability of the EWA to do its job has been limited due to inadequate acquisition of both operational and purchased assets.

Source: CALFED EWA Team, a multi-agency stakeholder group helping to coordinate the implementation of the EWA.

effectively reduced CALFED's Tier 1 capabilities to near zero. As a result of these changes, the EWA has been expected not only to do the job intended for it as part of the CALFED Plan but also to make up the water lost as a result of the court's and the Interior Department's interpretations of the CVPIA.

Diminished EWA

The EWA has had significantly less water than expected to do its job. Combined, the CVPIA and EWA have been underendowed by an average of 436,000 acre-feet over the past three years.¹³ Yet, the need for a sustainable and reliable supply of environmental water, in the context of both record levels of high exports and low fish populations, is even more important today.

The EWA was created as an innovative tool intended to solve some of the serious ecosystem problems in the Delta. Unfortunately, due to a combination of

insufficient operational assets and dwindling funding, early on the EWA was effectively robbed of some of its potential (Figure 6). As a result, in its four years of operations, the EWA has received mixed reviews.

From an operational perspective, the EWA has worked well to ensure reliable supplies to water users and has had some positive effects on the Delta's aquatic habitat. EWA purchases, when executed, have provided some environmental protection, which CALFED's EWA Technical Review Panel has noted as one of the most effective elements of the program.¹⁴ There have been various examples of fishery scientists using EWA supplies effectively to provide additional Delta inflows or decreasing export pumping to improve estuarine conditions.

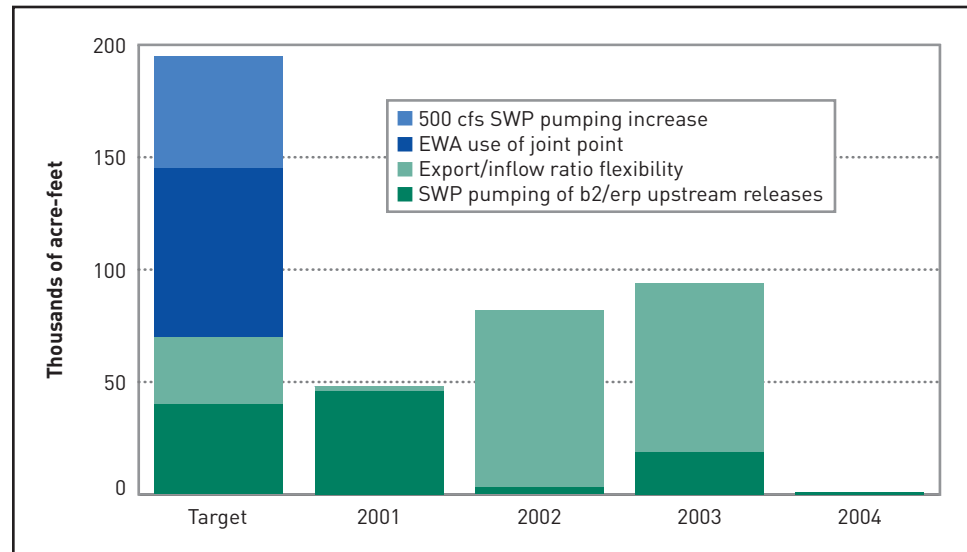
Unfortunately, however, the EWA has never received the amount of water anticipated by the CALFED Plan. On average, only 29% of the expected

195,000 acre-feet of operational assets have been available. The initial assumptions from CALFED's gaming process that preceded the EWA, projecting the EWA could expect significant supplies

through the normal course of project operations, have proven overly optimistic (Figure 7).

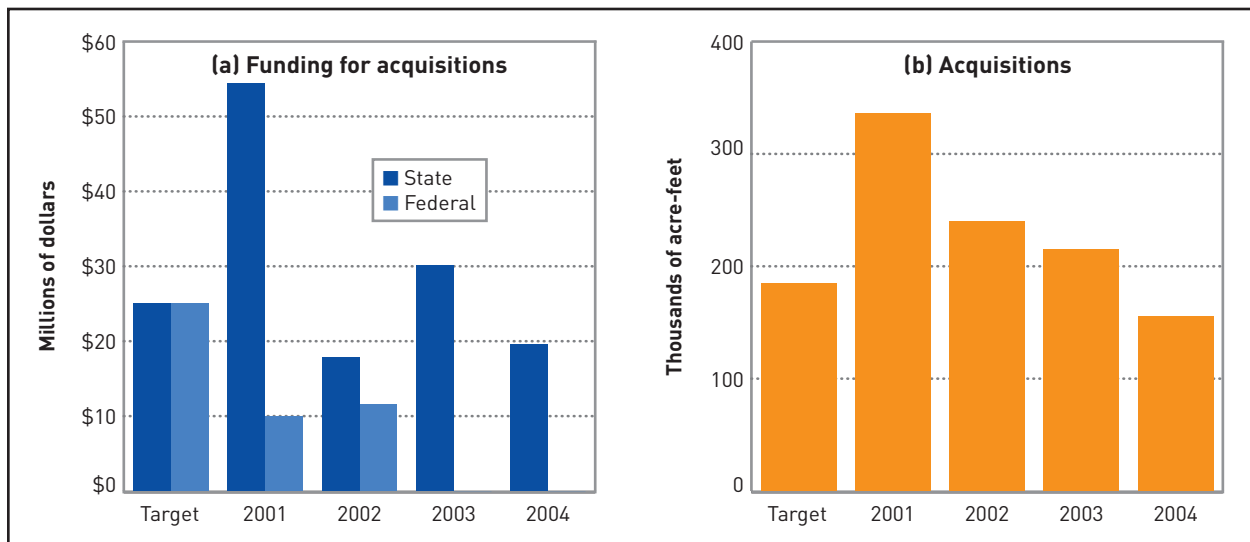
As a consequence, the EWA has had to rely almost entirely on purchases

FIGURE 7
Environmental Water Account operational assets, 2001–2004



The CALFED Plan targeted 195,000 acre-feet of operational assets for the EWA. Since 2001, many types of operational assets have seldom been available and have, on average, only produced 29% of the target.
Source: California Department of Water Resources, CALFED Plan

FIGURE 8
The Environmental Water Account



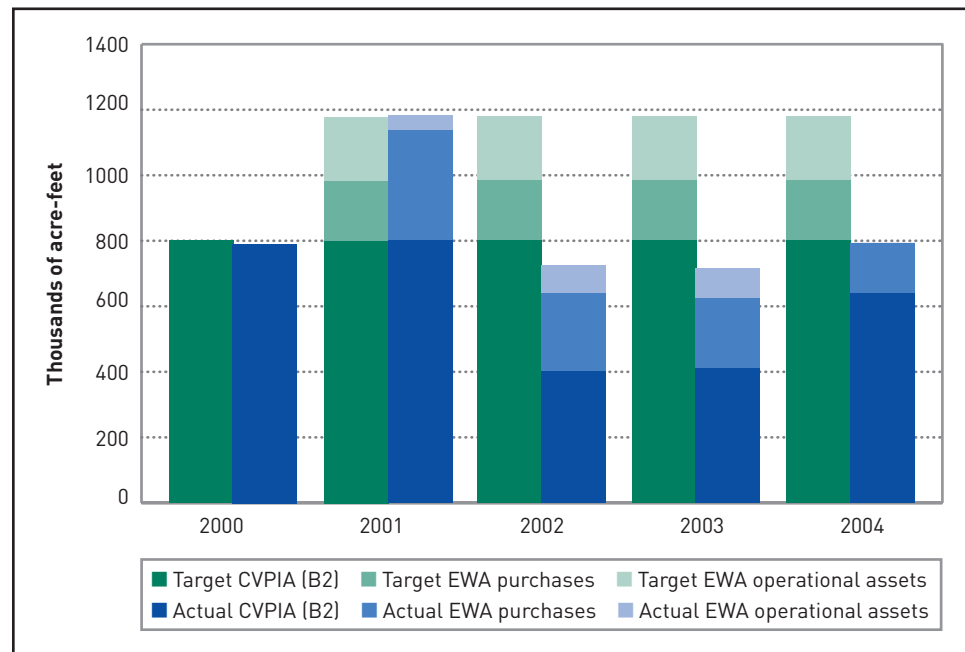
(a) The CALFED Plan targeted a 50/50 cost-sharing goal for the EWA among state and federal sources. Since 2001, however, the state has covered the majority of the EWA's costs. The state sources, comprised of various propositions, are running out and it is unlikely that the state will be able to continue to fund the EWA. (b) In the absence of available operational assets, the EWA has had to rely heavily on purchased assets to acquire water.¹⁵
Source: California Department of Water Resources, U.S. Bureau of Reclamation

from willing sellers to acquire its supplies.¹⁶ This approach worked well the first few years when significant bond funds were available to endow the EWA with purchasing power.¹⁷ As these various bonds, including Proposition 50, run out, it is uncertain how the EWA will be funded in the future (Figure 8). Without extensive changes, future prospects for a fully endowed EWA look poor, given the state's budget crisis and exhausted bond funding.

Dwindling assets have limited the EWA's ability to do its job. In a typical year, most EWA actions to protect fisheries are taken by curtailing export pumping to reduce entrainment and increase survival. Other actions have been taken

to supplement upstream flow releases for spawning and to control water temperature. In recent years, the EWA has increasingly been unable to achieve desired fish actions, despite growing evidence of declining fish populations. In 2004, the only fish actions taken were to implement the Vernalis Adaptive Management Plan and extend its protections into the late spring. More recently, in February 2005, after monitoring indicated that Delta smelt populations were at record low levels, fishery biologists recommended that exports be curtailed to reduce entrainment. Agency managers, keenly aware that the EWA's supplies were scarce and concerned that there would be inadequate supplies avail-

FIGURE 9
Unmet environmental water targets, 2000–2005



Between 2002 and 2004, the EWA and the CVPIA have been underendowed, on average, by 436,000 acre-feet. CVPIA supplies began diminishing after the Interior Department's 2003 Decision (already in place in 2002), which offered far less protection than the previous policy. The EWA, which began in 2001, has never acquired the operational assets that were assumed in the CALFED Plan and its purchased assets dropped significantly in 2004 due to funding limitations. Current trends indicate that neither the EWA nor the CVPIA supplies are likely to be available in 2005 and beyond, as intended in the CALFED Plan, unless significant changes are made. Without adequate and reliable CVPIA and EWA supplies, it is unclear whether the EWA's role as an insurance policy protecting water contractors from the Endangered Species Act can or should continue.

Source: California Department of Water Resources, U.S. Bureau of Reclamation

able later in the year, sharply reduced the amount of EWA water that would be provided to the endangered fish and did not curtail exports as much or as long as was requested.¹⁸

In summary, it is apparent that fishery agencies now have more than 400,000 acre-feet *less* water per year in CVPIA and EWA supplies alone, compared with the requirements of the

CALFED Plan, with which to comply with ESA objectives and restore the health of the Bay-Delta ecosystem (Figure 9). The backstop for this shortfall, CALFED's Tier 3, has no assets, no plan and has been virtually ignored. And, as the health of the Bay-Delta continues to spiral downward, exports from the estuary have reached record high levels.

Future funding prospects are highly uncertain

Since its inception, funding for the CALFED program, and particularly the EWA, has largely relied on annual allocations from California's General Fund and financing from bond revenues. Both of these sources are quickly dwindling, contrary to the CALFED Plan's expectations that long-term funding would be available from the state and federal government. After its first year, funding for the EWA has steadily declined, hindering the ability of the account to purchase water. As sources of public funding are becoming scarce and without reliable operational assets, it is uncertain how the protections included in the EWA, as set forth in the CALFED Plan, will be assured.¹⁹ Without a viable EWA, it is unclear whether its role as an insurance policy protecting water contractors from the Endangered Species Act can or should continue.

Given the funding uncertainty, the Bay-Delta Authority was charged with completing a ten-year finance plan in

2004 to determine how best to support CALFED in the long-term. Given the lack of available public funding, there has been a growing interest in looking to the "beneficiary pays" principle included in the CALFED Plan, which relates directly to the concept of a "user fee." Under this principle, the costs of a project are allocated to specific entities in the same proportion as the direct and indirect benefits the entity is intended to receive from the project.

The potential role of user fees and other finance strategies are currently coming into play as the CALFED program undergoes an audit to evaluate its finance strategy, program management, overall program effectiveness and governance. The review process is expected to be completed in late 2005 and will include recommendations for the future of the program. Our recommendations for providing and potentially increasing the environmental water supplies required in the CALFED plan are outlined below.

Opportunities for greater environmental protection

There are many opportunities to realize the environmental water assurances promised in the CALFED Plan and to extend additional protection to the Bay-Delta estuary. The CALFED Plan clearly states that the EWA should be expanded with an appropriate share of newly developed water supplies.²⁰ The most logical approach to meeting CALFED's objectives for improving fisheries protection is to increase the water supplies available to fish when they are at risk through flexibility in project operations. Such protections should be required as operating guidelines included in the regulatory standards to which water projects much adhere.

As actions are taken to modify and modernize water management in California, opportunities will arise for obtaining the water necessary to provide additional flexibility. Some of the most promising opportunities for additional environmental water are as follows.

Flexibility through integration of existing projects

At a closed-door meeting in Napa in 2003, state and federal export agencies, along with their contractors, identified how integrated operation of the SWP and CVP could generate additional water supplies.²¹ By integrating the conveyance-rich SWP with the storage-rich CVP, water contractors have shown that exports can be increased. These additional supplies should be provided to the environment as a first priority to ensure additional operating flexibility to mitigate the adverse effects of water project operations, rather than to the export agencies that are already enjoying historically high export levels.

Flexibility in increased export capability

Current proposals by the federal and state water projects and their contractors to increase the capacity to export water at the Delta pumping plants have met substantial resistance, given their potential impact on the Bay-Delta and its fisheries. In the event that pumping capacity is increased, however, we recommend that the additional capacity (estimated at 200,000 acre-feet) be dedicated to improving the timing of exports in order to protect fisheries. We also recommend that the overall volume of exports should not be increased until, and unless, there is a viable long-term upward trend in estuarine health. At a minimum, imposing such a constraint would motivate the water contractors to act creatively on behalf of estuarine recovery. Even with these caveats, however, it may well not be feasible to combine even higher levels of pumping with strong estuarine recovery programs, no matter how much flexibility is given to the operators in timing exports.

Increase usable storage in San Luis Reservoir

The CVP and SWP share San Luis Reservoir, a 2 million acre-foot storage facility located south of the Delta along the federal and state aqueducts. San Luis is the primary reservoir for storing EWA supplies, but the EWA has only junior rights in the reservoir and its supplies can "spill" when the CVP and SWP fill their shares of the reservoir. Due to poorly located outlets, San Luis Reservoir's current storage capacity is not fully usable without rendering the Santa Clara Valley Water District

(SCVWD) unable to access its supplies. Solving this “San Luis Reservoir Low Point problem” by physically modifying the reservoir would provide SCVWD with both improved water quality and year-round access to the CVP while creating another 200,000 acre-feet of additional active storage. The CVP and SWP have not, as of today, allocated this storage to a specific purpose. This additional capacity should be dedicated to the EWA to enhance the environment and provide additional protection without affecting water contractors. If, on the other hand, the additional storage is dedicated to increased water supply, it may increase exports by 200,000 acre-feet annually without mitigation and thereby exacerbate environmental problems in the Delta.

Restoring the CVPIA’s commitments to fisheries protection and restoration

There are several opportunities to attain greater protection using the environmental water provided to the Central Valley and Bay-Delta by the CVPIA. The Interior Department should:

- Revise and greatly expand the use of “reoperation” pursuant to Section 3406(b)(1)(B).²² Perhaps the single most useful application of the reoperation criteria is clarifying that B1 reoperation can be used to allow reduced late summer reservoir releases to compensate for increased springtime releases to aid outmigration, without additional charges to the B2 account.²³
- Formally implement the May 2003 ruling of the Court of Appeals for the Ninth District regarding the “Primary Purpose” of B2. As a result, the WQCP would still be fully applied but significant portions of the B2 supply would in all years be dedicated to providing

for the spawning and outmigration of salmon and steelhead. The WQCP would still be fully implemented. In 2004, the Interior Department did dedicate an additional 166,000 acre-feet to comply with obligations under the WQCP, but has shown no indication of how, or when, it will establish an official policy consistent with the court’s ruling.

- Develop a policy to facilitate the authorized “banking” of B2 water (Section 3408(d)). Currently, the B2 account is in a “use it or lose it” situation, in which at the end of the water year (September 30) any remaining B2 water is eliminated. In the 13 years since the CVPIA became law, the U.S. Department of the Interior has made no serious attempt to implement the CVPIA’s authorization of banking.

Implementing CALFED’s EWP and Section B3 of the CVPIA

CALFED’s Environmental Water Program and Section B3 of the CVPIA are tools created to purchase water to enhance instream flows on upstream tributaries. To date, however, neither tool has lived up to its potential largely due to a lack of dedicated funding. A serious commitment is needed to fully fund and implement these tools, which could result in improvements to both upstream and Delta environmental conditions.

Retiring drainage-impaired land in the San Joaquin Valley

The U.S. Bureau of Reclamation is currently reviewing alternatives to provide drainage service to dispose of salt-laden agricultural run-off on the west side of the San Joaquin Valley. The environmentally preferred alternative in the draft Environmental Impact Statement

involves the retirement of lands impaired by drainage which has left the soil saline and unproductive. A significant portion of the water saved as a result of land retirement should be dedicated to the environment to fulfill the assurances in the CALFED Plan.

Implementing user fees

The CALFED Plan included several commitments to user fees and to the beneficiary pays principle. In particular, it promised the creation of the Ecosystem Restoration Program, financed partially by user fees in the amount of \$35 million per year. Revenues from such a water use fee (as opposed to the

reallocation of existing user fees such as those in the CVP Restoration Fund, as has been proposed by some water users) could help assure that sufficient funds are available for additional operational flexibility and could be less subject to significant shortfalls than would be the case where reliance is placed on state and federal general funds.

A water use fee would also provide water contractors with significant incentives to manage their own supplies in the most efficient manner. If the fee is high enough, water contractors might find that rather than export additional water, they might better develop their own supplies or improve efficiency in their water use.

CHAPTER 6

Conclusion

State and federal projects are exporting record volumes of fresh water from the Bay-Delta while the Delta's fisheries and food web are severely distressed. Stakeholders have made great efforts over the years to forge creative solutions to meet a variety of program objectives, including Bay-Delta protection, but they have not been fully implemented. This report illustrates that while the environmental water supplies set forth in the CALFED Plan have not been provided, a number of opportunities exist to find the water needed to revive the Bay-Delta.

Debate will continue not only on how to balance the competing needs of environmental and developed water, but also how and when environmental water might best be applied. Research is needed to investigate the connection of introduced species, chemical contaminants and other factors to recent fishery declines. Regardless, the health

of the San Francisco Bay-Delta estuary depends on a reliable set of environmental safeguards, including dependable water supplies. The EWA and CVPIA supplies that have been lost should be replaced, and potentially expanded, as soon as possible.

Any plan to sustain the estuary must include a methodology for using environmental water, assurances that water will be provided and consequences for non-compliance. It is necessary that fishery interests have a strong hand in the operation of the water projects that control the flows into and out of the Delta. Over the last five years, the failure to implement the protective operating criteria outlined in the CALFED Plan has been unacceptable. It is time for government agencies, water contractors and the interested public to implement a sustainable plan to guarantee the long-term health of the San Francisco Bay-Delta estuary.

Notes

- ¹ Abundance of Delta smelt and other estuarine species are estimated by a population index that is determined by the results of the “fall mid-water trawl,” conducted monthly September through December at locations throughout the estuary.
- ² Interagency Ecological Program Workplan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary, 2005.
- ³ The CALFED Plan was formally released as a “Programmatic Record of Decision,” pursuant to state and federal environmental laws on August 28, 2000.
- ⁴ Tier 3 was intended to be a set of actions that would be available if the EWA did not have sufficient assets to accomplish its objectives. Despite the erosion of Tier 2, Tier 3 assets have never been provided nor is there a plan in place to do so.
- ⁵ The CVPIA also addresses pricing policies, contract renewal, water marketing and water conservation issues. All of these elements have been subject to at least some degree of controversy and have faced difficulties in their implementation.
- ⁶ Anadromous fish live in the ocean but return to freshwater to breed. Most of the focus of the AFRP has been on the four runs of salmon native to the Central Valley: winter run, spring run, fall run and late-fall run. The AFRP lists as a primary purpose the doubling of the natural production of anadromous fish (an objective not met by the 2002 target date).
- ⁷ Thoroughly addressing the use of Section B3 of the CVPIA is beyond the scope of this report. To date, the use of this tool has been limited.
- ⁸ The EPA has no authority to directly affect water rights under the Clean Water Act but the practical consequence of requiring salinity reduction in the estuary is that outflows would need to be increased.
- ⁹ Other “local” water projects, in both the Sacramento and San Joaquin basins, have negotiated for the sale of water, both as transfers to other agencies or for environmental protection, but have not been required to make any uncompensated contributions. For example, a group of water agencies have formed the San Joaquin River Group Authority to provide additional spring flows at Vernalis to assist with out-migration of salmon.
- ¹⁰ X2 is the location, measured in kilometers from the Golden Gate Bridge, where average daily salinity is 2 parts per thousand. The scientific underpinnings of the X2 standard were established in a series of workshops. See “Managing Freshwater Discharge to the San Francisco Bay/Sacramento-San Joaquin Delta: The Scientific Basis for the Estuarine Standard,” San Francisco Estuary Project, 1993, J.R. Schubel et al.
- ¹¹ The Vernalis Adaptive Management Plan (VAMP) is an experiment to determine the extent to which flows and exports impact San Joaquin River juvenile salmon survival as they outmigrate. The purpose of VAMP is to support the outmigration of San Joaquin River salmon and reduce exports at the federal and state pumps between April 15 and May 15 (or when San Joaquin smolts tend to be outmigrating). Challenges to VAMP that point out its inadequacies in meeting the salmon doubling objective on the San Joaquin River have not been squarely addressed by the SWRCB.
- ¹² The CVPIA states that the AFRP’s primary purpose is to double populations of anadromous fish, leaving water quality objectives in the Bay-Delta and Endangered Species Act compliance as secondary purposes. The Court of Appeals later ruled that the Interior Department did in fact need to apply the CVPIA’s primary purpose of giving anadromous fish first priority. The Interior Department has issued no ruling clarifying its adherence to the ruling, but did dedicate additional supplies to its WQCP obligations beyond the B2 account in 2004.
- ¹³ EWA data was provided by the Department of Water Resources. CVPIA data was provided by the U.S. Bureau of Reclamation. Environmental Defense applied Interior’s 1999 Decision to the Bureau’s data for 2002–2004.
- ¹⁴ Review of the 2003–04 Environmental Water Account (EWA). Submitted by the 2004 EWA Technical Review Panel, January 17, 2005.

- ¹⁵ A target of \$50 million annually for the EWA was initially proposed in “California’s Water Future: A Framework for Action”, released in June 2000 shortly before the CALFED Plan. This original estimate assumed that more than 80% of purchased supplies would be acquired south-of-Delta. Water managers have found it to be more cost-effective to purchase water north-of-Delta and move it south through the Delta export pumps when monitoring indicates that relatively few fish will be entrained in the Delta export pumps.
- ¹⁶ Availability of willing sellers has not been the problem. Acquiring funding to pay the sellers has been the challenge.
- ¹⁷ Whether bond funds were intended to be spent on annual operations, rather than on long-term or permanent capital improvements or acquisitions is an issue that has not explicitly been addressed in CALFED’s decision-making.
- ¹⁸ Summary of interagency “Data Assessment Team” conference call February 1, 2005.
- ¹⁹ The acquisition of assets and assurance of reliable supplies need not be identical to those defined in CALFED’s EWA. The key is to assure a sustainable and reliable supply of environmental water for the purpose of flexible and prescriptive actions for optimum environmental protection.
- ²⁰ CALFED Programmatic Record of Decision, August 28, 2000, p. 57.
- ²¹ Formally titled “Draft Proposition Concerning CVP/SWP Integrated Operations”, the Napa Proposition was made available to the public in August 2003.
- ²² The California Resources Agency tends to agree with this suggestion. See January 15, 2005 letter from California’s Department of Water Resources and Department of Fish and Game to the U.S. Bureau of Reclamation and the U.S. Fish & Wildlife Service regarding “Integration of Central Valley Project Improvement Act Actions with the Environmental Water Account.”
- ²³ This amount of reoperation often approaches 195,000 acre-feet since the CVP no longer makes releases to support its own exports through “D1485 Wheeling” at the state’s pumps in late summer. The CVP’s export reductions at that time are properly considered to be charges to the B2 account.



ENVIRONMENTAL DEFENSE

finding the ways that work

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EXHIBIT 2

TIER 3 PROTOCOL

Interrelationship of Tier 2 and Tier 3

Tier 3 is referenced on pages 57 and 58 of the CALFED August 2000 Record of Decision (ROD) in the following context:

ESA Commitments

As part of the MSCS Conservation Agreement and the FWS and NMFS biological opinions, the CALFED Agencies have provided a commitment, subject to specified conditions and legal requirements, that for the first four years of Stage 1, there will be no reductions, beyond existing regulatory levels, in CVP or SWP Delta exports resulting from measures to protect fish under FESA and CESA. This commitment is based on the availability of three tiers of assets:

Tier 1 is baseline water, provided by existing regulation and operational flexibility as described above. The regulatory baseline consists of the biological opinions on winter-run salmon and delta smelt, 1995 Delta Water Quality Control Plan, and 800 TAF of CVP Yield pursuant to CVPIA Section 3406(b)(2).

Tier 2 consists of the assets in the EWA combined with the benefits of the ERP and is an insurance mechanism that will allow water to be provided for fish when needed without reducing deliveries to water users. (These assets are shown in the table on page 58 of the ROD). Tier 1 and Tier 2 are, in effect, a water budget for the environment and will be used to avoid the need for Tier 3 assets as described below.

Tier 3 is based upon the commitment and ability of the CALFED Agencies to make additional water available should it be needed. It is unlikely that assets beyond those in Tier 1 and Tier 2 will be needed to meet ESA requirements. However, if further assets are needed in specific circumstances, the third tier will be provided. In considering the need for Tier 3 assets, the fishery agencies will consider the views of an independent science panel. Although the CALFED Agencies do not anticipate needing access to Tier 3 of water assets, the CALFED Agencies will prepare an implementation strategy for Tier 3 by August 2001, establishing a timely scientific panel process and identifying tools and funding should implementation of Tier 3 prove necessary.

Tier 3 Protocols

1. **Tier 3 is not an operational reserve for Tier 2.** The CALFED Agencies agree that Tier 3 actions are separate from EWA and that the EWA should not rely upon the existence of Tier 3 assets in its planning or operations. Tier 3 is a fail-safe device, intended to be used only when Tier 1 and Tier 2 are insufficient to avoid jeopardy to the continued existence of an endangered or threatened species.
2. Tier 3 assets will be used when: (1) EWA assets are exhausted (see Item 3); and (2) the Management Agencies determine that jeopardy due to project operations will occur unless additional measures are taken (see Item 4 below).
3. EWA assets are defined as exhausted when all real assets have been used and the limit on borrowing has been reached. The real assets include (1) the purchased assets that are being acquired for 2004; and (2) any operational assets that have been accrued or can reasonably be acquired in the near future. For 2004, the initial limit on borrowing has been established as 100 TAF. This amount represents the amount of water that could be extracted from groundwater in any single year. Additional borrowing may be developed through the year, but would be on a case-by-case basis.
4. The appropriate Management Agencies will make the determination that a species is near jeopardy if project operations are not modified. The Management Agencies will request and consider the views of an independent science panel. At a minimum, this science panel will consist of the two EWA science advisors who are expected to respond within 48 hours. If sufficient time is available, additional independent scientists may be consulted. The Management Agencies have the discretion to take action while awaiting feedback from the science panel.
5. **Tier 3 assets will be used to the extent available to compensate the Projects and water users for impacts to their water supply from actions taken to avoid jeopardy.** If all Tier 3 assets are used, and additional actions are needed to avoid jeopardy, ESA consultation regarding project operations will be re-initiated. The biological opinion on re-initiation will include reasonable and prudent alternatives necessary to avoid jeopardy. Actions to avoid jeopardy will not be limited by the “no harm” principle (i.e.: there is no commitment that all water supply losses can be fully mitigated).
6. **The State and Federal Projects will be responsible for making preparations for the activation of Tier 3.** DWR and USBR are responsible for making preparations for the activation of Tier 3, just as they are responsible for acquiring EWA assets. Such preparations could include the acquisition or identification of water purchase options that could be converted easily into water. The cost of exercising the options would be paid by the Tier 3 fund. The Project Agencies should work cooperatively with the EWAT and other CALFED-related water purchase programs in developing a Tier 3 purchase plan.

EXHIBIT 3

Briefing Statement

From: Delta Smelt Working Group

To: Water Operations Management Team

Date: May 15, 2007

Re: Recommendations for Spring Action

Problem:

To date, the 2007 20-mm Survey for juvenile delta smelt has collected record low numbers of juvenile delta smelt. After the fifth of eight surveys, only 25 individuals have been collected, about 7.7 percent of the 326 taken to this point in 2006, and only 7.1% of the 2000-2006 average of 353. The DSWG has reviewed the progression of catches that typically occur during the course of the 20-mm Survey to evaluate the chance that there will be an upswing in the number of larvae collected later this year that will bring 2007 catches more in line with previous years. The group considers such an increase in catches to be possible but unlikely.

The likelihood of a very low outcome creates a very high degree of concern for the Delta Smelt Working Group. Water temperatures in the Delta have risen above the range wherein the majority of delta smelt spawning occurs, meaning that very little additional spawning is likely to take place this year. Further, the most recent 20-mm Survey results shows that delta smelt are distributed in the central Delta, increasing the risk of entrainment. In fact, the first salvage of delta smelt juveniles were observed at the Federal water export facility on May 11. For an annual species such as delta smelt, failure to recruit a new year-class is an urgent indicator that the species has become critically imperiled and an emergency response is warranted.

Recommendation:

The goal is no further entrainment of delta smelt. To achieve this, the Projects should modify flows to achieve a non-negative daily net flow (meaning daily net flow should not be southward) in Old and Middle River. This should be implemented as soon as possible and continue until southern Delta water temperatures reach 25⁰C, the lab-lethal limit.

Uncertainties:

(1) The DSWG recognizes that water project operations are not the only forces driving down delta smelt numbers. Although we are confident the proposed action will reduce entrainment, it is uncertain whether it will substantially increase the percentage of this year's recruit class that survives to reproduce next winter. (2) The group also recognizes that it may not be possible, given flows and constraints on Project pumping, to achieve a zero net flow in Old and Middle River. (3) Given that delta smelt densities appear to be near the lower limit at which the 20-mm Survey may reliably detect them, our ability to accurately assess distribution of delta smelt larvae and to evaluate the efficacy of the recommended action is likely to be very low. (4) There is no prescriptive recommendation regarding the Head of Old River Barrier (HORB); however, it is possible that the HORB's influence on OMR flow may be significant. Removing the barrier may therefore be a possible management tool to achieve the Working Group's recommendation.

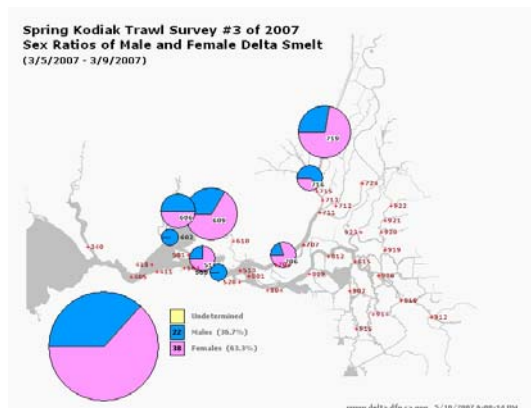
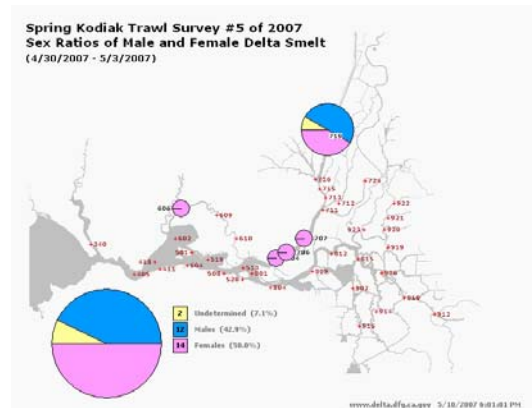
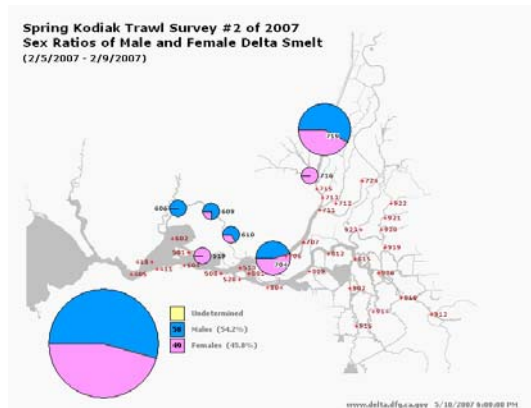
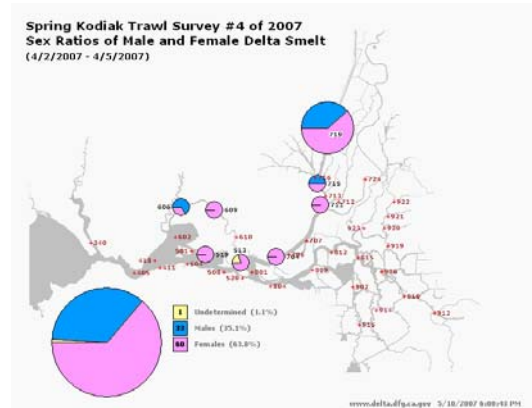
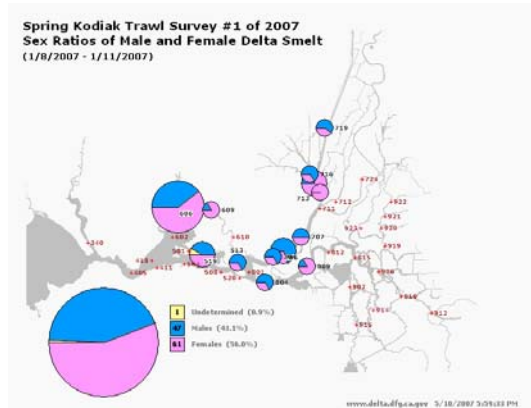
Management Implications:

The water cost of the recommended operational change is presently unknown, but may be significant.

Attachments:

1. Summary of Spring Kodiak Trawl survey for pre-spawning adult delta smelt
2. Summary of 20-mm Trawl survey for juvenile delta smelt
3. Frequency Distribution for 20-mm Survey
4. Frequency Distributions of Delta Smelt in the 20-mm Survey, 1995-2007
5. Frequency Distribution of Delta Smelt in the 20-mm Survey, 1995-2007. Equal scale on x-axis.

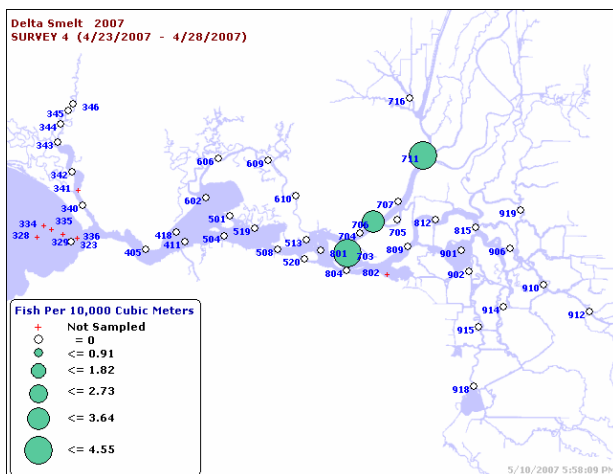
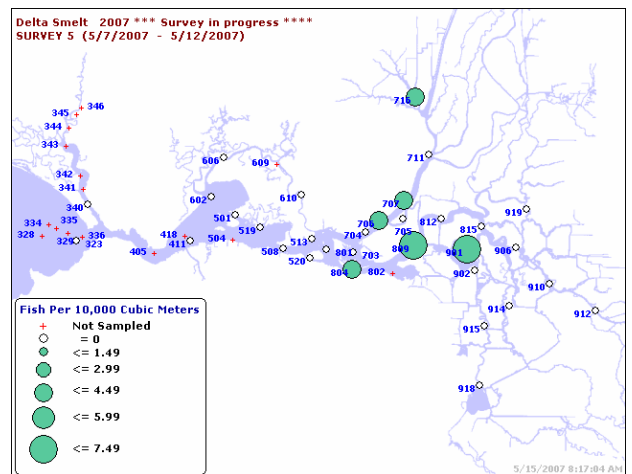
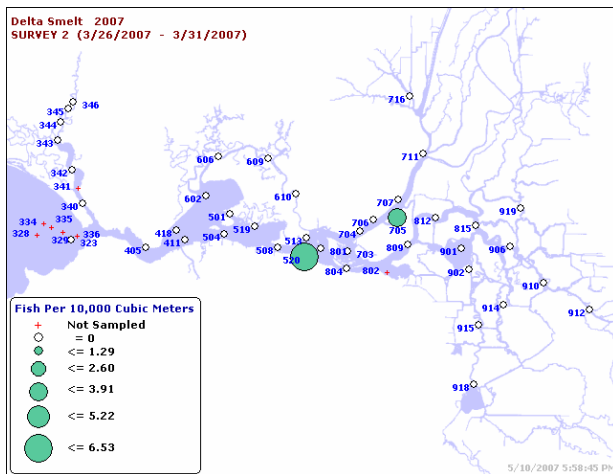
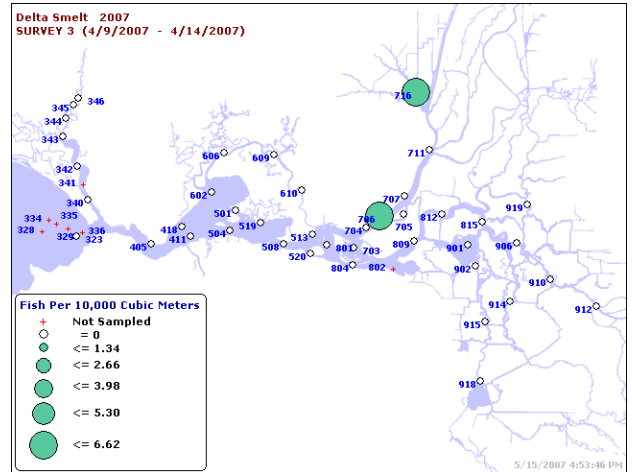
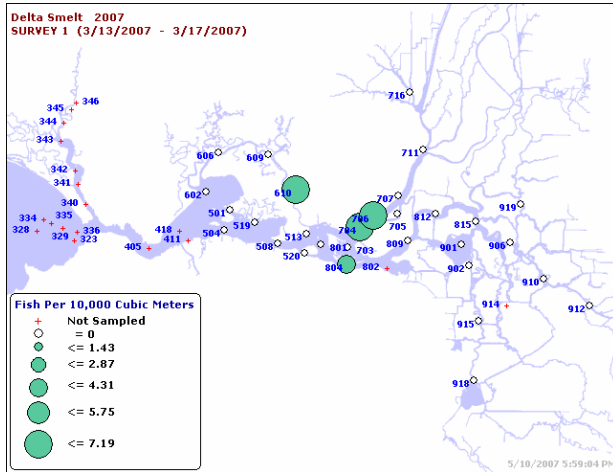
Attachment 1. Summary of Spring Kodiak Trawl survey for pre-spawning adult delta smelt, 2007. Note that the distribution of adult delta smelt appears to be favorable, with regard to risk of entrainment. Overall numbers collected were low relative to previous years.



Comparison of SKT surveys, by year

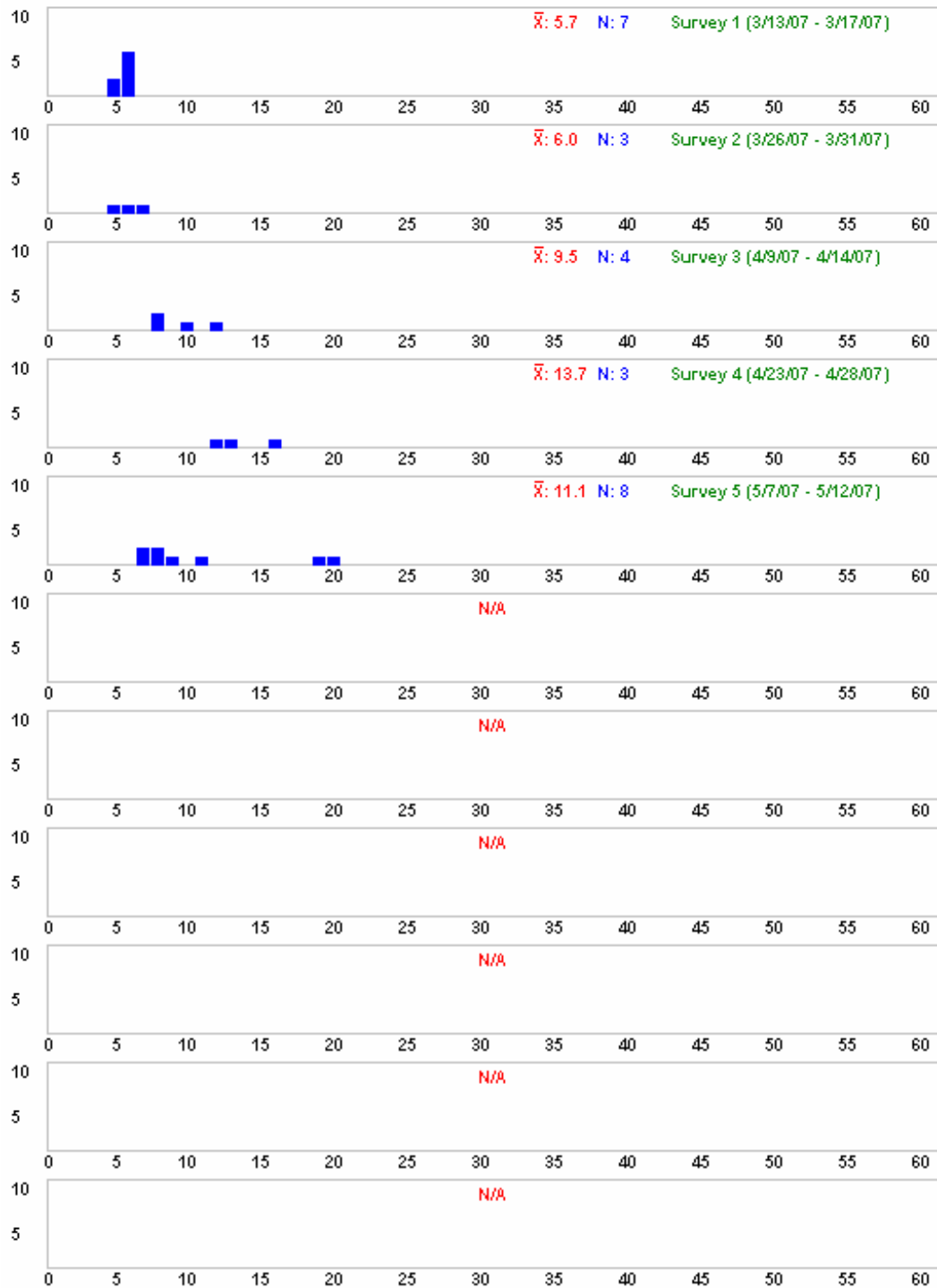
	2007	2006	2005	2004	2003	2002
1	109	42	220	380	232	261
2	107	84	218	300	373	392
3	60	70	27	196	43	238
4	94	77	28	62	33	-
5	28	14	-	13	-	-
N	398	287	493	951	681	891

Attachment 2. Summary of 20-mm Trawl survey for juvenile delta smelt, 2007. Early distributions of juveniles were similar to adult distribution as indicated by SKT results, but the latest survey results are less favorable. Overall numbers collected were extremely low relative to previous years.

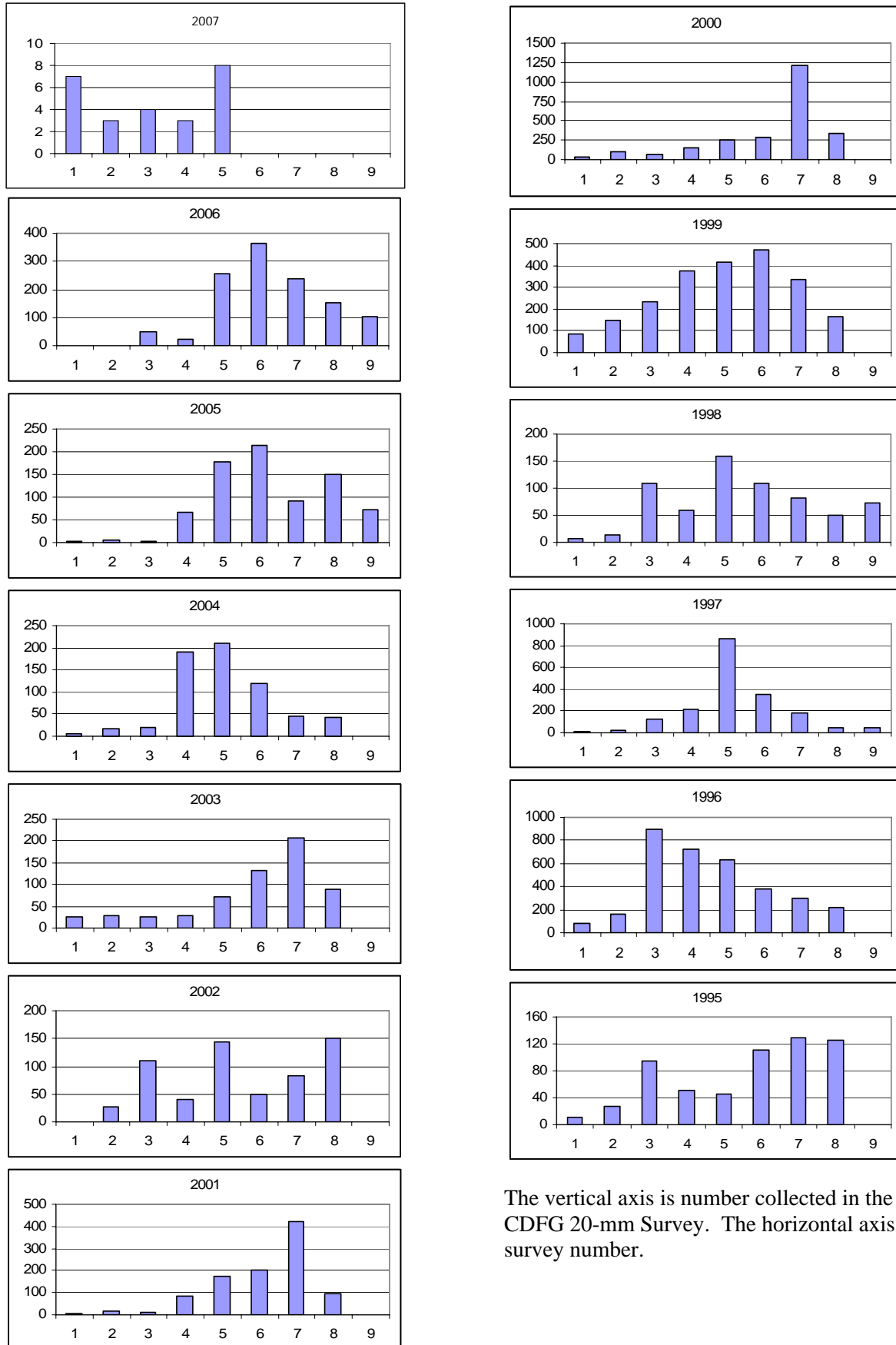


Attachment 3. Frequency Distribution of Catch, 20-mm Survey, 2007.

Delta Smelt Length Frequency for 2007

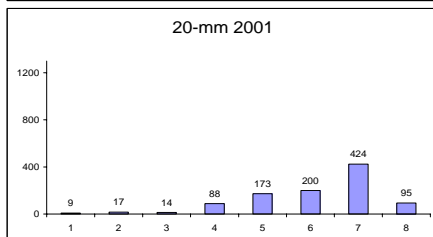
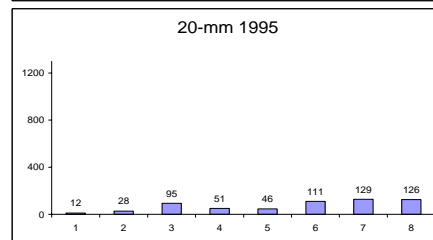
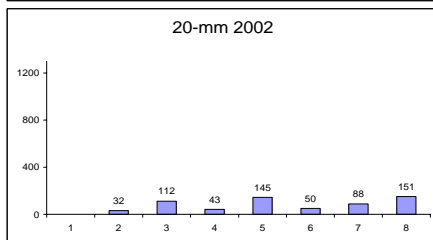
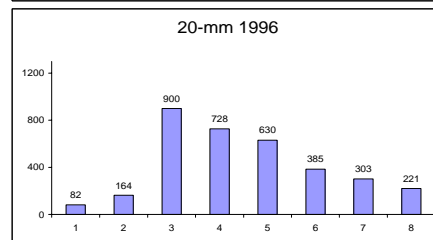
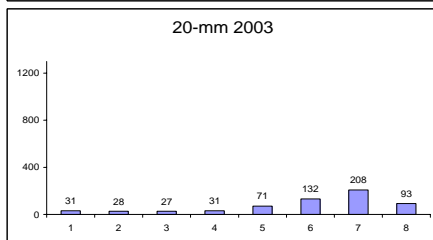
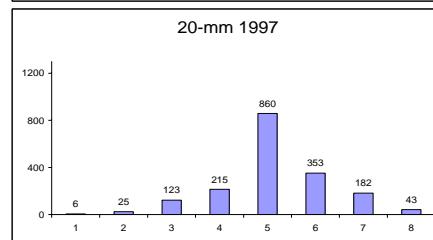
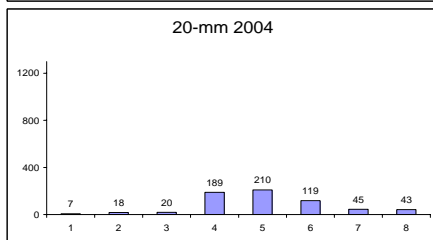
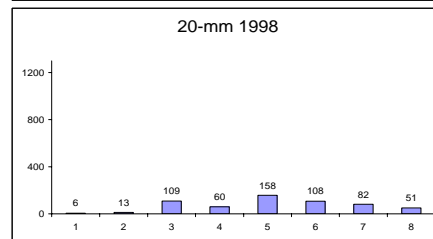
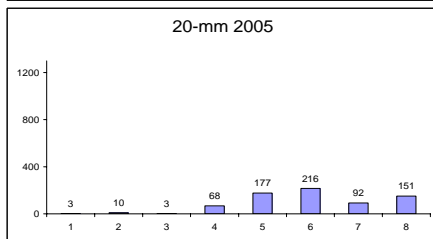
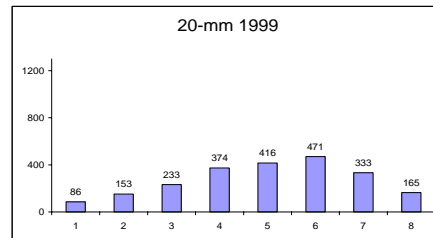
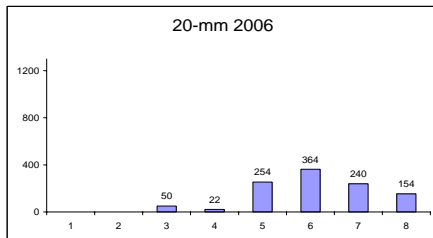
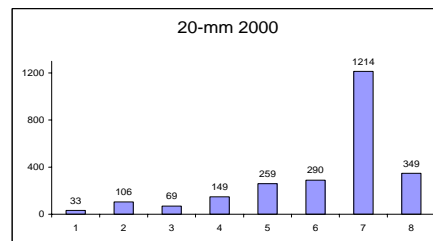
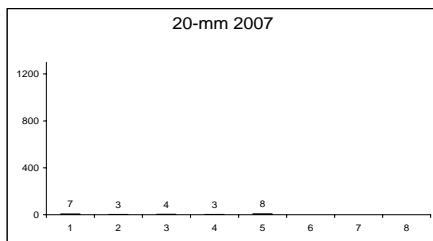


Attachment 4. Frequency Distributions of Delta Smelt in the 20-mm Survey, 1995-2007.



The vertical axis is number collected in the CDFG 20-mm Survey. The horizontal axis is survey number.

Attachment 5. Frequency Distribution of Delta Smelt in the CDFG 20-mm Survey, 1995 to 2007. Equal scale on x-axis.



The vertical axis is number collected in the CDFG 20-mm Survey. The horizontal axis is survey number.

EXHIBIT 4

Statement Presented by
Ryan Broddrick
Director, California Department of Fish and Game
To
U.S. House of Representatives, Committee on Natural Resources
Subcommittee on Water and Power
Oversight Hearing on “Extinction is not a Sustainable Water Policy: The Bay Delta
Crisis and the Implications for California Water Management”
July 2, 2007
Vallejo City Council Chambers, Vallejo, California

I appreciate the opportunity to provide input to this Subcommittee on the important and urgent matter of declining fishery resources in the San Francisco Bay/San Joaquin Delta Estuary. Of particular concern to us is the recent serious and unexpected decline (approximately 90%) in young Delta smelt produced this season. As alarming as the reduced numbers are, this decline is part of a more generally observed decline in other important fish and aquatic resources in the estuary. Anadromous fish (steelhead and salmon), sport fish (striped bass), other native fishes, and some important fish food organisms (invertebrates) of the Delta are in serious trouble and have been receiving our attention in planning and regulatory activities. The California Department of Fish and Game is actively involved in efforts to determine causes, implement response measures within our authorities, and develop a long-term strategy for Delta sustainability. The Federal Government’s involvement is crucial to developing a comprehensive and long term solution to fix the “broken Delta”.

There are many causes for the fish and invertebrate declines and our understanding of these causes is limited. Our cooperative efforts to determine the causes of the decline have pointed towards invasive species, toxics, predation and water diversions as having primary roles in the declining health of the Delta. We continue to monitor, evaluate and explore these issues in order to make further scientifically justified determinations as to the role of each factor and how issues may be addressed in order to ensure future Delta health.

Governor Schwarzenegger has initiated a comprehensive Delta Vision effort to rethink what the Delta should look like in the future. A Blue Ribbon task force has begun meetings designed to lead towards recommendations for actions by the legislature and Governor. In addition, many state and federal agencies, along with a growing number of environmental groups, signed a formal Planning Agreement in September 2006 and are developing the Bay Delta Conservation Plan (BDCP) for at-risk fish species under the provisions of the State Natural Community Conservation Planning Act (NCCPA) and Section 10 of the federal Endangered Species Act. These efforts will provide a framework, plan, and commitment for future action.

Background- The Pelagic Organism Decline

The Interagency Ecological Program (IEP), a multi-agency state and federal group, has monitored and studied biological and hydrological resources in the Estuary for almost 40 years. The data set generated by the IEP is one of the most complete data sets documenting relationships between fish and aquatic resources and water development projects in the world. The information developed during this time has provided the foundation for our understanding of the ecological implications of water resources management in this system. In early 2005, scientists from our IEP first observed serious declines in Delta smelt and certain other pelagic fish species (see Figure 1). In response, directors of the state and federal water and fish agencies directed approximately \$2.5 million for establishment of a Pelagic Organism Decline (POD) team to investigate the reasons for the decline. The POD team developed a study plan that identified three likely hypotheses responsible for the observed declines and embarked upon an aggressive and comprehensive effort to identify and address all likely causes for this decline. The three most likely stressors, possibly acting in concert, were identified as water diversions, invasive species/food chain changes, and toxics.

One year after the POD studies began, the team presented their first Synthesis Report and developed two scenarios among other possible causes: winter exports and bad environmental conditions in Suisun Bay. Data from the State and Federal water project facilities showed that water exports had increased during the winter months of November - March during the years of the pelagic organism decline (See Figure 2). Salvage data also showed that increased numbers of those fish showing the decline (Delta smelt, threadfin shad, striped bass and longfin smelt- see Figures 3 and 4) had also been taken in increasing numbers during that time. The second most likely hypothesis called the “Bad Suisun Bay Hypothesis”, suggested that conditions in the Suisun Bay area, a prime nursery area for young fish, had changed in some way to reduce its capability to sustain fish populations. The report suggested that some undefined combination of food production, invertebrate grazing rates, salinity regime changes, and introduced exotic species may be responsible for the declines. At that time toxics were not implicated as a major influence in the observed declines.

During the end of the first year of the POD investigations, researchers were beginning to develop information that could be helpful in understanding the declines and also for managing conditions to potentially reduce impacts. In the fall of 2006, the CALFED Program hosted the Science Conference and two significant findings were presented. First, a University of California researcher (Dr. Bill Bennett) suggested that the delta smelt females that reproduced early in the spawning season seemed to be most important in contributing to the next generation of smelt. This became known as the “Big Momma Hypothesis”. This suggested that more attention needed to be paid to water management earlier in the year than had been done heretofore. The second finding, by a USGS researcher (Dr. Pete Smith) suggested that there was a significant relationship between flows moving UPSTREAM toward the state and federal pumping plants in Old and Middle Rivers and fish caught later in the trawls surveys. In other words when flows upstream were greater, the negative impacts on smelt populations were greater. Both of

these findings would play a significant role in how fish and water agencies would manage the water projects in 2007.

During the 2006 water year, conditions were better and greater outflows moved the smelt further downstream in the estuary and away from the influence of the pumps. The abundance indices reflected a positive response and the numbers of Delta smelt increased slightly from the previous year. Things were looking slightly better for smelt.

2007 Activities

Water Diversions-Armed with new scientific findings, the fishery and water management agencies began to manage the water projects to facilitate protection of delta smelt and other aquatic resources in the estuary. The life cycle of Delta smelt (Figure5) was constantly considered in this process. Clearly water diversions from the Delta can cause direct and indirect mortality of Delta smelt and other aquatic organisms. For this reason, the Delta diversions of the State Water Project (SWP) and the Central Valley Project (CVP) are some of the most carefully regulated and monitored water diversions anywhere. Early in January 2007, a team of agency managers (Water Operations Management Team- WOMT) began operation of the state and federal pumping plants by trying to reduce upstream flows in Old and Middle rivers so that the important early reproducing smelt (“Big Mommas”) would not be drawn upstream toward the pumps and potentially removed from the estuary. Pumping rates were reduced using assets from the Environmental Water Account (EWA). By late May, the WOMT used over 300 thousand acre feet of Environmental Water Account water to implement fish protection actions, primarily protecting the spawning females during January, February and March. During winter and early spring the projects reduced net upstream flow in Old and Middle Rivers and no delta smelt were observed at the State Water Project and only a few at the Federal facility. Conditions looked good and the new management tools (reducing Old and Middle river flows to protect spawning females) seemed to be providing the desired impact avoidance. Field surveys showed the spawning smelt still securely distributed in Cache Slough and the Sacramento Ship Channel- out of the influence of the pumping plants.

On about May 15, field surveys (the 20 mm survey) carried out to monitor the relative abundance of juvenile smelt produced in the system produced alarming results. Numbers of young smelt were about 90 % below our previous year’s estimates (See Figure 6). More alarming was the fact that the young smelt were located in an area influenced by the pumps- the lower San Joaquin River! The WOMT immediately took action and reduced pumping significantly at the pumping plants. Diversions from the SWP facilities were reduced to 350 cubic feet per second (cfs), a 90 percent reduction from customary seasonal pumping levels, as a precaution. The federal CVP reduced pumping rates to 850 cfs. Additionally, WOMT ordered the Head of Old River Barrier culverts opened and

maintained flows in the Stanislaus River so that flows would remain higher in the San Joaquin River to help keep the young smelt from the pumps.

When greater smelt take occurred at the SWP intake facility in late May, DWR and the DFG jointly announced further curtailment of SWP Delta diversions and asked for voluntary curtailments by other Delta diverters. DWR stopped SWP Delta diversions entirely on May 31, 2007 for 12 days with future protective actions continuing to be guided by the best science and adaptive management. Other water diversions from the Delta are not monitored or regulated as carefully. Nevertheless, on June 1, 2007, DFG wrote to over 300 water diverters in the Delta asking them to “voluntarily cease or substantially reduce your diversions from the south delta channels...” DFG also restricted all non-essential scientific studies and fish sampling/monitoring that may incidentally take Delta smelt. Concurrently, the CVP reduced Delta diversions to the operation of a single pump, drawing about 850 cfs. After taking no smelt for two weeks, the CVP increased pumping to 2500 cfs on June 13, 2007. Nine hours later several smelt were taken at the Federal pumps, a clear indication that young smelt were still in the south delta area and caution regarding increased pumping should be used.

On June 17, 2007, the SWP and CVP increased pumping but still far below seasonal normal rates. Agency Directors became directly involved and daily operational decisions were made to reduce take of smelt at the facilities. As smelt grew and began to move downstream out of the influence of the pumps and temperatures approached the lethal limits of young smelt, pumping rates were allowed to increase to meet demands for water use in the state. As of June 27 some young smelt continued to be taken at the SWP.

Agency biologists studying the population dynamics of smelt now believe that the abundance of smelt in the estuary has reached such a low level that numbers are now being affected by the “stock recruitment relationship”. In other words, the most important factor affecting smelt numbers is the number of juveniles produced by the adult females. During other times when populations are higher, this relationship is not as significant and other factors contribute to the regulation of abundance (these are discussed below).

Therefore, it is DFG’s position that actions must be taken to protect as many individual smelt as can be through manipulation of the water projects. Each reproducing organism is important to the survival of the species.

Invasive Species-The San Francisco Estuary has been called the most invaded estuary on earth. Among the hundreds of introduced species, many cause competition, predation, or habitat modification that are detrimental to Delta smelt and other pelagic fishes.

Collectively all of these species are profoundly affecting the ecological functioning of the estuary. For example, the Asian clam Corbula, which became established in Suisun Bay in the 1980s is a filter feeder so effective and numerous that it can filter the entire volume of Suisun Bay in less than a day. This has had a devastating effect on the primary production of Suisun Bay. Further upstream the freshwater Asiatic clam, Corbicula, can

have a similar effect. In the late 1990s a new zooplankton Limnoithona invaded the estuary. This new zooplankton may not be a good food source for many important pelagic fish like Delta smelt and has replaced the smelt's preferred food source. Limnoithona is now the most abundant zooplankton in the estuary. This shift at the base of the food web may prove to be a major factor affecting Delta smelt. The toxic blue green algae Microcystis has increased in abundance in the past several years in the interior Delta causing concerns with both fish and human toxicity although none has been documented in this system. Other introduced species such as striped bass and black bass prey upon smelt directly. The Brazilian water weed Egeria, has also proliferated in recent years. This aquatic plant not only clogs water ways for boating but slows water velocity and allows suspended sediment to settle out. It is hypothesized that increased water clarity may reduce Delta smelt feeding success and increase predation upon them. Although eradication is impossible, DWR and the Department of Boating and Waterways are partnering to implement a control program for Egeria budgeted at \$3 million per year.

DFG and DWR are working aggressively to prevent new invasions. The two agencies responded swiftly when the quagga mussel Dreissena was discovered in Lake Mead and the Colorado River. If this prolific filter feeder were to invade the estuary it would likely cause further alteration in the food web. Much more effort needs to be exerted in order to deal with the problem of introduced species.

Toxics-Since 2005, scientists have been conducting toxicity screening of the waters in the Delta and Suisun Bay as part of the IEP Pelagic Organism Decline (POD) studies. Studies in 2005 and 2006 focused on the summer months when juvenile smelt are present in the Delta. To better characterize toxicity during the smelt spawning period, bi-weekly sampling and aquatic toxicity testing was initiated in January 2007. Preliminary evidence indicates potential toxicity in the Delta this winter and spring. The most troubling fact about these detections is that they occurred in the spawning grounds for Delta smelt this year when both adults and their young were present. Even though the number of adult Delta smelt this year was a little larger than last, the number of young smelt collected this year was about 90 percent less than last year (see above discussion). Although there is no evidence of direct toxicity to the Delta smelt, Delta toxicity could affect smelt directly or affect food availability for the species.

Researchers have initiated toxicity testing using cultured Delta smelt and are collecting samples upstream of the toxic sites in an attempt to identify the source and cause of the toxicity. The State Water Resources Control Board (State Water Board) and the Central Valley Regional Water Quality Control Board are actively evaluating all of this year's information to identify any necessary actions to prevent this type of toxic effect on endangered species from happening again next year.

Other new research provides an anecdotal suggestion that episodic toxicity could play a role in smelt survival. A study tracking tagged salmon in the south Delta collected apparent evidence in May of extensive salmon smolt mortality in a single area. This kind of event, if proven to be related to toxics, has the potential to seriously affect a species such as the Delta smelt and warrants further investigation.

The State Water Board held a workshop on June 19, 2007 to receive recommendations, and information to support these recommendations, on immediate, short term actions it should consider to slow or stop the decline of smelt and to improve fishery resources. The State Water Board is looking for information on both water quality and flow-related actions. Any increased involvement on the part of the federal government in these efforts would be welcome.

Current Restoration Efforts

In addition to near-real time management of the Estuary through processes discussed above, DFG is also involved in larger scale ecosystem planning to enhance the estuary. Early implementation of the Ecosystem Restoration Program (ERP) began three years prior to the signing of the CALFED ROD in August 2000 in recognition that ecological systems take time to show change. In the first nine years of implementation, ERP has made significant progress in improving the natural system. ERP has awarded more than \$615 million to 493 projects. To date, 276 projects or about 56 percent have been completed. Grant recipients reported approximately \$285 million in matching funds, which resulted in a combined total of about \$825 million spent on habitat and species associated with the Bay-Delta and its watersheds. Many ERP actions addressed priority Multi-Species Conservation Strategy (MSCS) species listed in the milestones. Restoration planning for the Suisun Marsh through the Suisun Charter process will result in the restoration and protection of 7,000 acres of wetlands in San Pablo Bay and Suisun Marsh, exceeding the Stage 1 target for tidal marsh restoration in San Pablo Bay. Restoration of tidal action to restore brackish marsh ecosystems within the next two years on the Blacklock property and Meins Landing will aid in the recovery of several listed and special status terrestrial and aquatic species. Restoration of tidal action and associated wetlands habitat on the 1,166 acre Dutch Slough Tidal Restoration Project will improve our understanding of ecological processes and how ecosystems function at different spatial scales.

The ERP has funded 82 fish screen projects to reduce mortality of salmonids. The ERP has also implemented channel and floodplain restoration projects to improve spawning and rearing habitat for salmonids including projects on key tributaries to the Sacramento and San Joaquin rivers. Removal of impediments to fish passage on Butte Creek, Clear Creek, and other Sacramento River tributaries has contributed to the rebounding of spring-run and fall run Chinook salmon populations observed in recent years. The Battle Creek Salmon and Steelhead Restoration Project is an exceptional conservation opportunity to reestablish 42 miles of prime and uniquely reliable salmon and steelhead habitat on Battle Creek and its tributaries. Successful implementation of this project will help restore populations of winter-run Chinook salmon, spring run Chinook salmon and steelhead, all of which are in danger or threatened with extinction as defined by the federal Endangered Species Act (FESA). Battle Creek offers this unique restoration opportunity because of its geology, hydrology, habitat suitability for several anadromous species, historical water allocation, and land use compatible with a restored stream environment. Of these qualities, the area's unique hydrology is perhaps the most important Battle Creek feature supporting its restoration potential. The Lower Yuba

River Accord EIR/EIS was released for public review on June 26th. The purpose of the Yuba Accord is to resolve instream flow issues associated with the operation of the Yuba River Development Project in a way that protects and enhances lower Yuba River fisheries, maintains local water-supply reliability and protects Sacramento-San Joaquin Delta fisheries. The ERP this year also funded the Narrows 2 bypass project on the Yuba River to protect habitat for the wild salmon and steelhead on the lower Yuba River.

Summary

This brief discussion of stressors, management actions, and organism responses is intended to convey our understanding that the pelagic organism decline, including the recent sharp drop in Delta smelt abundance, is an extremely complex phenomenon. We do not expect that the solution to such a complex problem lies in just one category of action. We will continue to be guided by the best science and adaptive management as our scientists work to understand the situation and our agencies seek solutions to Bay Delta problems both in the near-term and for the future.

Whatever actions we may take, we must include interests of all parties. As you know, there are no independent actions that can be taken in this complex system. Fishery agencies constantly balance needs of various listed species, and important non-listed species. Actions that affect the water projects also can potentially affect other users of water in the State including state and federal wildlife refuges. Before any actions are implemented careful consideration of associated fish and wildlife impacts is needed.

DFG is supportive of the federal government taking actions necessary to protect and restore the pelagic species and in particular the Delta smelt. We will work with you and others to accomplish this important result.

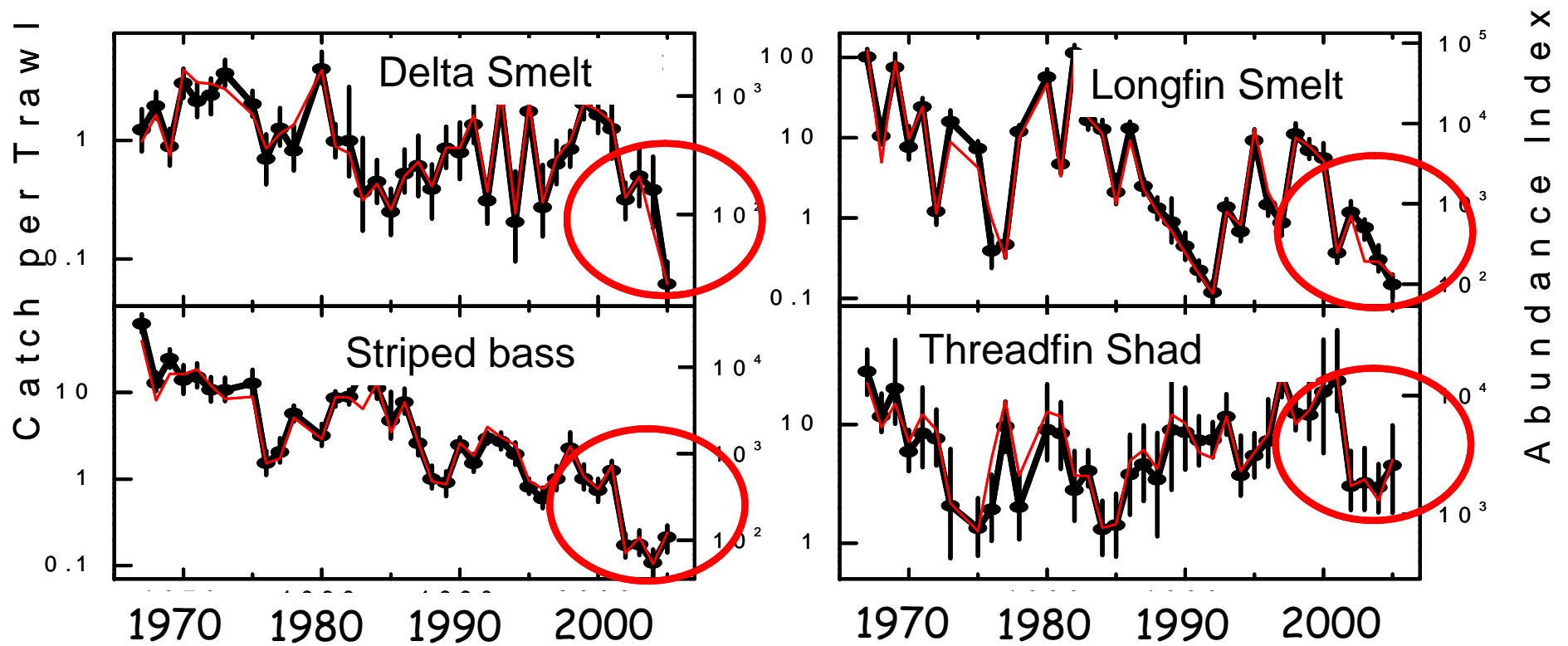


Figure 1. Annual abundance trends of four POD fishes based on Fall Midwater Trawl Survey data. Annual mean catch per trawl (black line) and annual abundance index (red line) are depicted.

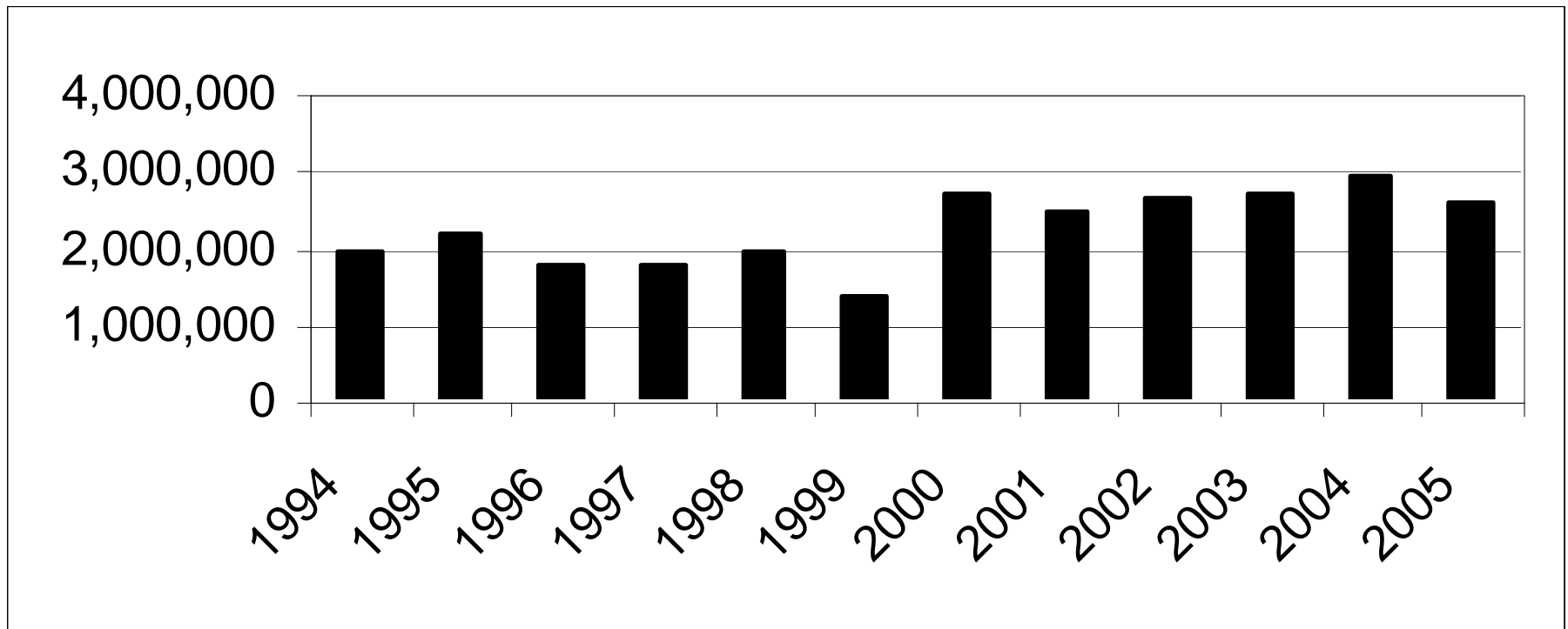


Figure 2. Total combined State Water Project and Central Valley Water Project winter exports (sum November through March) in acre feet plotted on year beginning in January.

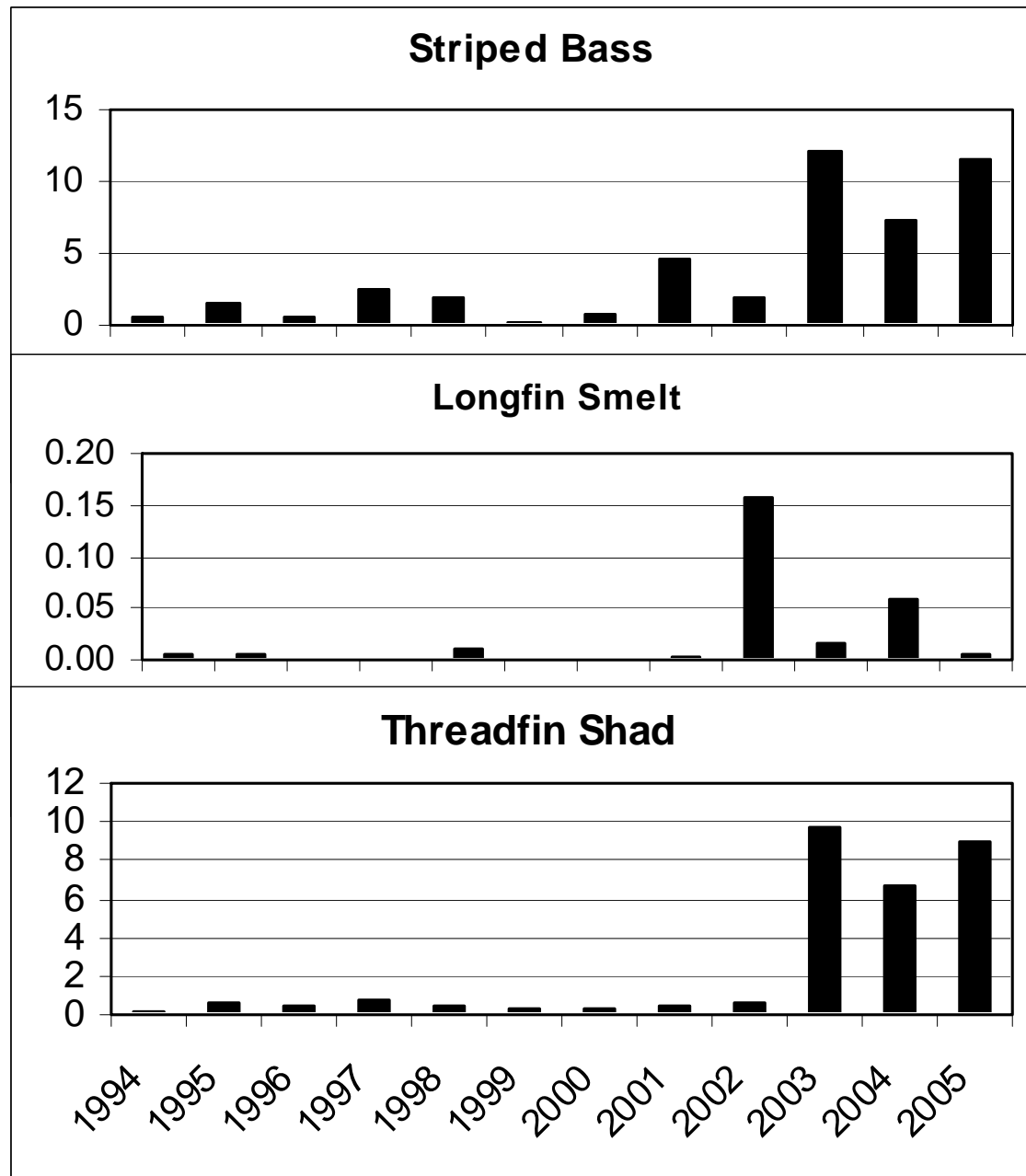


Figure 3. Winter salvage density (#/acre ft pumped) of three POD fishes scaled (divided) by the previous Fall Midwater Trawl abundance indices.

Delta Smelt

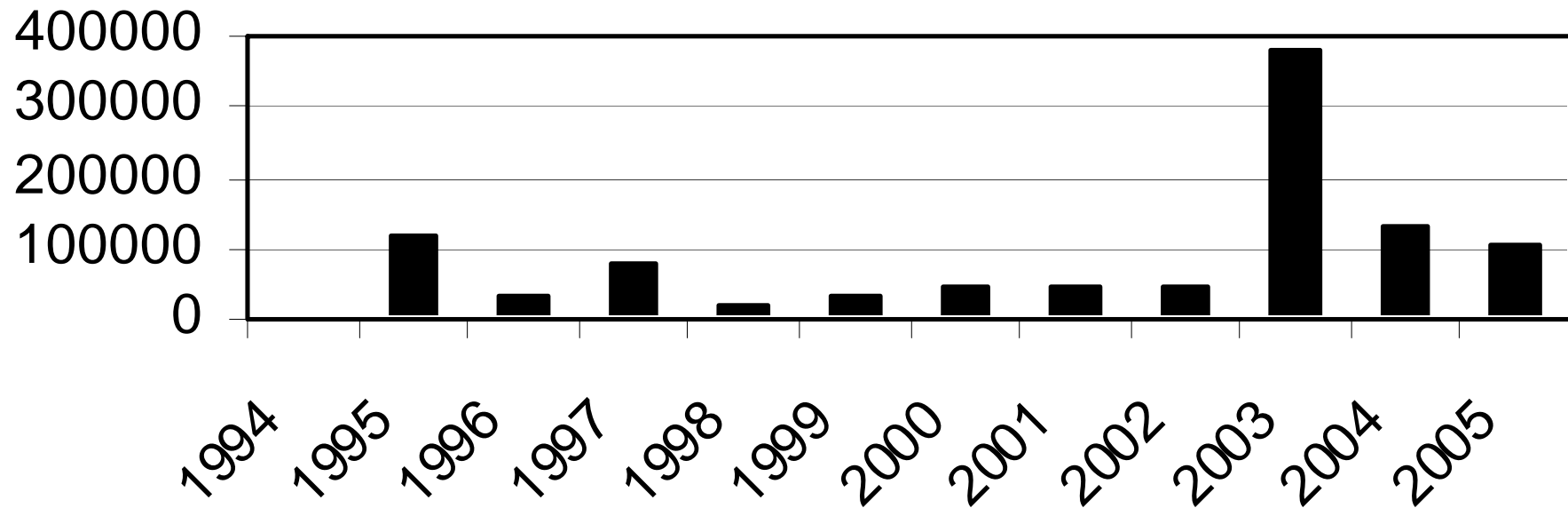


Figure 4. Winter salvage density (#/acre ft pumped) of delta smelt scaled (divided) by the previous Fall Midwater Trawl abundance indices.

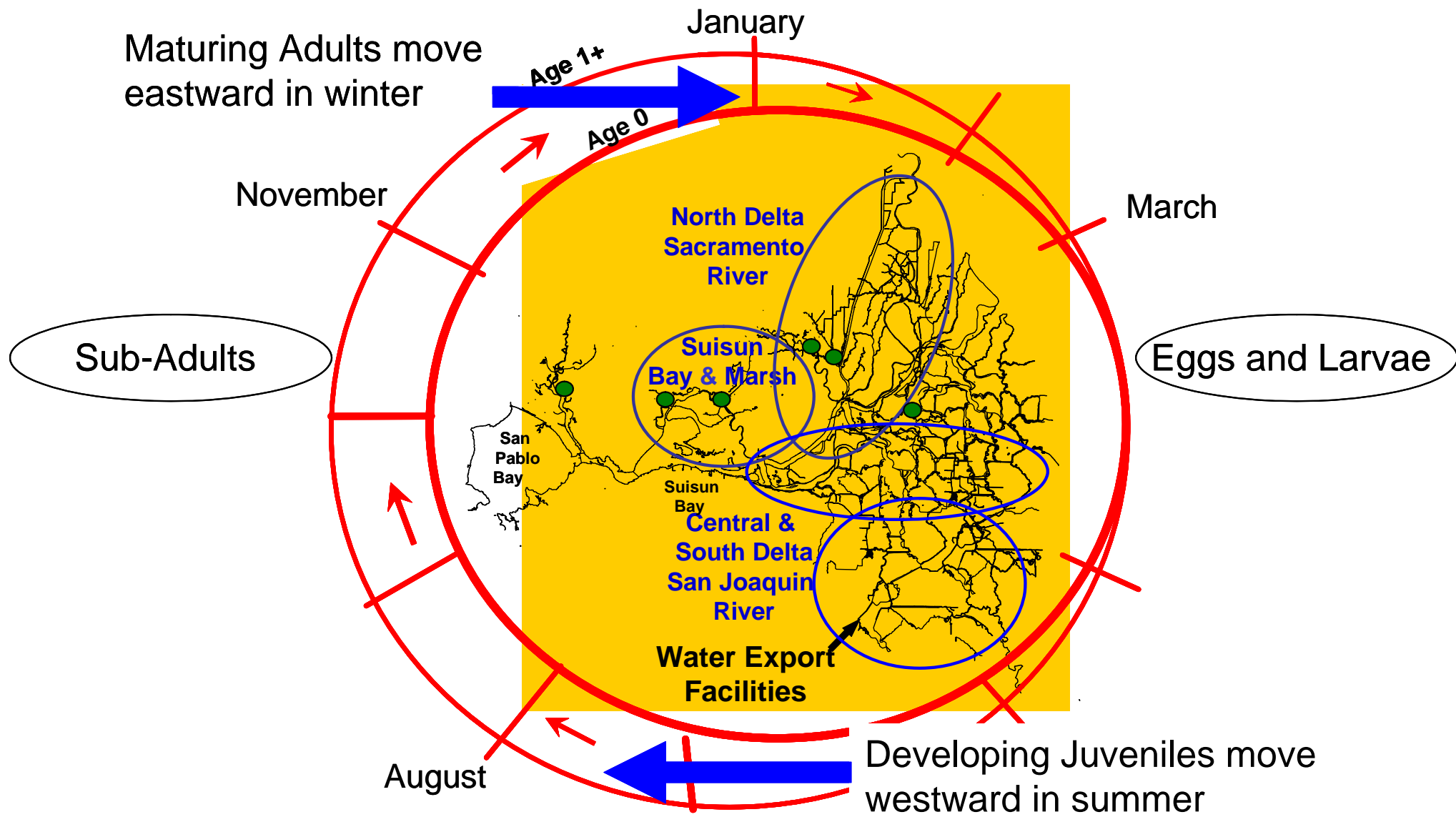


Figure 5. Delta smelt life history and general migration patterns: in winter and spring, maturing smelt move from the river confluence, Suisun Bay and Marsh eastward preparing to spawn, and become more vulnerable to entrainment by south delta export facilities. Subsequent progeny also remain vulnerable until they are able to swim and warm water temperatures drive them westward from the south delta.

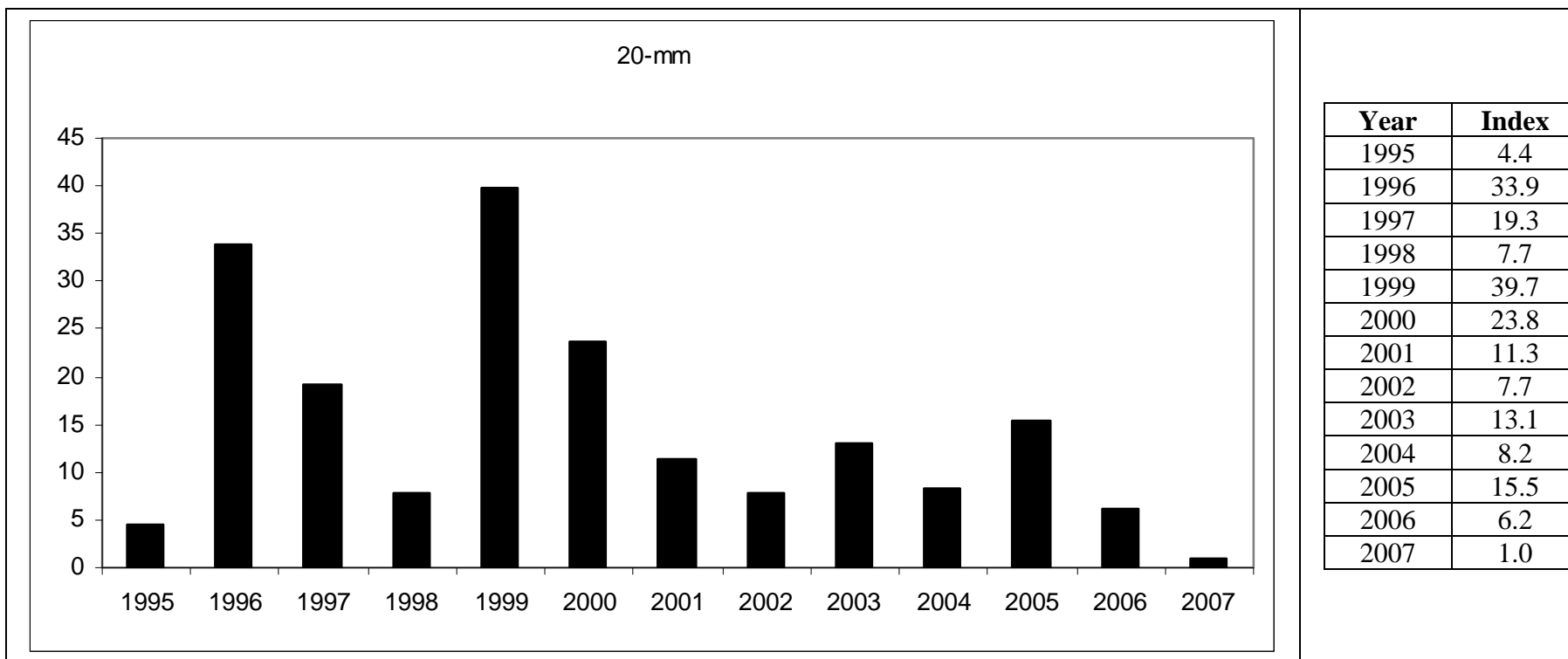


Figure 6. The 20mm survey delta smelt index by year, 1995-2007. Data processing for 2007 is not yet complete; data should be treated as preliminary and subject to revision.

EXHIBIT 5

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

May-07

Note: Bold numbers are not verified by DFG.

DATE	Delta Smelt				Splittail				Pumping						Delta Smelt Daily Density	
	Daily Total		Combined		Daily Total		Combined		Daily Total			Daily Total				
									In CFS			In Acre Feet				
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-May-07	0	12	12	2	4	0	4	2	531	849	1,380	1,054	1,684	2,738	0.0	7.1
2-May-07	0	0	0	2	0	0	0	1	872	560	1,432	1,730	1,110	2,840	0.0	0.0
3-May-07	0	0	0	1	4	0	4	1	677	848	1,525	1,342	1,682	3,024	0.0	0.0
4-May-07	0	0	0	1	0	0	0	1	676	846	1,522	1,340	1,679	3,019	0.0	0.0
5-May-07	0	0	0	1	0	0	0	1	675	844	1,519	1,339	1,674	3,013	0.0	0.0
6-May-07	0	0	0	1	0	0	0	1	673	855	1,528	1,335	1,695	3,030	0.0	0.0
7-May-07	0	0	0	1	0	0	0	1	679	693	1,372	1,347	1,375	2,722	0.0	0.0
8-May-07	0	0	0	1	0	0	0	1	578	852	1,429	1,146	1,689	2,835	0.0	0.0
9-May-07	0	0	0	1	0	0	0	1	652	853	1,504	1,293	1,691	2,984	0.0	0.0
10-May-07	0	12	12	2	0	0	0	1	532	853	1,385	1,056	1,691	2,747	0.0	7.1
11-May-07	0	48	48	5	0	0	0	1	538	849	1,387	1,067	1,684	2,751	0.0	28.5
12-May-07	0	0	0	5	0	0	0	1	530	849	1,379	1,052	1,683	2,735	0.0	0.0
13-May-07	0	12	12	6	0	0	0	1	786	850	1,637	1,560	1,686	3,246	0.0	7.1
14-May-07	0	0	0	6	0	0	0	1	661	844	1,505	1,312	1,674	2,986	0.0	0.0
15-May-07	0	0	0	5	0	0	0	0	521	853	1,374	1,034	1,692	2,726	0.0	0.0
16-May-07	0	0	0	5	0	12	12	1	302	852	1,154	600	1,689	2,289	0.0	0.0
17-May-07	0	0	0	5	0	0	0	1	275	855	1,130	545	1,696	2,241	0.0	0.0
18-May-07	0	0	0	5	4	0	4	1	317	852	1,169	629	1,689	2,318	0.0	0.0
19-May-07	0	0	0	5	0	0	0	1	273	855	1,127	541	1,695	2,236	0.0	0.0
20-May-07	0	0	0	5	0	0	0	1	272	850	1,122	540	1,686	2,226	0.0	0.0
21-May-07	0	0	0	5	0	0	0	1	271	856	1,127	538	1,698	2,236	0.0	0.0
22-May-07	0	0	0	5	4	0	4	1	273	852	1,125	541	1,690	2,231	0.0	0.0
23-May-07	0	24	24	7	2	24	26	3	798	848	1,646	1,583	1,682	3,265	0.0	14.3
24-May-07	0	24	24	8	0	0	0	3	359	849	1,208	713	1,683	2,396	0.0	14.3
25-May-07	2	0	2	4	0	0	0	3	358	851	1,209	710	1,688	2,398	2.8	0.0
26-May-07	22	24	46	8	0	12	12	4	358	845	1,203	711	1,676	2,387	30.9	14.3
27-May-07	24	24	48	10	0	48	48	8	260	854	1,114	516	1,693	2,209	46.5	14.2
28-May-07	20	0	20	12	0	24	24	9	321	853	1,173	636	1,691	2,327	31.4	0.0
29-May-07	58	12	70	17	0	0	0	9	315	853	1,167	624	1,691	2,315	92.9	7.1
30-May-07	46	24	70	22	0	12	12	9	315	854	1,169	624	1,694	2,318	73.7	14.2
31-May-07	40	0	40	25	0	0	0	9	261	856	1,116	517	1,697	2,214	77.4	0.0
Total	212	216	428	XXXX	18	132	150	XXXX	14,911	25,927	40,838	29,575	51,427	81,002	XXXX	XXXX

Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

Re-consultation level for May = 30,500

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

June-07

Note: Bold numbers are not verified by DFG.

(Note: Bold numbers are not verified by DFG.)

DATE	Delta Smelt				Splittail				Pumping						Delta Smelt Daily Density	
	Daily Total		Combined		Daily Total		Combined		Daily Total			Daily Total				
									In CFS			In Acre Feet				
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-Jun-07	0	0	0	25	0	0	0	9	0	852	852	0	1,689	1,689	#DIV/0!	0.0
2-Jun-07	0	0	0	25	0	0	0	9	0	853	853	0	1,692	1,692	#DIV/0!	0.0
3-Jun-07	0	0	0	25	0	0	0	9	0	854	854	0	1,694	1,694	#DIV/0!	0.0
4-Jun-07	0	0	0	25	0	0	0	9	0	858	858	0	1,702	1,702	#DIV/0!	0.0
5-Jun-07	0	0	0	25	0	24	24	10	0	851	851	0	1,687	1,687	#DIV/0!	0.0
6-Jun-07	0	0	0	23	0	12	12	9	0	850	850	0	1,685	1,685	#DIV/0!	0.0
7-Jun-07	0	0	0	21	0	0	0	9	0	847	847	0	1,680	1,680	#DIV/0!	0.0
8-Jun-07	0	0	0	21	0	0	0	9	0	845	845	0	1,677	1,677	#DIV/0!	0.0
9-Jun-07	0	0	0	18	0	0	0	9	0	849	849	0	1,683	1,683	#DIV/0!	0.0
10-Jun-07	27	0	27	16	0	0	0	5	90	845	935	178	1,677	1,855	151.7	0.0
11-Jun-07	9	0	9	15	0	0	0	3	90	846	937	179	1,679	1,858	50.3	0.0
12-Jun-07	30	0	30	13	0	0	0	3	89	853	941	176	1,691	1,867	170.5	0.0
13-Jun-07	9	48	57	12	0	0	0	3	89	2,009	2,098	177	3,984	4,161	50.8	12.0
14-Jun-07	9	0	9	9	0	12	12	3	90	2,526	2,616	178	5,010	5,188	50.6	0.0
15-Jun-07	18	0	18	11	0	0	0	3	96	2,575	2,671	191	5,107	5,298	94.2	0.0
16-Jun-07	9	0	9	11	0	24	24	5	97	2,575	2,672	192	5,108	5,300	46.9	0.0
17-Jun-07	168	12	180	24	0	60	60	9	495	2,697	3,191	981	5,349	6,330	171.3	2.2
18-Jun-07	90	0	90	31	0	0	0	9	400	2,689	3,088	793	5,333	6,126	113.5	0.0
19-Jun-07	90	0	90	37	2	0	2	8	840	3,363	4,203	1,666	6,671	8,337	54.0	0.0
20-Jun-07	9	0	9	38	0	24	24	9	717	3,754	4,471	1,422	7,447	8,869	6.3	0.0
21-Jun-07	30	0	30	40	0	12	12	10	932	3,525	4,456	1,848	6,991	8,839	16.2	0.0
22-Jun-07	57	0	57	44	0	0	0	10	934	4,017	4,950	1,852	7,967	9,819	0.0	0.0
23-Jun-07	15	0	15	45	0	0	0	10	945	4,278	5,223	1,874	8,486	10,360	8.0	0.0
24-Jun-07	24	0	24	45	0	0	0	10	587	4,211	4,798	1,164	8,352	9,516	20.6	0.0
25-Jun-07	0	0	0	44	0	12	12	10	192	4,279	4,471	381	8,488	8,869	0.0	0.0
26-Jun-07	30	0	30	44	0	12	12	11	324	4,268	4,592	642	8,466	9,108	46.7	0.0
27-Jun-07	327	0	327	63	0	0	0	11	847	4,254	5,101	1,681	8,437	10,118	194.5	0.0
28-Jun-07	30	0	30	65	0	0	0	10	856	4,270	5,125	1,697	8,469	10,166	17.7	0.0
29-Jun-07	78	0	78	69	0	0	0	10	878	4,277	5,156	1,742	8,484	10,226	44.8	0.0
30-Jun-07	390	0	390	96	0	0	0	9	1,360	4,431	5,791	2,698	8,789	11,487	144.6	0.0
Total	1,449	60	1,509	XXXX	2	192	194	XXXX	10,946	74,199	85,145	21,712	147,174	168,886	XXXX	XXXX

Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

Re-consultation level for June = 33,200

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

July-07

Note: Bold numbers are not verified by DFG.

DATE	Delta Smelt				Splittail				Pumping						Delta Smelt Daily Density	
	Daily Total		Combined		Daily Total		Combined		Daily Total			Daily Total				
									In CFS			In Acre Feet				
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-Jul-07	246	12	258	102	2	60	62	9	5,301	3,926	9,228	10,515	7,788	18,303	23.4	1.5
2-Jul-07	311	0	311	118	7	12	19	10	6,032	4,452	10,484	11,965	8,830	20,795	26.0	0.0
3-Jul-07	13	0	13	112	1	0	1	10	5,485	4,442	9,926	10,879	8,810	19,689	1.2	0.0
4-Jul-07	18	0	18	113	11	48	59	13	5,833	4,385	10,218	11,570	8,698	20,268	1.6	0.0
5-Jul-07	21	0	21	112	0	48	48	15	5,301	4,440	9,741	10,514	8,807	19,321	2.0	0.0
6-Jul-07	9	0	9	109	0	24	24	17	5,755	4,358	10,113	11,415	8,644	20,059	0.8	0.0
7-Jul-07	12	0	12	109	36	0	36	20	5,562	4,346	9,909	11,033	8,621	19,654	1.1	0.0
8-Jul-07	6	0	6	107	3	0	3	20	5,459	4,344	9,803	10,828	8,617	19,445	0.6	0.0
9-Jul-07	6	0	6	108	21	0	21	20	5,807	4,354	10,161	11,518	8,636	20,154	0.5	0.0
10-Jul-07	6	0	6	106	0	24	24	21	5,624	4,406	10,031	11,156	8,740	19,896	0.5	0.0
11-Jul-07	0	0	0	83	24	12	36	24	6,200	4,385	10,585	12,298	8,697	20,995	0.0	0.0
12-Jul-07	6	0	6	81	9	0	9	24	6,258	4,386	10,644	12,413	8,699	21,112	0.5	0.0
13-Jul-07	0	0	0	75	6	0	6	25	6,423	4,391	10,815	12,741	8,710	21,451	0.0	0.0
14-Jul-07	6	0	6	48	36	0	36	27	6,985	4,365	11,350	13,855	8,657	22,512	0.4	0.0
15-Jul-07	6	0	6	30	36	12	48	26	7,986	4,354	12,340	15,840	8,636	24,476	0.4	0.0
16-Jul-07	24	0	24	10	6	0	6	26	6,441	4,353	10,794	12,775	8,635	21,410	1.9	0.0
17-Jul-07	6	0	6	9	16	0	16	27	6,878	4,376	11,254	13,642	8,680	22,322	0.4	0.0
18-Jul-07	3	0	3	8	15	12	27	24	7,055	4,382	11,437	13,993	8,692	22,685	0.2	0.0
19-Jul-07	0	0	0	6	36	12	48	24	7,317	4,367	11,684	14,514	8,662	23,176	0.0	0.0
20-Jul-07	0	0	0	6	0	0	0	23	6,930	4,363	11,293	13,746	8,654	22,400	0.0	0.0
21-Jul-07	0	0	0	5	0	12	12	21	6,993	4,391	11,384	13,871	8,710	22,581	0.0	0.0
22-Jul-07	0	0	0	5	0	0	0	21	6,893	4,379	11,271	13,672	8,685	22,357	0.0	0.0
23-Jul-07	0	0	0	4	0	0	0	19	6,681	4,385	11,066	13,252	8,698	21,950	0.0	0.0
24-Jul-07	0	0	0	4	0	12	12	18	6,895	4,418	11,313	13,676	8,763	22,439	0.0	0.0
25-Jul-07	0	0	0	4	0	0	0	16	4,799	4,458	9,256	9,518	8,842	18,360	0.0	0.0
26-Jul-07	0	0	0	3	0	0	0	15	8,024	4,443	12,467	15,916	8,813	24,729	0.0	0.0
27-Jul-07	0	0	0	3	0	0	0	15	7,732	4,467	12,199	15,336	8,860	24,196	0.0	0.0
28-Jul-07	0	0	0	3	12	0	12	13	7,271	4,427	11,698	14,422	8,781	23,203	0.0	0.0
29-Jul-07	0	0	0	2	0	0	0	10	7,144	4,464	11,608	14,170	8,855	23,025	0.0	0.0
30-Jul-07	0	0	0	1	9	0	9	10	6,983	4,434	11,416	13,850	8,794	22,644	0.0	0.0
31-Jul-07	0	0	0	0	0	12	12	9	6,999	4,420	11,420	13,883	8,768	22,651	0.0	0.0
Total	699	12	711	XXXX	286	300	586	XXXX	201,047	135,862	336,908	398,776	269,482	668,258	XXXX	XXXX

Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

Re-consultation level for July = 2,500

EXHIBIT 6

From: Greene, Sheila [mailto:sgreene@water.ca.gov]

Sent: Monday, February 07, 2005 11:48 AM

To: calfedda@water.ca.gov

Subject: Summary of DAT Conference Call 2/1/2005

Attachments: COLFLOSS.xls; Fry_SmoltChinook2005.ppt; JuvenileChinook2005.ppt; WRLOSS05.ppt; WRSLV05.ppt; DAT20050201.wpd; DAT20050201.doc

Summary of DAT Conference Call 2/01/2005

Participants: SGreene, VPoage, PCadrett, JWhite, TBoardman, ROlah, BOppenheimer, BKinnear, PCoulston, EChappell, CReiner, PManza, JSnow, TBui, DSchuster, BHerbold, MMosses, RSitts

Conclusions and Recommendations

Last Friday, 1/28/05, there was a WOMET conference call to discuss the Delta Smelt Workgroup recommendation to reduce exports to a combined 1,500 cfs for one week due to high delta smelt salvage, high delta smelt salvage compared to low fall midwater trawl delta smelt index, and the delta smelt distribution from the first few days of the Kodiak trawl. The Delta Smelt Workgroup will evaluate delta smelt salvage, and if salvage density decreases significantly, they will recommend resuming normal export operations. WOMET agreed to the recommendation. Each project will export 700 cfs starting on 2/1/05 for one week, unless otherwise notified. The Delta Smelt Workgroup is scheduled to meet Thursday, 2/3 in the afternoon.

There was a pulse of juvenile Chinook catch in the tributaries and Sacramento River down as far as the north Delta, associated with the storm last week. But no significant catch of non-clipped Chinook in the Chipps Island trawl or at the Delta export facilities. There was a significant increase in the number of clipped juvenile Chinook at the export facilities, but the tags have not yet been read. Most are likely from the Coleman late fall production release, but with the number of outstanding tags, it is possible we could reach the first level of concern for the January yearling spring run surrogate release from Coleman hatchery.

The salvage of steelhead at the export facilities increased significantly last week.

Next DAT call Tuesday, 2/8/2005, at 9:00 am, at 916/657-4111.

Chinook Monitoring

Upper Sacramento River

Red Bluff Diversion - Flow peaked at 33,000 cfs on 1/27/05, but has decreased since. The traps were damaged, and not operating from 1/27 through 1/29. Starting 1/30, three of the four traps have been operating. Daily

fall length Chinook passage increased from 17,000 on 1/26 to 555,000 on 1/30. There were no older juvenile Chinook. There were 2 clipped Chinook and 7 clipped steelhead. Flows are decreasing and currently at ~7,500 cfs. FWS assumes the substantial numbers of fry Chinook passed RBDD when the traps were out.

FWS posts biweekly reports on the Bay-Delta and Tributaries Project website, at

http://baydelta.ca.gov/Php/Special_Reports/red_bluff.php4

Mill Creek - Flow increased from 200 cfs to a daily average of 625 cfs on 1/27, and then decreased to 336 cfs. Turbidity increased from 3 NTU to 21.6 NTU to 6.6 NTU. Spring run fry catch increased from less than 10/day to 268/day on 1/27, and is gradually decreasing. Yearling spring run catch went from 0 to 2 on 2/29, then decreased. There were 600 spring run fry and 3 yearlings last week. No steelhead.

Deer Creek - Flow increased from 220 cfs to 700 cfs on 1/28, then decreased. Turbidity increased from 2.2 NTU to 8.2 NTU, then decreased. Spring run fry catch increased from 0 to 240/day on 1/30. Yearling spring run increased from nearly 0 to 7/day on 1/30. There were 474 spring run fry, and 14 yearling spring run last week.

Butte Creek - Flow and spring run fry catch peaked on 1/27. Catch had been ranging from 2,600/day to 36,000/day, then peaked at 225,000/day on 1/27. DFG was operating the two rotary screws traps primarily for tagging. They tagged their 400,000 juveniles and removed the trap on 1/27. Last brood year, they had the second highest number of returning adults, 10,200, and very low pre-spawning mortality, 410. The high spring run fry emigration corresponds with the adult spawners.

GCID - Moderately low catch of mostly fry and smolts. 1 clipped Chinook on 1/25.

Knights Landing - Flow increased and peaked at 25,280 cfs on 1/29. Turbidity increased from 18 NTU to 300 NTU. Fry/smolt catch increased from 5/trap-day to 1,100/trap-day. Older juvenile catch increased from 0 to 6/trap-day. 19 clipped Chinook and 54 clipped steelhead last week.

Delta

Lower Sac River seine - 19 fry, 17 older juvenile, and 2 clipped Chinook in one day of sampling.

Sac Area seine - 439 fry/smolt, 2 older juvenile Chinook last week. About the same as last week.

Sac Trawl - only 2 fry/smolts. A significant decrease over last week. 5 clipped steelhead. No delta smelt.
North Delta seine - 224 fry/smolts. A significant increase.
Central Delta seine - Significant increase. 70 fry/smolts and 21 older juvenile.

South Delta, SJR and Bay seines - none

Mossdale trawl - None last week, but 22 fry/smolts on Monday, 1/31.

Chippis - Catch decreased. 1 older juvenile and 21 clipped Chinook 11 adult delta smelt.

Salvage Facilities

Chinook - SWP - No non-clipped Chinook salvage at the SWP. 62 clipped Chinook salvaged last week. They are all Coleman late fall origin. CVP - 24 non-clipped older juvenile, and 132 clipped Chinook salvaged last week.

The loss of clipped Chinook was high over the last week and a half. The tags have not been read, but the outstanding loss is about 2,472. We assume most are from the Coleman late fall production release, but it is possible that we could reach the first level of concern for the January yearling spring run surrogate release. We will distribute the tag reading results when we receive them.

Total winter run length non-clipped loss for the season is 250 at the SWP and 31 at the CVP, for a total of 281.

Steelhead - SWP - 15 non-clipped steelhead and 274 clipped steelhead salvaged last week. CVP - 24 non-clipped steelhead, and 48 clipped salvage last week. This is a significant increase for clipped steelhead salvage. There have been releases from Coleman, Feather, American and Mokelumne hatcheries recently.

Delta Smelt - SWP - Steadily salvaging delta smelt. 498 delta smelt salvaged last week. The January total is 1,107. CVP - 348 delta smelt salvaged last week. The January total is 540. The combined total is 1,647. We got close to the consultation level for January of 1,900. The consultation level for February is 1,700. There is no ripeness data taken at the salvage facilities. We did exceed the December through March adult cumulative salvage concern level of 892, with two months to go. Delta smelt salvage density increased for two weeks, but has been decreasing slowly in the last three days.

Splittail - Continuing to salvage splittail. SWP - 115 adult splittail salvaged last week. CVP - 128 adult splittail salvaged at the CVP last week.

Kodiak Trawl Delta Smelt

Survey number 1 is complete. There was a total of 220 adults. The sex ratio is 1:1. The size is normal with all stations

reported. The distribution is mostly in Montezuma slough and at the confluence of the Sacramento and San Joaquin rivers. There are not a lot of delta smelt in the south Delta, except at the export facilities. All stations were sampled last week and the next survey starts 2/7. The distribution and size is better than what was reported last Friday but the level of concern is still the same based on the high salvage and low fall midwater trawl index.

The delta smelt kodiak trawl distribution map is available on the website -

<http://www.delta.dfg.ca.gov/data/skt/DisplayMaps.asp>

Operations

SWP - 6,500 cfs today. DWR is scheduling 700 cfs for the delta smelt curtailment for the next 7 days. The estimated EWA cost is 80 taf. Prior to this export curtailment, DWR was expecting to fill San Luis next week, therefore the MAs expected the cost of this action to spill. But, with this export curtailment, the operators expect the debt will likely not spill. Article 21 was delivered last week due to a special condition which was O'Neill was full and the SWP was not able to send water to southern California due to their flooding problems. Article 21 may become available soon, but EWA wouldn't spill until there is water in excess of demands and Article 21.

In the absence of the delta smelt curtailment, SWP exports would have been about 6,000 cfs to comply with the 35% E/I ratio for February.

San Luis, - 1,013 taf. Full is 1,062 taf. Since they can't send water to southern California, they filled faster.
Oroville - 1,750 cfs.

CVP - 4,350 cfs today. The CVP operators are scheduling 750 cfs for the delta smelt curtailment for the next 7 days. The estimated b2 cost is 50 taf. They were projecting to spill in March before the export curtailment, but now they aren't sure they will fill.

San Luis - 797 taf. Full is 962 taf.
Trinity - 300 cfs.
Clear Creek - 200 cfs.
Keswick - 3,700 cfs and being supported by b2.
Nimbus - 2,500 cfs. In flood control.
Stan - 225 cfs.

Flows

Sacramento at Freeport ~ 31,236 cfs.
San Joaquin at Vernalis ~ 4,908 cfs.

Outflow ~ 27,900 cfs.
14-day E/I ratio - 38.7%.

X2 ~ The 14-day running average Port Chicago EC was 4.4 on 1/31. The daily EC was 1.6 microseimens/cm. According to the EWA biologists, they projects must meet Chipps Island the entire month of February.

Delta Water Quality
Water quality great.

Sheila Greene

Staff Environmental Scientist
CA Department of Water Resources
Division of Environmental Services
916/227-7538 voice
916/227-7554 fax

EXHIBIT 7

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

February-05

Note: Bold numbers are not verified by DFG.

DATE	Delta Smelt				Splittail				Pumping						Delta Smelt Daily Density	
	Daily Total		Combined		Daily Total		Combined		Daily Total			Daily Total				
									In CFS			In Acre Feet				
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-Feb-05	27	0	27	81	12	0	12	47	6,426	4,369	10,794	12,745	8,665	21,410	2.1	0.0
2-Feb-05	9	12	21	79	0	12	12	44	2,153	1,829	3,982	4,271	3,627	7,898	2.1	3.3
3-Feb-05	6	12	18	77	0	0	0	40	1,008	1,670	2,678	1,999	3,312	5,311	3.0	3.6
4-Feb-05	12	0	12	72	0	0	0	34	1,016	2,011	3,027	2,015	3,989	6,004	6.0	0.0
5-Feb-05	42	0	42	71	0	0	0	24	3,014	2,007	5,021	5,979	3,981	9,960	7.0	0.0
6-Feb-05	27	12	39	71	0	0	0	20	4,972	2,002	6,974	9,862	3,971	13,833	2.7	3.0
7-Feb-05	39	24	63	69	12	0	12	20	6,261	3,753	10,014	12,418	7,444	19,862	3.1	3.2
8-Feb-05	23	0	23	64	6	12	18	18	6,332	4,373	10,705	12,560	8,673	21,233	1.8	0.0
9-Feb-05	3	0	3	57	0	0	0	16	6,277	4,374	10,650	12,450	8,675	21,125	0.2	0.0
10-Feb-05	33	0	33	49	3	0	3	15	6,128	4,371	10,499	12,154	8,670	20,824	2.7	0.0
11-Feb-05	9	0	9	40	6	0	6	13	6,336	4,399	10,735	12,567	8,726	21,293	0.7	0.0
12-Feb-05	12	0	12	34	9	0	9	11	6,336	4,393	10,729	12,567	8,713	21,280	1.0	0.0
13-Feb-05	3	0	3	26	12	0	12	9	5,975	4,374	10,348	11,851	8,675	20,526	0.3	0.0
14-Feb-05	12	0	12	23	0	0	0	6	5,249	4,250	9,498	10,411	8,429	18,840	1.2	0.0
15-Feb-05	6	12	18	22	0	0	0	5	5,381	4,340	9,722	10,674	8,609	19,283	0.6	1.4
16-Feb-05	0	36	36	23	0	12	12	5	4,803	4,332	9,135	9,527	8,592	18,119	0.0	4.2
17-Feb-05	0	0	0	22	6	0	6	6	4,797	4,380	9,177	9,514	8,688	18,202	0.0	0.0
18-Feb-05	0	0	0	21	0	0	0	6	4,524	4,387	8,911	8,973	8,702	17,675	0.0	0.0
19-Feb-05	0	0	0	18	0	0	0	6	4,517	4,403	8,920	8,959	8,734	17,693	0.0	0.0
20-Feb-05	0	0	0	15	0	0	0	6	5,106	4,383	9,489	10,128	8,693	18,821	0.0	0.0
21-Feb-05	0	0	0	11	0	0	0	5	4,585	4,419	9,005	9,095	8,766	17,861	0.0	0.0
22-Feb-05	0	0	0	9	13	0	13	4	5,416	4,129	9,545	10,743	8,189	18,932	0.0	0.0
23-Feb-05	0	0	0	9	0	0	0	4	5,373	3,867	9,240	10,658	7,670	18,328	0.0	0.0
24-Feb-05	0	0	0	6	6	0	6	5	5,941	4,511	10,452	11,784	8,948	20,732	0.0	0.0
25-Feb-05	0	0	0	6	6	36	42	7	5,936	4,386	10,323	11,775	8,700	20,475	0.0	0.0
26-Feb-05	0	0	0	5	6	36	42	10	5,936	4,373	10,309	11,775	8,673	20,448	0.0	0.0
27-Feb-05	0	0	0	5	15	24	39	11	5,908	4,427	10,335	11,718	8,781	20,499	0.0	0.0
28-Feb-05	0	0	0	4	6	12	18	13	3,930	4,373	8,303	7,796	8,673	16,469	0.0	0.0
Total	263	108	371	XXXX	118	144	262	XXXX	139,636	108,882	248,518	276,968	215,968	492,936	XXXX	XXXX

Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

Re-consultation level for February = 1,700

EXHIBIT 8

Delta Smelt Working Group Meeting Minutes

July 10, 2006

Participating: Gonzalo Castillo (USFWS), Kevin Fleming (DFG), Bruce Herbold (USEPA), Ted Sommer (DWR), Matt Nobriga (DWR), Ann Lubas-Williams (USBR), Tracy Pettit (DWR), Tracy Hinojosa (DWR), Ryan Olah (USFWS), convener and scribe, Jim White (DFG), and Lenny Grimaldo (DWR).

For Discussion:

Continue discussions on possible fish actions for upcoming season

Recommendation for WOMT: The Working Group formally requests that DWR provide initial estimates of the cost in terms of water volumes to first achieve and then maintain a net outflow of 11,400 cfs at Chipps Island from September through November.

Minutes:

Ted Sommer presented an outline of potential actions (see attachment 1) that the Working Group used to rank potential actions to protect delta smelt. The Working Group developed a ranking system for each of the potential actions to clarify the action's biological basis and its likelihood of successful implementation in the next 12 months:

Biological Basis the next 12 months

0. None (for the specific season)
1. Reasonable biology
2. Supporting pattern in data
3. Correlation Present
4. Some causation known
5. Strongly supported by evidence

Likelihood of successful implementation in

- A. Not worth Doing
- B. Maybe
- C. Very Likely

Based on these criteria, the Working Group then assigned a ranking to each hypothesis under each season. These rankings were intended to apply only to water year 2007, and could change based on hydrology, new data, or species status.

Based on this exercise, the Working Group identified the need for a description of likely conditions this fall based on hydrologic forecast modeling. Since outflows may potentially be as low as 7,000 cfs net outflow, the Working Group requested that the following initial modeling take place:

- Based on the latest hydrologic forecasts, what would be the cost in terms of water volumes to first achieve and then maintain a net outflow of 11,400 cfs at Chipps Island from September through November? [Note that between the time that the meeting occurred and the notes were produced, DWR estimated that maintaining 11,400 cfs at Chipps Island would require

approximately 600 TAF of water in the median hydrology, and approximately twice as much in the dry hydrology.]

Additional modeling:

- Assuming that the 11,400 cfs net outflow was implemented, what would be the flows in Old and Middle River, given a variety of combined inflows and export rates? The best approach to this may be to vary San Joaquin River flow, export flow and Old/Middle River flow in a single nomograph at some specific Sacramento River flow. Several nomographs could be produced for various increments of Sacramento River flow; this concept needs to be refined and, perhaps, simplified before a formal request is made of DWR.

Action Items:

1. DWR will perform the initially-requested modeling and the group will then convene to discuss the results.
2. The Working Group will refine their request for additional modeling to examine flows at Old and Middle Rivers.

Next Scheduled Meeting: TBA, based on modeling results.

Submitted,

RO/vp

Attachment 1

ALTERNATIVES TO IMPROVE DELTA SMELT ABUNDANCE DURING THE NEXT YEAR

Draft Revised July 17, 2006

Assumptions

- This review focuses on actions that could be realistically conducted during the next year.
- The list is intended as talking points to evaluate the potential efficacy and feasibility of alternatives. It is not a set of recommendations.
- There are likely other actions—this is a starting point!
- Each action includes a partial list of useful metrics of the success of that alternative.
- Additional information is needed to document the supporting evidence for each alternative.

Fall Actions (September-November)

1. Habitat Improvements

Hypothesis: Higher fall flows (total delta outflow) will increase the amount of habitat for delta smelt.

Measures:

Fish: FMWT distribution, following year's TNS abundance, condition, size, energy density, growth.

Clams: Biomass, distribution, grazing rate (may be affecting habitat quality).

Food supply: Zooplankton density, Chlorophyll a, smelt diets.

Habitat: EQ index (turbidity, etc), X2

Ranking: 3/4 C-We have a relationship between habitat and summer production and fall flows are forecasted to be low (maybe around 7,000 cfs outflow)

2. Reduce Entrainment Losses (Mortality)

Hypothesis: Increased (more positive) Old and Middle River flows will reduce losses of adults.

Measures:

Fish: FMWT distribution, TNS abundance, salvage,

Hydrology: Exports, OR & MR flows.

Modeling: ptn experiments

Ranking: 3C-based on Pete Smith of USGS's relationship

Hypothesis: Reducing Delta Cross Channel closures will reduce losses of adults.

Measures:

Fish: FMWT distribution, TNS abundance, salvage,

Hydrology: Exports, OR & MR flows.

Modeling: ptm experiments

Ranking: 2C-based on conceptual understanding of Delta hydrodynamics and recent ptm work.

3. Food Supply

Hypothesis: Increased San Joaquin River flow to Suisun Bay will deliver more phytoplankton and zooplankton to support adults and egg production.

Measures:

Fish: TNS & FMWT abundance, condition, size, energy density.

Clams: Biomass, distribution, grazing rate.

Food supply: Zooplankton density, chlorophyll a, smelt diets.

Hydrology: SJR flow, exports, OR & MR flows, particle tracking.

Ranking: 1B

Hypothesis: Increased flow from Yolo Bypass (e.g. managed wetlands) will deliver more phytoplankton and zooplankton to support adults and egg production.

Measures:

Fish: 20 mm abundance and distribution, TNS & FMWT abundance, condition, size, energy density, salvage.

Clams: Biomass, distribution, grazing rate.

Food supply: Zooplankton density, chlorophyll a, smelt diets.

Hydrology: Sac flow, Cache Slough flow, particle tracking, hydrodynamics?

Ranking: 1B

Overbite Clam Hypothesis: Additional outflow will restrict Asian clam abundance

Ranking: 2B

Winter Actions (December-February)

1. Habitat Improvements

Hypothesis: Higher flows during late winter will increase the amount of habitat (e.g. X2) for delta smelt.

Measures:

Fish: FMWT & Kodiak trawl distribution, subsequent TNS abundance, condition, energy density, growth.

Habitat: X2

Ranking: 0

2. Reduce Losses (Mortality)

Hypothesis: Export reduction during “first flush” of delta tributaries will reduce losses of adults.

Measures:

Fish: FMWT distribution, TNS abundance, salvage,

Hydrology: Exports, inflow, outflow.

Modeling: ptm experiments

Ranking: 4C-fish are entrained during these times, based on historical salvage and Pete Smith's USGS work

Hypothesis: Increased (more positive) Old and Middle River flows will reduce losses of adults and result in a better spawning distribution.

Measures:

Fish: FMWT distribution, TNS abundance, salvage.

Hydrology: Exports, OR & MR flows.

Modeling: ptm experiments

Ranking: 4C-fish are entrained during these times, based on historical salvage and Pete Smith's USGS work

Hypothesis: Reducing Delta Cross Channel closures will reduce losses of adults and result in a better spawning distribution..

Measures:

Fish: FMWT distribution, TNS abundance, salvage,

Hydrology: Exports, OR & MR flows.

Modeling: ptm experiments

Ranking: 2C-based on conceptual understanding of Delta hydrodynamics and recent ptm work.

3. Food Supply

Hypothesis: Increased San Joaquin River flow to Suisun Bay will deliver more phytoplankton and zooplankton to support adult spawners. This action may also help to lower entrainment of fish.

Measures:

Fish: FMWT distribution, subsequent TNS abundance, condition, size, energy density, salvage.

Clams: Biomass, distribution, grazing rate.

Food supply: Zooplankton density, chlorophyll a, smelt diets.

Hydrology: SJR flow, exports, OR & MR flows.

Ranking: 0-there is evidence that material if provided, but it is too late for spawning adults

Hypothesis: Increased flow from Yolo Bypass will deliver more phytoplankton and zooplankton to promote egg production.

Measures:

Fish: subsequent 20 mm abundance and distribution, TNS & FMWT abundance, condition, size, energy density, salvage.

Clams: Biomass, distribution, grazing rate.

Food supply: Zooplankton density, chlorophyll a, smelt diets.

Hydrology: Sac flow, Cache Slough flow, particle tracking, hydrodynamics?

Ranking: 0

Spring Actions (March-May)

1. Habitat Improvements

Hypothesis: Higher flows during spring will increase the amount of habitat (e.g. X2) for delta smelt.

Measures:

Fish: 20 mm abundance, TNS abundance, condition, energy density, growth.

Habitat: X2

Food: Zooplankton, chlorophyll a, diets.

Ranking: 2B-Supportive pattern-efforts have shown that more flow will increase habitat

2. Reduce Losses (Mortality)

Hypothesis: Increased (more positive) Old and Middle River flows will reduce losses of larval and juvenile smelt.

Measures:

Fish: 20 mm abundance and distribution, TNS abundance & distribution, salvage, larval losses (e.g. Kimmerer method).

Hydrology: Exports, OR & MR flows.

Ranking: 4C-based on USGS work

3. Food Supply

Hypothesis: Increased San Joaquin River flow to Suisun Bay will deliver more phytoplankton and zooplankton to support young smelt. This action may also help to lower entrainment of fish.

Measures:

Fish: 20 mm abundance and distribution, TNS abundance and distribution, condition, size, energy density.

Clams: Biomass, distribution, grazing rate.

Food supply: Zooplankton density, chlorophyll a, smelt diets.

Hydrology: SJR flow, exports, OR & MR flows.

Ranking: 2B-critical period, first feeding, these sources do provide food

Hypothesis: Increased flow from Yolo Bypass (inflow or managed wetlands) will deliver more phytoplankton and zooplankton to support young smelt.

Measures:

Fish: 20 mm abundance and distribution, TNS abundance and distribution, condition, size, energy density.

Clams: Biomass, distribution, grazing rate.

Food supply: Zooplankton density, chlorophyll a, smelt diets.

Hydrology: Sac flow, Cache Slough flow, particle tracking, hydrodynamics?

Ranking: 2B-critical period, first feeding, these sources do provide food

Summer Actions (June-August)

1 Habitat Improvements

Hypothesis: Higher flows during summer will increase the amount of habitat (lower salinity, somewhat higher turbidity) for delta smelt.

Measures:

Fish: 20 mm abundance and water quality data, TNS & MWT abundance and water quality data, condition, energy density, growth.

Habitat: X2

Food: Zooplankton, chlorophyll a, diets.

Ranking: 3B-Matt Nobriga's analysis does show a relationship

Hypothesis: Increased turbidity via macrophyte removal will increase the amount of habitat for delta smelt.

Measures:

Fish: TNS & MWT abundance, condition, energy density, growth.

Habitat: EQ (ec & turbidity)

Food: Zooplankton, chlorophyll a, diets.

Ranking: 2A-turbidity is higher in summer and smelt distribution is related to turbidity

2 Food Supply

Hypothesis: Increased San Joaquin River flow to Suisun Bay will deliver more phytoplankton and zooplankton to support juvenile smelt. .

Measures:

Fish: TNS & FMWT abundance, condition, size, energy density.

Clams: Biomass, distribution, grazing rate.

Food supply: Zooplankton density, chlorophyll a, smelt diets.

Hydrology: SJR flow, exports, OR & MR flows, particle tracking.

Ranking: 4B-good evidence here-these sources both provide food

Hypothesis: Increased flow from Yolo Bypass (inflow or managed wetlands) will deliver more phytoplankton and zooplankton to support young smelt.

Measures:

Fish: 20 mm abundance and distribution, TNS & FMWT abundance, condition, size, energy density.

Clams: Biomass, distribution, grazing rate.

Food supply: Zooplankton density, chlorophyll a, smelt diets.

Hydrology: Sac flow, Cache Slough flow, particle tracking, hydrodynamics?

Ranking: 4B-good evidence here-these sources both provide food

Delta Smelt Working Group Meeting/Conference Call Minutes

August 21, 2006

Participating: Gonzalo Castillo (USFWS), Mike Chotkowski (USBR), Kevin Fleming (CDFG), Lenny Grimaldo (CDWR), Tracy Hinojosa (CDWR), Ann Lubas-Williams (USBR), Matt Nobriga (CDWR), Ryan Olah (USFWS), Tracy Pettit (USFWS), Jim White (CDFG) and Victoria Poage (USFWS, convener and scribe)

For Discussion:

1. Potential fall actions
2. Other actions
3. Fish Food Farm proposal

Recommendation for WOMT:

The Working Group agreed that the most defensible, critical period for using environmental water to protect delta smelt is the spring, when there is a clear link between flow, population distribution and entrainment risk. No data presently exists to demonstrate that the use of environmental water can influence the distribution of spawning adults, and the amounts of water needed to demonstrably improve fall habitat quantity/quality are unavailable. At times other than spring, it is likely that food limitation is a more critical problem than entrainment. The available data for striped bass and longfin smelt suggest that food limitation cannot be managed through the application of environmental water (attachment, Figure 1). Thus, it is very unlikely that small flow additions during fall could be reasonably expected to improve food availability for delta smelt. The Working Group therefore provisionally decided to recommend forestalling the use of EWA and other environmental water assets until the March-through-June period, when such use would have the greatest likelihood of a positive effect. The Working Group will, however, monitor Delta conditions and incidental take of adults, as per the 2005 OCAP B.O. and the Delta Smelt Risk Assessment Matrix. The DSWG may still recommend winter actions if adult delta smelt entrainment rises above the established threshold. The Working Group does not endorse the proposed fish food farm at Sherman Island.

Minutes:

Entrainment. At last Tuesday's WOMT meeting, Wim Kimmerer presented the results of an analysis of delta smelt entrainment that is part of an evaluation of the EWA that he is working on with co-authors. He estimates that at times, entrainment of delta smelt larvae may be as high as 30%, making it an important source of mortality. Larval losses due to entrainment may be over-ridden by food limitation during summer, but the Working Group is confident that it can minimize entrainment losses whereas mitigating for food limitation is more problematic and will require longer-term experiments and/or restoration programs.

Fall Flows. The Working Group discussed a proposal to maintain Delta outflow at a minimum of 7,000 cfs during September-December. Due to the wet spring, this action may be possible with little or no water cost. The Working Group is not opposed to this action, but did not recommend it because 7,000 cfs is not enough flow to detectably change physical habitat quantity/quality for delta smelt and will not likely change overbite clam distribution or abundance (attachment, Figure 2). Note that the quality of delta smelt fall habitat has recently been correlated with improved Summer Tow-Net Survey indices the following year (see notes from July 10, 2006). DWR generated new estimates on the water costs associated with proposed fall actions, based upon the most recent available forecast, as indicated below:

Net Outflow	October – December			
7,000 cfs	50% Hydrology	170 TAF	90% Hydrology	443 TAF
Net Outflow	September - December			
11,400 cfs	50% Hydrology	911 TAF	90% Hydrology	1,460 TAF

A net outflow of 11,400 cfs will maintain X2 at about Chipps Island if it is already at, or seaward of Chipps Island. Currently, X2 is near Collinsville about 10 km landward of Chipps Island. Fall physical habitat parameters do not respond linearly to changes in X2 position. Over the range of fall X2 positions observed since 1970, delta smelt habitat quality does not increase detectably until X2 passes seaward of Broad Slough (Figure 2 and Figure 3). The amount of environmental water required to move X2 seaward of Broad Slough to Chipps Island and keep it there throughout the fall is 3-4 times the annual EWA budget. Absent a formal and well-thought out experiment to develop an understanding of mechanisms underlying the fall habitat-summer abundance correlation, the DSWG cannot justify the water cost to maintain X2 at Chipps Island throughout the fall.

The Working Group believes that any fall flow control action should be set up as a full-fledged experiment to test competing hypotheses (i.e., reduction in clam distribution or abundance or reduction in entrainment susceptibility of adult delta smelt during winter or reduction in larval susceptibility to entrainment the following spring, etc.).

Old River/Middle River Flows. The Working Group recognized that Old River and Middle River flow targets could be achieved either by increasing San Joaquin River flow or by reducing exports, or more likely, through some combination of those actions. The Working Group believes that OR/MR flows that are neutral or positive through the spawning period of dry years are needed to minimize entrainment of larval delta smelt. These conditions are usually achieved for part of the spawning period through implementing the VAMP. However, the Working Group thinks that the VAMP starts too late in many years to be maximally protective. The target flows would depend to some extent on hydrology; if conditions in the spring are relatively wet, less flow could be needed, but in a 90% hydrology, OR/MR flows should be neutral or positive during a variable spring period based on water temperatures suitable for delta smelt spawning. In any hydrology, the Working Group would need to track fish distribution from survey data and determine the most appropriate flow targets as conditions develop. This year, San

Luis Reservoir may fill as early as December or January, which would potentially allow the Projects greater operational flexibility during spring 2007.

First Flush. Last winter, the Working Group looked at Delta conditions that could potentially influence the timing of adult delta smelt movement into areas wherein they would be subject to entrainment, and noted that in plots of the hydrograph against incidental take, it appeared that take increased in the days following the first major storms, as Sacramento River inflows increased. Definition of a “first flush” event may be based on precipitation or inflow; the Working Group will need to return to this concept in the next meeting.

Fish Food Farm. At last Tuesday’s WOMT meeting, Wim Kimmerer presented evidence that for several species the most important source of mortality in the Delta is food limitation. The Working Group was asked to review DWR’s proposal for an experimental food production facility on Sherman Island. The Working Group does not believe that the proposal should be implemented for several reasons. First, the proposed project is too small to make a detectable difference in estuarine food availability. Second, the project proposes to create a very shallow farm “habitat” for lower trophic level production during summer. This is likely to generate anoxic water similar to what often happens during fall in Suisun Marsh duck clubs. This poor-quality water would be discharged into a core delta smelt habitat area. Lastly, the project proposes to divert water onto Sherman Island from the surrounding waterways. Although the diverted water would be screened to exclude fish, larval fish may not be screened effectively. Furthermore, it cannot be screened to prevent nuisance organisms like Microcystis and overbite clam larvae that might have undesirable influences on what grows on the ‘farm.’

Action Items:

None

Next Scheduled Meeting: Conference call, Wednesday, August 30, 2006, 3:00 pm

Submitted,
VLP

Attachment 1.

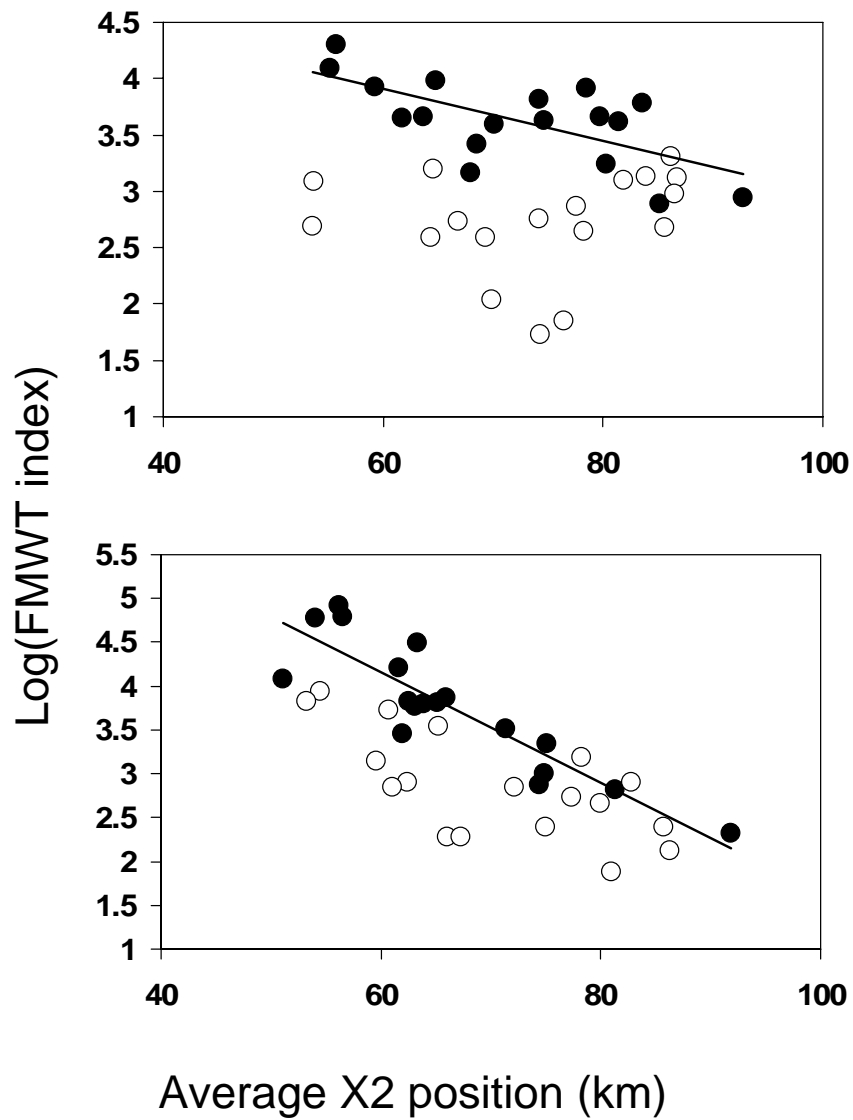


Figure 1. The 1967-2004 X2 relationships for striped bass (top panel) and longfin smelt (bottom panel) for before (solid symbols) and after (open symbols) the invasion of overbite clam, *Corbula amurensis*.

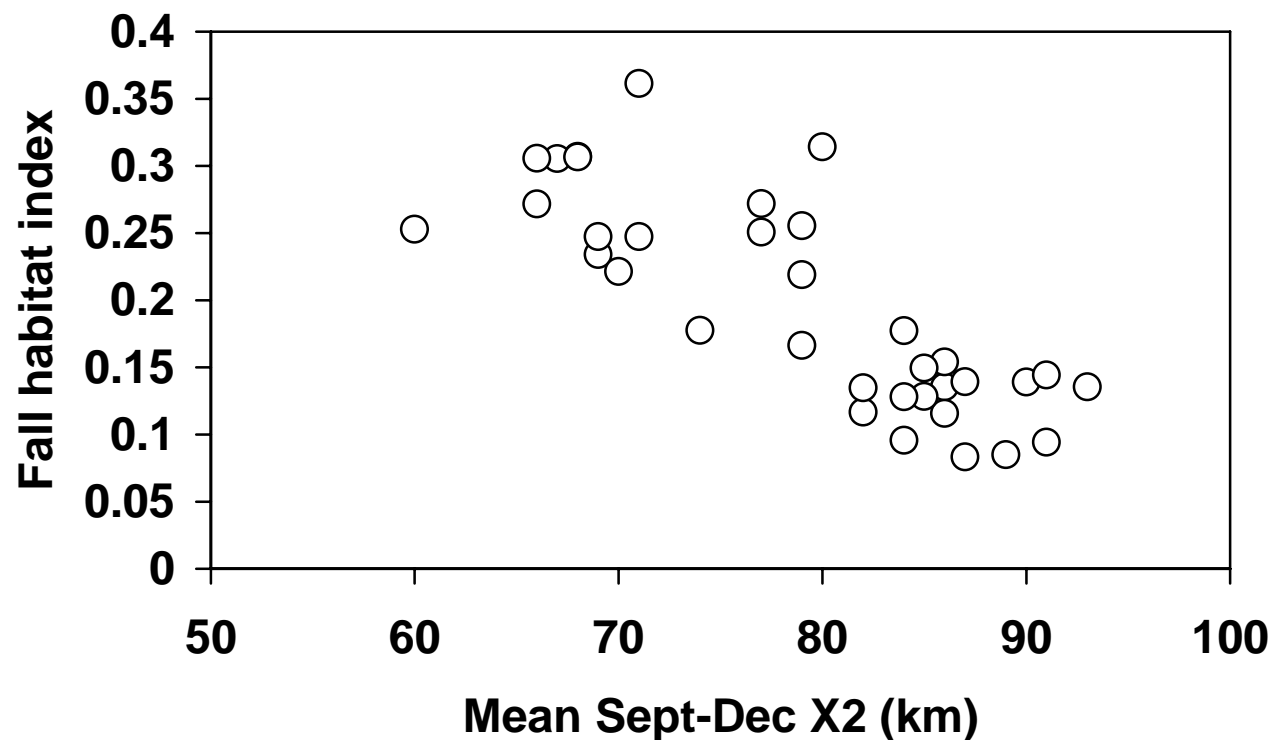


Figure 2. Relationship between fall X2 position and a delta smelt habitat index based on specific conductance, water clarity, and water temperature. Note that Chipps Island is approximately at X2 = 75 km and requires 11,400 cfs of Delta outflow to maintain its position there and higher flows to move it there from landward locations. Note that X2 was at approximately 85 km at the time of this meeting (August 2006).

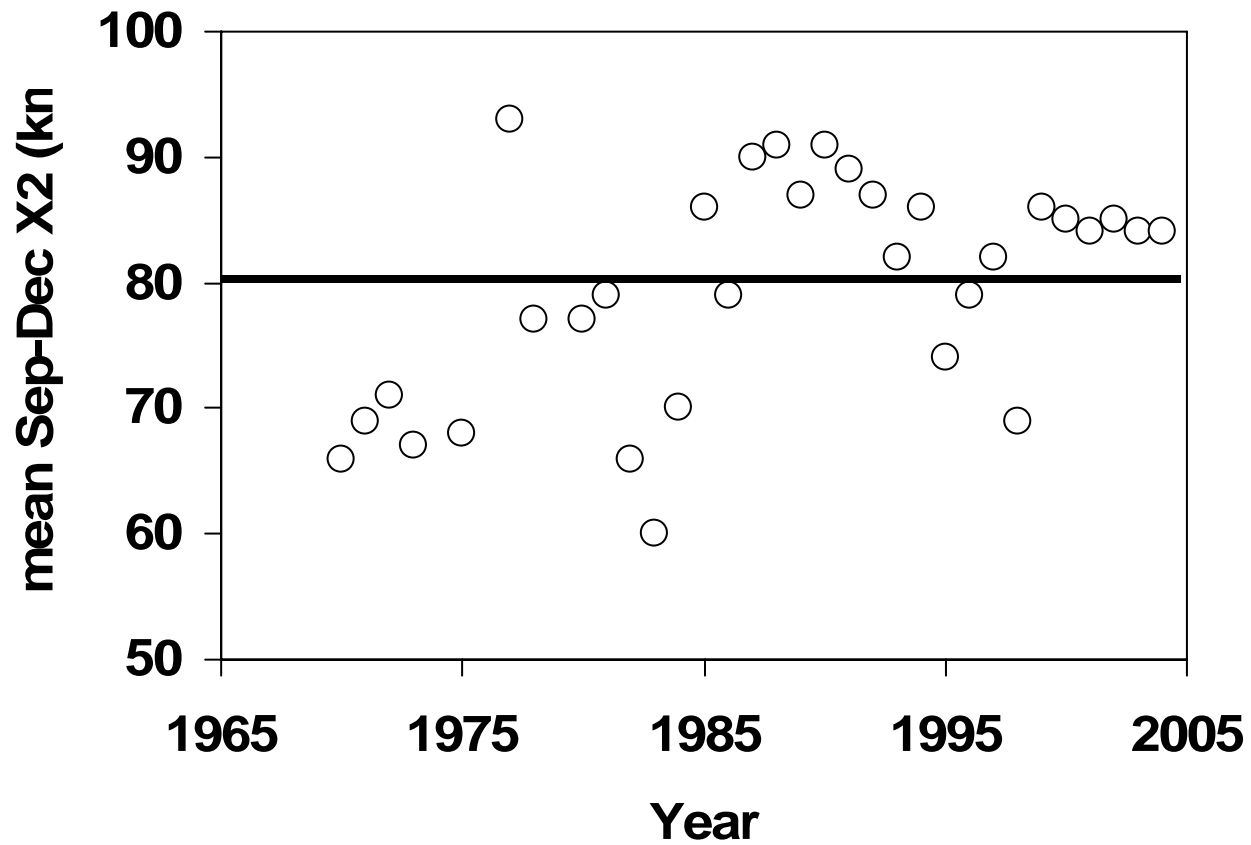


Figure 3. Time series of fall X2 positions for 1970-2004. The thick horizontal line denotes an X2 position near Broad Slough.

Delta Smelt Working Group Meeting Minutes

September 26, 2006

Participating: Gonzalo Castillo (USFWS), Mike Chotkowski (USBR), Kevin Fleming (CDFG), Bruce Herbold (USEPA), Tracy Hinojosa (CDWR), Peter Johnsen (USFWS), Ann Lubas-Williams (USBR), Matt Nobriga (CDWR), Kevin Sun (CDWR), Jim White (CDFG) and Victoria Poage (USFWS, convener and scribe)

For Discussion:

Action item from August 30:

1. Analyses of data pertinent to winter salvage events

Recommendation for WOMT:

The Working Group did not have a recommendation for WOMT.

The Working Group continued its August 30 discussion of the environmental factors that correspond to the onset or increases of salvage of pre-spawning adult delta smelt. The underlying hypothesis is that delta smelt cue on certain environmental factors when moving up the estuary to spawn, which may influence their vulnerability to entrainment at the export facilities. If environmental factors could be found that are sufficiently predictive of salvage, then modifications of Project operations could be designed to proactively avoid or minimize the entrainment of adult delta smelt. A small sub-group met previously to share data and prepare analyses for discussion by the entire Working Group. Analyses were intended to evaluate several hypothetical cues, including:

- Increases in Delta inflow
- Decreases in water temperature
- Changes in ambient light due to decreasing day lengths during late fall

Water temperatures and hydrodynamic indicator variables were plotted with historic salvage for the October-thru-January period and evaluated by eye (see attachment¹). Evaluation of the resulting graphs revealed that an algorithm would be needed to identify where a salvage “event” actually occurs, since in all years there is a period of relatively modest salvage followed by one or more peaks. As discussed at the previous meeting, inflow alone is not a satisfactory predictor of salvage events. X2 position, which is considered a good indicator of delta smelt distribution, does not respond quickly enough to be a good predictor of salvage events. Drops in water temperature always precede salvage events, but such drops occur every year, so as a single environmental factor temperature is not an adequate predictor. However, a drop in water temperature, perhaps to some threshold value, followed by an increase in inflow should be evaluated as a predictor of salvage events.

¹ The reader is cautioned to pay close attention to the scale of the various graphs; also, cumulative salvage is denoted by blue circles in all graphics except for those depicting the average temperatures at Antioch, where cumulative salvage appears as red triangles

The Working Group's next steps will be to refine the potential environmental triggers and guidelines and game them using historical salvage data. Adult delta smelt ride the tides to reach spawning habitats, so tide data could be added. An attempt must be made to define the amount and the extent of any potential curtailments. Curtailments would be defined in terms of Old River and Middle River flow targets, and the water costs of potential actions could be estimated. OR/MR flows allow for a certain amount of flexibility, as they can be achieved via reduced exports, increased SJR flow or various combinations of the two.

Potential scenarios to evaluate include:

- Export curtailment in response to an observed salvage event that triggers concern, i.e., business as usual
- A prescriptive curtailment, i.e., one beginning at a prescribed time and continuing for a prescribed period (more work would be needed)
- A curtailment triggered by an environmental predictor, e.g., temperature followed by flow as mentioned above

The same small subgroup will refine the analyses and report to the full Working Group at the next meeting.

On another topic, an evaluation of CDFG's Larval Survey sampling is needed. Thus far, the sampling has not collected very many larval delta smelt; its original intent was to evaluate gear types and sampling protocols, but last year it was subsumed by the POD effort in an attempt to determine larval distribution of species of concern. CDFG wishes to return to the original intent of the survey and use appropriate gears and deployment; however, the management questions that the survey is intended to address are unclear. If the question is when larvae become vulnerable to entrainment, it may be that this can be answered using a combination of data from spent adults, X2 and water temperatures. At a certain point, the 20-mm Survey is a more effective means of elucidating distribution. If the question is one of early detection so that actions can be taken to minimize entrainment, different gears and protocols may be needed. CDFG will submit a draft work plan to the Interagency Ecological Program.

Action Items:

1. Mike Chotkowski, Kevin Fleming, Matt Nobriga and Bruce Herbold will confer to refine the analyses, and will report back to the full Working Group at the next meeting.

Next Scheduled Meeting: Tuesday, October 10, 2006, at 2:00 pm in room W-1931 at the Cottage Way federal building.

One attachment

Submitted, VLP

Attachment

Figure 1. Delta smelt salvage by date, with dates represented as days after October 1.

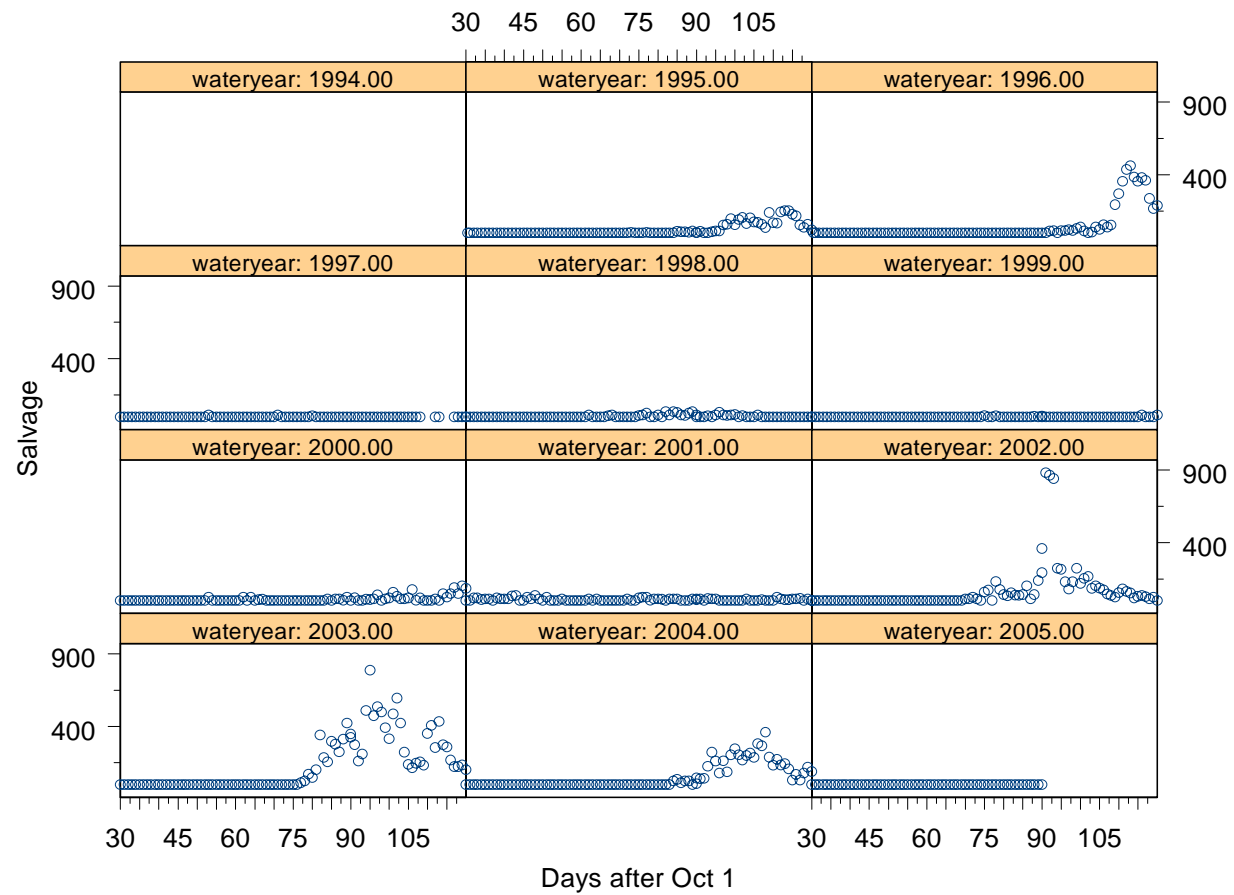


Figure 2. Cumulative delta smelt salvage with Delta inflow overlaid.

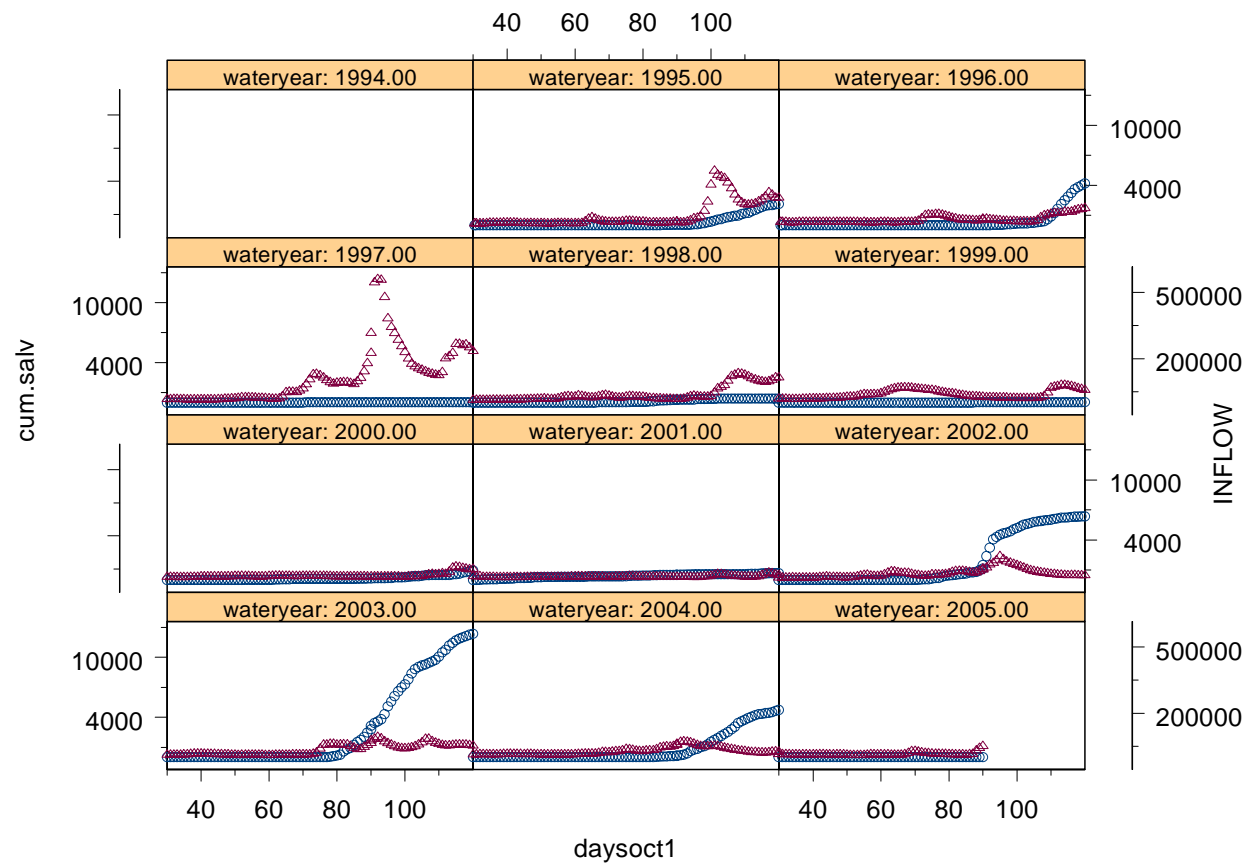


Figure 3. Cumulative delta smelt salvage with average X2 overlaid.

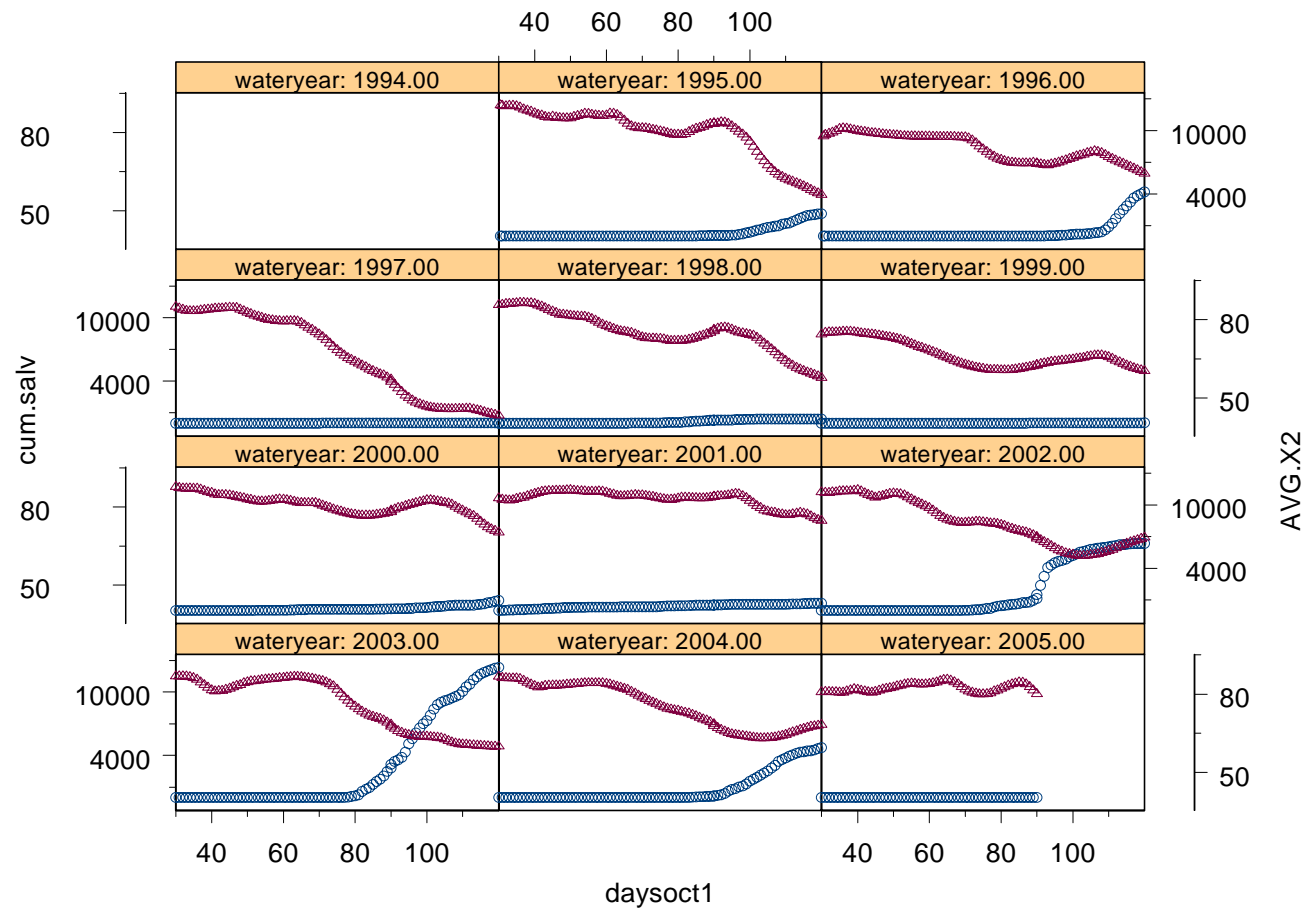


Figure 4. Cumulative delta smelt salvage with average water temperature at Antioch overlaid.

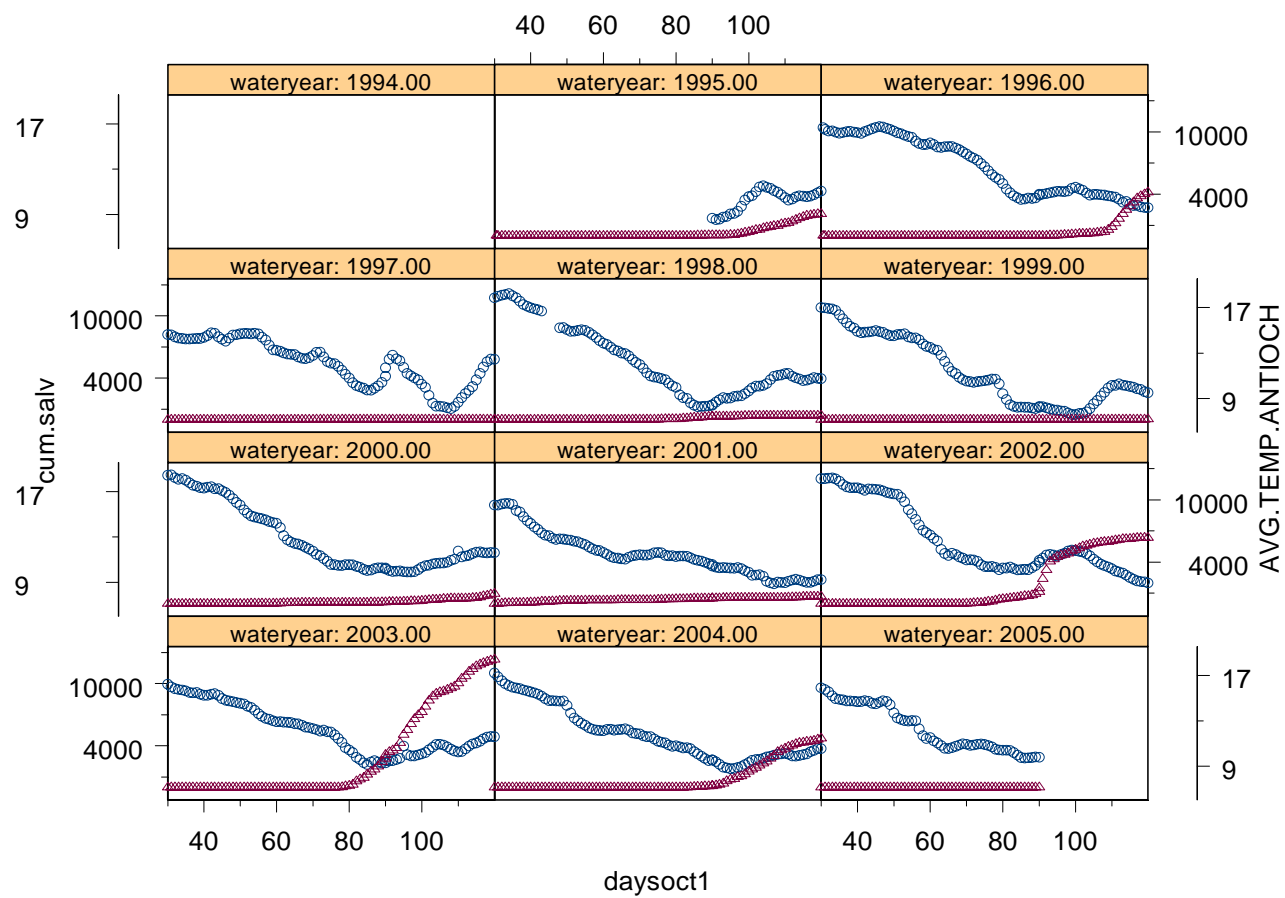


Figure 5. Cumulative delta smelt salvage with Sacramento River flow overlaid.

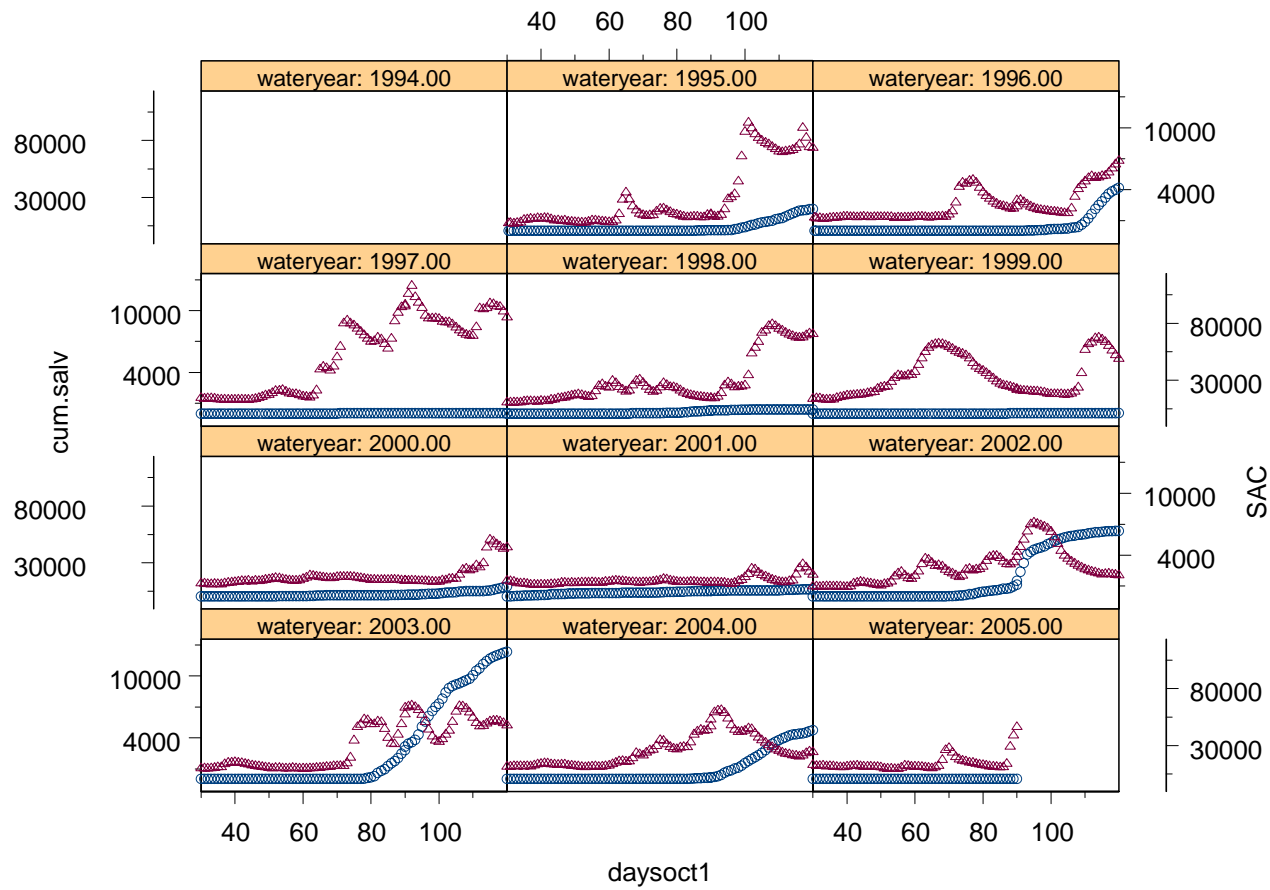


Figure 6. Cumulative delta smelt salvage with San Joaquin River flow overlaid.

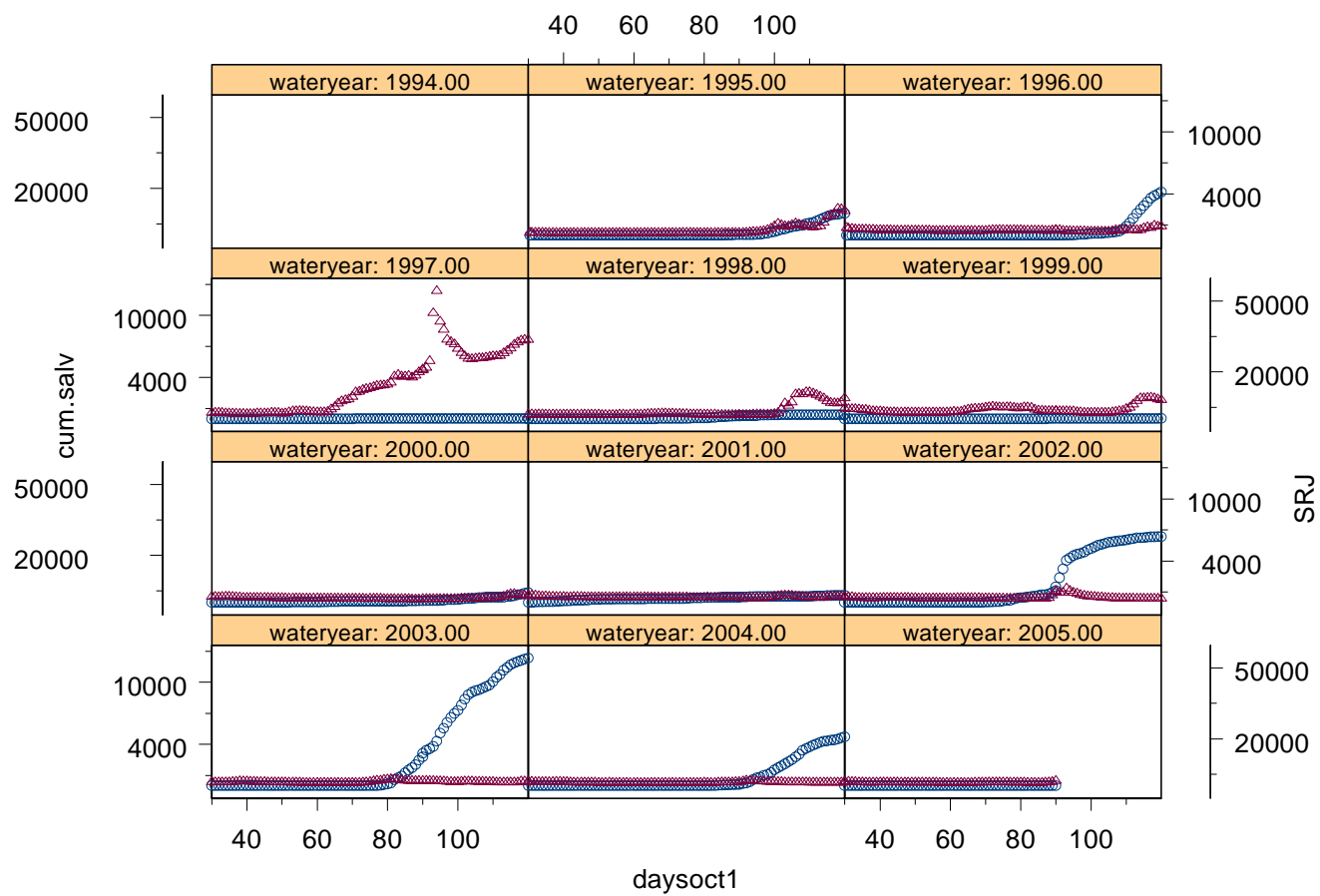


Figure 7. Cumulative delta smelt salvage with total daily solar radiation overlaid.

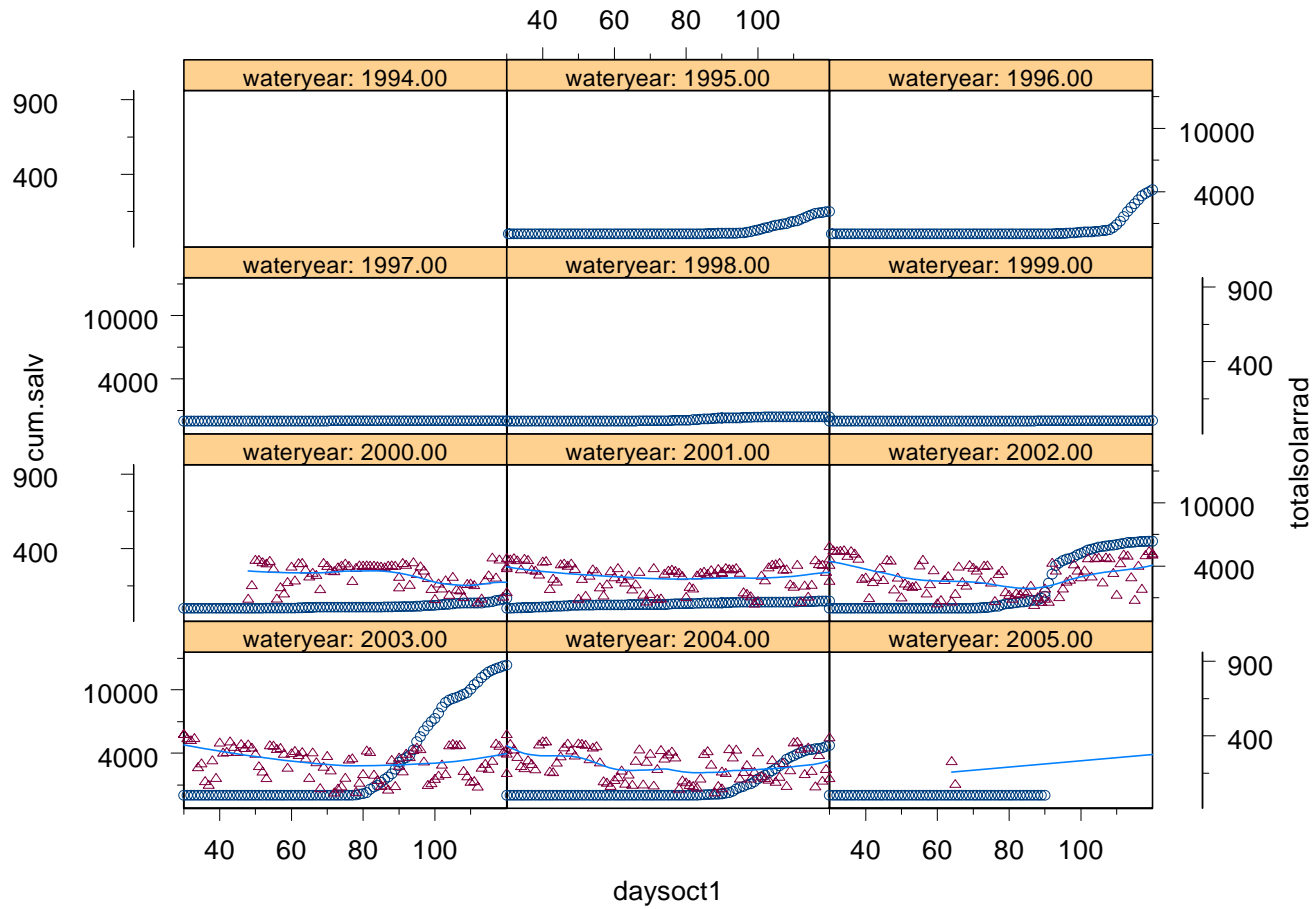


EXHIBIT 9

Delta Smelt Working Group Meeting Notes

December 11, 2006

Participating: Gonzalo Castillo (USFWS), Mike Chotkowski (USBR), Kevin Fleming (CDFG), Lenny Grimaldo (CDWR), Tracy Hinojosa (CDWR), Ann Lubas-Williams (USBR), Matt Nobriga (CDWR), Ted Sommer (CDWR), Jim White (CDFG) and Victoria Poage (USFWS, convener and scribe)

For Discussion:

1. Revisit the preliminary recommendation for a winter action from the October 10 meeting
2. Future recommendations for spring South Delta barrier installation
3. Resources' POD Action Matrix and supporting documentation

Recommendation for WOMT: The Working Group had two recommendations for WOMT. These recommendations reflect conditions which the Working Group believes are likely to minimize salvage of pre-spawning adult delta smelt in winter and larval delta smelt in spring, but if high salvage occurs, then other actions may be warranted.

First, the Working Group finalized the preliminary recommendation from October 10 as follows:

- Implement a proactive winter action to address concerns about wintertime entrainment of adults during "first flush" conditions. It is unlikely that any action will be needed until after December 25th. Delta water temperatures have already dropped below 13⁰ C (compiled from data from Mossdale, Antioch and Rio Vista). Once the time of year and water temperature cues are appropriate for smelt migration to spawning areas, the Working Group may recommend the following: no more than seven days after Sacramento River flow at Freeport rises above 25,000 cfs for at least three days, increase flows in lower Old and Middle Rivers to at least -3500 cfs until February 15th.
- If no Sacramento River pulse above 25,000 cfs occurs by January 15th then Old and Middle River flows should be moderated to a range of -5000 cfs to -3500 cfs until February 15th.
- If flows on the Sacramento River are above 25,000 cfs prior to Dec 25th, and remain above 25,000 cfs through Feb 15th, the Working Group does not anticipate requesting operational changes. However, actions may be considered if Freeport flows increase but are not sustained above 25,000 cfs or if high salvage events occur.

The Working Group will consider and/or generate additional analyses of existing data and continue to monitor conditions in the Delta and survey sampling results to determine whether further refinements to the recommendation are needed.

The second recommendation is to forego installation of the spring Head-of-Old River Barrier and to postpone installation and operation of the agricultural barriers until June 1.

Meeting Notes:

1. The Delta Smelt Working Group revisited the preliminary recommendation for a winter action made at its October 10 meeting. The Working Group retained its original “first flush” conceptual model, which assumes, based on an examination of salvage data and numerous environmental variables, that adult delta smelt movement up the estuary (which increases vulnerability to entrainment) follows decreases in Delta water temperature and increases in Sacramento River flow. The Working Group retained the temperature criterion of less than 13⁰C at Mossdale, Antioch and Rio Vista and Sacramento River flow criterion of exceeding 25,000 cfs for at least three days as triggers for a winter action. It was noted that the EWA Technical Panel and others have asked the Working Group why, if we accepted analyses presented by Pete Smith, we did not recommend setting net flows in Old and Middle Rivers to zero (cfs) to better protect pre-spawning adults. The Working Group believes that while eliminating net upstream OR/MR flow likely would be better for delta smelt, operating to this target would be prohibitively expensive, and that significant protection could be achieved with flows of -3500 cfs. DWR staff have derived estimates of the water costs of the potential actions in the Resources Agency POD Action Matrix and found that the proposed winter action could consume all available environmental water, leaving no assets for spring actions for larvae or juveniles. The Working Group discussed assessing the expected benefit of alternative OR/MR flows for adult delta smelt, given that there are two key issues: (1) the rate of the flow reduction and (2) the duration of the flow reduction. In relative terms, contingency tables of flow versus duration could look something like this:

Adults			Juveniles		
1 week			1 week		
4 weeks			4 weeks		
0 cfs	Better	Best	0 cfs	Not So Bad	Best
-3500 cfs	Worse	Not So Bad	-3500 cfs	Worse	Better

The Working Group discussed restructuring the recommendation so as to gain some of the expected benefit of zero cfs, if only for a short period of time, by prescribing zero cfs for two weeks, followed by -2000 cfs for 1 or two weeks, followed by -3500 cfs for one or two weeks, using the same criteria of temperature and flow to trigger an action. However, this flow regime would not alleviate the potential shortfall in available environmental water assets, so it was not added to the recommendation.

The Working Group decided to adopt its preliminary recommendation of October 10 as a formal recommendation for a winter action. It was noted that “first flush” conditions should not take anyone by surprise; Delta water temperatures will likely drop gradually, and significant increases in Sacramento River flows would likely become apparent three to five days before Freeport flows trigger an action. However, the Working Group believed that additional analyses of the relationship of salvage to OR/MR flows and of days post-flush to first salvage would be informative. Two families of recommendations, one for adults and one for juveniles, could conceivably be generated via additional analyses of salvage in relation to OR/MR flow. Some of this work may already have

been undertaken by others; the status of this work should be clarified and remaining analyses undertaken as appropriate.

2. Recent PTM modeling (see October 30 meeting notes) indicated that the South Delta barriers increase particle entrainment risk from the central Delta. The Working Group recommends against the installation of the spring Head-of-Old River barrier and postponement of the installation and operation of the agricultural barriers until June 1.

Discussion of the first two agenda items did not leave sufficient time for discussion of the supporting documentation for Resources' POD Action Matrix.

Submitted,
VLP

EXHIBIT 10

Delta Smelt Working Group Meeting Minutes

October 10, 2006

Participating: Gonzalo Castillo (USFWS), Mike Chotkowski (USBR), Kevin Fleming (CDFG), Lenny Grimaldo (CDWR), Bruce Herbold (USEPA), Tracy Hinojosa (CDWR), Peter Johnsen (USFWS), Ann Lubas-Williams (USBR), Matt Nobriga (CDWR), Ted Sommer (CDWR), Jim White (CDFG) and Victoria Poage (USFWS, convener and scribe)

For Discussion:

1. CDFG's action plan matrix
2. Refined analyses of data pertinent to winter salvage events (triggering variables)
3. Parameters for PTM modeling of CCF gate ops

Recommendation for WOMT:

The Working Group made a preliminary recommendation to implement a proactive winter action to address concerns about wintertime entrainment of adults during "first flush" conditions. No action will likely be needed until after December 25th and after Delta water temperatures drop below 13⁰ C (compiled from data from Mossdale, Antioch and Rio Vista). Once time and temperatures are appropriate for smelt spawning movements, Sacramento River flow at Freeport increases above 25,000 cfs should trigger operational changes to achieve flows in lower Old and Middle Rivers no more negative than -3500 cfs. If no Sacramento River pulse above 25,000 cfs occurs by January 15th then Old and Middle River flows should be moderated as much as possible until February 15th. This recommendation reflects conditions which the Working Group believes are likely to minimize salvage of pre-spawning adult delta smelt, but if high salvage occurs other actions may be warranted.

If flows on the Sacramento River are above 25,000 cfs prior to Dec 25th, and remain above 25,000 cfs through Feb 15th, no action should be necessary.

Salvage of adults or other conditions suggesting that adults are spawning in the South Delta are an indicator that springtime actions may also be beneficial. If salvage is low and flows in Old and Middle Rivers are not strongly negative in January and February, then springtime actions might not be warranted.

Minutes:

The second sampling period of the Fall Mid-Water Trawl survey is underway this week. No information was available.

CDFG has been asked to compile a supplement to the POD Action Plan that outlines any new actions that could potentially be taken to protect delta smelt. Kevin Fleming presented a draft document with separate potential actions for winter and spring (see attachment 1). The emphasis was on actions that could be implemented at the SWP. The first trigger would come with the Recovery Index, as before, but DFG proposed that if the

index is less than 74 and the net flow at Old and Middle Rivers is more negative than -5000 cfs, flows be increased so that net Old and Middle river flows are no more negative than -5000 cfs, either by reducing exports or increasing San Joaquin River flow. DFG proposed changing the level of salvage concern from reaching the 50th percentile of the ratio of salvage to the recovery index to reaching the 25th percentile of the ratio, and making both percentiles triggers for export reductions or increases in SJR flow. After reviewing the graphic of Old and Middle River flow plotted against salvage (attachment 2), the Working Group recommended that OR/MR flows be increased further, to no more negative than -3500 cfs. Although the graphic depicts a linear relationship, the Working Group discussed the possibility that it is likely more sigmoidal, with a threshold level of effect followed by a steep upward curve. The Working Group noted that some of the weaknesses of the DFG plan included the potential to exhaust all EWA and B2 assets in winter, leaving nothing in reserve for spring actions, and that the document specifies no magnitude or duration for the proposed export cuts/flow increases. The Working Group noted that if a winter action is triggered by a salvage event, indicating adult delta smelt are (or at least were) present in the southern Delta and will be spawning there, then the likelihood that a spring action would be needed is greater than if an action is triggered only by environmental factors. However, if the adult salvage concern level is not reached, a spring action may not be needed. These recommendations notwithstanding, decisions to implement the action would best be made in real-time, as circumstances dictate. Spring actions do not yet include a flow trigger; this needs further discussion, and may depend upon real-time conditions and the results of PTM modeling. Spring actions also include modifications to Clifton Court Forebay intake gate operations. Following the discussion, changes will be made to the document which will be circulated for further review and comment by the Working Group and then forwarded to DFG management for final review.

The Working Group continued its August 30 and September 26 discussions of the environmental factors that correspond to the onset or sudden increases in salvage of pre-spawning adult delta smelt. Preliminary analyses indicate that a drop in water temperature to about 13⁰ C followed by an increase in Delta inflow may be a good predictor of adult salvage. More work is needed to refine these potential environmental triggers; however, the Working Group made the following preliminary recommendation:

1. action triggered by environmental factors (proactive mode)
 - when Delta water temperatures reach 13⁰ C and Delta inflow increases to 25,000 cfs or greater, increase the net OR/MR flow to no more negative than -3500 cfs
 - if no Sacramento River pulse above 25,000 cfs occurs by January 15th then Old and Middle River flows should be moderated as much as possible until February 15th.
2. action triggered by salvage (reactive mode)
 - when the adult concern level is reached, be it the 25th or the 50th percentile of the ratio, respond as per the DSRAM

As always, the Working Group believes that reacting to a salvage event as it occurred would be far less effective than anticipating a salvage event; the former likely defers or extends salvage in time, whereas the latter is intended to avoid and/or minimize salvage.

A spring action could include reoperation of the CCF intake gates and modification of the schedule by which South Delta barriers (not just the HORB) are installed. Analysis of CCF gate operations and screening efficiency indicate that there may be a diel effect of pumping, and that decreases in approach velocities lead to increases in salvage, likely because of increased efficiency of the screens. Analysis of barrier operations indicates that all barriers, not just the HORB, affect South Delta circulation and particle fate. How this information may be used to reduce impacts to delta smelt warrants further discussion.

The Working Group has for some time been interested in Particle Tracking Modeling of the effects of CCF intake gate operations. Reoperation of the CCF intake gates could even out channel velocities, export pumping and approach velocities and therefore affect salvage. The Working Group proposed that the following PTM runs be performed:

	Barriers in:		Barriers out:	
SJR	4500	7000	4500	7000
Exports	1500 comb.	3000 comb.	1500 comb.	3000 comb.
Gates	Fully Open	Fully Open	Std. Ops	Std. Ops

The PTM would be run for VAMP-like conditions from April 15 – May 15. Particles would be released at 20-mm stations 815, 902 and 910, as in the runs performed last year. Rather than the traditional bar chart output, the Working Group requested a cumulative output of particle fates. Holding Sacramento River flows constant, potentially in the range of 20-30,000 cfs, for both San Joaquin flow values would avoid introducing a confounding factor. However, it may be more realistic to match historic SR flows to historic SJR flows.

Action Items:

1. Mike Chotkowski will work on refining the winter salvage trigger analyses.
2. DWR modeling staff will perform the requested PTM runs.

Next Scheduled Meeting: Not yet scheduled.

Attachments: 2

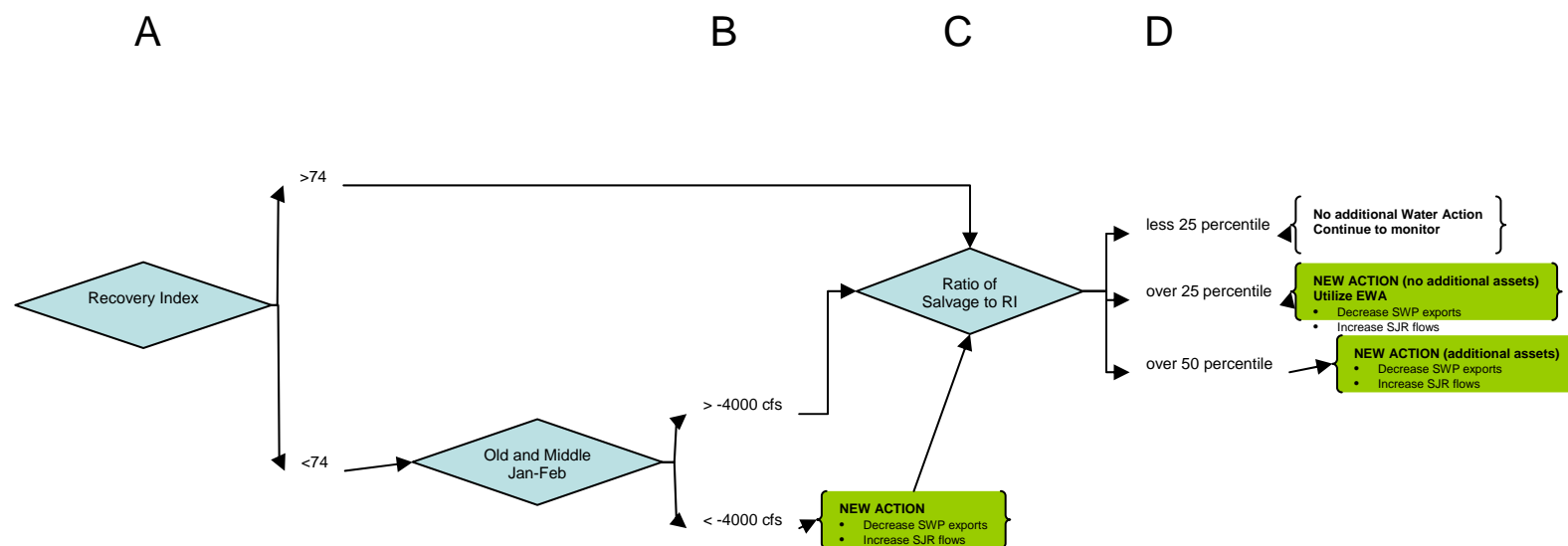
Submitted,

VLP

Winter Action – DRAFT for discussion only

Reduce entrainment of POD fish (delta smelt, longfin smelt and striped bass)

- *Modify Old and Middle River flows (pre-emptive)*
- *Reduce salvage (reactionary)*



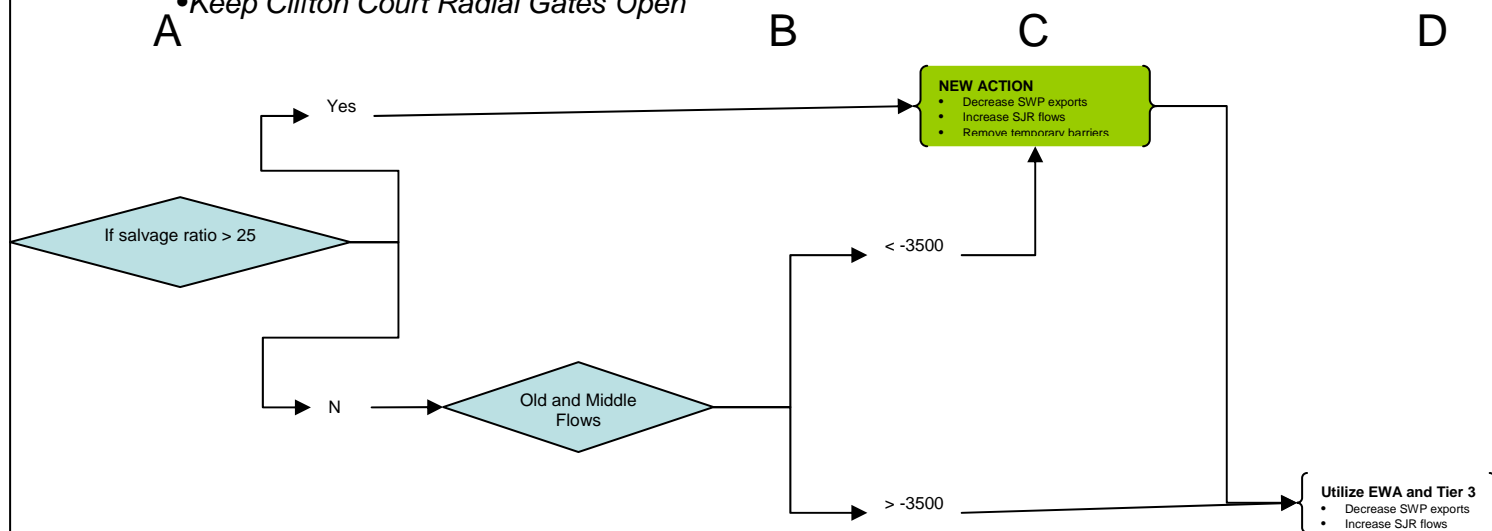
- *Recovery Index is based upon FMWT and will be available by mid October. The RI of 74 represents the median for all years. From the RI the salvage concern levels is calculated. This algorithm for the concern level is found in the 2005 USFWS OCAP BO.*
- *January and February combined Old and Middle River flows should be projected based upon model runs with both current and projected operations. The -4000 cfs criterion is only a first approximation based upon a visual inspection of the graphs prepared by Pete Smith, USGS. The actual target criterion will require further input from DSWG an other Agency staff.*
- *The amount and timing of the new action to reduce negative flows will require further input from DSWG an other Agency staff. It will likely determined by a combination of spawning migration cues (outflow and temperature) as well as historic patterns of salvage events.*
- *This is a modification of the current DSRAM with the inclusion of a more protective criterion for concern. Given a low RI the differences in salvage numbers between 25 and 50 percentile is not anticipated to be great and the length of time between hitting the 25 and 50 percentile will be short. Therefore, additional water assets need to be identified prior to the need and readied for implementation.*

Early Spring Action – DRAFT for discussion only

Reduce entrainment of POD fish (delta smelt, longfin smelt and striped bass)

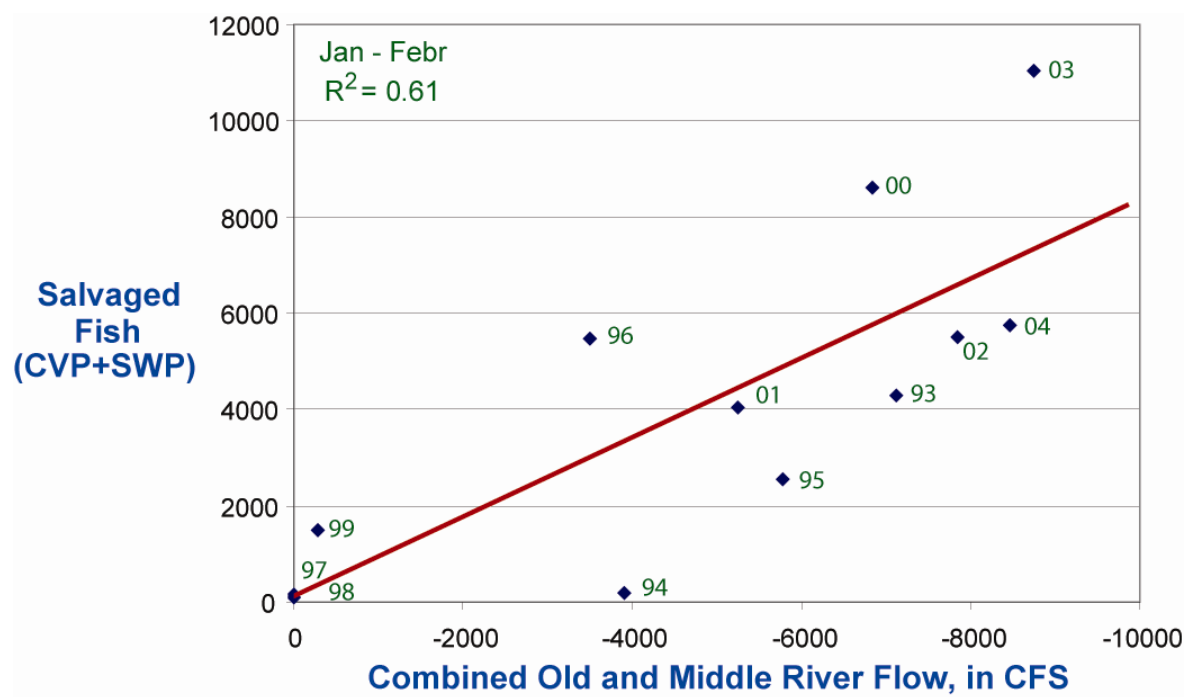
• *Modify delta hydrology during early delta smelt early larval stage*

- *Additional assets (SJR)*
- *Reduced SWP exports*
- *Remove Temporary Barriers*
- *Keep Clifton Court Radial Gates Open*



- *If there was a need for winter protection of the adults pre-spawn, there will be a need to protect the larvae.*
- *Relationship between early flows and subsequent delta smelt distribution. Based upon 20MM Survey "centroid" distribution, the higher the early flows the further downstream the resulting smelt distribution.*
- *The amount and timing of the new action to reduce entrainment will require further input from DSWG and Agency staff. It will likely determined by a spawning cues (temperature) as well as historic patterns of salvage events.*
- *This is would include a pre-VAMP use of EWA assets. It may turn out that the only time that the radial gates can be left open is during this pre-VAMP/VAMP period, in which case this is where that particular new action will be used.*

Attachment 2.



Source: Pete Smith, USGS

EXHIBIT 11

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17 **UNITED STATES DISTRICT COURT**
18 **FOR THE EASTERN DISTRICT OF CALIFORNIA**
19 **FRESNO DIVISION**

20 NATURAL RESOURCES DEFENSE
21 COUNCIL, et al.,

22 Plaintiffs,

23 v.

24 DIRK KEMPTHORNE, et al.,

25 Defendants.

Case No.: 1:05-CV-01207 OWW LJO

DECLARATION OF
BRUCE OPPENHEIM

26 I, Bruce F. Oppenheim, hereby declare as follows:

27 1. I am a Fishery Biologist for the National Marine Fisheries Service (NMFS), Southwest
28 Region, Sacramento Area Office and have been employed by the NMFS over 7 years. In my
capacity as a fishery biologist I have been responsible for implementing the Federal Endangered
Species Act (ESA) within the Sacramento and San Joaquin River Basins (California's Central
Valley). I have worked on various ESA section 7 consultations including the Central Valley
Project (CVP) and State Water Project (SWP) Operations, Criteria, and Plan (OCAP) for the past
7 years. I have been involved with CVP and SWP operations throughout my career as the NMFS
representative on the Water Operations Management Team, the Data Analysis Team, the B2
Interagency Team, the Environmental Water Account Team and the Sacramento River

1 Temperature Task Group. All of these teams are integrated into the adaptive management
2 process described in OCAP. Previously, I was employed by the U.S. Fish and Wildlife Service
3 in the Stockton Field Office (1999-2000), and the Arcata Field Office (1990-1999) where I was
4 involved in salmon monitoring on the Klamath and Trinity Rivers.

5 2. There are four anadromous fish species in the Sacramento River/San Joaquin River system
6 that are listed under the ESA over which the NMFS has jurisdiction: winter run Chinook
7 salmon, spring run Chinook salmon, the Central Valley steelhead Distinct Population Segment
8 (DPS), and the southern DPS of North American green sturgeon. In addition, fall run Chinook
9 salmon are present in this system. While fall run Chinook salmon are not listed under the ESA,
10 the federal actions affecting fall run Chinook salmon habitat are subject to provisions of the
11 Magnuson-Stevens Fishery Conservation and Management Act.

12 3. The continued existence of these anadromous species depend in large part on decisions
13 made by federal and state project operators that control the releases from upstream reservoirs.
14 Decisions made to manage habitat conditions for delta smelt, a resident pelagic fish in the
15 Sacramento-San Joaquin Delta (Delta), have direct consequences for other species that use the
16 same Delta habitat, including the four fish species under NMFS ESA jurisdiction. The system of
17 dams and water conveyance structures included in the CVP and SWP block access to a
18 significant portion of historical habitat limiting the available habitat for spawning and rearing.
19 Modification of planned releases of stored water in project reservoirs affects downstream flows
20 and the ability to manage water temperatures for anadromous fish. A limited amount of cold
21 water exists in project reservoirs and must be judiciously allocated during critical periods
22 (spawning and egg incubation).

23 4. Adequate attraction flows in the fall are necessary to overcome the adverse effects of poor
24 water quality and low flow conditions in the San Joaquin River for fall run Chinook salmon and
25 steelhead. Water usually reserved for fall actions was purchased on the Stanislaus and Merced
26 Rivers and released this spring in order to decrease reverse flows in the Delta.

27 5. Over the past several weeks, flows have fluctuated in the Stanislaus River. Historically, at
28 the end the 4-week pulse of flows and reduced export pumping associated with the Vernalis

Adaptive Management Plan (VAMP), flows are ramped down on the Stanislaus River to queue remaining salmonid species (including juvenile fall run Chinook salmon and listed steelhead) to outmigrate before water temperatures in the Delta reach lethal levels. Recently, when the U.S. Bureau of Reclamation (Reclamation) contacted NMFS and inquired about raising flows on the Stanislaus River to increase Delta inflow from the San Joaquin River watershed (in order to protect delta smelt by minimizing or avoiding reverse flows in Old and Middle Rivers), NMFS did not oppose the action. However, NMFS encouraged Reclamation to ramp flows downward as soon as possible, to avoid potential impacts to salmonid species. NMFS intends to continue to work with Reclamation to ensure continued protection of salmonid species.

6. NMFS is concerned that the proposed remedial actions for delta smelt may reduce fall attraction flows in the San Joaquin River system, and the ability to meet water temperature requirements in the Sacramento River basin next spring and summer. Water temperature criteria for ESA listed fish species are non-discretionary conditions described in the NMFS 2004 OCAP biological opinion. Flow and temperature standards are considered part of the baseline operations required by the State Water Resource Control Board Decision Order 90-05 for the Sacramento River, and Water Right Decision 1641 for the Delta. The operations of the CVP are linked together, therefore, the use of environmental water after VAMP on the San Joaquin River may have consequences later in the year on the Sacramento River.

7. The 90 percent exceedence forecast for May 2007, shows the End-of-September (EOS) carry-over storage requirement in Shasta Reservoir will be about 1.902 million acre feet (MAF). This required storage level is considered necessary to protect the cold water pool available for winter run Chinook salmon spawning below Keswick Dam. Any additional releases from Shasta Reservoir could reduce EOS storage below the 1.9 MAF criteria and limit the ability to control water temperatures in upstream spawning areas. In addition, higher releases from Folsom Dam on the American River for delta smelt may reduce the ability to manage water temperatures for Central Valley steelhead and reduce the cold water available for commercially valuable fall run Chinook salmon spawning in November. This year (2007) is considered a "dry" water year, therefore, reservoir storage levels should be conserved in case of a subsequent "dry" or "critical"

year in 2008.

8. Remedial actions for delta smelt (such as export reductions and positive Old and Middle River flows) will have positive effects on juvenile salmonids through reduced entrainment at the Delta pumps and higher survival rates. However, some proposed actions such as opening the Delta Cross Channel gates early, and not installing the Head of Old River Barrier would reduce survival of salmonids, while being of questionable significance to delta smelt. The actions taken for delta smelt need to be balanced against the impacts on other listed fish species.

This declaration is made pursuant to 28 U.S.C. 1746. I declare under perjury that the foregoing is true and correct to the best of my current knowledge.

Respectfully submitted this 15th day of June, 2007, in Sacramento, California.

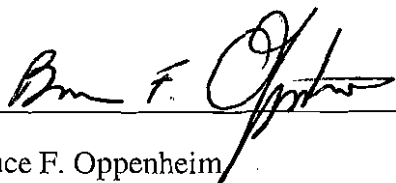

Bruce F. Oppenheim

EXHIBIT 12

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9 Attorneys for the Federal Defendants

10 **UNITED STATES DISTRICT COURT**
11 **EASTERN DISTRICT OF CALIFORNIA**

12 NATURAL RESOURCES DEFENSE COUNCIL,)
13 CALIFORNIA TROUT, BAYKEEPER & ITS)
14 DELTAKEEPER CHAPTER, FRIENDS OF THE)
15 RIVER, and THE BAY INSTITUTE, all non-profit)
16 organizations,)

17 Plaintiffs,)

18 v.)

19 DIRK KEMPTHORNE, in his official capacity as)
20 Secretary of the Interior, and H. DALE HALL, in his)
21 official capacity as Director of the U.S. Fish and)
22 Wildlife Service,)

23 Defendants.)

Case No.: 05-CV-01207 OWW LJO

24 SAN LUIS & DELTA MENDOTA WATER)
25 AUTHORITY, WESTLANDS WATER)
26 DISTRICT, CALIFORNIA FARM BUREAU)
27 FEDERATION, GLENN-COLUSA)
28 IRRIGATION DISTRICT, et al., CALIFORNIA)
DEPARTMENT OF WATER RESOURCES,)
STATE WATER CONTRACTORS; and KERN)
COUNTY WATER AGENCY.)

Intervenors/Defendants.)

DECLARATION OF RONALD MILLIGAN

I, Ronald Milligan, declare as follows:

1. I am the Manager of the Central Valley Operations (CVO) Office of the United States Bureau of Reclamation (Reclamation), Mid-Pacific Region. In my capacity as CVO Manager, I have responsibility for the day to day operations of the Central Valley Project (CVP). I have held this position since November, 2004.

- 1 2. CVP is currently pumping at 3500cfs from Jones Pumping Plant (Jones). Since May 30,
2 there has been estimated salvage of 61 delta smelt (5 actual observed and one incidental
3 observation) at Jones.
- 4 3. Water temperatures in the south delta have been have ranged from 20.4°C on May 23 to
5 25°C on June 18 for the three station average. On Monday, June 18, the three station
6 average reached 25°C for the 1 pm to 6 pm period. Attachment 1 to this declaration
7 shows the data collected from the monitoring stations for May 22, 2007 to June 20, 2007.
- 8 4. To date, Reclamation has spent approximately \$5.2 million to augment flows on the San
9 Joaquin River to improve Old and Middle River Flows. Releases from the Merced River
10 (approximately 15,000acre feet in total releases) continue to reach Vernalis and should
11 continue through the Delta for the remainder of this week. Reclamation also purchased
12 approximately 20,000 acre-feet of water on the Stanislaus River, which was released in
13 May and June. Reclamation did not seek further releases on the Stanislaus in order to
14 maintain sufficient storage to provide fall flows for salmon, and to cue any salmon or
15 steelhead remaining in the Stanislaus to move into the Delta before temperatures in the
16 Delta reached lethal limits.
- 17 5. Current tidal projections should significantly improve Old and Middle River flows this
18 week.
- 19 6. Reclamation operates two reservoirs in the San Joaquin watershed, Friant Dam on the San
20 Joaquin River and New Melones on the Stanislaus River. Friant is hydrologically
21 isolated upstream from the confluence of the Merced River in all but the wettest of years,
22 and operations of Friant Dam are subject to a court approved settlement in the matter of
23 Natural Resources Defense Council, et al. v. Kirk Rodgers, et al., Civ. No. S-88-1658
24 LKK/GGH (E.D. Cal.).
- 25 7. Reclamation operates New Melones Reservoir to meet obligations to senior water rights
26 holders, instream fishery flow in accordance with a 1987 agreement with the Department
27 of Fish and Game, water quality and flow criteria at Vernalis as specified in Water Rights
28 Decision D-1641, water dedicated under Central Valley Project Improvement Act Section

1 3406(b)(2), and project needs of the East Side Division CVP contractors. There is no
2 additional water available for out of basin releases from New Melones Reservoir and
3 releasing additional water would impact Reclamation's ability to meet its water
4 obligations from New Melones Reservoir this year and into future years.

5 8. CVP demands for water from contractors are currently being met through a combination
6 of pumping at Jones and withdrawal of water from San Luis Reservoir. Withdrawal of
7 storage from San Luis Reservoir is still limited to 2 feet per day to protect from sloughing
8 of the dam face. As the reservoir lowers the maximum withdrawal rate produces less
9 supply.

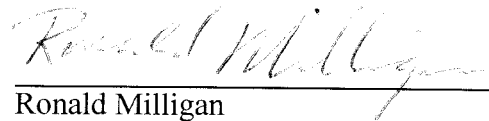
10 9. Given warm weather and maturing crops, current demands require pumping levels greater
11 than the pumping that occurred on June 17 and 18, which was approximately 2500cfs at
12 Jones and 500 cfs at Banks Pumping Plant (Banks), a State Water Project (SWP) facility.
13 Even at these rates water levels in O'Neill Forebay were critically low for several days.
14 Supply interruption caused by low O'Neill storage was narrowly averted this last
15 weekend. Such an interruption would result in reduced deliveries to SWP contractors
16 south of Dos Amigos pumping plant and could take up to 9 hours to restore full deliveries
17 to the Delta Mendota Canal.

18 10. Additional pumping is needed to avoid excessive drawdown of San Luis Reservoir and
19 eventual allocation reductions caused by very low water levels in San Luis Reservoir.
20 Failure to increase pumping will also likely result in reduced water quality for municipal
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1 contractors in the San Felipe Division who receive water from San Luis Reservoir when
2 the reservoir level reaches its lowest point in September (low-point).

3 I declare under penalty of perjury under the laws of the State of California and the United States,
4 that the foregoing is true and correct.

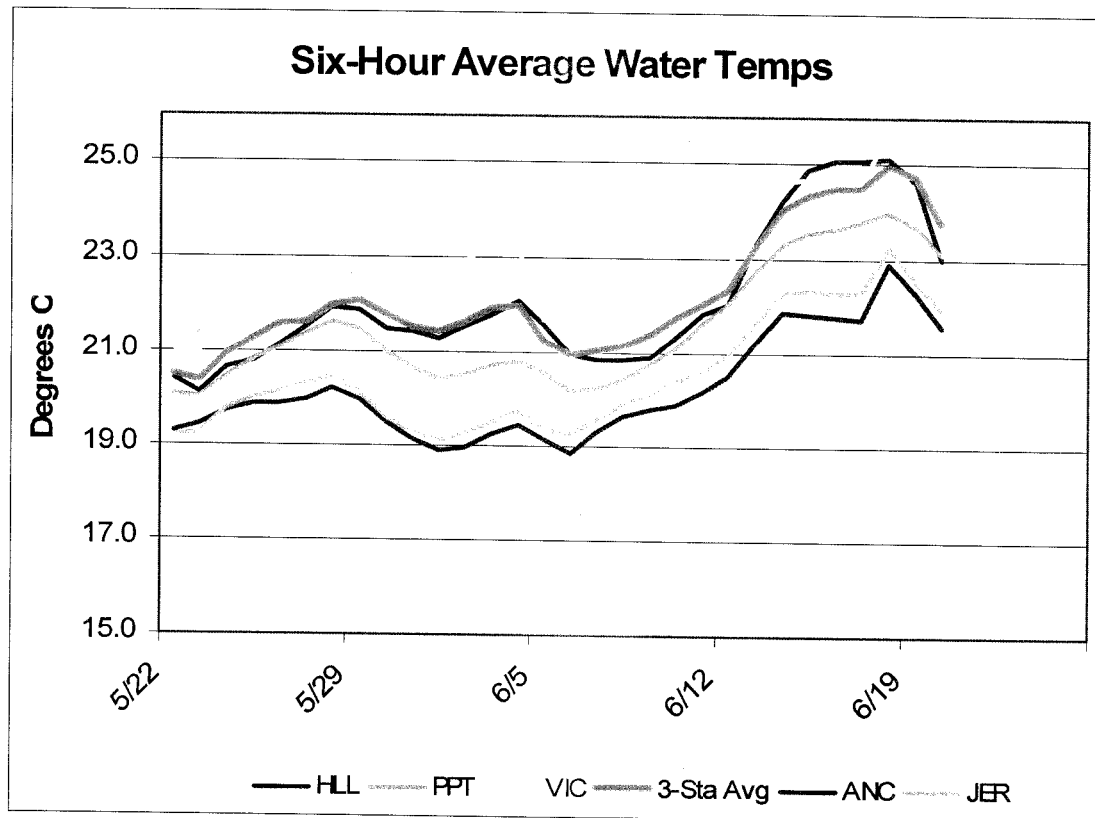
5 Dated this 21th day of June, 2007.

6 
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8 Ronald Milligan
9 Manager, Central Valley Operations Office,
10 Mid- Pacific Region, U.S. Bureau of Reclamation
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Attachment 1



Date	HLL	PPT	VIC	3-Station Average	ANC	JER
5/22/2007	20.4	20.1	21.1	20.5	19.3	19.2
5/23/2007	20.1	20.0	21.0	20.4	19.4	19.3
5/24/2007	20.6	20.5	21.8	21.0	19.7	19.8
5/25/2007	20.8	20.9	22.2	21.3	19.9	20.0
5/26/2007	21.1	21.1	22.5	21.6	19.9	20.1
5/27/2007	21.6	21.4	22.0	21.7	20.0	20.3
5/28/2007	21.9	21.6	22.4	22.0	20.2	20.5
5/29/2007	21.9	21.5	22.8	22.1	20.0	20.1
5/30/2007	21.5	21.0	22.9	21.8	19.5	19.6
5/31/2007	21.4	20.7	22.5	21.5	19.1	19.3
6/1/2007	21.3	20.4	22.5	21.4	18.9	19.1
6/2/2007	21.5	20.5	22.9	21.6	19.0	19.3
6/3/2007	21.8	20.7	23.3	21.9	19.2	19.5
6/4/2007	22.1	20.8	23.1	22.0	19.5	19.8
6/5/2007	21.6	20.6	21.7	21.3	19.2	19.4
6/6/2007	20.9	20.2	21.8	21.0	18.9	19.3
6/7/2007	20.9	20.2	22.1	21.1	19.3	19.5
6/8/2007	20.8	20.4	22.3	21.2	19.7	19.9
6/9/2007	20.9	20.8	22.6	21.4	19.8	20.1
6/10/2007	21.3	21.1	22.8	21.8	19.9	20.4
6/11/2007	21.8	21.6	22.6	22.0	20.2	20.6
6/12/2007	22.1	22.1	22.9	22.3	20.5	21.0
6/13/2007	23.3	22.7	23.8	23.3	21.3	21.6
6/14/2007	24.2	23.3	24.6	24.1	21.9	22.3
6/15/2007	24.9	23.5	24.7	24.4	21.9	22.3
6/16/2007	25.1	23.7	24.7	24.5	21.8	22.3
6/17/2007	25.1	23.8	24.6	24.5	21.8	22.3
6/18/2007	25.1	24.0	25.7	25.0	22.9	23.3
6/19/2007	24.6	23.7	25.8	24.7	22.3	22.5
6/20/2007	23.0	23.1	25.2	23.8	21.6	22.0

EXHIBIT 13

Reported by: KAREN LOPEZ, Official Court Reporter

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Of Water Resources:

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1 Friday, August 31, 2007

Fresno California

2 8:32 a.m.

3 THE COURT: Good morning, ladies and gentlemen.
4 Please be seated. We're back on the record in NRDC versus
5 Kempthorne. Mr. Lee, are you going -- Ms. Wordham.

6 MS. WORDHAM: Your Honor, we are prepared to call Mr.
7 Leahigh. However, there is the preliminary matter of DWR's
8 objections to the declaration of Mr. Rosekrans.

9 THE COURT: All right. What I can tell you is that I
10 have received -- apparently there is a party or parties who
11 want to telephonically observe the proceedings and so they're
12 being connected now.

13 THE CLERK: Hello. This is the Eastern District of
14 California.

15 A VOICE: I've got Chris Stevens from the CALFED
16 Bay-Delta program on the line.

17 MR. STEVENS: Hello this is Chris Stevens from the
18 Bay-Delta Authority in Sacramento.

19 THE COURT: Okay. Thank you.

20 Mr. Stevens, can you hear me? This is Judge Wanger.

21 MR. STEVENS: I can, Your Honor. Thank you.

22 THE COURT: I understand that you want to observe the
23 proceedings telephonically?

24 MR. STEVENS: That would be my preference.

25 THE COURT: All right. Well, with the understanding

1 that you're not going to participate. Does anybody object?

2 MS. POOLE: No, Your Honor.

3 MS. WORDHAM: No, Your Honor.

4 MR. WILKINSON: No, Your Honor.

5 THE COURT: All right. Well, then, you will be
6 permitted to observe telephonically with the understanding
7 that you're not going to participate. Do you agree?

8 MR. STEVENS: I agree, thank you, sir.

9 THE COURT: All right. Let me indicate that I have
10 objections from the plaintiffs to the admission of the
11 declarations of James Snow, Russ Freeman, Russell D. Harrison,
12 Daniel G. Nelson, Joan Maher, G.F. Duerig. I have the State
13 Water Contractors opposition to those objections. Now, those
14 are the only evidentiary objections I've received.

15 MS. WORDHAM: Your Honor, the Department of Water
16 Resources reserved its right to make oral objections this
17 morning to the declaration of Spreck Rosekrans.

18 THE COURT: All right. This would be -- this was
19 identified yesterday as Plaintiffs' Exhibit 24.

20 I thought there were two declarations of Mr.
21 Rosekrans.

22 MS. WORDHAM: There are, Your Honor. 24 and 25. We
23 are only objecting to a couple of exhibits in Mr. Rosekrans'
24 July 23rd declaration, which is document No. 420.

25 THE COURT: All right. You may proceed.

1 MS. WORDHAM: Your Honor, the Department of Water
2 Resources objects to the Exhibits 4 and 5 of Mr. Rosekrans'
3 July 23, 2007 declaration. The basis for the objection is
4 that as to document 4, there is no citation to it or reference
5 to it in the declaration itself. There's no basis, no
6 foundation for it. Regardless of whether Mr. Rosekrans
7 authored the document, there's no indication in the
8 declaration itself that he relied on it in any part.

9 As to Exhibit Number 5, again, even though Mr.
10 Rosekrans may have authored the document, there's one single
11 reference to it at, I believe, the last paragraph of his
12 declaration. But it provides no foundation for the document,
13 it provides no support for any of the statements made in the
14 document.

15 THE COURT: All right. Thank you very much.

16 MS. POOLE: Your Honor --

17 THE COURT: Ms. Poole.

18 MS. POOLE: With regard to Exhibit 4, Mr. Rosekrans'
19 declaration, beginning at around paragraph 25, which is page 7
20 of 9, discusses alternative water supplies that have been
21 developed in the State of California in the last 15 years.
22 And that discussion relates, obviously, to how they'll respond
23 to reductions in pumping. And that is what Exhibit 4 goes to.
24 Those additional storage facilities.

25 THE COURT: But without any page and line references,

1 as I indicated yesterday, I wasn't simply going to read
2 through hundreds of pages of exhibits that have been attached.
3 Because there physically isn't the time to do it. And so he
4 describes what he understands, if you will, additional storage
5 capacity is.

6 And he doesn't refer to the exhibit nor am I directed
7 to a place within the exhibit where I can find it. He refers,
8 for instance, on page 8 to Article 21, surplus and unscheduled
9 water. And Table A, deliveries. But to the Court's
10 understanding, that would be Table A to Schedule 21.

11 MS. POOLE: If Your Honor would go to the top of that
12 page, line 1 and 2.

13 THE COURT: Yes.

14 MS. POOLE: Looking at page 8 of 9, there's a
15 reference to Diamond Valley Reservoir. That, for example, is
16 one of the facilities identified on Exhibit 4 with the
17 capacity of 800,000 acre feet. And also on paragraph 24 on
18 page 7 of 9, there's a discussion about the contractors making
19 significant investments -- excuse me, Your Honor, I'm at lines
20 21 through 26.

21 THE COURT: Yes. Well, I'm going to consider what he
22 says here. The objection is only to the attached exhibit,
23 which is not referred to, incorporated and doesn't appear to
24 be any foundation for.

25 MS. POOLE: It's not directly referred to, Your

1 Honor. This discussion is based on information in that
2 exhibit. So we would contend that it is -- should be
3 submitted as a basis for the expert's opinion. But not
4 necessarily for the truth of the matter asserted.

5 THE COURT: Ms. Wordham.

6 MS. WORDHAM: Your Honor, notwithstanding counsel's
7 representation, there is nothing in the declaration to
8 indicate that Mr. Rosekrans relied on this document in
9 formulating this opinion.

10 THE COURT: That does -- go ahead, Ms. Poole.

11 MS. POOLE: Your Honor, that reference that I just
12 gave to page 7 of 9 at line 22 does refer to Exhibit SR 4 as
13 an explicit reference. That's Exhibit 4 to Spreck Rosekrans'
14 declaration.

15 THE COURT: All right. I'm going to sustain the
16 objection in part -- is the matter submitted?

17 MS. POOLE: Yes, Your Honor.

18 THE COURT: Ms. Wordham?

19 MS. WORDHAM: Yes, Your Honor.

20 THE COURT: I'm going to sustain the objection in
21 part. I will consider the attached exhibit because there is a
22 foundation of personal knowledge by the expert, Mr. Rosekrans.
23 There is also a specific reference to SR 4, which is one of
24 the objected to exhibits as providing a list of over 6 million
25 acre feet in recently developed storage. And then there's a

1 listing about what entities have, in effect, to use the
2 expert's words, invested in those storage facilities.

3 To that extent, I'm going to consider the
4 declarations for no other purpose. I'm sorry, the exhibit,
5 which is number 4.

6 Now, as to Exhibit Number 5, Ms. Poole, was there any
7 reference in his declaration to Exhibit 5? And is there any
8 need for Exhibit 5?

9 MS. POOLE: Yes, Your Honor. If you look at page 8
10 of 9, paragraph 27, lines 23 through 25. That's an explicit
11 reference to Exhibit 5.

12 THE COURT: This reads "Finally, much of the water
13 that the CALFED Record of Decision (2000) intended to provide
14 environmental uses has not been made available during recent
15 years. This shortfall, averaging approximately 420,000 to
16 460,000 acre feet for the 2002-2004 period, is documented in
17 'Finding the Water,' Environmental Defense 2005 (See Exhibit
18 SR-5)."

19 There is that one specific reference without giving
20 me a page cite in the exhibit. So that means I have to search
21 the exhibit to find it. What I'll do is this. I'm going to
22 make the same ruling if you'll provide me the page cite within
23 SR-5.

24 MS. POOLE: I will do that, Your Honor.

25 THE COURT: All right. Are those the DWR's

1 objections?

2 MS. WORDHAM: That was the extent of DWR's
3 objections, yes, Your Honor.

4 THE COURT: Thank you. Now we'll take up the
5 objections of the plaintiffs to the State Water Contractors
6 offerings and there may be other witnesses from other parties.

7 MR. O' HANLON: Yes, Your Honor. Daniel O' Hanlon.
8 I -- you recall yesterday I did not have with me the redacted
9 form of the declarations that we are offering that the
10 plaintiffs are objecting to. So at this time I'd like to have
11 marked and offered into evidence those declarations.

12 THE COURT: Yes. We had a little difficulty finding
13 them this morning.

14 MR. O' HANLON: Sorry, Your Honor.

15 THE COURT: By the way, let me totally change the
16 subject. A briefcase was left outside the courtroom
17 yesterday. Did the person whose briefcase that is get it?

18 Yes? Good. All right. You may proceed.

19 MR. O' HANLON: Thank you, Your Honor. The first
20 declaration that we're offering is a redacted declaration of
21 James Snow. It was document 410 filed on July 23rd.

22 THE COURT: Which now is Exhibit Number SL --

23 MR. O' HANLON: SL 1, Your Honor.

24 (Defendant's Exhibit SL 1 was marked for
25 identification.)

1 MR. O' HANLON: The second declaration, which will be
2 Exhibit SL J, is a supplemental declaration of Mr. Snow,
3 document No. 462, filed on August 13th.

4 (Defendant's Exhibit SL J was marked for
5 identification.)

6 MR. O' HANLON: The third declaration, which will be
7 SL K, is a redacted version of the declaration of Daniel
8 Nelson, document 460, filed on August 13th.

9 (Defendant's Exhibit SL K was marked for.
10 identification.)

11 MR. O' HANLON: The fourth declaration, which will be
12 marked as Exhibit SL L, is document No. 459 filed on August
13 13th, 2007, declaration by Russ Freeman.

14 (Defendant's Exhibit SL L was marked for.
15 identification.)

16 MR. O' HANLON: And the final declaration, Your Honor,
17 is Exhibit SL M, is document 463 filed on August 13th, 2007.
18 It's the declaration of William Harrison.

19 (Defendant's Exhibit SL M was marked for.
20 identification.)

21 THE COURT: Thank you. Those are objected to
22 declarations along with declarations from State Water
23 Contractors. And so that we're clear, there are objections
24 made on the grounds of relevance, lack of personal knowledge,
25 time consuming, probative, less probative, prejudicial effect

1 under 403 to the James Snow declarations, Russ Freeman,
2 William D. Harrison, Daniel Nelson, Joan Maher, G.F. Duerig.

3 And the opposition to State Water Contractors to
4 these declarations, the Court has -- I received these at about
5 8:10 this morning and I've done my best to read them. So
6 these are your objections, Ms. Poole or Mr. Wall.

7 MS. POOLE: Yes, Your Honor.

8 THE COURT: All right. Do you wish to -- I've read
9 the papers. If you want to provide any argument, you can,
10 otherwise I can rule on the objections.

11 MS. POOLE: Your Honor, I'm happy to submit it on the
12 papers.

13 THE COURT: All right. Thank you.

14 MR. WILKINSON: We are as well, Your Honor.

15 THE COURT: All right.

16 MR. O'HANLON: Your Honor, if I may.

17 THE COURT: Yes, you may.

18 MR. O'HANLON: One additional point in addition to
19 the points made by the State Water Contractors, which we join
20 in. There's an additional reason why these declarations are
21 relevant to the Court's consideration and that is under the
22 Endangered Species Act, a major change to project operations
23 can be required only if necessary to avoid jeopardy. These
24 declarations help establish which of these actions will
25 require major action meter changes to project operations and

1 therefore are relevant under the substantive provisions of the
2 ESA as well.

3 THE COURT: Thank you very much. Ms. Poole.

4 MS. POOLE: May I briefly respond to that, Your
5 Honor?

6 THE COURT: Yes.

7 MS. POOLE: There's no distinction within the
8 Endangered Species Act injunctive relief guidelines for major
9 changes versus minor changes. That's irrelevant as are all
10 cost discussions. The issue is whether actions can go forward
11 that will not jeopardize the species or cause adverse
12 modification of habitat. That's the sole issue Your Honor
13 should be focused on here.

14 THE COURT: All right. Thank you very much. Is the
15 matter submitted?

16 MR. WILKINSON: Yes, Your Honor.

17 MR. O'HANLON: Yes, Your Honor.

18 THE COURT: The Court notes that the plaintiffs have,
19 in their remedies proposal and their briefs in support of
20 these proceedings, offered, and they haven't provided specific
21 language, but they have indicated that they recognize that
22 there should be a public health and safety exception to any
23 interim order that the court were to enter.

24 And they distinguish between economic loss, costs
25 that would be not only monetary but resource or other material

1 or tangible costs as allegedly irrelevant from actions that
2 would directly cause a risk to human health, safety, the human
3 environment, which they have from the outset indicated that
4 such an exception should be part of any order that is issued.

5 The Court has based rulings on that general
6 demarcation which applies under the Endangered Species Act.
7 We have a Biological Opinion that was vacated under the
8 authority of the Administrative Procedures Act.

9 And to the extent that we are going to be addressing
10 the form, the substance, the effect, the scope, the operation
11 and the intent of any remand, with or without vacatur, any
12 other specific orders that the Court enters that would affect
13 the agency, any operation of its ordinary course of business
14 and the conduct of its statutorily mandated and authorized
15 duties, the Court believes there is a two-fold, if you will,
16 legal and equitable basis on which this relief is sought.

17 Because the Biological Opinion and its contents,
18 including the take limits and remedial action measures, the
19 DSRAM, D-S-R-A-M, all of that was done under the provisions of
20 administrative law.

21 The Court believes that administrative law continues
22 to apply in any relief that will be granted as well as, as of
23 yesterday, there is now amended species or there are, I guess
24 there's more than one, amended species claims before the Court
25 which the Court understands, based on the form of remedy that

1 is sought, is in effect a claim for injunctive relief for
2 violations that are alleged of the Endangered Species Act.

3 So this is, if you will, a dual proceeding. It
4 proceeds both under the Administrative Procedures Act and that
5 jurisprudence and the injunction jurisprudence that attaches
6 to APA cases, judicial review of administrative actions under
7 Title 5, Section 702, et seq.

8 And it is also an Endangered Species Act case now, at
9 least as of yesterday, as to the action agency the Bureau of
10 Reclamation. And so the law that applies, that has been
11 correctly cited by the plaintiffs, continues to apply.

12 It is my view that because the Court has the
13 responsibility to understand and to endeavor to protect all
14 the interests that are represented in the litigation and that
15 are before the Court, that for limited purposes, the effect on
16 human health, safety and the environment would include water
17 costs because those affect the operations of the projects.

18 The operations of both the state and the federal
19 project have the potential not only to harm this species but
20 other species. There is direct reference made to the
21 winter-run Chinook salmon and other salmonid species that are
22 potentially affected by actions that are proposed to be
23 implemented under an order that the plaintiffs seek.

24 Day-to-day operations of the projects, because they
25 directly impact water service districts, emergency service

1 districts, municipal water supplies and industrial power and
2 related energy sources have direct effect on human health and
3 the environment.

4 And so the Court is satisfied that that evidence is
5 not irrelevant and that, in terms of being able to evaluate
6 the overall effect of any injunctive relief, that to not
7 consider it would be an abuse of discretion because the Court
8 would, in effect, be foreclosing the exercise of its legal and
9 equitable judgment and ultimately discretion to determine what
10 remedies, if any, are appropriate. There's no way to fully
11 analyze and determine the ultimate effect of those remedies
12 without considering this evidence.

13 As to -- when we get to -- so that covers, I believe,
14 the State Water Contractors, who are municipal and industrial
15 users. It covers, to the extent that water districts supply
16 water for not just irrigation purposes, but for related
17 purposes because we know that there are additional purposes
18 besides only irrigation purposes.

19 But to the extent that water shortages, if under
20 certain scenarios there would be zero water available, for
21 instance, for irrigation districts in the next water year if
22 it continues to be dry, we would be looking at alternate water
23 sources by the irrigation district members who would be, as
24 the Court knows, could take judicial notice of it, relying on
25 groundwater, water exchanges, other types of sources.

1 And given the potential effects of groundwater
2 pumping with regard to overdrafting water tables, causing
3 subsidence, creating air pollution potential, those kinds of
4 risks are also both environmental and affect human health and
5 safety. And so they really cannot be ignored.

6 In terms of ultimately, if the economic losses are
7 converted into what would be, if you will, the human result,
8 where employment is ended, jobs are lost, communities that
9 depend on people who are employed in agriculture are
10 unemployed and, in effect, although we're not, under the
11 Endangered Species Act, concerned about the dollar effect of
12 that on parties.

13 When what we are talking about is the health of a
14 community, of the ability of its citizens and participants to
15 have livelihoods and to be able to maintain themselves, that
16 is an indirect -- it is somewhat remote, but it is an indirect
17 potential effect.

18 And the Court -- because we have this, if you will,
19 dual jurisdiction under the APA and the ESA, should not be
20 entirely ignored. I don't intend to spend any time on it
21 except to have what direct effects the parties who are relying
22 on these matters in a declaration form. All I want in their
23 arguments is for those to be summarized, cataloged and then
24 I'll let the plaintiffs specifically respond to those. But
25 I'm not considering it beyond that and for any other purpose.

1 So the objections are sustained in part consistent
2 with my prior rulings, but adding the additional grounds that
3 I have just added.

4 MS. POOLE: Thank you, Your Honor.

5 THE COURT: All right. Are we ready to proceed
6 with --

7 MR. ORR: Your Honor, one other --

8 THE COURT: Yes, Mr. Orr.

9 MR. ORR: Good morning, Your Honor, Trent Orr for the
10 plaintiffs.

11 THE COURT: Good morning.

12 MR. ORR: One brief housekeeping matter which Your
13 Honor indicated he didn't want to fall between the cracks,
14 which is this question of --

15 THE COURT: Oh, the time to respond. Yes.

16 MR. ORR: Yes. We've conferred and, you know, we
17 would prefer something on the order of 30 days.

18 THE COURT: 30 days. That's what the Court was
19 thinking.

20 MR. ORR: Yeah.

21 THE COURT: And we're not meaning to inconvenience
22 you personally, Mr. Lee, but Ms. Wordham is in the case, she's
23 been in it all the way, and so my inclination is to give all
24 the responding parties 30 days to respond and we'll run that
25 from the date that the second supplemental complaint was

1 filed, which was the 30th of August. Can you live with that?

2 MR. LEE: Could I just confer with my co-counsel just
3 for a minute?

4 THE COURT: Yes, you may. What about other parties
5 while they're conferring?

6 MR. O'HANLON: Yes, Your Honor.

7 MR. MAYSONETT: Your Honor, that's acceptable to the
8 federal defendants.

9 MR. BUCKLEY: No problem with that, Your Honor, for
10 the Farm Bureau.

11 MS. McDONALD: That is fine, Your Honor. Thank you.

12 THE COURT: Mr. Wilkinson?

13 MR. WILKINSON: We'll struggle through it, Your
14 Honor.

15 THE COURT: We're all struggling. Mr. Lee? Ms.
16 Wordham?

17 MS. WORDHAM: Your Honor, as Mr. Lee represented
18 yesterday, he departs on vacation for about a three-week
19 period beginning the end of this week. Next week. Sorry. My
20 apologies. What I would suggest is that -- so an
21 additional -- 45 days would be the minimum required for Mr.
22 Lee to respond.

23 I would offer to respond, but I have a wealth of
24 cases that have been neglected in the last couple of weeks as
25 I'm sure other counsel have. And Mr. Lee has been the primary

1 attorney on this matter on behalf of the Department of Water
2 Resources.

3 What I would suggest is, if the plaintiffs would
4 agree to this, the Department of Water Resources could agree
5 to comply with the Court's ordered remedy today voluntarily
6 and then the issue of whether this Court ultimately has
7 jurisdiction over the department for the plaintiffs' failure
8 to serve a 60-day notice on the department for its EPA actions
9 could be addressed subsequently following DWR submission of a
10 12(b) rule motion.

11 THE COURT: Mr. Orr?

12 MR. ORR: I would provided they're willing to submit
13 themselves to the Court's jurisdiction in the interim, that
14 would be fine.

15 THE COURT: That is what was just stated. And I
16 believe that I can trust Ms. Wordham to be consistent with her
17 representation.

18 All right. Then every party except the DWR shall
19 respond within 30 days following -- let's have a date, please,
20 Ms. Timken.

21 THE CLERK: You want it at 30 days from the August
22 30th; correct? October 1st.

23 THE COURT: It will be October 1st. And for DWR
24 only, it's October 15th. Are those week days?

25 THE CLERK: Yes.

1 MR. ORR: Thank you, Your Honor.

2 THE COURT: You're welcome. With the condition that
3 the DWR's response is on the express undertaking that the DWR
4 consents to the Court's jurisdiction for the imposition of any
5 remedy that may be pronounced in these proceedings. Ms.
6 Poole.

7 MS. POOLE: Your Honor, one final housekeeping
8 matter. I have that page reference for the Rosekrans
9 declaration document 420, which has been marked Plaintiffs'
10 Exhibit 25. On page 8 of 9 of that exhibit at line 25, the
11 page reference to Exhibit 5 would be roman four.

12 THE COURT: Thank you very much. And I will look at
13 that declaration now to make sure that I can find it. Is that
14 in Exhibit 24 or 25? It's in 25.

15 MS. POOLE: I believe it's Plaintiffs' Exhibit 24.

16 THE COURT: I think it's 24 too.

17 MS. POOLE: Oh, you're correct, Your Honor.

18 THE COURT: It is 24. That was my concern because
19 those exhibits are not present on this.

20 All right. And I'm just going to look at Exhibit 5.
21 You said page roman numeral four?

22 MS. POOLE: Correct.

23 THE COURT: Is that the executive summary, page six
24 of 32? Document 420-3.

25 MS. POOLE: Yes, Your Honor.

1 THE COURT: All right. I have it. Thank you very
2 much.

3 All right. Are we ready to proceed with evidence?

4 MR. LEE: Yes, Your Honor.

5 THE COURT: You may proceed, Mr. Lee.

6 MR. LEE: We would like to divide it up in the
7 following fashion. I would like to make a brief opening
8 statement on behalf of the State of California and Ms.
9 Wordham, then, will conduct the direct examination of our one
10 witness.

11 THE COURT: All right. You may proceed with your
12 opening statement.

13 MR. LEE: Your Honor, there have been extensive
14 briefing in this case and we do not intend to repeat the vast
15 quantity of material that has been presented. We see that
16 there are basically two components to the evidence that are
17 coming in. The first component we have heard a lot of to
18 date, which is the biological evidence regarding the delta
19 smelt and its condition.

20 The second component is what we are just commencing
21 today, which is the operational consequences of the respective
22 remedy proposals on project delivery.

23 In order to meet our requirement of having one live
24 witness and to minimize duplicate testimony and also to
25 encourage the best use of this Court's time, DWR has not and

1 will not be introducing any testimony regarding biological
2 issues relating to the delta smelt.

3 We will rely instead on the biological testimony of
4 Ms. Cay Goude as presented by the United States and the
5 testimony of Dr. Charles Hanson as presented by the State
6 Water Contractors and any declarations that are appropriately
7 considered by this court.

8 DWR will limit its testimony on direct to the
9 introduction of evidence through the Department of Water
10 Resources engineer John Leahigh regarding the operational
11 costs of the respective remedies in terms of water deliveries
12 and exports.

13 We will have four general points. The first point
14 will be Mr. Leahigh will discuss the water costs of the
15 respective proposals. He will discuss the water costs, first
16 of all, in plaintiffs' revised proposal.

17 Just by way of peek and summary, we have determined
18 that the low end of that water cost in an average year would
19 be 2.5 million acre feet and the high end of that cost, water
20 cost in an average year might be as much as 3.5 million acre
21 feet.

22 In a dry year, the plaintiffs' revised proposal would
23 have a low end water supply cost of 1.1 million acre feet and
24 a high end water cost of a 1.6 million acre feet.

25 These spreads in costs are due to the fact, as this

1 court is aware, that most of the remedy proposals have ranges
2 of protections. And therefore, the ranges of the costs are
3 reflective of the ranges of the protections.

4 THE COURT: I know we'll get there, but why is an
5 average year a higher water cost than a dry year?

6 MR. LEE: Well, Your Honor, this will be explained in
7 some detail by Mr. Leahigh. My understanding is that in a dry
8 year, there is generally, notwithstanding the impositions of
9 the remedies, significant reductions in deliveries already
10 built into the system. And so it's a -- it's a narrower and
11 smaller base.

12 THE COURT: All right. So those are the contractual
13 terms that excuse delivery of water in shortage periods?

14 MR. LEE: If there isn't water in the system, we
15 can't deliver it, Your Honor.

16 THE COURT: All right. Thank you.

17 MR. LEE: The next remedy proposal was the US Fish &
18 Wildlife Service matrix that was presented by Ms. Goude. This
19 has a lesser impact on water supply and the average year low
20 end range of the water cost is roughly 820,000 acre feet. The
21 high end average year water cost, however, could be as much as
22 2.1 million acre feet. In a dry year, the low end cost would
23 be 183,000 acre feet with a high end cost of possibly 814,000
24 acre feet.

25 Now, the Department of Water Resources has embraced,

1 for the most part, the US Fish & Wildlife Service matrix, but
2 we have two minor modifications which we will address in
3 direct examination. Which does alter the water costs.

4 And in those situations, on an average year, the
5 modified US Fish & Wildlife Service matrix, as proposed by the
6 Department of Water Resources would have a low end cost in an
7 average year of 476,000 acre feet and a high end cost of 1.4
8 million acre feet. In a dry year, the low end cost would be
9 84,000 acre feet and a high end cost could be 415,000 acre
10 feet.

11 Now, there is one last proposal that we've had
12 discussed here over the last seven days and that's the State
13 Water Contractors proposal. We are -- will not be able to
14 provide this Court, unfortunately, with a full water cost of
15 this proposal.

16 We are going to be able to provide this Court with an
17 estimate of the cost of tier one. Their Q west or westerly
18 flow, which I believe will be 316,000 acre feet.

19 However, due to the contingent nature of the
20 remaining State Water Contractor proposals tiers, and there's
21 a tier two and a tier three and a tier four, the Department of
22 Water Resources has been unable, in the short time frame in
23 this trial, to be able to develop a full set of water cost
24 estimates for the State Water Contractor proposal.

25 So that's the first issue.

1 THE COURT: Yes. And when we're talking about all of
2 these quantitative measures of water, this is for the State
3 Water Project only.

4 MR. LEE: No, Your Honor --

5 THE COURT: This is not -- is this combined or only
6 State Water Project?

7 MR. LEE: We are going to provide you with a total
8 package on this. This will be both for the State Water
9 Project and the Central Valley Project.

10 THE COURT: Thank you.

11 MR. LEE: The second area which we will get into is
12 some discussion of the issues raised in the plaintiffs'
13 declarations by Spreck Rosekrans regarding the plaintiffs'
14 view of the operational consequences of the remedy measures.
15 In a nutshell, we will -- we will contend that reliance solely
16 on past historic conditions is an unwise practice when
17 projecting water delivery costs for new water year.

18 Such short term projections must rely on real world
19 hydrologic data regarding runoff, storage and demand in order
20 to secure an honest assessment of water supply costs.

21 If there's a simple principle here, Your Honor, it's
22 a principle that all engineers in the water business seem to
23 operate under. Which is you hope for the best, but you must
24 plan for the worst.

25 Third issue, which we intend to address, is the fall

1 actions as proposed by the plaintiffs for salinity control in
2 the western Delta --

3 THE COURT: Why don't we call that measure ten.

4 MR. LEE: Yes, that's measure ten on the project's
5 operations with an emphasis on the adverse impacts, the
6 potential adverse impacts on other listed species and on
7 potential health and safety issues relating to project
8 operations and project deliveries.

9 Lastly, Mr. Leahigh will touch upon the dispute the
10 plaintiffs and the Department of Water Resources have had in
11 our pleadings regarding the use of appropriate averaging
12 period for the flow measures.

13 This is this question of whether we should be using a
14 14-day running average or a five-day running average. Mr.
15 Leahigh will explain that and indicate why we believe a 14 or
16 7-day running average is appropriate given the hydrology of
17 the system.

18 There will be a few miscellaneous operational issues,
19 which we will address. But these are the key points.

20 THE COURT: All right.

21 MR. LEE: In conclusion, we anticipate that the
22 plaintiffs may object to some of Mr. Leahigh's testimony. In
23 response, we would note that the DWR stresses that we submit
24 that this Court has a responsibility to narrowly tailor the
25 remedy order --

1 THE COURT: I've already ruled on the objections.
2 I'm going to offer the plaintiffs a continuing objection so we
3 don't have to interrupt the testimony unless they want to do
4 it otherwise.

5 MR. LEE: All right. We would just note that DWR
6 received surprising support for this concept of narrowly
7 tailored approach in Wednesday's testimony by Dr. Swanson.
8 Dr. Swanson noted that the plaintiffs had, at the very 11th
9 hour in this case, revised their fish actions four, five and
10 seven to remove the inflexible target flow of 1500 cfs for Old
11 and Middle River and to replace those flows with a more
12 flexible range of flows from a lower end range to a higher end
13 range.

14 Now, surprisingly Dr. Swanson did not justify this
15 new range of flows based upon improved biological protection
16 for the smelt, but instead said on Wednesday the range would
17 make it easier for the projects to operate.

18 In setting this Court's remedy proposal, DWR simply
19 asks this Court to adopt the same approach. If the evidence
20 shows that more than one remedy proposal is biologically
21 defensible, then this Court should also choose the remedy that
22 is easier for the project to operate.

23 And with that, Your Honor, Ms. Wordham will be
24 prepared to put on our case.

25 THE COURT: Thank you, very much, Mr. Lee. Ms.

1 Wordham, you may proceed.

2 MS. WORDHAM: Thank you, Your Honor. The Department
3 of Water Resources calls Mr. John Leahigh.

4 MS. JAISWAL: Your Honor, Anjali Jaiswal on behalf of
5 plaintiffs. I just wanted to inform the Court that plaintiffs
6 will be accepting the continuing objections to Mr. Leahigh's
7 testimony.

8 THE COURT: All right. Thank you very much. And I
9 have sustained the objection in part consistent with the
10 ruling I just announced on the evidence. Your objections that
11 were submitted in writing to other, I'm going to call it
12 omnibus cost, which I think is inseparable from human health
13 and safety concerns. And so that's the basis for my ruling.

14 Any objection to the continuing objection?

15 MS. WORDHAM: No objection, Your Honor.

16 MR. WILKINSON: No, Your Honor.

17 THE COURT: All right. Please swear the witness.

18 JOHN LEAHIGH,
19 called as a witness on behalf of the Defendants, having been
20 first duly sworn, testified as follows:

21 THE CLERK: Please state your full name for the
22 record and spell your last name.

23 THE WITNESS: John Leahigh, last name is spelled
24 L-E-A-H-I-G-H.

25 THE COURT: You may proceed, Ms. Wordham.

1 DIRECT EXAMINATION

2 BY MS. WORDHAM:

3 Q. Good morning, Mr. Leahigh. Would you please provide the
4 Court with your educational background.

5 A. Yes. I have a bachelors degree in civil engineering from
6 the University of New Mexico. Also have a masters degree in
7 civil engineering with emphasis in water resource management
8 from California State University at Sacramento.

9 Q. Where are you currently employed?

10 A. Currently employed with Department of Water Resources.
11 State Water Project Operations Planning Branch Chief.

12 Q. Your title is chief?

13 A. Yes.

14 Q. Of the plan --

15 A. Of the State Water Project Operations Planning Branch.

16 Q. How long have you been with the Department of Water
17 Resources?

18 A. Been with the Department of Water Resources since 1992.

19 Q. And how long have you held your current position?

20 A. My current position for two years, although the current
21 responsibilities I've had since 1999.

22 Q. Would you please describe your responsibilities?

23 A. Yes. I lead a team of engineers that are responsible for
24 the water management decisions for the State Water Project.
25 This would include forecasting the operations for the State

1 Water Project and its -- and the Central Valley Project.

2 We're responsible for recommending the water delivery
3 allocations for the State Water Project to the director of the
4 Department of Water Resources. We are responsible for short
5 term and scheduling of releases from Lake Oroville to the
6 Feather River. And the export of water in the south Delta at
7 the SWP export facilities in compliance with all contractual
8 and regulatory obligations.

9 Q. So your responsibilities include estimating water
10 deliveries for the coming water year; is that correct?

11 A. That's correct.

12 Q. When estimating water deliveries, what factors do you
13 consider?

14 A. Factors we consider is essentially we need estimates for
15 the supply and the demand in the upcoming year. And we need
16 to feed those into a model which represents all of the
17 constraints that exist in the system.

18 Q. So you have supply, demand and system constraints; is that
19 correct?

20 A. That's correct.

21 Q. Under demand, what components determine demand on an
22 annual basis?

23 A. The demand estimates we get directly from our water users.
24 And this is in terms of volume and also a demand pattern. So
25 the timing of that demand is very important.

1 Q. What component do you consider when -- for determining
2 supply on an annual basis?

3 A. For supply, it's really broken down to two aspects. Two
4 components. One is the stored water available to the project,
5 carried over from the previous year. So this would be storage
6 in Lake Oroville, the state share of San Luis Reservoir. This
7 can be reliably projected from one year to the next, going
8 into the next year.

9 The other component would be the unstored flow or
10 natural flows that would enter the system as a result of
11 precipitation in the next year. And this is highly variable.
12 So the estimates must be taken -- must be in terms of
13 probabilities, in terms of what the observed hydrology has
14 been in past years.

15 Q. Is there a way that you characterize your estimate for
16 forecasted runoff?

17 A. Yes. As far as the estimate, as far as the official water
18 supply allocations that we make to our contractors, that is
19 based on what is called a 90 percent exceedance probability.

20 Essentially that's where taking a look at the past
21 record hydrology, 90 percent of the years would have exceeded
22 that assumption of hydrology. So it is a very conservative
23 assumption for hydrology going into the next year. A very dry
24 year type.

25 Q. So 90 percent exceedance would be considered a dry year;

1 is that correct?

2 A. That's correct.

3 Q. Do you ever estimate future runoffs based on any other
4 exceedance level?

5 A. Yes. Typically we also look at a 50 percent exceedance
6 level, where half the historical record is drier and half
7 wetter. So this represents an average condition for hydrology
8 for the coming year. And that's kind of supplemental
9 information for planning purposes.

10 Q. But for purposes of your official allocation, you use the
11 90 percent exceedance; is that correct?

12 A. That's correct.

13 Q. Do you ever use an above normal or a wet year for
14 projecting water deliveries?

15 A. Occasionally we will take a look at a wetter scenario,
16 say, a 25 percent exceedance where only 25 percent of the
17 historical record is wetter. There's less value to us in
18 looking at those wetter cases. Typically, at the 50 percent
19 hydrology we're able to meet most of the delivery requests for
20 contractors. So the assumption is anything wetter than that,
21 we're able to meet those commitments.

22 Q. You would never use an above average or a wet year for
23 projecting official delivery allocations; is that correct?

24 A. Not for the official delivery allocation, no.

25 Q. In addition to demand and supply, you also mentioned

1 system constraints; correct?

2 A. That's correct.

3 Q. What are the system constraints that are factored in to
4 your delivery estimates?

5 A. Well, the system constraints would include all physical
6 and regulatory constraints on both the storage and conveyance
7 in the system. So, for example, as far as Lake Oroville is
8 concerned, physically we could store 3.5 million acre feet in
9 storage. However, in the wintertime, we're restricted to 80
10 percent of that storage due to regulatory requirements for
11 flood control purposes.

12 We have other constraints downstream, for example,
13 minimum flow requirements on the Feather River for fishery --

14 THE COURT: Let me interrupt, if I could, for a
15 second.

16 THE WITNESS: Yes.

17 THE COURT: Just so that we have it. Is this every
18 winter that the flood control limit is 80 percent of capacity?

19 THE WITNESS: That's correct. And that's a
20 requirement from the United States Army Corps of Engineers.

21 THE COURT: And so approximately 280,000 acre feet
22 are not in the reservoir year in and year out for flood
23 control purposes. It's release -- the water is released out
24 of the reservoir?

25 THE WITNESS: If we encroach into that required top

1 20 percent that's reserved for flood control, we must release
2 that water downstream and maintain vacant space in the event
3 that there's a large storm event to capture the runoff.

4 THE COURT: And that's year round. So that
5 is -- that's an operative level, that's the maximum capacity
6 for Lake Oroville.

7 THE WITNESS: That makes a regulatory limit on the
8 amount of storage that we can hold in the wintertime.

9 THE COURT: Winter.

10 THE WITNESS: Winter, right.

11 THE COURT: All right. Thank you. You may proceed.

12 BY MS. WORDHAM:

13 Q. You've just finished describing the storage capacity. Are
14 there any other elements that -- any other system constraints
15 that are factored in to your delivery estimates?

16 A. Yes. I think I talked about the minimum instream
17 requirements to the Feather River. There are also a number of
18 constraints related to managing the Delta. And that includes
19 flow requirements. Delta outflow requirements. Salinity
20 management. Number of salinity requirements. And there are
21 also export limitations for fishery benefits as well.

22 Q. Are these objectives that you just described, are they the
23 objectives that are outlined in State Water Resources Control
24 Board Decision 1641?

25 A. Yes. All those Delta requirements are outlined in that

1 document.

2 Q. Are you responsible for estimating --

3 THE COURT: Let me ask one question before you
4 continue.

5 MS. WORDHAM: Certainly, Your Honor.

6 THE COURT: Does the operational regime that you
7 manage take in any consideration of the Central Valley Project
8 Improvement Act?

9 MS. WORDHAM: You anticipated my question, Your
10 Honor.

11 THE COURT: Do any of those requirements apply to the
12 state operations?

13 THE WITNESS: No. Those requirements do not apply to
14 the State Water Project. That is a Central Valley Project
15 program.

16 THE COURT: Thank you.

17 BY MS. WORDHAM:

18 Q. Are you responsible for estimating Central Valley Project
19 water deliveries?

20 A. It's important to -- yes, we have that capability in our
21 model. We have all of their constraints built within our
22 model as well. So we have the capability of estimating their
23 delivery capabilities. And we get input from the CVP on their
24 operations.

25 Q. But you're not responsible for estimating their

1 deliveries, you just have the capability?

2 A. That's correct.

3 MS. WORDHAM: Your Honor --

4 THE COURT: I'm going to ask a question. Do you
5 operate the SWP under a cooperative regime, if you will, the
6 OCAP, for coordinated operations or you operate independently?

7 THE WITNESS: No, we -- the two operations are very
8 much intertwined. As far as the Bay-Delta requirements that
9 we just described, both projects are responsible for meeting
10 those. And there's a sharing formula for that that is part of
11 our coordinated operations agreement or COA, which is an
12 important component into determining the delivery capabilities
13 of both projects.

14 THE COURT: Thank you. You may continue.

15 MS. WORDHAM: At this time, Your Honor, I would like
16 to move that Mr. Leahigh be accepted as an expert on the State
17 Water Project and, where it coordinates with the Central
18 Valley Project, on the Central Valley Project as well, of the
19 regulatory and hydrological conditions of the project
20 operations as they relate to water exports and delivery.

21 THE COURT: Is there any objection?

22 MS. JAISWAL: No objections, Your Honor.

23 THE COURT: All right. The Court accepts the tender
24 of Mr. Leahigh as an expert by background, experience,
25 education and training on the subjects of the coordinated

1 operations of the State Water Project and the Central Valley
2 Project, including compliance with all regulatory
3 requirements, hydrologic management and water supply delivery
4 concerns. You may continue.

5 BY MS. WORDHAM:

6 Q. Mr. Leahigh, you've just outlined the factors that you
7 look at in estimating water deliveries. What do you do with
8 these factors?

9 A. Well, the estimates of supply and demand are input into a
10 simulation model that we have, which has all of the
11 constraints, both physical and regulatory built in to it. We
12 use this as a tool to estimate what the maximum deliveries
13 that would be -- that we'd be capable of delivering, given all
14 the constraints in the system.

15 THE COURT: Is this annual?

16 THE WITNESS: Yes. This is annual. And we actually
17 update these estimates as we step through the year.

18 THE COURT: And when does the water year start for
19 the state?

20 THE WITNESS: Well, the contract -- the delivery year
21 is the calendar year.

22 THE COURT: Is there any different time period for op
23 erations?

24 THE WITNESS: Well, the water year is from October
25 through September.

1 THE COURT: October 1st through September 30th. So
2 it's the same as for the CVP?

3 THE WITNESS: The water year is the same. The CVP's
4 contractual delivery year is slightly different, it is March
5 through February.

6 THE COURT: Thank you.

7 BY MS. WORDHAM:

8 Q. The model you refer to, does that model have a name?

9 A. Yes, it's the Delta Coordinated Operations model or DCO
10 for short.

11 Q. And this is the same model that you have used for
12 estimating water cost associated with implementing the US Fish
13 & Wildlife remedy proposal that was submitted in this matter?

14 A. That's correct.

15 Q. Is it the same model that you used for estimating the
16 water cost associated with all of the remedy proposals
17 submitted in this matter?

18 A. Yes.

19 THE COURT: And how long has that model been in
20 operation?

21 THE WITNESS: We've used that model for estimating
22 deliveries since about 1995, '96.

23 THE COURT: Thank you. You may continue.

24 BY MS. WORDHAM:

25 Q. Mr. Leahigh, you've just testified that the water year is

1 from October through September; is that correct?

2 A. That's correct.

3 Q. So we are currently in the 2007 water year; would that be
4 correct?

5 A. That is correct.

6 Q. How would you characterize the current water year?

7 A. Officially, the water year type for the Sacramento basin
8 is dry. For the San Joaquin basin, it's actually critically
9 dry this year. And as you move south, it's -- it's very dry.
10 In fact, Los Angeles is -- this is the driest year on record
11 for Los Angeles in 130 years of record.

12 Q. Mr. Leahigh, you have projected water costs associated
13 with the various remedy proposals submitted in this
14 proceeding; is that correct?

15 A. I'm sorry? Would you repeat the question?

16 Q. You've projected water costs associated with each of the
17 remedy proposals submitted in this proceeding?

18 A. Yes.

19 MS. WORDHAM: Your Honor, at this time, I'd like to
20 mark the declarations of Mr. John Leahigh submitted in this
21 matter. These will be DWR next in order.

22 THE COURT: What is the next exhibit?

23 MS. WORDHAM: I, I believe.

24 THE CLERK: I.

25 THE COURT: It will be DWR I for identification.

1 (Defendant's Exhibit DWR I was marked for
2 identification.)

3 MS. WORDHAM: And that will be the declaration of
4 John Leahigh filed on July 9th, 2007, document No. 398.

5 THE COURT: Any objection to its admission?

6 MS. JAISWAL: No, Your Honor.

7 THE COURT: Subject to my earlier ruling. Thank you.

8 All right. Subject to my earlier ruling on the
9 evidentiary objections, DWR I is received in evidence.

10 (Defendant's Exhibit DWR I was received.)

11 MS. WORDHAM: And then the supplemental declaration
12 of John Leahigh filed on August 3rd, 2007, document No. 428.

13 THE COURT: This will be DWR J.

14 (Defendant's Exhibit DWR J was marked for
15 identification.)

16 THE COURT: And I will receive DWR J subject to the
17 plaintiffs' objections and my ruling on those objections.

18 (Defendant's Exhibit DWR J was received.)

19 MS. WORDHAM: If I may approach the witness, Your
20 Honor?

21 THE COURT: You may.

22 BY MS. WORDHAM:

23 Q. Mr. Leahigh, do you recognize the two documents I've just
24 handed you?

25 A. Yes.

1 Q. And could you please describe them?

2 A. Well, the first one is my original declaration dated July
3 9th. And the second is my supplemental declaration dated
4 August 3rd.

5 Q. And if you will look at the exhibits to your August 3rd
6 declaration, there are numerous exhibits; are there not?

7 A. Yes.

8 Q. Do you recognize all of these exhibits?

9 A. Yes, I do.

10 Q. There are several tables in this -- in your exhibits. Do
11 you know who prepared these tables?

12 A. Yes, my staff under my direction.

13 Q. There's also a map that is your Exhibit E. Do you know
14 how this map was prepared?

15 A. Yes. By my staff under my direction.

16 Q. And lastly, Exhibits A and B, would you please describe
17 these exhibits.

18 A. Exhibits A and B define the water year type. Exhibit A is
19 definition for water year type for the Sacramento Valley basin
20 and Exhibit B is definition for water year type for the San
21 Joaquin River basin.

22 Q. Where did these exhibits come from?

23 A. They come from -- originally from water quality control
24 plan, which was incorporated into decision 1641.

25 MS. WORDHAM: At this time, Your Honor, I'd like to

1 move Exhibits -- DWR Exhibits I and J into evidence.

2 THE COURT: I've already received them in evidence
3 subject to the plaintiffs' objections. They're in.

4 MS. WORDHAM: Thank you, Your Honor.

5 Q. Mr. Leahigh, if you would turn to Exhibits C and F of your
6 August 3 declaration, which is DWR Exhibit J.

7 A. Okay.

8 Q. I think you have just testified that you prepared -- or
9 your staff prepared these tables under your direction; is that
10 correct?

11 A. That's correct.

12 Q. At this time, just for ease of reference, Your Honor, I
13 would like to mark Exhibit C to Mr. Leahigh's August 3
14 declaration as DWR next in order K.

15 (Defendant's Exhibit DWR K was marked for
16 identification.)

17 THE COURT: All right. DWR K is what? A table?

18 MS. WORDHAM: And Exhibit F --

19 THE COURT: Let me describe K. It is a water cost
20 analysis. And it appears to be demonstrative or illustrative.
21 Any objection to the admission of DWR K?

22 MS. JAISWAL: No, Your Honor. Just based on our
23 earlier objections and your ruling.

24 THE COURT: Thank you. Subject to my rulings on
25 plaintiffs' earlier objections, DWR K is received in evidence.

1 (Defendant's Exhibit DWR K was received.)

2 MS. WORDHAM: And similarly, I would like to
3 move -- I would like to mark as DWR's next in order, L,
4 Exhibit F to Mr. Leahigh's August declaration.

5 (Defendant's Exhibit DWR L was marked for
6 identification.)

7 THE COURT: Any objection to L?

8 MS. JAISWAL: The continuing --

9 THE COURT: The same? All right. We will receive
10 DWR L subject to my ruling on plaintiffs' objections. It's in
11 evidence.

12 (Defendant's Exhibit DWR L was received.)

13 MS. WORDHAM: And just to get all of these tables in
14 at once.

15 THE COURT: It is also a water cost analysis, Exhibit
16 L.

17 MS. WORDHAM: Yes. For clarification, DWR Exhibit K
18 is a comparison of the plaintiffs' remedy proposal as
19 submitted on July 9th, 2007 with the US Fish & Wildlife
20 Service Action Matrix also submitted to this Court on July 9,
21 2007.

22 Exhibit C -- I mean Exhibit F, I apologize, which is
23 DWR Exhibit L is a comparison of the US Fish & Wildlife Action
24 Matrix with the US Fish & Wildlife Action Matrix as modified
25 by the Department of Water Resources.

1 Next I would like to mark as Exhibit DWR M a table
2 which may need some foundation.

3 (Defendant's Exhibit DWR M was marked for
4 identification.)

5 THE COURT: So you're going to lay a foundation for
6 this?

7 MS. WORDHAM: Yes, Your Honor.

8 THE COURT: You may proceed.

9 MS. JAISWAL: Your Honor, we haven't received a copy.
10 Thank you.

11 MS. WORDHAM: For identification, what has just been
12 marked as DWR Exhibit M is another water cost analysis. And
13 this is a comparison of the water cost associated with the
14 plaintiffs' remedy proposal submitted, this says, on July
15 23rd. I believe that -- and I think that's correct. I think
16 I had previously represented that the plaintiffs' proposal had
17 been submitted on July 9th, so I stand corrected. So this --

18 THE COURT: You intended to say the 23rd.

19 MS. WORDHAM: I did, Your Honor.

20 THE COURT: All right. So that would be for DWR I.

21 MS. WORDHAM: That is correct, Your Honor. K. K.

22 THE COURT: Thank you.

23 MS. WORDHAM: So this compares the plaintiffs'
24 proposal as submitted on July 23rd with their proposal as
25 submitted on August 13th. If I may approach.

1 THE COURT: You may.

2 BY MS. WORDHAM:

3 Q. Mr. Leahigh, I've just handed you what has been marked as
4 DWR Exhibits K, L and M. Do you recognize these documents?

5 A. Yes.

6 Q. Would you please briefly describe them?

7 A. Yes. The Exhibit that's marked DWR K is the water cost
8 analysis which compares the plaintiffs' original remedy
9 proposal with US Fish & Wildlife Service Action Matrix.

10 Exhibit L, DWR L is the water cost analysis comparing
11 US Fish & Wildlife Service Action Matrix to that same matrix
12 as modified by DWR. And both of those two exhibits were
13 exhibits to my supplementary declaration.

14 The document, DWR M, is a water cost analysis
15 comparing the plaintiffs' proposal, original proposal as of
16 July 23rd with the revised plaintiffs' proposal dated August
17 13th.

18 Q. Mr. Leahigh, you testified that Exhibit C and F were
19 prepared by your staff under your direction; is that correct?

20 A. That's correct.

21 MS. WORDHAM: At this time, Your Honor, I'd like to
22 move Exhibits -- DWR Exhibits K and L into evidence.

23 THE COURT: I believe we've received K into evidence.
24 We've also received L into evidence. And so all that is left
25 is M.

1 MS. WORDHAM: Thank you, Your Honor.

2 Q. Mr. Leahigh, turning to DWR Exhibit M, did you prepare
3 this table?

4 A. It was prepared by my staff under my direction.

5 Q. Using the same criteria as Exhibit C and F, which would be
6 DWR's K & L?

7 A. Yes. Using the same model. Same methodology.

8 MS. WORDHAM: At this time, Your Honor, I would like
9 to move DWR Exhibit M into evidence.

10 THE COURT: And I will admit it subject to the
11 plaintiffs' objections and my ruling on those objections.

12 MS. WORDHAM: Thank you, Your Honor.

13 THE COURT: M is received in evidence.

14 (Defendant's Exhibit DWR M was received.)

15 BY MS. WORDHAM:

16 Q. Mr. Leahigh, would you please just generally describe what
17 is contained in these exhibits? In these tables.

18 A. Yes. I mean, generally it -- it is a comparison of the
19 various remedy proposals. And it is broken down by action.
20 And what we attempted to do here was -- a lot of the actions
21 are similar between remedy proposals. So we attempted to
22 show -- to line up the appropriate action numbers for one
23 proposal and the corresponding action that takes place in the
24 alternative proposal.

25 Q. And you have broken it down by the different actions that

1 each proposal includes; is that correct?

2 A. Yes. For example, US Fish & Wildlife Service matrix is
3 broken down into each of its five actions and the plaintiffs'
4 proposals are broken down into actions one through ten.

5 Q. Thank you. Looking at the --

6 THE COURT: Let me ask one question. I withdraw my
7 question. I see that you have addressed number ten here. You
8 may continue.

9 MS. WORDHAM: Thank you.

10 Q. Looking at DWR Exhibit M, looking at the plaintiffs'
11 revised proposal, would you please describe the costs that are
12 associated with plaintiffs' action numbers one through three?

13 A. Well, there's no cost associated with those three. Those
14 were -- those actions had to do with changes in monitoring.

15 Q. So those do not affect exports?

16 A. Those do not affect exports.

17 Q. Looking at plaintiffs' action in its revised proposal,
18 action number four. Would you please describe the water costs
19 associated with plaintiffs' action four?

20 A. Well, in all these proposals, we have a range given for
21 potential impacts. And that was looking at each proposal
22 under the average year scenario that was described earlier and
23 the dry year scenario described earlier.

24 So for this particular action four, there are two
25 components to their action four. One is a shorter duration,

1 ten-day export reduction. The other is a -- and this -- well,
2 it's an objective for Old and Middle River flow.

3 And the way to meet that objective is with an export
4 reduction is the assumption here. The cost associated with
5 that particular action averaged, in an average year, estimated
6 cost is a total of 800,000 acre feet. And in a dry year,
7 400,000 acre feet.

8 Q. Let's walk you through this a little more, in a little
9 more detail, if you don't mind. And let me preface this, lay
10 a little bit of a foundation.

11 You are familiar with the plaintiffs' revised
12 proposal that was submitted on August 13th, 2007; is that
13 correct?

14 A. Yes.

15 Q. And you are familiar with the flow recommendations they
16 have included in their proposal; is that correct?

17 A. Yes.

18 Q. So for the first part of the plaintiffs' action four, the
19 December 25 through January 3 period, as I read your flow
20 objectives column, the plaintiffs' proposal would require that
21 Old and Middle Rivers -- and I'm -- am I correct in assuming
22 that "OMR" stands for Old and Middle Rivers?

23 A. That's correct.

24 Q. The objective would be to maintain flows in Old and Middle
25 Rivers at zero cubic feet per second; is that correct?

1 A. Correct. Essentially achieving non-negative flows in Old
2 and Middle River.

3 THE COURT: For ten days?

4 THE WITNESS: Yes. For ten days. The assumption
5 here, that action could be triggered at any time during that
6 period in the pre-spawning period. The assumption that we
7 make here was that it was triggered at the -- the first day
8 that would be possible to trigger it, which would be December
9 25th. And so it's triggered for ten days following December
10 25th.

11 THE COURT: What was the reason for choosing December
12 25th as opposed to December 1st?

13 THE WITNESS: I believe the plaintiffs' proposal
14 identifies December 25th as the first possible date to trigger
15 this action.

16 THE COURT: And that's the reason it was selected?

17 THE WITNESS: That was the reason it was selected.

18 THE COURT: Thank you. And this action lasts until
19 when?

20 THE WITNESS: It lasts until -- the duration is ten
21 days, so the ending date was January 3rd. And there are two
22 components to that action four. There's that short ten-day
23 period of achieving non-negative flows, but then for the
24 remainder of that pre-spawning period, the objective
25 is -- well, the original proposal is a negative 3500 cfs.

1 THE COURT: Well, the pre-spawning period ends when?

2 THE WITNESS: What we assumed is that it would end
3 February 20th. That is -- it will vary from year to year when
4 the spawning start -- begins to occur. But February 20th was
5 the date which our biologist provided us, as far as an average
6 spawning date.

7 THE COURT: But in operation, the plan would go
8 through the actual or through the average date? Spawning?

9 THE WITNESS: The proposal talks about this action
10 continuing until the onset of spawning. And we had to make
11 some assumption as to when that date of --

12 THE COURT: Yes. But in operation, would you run the
13 program to this pre-determined date or to the actual date?

14 THE WITNESS: Oh, we would operate to it until the
15 actual date of spawning.

16 THE COURT: Which could be different?

17 THE WITNESS: Which could be different than February
18 20th.

19 THE COURT: Thank you. And that's what your
20 calculation is based on.

21 THE WITNESS: Yes.

22 THE COURT: Actual date of spawning.

23 THE WITNESS: Well, no, our calculation is based
24 on -- since we don't know what that date will be next year, we
25 used the average date that has occurred in the past, which is

1 February 20th.

2 THE COURT: Thank you.

3 BY MS. WORDHAM:

4 Q. Mr. Leahigh, returning your attention to the
5 plaintiffs' -- the first part of plaintiffs' action four,
6 which the flow objective is zero or greater -- zero net
7 negative flows on Old and Middle Rivers. In a dry year, what
8 would be the export reductions associated with the first part
9 of plaintiffs' action four?

10 A. 140,000 acre feet.

11 Q. And in an average year?

12 A. 200,000 acre feet.

13 Q. Now, turning to the second half of plaintiffs' action
14 four, you have two flow objectives identified here; correct?

15 A. Yes.

16 Q. And why do you have two flow objectives identified?

17 A. Well, there were two different flow objectives identified
18 in the plaintiffs' revised proposal.

19 Q. The plaintiffs' revised proposal provides a range of
20 between negative 2,750 cubic feet per second and negative
21 4,250 cubic feet per second; is that correct?

22 A. That's correct.

23 Q. Of these -- of this range, which would you characterize as
24 the more water costly flow objective?

25 A. Well, the more water costly would be the one that is least

1 negative, which is the negative 2750 cfs.

2 Q. In a dry year, what would be the water cost associated
3 with plaintiffs' action -- the second part of plaintiffs'
4 action four if the projects were required to operate at
5 negative 2,750 cfs on Old and Middle Rivers?

6 A. 340,000 acre feet.

7 Q. Same question for an average year.

8 A. 680,000 acre feet.

9 Q. Those costs would be less if they were able to operate at
10 the higher end of that range; is that correct?

11 A. That's correct.

12 Q. And those are the 180,000 acre feet and 530,000 acre feet
13 respectively; correct?

14 A. Correct.

15 Q. In plaintiffs' action five, they also have a range of flow
16 objectives; correct?

17 A. That's correct.

18 Q. If the projects were required to operate to the more water
19 costly flow objective, which I understand from your previous
20 testimony would be the negative 750 cubic feet per second,
21 what would be the water cost associated with plaintiffs'
22 action five in a dry year?

23 A. Estimate is 350,000 acre feet.

24 Q. And in a wet year -- in an average year?

25 A. 920,000 acre feet.

1 Q. Plaintiffs' action seven has the same flow
2 objective -- range for flow objectives; correct?

3 A. Correct.

4 Q. In plaintiffs' action seven, what would be the water cost
5 associated with complying with plaintiffs' action seven if the
6 projects were required to operate at the more water costly
7 flow objective?

8 A. 150,000 acre feet dry year.

9 Q. And in an average year?

10 A. 800,000 acre feet.

11 Q. For plaintiffs' actions eight and nine, what are the water
12 costs associated with those actions?

13 A. We didn't have any cost associated with those two actions.
14 They dealt with barrier configuration.

15 Q. So no water costs?

16 A. No water costs were estimated for those.

17 THE COURT: And the response to those two actions was
18 positive or negative, as far as the change of the barriers?

19 THE WITNESS: Well, the not installing the Head of
20 Old River Barrier would have -- would have a tendency to make
21 the flow at Old and Middle River less negative, would allow
22 more of the San Joaquin flow to come down Old and Middle
23 Rivers.

24 THE COURT: And are you generally in agreement or
25 disagreement with that proposal?

1 THE WITNESS: We have a similar -- we have the same
2 recommendation in the Fish & Wildlife Service action matrix.

3 THE COURT: So that would be agreement?

4 THE WITNESS: Yes. I'm not sure all the details, but
5 I believe that in general we are in agreement on that.

6 THE COURT: All right. And how about number nine?

7 THE WITNESS: I'm sorry. That was number nine.

8 THE COURT: That was number nine. All right. How
9 about number eight? I think those are the gates.

10 THE WITNESS: Correct. That would be no ag barrier
11 operation. And there -- there is very similar proposal in the
12 Fish & Wildlife Service Action Matrix.

13 THE COURT: So there's general agreement on number
14 eight?

15 THE WITNESS: I'd say there's general agreement. I'm
16 not sure about all the details, but general agreement.

17 THE COURT: All right. Thank you.

18 BY MS. WORDHAM:

19 Q. And turning last to plaintiffs' action ten. You
20 testified -- or you stated in your declaration, as I recall,
21 that your cost estimate for action ten was based on an
22 assumption that action ten would be met through a combination
23 of export reductions and upstream storage releases; correct?

24 A. That is correct.

25 Q. With that understanding, what would be the water cost

1 associated with the projects having to comply with action ten
2 in a dry year?

3 A. We're still talking about the revised proposal?

4 Q. Yes.

5 A. Actually either proposal, it doesn't matter. The dry
6 year -- there's a -- in our analysis, we assume 350,000 acre
7 feet of export reduction, but it would also require 310,000
8 acre feet of additional releases from upstream.

9 Q. Would all of that upstream storage come from State Water
10 Project facilities?

11 A. No. That would -- the assumption that we made is this
12 would fall under the coordinated operation agreement and
13 therefore about two-thirds of it would come from the federal
14 reservoirs, most likely Shasta and a third of it coming from
15 Lake Oroville.

16 Q. So just looking at export reductions again, for action ten
17 in an average year, if the projects attempted to comply with
18 the plaintiffs' action ten relying on your allocation between
19 export reductions and upstream water storage releases, what
20 would be the water cost to the projects?

21 A. In an average year, we had estimated 490,000 acre feet
22 export reduction in a small amount of additional releases from
23 upstream.

24 Q. You testified in your declaration that there isn't a
25 direct correlation or -- between export reductions and

1 delivery reductions; correct?

2 A. That's correct.

3 Q. So in this table immediately below the -- the
4 summary -- or the detailed analysis of the cost, water cost
5 associated with plaintiffs' revised proposal for August 13,
6 2007. Where you have summarized delivery reductions, the
7 total acre feet, thousands of acre feet that you have there
8 are not going to be the total of the costs in the table above;
9 is that correct?

10 A. That's correct.

11 Q. What's the difference between export reductions and
12 delivery reductions?

13 A. Well, the export reductions would be the immediate impact.
14 Now, how that translates to an overall annual delivery impact
15 will vary on a number of things. In -- for example, in a
16 drier year, there could be an immediate export reduction that
17 could be made up later. So in that case it wouldn't
18 necessarily be according to delivery reduction.

19 But also, on the flip side, you could have -- in a
20 winter type year, average year, you could have an export
21 reduction that occurs at a very critical time, which in the
22 demand pattern, when demands are peaking, that could actually
23 result in much larger annual delivery impacts. It's rather
24 complicated, but they're not going to match up necessarily.

25 Q. For purposes of this water cost analysis, how did you

1 estimate delivery reductions?

2 A. We -- as I said earlier, we inputted all of these -- well,
3 we input all these export reductions into the DCO model that
4 also has all the constraints of the system. We had our
5 estimates of demand and the demand pattern and we had all of
6 our estimates on hydrology. And the model allows us to
7 simulate the operations and allows us to come up with a bottom
8 line delivery for the entire year.

9 Q. So if the projects were required to comply with the
10 plaintiffs' revised proposal submitted on August 13th, what
11 did you determine would be the annual export
12 reduction -- annual delivery reductions in a dry year
13 operating under their less water costly proposal? Or range of
14 flow objectives.

15 A. In a dry year, we -- we calculated 1.11 million acre feet.

16 Q. And in an average year?

17 A. 2.56 million acre feet.

18 Q. So what percent of -- percentage reduction in deliveries
19 does the 1.117 million acre feet represent?

20 A. It represents a 35 percent reduction from our baseline
21 delivery.

22 Q. And what percentage reduction does the 2.557 million acre
23 feet represent?

24 A. 43 percent reduction from our baseline delivery.

25 Q. If the projects were required to operate to the most water

1 costly flow requirements of the plaintiffs' revised proposal,
2 what would be the annual delivery reductions in a dry year?

3 A. 1.62 million acre feet.

4 Q. And what percentage of the delivery reductions does that
5 represent?

6 A. 50 percent reduction in baseline delivery.

7 Q. And in an average year, what would be the acre foot
8 reduction?

9 A. 3.57 million acre feet.

10 Q. And what percentage in delivery reductions does that
11 represent?

12 A. 60 percent.

13 MS. WORDHAM: Thank you. At this time, Your Honor,
14 rather than walking the witness through each of the tables for
15 each of the proposals, I would like to mark as DWR Exhibit M,
16 I believe --

17 THE COURT: N as in Nancy.

18 MS. WORDHAM: N.

19 (Defendant's Exhibit DWR N was marked for
20 identification.)

21 THE COURT: After that's marked, we're going to take
22 a ten-minute recess because we're going to go until 12:30
23 today because I have a short proceeding at 1:15. So our noon
24 break is going to be 12:30 to 1:15.

25 MS. WORDHAM: Yes, Your Honor.

1 THE COURT: You know what? We've got a 10:30
2 proceeding as well. Okay. We're going to go until 10:30.

3 MS. WORDHAM: For purposes of identification, this is
4 a table entitled Estimated Total 2008 State Water Project and
5 Central Valley Project Delivery Reductions Associated with
6 Interim Remedy Proposals.

7 MS. JAISWAL: Plaintiffs have not received it.

8 THE COURT: Beg your pardon?

9 MS. JAISWAL: I have not received the exhibit.

10 THE COURT: You now have?

11 MS. JAISWAL: Yes, Your Honor.

12 MS. WORDHAM: May I approach?

13 THE COURT: Yes.

14 BY MS. WORDHAM:

15 Q. Mr. Leahigh, do you recognize this table that I have now
16 handed you?

17 A. Yes.

18 Q. Marked as DWR Exhibit N.

19 A. Yes.

20 Q. Does this table accurately summarize the water cost you
21 had estimated for each of the remedy proposals that have been
22 submitted in this proceeding?

23 A. Yes, I believe so.

24 MS. WORDHAM: At this time, Your Honor, I'd like to
25 move DWR Exhibit N into evidence.

1 THE COURT: Any objection?

2 MS. JAISWAL: Continuing objection, Your Honor.

3 THE COURT: All right. Exhibit N is received in
4 evidence. It appears simply to be a summary of the
5 compilation of the cumulative totals of the underlying
6 Exhibits I through M, therefore it's subject to the same
7 ruling on the plaintiffs' objections.

8 (Defendant's Exhibit DWR N was received.)

9 MS. WORDHAM: Your Honor, did you wish to take a
10 break at this time?

11 THE COURT: No. We have a proceeding at 10:30, so
12 we're going to go until 10:30 and the court reporter is going
13 to take a break then.

14 MS. WORDHAM: Thank you.

15 Q. Mr. Leahigh, if you will look at the left-hand column of
16 this table. What is the caption across the top?

17 A. "Proposals."

18 Q. And underneath that, does it list the various proposals
19 that have been submitted in this matter?

20 A. Yes, it does.

21 Q. And then the columns next to that, please describe them.

22 A. Yes. There's two columns, one that takes a look at the
23 average year cost and the dry year cost. And it breaks it
24 down in terms of the cost in acre feet, delivery reductions in
25 acre feet and the percent that that represents from baseline

1 operations for both average and dry years.

2 Q. You have mentioned baseline operations a couple of times
3 now. Could you please define what you mean by "baseline
4 operations"?

5 A. Yes. Baseline operations, as I'm using it here, would be
6 the delivery capabilities of both projects absent the
7 implementation of any of the proposals. So in an average
8 year, that's a combined of 5.9 million acre feet, I believe;
9 and in a dry year, it's 3.2 million acre feet.

10 Q. Under the proposals, the first proposal is the US Fish &
11 Wildlife Service Action Matrix or USFWS Action Matrix;
12 correct?

13 A. Correct.

14 Q. And you have -- are you familiar with the US Fish &
15 Wildlife Service Action Matrix?

16 A. Yes.

17 Q. Beneath the title "USFWS Action Matrix" are the words
18 "upper range" and "lower range." Would you briefly explain
19 what those refer to?

20 A. Yes. As part of the US Fish & Wildlife Service proposal,
21 a couple of the actions, specifically three and four, although
22 the process is very specific, it allows for a range of
23 protective objectives at Old and Middle River. And so we --
24 in order to come up with the potential delivery impacts, we
25 analyzed the proposal at both the upper range and the lower

1 range of those Old and Middle River objectives.

2 Q. So would it be fair to say that the upper range represents
3 the more restrictive flow objectives and therefore the more
4 cost -- water costly proposal?

5 A. Yes.

6 Q. And does the same hold true for the Fish & Wildlife
7 Service action matrix as revised by the Department of Water
8 Resources?

9 A. That's correct.

10 Q. And is this the same type of range that the plaintiffs
11 included in their revised remedy proposal?

12 A. Well, the plaintiffs provided a range in their revised
13 proposal. It's -- and so we analyzed it using each of the
14 objectives indicated in that revised proposal.

15 Q. If the projects were required to implement the US Fish &
16 Wildlife Service action matrix using the most restrictive flow
17 objectives on Old and Middle Rivers, what would be the total
18 impacts to the Central Valley Project and State Water Project?

19 A. I'm sorry, this is for the US Fish & Wildlife Service
20 proposal?

21 Q. Yes.

22 A. That's --

23 Q. In an average year.

24 A. 2.17 million acre feet.

25 Q. And what percentage loss of delivery, water delivery does

1 that represent?

2 A. 37 percent.

3 Q. And in the lower -- if they were required to implement the
4 US Fish & Wildlife Service action matrix using the less
5 restrictive flow objectives, what would be the total impacts
6 in an average year?

7 A. 820,000 acre feet.

8 Q. And what would be the percentage of loss --

9 A. 14 percent.

10 Q. -- in water deliveries?

11 Under the US Fish & Wildlife Service action matrix as
12 modified by the Department of Water Resources, what would be
13 the total impacts to the State Water Project and Central
14 Valley Project if they were required to operate under the most
15 restrictive flow objectives?

16 A. In a dry year, 814,000 acre feet. Or 25 percent
17 reduction.

18 Q. Actually I'm referring now to the --

19 A. Oh, I'm sorry. You moved to the DWR's modification?

20 Q. Yes.

21 A. I'm sorry. Under DWR's modification to the Fish &
22 Wildlife Service action matrix, under an average year,
23 the -- in the most restrictive range, the cost would be 1.41
24 million acre feet.

25 Q. And in the lower range?

1 A. 476,000 acre feet.

2 Q. Now, in a dry year, the water delivery costs appear to be
3 less; is that correct?

4 A. That's correct.

5 Q. And why would that be?

6 A. That's because the baseline deliveries are substantially
7 less. And that's due to hydrology, just the water supply not
8 being there, not being available.

9 Q. You have also estimated a water cost associated with the
10 proposal of the State Water Contractors tier one; is that
11 correct?

12 A. Yes.

13 Q. And you --

14 THE COURT: If you don't mind.

15 MS. WORDHAM: Beg your pardon?

16 THE COURT: Let me go back to these two answers that
17 you gave. If you have, under the DWR revised proposal, I'm
18 looking at the middle of Exhibit N and I don't find the figure
19 that you mentioned. Is it on this exhibit? Or are you giving
20 me that from some other source?

21 THE WITNESS: As far as the impacts --

22 THE COURT: Yes.

23 THE WITNESS: -- associated --

24 THE COURT: With the 1,400,000 dollar -- I'm sorry, 4
25 00,000 acre foot reduction.

1 THE WITNESS: Correct. That's on the exhibit. Under
2 "upper range" under "average year."

3 THE COURT: I see. It just doesn't say "average
4 year."

5 THE WITNESS: "Average year" at the top of the
6 column.

7 THE COURT: There. I see. All right. Thank you.
8 BY MS. WORDHAM:

9 Q. Mr. Leahigh -- I apologize. May I continue?

10 THE COURT: Yes, you may.

11 BY MS. WORDHAM:

12 Q. Mr. Leahigh, these totals that are listed in this table
13 are taken from your Exhibits F and C, which have been marked
14 as DWR Exhibits L and K; is that correct?

15 A. That's correct.

16 Q. With the exception of the estimate for the State Water
17 Contractors proposal?

18 A. Yeah. Actually with the exception of the revised
19 plaintiffs' proposal and the tier one, Hanson tier one
20 proposal.

21 Q. And the plaintiffs' revised proposal -- numbers for the
22 plaintiffs' revised proposal come from DWR Exhibit M, the
23 table that you authenticated earlier; is that correct?

24 A. That's correct.

25 Q. Going back to the Hanson tier one proposal. It states

1 here that you estimated that with Q west. Can you briefly
2 describe what that means?

3 A. Yes. The tier one proposal essentially calls for
4 non-negative flows on the lower San Joaquin River just before
5 the confluence with the Sacramento River. And actually there
6 is a parameter of Q west as an equation, a thresh equation
7 that's been developed in order to essentially estimate that
8 exact same thing.

9 So that equation takes into account inflows into the
10 Delta, export rates and consumptive use in that -- in that
11 part of the Delta and gives us an estimate for that flow, net
12 flow on the lower San Joaquin River.

13 Q. In estimating the water delivery impacts from the Hanson
14 tier one proposal, did you use the Delta coordinated
15 operations model?

16 A. Yes, we did.

17 Q. What would be the total impacts to the Central Valley
18 Project and State Water Project in an average year if the
19 projects were required to implement the state water contract
20 tier one proposal?

21 A. The estimate is 316,000 acre feet.

22 Q. And what percentage reduction in delivery, water
23 deliveries does that represent in an average year?

24 A. Five percent.

25 Q. You testified that these percentages of reduction in water

1 deliveries is from a baseline; correct?

2 A. Correct.

3 Q. And in an average year, the baseline would be 5.9 million
4 acre feet; correct?

5 A. Correct.

6 Q. So under the plaintiffs' revised proposal, if the projects
7 were required to operate to the most restrictive flow level,
8 meaning the most water costly flow level, of the 5.9 million
9 acre feet baseline, how much would the projects be able to
10 deliver?

11 A. Well, the difference between the 5.9 and 3.6. So 2.3.

12 Q. And in a dry year, if the projects were required to
13 operate to the most restrictive of the plaintiffs' flow
14 requirements in their revised proposal, from baseline of 3.2
15 million acre feet, how much would the projects -- how much
16 water would the projects be able to deliver?

17 A. 1.6.

18 Q. Thank you. Mr. Leahigh, are you familiar with the
19 Environmental Water Account?

20 A. Yes.

21 Q. Will you briefly describe your understanding of the
22 Environmental Water Account?

23 A. Yes. The Environmental Water Account came about as part
24 of the science the CALFED brought back in 2000 and it's a
25 program that provides for the purchase of water assets to be

1 applied towards primarily export reductions for the protection
2 of fish. And it's managed by five agencies, Department of
3 Water Resources, Bureau of Reclamation, US Fish & Wildlife
4 Service, Department of Fish & Game and NOAA Fisheries.

5 Q. When you were estimating your water costs associated with
6 the various remedy proposals submitted in this matter, did you
7 take into consideration the availability of water under the
8 Environmental Water Account?

9 A. No. This -- these costs do not account for any mitigation
10 that might be possible with the Environmental Water Account.

11 Q. Why is that?

12 A. Well, partly because at the time that we first put these
13 proposals together, the financing for the Environmental Water
14 Account was shaky at best for next year. I think another
15 reason is it's not entirely clear how Environmental Water
16 Account would be applied towards these -- Environmental Water
17 Account water could be used for both protection of Chinook
18 salmon as well as delta smelt. It's not entirely clear how
19 this -- how it would be applied to any possible remedy.

20 Q. Do you have any idea how much water is generally available
21 under the Environmental Water Account?

22 A. Yeah, typically the purchased amounts are between 200 and
23 250,000 roughly acre feet. In addition, there are
24 opportunities under flexible operations for possibly another
25 100,000 acre feet or so.

1 Q. In your opinion, if the projects had access to
2 Environmental Water Account water for the coming water year,
3 would that significantly reduce the water costs associated
4 with the various remedy proposals?

5 A. Well, to a certain extent it could mitigate the costs
6 of -- it would mitigate, most likely, the costs of these
7 proposals. Although the magnitude of these costs is, as you
8 can see, for some of the more extreme costly proposals is --
9 you know, the full 300,000 would be a mere ten percent of the
10 total cost of the most expensive proposal here.

11 Q. Mr. Leahigh, are you familiar with something that is
12 sometimes referred to as B2 water?

13 A. Yes.

14 Q. Can you briefly describe your understanding of B2 water?

15 A. Well, B2 water does fall under the CVPIA that we -- that
16 the Court mentioned earlier. It is a federal program that
17 allows for the use of CVP supply of 800,000 acre feet from
18 year to year for fishery protection.

19 Q. Did you take the availability of B2 water into
20 consideration when estimating your water costs associated with
21 the various remedy proposals?

22 A. No. Did not.

23 Q. And why not?

24 A. Well, as I said, this is a -- this is a federally run
25 program. It has quite a complicated accounting system, which

1 we do not have the expertise to implement in our model. So we
2 did not make an attempt to try to analyze how B2 might be
3 applied to any remedy.

4 I mean, just in general, we do know that -- the
5 amount of 800,000 that's available varies from year to year.
6 Much of that 800,000 is applied to meeting the baseline
7 standards, which is the D 1641. And I do know that in
8 general, in dry years, there's typically -- there
9 typically -- most or all of the 800,000 is used just to meet
10 those baseline requirements.

11 So, for example, this year, essentially the entire
12 800,000 was used to meet the 1641 objectives and there would
13 be nothing available to meet any remedy proposal.

14 THE COURT: Did you give any consideration to the
15 provisions of B2 that refer to ESA and other requirements
16 under state and federal law as to what applicability, if any,
17 that would have to this, the issues here?

18 THE WITNESS: No.

19 BY MS. WORDHAM:

20 Q. Mr. Leahigh, are you familiar with the declarations
21 submitted by Mr. Spreck Rosekrans in this proceeding?

22 A. Yes.

23 Q. I think these have been identified as plaintiffs' Exhibits
24 24 and 25.

25 Have you looked at Mr. Rosekrans' methodology for

1 determining water costs associated with the various remedies?

2 A. Yes.

3 Q. Does Mr. Rosekrans' methodology differ from the one that
4 you used?

5 A. Yes. Very much so.

6 Q. Would you please explain how.

7 A. Well, as we reviewed earlier, we actually took a
8 projection of next year's operations in order to
9 determine -- estimate the delivery impacts. So we took into
10 account such things as the estimate of the delivery demand
11 patterns, the supply that's available, including carryover
12 storage in reservoirs and the current regulatory environment
13 that we're operating to.

14 Whereas Mr. Rosekrans took a look at historical
15 operations and tried to apply these proposed -- his -- the
16 plaintiffs' proposed remedy on to that historical data. So he
17 actually did not model next year's operations.

18 And there's a number of -- one of the problems with
19 that is there's a number of years that he analyzed the demand
20 patterns to be quite different. The land use patterns
21 upstream of the Delta, which affects the inflow would be quite
22 different; the regulatory environment as far as the Bay-Delta
23 standards would be quite different in most of those years; the
24 beginning storages in the system that we have a good
25 prediction of going into next year would be different in every

1 single one of those years than the unique set of circumstances
2 we have this year.

3 So I believe our estimates would be much more
4 reliable, as far as estimating the impacts into next year.

5 Q. Are there any other differences in your assumptions than
6 Mr. Rosekrans' assumptions in estimating water supply impacts?

7 A. Yeah. There was another key difference as far as the
8 assumption on the extent of the plaintiffs' action seven on
9 how long that action would take place. Mr. Rosekrans assumed
10 that that action would end June 15th.

11 In our analysis, we assumed it would end July 15th.
12 And the reason we assumed July 15th was that this was five
13 days beyond the average observation of delta smelt in salvage
14 at the fish facilities. And that is the triggering mechanism
15 identified in the plaintiffs' proposal for the end of action
16 seven.

17 Now, this additional 30 days that we assumed for this
18 implementation of this objective is critical, that 30-day
19 period from June 15th to July 15th represents the peak of the
20 demand, of the water demand on the system on both projects.
21 So this really created a choke point in our delivery
22 capability for the project.

23 Essentially meeting that objective would require us
24 to minimize our exports during that 30-day period whereby we
25 would have to meet the entire supply out of San Luis Reservoir

1 south of the Delta. There are limitations, physical
2 limitations on how quickly we can withdraw water from San Luis
3 Reservoir.

4 So in many cases we would not be able to meet the
5 demand that occurred in that critical period.

6 Q. Mr. Leahigh, do you know why Mr. Rosekrans selected June
7 15th as their end of action?

8 A. Well, the triggering --

9 MS. JAISWAL: Objection.

10 THE COURT: I'm assuming that you're objecting on the
11 ground of lack of foundation. And so you may lay the
12 foundation.

13 MS. JAISWAL: Yes, Your Honor. And calls for
14 speculation.

15 THE COURT: That is subsumed within my ruling.

16 BY MS. WORDHAM:

17 Q. Mr. Leahigh, is there any explanation in Mr. Rosekrans'
18 declaration for why he selected June 15th as the date for
19 estimating the end of action, of the plaintiffs' action seven,
20 I believe.

21 A. Well, June 15th is identified as the end of action seven
22 or the last detected delta smelt at the fish facilities, with
23 whichever comes later.

24 I believe that in Mr. Rosekrans supplemental
25 declaration, he talks about the justification for June 15th in

1 that he refers to Dr. Swanson's declaration that the taking of
2 actions, taking of actions earlier in the year would influence
3 how late into the year we would detect delta smelt at the
4 facilities. So I think that's what he stated as his, if I
5 understand it correctly, his reasoning for using June 15th.

6 Q. And if you will look at Plaintiffs' Exhibit 4, which
7 should be somewhere in front of you there. It is the
8 declaration of Christina Swanson filed on August 13th.
9 Document No. 466-2. Do you have that?

10 THE COURT: Before you go on to this, let me ask a
11 question. What is your analysis of the time frame that Mr.
12 Rosekrans establishes there as opposed to the period that you
13 have utilized for the combined operation response?

14 THE WITNESS: For action seven? For the end --

15 THE COURT: For action seven, yes.

16 THE WITNESS: What we did was we took a look at the
17 historical salvage in each year, since '93. And what we did
18 was we used the median of all those last dates of salvage
19 detected at either facility, which turned out to be July 10th.
20 The triggering -- the language for the trigger talks about
21 five days beyond the last detected smelt, so that's why we
22 used July 15th in our analysis. And there's --

23 THE COURT: Go ahead.

24 THE WITNESS: I was going to say, there's -- I mean,
25 as far as the reasoning given by Mr. Rosekrans, there have

1 been a number of years in the past, wet years where we would
2 have seen Old and Middle River flows at least meeting the
3 objectives of the plaintiffs earlier in the year, if not more
4 positive than the objectives proposed by the plaintiffs. But
5 yet, many of those years, in fact most of those years, we saw
6 salvage at the facilities into July. So I feel that
7 our -- our assumption is the correct one.

8 THE COURT: Thank you. Did you have a question?

9 MS. WORDHAM: Yes, Your Honor.

10 Q. Mr. Leahigh, if you would turn to page 31 of Dr. Swanson's
11 declaration, paragraph 38.

12 A. Got it.

13 Q. I'm going to read, beginning line 27.

14 "Based on particle tracking modeling and statistical
15 relationships between Old and Middle reverse and take
16 of adult delta smelt, these conditions" -- and I will
17 say these are referring to conditions on Old and Middle River
18 for the plaintiffs' action seven -- I won't make that
19 representation because I'm afraid I'm going to misrepresent
20 what all of paragraph 38 says.

21 MR. WILKINSON: Start over, please.

22 BY MS. WORDHAM:

23 Q. I think I'll start over from the beginning of paragraph
24 38.

25 "Mr. Leahigh's analysis of water cost for

1 implementation of the plaintiffs' recommended interim
2 protection actions includes the assumption that
3 salvage of juvenile delta smelt would continue
4 through mid July." And then cites to Leahigh reply
5 declaration at paragraph 24.

6 "He basis this on examination of historical salvage
7 of delta smelt since 1993, which shows that in half
8 of those years seasonal salvage of young delta smelt
9 ended on July 10. However, during that period,
10 reverse flows on Old and Middle Rivers averaged
11 negative 3,265 cubic feet per second in June with a
12 range of negative 8,853 to 8,747 and negative 7,760
13 cfs in July with a range of negative 897 to negative
14 10,819 cfs. Based on Particle Tracking Model and
15 statistical relationships between Old and Middle
16 reverse and take of adult delta smelt, these
17 conditions correspond to high rates of entrainment of
18 fish into the central and south Delta and into CVP
19 and SWP fish salvage facilities. Under the much
20 lower reverse flow conditions for Old and Middle
21 Rivers specified in plaintiffs' action seven and the
22 preceding months (i.e., plaintiffs action five and
23 six) it is likely that the movement of young delta
24 smelt from the Delta channels and sloughs where they
25 were hatched to downstream rearing areas near the

1 confluence and in Suisun Bay and beyond the influence
2 of the export pumps would have been improved and few
3 or no fish would remain in the south Delta as late as
4 July. "

5 Mr. Leahigh, attached as Exhibit D to your August 3,
6 2007 declaration, which has been marked as DWR Exhibit F is a
7 table entitled "Analysis of Last Date of Delta Smelt Salvage
8 by Banks PP and Jones PP." Do you have that document in front
9 of you?

10 THE WITNESS: Yes. Yes, that's -- is that DWR
11 Exhibit J?

12 Q. DWR Exhibit F. It's a one-page table and it's Exhibit D
13 to your supplemental declaration.

14 A. Oh, okay. Yes. I have it.

15 Q. You have that?

16 A. Yes.

17 Q. Mr. Leahigh, looking at year 1996, what type of year was
18 that?

19 A. That was a wet year.

20 Q. And in 1996, how wet was it?

21 A. 1996?

22 Q. Well --

23 A. 1990 -- well --

24 Q. Perhaps I mean 1998.

25 A. Yes. 1998 was the last big El Niño year, so it was

1 a -- on the wetter side of wet, extremely wet year. In fact,
2 we were curtailed at the exports for long periods of time in
3 the spring, for a good deal of the spring. There was flooding
4 going on in the San Joaquin basin. We actually had some flows
5 actually coming in to the aqueduct rather than making
6 deliveries. So we were shut down for most of -- or long
7 periods during the spring. Old and Middle River flows were,
8 in fact, positive from the end of February all the way through
9 the middle of July.

10 THE COURT: All right. We're going to take the
11 morning recess at this time. We'll stand in recess until 15
12 minutes before 11.

13 MS. JAISWAL: Your Honor, if we could just get some
14 direction for the Court for the schedule for today. Given
15 that we are at 10:30.

16 THE COURT: We're going until 12:30 and we're going
17 to resume at 1:30 and we'll be going at least until five, I
18 presume. We're in recess until 10:45.

19 (Recess.)

20 THE COURT: We're going back on the record in NRDC
21 versus Kempthorne. And we're going to continue Mr. Leahigh's
22 testimony.

23 Mr. Wordham, you may proceed.

24 BY MS. WORDHAM:

25 Q. Mr. Leahigh, before the break we were looking at DWR

1 Exhibit F, which I believe is Exhibit D to your August 3, 2007
2 declaration. Do you have that in front of you?

3 A. Yes, I do.

4 Q. And you had just described the water year 1998 as a very
5 wet year; is that correct?

6 A. Yes.

7 Q. And it was so wet, in fact, I believe you testified that
8 there were positive flows on Old and Middle Rivers from
9 February through July of that year; is that correct?

10 A. That's correct.

11 Q. And it was so wet that there were periods of time when the
12 projects were not even pumping; is that correct?

13 A. Yes. As far as State Water Project, there were long
14 periods of time we were not pumping.

15 Q. In 1998, what was the last date of salvage taken by either
16 the State Water Project or the Central Valley Project?

17 A. July 10th.

18 Q. Going back to paragraph 38 of Dr. Swanson's August 13,
19 2007 declaration. In your opinion, given the conditions that
20 existed in 1998 and the last date of salvage for 1998, in your
21 opinion is it possible that fish may -- smelt may be salvaged
22 at the Jones or Banks Pumping Plants after June 15th --

23 MS. JAISWAL: Objection.

24 MS. WORDHAM: If I may finish the question.

25 MS. JAISWAL: I'm sorry. I thought you were done.

1 BY MS. WORDHAM:

2 Q. -- even if plaintiffs' actions five, six and seven were
3 implemented?

4 A. That's what the historical data seems to indicate, yes.

5 Q. Thank you. We have been talking about Dr. Swanson's
6 August 13 declaration. You are familiar with this
7 declaration?

8 A. Yes.

9 Q. Are you familiar with the plaintiffs' proposed action ten
10 of their remedy proposal?

11 A. Yes, I am.

12 Q. Would you please briefly describe your understanding of
13 their action ten?

14 A. Yes. Action ten requires that the X2 line or two parts
15 per thousand salinity be maintained at 80 kilometers from the
16 Golden Gate or three-day outflow of 7500 cfs to be maintained
17 for the period from September 1st through December 15th.

18 Q. If you look at paragraph 21 of Dr. Swanson's August 13
19 declaration, which is Plaintiffs' Exhibit 4, on page 19. At
20 the bottom of page 19, Dr. Swanson -- in paragraph 21, Dr.
21 Swanson states that, "The projects can -- well, let me read
22 all of paragraph -- the first part of paragraph 21.

23 "There are at least three strategies that can be
24 employed singly or in combination by the state and
25 federal water projects to modify operations to

1 maintain Delta outflows at the levels that protect
2 delta smelt critical habitat as proposed in
3 plaintiffs' action ten without causing potential
4 adverse impacts on listed salmonid species on the
5 Sacramento River. First, the projects can reduce
6 Delta export rates."

7 In your opinion, Mr. Leahigh, do you believe that the
8 projects could meet the outflow requirements of plaintiffs'
9 action ten strictly through export reductions?

10 A. In most years, we wouldn't be able to meet it through
11 export reductions without some kind of impact to San Luis
12 Reservoir.

13 Q. What would be those impacts?

14 A. They would be in terms of water quality and slope
15 stability.

16 Q. And what would be the water quality impacts?

17 A. The water quality impacts are essentially, when you get
18 down to the last ten to 15 percent of storage in San Luis
19 Reservoir, all of the impurities in the water are
20 consolidating. For example, you get the blue-green algae
21 that's on the surface at that storage, low storage level, it's
22 within -- starts to be brought into the intakes, into the San
23 Felipe diversion, which is Santa Clara Valley Water District's
24 diversion, which diverts directly out of San Luis Reservoir.

25 Q. At what point would you start experiencing these water

1 quality impacts?

2 A. Yes. This would be at about 300,000 acre feet and below
3 is where you start to see those type of impacts.

4 Q. So once the storage level reaches about 300,000 acre feet,
5 then you start experiencing these water quality impacts?

6 A. That's correct.

7 Q. What's the current storage level in San Luis Reservoir?

8 A. Current storage as of midnight last night was about
9 470,000 acre feet.

10 THE COURT: What is the capacity?

11 THE WITNESS: Capacity is a little over 2 million
12 acre feet.

13 THE COURT: And what is the normal storage as of
14 August 31st historically in the San Luis Reservoir?

15 THE WITNESS: As of August 31st, if you were to look
16 back at the historical record, it's probably a bit higher than
17 we are now. Although typically this is -- this is when we hit
18 the low point in San Luis. This is when it is at its lowest
19 point. This is the end of the agricultural season.

20 THE COURT: Thank you.

21 BY MS. WORDHAM:

22 Q. You have testified, I believe, Mr. Leahigh, that this
23 current water year we are in, which ends at the end of
24 September, is a dry water year; is that correct?

25 A. Yes.

1 Q. And that the conditions in the Sacramento and San Joaquin
2 basins are dry; is that correct?

3 A. Yes. Dry. In fact, critically dry in the San Joaquin
4 basin.

5 Q. And do you expect those conditions to continue into the
6 fall?

7 A. Well, those conditions would continue until we get the
8 first big rains of the year, which nobody knows when that will
9 occur. But typically, the earliest we see significant precip,
10 end of October possibly, but could be as late as into January
11 or possibly in critically dry years, you don't see much of an
12 event at all as far as precip.

13 Q. If the Department of Water Resources and the Bureau of
14 Reclamation were required to implement plaintiffs' action ten
15 and meet the flow objectives of plaintiffs' action ten
16 strictly through export reductions, would the water level in
17 San Luis Reservoir reach 300,000 acre feet this fall?

18 A. It's likely that we would reach that storage level before
19 the end of October.

20 Q. If the projects were to implement plaintiffs' action ten
21 solely through export reductions, but not impact San Luis
22 Reservoir to the point of reducing the level of San Luis
23 Reservoir to 300,000 acre feet or below, would that result in
24 significant water delivery impacts to water contractors?

25 A. I'm sorry. Can you restate the question?

1 THE COURT: Read it back, please.

2 (Record read as requested.)

3 THE WITNESS: Yes.

4 BY MS. WORDHAM:

5 Q. Have you quantified that amount of that impact?

6 A. Yeah. We estimated that it would be on the order -- well,
7 let's see, in order to maintain San Luis at 300,000 acre feet,
8 and all of the delivery -- I mean, all of the -- action ten is
9 met strictly through export reductions, would require delivery
10 reductions of two to 300,000 acre feet in a short period of
11 time. We're talking the next two months.

12 Q. And you testified that another impact of San Luis
13 Reservoir could be structural stability; correct?

14 A. Correct.

15 Q. And what is that structural stability issue?

16 A. Well, we took a look at -- we analyzed if we were to meet
17 action ten strictly through export reductions, what kind of
18 draw down rates we would be looking at in San Luis Reservoir
19 in order to meet -- because exports would be very low. All of
20 the demand would be coming out of San Luis Reservoir. Those
21 draw down rates would be on the same order as those that were
22 experienced back in 1981 when we had a major slide on the
23 inside face of Sisk Dam at San Luis Reservoir. That this
24 would require taking the reservoir out of service, it was
25 completely drained and repairs took about a year to repair the

1 damage. And we would anticipate if we saw a similar type
2 failure, we would anticipate similar type outage.

3 Q. Referring back to Plaintiffs' Exhibit 4, which is the
4 Christina Swanson declaration. And again looking at paragraph
5 21. Now on page 20. At line seven, Dr. Swanson states that
6 "The CVP and the SWP could increase releases from their other
7 upstream reservoirs, including Oroville, Folsom and New
8 Melones instead of relying so heavily or exclusively on Shasta
9 Reservoir" as one means of implementing plaintiffs' action
10 ten. Do you see that?

11 A. Yes.

12 Q. In your supplemental declaration, you stated that one
13 means of managing the projects if plaintiffs' action ten were
14 implemented would be by a combination of reducing
15 storage -- exports and releasing water from storage; correct?

16 A. Correct.

17 Q. How much water did you anticipate that the projects would
18 need to release from storage to implement plaintiffs' action
19 ten?

20 A. We analyzed it a couple of ways. In my declaration, it
21 was assumed that under dry conditions, about 300,000 acre feet
22 would be required from upstream in order to meet it. In order
23 to avoid any impacts that we just discussed at San Luis
24 Reservoir, we would require something closer to 500,000 acre
25 feet from upstream.

1 Q. Is that the same estimate that Mr. Milligan -- let me
2 rephrase. Or let me strike that and start over.

3 Are you familiar with the declaration of Ronald
4 Milligan that was filed by the federal defendants in this
5 matter?

6 A. Yes.

7 Q. Did Mr. -- Mr. Milligan, in his declaration, estimated
8 that under dry conditions and the forecasted reservoir levels,
9 export releases of up to 500,000 acre feet would be required
10 to implement plaintiffs' action ten. Is that the level of
11 releases that you're referring to?

12 A. Yes. That --

13 MS. JAISWAL: Your Honor, I'd like to restate our
14 continuing objection.

15 THE COURT: All right. And the ruling is the same.

16 BY MS. WORDHAM:

17 Q. Mr. Leahigh.

18 A. Yes. That figure that Mr. Milligan quoted is consistent
19 with our analysis in how much water would be required from
20 upstream in order to avoid impacts at San Luis Reservoir in
21 dry conditions.

22 Q. And the 310,000 acre feet that you estimated would
23 be -- should be released to manage the projects if the
24 plaintiffs action ten were implemented with a combination of
25 export reductions and upstream releases could have an impact

1 on water quality in San Luis Reservoir; is that correct?

2 A. Yes. If we operated under dry year conditions as I laid out
3 in my declaration, it shows 300,000 necessary from upstream.
4 But San Luis does drop well below that 300,000 mark in that
5 particular analysis.

6 MS. WORDHAM: At this time, Your Honor, I'd like to
7 mark as DWR next, I think it's 0. This is an excerpt from the
8 Biological Opinion on the long-term Central Valley Project and
9 State Water Project operations criterion plan, which I believe
10 is the subject of litigation in a companion case, PCFFA versus
11 Gutierrez, which is case number 06-CV-00245.

12 THE COURT: It will be marked for identification DWR
13 Exhibit 0.

14 (Defendant's Exhibit DWR 0 was marked for
15 identification.)

16 MS. WORDHAM: I'd also like to mark as DWR Exhibit P
17 an agreement between the Department of Water Resources and the
18 Department of Fish & Game concerning the operation of the
19 Oroville division of the State Water Project for management of
20 Fish & Wildlife.

21 (Defendant's Exhibit DWR P was marked for
22 identification.)

23 MS. WORDHAM: And last, for the time being, I would
24 like to mark as DWR Exhibit Q, if I remember my alphabet
25 correctly, a US -- United States Federal Energy Regulatory

1 Commission order amending a Federal Energy Regulatory
2 Commission License.

3 (Defendant's Exhibit DWR Q was marked for
4 identification.)

5 MS. WORDHAM: If I may approach?

6 THE COURT: Yes, you may.

7 BY MS. WORDHAM:

8 Q. Mr. Leahigh, I have just handed you three documents which
9 have been marked as Exhibits DWR O, DWR P and DWR Q. Looking
10 at the first document, Exhibit DWR O, do you recognize this
11 document?

12 A. Yes.

13 Q. Can you briefly describe it?

14 A. Well, this is an excerpt from our Biological Opinion for
15 long term operations for both Central Valley Project and State
16 Water Project Operations Criteria and Plan or OCAP.

17 Q. Is this a complete copy of the Biological Opinion?

18 A. No. This is an excerpt.

19 MS. WORDHAM: Your Honor, at this time I would like
20 to request that the Court take judicial notice of the complete
21 Biological Opinion, which is on file in the related case,
22 PCFFA versus Gutierrez.

23 THE COURT: Any objection?

24 MS. JAISWAL: Your Honor, we are objecting on grounds
25 of completion for the document.

1 THE COURT: The request was just made that I take
2 judicial notice of the entire Biological Opinion, which would
3 include this document. Any objection to that?

4 MS. JAISWAL: No, Your Honor.

5 THE COURT: The request for judicial notice is
6 granted. And I will -- if you tell me what part you want me
7 to look at, if there's anything more than this, I will refer
8 to the OCAP BiOp as the subject of case number 06-CV-00245.

9 BY MS. WORDHAM:

10 Q. Mr. Leahigh, to your knowledge, does the Biological
11 Opinion for the long-term -- strike that.

12 Mr. Leahigh, do you know what bio -- what species are
13 addressed in this Biological Opinion that we are now referring
14 to?

15 A. Yeah. What I failed to mention is this is the Biological
16 Opinion issued by National Marine Fisheries Service, so it
17 covers Chinook salmon and steel head spring-run -- more
18 specifically spring-run Chinook salmon and steel head.

19 Q. Are these species listed under the Endangered Species Act?

20 A. Yes.

21 Q. Do you know if they're listed as threatened or endangered?

22 A. I believe it's threatened.

23 Q. To your knowledge, does this Biological Opinion require
24 that DWR maintain water temperatures on the Feather River at
25 certain levels for protection of the spring-run and steel head?

1 A. Yes.

2 Q. If I may turn your attention now to DWR Exhibit P. Are
3 you familiar with this document?

4 A. Yes, I am.

5 Q. Would you please briefly describe it.

6 A. This is an agreement, an operating agreement between
7 Department of Water Resources and Department of Fish & Game.
8 Dated August 1983. And it has numerous provisions in it
9 related to minimum instream flow requirements downstream of
10 the Oroville complex on the Feather River. Also includes
11 ramping criteria, change in those releases and also flow
12 stability provisions where once a certain level of habitat is
13 established at a certain level of flow, that those flows need
14 to be maintained for a period of time.

15 Q. How is it that you are familiar with this particular
16 document?

17 A. Well, it's -- it's essential that in order to operate the
18 project, that we are familiar with this. These are the
19 conditions on which we operate the project. The -- these
20 provisions are -- as far as the minimum flow requirements, are
21 built into our operations model that analyzes the operations
22 and the delivery capabilities.

23 MS. WORDHAM: Your Honor, at this time I would like
24 to move DWR Exhibit P into evidence.

25 THE COURT: Any objection?

1 MS. JAISWAL: Completion, Your Honor.

2 THE COURT: This appears to be a stand alone
3 agreement. The objection is overruled. Exhibit P of DWR is
4 received in evidence.

5 (Defendant's Exhibit DWR P was received.)

6 BY MS. WORDHAM:

7 Q. Mr. Leahigh, is the State Water Project required to
8 operate to any specifications set forth by the Federal Energy
9 Regulatory Commission?

10 A. Yes. The FERC license covers all operations of the
11 Oroville complex. It has actually incorporated the flow
12 provisions that are in this agreement between the Fish & Game
13 and DWR.

14 Q. Would you turn your attention to DWR Exhibit Q. Are you
15 familiar with this document?

16 A. Yes.

17 Q. Would you please briefly describe this document.

18 A. Well, this is the order amending our license, our FERC
19 license, and this does incorporate these flow provisions from
20 the Fish & Game agreement into our FERC license.

21 Q. So you are required to comply with the provisions of this
22 order in operating Oroville Reservoir?

23 A. Yes.

24 MS. WORDHAM: Your Honor, at this time I would like
25 to move DWR Exhibit Q into evidence. Any objection?

1 MS. JAISWAL: Your Honor, it appears we have pages
2 one, two and five for this document. I'm not sure if this is
3 a copy error or if it is not complete.

4 THE COURT: That does appear to be the case. Did you
5 just omit a couple of pages?

6 MS. WORDHAM: Well, if I have, I've omitted them from
7 all the copies I have here today, Your Honor.

8 THE COURT: Was that intentional or just inadvertent?

9 MS. WORDHAM: It was inadvertent.

10 THE COURT: All right. Well, what I'll do is this.
11 Subject to your adding the two pages that are not present,
12 I'll admit Exhibit Q into evidence.

13 MS. WORDHAM: I will make sure that the missing pages
14 are provided to the Court and all parties as soon as possible,
15 Your Honor.

16 THE COURT: Thank you very much.

17 (Defendant's Exhibit DWR Q was received.)

18 Q. Mr. Leahigh, is the Department of Water Resources, at its
19 Oroville Reservoir facility, required to comply with the
20 various flow restrictions and temperature restrictions that
21 you just described in each of these documents?

22 A. Yes.

23 Q. This is a legal requirement?

24 A. Yes.

25 Q. Now, if the projects, being both the State Water Project

1 and the Central Valley Project, were required to implement the
2 plaintiffs' action ten by releasing water only from Lake
3 Oroville, would that have an effect on DWR's ability to meet
4 the flow restrictions and water temperature restrictions that
5 you've just described in these documents?

6 A. Yes. Very much so.

7 Q. And how is that?

8 A. If we were required to meet -- if I understood your
9 question correctly, if we were required to meet the Delta ten
10 action solely, that the upstream portion of that, from Lake
11 Oroville, there would be extreme impacts to Oroville storage.
12 Most notably due to the provision three of the agreement with
13 Fish & Game as far as having to provide releases above the
14 threshold release identified in provision three.

15 Once that higher flow is established, we must
16 maintain that higher flow from the fall through March of the
17 following spring.

18 This would have a devastating effect on Lake Oroville
19 storage and it would severely compromise our ability not only
20 to meet the temperature requirements the following year, but
21 most likely it could very well have impacts if this following
22 winter is dry or critically dry on our ability to meet even
23 our share of Delta requirements.

24 Q. By "Delta requirements," you mean the water quality
25 standards and flow requirements of --

1 A. The flow standards, salinity standards for Fish & Wildlife
2 purposes and agricultural uses, yes.

3 Q. Why would you be required to maintain such high flows
4 from -- high release rates from Lake Oroville? What would be
5 the purpose of maintaining those releases?

6 A. Well, the reasoning behind it is that once we make
7 releases at the higher level, we establish new habitat for
8 Chinook and steelhead in the Feather River. In order to avoid
9 dewatering redds or straining fry later in the season, we have
10 to maintain that same level of habitat. So thereby
11 maintaining that same level of release through the spring of
12 the following year.

13 Q. So these higher flows are intended to protect endangered
14 species; is that correct?

15 A. That's correct. All species, including endangered
16 species.

17 Q. Do you have any option -- any alternative to maintaining
18 these flows --

19 A. No.

20 Q. -- at these higher --

21 A. It's in our legal requirements, it's in our agreement with
22 Fish & Game and it's also legally binding in our FERC license.

23 Q. So the only way that you could avoid those impacts that
24 you just described would be to violate your regulatory
25 requirements under the FERC license, under the Fish & Game

1 agreement and as imposed by the biological opinions that we
2 were just discussing; is that correct?

3 MS. JAISWAL: Objection, Your Honor.

4 THE COURT: Ground?

5 MS. JAISWAL: Assumes fact not in evidence.

6 THE COURT: Overruled. You may answer.

7 THE WITNESS: Yes.

8 BY MS. WORDHAM:

9 Q. Mr. Leahigh, in the remedies proposed by the US Fish &
10 Wildlife Service and the Department of Water
11 Resources -- you're familiar with all of those remedy
12 proposals; correct?

13 A. Yes.

14 Q. There's certain actions that require the Old and Middle
15 River flows to be maintained at a certain rate; is that
16 correct?

17 A. That's correct.

18 Q. And this level is achieved by averaging flows over a
19 period of days; correct?

20 A. That's correct.

21 Q. And what is that averaging period?

22 A. Well, the averaging period -- oh, in the Fish & Wildlife
23 Service proposal specifically?

24 Q. Yes.

25 A. Is that what you're --

1 Q. I'll start with them.

2 A. It requires it to meet it on -- the objective on a 14-day
3 average, less restrictive -- I'm sorry, more restrictive on a
4 seven-day average. Sorry. Less restrictive on a seven-day
5 average.

6 Q. Why is a 14-day average used?

7 A. Okay. To answer this question, I think I need to go into
8 a little bit background on some more of the process of the
9 tides and how they influence flows in the interior Delta.

10 Q. Okay.

11 A. There's been testimony, we've talked about the
12 semi-diurnal sloshing of the tide, the two flood tides, two
13 ebb tides each day. So that's one component of the tides and
14 how it affects the interior channels in the Delta. And the
15 result is a net either negative flow or net positive flow.

16 There is also an effect of the moon on the tides and
17 on these flows in these interior channels. And so this is
18 superimposed on the daily sloshing. There is approximately a
19 seven-day filling of the Delta on a net flow basis and a
20 seven-day draining of the Delta on a seven-day basis. So a
21 cycle from -- and the filling is referred to as the spring
22 tide and the draining is the neap tide. So there is
23 essentially a 14-day period between -- from spring tide to
24 spring tide because the spring tides occur both during the
25 full moon and the new moon.

1 Q. Are there any other --

2 A. Um --

3 Q. -- influences -- are there any other factors that support
4 a 14-day running average?

5 A. Well, I -- that's -- this cycle has been recognized in the
6 other standards that we're required to meet as part of the D
7 1641, as far as the salinity requirements that are within the
8 interior of the Delta that is influenced by this neap/spring
9 cycle. All of those standards are based on a 14-day running
10 average. And the Old and Middle River objective, Old and
11 Middle River at this -- as measured is also affected by this
12 neap spring cycle.

13 Q. I believe in your declaration you also testified -- stated
14 that there were certain meteorological events that make a
15 14-day running average an appropriate measurement.

16 A. Well, yeah, the -- in addition to the astronomical effects
17 on the tides, which are predictable based on movement of the
18 moon around the earth, there are other aspects of the tide
19 that are -- that are not predictable and not very well
20 understood. And these would be the effects, the
21 meteorological effects on the tides. And this would be winds,
22 barometric pressure, storm surges.

23 And these have effects on the short-term on the
24 stages and flows of the channels within the Delta, on a
25 short-term basis, that overwhelm this longer term process of

1 the tides as far as the spring and neap.

2 So it would be extremely challenging to meet a short
3 duration objective or running average objective, just for
4 practical purposes of the projects being able to adjust their
5 operations in a way to compensate for these very large effects
6 from meteorological influences.

7 Q. Are you familiar with the 2006 Water Quality Control Plan?

8 A. Yes.

9 Q. Are you familiar with the quantitative flow objectives for
10 river flows and Delta outflows as discussed in the 2006 Water
11 Quality Control Plan?

12 A. Yes.

13 Q. How are those quantitative flow objectives determined in
14 the water quality control plan?

15 A. The -- well, the main flow objective that's in the water
16 quality control plan would be net Delta outflow index. And
17 that is an index. It is not a measured flow. It is a
18 calculated flow based on -- it's an equation based on inputs
19 and outputs into the Delta. The inputs would be the inflows
20 primarily from the Sacramento River as measured at Freeport,
21 the San Joaquin River as measured at Vernalis. The outputs
22 would be consumptive use within the Delta and the project
23 exports in the south Delta. So you've got the plusses of the
24 inflows, the minuses of the consumptive use and the exports
25 and that gives you a net Delta outflow.

1 Q. Are the Delta outflow objectives met based on an averaging
2 period?

3 A. Yes.

4 Q. And what is that period?

5 A. Well, most of the Delta outflow objectives have either
6 have a 30-day -- based on a monthly average, usually with a
7 provision for seven-day -- seven-day minimum as well.

8 Q. Are there any outflow objectives that are met based on a
9 three-day running average?

10 A. Yes. There is. One of the ways to meet one of the more
11 complicated standards in the D 1641, which is the X2 standards
12 for protection of delta smelt, one of the ways to meet that
13 objective is through a three-day running average for Delta
14 outflow.

15 Q. Under the Water Quality Control Plan, is there a salinity
16 standard?

17 A. Yes. There are numerous salinity standards. Yes.

18 Q. And where is salinity measured under the water quality
19 control plan?

20 A. Well, there's various -- various ones. There's -- in the
21 interior of the Delta, primarily Jersey Point, Emmaton, there
22 are other requirement -- M and I salinity requirements at
23 other places.

24 Q. Does the water quality control plan provide an averaging
25 period over which the projects maintain salinity levels?

1 A. Yes. Those locations in the interior Delta for
2 agricultural salinity are based on 14-day running average.

3 Q. Is there a reason why, on that one instance, Delta
4 outflows can be measured using a three-day running average or
5 can be maintained, rather, using a three-day running average
6 while salinity levels require a 14-day running average?

7 A. Yes. The components, as I stated, that go into
8 calculating the Delta outflow. The inflow, the observed
9 inflow is at Freeport on the Sacramento River, Vernalis on the
10 San Joaquin River. These are essentially on the periphery of
11 the Delta and they are not influenced by this neap/spring tide
12 cycle.

13 Q. In your --

14 A. So we could -- we could meet it in a shorter duration.

15 Q. The one, the Delta outflow requirement that's based on a
16 three-day running average.

17 A. Yes.

18 Q. That could be met on a three-day running average.

19 A. Yes. And that's only one way to meet that particular
20 standard.

21 Q. But the salinity levels need to be maintained on a 14-day
22 running average; correct?

23 A. That's correct.

24 Q. And is that because they are more tidally influenced?

25 A. Yes. Essentially that would be to filter out the effects

1 of this neap/spring tidal cycle.

2 Q. Are the flows in Old and Middle Rivers also tidally
3 influenced?

4 A. Yes.

5 Q. In your opinion, would it be possible for the projects to
6 meet the flow objectives outlined in the plaintiffs' proposed
7 remedy based on a five-day running average?

8 A. It would be very challenging, as I stated earlier, because
9 of -- more so because of the meteorological effects. The
10 astronomical effects could be -- can be predicted to a certain
11 extent. But the meteorological effects cannot. And so it
12 would be quite challenging.

13 If we had to meet it with a five-day running average,
14 we would have to operate very conservatively. We'd have to
15 target Old and Middle River flow objectives much more less
16 negative than the objectives from the proposal, thereby
17 incurring greater water costs than have been analyzed in our
18 table here.

19 Q. And would the same hold true for attempting to meet Old
20 and Middle River flows based on -- as outlined in either the
21 Fish & Wildlife Service remedy or in the Department of Water
22 Resources modifications to the Fish & Wildlife Service's
23 remedy on a five-day average?

24 A. Yes, it would be just as challenging.

25 THE COURT: Give me, in succinct terms, why that is.

1 What is it about the five-day running average that makes this
2 more difficult?

3 THE WITNESS: Well, it is -- in the short duration,
4 you can have these meteorological effects, like I said, the
5 winds, the Delta -- the onshore winds, the barometric
6 pressure, when barometric pressure is very low, you tend to
7 see a big increase in stage in the interior Delta, which is
8 caused by this -- by the flows coming in from the bay and
9 they're causing -- they tend to make the flows much more
10 negative. And they actually overwhelm the normal predictable
11 cycle of the tides. And this will happen for a period of a
12 day or two as you get a storm system coming through the Delta.

13 And so we can predict this ahead of time, what the
14 effects of those are going to be. And with only five days,
15 and we're looking at an average, it would be very challenging
16 to -- we'd have to make, for example, if we got one of these
17 storm surges, we'd have to make a significant change in our
18 export operations that may not even be enough in order to meet
19 that requirement, that five-day average.

20 THE COURT: There have been seven-day averages
21 referred to as well as the 14-day averages.

22 THE WITNESS: Right.

23 THE COURT: And for this particular measure, is there
24 a preference as to a running average that is to be met?

25 THE WITNESS: Well, the preference would be the

1 14-day average. There is a provision in there for an upper
2 cap of seven days that is not as restrictive as the 14 days.
3 So that's kind of in recognition of -- well, that essentially
4 puts a cap so we couldn't vary too greatly within that 14 days
5 on meeting whatever the particular objective is.

6 THE COURT: And is the reason that the 14 days is
7 more feasible because that gives more time for whatever
8 natural conditions are to operate which would then enable DWR
9 or CVP not to take affirmative measures?

10 THE WITNESS: I'm not sure if I fully understood --

11 THE COURT: What I'm saying is, in the most
12 simplistic terms, you've described what are, in effect,
13 natural causes that affect the direction of flow in the Delta.
14 And these relate to all the different things you've talked
15 about. Tides. Meteorological conditions. I thought I heard
16 astrological, but I --

17 THE WITNESS: I meant to say astronomical.

18 THE COURT: Astronomical. All right. I don't think
19 we're using astrology yet in this case. Before it's over, we
20 may get there.

21 Does the longer period in effect permit the natural
22 courses to operate to meet the running average without either
23 reducing exports, putting more water into the system to try to
24 effect the direction of flows? Is that --

25 THE WITNESS: Well, yeah --

1 THE COURT: -- the practical result?

2 THE WITNESS: That would be the practical result.

3 Tend to stabilize the operations to a --

4 THE COURT: To require less action by the operators.

5 THE WITNESS: Yes. And -- that's correct. And as I
6 said, as that duration of time gets shorter and shorter, we
7 would have to operate more and more conservatively to actually
8 target objectives further below or more restrictive than
9 what's in any of these proposals in order to ensure that we do
10 meet the proposals' objectives.

11 THE COURT: And do you see any net benefit to this
12 shorter period?

13 THE WITNESS: I don't.

14 THE COURT: Thank you. You may continue.

15 BY MS. WORDHAM:

16 Q. Mr. Leahigh, are there any other operations that draw
17 water from the Delta besides the State Water Project and
18 Central Valley Project that could have an influence on the
19 flows in Old and Middle Rivers?

20 A. Yes. There are other diverters in the south Delta
21 upstream of the measuring point for Old and Middle River
22 flows. These would be agricultural diverters as well as M and
23 I diverters. Contra Costa Water District, for example.

24 Q. And have you had occasion to quantify the amount of their
25 diversions?

1 A. Well, it varies throughout the year. But at their peak,
2 it's estimated that the agricultural diversions upstream of the
3 Old and Middle River sites could be in the order of 1,000,
4 1500 during the peak of their water -- their demand for
5 agricultural uses. Contra Costa Water District
6 probably -- and this is at their Old River pumping plant, is
7 probably on the order of about 200 cfs or so.

8 Q. You're familiar with DWR's revised remedy proposal; is
9 that correct?

10 A. That's correct.

11 Q. Under DWR's remedy actions three and four -- well, three,
12 do you know what the flow requirements are?

13 A. The flow objective for Old and Middle River varies from
14 1500 -- negative 1500 cfs to negative 4,000.

15 Q. Is that different from the Fish & Wildlife Service's flow
16 objectives for action three?

17 A. Yes. The Fish & Wildlife Service's is from zero or
18 non-negative flow to negative 4,000 cfs.

19 Q. In your opinion, could the agricultural diversions and
20 the -- and the M and I, or municipal and industrial diversions
21 that you were just describing, have an effect on the project's
22 ability to meet a zero or non-negative flow requirement in Old
23 and Middle Rivers during the time period of action three?

24 A. Yes. In -- during the time period of action three, which
25 is late spring, that's right at the time when the agricultural

1 users are starting to peak their diversions out of the Delta.
2 If that's in combination with a low flow on the San Joaquin
3 River, also if there were -- happened to be in the part of the
4 spring/neap tidal cycle that is the spring, which tends the
5 tendency to cause more negative flows on the interior Delta,
6 it's possible we could see negative flows without any pumping
7 at all at either facility. At either project, project export
8 facility.

9 Q. So in your opinion, if the projects were required to
10 operate to the slightly less restrictive requirements of DWR's
11 proposal of negative 1500 cfs, would they be able -- would it
12 be possible for them to -- let me rephrase.

13 Would it be easier for them to meet those flow
14 objectives given the agricultural diversions and municipal and
15 industrial diversions that you've described?

16 A. Yes. It would be much more practical to be able to meet
17 that level of flow given all the other factors that are
18 outside of our control.

19 MS. WORDHAM: One moment, Your Honor.

20 THE COURT: Yes.

21 MS. WORDHAM: Thank you, Your Honor. I have no
22 further questions at this time.

23 THE COURT: Thank you very much. Do the plaintiffs
24 wish to cross-examine?

25 MS. JAI SWAL: Yes, Your Honor.

1 THE COURT: All right. You may proceed.

2 CROSS-EXAMINATION

3 BY MS. JAISWAL:

4 Q. Good morning, Your Honor. Good morning, Mr. Leahigh. I'm
5 Anjali Jaiswal representing the plaintiffs. Before I begin
6 the cross-examination, I just wanted to restate our continuing
7 objection, Your Honor.

8 THE COURT: Yes. You may proceed.

9 BY MS. JAISWAL:

10 Q. Mr. Leahigh --

11 THE COURT: It is noted.

12 BY MS. JAISWAL:

13 Q. Mr. Leahigh, I am going to begin with the Department of
14 Water Resources Exhibit N. Do you have that in front of you?

15 A. Yes.

16 Q. You've already read the title of this exhibit. And you've
17 already testified that actions one through three propose
18 monitoring; correct?

19 A. Correct.

20 Q. And that's for both the plaintiffs, the original as well
21 as the revised; correct?

22 A. That's correct.

23 Q. And the charts for actions one, two, three -- excuse me.
24 The chart states that for actions one through three, there
25 will be no cost; is that correct?

1 A. Correct.

2 Q. Now, let's go to your Exhibit C, which has been
3 marked -- let's see. That is contained in Department of Water
4 Resources Exhibit J and it has also been separately entered, I
5 believe, as Exhibit K. Do you have that in front of you?

6 A. Yes, I do.

7 Q. Thank you.

8 MS. WORDHAM: Your Honor, I'm having a hard time
9 hearing counsel. I apologize, but I am having a hard time
10 hearing counsel.

11 THE COURT: If you could try to speak directly into
12 the microphone.

13 MS. JAISWAL: I will do my best, Your Honor.

14 THE COURT: Thank you. Yes, you have a soft voice.

15 BY MS. JAISWAL:

16 Q. Looking at Exhibit C attached to your supplemental
17 declaration -- is that better?

18 MS. WORDHAM: Thank you.

19 MS. JAISWAL: Okay. I will hold it the best that I
20 can.

21 Q. If I could direct your attention to the chart on the
22 right. That is the service's action matrix; correct?

23 A. Correct.

24 Q. And there are -- there is no equivalent to actions one,
25 two, three; correct?

1 A. Correct.

2 Q. Now if I could go back to Exhibit N. Department of Water
3 Resources Exhibit N. When you look at both charts for
4 plaintiffs' action 6, that's VAMP; correct?

5 A. Correct.

6 Q. And for both of those across the board, there's no cost;
7 correct?

8 A. That's correct.

9 Q. And just moving down quickly to eight and nine, again, the
10 barriers. And for both of those across the board, there's no
11 cost; correct?

12 A. Correct.

13 Q. Thank you. So in analyzing, you concluded that six of ten
14 of the plaintiffs' actions had no cost; correct?

15 A. That's correct.

16 Q. Thank you. Moving on. Your analysis evaluated the remedy
17 proposals only under a dry and average year hydrological
18 condition; correct?

19 A. Correct.

20 Q. Mr. Leahigh, do you have in front of you your supplemental
21 exhibit, which has been introduced as -- which has been
22 entered as Department of Water Resources Exhibit I?

23 A. Yes. I have it.

24 Q. Take a look at Exhibit A. This exhibit indicates that
25 there are five classifications for hydrological year types;

1 correct?

2 A. I'm sorry. Is this -- this would be my supplemental
3 declaration?

4 Q. Yes.

5 A. I think that's DWR --

6 Q. I'm sorry. That is J.

7 A. J. Okay. Yes, I have that and I'm looking at Exhibit A
8 to that supplemental declaration.

9 Q. Great. And -- is that better? Everyone can hear me
10 better now? Great. Thank you for turning up the microphone.

11 So when you look at Exhibit A, you see five
12 classifications for hydrological year types; correct?

13 A. That's correct.

14 Q. And in your analysis of the various proposals, you did not
15 present any analysis for wet years; is that correct?

16 A. That's correct. The 50 percent exceedance, I believe,
17 falls under above normal category.

18 Q. Thank you. And so if 2008 were a wet year, the water cost
19 of plaintiffs' proposal would be less; correct?

20 A. It would depend.

21 Q. You testified that for conditions above normal, the
22 projects could meet their contractor demands.

23 MS. WORDHAM: Objection. Misstates his testimony.

24 MS. JAISWAL: Could you please explain what you
25 testified -- I'm sorry, Your Honor.

1 THE COURT: Let me rule on the objection. The
2 objection is sustained. You may rephrase.

3 MS. JAISWAL: Thank you.

4 Q. Mr. Leahigh, would you please restate what you informed
5 the Court today regarding wet year analysis.

6 MS. WORDHAM: Objection. Vague.

7 THE COURT: Do you understand the question?

8 THE WITNESS: I believe -- I believe I do.

9 THE COURT: Overruled. You may answer.

10 THE WITNESS: I think you're referring to a comment I
11 made that doing an analysis on years wetter than the 50
12 percent exceedance, I believe I stated that we typically do
13 not look at year types that are wetter because we're able to
14 meet most of the delivery requests of our contractors.
15 That -- I think that's what I stated earlier.

16 The question about wetter years, and I -- the reason
17 I answered "it depends" is because it's possible, it depends
18 on which basin receives more water. If, for example,
19 Sacramento were wet, San Joaquin were drier, the cost could
20 actually be greater than what was analyzed in our assessment.

21 If you've got a wet San Joaquin basin and a drier San
22 Joaquin, then yes, those costs would tend to come down. On
23 the most extreme wet years, it's possible that the cost could
24 be zero for -- at least for the spring actions. There's
25 the -- yeah, that's -- that would be my analysis of wet year

1 and the effect of a wet year on these proposals.

2 BY MS. JAISWAL:

3 Q. Thank you, Mr. Leahigh.

4 You testified that you reviewed Mr. Rosekrans'
5 evaluation; correct?

6 A. Yes.

7 Q. His declaration.

8 A. Yes.

9 Q. Do you have Plaintiffs' Exhibit 25 in front of you?

10 A. I'm sorry. Which exhibit?

11 THE COURT: 25. I don't think he has it up there.

12 MS. JAISWAL: Your Honor, yesterday I gave the
13 witness' copies to the Court --

14 THE CLERK: I put them over there.

15 THE COURT: If you can look, it should have a pink
16 tag on it with 25.

17 THE WITNESS: I found it.

18 THE COURT: All right.

19 BY MS. JAISWAL:

20 Q. Mr. Leahigh, would you please turn to the last page of Mr.
21 Rosekrans' exhibit.

22 A. Exhibit, the SR Supplemental 2?

23 Q. Yes. Thank you.

24 MS. JAISWAL: Your Honor, for ease of the Court, I
25 would like to identify this separately as Plaintiffs' Exhibit

1 26.

2 THE COURT: All right. Any objection? 26 for
3 identification.

4 (Plaintiffs' Exhibit 26 was marked for
5 identification.)

6 BY MS. JAISWAL:

7 Q. Mr. Leahigh, looking at plaintiffs' 26, Mr. Rosekrans
8 analyzed impacts over a range of hydrological year types; is
9 that correct?

10 THE CLERK: Excuse me. Did you give me two copies of
11 the same thing? One for the witness or --

12 MS. POOLE: I gave you two copies.

13 THE CLERK: Okay.

14 THE WITNESS: I'm sorry. Could you repeat the
15 question?

16 MS. JAISWAL: Yes. Should I have the court reporter
17 repeat it?

18 THE COURT: Can you read it back?

19 (Record read as requested.)

20 THE WITNESS: Not necessary -- no. I think what Mr.
21 Rosekrans did was look at a number -- look at historical data
22 from a number of years in the past that fell under different
23 year types.

24 BY MS. JAISWAL:

25 Q. And those year types are critical to wet; correct? If you

1 look at the exhibit, there's critical, critical dry, below
2 normal, above normal, normal wet. Those are the five year
3 types?

4 A. The years that were analyzed, yeah, they fall under
5 critical to wet with the exception of a "below normal." I
6 don't see a "below normal."

7 Q. Thank you. There's -- if I could draw your attention to
8 2003.

9 A. Okay. On the San Joaquin Valley, you're correct, that was
10 below normal.

11 Q. So the exhibit also shows that Mr. Rosekrans included
12 beginning of year storage for purpose of this analysis;
13 correct?

14 A. In his analysis, he states what the beginning of year
15 storages were for each of those years, yes.

16 Q. Thank you. And Mr. Rosekrans determined that exports
17 would be reduced on average by 1.652 million acre feet for
18 plaintiffs' interim protections; correct?

19 A. He -- okay. I see that. He shows that as the average of
20 all of those years that he analyzed. Yes.

21 Q. Thank you. And Mr. Rosekrans determined that exports
22 would be reduced by 923,000 acre feet for a wet -- for wet
23 year conditions; is that correct?

24 A. Well, for that particular year, 1995, under the conditions
25 that existed in that particular year, that's what he came up

1 wi th.

2 Q. And 1995 was a wet year; correct?

3 A. 1995 was a wet year.

4 Q. Moving on, Mr. Leahigh. Do you have in front of you your
5 exhibit, your supplemental exhibit, and that, again, is
6 Defendants' J. Department of Water Resources J.

7 THE COURT: Before you move on, let me ask Mr.
8 Leahigh two questions. Go back, if you would, to Exhibit 26.
9 Look at the total storage. Do you agree that that is the
10 total storage? Is this for both projects?

11 THE WITNESS: It looks as if it is for both projects.

12 THE COURT: And the historic exports, is that -- it's
13 5,201,000. Does that comport with your recollection? These
14 are selected years obviously.

15 THE WITNESS: Right. You know, I have no way of
16 verifying that right here, but I'll assume it's correct.

17 THE COURT: All right. Thank you. You may proceed.

18 THE WITNESS: And --

19 MS. JAISWAL: Thank you, Your Honor.

20 Q. Mr. Leahigh, if I could direct you to your Exhibit J,
21 which has also been marked as Exhibit K, which is Exhibit C to
22 your supplemental declaration.

23 A. Yes, I have it.

24 Q. Please let me direct your attention to the right box.

25 A. Okay.

1 Q. If you could go to the service's action item four.

2 A. Okay.

3 Q. Okay. For action item four, you assumed two assumptions;
4 correct?

5 A. Yes.

6 Q. And you assumed Old and Middle River flows greater than
7 zero and Old and Middle River flows greater than negative
8 4,000. I'm sorry. Greater than negative 4,000. Correct?

9 A. That's correct.

10 Q. Now, if you could please find federal Defendants' Exhibit
11 A, I believe, that is a declaration of Ms. Goude.

12 THE COURT: Before you do that, let me ask about this
13 second figure. Is it your understanding that the June 1st to
14 June 30th period, this follows the Vernalis Adaptive
15 Management Period, the flows are supposed to be maintained
16 greater than zero and greater -- or should that be less than
17 minus 4,000? Isn't that a bracket between zero and minus
18 4,000?

19 THE WITNESS: It is a bracket between zero and
20 negative 4,000.

21 THE COURT: It should be a less than rather a greater
22 than sign?

23 THE WITNESS: No, the objective should be to maintain
24 a flow less negative than negative 4,000. So it should be
25 greater than negative 4,000. I think that's stated correctly.

1 THE COURT: Thank you.

2 MS. JAISWAL: May I continue, Your Honor?

3 THE COURT: Yes.

4 MS. JAISWAL: Thank you.

5 Q. Mr. Leahigh, if I could please direct your attention to
6 Federal Defendants' A. That's the declaration of Ms. Goude
7 that's docket number 396-5.

8 MR. MAYSONETT: Your Honor, I believe it's actually
9 Federal Defendants' 3.

10 MS. JAISWAL: Thank you.

11 THE COURT: Do you have it?

12 THE WITNESS: Exhibit 3? These appear to be letters
13 here.

14 THE COURT: The declaration of Ms. Goude.

15 MS. JAISWAL: I can separately introduce it.

16 THE COURT: Have you found it?

17 THE WITNESS: Thank you. I have it.

18 MS. JAISWAL: Thank you very much for finding it.

19 Q. Now, if you could please turn to what is Exhibit 2 and it
20 is on page 8 of 24 on the top following the docket numbers.

21 A. Yes, I have it.

22 Q. If you could go down to action number four. This is the
23 service's action number four that's attached to Ms. Goude's
24 declaration. Please review action number four.

25 A. Okay.

1 Q. Nothing in the service's action matrix for action four
2 requires the flows that you used in your analysis as described
3 in your Exhibit C; is that correct?

4 A. Well, it doesn't explicitly state it on this particular
5 document, but I believe it's referenced in the footnotes to
6 this table.

7 Q. If you could go to the footnotes of the table.

8 A. It would be the next page.

9 Q. Please read the footnote to yourself.

10 A. Okay.

11 Q. Does anything in the footnote for action four specify the
12 assumptions that you used in your analysis for action four?

13 A. Well, footnote six, although footnote six is not
14 referenced for action --

15 Q. Thank you. For action four.

16 A. I believe that was the intent.

17 Q. But nothing in the footnote and nothing in the action
18 matrix explicitly states the assumptions that you explicitly
19 used in your exhibit and model; is that correct?

20 A. Well, I don't see it right now.

21 Q. Thank you.

22 A. But --

23 Q. The service's action four is actually a process. It's not
24 a flow standard; correct?

25 A. It is a process. With actions three and four, the

1 objective can vary.

2 Q. Thank you.

3 A. But the process is the same.

4 Q. And it's a process that's not dissimilar to DSRAM, the
5 Delta Smelt Risk Assessment Matrix; correct?

6 MS. WORDHAM: Objection. Exceeds the scope of this
7 witness' direct.

8 THE COURT: The subject is action four and I will
9 permit a comparison to be made. Objection's overruled. That
10 subject was covered on direct. Although not the DSRAM. You
11 may answer.

12 MR. WILKINSON: Your Honor, I'm also going to object
13 on the grounds of vagueness.

14 THE COURT: All right. Do you understand the
15 question?

16 THE WITNESS: I think it is somewhat vague.

17 THE COURT: Sustained. Rephrase, please.

18 BY MS. JAISWAL:

19 Q. Are you familiar with the Delta Smelt Risk Assessment
20 Matrix, Mr. Leahigh?

21 A. Yes.

22 Q. The delta smelt risk assessment matrix set up a process;
23 didn't it?

24 MS. WORDHAM: Objection. Vague as to "process."

25 THE COURT: Do you understand the question?

1 THE WITNESS: Sort of.

2 THE COURT: Well, you don't have to define your
3 question. I'll sustain the objection. You may rephrase.

4 BY MS. JAISWAL:

5 Q. Could you please explain how DSRAM differs from the
6 service's action four?

7 A. I think we're comparing apples and oranges. I don't think
8 there is any comparison.

9 Q. Thank you, Mr. Leahigh. Moving on.

10 Your Honor, did the Court have anything further?

11 THE COURT: No, I don't.

12 BY MS. JAISWAL:

13 Q. Mr. Leahigh, you analyzed the water costs for plaintiffs'
14 interim protective action seven; correct?

15 A. Yes.

16 Q. And in analyzing plaintiffs' action seven, you selected an
17 end date of July 15th as the end of juvenile salvage; correct?

18 A. Yes.

19 Q. Earlier in your testimony, did you testify to the effect
20 that relying on historical data is not useful?

21 MS. WORDHAM: Objection. Misstates his testimony.

22 THE COURT: Well, it seems to be an incomplete
23 question. Are you able to answer the question in its present
24 form? If you don't agree with it, you can simply say --

25 THE WITNESS: It's not clear enough.

1 THE COURT: All right. Sustained. You may rephrase.

2 MS. JAISWAL: Thank you.

3 Q. Mr. Leahigh, this morning, did you testify and use as a
4 criticism using historical data and using historical data is
5 not useful? Do you recall testifying to something to that
6 effect?

7 MS. WORDHAM: Objection. Vague.

8 THE COURT: Well, do you understand the question?

9 THE WITNESS: Yes. Yes.

10 THE COURT: If you don't, say so.

11 THE WITNESS: Yes.

12 THE COURT: All right. Overruled. You may answer.

13 THE WITNESS: I criticized the use of historical data
14 when the parameter that you're looking at is known. So if
15 you -- for example, if you know what carryover storage is
16 going into next year, then you should use it. You shouldn't
17 rely on historical data for that particular parameter.

18 BY MS. JAISWAL:

19 Q. Thank you. And for action seven, you relied on historical
20 data; is that correct?

21 A. Yes. Because it's not known when the last salvage of data
22 will be detected at the facilities. So this is not a known
23 quantity. So that's the only estimate that we could have,
24 that would be the best estimate available to us.

25 Q. You also testified earlier today -- and I'm probably not

1 going to get the testimony exactly right, so maybe you could
2 help me out and restate what you said. But you testified
3 something to the effect that selecting July 15th as your end
4 date is a critical assumption. Is that correct?

5 A. Yes.

6 Q. And you testified, and please correct me if I misstate it
7 unintentionally, because this time period of 6-15 to 7-15 is a
8 peak demand time period. Is that correct?

9 A. That's correct.

10 Q. Are you aware that plaintiffs' proposal specifies an end
11 date of June 15th or five days after the end of salvage?

12 A. Yes.

13 Q. Mr. Leahigh, you were here last week during Ms. Goude's
14 testimony; weren't you?

15 A. For the first half of her testimony on Thursday, but not
16 on Friday.

17 Q. Do you recall Ms. Goude evaluating the years for the end
18 of juvenile salvage?

19 A. No.

20 Q. Okay. Sounds like you weren't here.

21 If I could direct your attention to your supplemental
22 exhibit. I'm sorry. Your supplemental declaration. And
23 that, for the record, has been identified as Exhibit J for the
24 Department of Water Resources.

25 A. I have it.

1 Q. Okay. Please go to -- you've looked at this chart earlier
2 today; haven't you?

3 A. Which chart? I'm sorry.

4 Q. It's Exhibit D -- I'm sorry. If you could go to your
5 Exhibit D in that exhibit.

6 A. Yes. I am familiar with it.

7 Q. Thank you. Can you please look at 2006.

8 A. Yes.

9 Q. When does salvage end in 2006?

10 A. The last day of salvage is listed as April 22nd at the
11 state facility.

12 Q. Thank you. In such years, plaintiffs' action seven would
13 end on June 15th; correct?

14 MS. WORDHAM: Objection. Vague as to "such years."

15 MS. JAISWAL: In years --

16 THE COURT: Sustained.

17 MS. JAISWAL: I'm sorry.

18 Q. In years like 2006, plaintiffs' action seven would end on
19 June 15th; correct?

20 A. Yes.

21 Q. In your analysis, you did not present the calculation of
22 water costs in plaintiffs' action seven ended on June 15th;
23 did you?

24 A. No, I don't believe so.

25 Q. Thank you. How about June 30th?

1 A. No.

2 Q. Thank you. Now, Mr. Leahigh, if you could please go to
3 Plaintiffs' Exhibit 4, I believe, that is Dr. Swanson's
4 supplemental declaration.

5 A. Okay. I have it.

6 Q. I believe you were referring to it earlier today.

7 A. Probably. I have it.

8 Q. Thank you. If you could please turn to page 32. And I'm
9 going to read from line two starting with "Under the much
10 lower reverse flow." And if you could tell me if I'm
11 accurate.

12 "Under the much lower reverse flow conditions for
13 Old and Middle River specified in plaintiffs' action seven and
14 the preceding months (i.e., plaintiffs' actions five and six)
15 it is likely that the movement of young delta smelt from the
16 Delta channels and sloughs where they were hatched to
17 downstream rearing areas near the confluence and in Suisun Bay
18 and beyond the influence of export pumps would have been
19 improved and few or no fish would remain in the south Delta as
20 late as July."

21 A. That's what it says.

22 Q. Thank you. And that's Dr. Swanson's declaration; correct?

23 A. That's correct.

24 Q. So is it fair to say that plaintiffs' action seven could
25 end as early as June 15th?

1 MR. WILKINSON: Your Honor, I'm going to object on
2 the basis that this calls for an answer that's beyond the
3 scope of the witness' expertise.

4 THE COURT: It appears to be asking him what the
5 exhibit says. Isn't the proposal for it to end on June 15th?

6 MS. JAISWAL: Yes, Your Honor.

7 MR. WILKINSON: If counsel is asking for his
8 interpretation of when the last smelt would be taken, I
9 believe that gets into biological expertise.

10 THE COURT: The question could be asked directly.
11 I'm going to sustain the objection to the form of the
12 question. You may rephrase it.

13 MS. JAISWAL: Your Honor, he offered his opinion
14 exactly on that during direct.

15 THE COURT: Yes. No question about it. But are you
16 asking him is it possible that the last salvage could be -- of
17 juvenile could be taken on June 15th? Is that your question?

18 MS. JAISWAL: Yes, Your Honor.

19 THE COURT: Answer that question.

20 MR. WILKINSON: Goes beyond his expertise.

21 THE COURT: What?

22 MR. WILKINSON: I believe that goes beyond his
23 expertise, Your Honor.

24 THE COURT: Well, here he's being asked to interpret
25 and he covered it in direct. In fact, I think he expressed

1 his opinion that the last date of salvage would be July 15th.
2 And that he chose.

3 MR. WILKINSON: Well, my recollection was that he
4 read from certain data about smelt collections.

5 THE COURT: Let's ask him. Do you have that opinion
6 that the most efficacious date for the last salvage of
7 juvenile delta smelt is July the 15th? Do you personally hold
8 that opinion or are you just --

9 THE WITNESS: Well, the historical data shows an
10 example of where actions that were even more protective at Old
11 and Middle River resulted in fish salvage into July.

12 THE COURT: So as the project leader, then you
13 endorse July 15th as the last date of salvage for juveniles?

14 THE WITNESS: Yes. I believe that would be the more
15 prudent way to assess potential water costs.

16 THE COURT: All right. Now you're being asked what
17 about July 15th, is that a reasonable date for last salvage of
18 juveniles?

19 THE WITNESS: June 15th?

20 THE COURT: June 15th. I'm sorry.

21 THE WITNESS: If I were to be shown evidence that
22 supported some historical data that showed Old and Middle
23 River flows similar to the plaintiffs' actions five and six
24 taking place and also salvage, the last salvage occurring
25 before June 15th, I could say yes. But I don't see that date.

1 THE COURT: You don't have any basis for that now?

2 THE WITNESS: I don't see that date in front of me.

3 THE COURT: So you don't have that opinion?

4 THE WITNESS: I don't have that opinion.

5 MS. JAISWAL: Thank you, Your Honor.

6 Q. If you assumed that what Dr. Swanson said in her
7 declaration, which I read, is correct.

8 A. Would I assume that?

9 Q. If you would, please --

10 THE COURT: You're being asked.

11 THE WITNESS: Oh, I see. Okay. I will assume that.

12 BY MS. JAISWAL:

13 Q. Thank you. Would plaintiffs' action -- could plaintiffs'
14 action seven end as early as June 15th?

15 A. If I assume what she's saying is correct?

16 Q. Yes.

17 A. Then --

18 Q. Could it end as early as June 15th?

19 A. I suppose so.

20 Q. Thank you. If I could direct your attention back to your
21 supplemental declaration and your Exhibit C to your
22 supplemental declaration, which is in evidence as Exhibit J as
23 well as Exhibit K.

24 A. Okay.

25 Q. Your analysis goes for a two-month period; correct?

1 THE COURT: Analysis of what?

2 BY MS. JAISWAL:

3 Q. I'm sorry. Your analysis for action seven goes for a
4 two-month period, from May 16th to July 15th; correct?

5 A. That's correct. That's the assumption.

6 Q. Thank you. The assumption. If you choose the June 15th
7 as an end date, it cuts the duration of action seven in half;
8 correct?

9 A. Yes. That would cut the assumption in half.

10 Q. It goes from a two-month period to a single month period;
11 correct?

12 A. Correct.

13 Q. If you assume an end date of June 15th, which you've
14 already done once, and all other factors remain the same, in
15 your water cost modeling, plaintiffs' action seven would have
16 significant -- excuse me, would have significantly less water
17 cost for an average year; correct?

18 MS. WORDHAM: Objection. Vague as to
19 "significantly."

20 MS. JAISWAL: I'm asking --

21 THE COURT: All right. Do you understand what is
22 meant by the term "significantly"?

23 THE WITNESS: Not exactly, no.

24 THE COURT: Sustained. You may rephrase.

25 BY MS. JAISWAL:

1 Q. Would it be reduced by a quarter? Could it be reduced by
2 a quarter?

3 A. The cost of just that action?

4 Q. Yes.

5 A. Probably. I don't have -- yeah, probably.

6 Q. Could it be reduced by half?

7 A. I don't know for sure, but it's possible.

8 Q. Thank you. Moving on.

9 Are you aware that in California water districts sell
10 and exchange water amongst themselves?

11 MS. WORDHAM: Objection. Exceeds the scope of his
12 direct.

13 THE COURT: Yes, it does. The objection is
14 sustained.

15 BY MS. JAISWAL:

16 Q. I believe on direct you were asked about water districts
17 and exchange of water among water districts.

18 MS. WORDHAM: Objection. Misstates his testimony.
19 Misstates the direct examination.

20 THE COURT: Well, he was asked a question. I know
21 because I asked it.

22 MS. WORDHAM: Fair enough, Your Honor.

23 THE COURT: So I guess you were asked such a
24 question. Do you agree?

25 THE WITNESS: I guess I was.

1 THE COURT: You can contradict me.

2 THE WITNESS: I don't remember it, but if you say I
3 did, I suppose I did.

4 MS. JAISWAL: Thank you.

5 Q. You did not adjust your delivery reduction estimates to
6 reflect that water users can purchase additional supplies from
7 other users; correct?

8 A. Did I -- did I testify to that? Is that what you're
9 asking?

10 Q. No. I'm just asking you the simple -- I tried to format
11 my question so that they would be yes or no type questions.
12 So it would be great if we could follow that format. But if
13 you don't understand, please let me know and I will clarify.

14 A. Okay. I'm sorry. Could you repeat the question?

15 MS. JAISWAL: Should I have the reporter repeat it.

16 THE COURT: Yes, you may. Can you read back the
17 question, please?

18 (Record read as requested.)

19 THE WITNESS: No, because that wouldn't be relevant
20 to my analysis as far as State Water Project's delivery
21 capabilities.

22 BY MS. JAISWAL:

23 Q. So the answer is no; correct?

24 A. The answer is no.

25 Q. Thank you. You are aware of the Environmental Water

1 Account; correct?

2 A. Yes.

3 Q. Are you aware that water from the Environmental Water
4 Account may be made available to compensate for export
5 reductions to meet environmental requirements?

6 A. Yes, I testified as such.

7 Q. Now I'm going into the territory where I'm trying to get
8 your testimony from earlier today. And I don't have an
9 instantaneous transcript unfortunately. So if I don't get
10 this right, please help me along and clarify what you
11 testified to.

12 But you testified that there is somewhere -- 300,000
13 acre feet for the Environmental Water Account?

14 A. Typically that's a range of assets that would be
15 available.

16 Q. Now, if I could draw your attention back to your Exhibit C
17 attached to your supplemental declaration, which is
18 in -- which is in evidence as J as well as K.

19 A. Yes.

20 Q. Actually, I'm sorry, if you could go to N, the new one.

21 A. Okay. I have it.

22 Q. Thank you. Now, when you look to plaintiffs' revised
23 proposal and you look at the cost for some of these actions,
24 some of the actions are less than 300,000 acre feet; aren't
25 they?

1 A. The plaintiffs' proposals?

2 Q. In your analysis of the plaintiffs' revised proposal. It
3 is the right-hand chart. Right-hand side of the chart. And
4 if you look at the export reductions.

5 A. I'm looking at DWR Exhibit N, which is --

6 Q. I'm sorry. Exhibit M like Mary.

7 A. Oh, I'm sorry.

8 THE COURT: Oh.

9 THE WITNESS: Okay. I have it.

10 BY MS. JAISWAL:

11 Q. Thank you. Now for Exhibit M, if you look at the
12 right-hand chart, which is the plaintiffs' revised proposal
13 August 13th.

14 A. Yes.

15 Q. And when you look at the export reductions there, some of
16 those reductions are less than 300,000 acre feet; is that
17 correct?

18 A. Yes. Some of the individual actions or portions of
19 actions are less than 300,000 acre feet.

20 Q. And for action ten, for a dry year, it's 350,000 acre
21 feet; is that correct?

22 A. That is just the export reduction part of meeting that
23 action. There's an additional 310,000 acre feet above stream
24 required.

25 Q. Thank you. My question was to action ten.

1 A. Yes. And that's the one I'm referring to.

2 Q. Thank you. A final question on the Environmental Water
3 Account. You didn't adjust your model -- your model delivery
4 estimates to reflect the water that may be available to
5 compensate for reductions from the Environmental Water
6 Account; did you?

7 MS. WORDHAM: Objection. Asked and answered.

8 THE COURT: I'm not sure it was answered. Did you
9 make any such adjustments? Did you assume Environmental Water
10 Account availability?

11 THE WITNESS: No. I think I did state that earlier,
12 that that was not applied to these costs, Environmental Water
13 Account mitigation for these costs was not.

14 BY MS. JAISWAL:

15 Q. Thank you. I'm moving on now. Many customers of the
16 State Water Project and Central Valley Project use non-project
17 sources of water; right?

18 MR. WILKINSON: Objection.

19 MS. WORDHAM: Objection. Exceeds the scope of the
20 direct.

21 MR. WILKINSON: We concur. Join in the objection.

22 THE COURT: Yes. The objection is sustained. It
23 does exceed the scope of direct. You may ask your next
24 question.

25 BY MS. JAISWAL:

1 Q. Mr. Leahigh, in your supplemental declaration, you stated
2 that implementation of plaintiffs' action ten could be
3 achieved by either export reductions or upstream storage
4 releases or a combination; correct?

5 A. Yes. But there would be impacts associated with both
6 upstream and --

7 Q. My question is what you stated in your supplemental
8 declaration. And the question is: You stated in that
9 declaration that implementation of plaintiffs' action ten
10 could be achieved by either export reductions or upstream
11 storage releases or a combination. Is that correct?

12 A. That's correct with a qualifier.

13 THE COURT: Yes. What is it?

14 THE WITNESS: The qualifier is that it could only be
15 met with other impacts experienced elsewhere in system.

16 BY MS. JAISWAL:

17 Q. In your analysis, you choose to evaluate -- you chose to
18 evaluate plaintiffs' action ten through a combination of
19 storage and export reductions; is that correct?

20 A. Yes.

21 Q. Thank you. Increases in the San Joaquin River inflow
22 could be used to help meet plaintiffs' action ten; is that
23 correct?

24 A. Increases at San Joaquin River flow have a positive effect
25 on Old and Middle River flow, yes.

1 Q. Thank you. In your water cost estimates, you assume that
2 there would be releases from Oroville, Shasta and Folsom
3 Reservoirs to meet plaintiffs' action ten; is that correct?

4 A. Yes.

5 Q. Thank you. Plaintiffs' recommended action ten doesn't
6 specify a single reservoir; does it? Release from a single
7 reservoir; does it?

8 A. No, it doesn't specify.

9 Q. And it doesn't require action ten solely based on releases
10 from Oroville; does it?

11 A. No.

12 Q. In your water cost estimates, did you assume releases from
13 New Melones Reservoir for plaintiffs' action ten?

14 A. No.

15 Q. Do you know what the current storage in New Melones
16 reservoir is?

17 A. No, I don't.

18 MS. JAISWAL: Your Honor, if I could identify
19 Plaintiffs' Exhibit 27. Let the record reflect that counsel
20 has it before them. And if I may approach the witness, Your
21 Honor.

22 THE COURT: Yes, you may.

23 (Plaintiffs' Exhibit 27 was marked for
24 identification.)

25 BY MS. JAISWAL:

1 Q. Do you know what this document is?

2 A. This looks to be a printout from CDEC, California Data
3 Exchange Center.

4 Q. Do you go on this website?

5 A. Yes, I do.

6 Q. Thank you. What is this exhibit?

7 A. Well, this looks to be data for New Melones Reservoir.
8 And it looks to be -- it's a daily data. And this is data
9 that goes through August 28th, 2007.

10 Q. Thank you. So for -- so looking at the chart, the storage
11 level for New Melones, as of August 28th, is approximately 1.5
12 million acre feet; is that correct?

13 A. That's what this shows.

14 Q. Thank you.

15 MS. JAISWAL: Your Honor, if I may move to have
16 Plaintiffs' Exhibit 27 admitted.

17 THE COURT: Any objection?

18 MR. WILKINSON: No objection.

19 THE COURT: Exhibit 27 is received in evidence.

20 (Plaintiffs' Exhibit 27 was received.)

21 THE COURT: What is your time estimate, Ms. Jaiswal?

22 MS. JAISWAL: Half an hour, Your Honor.

23 THE COURT: You may proceed.

24 MS. JAISWAL: Thank you. If I could identify
25 Plaintiffs' Exhibit 28. Counsel has received a copy.

1 (Plaintiffs' Exhibit 28 was marked for.
2 identification.)

3 MS. JAISWAL: May I approach, Your Honor?

4 THE COURT: You may.

5 BY MS. JAISWAL:

6 Q. Mr. Leahigh, do you know what this document is?

7 A. I'm not familiar with this particular report, but --

8 Q. Have you seen this kind of report before?

9 A. Similar, yes.

10 Q. And what is the title of this?

11 A. Daily reservoir storage summary.

12 Q. Thank you. And where does it appear from? To be?

13 A. It looks like it is -- it could be a CDEC report.

14 Q. Thank you.

15 A. Same database.

16 Q. And where is it from?

17 A. Excuse me?

18 Q. Which agency is it from?

19 A. If it is CDEC, that would be Department of Water
20 Resources.

21 Q. Right. At the top, that top bar reads "California
22 Department of Water Resources"; is that correct? At the very
23 top of the exhibit.

24 A. Very top of the exhibit actually I don't see that, but --

25 Q. There is a black bar at the top of page one.

1 A. Is it on the right-hand corner?

2 Q. It is on the left-hand corner.

3 MS. WORDHAM: Your Honor, counsel's copy does not
4 have a black bar at the top across the top of page one.

5 THE COURT: Nor does mine.

6 MS. JAISWAL: I'm sorry, Your Honor, it seems that
7 the correct copies were not photocopied. I have one copy of
8 the exhibit that I would like to use.

9 THE COURT: You'll have to show it to other counsel.
10 You can use the Elmo, Ms. Jaiswal.

11 MS. JAISWAL: Okay. Thank you for the excellent
12 suggestion, Your Honor.

13 THE COURT: That means --

14 MS. JAISWAL: If I may show it to the rest of
15 counsel, to make sure --

16 THE COURT: You may show it to counsel.

17 MS. JAISWAL: If I may put the exhibit on the Elmo?

18 THE COURT: You have to move it into evidence first.

19 MS. JAISWAL: Thank you, Your Honor.

20 THE COURT: Did you show it to the witness?

21 MS. JAISWAL: I have identified it as Plaintiffs'
22 Exhibit 29, Your Honor. And if I may approach the witness.

23 THE COURT: It's Exhibit 29. All right. So 28 is
24 withdrawn?

25 MS. JAISWAL: Yes, Your Honor.

1 THE COURT: All right.

2 (Plaintiffs' Exhibit 29 was marked for
3 identification.)

4 THE COURT: Does the witness recognize the exhibit?

5 THE WITNESS: Yes. Now it's clear to me that this is
6 from the California Data Exchange Center database.

7 THE COURT: All right.

8 MS. JAISWAL: Just so that the record is clear and
9 Mr. Leahigh is clear, I have withdrawn Exhibit 28 and I am not
10 relying on it and I apologize for the error in the copies.

11 Q. Now, if I could put Exhibit 29, Plaintiffs' Exhibit 29 on
12 the Elmo.

13 THE COURT: The witness identifies it. Are you
14 moving it into evidence?

15 MS. JAISWAL: I was going to ask a few questions and
16 then move it into evidence, Your Honor. But I could do it at
17 this time.

18 THE COURT: Any objection?

19 MR. WILKINSON: No objection.

20 MS. WORDHAM: None, Your Honor.

21 THE COURT: Exhibit 29 is received in evidence.

22 MS. JAISWAL: Thank you, Your Honor.

23 (Defendants' Exhibit 29 was received.)

24 BY MS. JAISWAL:

25 Q. Mr. Leahigh, can you read that? Overall, can you see it?

1 A. Yes, I can.

2 Q. And can you please read the black bar on the top of that
3 exhibit?

4 A. It says California Department of Water Resources, Division
5 of Flood Management.

6 Q. And what is that document?

7 A. This is a report from the California Data Exchange Center
8 database.

9 Q. Thank you. Now I'm going to put up page two. It's a
10 continuation from page one.

11 Now, this chart is a daily reservoir storage summary;
12 correct?

13 A. That is the title of the report, yes.

14 Q. And now looking on page two, you can see on the Elmo where
15 it says "2 of 2" on the corner; correct?

16 A. Correct.

17 Q. And the first one listed is New Melones Reservoir; is that
18 correct?

19 A. Yes.

20 Q. And if you look at New Melones, you see that New Melones
21 storage is currently at 108 percent of historical average; is
22 that correct?

23 MS. WORDHAM: Your Honor, I would like to request
24 that at least we can see the captions for each of the columns.
25 As it's presently displayed on the Elmo, we cannot tell what

1 column she's referring to.

2 THE COURT: All right. Thank you. All right. Well,
3 the exhibit does speak for itself. You may ask your next
4 question.

5 MS. JAISWAL: Thank you.

6 Q. Now, if you could move to Don Pedro Reservoir. Have you
7 located Don Pedro Reservoir? It's up on the Elmo.

8 A. Yes, I see it.

9 Q. And Don Pedro Reservoir is currently at 91 percent
10 historical average; is that correct?

11 A. As of the date of this report, it shows it as 91 percent
12 of average, yes.

13 Q. Thank you.

14 THE COURT: We've actually gone five minutes over our
15 time period. We've got to give the reporter a break. I'm
16 exceedingly concerned. We are not going to have enough time
17 to finish this proceeding. What are we going to do?

18 MS. JAISWAL: After the break, Your Honor, if I could
19 have 15 minutes and I will wrap up the cross-examination.

20 THE COURT: That is going to further cut into our
21 time. We were hoping to get to arguments this morning, quite
22 frankly.

23 What we're going to do is this. We're going to take
24 a recess now. We're going to return at 1:30 and I want
25 counsel to consider what is in the best interest of all

1 parties insofar as proceeding. What kind of questions are any
2 of the other intervenors or the United States going to have
3 for this witness.

4 MR. MAYSONETT: Your Honor, the federal defendants
5 will have only very brief questioning for this witness.

6 MR. WILKINSON: That would be true for us, Your
7 Honor, I would imagine it would be less than ten minutes.

8 MR. O'HANLON: I agree as well, Your Honor. If not
9 five minutes.

10 THE COURT: Let's stand in recess until 1:30.

11 (Recess.)

12 THE COURT: All right. We're going back on the
13 record in NRDC versus Kempthorne. We're going to complete the
14 testimony of Mr. Leahigh. With dispatch, please.

15 MS. JAISWAL: Your Honor, I only have two questions
16 for Mr. Leahigh.

17 THE COURT: All right. Thank you.

18 MS. JAISWAL: You're welcome.

19 Q. Mr. Leahigh, you did not present any water cost analysis
20 for Dr. Hanson's tier two and tier two proposal; is that
21 correct?

22 A. That's correct.

23 Q. And that's because you couldn't determine what would be
24 required under Dr. Hanson's tier two and tier three proposal;
25 is that correct?

1 A. Well, the analysis could probably be done. We haven't had
2 an opportunity to complete it.

3 MS. JAISWAL: Thank you.

4 THE COURT: Thank you very much, Ms. Jaiswal. Mr.
5 Maysonett.

6 MR. MAYSONETT: Your Honor, I just have a handful of
7 questions.

8 THE COURT: All right. You may proceed.

9 CROSS-EXAMINATION

10 BY MR. MAYSONETT:

11 Q. Mr. Leahigh, who operates the reservoir at New Melones?

12 A. Bureau of Reclamation.

13 Q. And do you know what operational restrictions make just on
14 Bureau of Reclamation's operations at New Melones?

15 A. No, I'm not familiar with all the water rights
16 restrictions.

17 Q. Do you know whether or not the Bureau of Reclamation has
18 discretion to release water freely from the New Melones Water
19 Reservoir?

20 A. No, I don't believe they do.

21 Q. And Mr. Leahigh, can you tell me who operates the Don
22 Pedro Reservoir?

23 A. I'm not sure exactly, but I believe Turlock Irrigation
24 District possibly, Modesto ID.

25 Q. But it's not the California Department of Water

1 Resources --

2 A. It is not --

3 Q. -- or the Bureau of Reclamation; is it?

4 A. No, it is neither of the project agencies.

5 MR. MAYSONETT: Thank you, Your Honor. I don't have
6 any questions for Mr. Leahigh. I would say only as a result
7 of the fact that the state and federal governments were
8 restricted to two witnesses, as Mr. Lee explained, they relied
9 on our biologist and we have relied on Mr. Leahigh as the
10 operator.

11 We do have Mr. Milligan here in the courtroom. He is
12 available for the Court if you have further questions for the
13 details of CVP operations or if you conclude that these
14 questions about reservoir operations are critical. But I
15 understand that in the interest of time, it won't be possible
16 to present them both.

17 THE COURT: Thank you very much, Mr. Maysonett. Mr.
18 Wilkinson.

19 MR. WILKINSON: Your Honor, I had a few questions,
20 but I frankly think there's nothing so earth shattering there
21 that I have to take the time to do it. I'm going to waive in
22 the interest of having this proceeding completed today.

23 THE COURT: Thank you very much, Mr. Wilkinson. Mr.
24 O'Hanlon?

25 MR. O'HANLON: Your Honor, likewise, in the interest

1 of saving time and moving the proceedings along, I waive cross
2 as well.

3 THE COURT: All right. Thank you very much. Is
4 there any redirect?

5 MS. WORDHAM: Yes, Your Honor. Just very briefly.

6 REDIRECT EXAMINATION

7 BY MS. WORDHAM:

8 Q. Mr. Leahigh, would you please find the Federal Defendants'
9 Exhibit Number 3 in front of you. This is the declaration of
10 Cay Goude filed by the federal defendants on, I believe it was
11 July 9, 2007.

12 A. Yes, I have it.

13 Q. If you will go to Exhibit 2, Attachment B of Ms. Goude's
14 declaration.

15 Have you found that?

16 A. Yes, I have. I see it.

17 Q. Attachment B. Could you please describe that briefly?

18 A. Yes. Attachment B is a flow chart that is
19 the -- identifies the specific process for ending action three
20 and implementing action four.

21 Q. So in the -- one-third of the way in from the
22 left-hand-hand column, there is a small box which indicates
23 "start of action four" -- "start action four"; is that
24 correct?

25 A. That's correct.

1 Q. And then there's an arrow pointing to the right; correct?

2 A. Yes.

3 Q. So if I understand this chart correctly, all the actions
4 identified to the right of the box that says start action four
5 would pertain to implementation of action four; is that
6 correct?

7 A. Yes.

8 Q. And the boxes and diamond shapes in here describe what
9 operations or how decisions would be made under plaintiffs'
10 action -- or the service's action four; is that correct?

11 A. That's correct.

12 Q. If you follow the arrows to a conclusion, where, at the
13 bottom right, not the diamond box, but the long rectangular
14 box, it says, "Modify operations (footnote 1)." Is that
15 correct?

16 A. That's correct.

17 Q. Turning to the footnotes for Attachment B immediately
18 following the diagram, and going to footnote 1. Would you
19 please read footnote 1 for the record.

20 A. Yes. "Operations of the two water export facilities will
21 be modified in a manner similar to what is described in action
22 three of Exhibit 2. Other actions may be taken that are found
23 to appropriately avoid or minimize entrainment effects at the
24 water export facilities."

25 Q. Now, when you estimated the water impacts, water costs

1 associated with the service's action four, you estimated a
2 range of flows in Old and Middle Rivers at zero to negative
3 4,000 cfs; is that correct?

4 A. That is correct.

5 Q. And there is no specified flow in the chart, the action
6 matrix itself, that says negative -- zero to negative 4,000
7 flows for action four; is that correct?

8 A. Correct.

9 Q. Did you rely on footnote I of Attachment B of Exhibit 2 to
10 support your decision to include a flow objective of zero to
11 negative 4,000 cfs in estimating your water costs for the
12 service's action four?

13 A. Yes.

14 MS. WORDHAM: Thank you. No further questions.

15 THE COURT: Further cross?

16 MS. JAISWAL: No, Your Honor.

17 THE COURT: Ms. Jaiswal?

18 MS. JAISWAL: No, Your Honor.

19 THE COURT: Does any intervenor have any further
20 questions for Mr. Leahigh?

21 MR. WILKINSON: No, Your Honor.

22 MR. O'HANLON: No, Your Honor.

23 THE COURT: May this witness be excused?

24 Thank you, Mr. Leahigh. You may step down. You are
25 excused.

1 All right. I am going to ask Mr. Maysonett that we
2 call Mr. Milligan for some brief questions.

3 MR. MAYSONETT: Yes, Your Honor.

4 MS. WORDHAM: Your Honor, I have one minor
5 housekeeping matter if I might.

6 THE COURT: Yes.

7 MS. WORDHAM: During Mr. Leahigh's testimony, we
8 offered an exhibit, order amending the Department of Water
9 Resources Federal Energy Regulatory Commission license that
10 was missing a page. We have since been able to obtain a
11 complete copy of the order. I would like to substitute the
12 order that was --

13 THE COURT: All right. If you would hand the
14 original and duplicate to the courtroom deputy.

15 MS. WORDHAM: I will do that, sir.

16 THE COURT: And she'll give you back the old one and
17 we can substitute the new one.

18 MS. WORDHAM: Yes, sir.

19 THE COURT: For the integrity of the record, let's
20 keep the old one and we'll mark this as -- what was the old
21 one? DWR Q, we'll make this DWR Q-1.

22 (Defendants' Exhibit DWR Q-1 was marked for
23 identification.)

24 ///

25 ///

1 RONALD MILLIGAN,
2 called as a witness on behalf of the Federal Defendants,
3 having been first duly sworn, testified as follows:

4 THE CLERK: Please state your full name for the
5 record and spell your last name.

6 THE WITNESS: My name is Ronald Milligan, last name
7 spelled M-I-L-L-I-G-A-N.

8 EXAMINATION BY THE COURT

9 THE COURT: Please have a seat. You have just stated
10 your name for the record. Can you tell us by whom you're
11 employed?

12 THE WITNESS: I am employed by the US Bureau of
13 Reclamation.

14 THE COURT: For how long?

15 THE WITNESS: Since -- since November of 1999.

16 THE COURT: What's your present assignment?

17 THE WITNESS: I am the operations manager for the
18 Central Valley Operations Office in Sacramento.

19 THE COURT: Does that operations office at Sacramento
20 include responsibility for operation of the Central Valley
21 Project?

22 THE WITNESS: Yes, it does.

23 THE COURT: How long have you held this position?

24 THE WITNESS: Since November of 2004.

25 THE COURT: And have you had direct knowledge of the

1 work on the 2004-2005, what's referred to as the OCAP and the
2 Biological Opinion that was prepared relative to that?

3 THE WITNESS: Not in the direct preparation, but upon
4 its completion, we've been operating to that in part, within
5 our other operations, since that time.

6 THE COURT: If I understand your answer, then you had
7 no role in the preparation of any portion of the materials
8 that comprised the administrative record or the Biological
9 Opinion and the evaluation of the OCAP?

10 THE WITNESS: That is correct. That was completed --
11 at least the reclamation part of that, was completed before I
12 took my position at the CVO.

13 THE COURT: Commencing in March of 2005, were you
14 familiar with the process known as the DSRAM?

15 THE WITNESS: Yes, I was -- I am familiar with that.

16 THE COURT: And what is the basis for your
17 familiarity?

18 THE WITNESS: Primarily working as a -- say the week
19 to week operations of what's referred to as the Water
20 Operations Management Team. I act as the co-chair for that
21 group. And then the work with receiving the information from
22 the Delta Smelt Working Group every fall depending on the fall
23 midwater trawl that would trigger -- or other triggers as to
24 when the Delta Smelt Working Group would convene and basically
25 be apprised of what their discussions had been on a weekly

1 basis.

2 THE COURT: And so you had regular communication,
3 including observation, of the delta smelt Working Group's
4 activities in this, if you will, implementation of the DSRAM?

5 THE WITNESS: Not in their -- not directly to their
6 deliberations, if you will, or their meetings. I have a staff
7 person that's under my direction that attends typically to
8 provide information to the working group along with a person
9 from the state project. Provide them information about
10 current operations and what projected operations would be over
11 the next week, month. What standards in the Delta may be
12 controlling at a particular time.

13 And then if there's any information or
14 recommendations that may come out of that group, it would come
15 then to the WOMET, who would then discuss those recommendations
16 or those findings or information to see if there was any
17 operational changes that would be appropriate for the coming
18 week.

19 THE COURT: I'm not going to ask you to summarize it
20 at all, but I am going to refer to testimony that has been
21 given here by various biologists concerning the decline of
22 the, if you will, health of the delta smelt species. You're
23 familiar with that information?

24 THE WITNESS: Yes, I am.

25 THE COURT: And in the years commencing with 2005,

1 after these, the DSRAM, the DSWG and the WOMT were actually
2 constituted and started their work, you've been on the WOMT,
3 an active participant in that process?

4 THE WITNESS: Yes. Yes, I have.

5 THE COURT: Now, is it true that there were
6 recommendations made in the year 2006 starting in the spring
7 by the Delta Smelt Working Group that called for actions,
8 protective actions to be taken with regard to delta smelt?

9 THE WITNESS: There were recommendations from the
10 working group that started prior to that. But then they
11 continued through the late winter into the spring. Is
12 your -- are we going to talk about at all the earlier
13 recommendations or findings or are we going to focus more on
14 the later ones?

15 THE COURT: If you want to start with the earlier
16 ones. I don't want to prolong this or extend it.

17 THE WITNESS: Sure.

18 THE COURT: But start with the earlier ones and then
19 move into the 2006 water year.

20 THE WITNESS: Well, within the 2006 water year, there
21 were some recommendations that were -- that were made in
22 conjunction with some triggers about the hydrology. This last
23 winter was dry, so there were several occasions where some of
24 the -- some of the recommendations were not -- the trigger did
25 not occur. Some of those were in the early winter months

1 where the trigger would have been, if I recall without having
 2 them in front of me, if we had flows on the Sacramento River
 3 near Rio Vista that would get above a certain three-day
 4 average, then a particular set of curtailments that may relate
 5 to Old and Middle River flows would come into play. Those
 6 triggers did not occur and there were no modifications to
 7 operations.

8 I think there were probably -- there was some times
 9 we certainly operate to Old and Middle River flows in January
 10 and February, we would continue to touch base week to week.
 11 If I recall, the management to Old and Middle River was in the
 12 range of about negative 5,000. I think there was a time that
 13 may have been near 4,000, negative 4,000. I can't remember
 14 the exact dates. But it was in that range.

15 We had discussions back and forth, because this was a
 16 fairly new way of managing the central Delta's hydrodynamics.
 17 So we had some spirited discussions as to -- as to what's the
 18 proper averaging period, how the projects could -- what would
 19 be construed as being consistent with the recommendations or
 20 the spirit of them.

21 Because typically although both the USGS and the
 22 Bureau of -- USGS and the Department of Water Resources have
 23 some empirical equations that would predict an approximation
 24 in Middle and Old River flows, they do vary and they
 25 are -- there is some error bounds around those.

1 To get an actual measured reading from the USGS on
2 those -- to get a middle and Old River flow takes several
3 days, it's several days in arrears. And we found that when
4 we're working, I think, if I remember correctly, a five-day
5 averaging period. So we were trying to modify operations in
6 terms of pumping and reservoir releases in the upper -- mostly
7 in the Sacramento watershed to be able to maintain a negative
8 Old River flow in a range that seemed appropriate.

9 But with the several days in arrears from the USGS,
10 we were -- I won't say that we were struggling, but we were
11 really looking to see and document what the response was to
12 the gauges to different actions. And there were times that
13 there were lags.

14 It was not instantaneous or one-day response to,
15 let's say, a pumping curtailment or a reservoir -- or say a
16 flow increase at -- let's say at Rio Vista, that -- or even at
17 Vernalis, that would respond very quickly. So -- and there
18 would be some swings. It wouldn't be a smooth transition
19 either. So we had some observations for further consideration
20 if we were to use this as a tool in subsequent years.

21 THE COURT: Are you aware that in this case, the
22 plaintiffs have referred to recommendations made in the
23 spring, the late spring of 2006, action recommendations that
24 then were communicated to the WOMET and ultimately resulted in
25 no action being taken? Are you familiar with the plaintiffs'

1 claims about that?

2 THE WITNESS: Yes, I am.

3 THE COURT: And relative to the fact that no action
4 was taken in regard to the Delta Smelt Working Group
5 recommendations, would you say that that was accurate or not
6 accurate?

7 THE WITNESS: There were some -- there were
8 some -- I'm trying to find the right word. There were some
9 actions that were referred to as recommendations by the Delta
10 Smelt Working Group in the later -- let's say in the spring
11 period, particularly, I believe, after the VAMP pulse, which
12 was --

13 THE COURT: Yes.

14 THE WITNESS: -- delayed a week this year because of
15 the size of hatchery fish within the San Joaquin River basin.

16 But as we were coming out of the VAMP period, there
17 were some recommendations made. I do remember one in
18 particular recommendation to keep cross-channel gate in an
19 open position. That was, upon review, countered to both the
20 Water Quality Control Plan, which would have necessitated an
21 urgency change petition with the state board, and subsequent
22 discussions with NOAA Fisheries, they were concerned about
23 leaving it open because there were some out-migrating salmon
24 in the system. So that is one aspect of a recommendation that
25 was not followed.

1 There were certainly, later on, as it became apparent
2 that both EWA assets or the ability for the EWA to function in
3 a manner that it could, in essence, pay back the projects for
4 curtailments without impacting operations in the long term
5 sense or allocations to contractors, that -- this is my
6 characterization of that circumstance. This situation was
7 elevated to the director's level of each of the five agencies,
8 meaning DWR, Bureau of Reclamation, NOAA Fisheries, Department
9 of Fish & Game and the Fish & Wildlife Service.

10 There were discussions there about what should be
11 done at that point because we had exhausted the typical asset
12 set, if you will, that was described within the Biological
13 Opinion and project description in the biological assessment.

14 The work that was -- after discussions at that level,
15 it came back that the recommendation would be -- there would
16 be some modification and continued assessment of the
17 circumstances. But the -- the work of the Delta Smelt Working
18 Group was taken certainly under advisement by the directors.
19 But some subsequent changes in operations were -- came out of
20 that particular sets of meetings. And some of those meetings
21 were two or three times a week.

22 THE COURT: All right. And going into the '07 water
23 year, you're familiar with the June actions where pumps were
24 stopped --

25 THE WITNESS: Yes.

1 THE COURT: -- relative to both recommendations and
2 conditions?

3 THE WITNESS: Pumping was curtailed significantly. I
4 will use the example of at the Jones Pumping Plant in the
5 Central Valley Project. We were at one unit pumping, which is
6 one of the large pumps there with the capacity of 850 cfs,
7 which started the beginning of the VAMP period. And that
8 lasted for 31 days. And then we had another subsequent 19 or
9 20 days where we sustained our pumping at one unit.

10 The recommendation at the time, if I'm not mistaken,
11 from the Delta Smelt Working Group was to try to achieve a
12 zero Old and Middle River flow. Zero to positive. It was for
13 a number of reasons that had been discussed about the
14 hydrodynamics of the Delta and the pumping within the interior
15 itself for non-project purposes, and also the base flow in the
16 San Joaquin River after the pulse flow period, even if it was
17 a critically dry year from the San Joaquin River basin.

18 Even if the project, both projects had cut to zero,
19 it was our assessment that a Middle and Old River flow of at
20 zero could not be achieved. The Bureau of Reclamation
21 assessed our particular demand for our project at the time and
22 we assessed that some flow was necessary to -- for several
23 reasons.

24 One, to maintain deliveries to the upper Delta
25 Mendota Canal contractors, who would have -- in essence, some

1 portions of those districts had no other source of water that
2 they could rely on quickly. Other portions of those districts
3 would have had to begin pumping from the San Joaquin River to
4 be able to meet some of their demands. Which would have
5 further reduced the influence of the Delta, which would have
6 further compounded the middle and Old River situation. The
7 reclamation used some authorities that we had within
8 the -- both within EWA and B3 of the Central Valley Project
9 Improvement Act to make some purchases of water from known
10 sellers to augment flows in the San Joaquin River to, if you
11 will, compensate for the one unit operation at Jones Pumping
12 Plant.

13 THE COURT: In your opinion, did the Bureau -- and
14 let me ask one question foundationally before I ask that
15 opinion. Is the WOMT, is that the final authority on whether
16 or not a recommended action is going to be implemented or does
17 it go higher?

18 THE WITNESS: The documentation of the WOMT is
19 somewhat different in a couple of places. Typically WOMT will
20 be representatives designated by the individual directors to
21 represent them on a weekly basis. And that's ordinarily how
22 we operate.

23 In other places, the WOMT, in essence, is the
24 director's level. And that when we elevated a discussion of
25 22 directors, that is still really within the WOMT structure.

1 I will say that the project agencies, because they are the
2 ones who actually have to issue the order to make a change,
3 whether it's in the pumping or releases, ultimately have the
4 final decision that's made about what is done. But in this
5 case, most often it would be an extreme circumstance of some
6 emergency where an agency would override, let's say, consensus
7 of the WOMET.

8 THE COURT: Now, I'm going to ask for your opinion.
9 Relative to the plaintiffs' claims that the Delta Smelt
10 Working Group action recommendations for protection of the
11 delta smelt were not followed or implemented, can you express
12 your opinion about whether or not there was a response and
13 whether actions were or were not taken in response to the
14 recommendations?

15 THE WITNESS: In my opinion, as an observer and one
16 who was providing some information to that collective group,
17 and meaning at this point the director's level, who had
18 recommendations from the Delta Smelt Working Group, that
19 certainly the recommendations were taken very seriously for
20 consideration. Those were balanced with other considerations
21 of the other species, the economic effects of making changes
22 or curtailing deliveries that occur at the time both from an M
23 and I and an agricultural standpoint.

24 Considerations were given to the withdrawal rate at
25 San Luis Reservoir. We've touched on that with some of the

1 testimony. And staying within a safe limit there without
2 causing some major structural damage.

3 At that time we had several periods where O'Neill
4 Forebay elevations were very low, which would have -- could
5 have potentially triggered shutting off of the pump generation
6 plant associated with that facility, which would have been
7 interruption of supply.

8 So the projects collectively were operating as close
9 as they could to the edge in terms of trying to minimize
10 pumping as much as we could during this period. And also
11 looking very carefully at what the salvage was at both
12 facilities, trying to determine if any fish that were in the
13 southern Delta were taking -- were being -- were being taken
14 in. We had very little fish taken during this period at the
15 Tracy fishery facility.

16 And there was a number of discussions about the
17 dynamics of the Clifton Court Forebay and potential for some
18 fish to -- whether they were maybe coming in from Old River
19 into the forebay somehow before they got to the Tracy Fishery
20 Facility or if they had been around in that area from some
21 period of time before.

22 There was a great deal of focus on the temperatures
23 in the southern Delta and the survivability of any juvenile
24 smelt. Certainly continued observations of smelt distribution
25 that came from the 20 millimeter trawls.

1 Initially there was some concern about the low
2 numbers being such that it may not be readily apparent as to a
3 distribution given the low numbers. But as we got into this,
4 you know, four, six weeks at a time, the distribution -- a
5 pattern of finding of the few fish that were found indicated
6 that although it wasn't a strong indication of distribution,
7 the distribution of the fish tended more towards the northern
8 Delta out towards the bay.

9 THE COURT: Would you agree with the biological
10 assessment that the status of the delta smelt is presently at
11 a critical stage in terms of its jeopardy for survival?

12 THE WITNESS: I assume you mean that in a small b,
13 small a, not a biological assessment as a document.

14 THE COURT: I'm sorry. You're exactly right.

15 THE WITNESS: Okay. Given -- again, this is not my
16 area of expertise, I am an engineer.

17 THE COURT: I am looking to you as the executive who
18 runs these operations.

19 THE WITNESS: Certainly as a concern to the Bureau of
20 Reclamation that for the last three years, the fall midwater
21 trawl, which we would agree from, at least my discussions with
22 our biologists and those at the service, is the key indices on
23 the smelt, to give us some indication of the status of the
24 species.

25 We are very concerned about that. Reclamation,

1 beyond the operation of the projects, have invested in the
2 Pelagic Organism Decline effort. We fund roughly half of
3 that. Plus provide a number of key staff to participate in
4 the 30 some odd scientific studies. Because there seems to be
5 something that's happened in the estuary that has changed,
6 probably since about the year 2000.

7 And to this point, we're not -- I don't think anybody
8 can say that it is not entirely that the project has some
9 effect because there is some hydrodynamic effect there. But
10 there are a couple of other stressors in the system that have
11 been discussed in court that we feel are worthy of
12 investigation. And to get -- because we actually think if we
13 were to just focus solely on the operations of the project,
14 that we would see further declines potentially.

15 THE COURT: There isn't any question, as an operating
16 executive, that you recognize your full responsibilities under
17 the Endangered Species Act on behalf of the Bureau of
18 Reclamation? Not asking for a legal conclusion.

19 THE WITNESS: I believe --

20 THE COURT: As an operator.

21 THE WITNESS: So. I will submit that Bureau of
22 Reclamation, under my signature, requested consultation with
23 the Fish & Wildlife Service based on the status of the
24 species. And that was July of a year ago. July of '06.
25 Reclamation, me and my office, who is responsible for

1 preparing the biological assessment, requested reconsultation.
2 We've also requested reconsultation with NOAA Fisheries on our
3 other opinion, and that's based more upon the listing of the
4 green sturgeon and some critical habitat designation. But --

5 THE COURT: We don't have to have any concerns, any
6 judicial concerns about the agency following the law.

7 THE WITNESS: No. We've also stated some 7(d)
8 responses, if you will, that may not be the proper word. But
9 under the -- let's say, we -- there's certain actions that we
10 have indicated that they are going to put on hold and not
11 commit long-term to until we have a re-worked reconsultation
12 Biological Opinion in place.

13 THE COURT: And are you familiar with the Fish &
14 Wildlife Service proposed action matrix that has been
15 presented in the context of these proceedings?

16 THE WITNESS: I am familiar with these.

17 THE COURT: And were that or some other remedy to be
18 ordered by the Court, do you foresee any difficulties,
19 impediments to the implementation of any such remedies?

20 THE WITNESS: I will say that all of the matrices of
21 actions that I have seen would present some difficulties, yes,
22 in operating the projects. Is there a reason that we could
23 not do that, reclamation would make every attempt to find
24 within its authorities to implement those actions and work in
25 a coordinated matter with the state project.

1 In particular, for the Fish & Wildlife Service
2 matrices, we believe that that is implementable, if that word
3 makes sense.

4 THE COURT: It does.

5 THE WITNESS: Is that it could be done. It would be
6 with significant effects, depending on the hydrology. Would
7 it be beyond the current B2 EWA set of assets that -- as I laid
8 out in the biological assessment for the last opinion? It
9 very well could. And reclamation would try to find other ways
10 within its authorities to account for those effects as they
11 are related to the CVP.

12 THE COURT: Thank you very much. Those are my
13 questions. Do you wish to question, Mr. Maysonett?

14 MR. MAYSONETT: Your Honor, I don't have any followup
15 questions in addition to the Court's unless there's some area
16 that the Court would like me to --

17 THE COURT: Do the plaintiffs wish to address any
18 questions to Mr. Milligan?

19 MS. POOLE: Two questions, if I may, Your Honor.

20 THE COURT: Yes.

21 CROSS-EXAMINATION

22 BY MS. POOLE:

23 Q. Good afternoon, Mr. Milligan, my name is Kate Poole, I'm
24 an attorney for the plaintiffs. I have a clarifying question
25 for you.

1 I believe that the judge was asking you about Delta
2 Smelt Working Group recommendations and WOMET responses in two
3 different time periods during this testimony you just gave.
4 Spring, '06 and spring, '07. I understood your answer to be
5 only addressing spring '07 operations. Is that correct?

6 A. That is not my recollection of our conversation just now.
7 I think the two periods we spoke of were certainly the spring
8 of '07, but I believe it was the earlier winter '07 that we
9 were -- that I was referring to in terms of some actions that
10 were contemplated by the Delta Smelt Working Group that were
11 not triggered.

12 THE COURT: Did you mean to say winter '06?

13 THE WITNESS: Yes, I did. Well --

14 THE COURT: We haven't got to winter '07.

15 THE WITNESS: It was the January/February '07 that
16 I'm referring to. There was some late -- there were
17 discussions among these lines in December of '06. I
18 don't -- I don't remember anything that we discussed that
19 related to the spring of '06.

20 MS. POOLE: Thank you.

21 Q. And if I understood you correctly, I believe you just
22 testified that during the period when the Delta Smelt Working
23 Group recommendations were in place this May and June of '07,
24 that the bureau was, quote, "operating as close to the edge as
25 we could." Is that correct?

1 A. My reference to "close to the edge" in terms of operations
2 were primarily south of Delta, withdrawals from San Luis
3 Reservoir and the operational range within O'Neill Forebay.

4 Q. So you were not referring to Delta export rates from the
5 bureau and Tracy pumps?

6 A. I think I mentioned that we had one pump unit going at 850
7 cfs, which is the minimum we can pump at that location. And
8 that we were simultaneously at that time making purchases and
9 having water released into the San Joaquin River to compensate
10 for that. However, the collective hydrodynamics in the Delta
11 did not allow for that combined operation or collective
12 operations to get to the zero in middle and Old River flow.

13 Q. Thank you. In the second half of June, the bureau's
14 pumping rate from banks ranged between over 2,000 cfs and
15 close to 6,000 cfs; is that right?

16 A. I'm confused by your question because I'm not sure if you
17 mean Jones Pumping Plant.

18 Q. I'm sorry. Yes, I do mean the Jones Pumping Plant.

19 A. I believe early in the month of June, there was a time
20 that we transitioned up to a three-unit operation, which would
21 probably be -- I'm not sure what the lower end of your range
22 was that you discussed.

23 Q. 2000 cfs.

24 A. Approximately 2000. It probably was 2100 potentially.
25 But probably a little over 2,000 cfs with three units in place

1 to be able to meet demands as they were also being elevated
2 within the State Water Project. Not to delay or -- delay the
3 answer, but the circumstances at the time were the State Water
4 Project had for a period allowed the CVP to take more than its
5 47 percent share, if you will, of withdrawal from San Luis
6 Reservoir.

7 Circumstances within the State Water Project south of
8 that point necessitated that they needed to take a larger
9 share of their withdrawal much closer to their 52 percent, 53
10 percent. So the -- at that time, again, under consultation
11 with the directors of the five agencies, a decision was made
12 to put several more units online at Jones Pumping Plant given
13 the low salvage numbers at the Tracy fishery.

14 And the intent there was to monitor that very closely
15 and see how that was to respond. And as we got closer to the
16 end of the month, as temperatures rose in the south Delta,
17 several more units were brought online.

18 Q. For a pumping rate of close to -- of more than 4,000 cfs;
19 is that right?

20 A. Our five unit operation would have been at 43 to 4400 cfs.

21 MS. POOLE: Thank you, Mr. Milligan.

22 THE COURT: Mr. Lee, Ms. Wordham, does the DWR have
23 any questions?

24 MR. LEE: We have no questions.

25 THE COURT: Thank you. Mr. Wilkinson, any questions?

1 MR. WILKINSON: Yes, Your Honor, I do have just a
2 couple of questions.

3 CROSS-EXAMINATION

4 BY MR. WILKINSON:

5 Q. Mr. Milligan, I believe you testified that part of the
6 action matrix requires the maintenance of a zero cfs or a
7 potential zero cfs flow in Old and Middle River at certain
8 times of the year?

9 A. I believe several of the matrices have that as one end of
10 the bounds, yes.

11 Q. And was it your testimony that maintaining a zero cfs flow
12 would be difficult for both the state and federal projects?

13 A. Thinking of the projects combined overall, during periods
14 where the San Joaquin River inflow at Vernalis is low and
15 there is, let's say, at least some degree of pumping by
16 in-Delta diverters, and particularly at times where the tide
17 cycle was such coming from the neap tide to the spring tide
18 that, as Mr. Leahigh referred to, is the kind of filling of
19 the Delta, if you will, that a very low Middle and Old River
20 flow, whether it's negative 1,000 or down to zero or even
21 trying to achieve positive, is probably beyond the ability of
22 the projects, within their pumping.

23 Q. Is it also true that there are diversions made by the
24 Contra Costa Water District and agricultural diversions on Old
25 and Middle Rivers as well?

1 A. When I referred to in-Delta diversions, those are the two
2 primary areas. Both the agricultural diversions and also
3 Contra Costa's pumping.

4 Q. If you were required to meet a zero flow in Old and Middle
5 River, and you already had your project pumps shut off, how
6 would you try to meet that flow?

7 A. Realizing that modifying the tides toward -- the
8 meteorological condition that might also affect, low pressure
9 systems, winds, storm surges that were a concern at the time,
10 one might send -- I believe, that the State Board actually
11 sent out letters to those diverters asking them to curtail as
12 much as they could. The only other option that the projects
13 might have available to them is finding water on the San
14 Joaquin River, whether it's in the form of rolling cellars or,
15 in the case of reclamation, potentially operations at New
16 Melones to provide additional flow into the San Joaquin River.

17 Now, New Melones, as a point in fact, for the coming
18 year would be very difficult. Reclamation doesn't have any
19 extra water, so to speak, within New Melones.

20 Q. Even if you were able to follow one of those actions, Mr.
21 Milligan, do you have any assurance that doing so would result
22 in zero flow in Old and Middle River?

23 MS. POOLE: Objection. Incomplete hypothetical.

24 THE COURT: Do you have enough information to answer
25 this question?

1 THE WITNESS: I would probably ask as a hypothetical,
2 if you could add just a little more detail to that.

3 THE COURT: All right. The objection is sustained.
4 BY MR. WILKINSON:

5 Q. Mr. Milligan, are you aware that the Department of Water
6 Resources has made one change to the proposed Fish & Wildlife
7 Service action matrix?

8 A. I am aware that within Mr. Johns declaration, he has
9 proposed -- I would have thought changes. I'm not aware
10 there's just one change. But I'm aware --

11 Q. Let me ask you --

12 A. I am aware of a change.

13 Q. Let me ask specifically. Are you aware that the
14 Department of Water Resources has suggested that the zero
15 flow, the lower end of the range in the Fish & Wildlife
16 Service action matrix, action number three, be changed to a
17 negative 1500 cfs.

18 MS. POOLE: Your Honor, I'm going to object. This is
19 beyond the scope of any direct testimony.

20 THE COURT: I'm going to overrule the objection.
21 I'll permit the witness to answer this question. This is
22 about a proposed remedy and feasibility of implementation.
23 This would be one of the implementing agencies. You may
24 answer.

25 THE WITNESS: I am aware of that suggestion.

1 BY MR. WILKINSON:

2 Q. I'm sorry, Mr. Milligan. Did you complete your answer?

3 A. I am aware of that suggestion from Mr. Johns' declaration.

4 Q. As project operator, Mr. Milligan, would you support that
5 change?

6 A. From a -- from the context of treating these tables
7 as -- let's say the same par as the tables that we've been
8 looking at from the D 1641, for example, I would certainly
9 support making the lower range or the upper range, depending
10 on your point of view, as achievable for the projects if
11 possible.

12 I would probably also, as a steward of resources,
13 probably say that that's probably, as a remedy or as a
14 standard or as an objective, would be appropriate to move to a
15 negative 1500. There probably are times on the reverse of the
16 out -- of the water leaving the Delta, that it also seemed it
17 was possible to add another level of protection that would be
18 maybe a reasonable thing to do, depending on the input from
19 the biologists.

20 MR. WILKINSON: Thank you very much.

21 THE WITNESS: But as an objective, I would say
22 negative 1500 would be -- would allow the projects the greater
23 ability to actually meet what's being asked of us.

24 MR. WILKINSON: Thank you very much. I have no
25 further questions.

1 THE COURT: Mr. O' Hanlon.

2 MR. O' HANLON: Yes, Your Honor.

3 THE COURT: Do you have any questions?

4 MR. O' HANLON: Yes, Your Honor.

5 CROSS-EXAMINATION

6 BY MR. O' HANLON:

7 Q. Mr. Milligan, since you joined the Bureau of Reclamation,
8 how much money has the Bureau of Reclamation spent on efforts
9 to protect the delta smelt?

10 MS. POOLE: Objection. Beyond the scope. And also
11 calls for economic costs.

12 THE COURT: All right. I will allow the question to
13 be answered for the limited purpose of showing any action by
14 the agency to respond to the status of the species as
15 threatened or endangered. You may answer.

16 THE WITNESS: I am afraid that I am not fully aware
17 of all the budgetary costs that may have gone into doing that.
18 I'm not entirely sure if you are referring to just monetary
19 budgetary-wise or, let's say, water costs.

20 BY MR. O' HANLON:

21 Q. Let me modify my question then, given your area of
22 responsibility. Since you joined the Bureau of Reclamation,
23 how much water has the Bureau of Reclamation dedicated to
24 efforts to protect the delta smelt?

25 A. Whether directly or indirectly, I would some -- I have

1 seen some indication of, at least indirectly, virtually all
2 the B2 assets that are spent in the course of a year have some
3 benefit to delta smelt. So whether it's meeting the
4 incremental Water Quality Control Plan costs above Decision
5 1485 in the Delta, to some degree the fall releases that may
6 primarily be for the benefit of the salmon species or
7 steelhead species in CVP controlled rivers and streams.

8 Some might say that the cold water releases in Clear
9 Creek may have very little effect on delta smelt. We've never
10 tabulated it that way. But I would say at least a very high
11 majority of the B2 water that's used in a given year has at
12 least an indirect benefit to smelt.

13 THE COURT: And is that approximately 800,000 acre
14 feet you're referring to or some different quantity?

15 THE WITNESS: The 800,000 I'm speaking to. Now, some
16 piece of that, Clear Creek flows may have a very minimal and
17 some might argue no effect. But that's not the
18 large -- that's not a majority of that water, even a large
19 portion.

20 BY MR. O'HANLON:

21 Q. So can you give us --

22 A. I guess I'd add to that, reclamation does also provide
23 funding to the Environmental Water Account, both from a
24 staffing perspective, and then also as budgetary constraints
25 allow also for the purchase of water for EWA. Many of those

1 actions are also for the benefit of smelt, either directly or
2 indirectly.

3 Q. Can you give me an estimate -- of 800,000 acre feet
4 dedicated under B2, can you give me an estimate of
5 approximately how much of that water is dedicated annually for
6 delta smelt measures or that benefits delta smelt indirectly?

7 MS. POOLE: Objection. Asked and answered.

8 THE COURT: Is there a different figure from what
9 you've just stated?

10 THE WITNESS: I am -- I am searching to see if I can
11 try to make an attempt to quantify, let's say Clear Creek
12 flows, let's say above 700,000 I would say.

13 THE COURT: Thank you.

14 MR. O'HANLON: Thank you, Mr. Milligan. I have no
15 further questions, Your Honor.

16 THE COURT: All right. I have no further questions.
17 Do the plaintiffs have any recross?

18 MS. POOLE: Two questions, Your Honor.

19 RECROSS-EXAMINATION

20 BY MS. POOLE:

21 Q. Mr. Milligan, I believe you just stated that meeting the D
22 1641 salinity standards benefit delta smelt as assisted by the
23 B2 releases. Would additional fresh water outflows to the
24 Delta benefit delta smelt?

25 A. Beyond what's in D 1641?

1 Q. Yes.

2 MR. WILKINSON: I'm going to object on the basis it's
3 beyond the area of expertise.

4 MS. POOLE: The witness just testified that --

5 THE COURT: Yes. I'm going to overrule the
6 objection. As an operator, he can answer in the context of
7 his operational responsibilities in performance of his duties.
8 Not as a biologist. You may answer.

9 THE WITNESS: To help me formulate my answer, will
10 you please repeat the question, so I --

11 THE COURT: Read it back, please.

12 (Record read as requested.)

13 THE WITNESS: I will say as an operator that -- let's
14 say an increased net Delta outflow index would move the X2
15 position further to the Golden Gate. To the degree to which
16 that would be moved and to the degree that that would provide
17 additional habitat, I could not tell you given the current
18 population levels that that is a significant -- or would
19 benefit the population significantly. That would be beyond my
20 expertise.

21 MS. POOLE: Thank you, Mr. Milligan. That's all,
22 Your Honor.

23 THE COURT: Anything further, Mr. Maysonett?

24 MR. MAYSONETT: I have nothing further, Your Honor.

25 THE COURT: Mr. Lee?

1 MR. LEE: No, sir.

2 THE COURT: Mr. Wilkinson?

3 MR. WILKINSON: No, Your Honor.

4 THE COURT: Thank you, Mr. Milligan. You may step
5 down.

6 THE WITNESS: Thank you.

7 THE COURT: You're excused.

8 Does any party have any further evidence?

9 MR. WALL: Your Honor, we have a very brief rebuttal.
10 I think it will take about five minutes.

11 THE COURT: Proceed.

12 MR. WALL: Dr. Swanson, if you'd come forward.

13 THE COURT: You're still under oath, Dr. Swanson.

14 THE WITNESS: Thank you, Your Honor.

15 CHRISTINA SWANSON,
16 called as a rebuttal witness on behalf of the Plaintiffs,
17 having been previously sworn, testified as follows:

18 THE COURT: Mr. Wall, you may proceed.

19 DIRECT EXAMINATION

20 BY MR. WALL:

21 Q. Dr. Swanson, there's going to be a stack of papers in
22 front of you. And if I could ask you to find Plaintiffs' 19,
23 which I'll put on the Elmo.

24 A. Could you describe it for me, please?

25 Q. Should be on your screen.

1 A. Yes.

2 Q. This is plaintiffs' 19 for identification. Are you
3 familiar with this document?

4 A. I am.

5 Q. Could you describe it, please.

6 A. This document shows three graphs which plot daily delta
7 smelt salvage rates at the two facilities combined for the
8 months of December, January, February and March for the years
9 December, 1999 to -- through March 2000. December 2000
10 through March 2001 and December 2001 through March 2002.

11 The -- below the graphs, I have also -- is also shown the
12 average monthly Old and Middle River flow for those months.

13 Q. How did you come to become familiar with this document?

14 A. I created this graph.

15 Q. How did you create it? Where did you get the data from?

16 A. I used the data from the Central Valley Operations website
17 for daily salvage rates for delta smelt and I used data from
18 the US Geological Survey sensors in Old and Middle River to
19 calculate daily flows for Old and Middle River from which I
20 calculated the monthly averages.

21 MR. WALL: Your Honor, I move that Plaintiffs' 19 be
22 entered into evidence.

23 THE COURT: Any objection?

24 MR. WILKINSON: No objection.

25 THE COURT: Exhibit 19 is received in evidence.

1 (Plaintiffs' Exhibit 19 was received.)

2 BY MR. WALL:

3 Q. Dr. Swanson, your proposed remedies in this proceeding
4 call for monitoring of larval juvenile smelt at the project
5 export facilities; correct?

6 A. That is correct, yes.

7 Q. Were you here for the testimony of Dr. Hanson?

8 A. Yes.

9 Q. And do you recall Dr. Hanson testifying regarding whether
10 he thought that monitoring was necessary or not?

11 A. Yes.

12 Q. Do you have a view on the necessity or the importance of
13 monitoring for larval smelt at the project export facilities?

14 A. In my judgment, monitoring for larval delta smelt
15 represents an essential component necessary for us to be able
16 to protect the delta smelt in this interim period. And I
17 believe into the future.

18 We currently have inadequate information for us to
19 evaluate the risk of entrainment for this early life stage of
20 delta smelt and, given the current low population abundance
21 and the limited detection ability of our existing surveys, we
22 cannot rely on those.

23 Particle Tracking Model can only get you so far,
24 especially if you don't know where the larval delta smelt are.
25 And current monitoring at the two export facilities does not

1 detect, measure or count delta smelt smaller than 20
2 millimeters in length.

3 Q. Dr. Swanson, were you here for the testimony of Dr.
4 Miller?

5 A. I was.

6 Q. Do you have any response to his testimony?

7 A. I remain concerned about the analyses and interpretation
8 that Dr. Miller presented in regards to his efforts to
9 understand what are the driving forces controlling delta smelt
10 population abundance.

11 Dr. Miller's principle conclusions, I have two
12 general responses. One is Dr. Miller appears to view the
13 only -- the only aspect of water project operations that he
14 considers in his analyses appear to be related directly to
15 water export operations.

16 And I think it's extremely clear that operations of
17 the two water projects and their impacts on delta smelt and
18 delta smelt critical habitat are far greater than that. And
19 therefore, analyses that focus exclusively on exports are not
20 particularly useful, particularly with reference to trying to
21 determine how we need to modify operations to minimize their
22 adverse impacts on the species and its critical habitat.

23 With regard to his analyses of the effect of
24 zooplankton density on delta smelt population abundance, I
25 continue to find those analyses highly questionable with

1 regard to his statistical techniques and I think they
2 represent another example of Dr. Miller's selective use of
3 data.

4 And I'll just give one example for that. And that is
5 in his analyses to determine whether or not the availability
6 of zooplankton food for delta smelt is a limiting or critical
7 or driving factor for delta smelt population abundance, he has
8 limited his analysis to looking at just two of the copepod
9 species which are present in the Delta. Eurytemora and
10 Pseudodiaptomus.

11 He has actually also admitted that one of those
12 species is, in fact, no longer present in the Delta and
13 ignores the fact that we know delta smelt eat many more
14 copepod species than just those two. That alone is enough to
15 provide a lot of questions as to how he can interpret those
16 analyses.

17 Q. Dr. Swanson, you mentioned --

18 THE COURT: Did you mean to say that there are known
19 species of zooplankton that exist that are present in the
20 water column that are not included in the analysis?

21 THE WITNESS: Yes, that is correct, Your Honor, at
22 least several.

23 THE COURT: And the inference that the expert would
24 have the Court draw is that there are only two sources of food
25 present in these zooplankton for the delta smelt?

1 THE WITNESS: His analysis examines only the
2 abundance of those two zooplankton species with regard to
3 delta smelt and ignores the fact that we know, based on gut
4 content analysis, that delta smelt eat many more species than
5 just the two that he included in his analysis.

6 THE COURT: And can you identify some of those?

7 THE WITNESS: I will hope to pronounce the names
8 correctly. One of them is Limnoithona.

9 THE COURT: Help the court reporter, please.

10 THE WITNESS: That's, oh, my goodness,
11 L-I-M-N-O-I-T-H-O-N-A.

12 Another one is called Acartiella, and I'm probably
13 going to spell that one wrong, but I think it's
14 A-C-A-R-T-I-E-L-L-A.

15 And after that, I'm running out of species names,
16 Your Honor.

17 THE COURT: Thank you. You may proceed.

18 BY MR. WALL:

19 Q. Dr. Swanson, is the abundance of any of the species of
20 zooplankton on which delta smelt feed increasing?

21 A. Yes. The abundance of Limnoithona has increased
22 dramatically in recent years.

23 Q. And that's a time period when delta smelt population has
24 declined; correct?

25 A. Yes, it is.

1 Q. Dr. Swanson, you testified that you were here for the
2 testimony of Dr. Hanson. Do you recall him mentioning new
3 survey data that's come out?

4 A. Yes, I do.

5 Q. And that's new survey data from the Summer Townet Survey;
6 am I correct?

7 A. Yes.

8 Q. Have you become aware of this new survey data since your
9 earlier testimony a few days ago?

10 A. Yes, I have.

11 Q. Could you briefly describe for us what the new Summer
12 Townet Survey data shows?

13 A. Yes. Last night I went on to the internet and I accessed
14 the website of the Department of Fish & Game and reviewed the
15 most recent data from the Summer Townet Survey. I've written
16 myself a little note. A cheat sheet with some of the results,
17 which I hope is okay. The summer townet typically consists
18 of --

19 THE COURT: If you don't have any independent
20 recollection and you need to refer to the notes to refresh
21 your recollection, it's okay.

22 THE WITNESS: Thank you, Your Honor.

23 THE COURT: That is the case?

24 THE WITNESS: Could you --

25 THE COURT: Do you need the notes to refresh your

1 recol l ection?

2 THE WITNESS: Yes. Thank you, Your Honor.

3 THE COURT: You may proceed.

4 THE WITNESS: The Summer Townet Survey consists of
5 six sequential surveys. At the point where I prepared my
6 testimony and my declarations, four of those had been
7 completed. Or the results for the four were up. And they now
8 have completed surveys five and six. And the numbers of del ta
9 smelt found in these last surveys is extremely low.

10 And, in fact, the other thing that I find equally
11 disturbing is that the numbers of different stations, sampling
12 stations within the Del ta that are surveyed by the townet
13 survey, the numbers of stations at which del ta smelt are being
14 detected is extremely low.

15 For example, the fifth survey of the 2007 Summer
16 Townet Survey found del ta smelt at just two of more than 20
17 stations sampled. And the sixth survey found del ta smelt at
18 only one survey and, in fact, only found a total of five del ta
19 smelt. The total number of del ta smelt collected in the six
20 surveys for 2007 summed to 55 fish. This is compared to A2
21 fish --

22 Q. If you could just pause and I'll write those down on the
23 El mo.

24 A. Certainly.

25 Q. If you could tell us the number of del ta smelt found in

1 the first six surveys, Summer Townet Surveys in 2007.

2 A. 55 delta smelt were collected in 2007.

3 Q. And do you have that information for 2006?

4 A. I do.

5 Q. What is that?

6 A. 82 fish.

7 Q. Do you have that information for 2005?

8 A. Yes. It was 119 fish.

9 Q. How about for 2004?

10 A. In 2004, 189 fish were collected.

11 Q. Do you have that information for 2003?

12 A. Yes. In 2003, 338 delta smelt were collected.

13 Q. Do you have information on the number of stations at which
14 delta smelt were found by the first -- or the sixth Summer
15 Townet Survey in each of those years?

16 A. Yes. For survey number six, which would you like, in
17 2003? Delta smelt were found at six stations. In 2004, they
18 were also found at six stations. In 2005 -- oh, I beg your
19 pardon. 2004 is four stations. In 2005, they were found at
20 five stations. In 2006, they were found at five stations.
21 And in 2007 for survey number six, they were found at only one
22 station, which was located in the lower Sacramento River near
23 Decker Island.

24 Q. Dr. Swanson, do you have any conclusions from this new
25 data?

1 A. As I testified earlier, both the abundance and
2 distribution of a species are critical indicators of its risk
3 of extinction and population status. I think these new data,
4 they have re-emphasized my very high level of concern for the
5 species because they indicate that, in fact, the population is
6 in decline compared to last year and all previous years. And,
7 in fact, the distribution of the species is becoming much more
8 limited.

9 And I think the new data reemphasized the very high
10 risk of extinction for the species right now. And
11 re-emphasized, in my judgment, the critical need to implement
12 all possible actions to minimize and hopefully eliminate, to
13 the extent that we can, the adverse impacts of water project
14 operations both on the fish itself, in terms of direct lethal
15 take at the facilities, as well as the adverse impacts of
16 operations on its critical habitat, including, during this
17 period when the fish is distributed in low salinity brackish
18 water habitat, beyond the direct influence of the pumps, but,
19 in fact, that habitat is being affected by water project
20 operations.

21 Q. Dr. Swanson, where was the one station where delta smelt
22 were found in the sixth Summer Townet Survey this year?

23 A. It was located on the Lower Sacramento River near Decker
24 Island. I do not recall the station number.

25 Q. And is that the Delta smelt's preferred habitat for this

1 time of year?

2 A. Typically at this time of year delta smelt are distributed
3 in low salinity habitat, wherever that habitat is in the
4 Delta. Under most conditions, and certainly in the recent and
5 historical past, that habitat would have been located further
6 downstream in the Delta beyond the confluence and Suisun Bay
7 because outflows would be higher than they are right now.

8 Q. Do these new survey data have any implications for your
9 proposed action number ten, the fall action?

10 A. Our fall action was developed based on scientific research
11 conducted by DWR scientists that show that during the fall,
12 the September through December period, the quality and
13 quantity of delta smelt habitat was determined in part by
14 salinity and, in particular, outflows which drive the location
15 of low salinity habitat preferred by delta smelt.

16 The location of low salinity habitat right now, on
17 the basis of outflow in X2, is at approximately 85 to 89
18 kilometers. Analyses of the results of that research
19 conducted by DWR scientists on habitat quality that were
20 followed up by work by scientists on the Delta Smelt Working
21 Group, some of whom are the same scientists, showed that
22 habitat quality, which they defined using these three water
23 quality metrics, was, in fact, related to the location of X2
24 or the location of low salinity habitat. And they found that
25 when low salinity habitat was located upstream of 80

1 kilometers, comparable to where it is located right now, that
2 overall habitat quality for delta smelt was low.

3 Our fall action was designed to increase Delta
4 outflows and to shift the location of low salinity habitat
5 downstream to or downstream of Kilometer 80. And those
6 locations, the quality of habitat, as defined by this habitat
7 quality index developed by these scientists, is better than it
8 is where -- compared to where it is currently located right
9 now. Our action was designed to achieve these conditions.

10 Q. Dr. Swanson, is it your understanding that the location of
11 X2 is regulated by operations of the CVP and SWP reservoir
12 facilities?

13 MR. WILKINSON: Your Honor, I wonder if I could
14 interrupt just for a moment. Yesterday Mr. Wall was asked
15 what the length of his rebuttal testimony was going to be and
16 he said 15 minutes. This afternoon he told us it was five
17 minutes. We've now gone three times that length of time. And
18 I want to assure the Court I did not waive my
19 cross-examination of Mr. Leahigh in order to allow Mr. Wall to
20 expand his rebuttal testimony of Dr. Swanson. So I'd
21 appreciate an accurate estimate of what the rebuttal time is
22 going to be.

23 MR. WALL: This is my last question, Mr. Wilkinson.

24 MR. WILKINSON: Thank you.

25 THE COURT: Thank you.

1 MR. WALL: Except for getting the document admitted
2 into evidence.

3 THE COURT: All right.

4 MR. WALL: Could you read back my question, please?

5 THE COURT: Yes, you may.

6 (Record read as requested.)

7 THE WITNESS: It's a combination of the operations of
8 the reservoir facilities and the Delta export facilities.

9 BY MR. WALL:

10 Q. Dr. Swanson, I put on the Elmo a piece of paper on which I
11 was doing my best to scribble down the numbers that you gave
12 me for the number of delta smelt found in the three surveys,
13 the Summer Townet Survey, the number of stations delta smelt
14 were found in that survey. Is that -- did I scribble those
15 numbers down accurately?

16 A. Yes.

17 Q. Your Honor, I can mark this piece of paper as Plaintiffs'
18 30 and I'd like to ask it be moved in evidence.

19 THE COURT: Is there any objection?

20 MR. WILKINSON: None, Your Honor.

21 THE COURT: Exhibit 30 is received in evidence.

22 (Plaintiffs' Exhibit 30 was received.)

23 MR. WALL: Thank you, Your Honor. That's our
24 rebuttal testimony.

25 THE COURT: Mr. Maysonett, do you wish to

1 cross-examine?

2 MR. MAYSONETT: Just a moment, Your Honor.

3 Your Honor, in the interest of time, we're going to
4 waive cross-examination.

5 THE COURT: Mr. Lee?

6 MR. LEE: Similarly in the interest of time, we're
7 going to waive cross-examination.

8 THE COURT: Mr. Wilkinson.

9 MR. WILKINSON: No questions, Your Honor.

10 THE COURT: Mr. O'Hanlon?

11 MR. O'HANLON: No, Your Honor.

12 THE COURT: It appears that the examination on
13 rebuttal of the doctor is complete.

14 Thank you, Dr. Swanson. You may step down. You are
15 excused.

16 Does any party have further evidence?

17 All right. That then concludes the taking of
18 evidence in this proceeding. We are now at the hour of 2:45.
19 And we had planned to allocate three hours to argument and
20 half an hour for the Court to announce a decision. That would
21 take us to some time after 6:30 p.m. And as I have previously
22 indicated to the parties, I do not ask the Court staff -- I
23 stay, but I don't ask the Court staff to stay after the hour
24 of five p.m. and they aren't necessarily in the position to do
25 that. Plus the building closes now at five p.m. and the Court

1 security officers, as I understand it, leave only a skeleton
2 staff. And although I think you will now notice that the HVAC
3 has come on in the room, to our mutual comfort, after five
4 they turn the HVAC off in the building. So that might also be
5 a limiting factor.

6 So I am going to propose that you try to attenuate
7 your presentations here to that which is ultimately essential
8 and that we try to make our way through this by 5:30 p.m.
9 We're going to have to give the court reporter breaks because
10 this testimony has been very rapid, it's very complicated and
11 it's very, very difficult to take, as you all know.

12 So at this point, we can simply take the time and
13 mathematically divide it, we'll all reduce our respective
14 shares of the time that's left.

15 MR. WALL: Your Honor, that would be acceptable to
16 us. It would be, if I calculate correctly, a little bit more
17 than half an hour for each of the three groups. It would help
18 me focus my testimony if the Court gave some indication of the
19 areas of its greatest interest. If the Court would like me to
20 make that decision, I'm happy to try to do it.

21 THE COURT: All right. Let me say this to all of
22 you. You don't need to talk about the law. I understand the
23 law and I'm going to cover the law in my decision. And so
24 what I think we need to focus on is the seminal issues that
25 have been raised.

1 First of all, the status of the species as to how
2 critical jeopardy is, both to its survival and recovery and to
3 the impacts on its habitat of current and future conditions.

4 We are focused on, as part of that analysis then,
5 what the present, if you will, information -- and that's
6 mathematical quantitative information -- shows us on the
7 nature and extent of the distribution of the species.

8 The intervenors have raised issues about causes for
9 decline and they have -- and I think, by way of tentative
10 rulings, so you can direct your arguments, as I see this now,
11 Dr. Hanson, even Dr. Miller and all of the -- Mr. Milligan,
12 the operator for the action agency, nobody is arguing that the
13 species is in critical status.

14 And the question, I guess, is how does that translate
15 into the legal term of jeopardy. And there is, in the NMFS
16 case, a very specific definition of jeopardy that the Ninth
17 Circuit has very recently promulgated. It's a 2006 case.

18 And so the intervenors, primarily San Luis and Delta
19 Mendota Water Association and Westlands have essentially said,
20 well, we've got a problem here, but it has nothing to do with
21 the project operations and nothing to do with, in effect,
22 what's going on except as may be related to causes other than
23 water operations. I think that's a trial strategy that you
24 selected and that you have proceeded on.

25 I will tell you simply that in light of the

1 scientific evidence that's been presented on both sides, that
2 evidence doesn't preponderate.

3 And so in terms of the requisite foundational
4 elements of the critical jeopardy and the status of the
5 species and the threats to the deprivation of its habitat are
6 found to exist, then we are essentially on to the question of
7 what remedy is going to be necessary in the interim because
8 that then leads us to three more legal than factual issues.

9 And that is the agency has requested, as have all the
10 parties who are opposing the plaintiffs, they have requested
11 that, one, there be a remand. Well, there's no doubt there's
12 going to be a remand, the law requires it and there has to
13 be -- in effect, there's already been reinitiated consultation
14 as Mr. Milligan indicated to us.

15 And so the question then becomes all the parties have
16 requested that there be no vacatur of existing Biological
17 Opinion. However, again, by way of tentative ruling, what you
18 have is you have the indication of every expert who has
19 testified, there is no controversy or dispute among any expert
20 that at the current time the take limits are inadequate.

21 And we don't have to worry about the Biological
22 Opinion because that's been ruled unlawful and so that is the
23 operative status. We have an illegal Biological Opinion with
24 take limits that are admitted by all experts in this case who
25 are biologists and have the competence to say so, it's

1 inadequate to protect the species.

2 And given the requirements for the establishment of
3 the take limit, there isn't any party in this case who
4 provided us any legal authority on what we do about that in
5 terms of whether there is vacatur or non-vacatur of the
6 Biological Opinion and the take limits, when the evidence
7 tells us that the take limits aren't legally or actually
8 factually sufficient to protect the species. And so you
9 better spend some time on that.

10 And that will lead us then to remedies. And we have,
11 as I see it, the plaintiffs' ten element action. I'm not
12 going to call it a matrix because they haven't called it a
13 matrix. Their ten proposals, action proposals I'll call it.
14 I believe that's how Dr. Swanson has referred to them.

15 We have the Fish & Wildlife Service's five point
16 action matrix, they do call it a matrix so I'll call it a
17 matrix. It is proposed to be amended, it's not under Robert
18 Rules of Order, but as I understand it, DWR would like to
19 modify it in accordance with Mr. Leahigh's testimony this
20 afternoon.

21 Then we have Dr. Hanson for the State Water
22 Contractors who has proposed a three-tier approach which I
23 think essentially we can fold in to the Fish & Wildlife
24 Service as proposed to be modified by DWR.

25 And Mr. O'Hanlon has indicated that these Delta

1 Mendota and Westlands parties have some proposals, but
2 candidly, I've kind of lost them or maybe I don't understand
3 them in what we've been going through. So you can tell me
4 about those if you think they're going to add anything.

5 Otherwise it would be more productive for you to
6 focus on the other remedies that are proposed and tell me
7 what's wrong or right about any of them because that's going
8 to be most helpful. And then if Mr. Buckley is going to be
9 taking some time, hopefully this gives us clear direction.

10 That's what I'd like to hear from you about. Does
11 that help?

12 MR. WALL: That does, Your Honor. And I'm sure the
13 Court will feel free to give me further direction as I
14 proceed.

15 THE COURT: Yes. A break first says the reporter and
16 she's the boss. So we're going to stand in recess until 10
17 minutes after three.

18 (Recess.)

19 THE COURT: We're going back on the record in NRDC
20 versus Kempthorne. Please be seated.

21 All right. We are going to now hear from the
22 plaintiffs. Bear with me one moment. Mr. Wall, you may
23 proceed.

24 MR. WALL: Thank you, Your Honor. Your Honor, the
25 delta smelt teeters precariously on the edge of extinction.

1 We don't know exactly why. We don't know the exact population
2 level. But we do know that the species could go extinct
3 within the next year. We also know, without any dispute, that
4 the Central Valley Project and the State Water Project
5 operations, both at the export facilities and in their
6 management of flow through the Delta, are killing delta smelt
7 and adversely modifying its critical habitat.

8 Your Honor, this proceeding is not about assigning
9 blame or determining relative causation. The sole question
10 here is whether, in the face of considerable scientific
11 uncertainty, the defendants have proven that their proposed
12 operations will be deepen the jeopardy of delta smelt and will
13 not stand as an obstacle to this fish swimming back from the
14 edge of the cliff of extinction toward recovery.

15 Your Honor, by every reliable scientific measure, the
16 Delta smelt's population has crashed. All four indices by
17 which state and federal agencies measure smelt abundance have
18 set record lows. Delta smelt are hard to find in areas of the
19 fishes' critical habitat where they once thrived. These facts
20 are not disputed.

21 We also know that the geographic dispersion of the
22 delta smelt has been reduced. As Dr. Moyle and Dr. Swanson
23 testified, the delta smelt once spawned throughout both the
24 northern Delta and the southern Delta. No more. In 2007, the
25 delta smelt spawned only in the Sacramento River in a tiny

1 part of their historic range. And as the recent Summer Towner
2 Survey indicates, they remain confined at this time to a tiny
3 part of their historic range.

4 This is a critical condition for the delta smelt. As
5 Dr. Moyle explained, when the fish are concentrated in one
6 small place, they are vulnerable to any environmental
7 catastrophe, they only have one population. As Dr. Moyle put
8 it, they have no backup or insurance policy.

9 Your Honor, the diversity of this species has
10 diminished as well. Delta smelt spawn over several months.
11 But according to the recent findings of Dr. William Bennett,
12 on whose research all of the parties here have relied to some
13 extent, the only delta smelt that are surviving to reproduce
14 at present are those delta smelt hatched during the period of
15 VAMP. Months of delta smelt on either side -- yes.

16 THE COURT: Excuse me just one second. I'm going to
17 ask the court security officer -- what we'll do is if it
18 appears that we don't have enough seating in the courtroom,
19 those of you who are standing can take seats in the jury box.
20 We'll let the court security officer help you do that if you
21 wish. Otherwise try to find seats for them.

22 I'm sorry for the interruption, Mr. Wall.

23 MR. WALL: Should I continue?

24 THE COURT: Please.

25 MR. WALL: Literally months of delta smelt that are

1 hatching before and after VAMP are disappearing from the
2 population.

3 Now, when thinking about the question of jeopardy,
4 one naturally asks the question how many delta smelt are left.
5 And the most we can say about that is that no one really
6 knows. The only published peer review literature that
7 contains a population estimate is that of Dr. Bennett. And he
8 estimated, for 1994, a population of 86,000 delta smelt give
9 or take about 86,000. In other words, he didn't know. And he
10 acknowledged that the assumptions he made were not reliable.

11 There have been population numbers put forward in the
12 course of this trial. 1.8 million juvenile smelt. 600,000.
13 But Dr. Hanson's testimony put those estimates in perspective.
14 As he explained, and I'm quoting here, "A million fish may
15 sound like a lot to a layperson. In the context of a pelagic
16 species like delta smelt, a million larval and early juvenile
17 fish is a remarkably low number."

18 Your Honor, the species is not only in jeopardy, it
19 is at the tipping point. Every day seems to bring new bad
20 news. Dr. Moyle, who is widely recognized as the leading
21 expert on California native fishes and has been studying delta
22 smelt for decades and began studying them because when he
23 started they were easy to find, testified that, quote, we're
24 at a point where we need every small smelt out there we can
25 get to contribute to the survival of this species.

1 Ms. Goude told us that if the Biological Opinion she
2 authored a year or so ago were carried out today, delta smelt
3 could go extinct within a year. Dr. Hanson testified that,
4 quote, given the extremely low population abundance levels
5 conducting more sampling for delta smelt was too risky because
6 it might cause take in the hundreds of fish. Quote, "take in
7 the hundreds of fish," he said, "would certainly be high."
8 This species could go extinct this year.

9 The question in this trial is whether the proposed
10 CVP and SWP operations have the potential to tip this species
11 a little bit further over that edge. They clearly do. And I
12 think if the burden were on us, we would have carried it, but
13 of course the burden is not on us. The operations of the
14 projects affect delta smelt in various ways. They affect
15 delta smelt by impinging on their habitat quality in the fall.

16 The projects regulate flow of water through the Delta
17 in the fall, which in turn affects salinity, which, according
18 to the findings of Feyrer, et al., scientists at the Defendant
19 Department of Water Resources, affects delta smelt abundance.
20 This study found that salinity levels in the Delta, that
21 complement of their water quality index, explained 19 percent
22 of delta smelt abundance.

23 Reduced fresh water outflows through the Delta
24 changed the location and amount of low salinity habitat,
25 moving it further away from the nutrient rich Suisun Bay

1 towards the deeper less protective upstream channels and, in
2 particular, in the Sacramento River channel where those fish
3 are now confined.

4 Those reduced outflows are caused when water is kept
5 in storage or exported. The projects also affect the Delta
6 smelt's habitat in the southern part of the Delta.

7 Your Honor, Plaintiffs' Exhibit 1 is a map of the
8 Delta smelt's critical habitat. At present, the delta smelt
9 find themselves right up here in the northern part of the
10 Delta. And the testimony of Dr. Swanson and Dr. Moyle
11 establishes that a good third of their critical habitat in the
12 southern part of the Delta is entirely inhospitable to them
13 because of operations of the export facilities.

14 THE COURT: Why don't you use the letter and number
15 designation from the other map so that we'll have it for the
16 record where the north part of the Delta is.

17 MR. WALL: Your Honor, I'm not sure this other map
18 was admitted in evidence.

19 THE COURT: Then let's admit it now. Whose exhibit
20 was it?

21 MR. WALL: Well, we were intending to use it. We
22 ultimately thought this one was cleaner. But if there's no
23 objection, I think we --

24 THE COURT: No. I'm referring to the map that
25 had -- used by Dr. Hanson. It broke down the various areas of

1 the Delta where sampling in effect and measurements were
2 taken. Where is that exhibit? Can you help us, Mr.
3 Wilkinson?

4 MR. WILKINSON: I'll find it, Your Honor, if I may.

5 THE COURT: Thank you. That's it. All right. Does
6 that have an exhibit tag on it, Mr. Wall?

7 MR. WILKINSON: Yes, Your Honor, it's State Water
8 Contractors Exhibit H.

9 THE COURT: All right. If -- the color diagram is
10 helpful, but just in terms of a locational reference, let's
11 use the letter and number as close to the north Delta where
12 you are arguing the delta smelt now exist.

13 MR. WALL: Your Honor, I believe Dr. Hanson, in his
14 testimony, said that this past year the delta smelt spawned in
15 the area of A4 on the Sacramento River.

16 THE COURT: All right. I agree.

17 MR. WALL: The southern part of the Delta, which
18 would be in the area of perhaps A8 and A10 and A12, which
19 contain critical habitat, is no longer regularly occupied by
20 the delta smelt. Some of the smelt are entrained on their way
21 in or out of that area.

22 And Dr. Moyle also testified that when the pumps in
23 the Delta operated at high or moderate levels, they change the
24 hydrodynamics of the Delta. They may confuse these fish as
25 they try to swim into that area or be pulled off course into

1 less favorable environments.

2 Your Honor, and then there's the issue of
3 entrainment, of course, which the defendants have principally
4 focused and it is an important issue. We know that fish are
5 being entrained at the project export facilities. We don't
6 know how many. We know some are lost to predation before
7 they're salvaged. We know some of them get pulled through the
8 louvers at the fish screens. We know that the littlest smelt
9 under 20 millimeters are not counted at all and no one has a
10 precise idea of how many are lost.

11 What we do know is that this past summer, when the
12 projects were allowed to operate without being subject to a
13 court order, there were repeated days on which the projects
14 counted not tens, but hundreds of delta smelt in salvage. And
15 that was only the take of which we were aware.

16 Each of these adverse project impacts pushes the
17 delta smelt a bit further towards extinction. Delta smelt is
18 a species with no reserves, no spares, no back ups. And the
19 projects are chipping away at its population. Most of these
20 impacts are either not addressed by the defendants' proposed
21 remedies at all or are addressed only partially.

22 Now, Your Honor, I won't reiterate the law. The
23 Court is familiar with the NWF decision and the Court is
24 familiar with the burden of proof. I will say this. In the
25 face of uncertainty, the NWF decision, the Gifford Pinchot

1 decision, which has a similar ruling for criminal habitat, and
2 the burden of proof require that uncertainty be resolved in
3 the Delta smelt's favor.

4 Dr. Swanson has proposed ten remedial measures. And
5 let me briefly review the evidence on those measures.

6 The first three involved monitoring. Continuation of
7 existing monitoring or improvement of monitoring at the
8 facilities, for example, that detect larval smelt. Larval
9 monitoring at the project facilities is critical because we
10 have no direct information at this time on when or how many
11 larval smelt are being taken. They just aren't counted.

12 Better information about the presence and location of
13 larval smelt is critical to effective operation of these
14 projects, to avoid taking large numbers of delta smelt.

15 Defendants have raised no meaningful objections to
16 this proposal. The agencies have contended that they might
17 need to train some additional staff --

18 THE COURT: I believe they're also proposing that if
19 we get to their remedies.

20 MR. WALL: I'm sorry, Your Honor?

21 THE COURT: I believe they're also proposing the
22 monitoring if we get to their remedies.

23 MR. WALL: Your Honor, I believe the Fish & Wildlife
24 Service does not. And I believe that Dr. Hanson's proposal,
25 he mentions the possibility of exploring or developing

1 monitoring but he has no concrete proposal.

2 THE COURT: All right.

3 MR. WALL: If the agencies -- the contention they've
4 raised is that they have to train some additional staff or
5 perhaps buy some new equipment. If the agencies do not
6 believe they're up to the task of training a few additional
7 staff to conduct this monitoring, it's difficult to see how
8 they could be entrusted with the more weighty work that they
9 propose to be left to their discretion.

10 Dr. Swanson also proposes measures four through nine
11 that are principally addressed at entrainment and improving
12 the habitat of the southern part of the Delta as it's affected
13 by the export operations.

14 Now, there's several of these about which there's no
15 real contention. Dr. Swanson's action six is
16 essentially -- it's just a continuation of the VAMP.

17 And actions eight and nine, which involve
18 agricultural barriers, I don't believe any of the parties
19 dispute those actions are a good idea as well.

20 So the focus of the contention here is on actions
21 four and then actions five and seven. Much of the debate has
22 been around the particular flow levels that Dr. Swanson
23 proposed for her action four. And this is a measure that is
24 timed to protect delta smelt adults before they spawn. These
25 are the fish that have survived all the many causes of

1 mortality.

2 You recall that there is a very tiny percentage of
3 the hatched fish that survive to reproduce. These are those
4 fish. They are the mothers of the next generation, hopefully
5 not the last generation of delta smelt. And it is critical
6 that they be protected.

7 Dr. Swanson modeled her fourth protective measure,
8 her action four, on a recommendation of the Delta Smelt
9 Working Group, which is composed of the agency scientists.
10 They proposed a range of flows and she chose the more
11 conservative protective side of that range of flows, given the
12 present status of the species that careful conservative
13 approach is warranted.

14 Your Honor, Dr. Swanson's measures five and seven
15 would essentially provide for Old and Middle River flows like
16 those found during the VAMP period. But would begin those
17 flows earlier and continue them later extending the period of
18 protection that Dr. Bennett's work suggests VAMP provide.

19 Dr. Swanson took this approach because Dr. Bennett's
20 work provides compelling, if new evidence that entire age
21 classes of delta smelt, entire months of hatched fish are
22 dying in mass.

23 Dr. Swanson also took this approach because, as she
24 testified, she does not have confidence that the very
25 statistical relationships between flow on the Old and Middle

1 River and take provide the necessary resolution to decide an
2 appropriate level of Old and Middle River flows, if there is
3 better information, such as that provided by Dr. Bennett.

4 These VAMP like flows would end once salvage ends.
5 And there's some dispute about what that end date would be.
6 Dr. Swanson is the only biologist who's addressed that point.
7 And she's testified that the fish would likely exit the system
8 sooner under the flow conditions she's proposed.

9 The testimony of the DWR witness looked at
10 a -- looked specifically at 1998, which was a very unusual
11 hydrological condition, where there was flooding throughout
12 the San Joaquin Valley that might have brought numerous delta
13 smelt into that area that would not normally be there.

14 And I respectfully submit, Your Honor, that is not a
15 typical condition and certainly is not the condition that Dr.
16 Swanson has specified in her proposed remedial action.

17 THE COURT: When she does say that salvage ends?

18 MR. WALL: June 15th or five days after the last date
19 of salvage. But she doesn't know the date when that will be,
20 but she says she expects, based on the response of these fish
21 to favorable conditions, that they would move out of the
22 system sooner than they have under higher export rates.

23 Dr. Swanson's tenth and final measure is designed to
24 protect delta smelt sub-adults during the fall. There's clear
25 peer reviewed persuasive evidence, both from the -- well, the

1 Feyrer work and also the work of the Delta Smelt Working
2 Group, and Dr. Moyle's research on the habitat needs of
3 rearing delta smelt that more fresh water outflow during the
4 fall will help push the low salinity zone down towards more
5 favorable habitat in Suisun Bay where it would be, but for
6 operation of the projects.

7 Defendants have argued that this measure is risky.
8 It is not risky. We know what habitat conditions are
9 beneficial to delta smelt. Creating habitat conditions that
10 are beneficial by moving the low salinity zone further
11 downstream may or may not prove sufficient to allow the
12 species to recover. But the trajectory of which this fish has
13 displayed in recent years at least indicates that providing
14 good habitat is a necessary condition for recovery.

15 Dr. Swanson's tenth measure is the only measure
16 proposed by any party to address this critical lifestage of
17 delta smelt. Now, this is a one-year species with high
18 mortality during the course of the year. We simply cannot
19 afford to ignore any lifestage nor may the projects' impacts
20 on that lifestage be ignored consistent with the Endangered
21 Species Act.

22 Your Honor, I'd like to briefly address the
23 defendants' and defendant intervenors' proposed remedies. And
24 I'd like to do that first by identifying some common
25 deficiencies in their proposals. The first is that these

1 remedies give the agencies extraordinary discretion at where
2 to set flow levels.

3 Ms. Goude's action four is a process. And though it
4 illustrates what might be done, it doesn't require anything
5 specific. It's effectively a new version of the DSRAM process
6 that this Court already held insufficient.

7 Similarly, Dr. Hanson's tier two remedy sets wide
8 sideboards between minus -- I believe it's minus 1,000 cfs and
9 minus 6,000 cfs for flow in the Old and Middle River. These
10 sideboards are so wide you could get lost in their waters.
11 Now -- he now says that the prudent thing to do would be to
12 operate at the protective end of that range. His proposal
13 does not require the agencies to do so. And in the past, the
14 agencies have not demonstrated a willingness to operate the
15 projects in a fully protective manner.

16 Dr. Hanson's third tier measure sounds strict. Once
17 you have substantial salvage, dramatic increase in salvage, I
18 think he says, then you curtail pumping operations at the
19 level necessary to protect the public health and safety. But
20 this only lasts four days and after that the agencies get to
21 consider what they're going to do.

22 Well, what happened this past summer? Once they
23 began increasing their pumping operations, we saw days after
24 days of high levels of take that continued for the better part
25 of the month.

1 A second flaw with the defendants' remedies is that
2 they rely on imperfect monitoring data. In many instances,
3 they are triggered by identification of delta smelt in the
4 vicinity of the project export facilities. The present
5 surveys and salvage measurements do not even count larval
6 smelt.

7 One of the surveys does look at larval smelt, but the
8 present abundance of larval smelt is so low that these surveys
9 are increasingly having difficulty detecting them even in
10 areas where they do exist.

11 The defense remedies are also deficient because they
12 don't look at protecting the fall life stage of the species.
13 They're deficient because they, in the face of uncertainty,
14 err against more protective precautionary levels, which is
15 contrary to the requirements of the Endangered Species Act.

16 And finally, the defense experts were not willing to
17 testify that these remedies met the necessary legal standard.
18 This is really quite extraordinary.

19 Ms. Goude pointedly and repeatedly declined to offer
20 her opinion on whether the project's proposed operations would
21 cause jeopardy or avoid adverse modification. "I wouldn't
22 proffer an opinion on that," she said. I don't see how the
23 federal defendants can carry their burden of proof if their
24 expert won't testify that their project meets the legal
25 standard.

1 Dr. Hanson, for his part, asserted that his proposal
2 would be sufficient to prevent jeopardy or adverse
3 modification attributable to the project export facilities
4 depending on how they are operated. But he isn't saying that
5 if they operate at the less protective end of his range, they
6 would necessarily avoid jeopardy.

7 He also admitted that he had not even considered the
8 incremental contribution of any factor other than export
9 facilities. That apparently means in reaching a no jeopardy
10 decision or opinion, he did not consider the operations of the
11 remainder of these projects, the reservoirs that are
12 withholding outflow in the Delta in the fall.

13 Your Honor, I'm going to only say two things about
14 Dr. Miller's hypothesis. The first is that facts are
15 stubborn, but statistics are pliable. If I understood Dr.
16 Miller correctly, he has taken two variables, delta smelt at a
17 juvenile stage and food abundance, and put them into one
18 variable and related this to later delta smelt abundance.

19 This is a little bit like saying I'm going to try to
20 relate the co-occurrence of tomato plants and gardening gloves
21 with later tomatoes. Well, the fact that you get the tomatoes
22 later doesn't mean that they were caused by the gardening
23 gloves, they were caused by the tomato plants.

24 It's statistically invalid and it's consistent with
25 the findings of the peer review on his earlier conclusion,

1 which he proved through statistics just a few years ago that
2 delta smelt had recovered.

3 Your Honor, I'd like to briefly address the health
4 and safety and water supply issues. Plaintiffs propose an
5 explicit exception to their remedy to protect public health
6 and safety. There is a definition of public health and safety
7 in this context in federal law.

8 What this means is that under plaintiffs' proposal,
9 the defendants would not be required to take any action that
10 would impair the projects' ability to meet public health and
11 safety needs. This is a safety valve.

12 If the Court issues an order, it would have a safety
13 valve, an escape hatch, that if they need to do something else
14 to protect the public health and safety, they could do so.

15 This approach, under my understanding of the Court's
16 rulings about the evidence, makes the water cost information
17 presented to the Court irrelevant. Predicting the quantity of
18 water that would be needed to meet public health and safety
19 obligations in advance without information on the hydrology of
20 the coming year would probably be impossible and certainly be
21 unwise. Under our approach, the Court doesn't need to make
22 that prediction.

23 Beyond that, this Court has no warrant -- excuse me,
24 I'm losing my voice after several nights of no sleep. Get
25 some water. This Court has no warrant to consider costs

1 economic water or otherwise in deciding what remedy is
2 necessary to avoid increasing the Delta smelt's jeopardy or
3 adversely modifying its critical habitat.

4 This case is remarkably similar to TVA v Hill decided
5 by the Supreme Court, in the landmark and defining ESA
6 decision. In that case, also involved a federal water
7 project, it also involved a small uncharismatic fish.

8 The federal water project had cost something on the
9 order of 100 million dollars to build, which was a lot of
10 money back then. It was designed to provide electricity for
11 20,000 homes as well as flood control benefits, jobs and
12 recreational benefits. The Court said one might argue that
13 the burden on the public through the loss of millions of
14 unrecoverable dollars would greatly outweigh the loss of the
15 snail darter.

16 But neither the Endangered Species Act nor Article 3
17 of the constitution provide federal courts with the authority
18 to make such fine utilitarian calculations.

19 Congress viewed the value of the endangered species
20 as incalculable. Quite obviously, it would be difficult for a
21 court to balance the loss of a sum certain, even 100 million
22 dollars, against the Congressionally declared incalculable
23 value. Even assuming we had the power to engage in such a
24 weighing process, which we emphatically do not.

25 Your Honor, Congress has provided a process in

1 which -- by which the Section 7 obligations may be waived by
2 the executive branch to address public health and safety
3 emergencies or other problems of national and regional
4 significance.

5 Section 7 creates the endangered species committee
6 made up of high ranking executive branch officials in a
7 politically accountable branch of the government. And upon
8 proper application, this committee is empowered to exempt an
9 action agency from the requirements of Section 702 if doing so
10 is in the public interest.

11 The courts, however, are not empowered to do so.
12 Whether the delta smelt survives or falls finally over the
13 cliff of extinction, may well be decided in the next 12 to 18
14 months. Every biologist who has appeared before this Court
15 has reached that same conclusion. The science on what is
16 necessary to protect the delta smelt from falling over the
17 edge into extinction, let alone the science on what is
18 necessary to comply with the adverse modification requirement
19 is uncertain. We cannot look at a textbook, even Dr. Moyle's
20 textbook, and be as confident as we would like that flows at
21 one level or another are protective while flows at another
22 level are not.

23 This uncertainty could make the Court's duty seem
24 difficult. This court's duty is not difficult, it is weighty,
25 but its duty is clear. The Court's duty is clear because we

1 stand in a courtroom, not in a legislative chamber. Congress
2 has made a choice to preserve endangered species, whatever the
3 cost. The judicial branch's duty is to enforce Congress'
4 will. The agencies have failed to carry out their duty to
5 prevent jeopardy and adverse modification. This Court must,
6 however reluctantly, assume that responsibility. In doing so,
7 the Court must, under controlling precedent, resolve
8 uncertainties in favor of the delta smelt.

9 Your Honor, you asked about the issue of take limits
10 and let me briefly address that. Our concern is protection of
11 the delta smelt. We do not believe the present take limits
12 are protected. On the other hand, invalidate -- or vacating
13 the Biological Opinion doesn't put in place new take limits.
14 And it may cause some take concerns for the agencies in
15 operation of these projects.

16 We do not require vacatur of the Biological Opinion
17 if the Court layers on top of it a protective remedy that
18 ensures that these project operations will not deepen the
19 jeopardy of the delta smelt or cause adverse modification of
20 their critical habitat.

21 But the Court's order must accomplish those purposes.
22 If the delta smelt loses its grasp, if the agency officials
23 and defendant scientists who have guessed wrong in the past
24 are guessing wrong again, if this Court's remedial order
25 shaves the protections too closely, there will be no second

1 chance. One of the species placed on this earth, a species of
2 little consequence to some, but incalculable value to
3 Congress, will disappear forever.

4 Your Honor, the defendants have not carried their
5 burden and this Court's duty is clear. We respectfully ask
6 the Court to adopt the proposed remedies described by Dr.
7 Swanson. Thank you.

8 THE COURT: Thank you, Mr. Wall.

9 MR. WALL: I'd be happy to answer any questions if
10 you'd like.

11 THE COURT: I don't think we have time for questions.
12 Mr. Maysonett.

13 MR. MAYSONETT: Your Honor, am I correct in
14 understanding that I should try to limit my comments to 15
15 minutes? Is that where we are?

16 THE COURT: I'm going to leave it to both the
17 defendants and the intervenors to divide the time as you see.

18 MR. WILKINSON: Yes.

19 MR. MAYSONETT: Thank you, Mr. Wilkinson.

20 THE COURT: So your colleagues will tell you. I will
21 not.

22 MR. MAYSONETT: Your Honor, every scientist that has
23 appeared before the Court has expressed serious concern over
24 the current status of the delta smelt and the decline that it
25 has experienced over the last four or five years. I'm not

1 going to dwell on those issues.

2 One question that I have heard the Court ask over and
3 over again is what have the agencies that operate these
4 projects been doing during that time to respond to the Delta
5 smelt's decline? I'd like to answer that question on behalf
6 of the Bureau of Reclamation and the US Fish & Wildlife
7 Service.

8 First, as the Court is aware, reclamation has
9 consulted with Fish & Wildlife Service repeatedly under the
10 Endangered Species Act on the effects of its operations on the
11 delta smelt.

12 It's operated the projects in compliance with the
13 Biological Opinion since 1995. It's implemented the Vernalis
14 Adaptive Management Program and other measures to benefit of
15 the delta smelt.

16 This summer, for example, as we heard Mr. Milligan
17 testify, reclamation took extraordinary steps for the benefit
18 of the delta smelt, limiting pumping down to one pump, which
19 Mr. Milligan testified was minimum, from April 22 until June
20 12th. First as part of the VAMP, and then later under
21 adaptive management.

22 Reclamation spent 5.2 million dollars to buy water to
23 augment flows on the San Joaquin River for the benefit of the
24 delta smelt.

25 As Mr. Milligan testified, as data came in showing

1 this decline of the delta smelt, reclamation reinitiated
2 consultation of the service in 2006 before the Court had
3 invalidated the most recent Biological Opinion.

4 Because it reinitiated consultation, reclamation also
5 took steps under Section 7(d) of the Endangered Species Act.
6 It has committed to not entering into any new long-term water
7 service contracts until the new Biological Opinion is
8 complete. It's halted progress on several major construction
9 projects, including the Delta Mendota Canal, California
10 Aqueduct Intertie. It's committed to maintaining pumping
11 within recent historic levels.

12 Reclamation and the service also participate in the
13 Pelagic Organism Decline group, which is sponsoring dozens of
14 studies to investigate the cause of this decline
15 comprehensively. And that the POD is -- which is the Pelagic
16 Organism Decline -- is staffed and funded in large part by the
17 Fish & Wildlife Service and Reclamation.

18 Now, in addition to those steps, Your Honor, the
19 service has convened an interagency team of biologists to
20 devise a matrix of actions that in the service's opinion will
21 protect the delta smelt over the coming years. That proposal
22 and its basis were described in Ms. Goude's declarations and
23 her testimony.

24 As Ms. Goude testified, the service's proposal is
25 based firmly in biology and was developed without the

1 consideration of potential economic impacts or reductions in
2 exports. And importantly, the service has concluded that it
3 will adequately protect the delta smelt over this interim
4 period.

5 In many ways, the service's proposal is not entirely
6 dissimilar from the suite of actions that the plaintiffs
7 themselves have proposed. Throughout their proposal, however,
8 the plaintiffs have generally, although not always, used more
9 restrictive flow levels.

10 And they have included additional actions, including
11 their action ten, the fall action, which would require certain
12 minimum outflows from the Delta during the fall.

13 As a result, the plaintiffs' proposal will use
14 significantly more water than the service's for benefits that
15 the service concluded were marginal or uncertain.

16 Now, the plaintiffs have objected throughout these
17 proceedings to any discussion of water costs. But I submit,
18 Your Honor, that the Court not only can, but that it must
19 consider the relative water costs of these proposals for
20 interim relief.

21 And when I say "water costs," Your Honor, allow me to
22 be clear. I'm not talking about the potential economic
23 consequences of reduced exports, although those are
24 considerable. I'm talking about the amount of water that
25 would be required to implement the actions.

1 As Ms. Goude explained, the service and the Bureau of
2 Reclamation cannot afford to look at project operations just
3 over one year -- without considering how those operations will
4 resound into the future. We have -- we are coming off a dry
5 year on the Sacramento and a critically dry year on the San
6 Joaquin. Storage at many reservoirs is below normal.

7 While there is disagreement over exactly how much
8 each of the -- these proposals will cost, there is broad
9 agreement that the plaintiffs' proposed action ten, the fall
10 action, will by itself use about half a million acre feet of
11 water.

12 So we know the plaintiffs proposed actions will use
13 more water. Depending on conditions in the basin, that
14 increased use of water could lead to low reservoir levels and
15 if conditions remain dry, the effects of those operations
16 could carry over through those reduced reservoir levels into
17 next year.

18 In deciding how the projects are going to be operated
19 over the next year, Your Honor, the Court cannot assume that
20 we're going to have a wet year. The Court has to at least
21 consider what will happen if we implement these actions and we
22 are entering the second of a series of dry years. The Court
23 has to consider the potential effects of a drought. And it
24 has to consider those issues not just because of economic
25 impacts, but because using water now may affect our ability to

1 meet the needs of listed species, including the Delta smelts
2 and listed salmon in the future.

3 Your Honor, with introductory remarks done, I'd like
4 to turn to the issue of remand and whether it should be with
5 or without vacatur.

6 What I hear the Court saying, at least in its
7 tentative ruling, is that it is considering remanding the
8 Biological Opinion, of course it's going to remand the
9 Biological Opinion, but doing so and vacating the Biological
10 Opinion at the same time. And we have grave concerns over
11 that result.

12 Because vacating the Biological Opinion will vacate
13 the incidental take statement contained in that opinion and
14 that incidental take statement shields reclamation and its
15 employees from civil and criminal liability under the
16 Endangered Species Act from take of delta smelt that occurs at
17 the pumps.

18 THE COURT: What is the legal authority for the Court
19 to leave in place an acknowledgedly insufficient
20 scientifically inadequate take measure that does not offer the
21 legally required protection of the species?

22 MR. MAYSONETT: Your Honor, I would say the cases
23 we've identified in our briefs support the conclusion that
24 vacatur can be without remand, where that --

25 THE COURT: Remand without vacatur.

1 MR. MAYSONETT: Is that -- the remand could be
2 without vacatur.

3 THE COURT: You got it backward.

4 MR. MAYSONETT: Vacatur without remand, I'm not sure
5 what that --

6 THE COURT: Nor am I.

7 MR. MAYSONETT: The remand could be without vacatur
8 or it would result in serious disruption. And without an
9 incidental take statement, we may have to shut the pumps down.
10 We'll have to obviously evaluate the legal status there very
11 carefully, but the pumps can't be operated with literally no
12 risk of causing take. And we will have to look at that issue
13 very, very carefully. We will have to operate the projects at
14 our peril.

15 I think the plaintiffs are correct, what we should do
16 is remand without vacatur, but then the Court should order
17 whatever interim relief it believes is appropriate based on
18 the evidentiary proceedings we've had to protect the delta
19 smelt over the next year. In that way, we will both protect
20 the delta smelt --

21 THE COURT: And they're willing to stipulate to that
22 if the level of protect they seek is imposed. That's what Mr.
23 Wall just said.

24 MR. MAYSONETT: Well, I understand that, Your Honor,
25 of course we --

1 THE COURT: Did you hear him?

2 MR. MAYSONETT: I did hear him, Your Honor. And we
3 would accept that stipulation, of course, we take the position
4 that the level of protection that should be imposed is the
5 level of protection proposed by the service.

6 Let me turn briefly, Your Honor, to some of the
7 important distinctions between the proposals before you. And
8 I'm going to focus on the differences between the plaintiffs'
9 proposals and the service's.

10 One of the obvious ones is this action ten, the fall
11 action, which would require us to keep X2 at 80 kilometers or
12 minimum outflows of the 7500 cfs, whichever is less water.
13 The theory is that it will increase the quality of the habitat
14 for the delta smelt.

15 As I've already said, the measure has a very
16 significant water cost. It's likely to use -- it depends on
17 the water year, of course, but it's likely to use about a half
18 a million acre feet of water.

19 As Ms. Goude testified, the service considered
20 including this kind of requirement in its proposal, but
21 ultimately decided that the benefits were too uncertain and
22 the water cost too high.

23 And in reaching that conclusion, the service wasn't
24 alone. None of the groups that have considered this kind of
25 fall action have actually recommended it, or at least not

1 without significant reservations. When the Delta Smelt
2 Working Group looked at this --

3 THE COURT: You know, let me ask. It wasn't
4 presented -- at least if it was presented, it certainly was
5 referred to, I haven't had a chance to read it.

6 But the Bennett study, any recommendations that came
7 out of the Bennett study. I know it wasn't for this project,
8 but do the most recent peer-reviewed scientific analysis of
9 the status, does that study recommend or address fall remedial
10 action?

11 MR. MAYSONETT: My understanding, Your Honor, is that
12 the plaintiffs' action ten is not based on the Bennett study,
13 but rather on the Feyrer study, which is Plaintiffs' Exhibit
14 5. The Feyrer study cautions that the degree at which -- the
15 Feyrer study had that analysis of environmental quality for
16 the delta smelt. And they caution that the degree to which
17 their analysis could be used for management purposes remain
18 unclear.

19 And I'd like to point out that one of the co-authors
20 of that Feyrer study was, in fact, sitting on the Delta Smelt
21 Working Group when the Delta Smelt Working Group considered a
22 very similar fall action. This is in Plaintiffs' Exhibit 10.
23 And the Delta Smelt Working Group thought about it and decided
24 not to recommend because it concluded that it was not likely
25 to result in a significant increase in the amount of habitat

1 quality or quantity.

2 And the Delta Smelt Working Group also cautioned that
3 before we did any kind of fall action like this, it should be
4 set up as an experiment first so that we could test the
5 competing hypotheses about what effects it might have. And
6 that hasn't been done.

7 It's also worth noting that the California Department
8 of Fish & Game and the Department of Water Resources in their
9 Pelagic Fish Action Plan thought about a similar action that
10 would maintain X2.

11 Now, that action did go from May to December instead
12 of just September to December, so it was a much longer term.
13 But they describe the effects of that action as having a high
14 scientific uncertainty. And they caution that it should not
15 be undertaken in below normal years because then it would have
16 potentially dramatic effects on storage levels and temperature
17 conditions for fish upstream in the fall. And that's at State
18 Water Contractors Exhibit C at page 48.

19 So the benefits of the proposed fall action, Your
20 Honor, are uncertain. It's not clear that it will
21 significantly increase the quantity or quality of habitat
22 available to the smelt. And as Dr. Hanson testified and Dr.
23 Swanson acknowledged, it's unclear how the smelt will respond
24 to whatever increase in habitat quality or quantity occurs.

25 What is certain is that the fall action will use a

1 lot of water and, depending upon conditions in the basin,
2 using that water may have long-term effects. It may
3 ultimately impair our ability to provide flows for the delta
4 smelt and for listed endangered salmon species in future
5 years.

6 For those reasons, Your Honor, we think the service
7 was right to reject it.

8 Turning briefly to monitoring, Your Honor, the
9 plaintiffs have proposed several monitoring actions. The
10 third, action three, would propose a new monitoring program
11 for sub-20 millimeter delta smelt. You had a brief colloquy
12 with counsel about that. We don't think that's appropriate.
13 I'm not sure that's clear.

14 We think that it suffers from important legal
15 scientific and simply practical problems. Legally, we don't
16 think there's a basis in the Endangered Species Act to order
17 an agency to conduct new monitoring. We believe that the
18 Endangered Species Act requires agencies to rely on the best
19 scientific and commercial data available. That's the standard
20 of the statute.

21 The statute doesn't allow the service to wait for
22 more better data to be developed and we think that the relief
23 here should be found on the same standards.

24 Significantly, I'm not aware of any case where a
25 Court ordered, under the Endangered Species Act claim, some

1 agency to conduct new monitoring.

2 We think there are scientific reasons to be skeptical
3 about the value of this data as both Dr. Swanson and Ms. Goude
4 explained. One of the reasons we have such valuable data on
5 the delta smelt is that so much of these surveys and so many
6 of this monitoring has been conducted for a long period.

7 And finally, there are practical problems, Your
8 Honor, in the sense that we wouldn't just have to hire new
9 staff, but it will take time. Telling two five-millimeter
10 fish larvae apart is very difficult. And the time it takes to
11 identify those larvae may create backlogs, it could jeopardize
12 our ability to create the real time salvage data that we have
13 been able to provide in previous years.

14 I think I'm going over my time here, Your Honor. I'm
15 getting that look from my co -- or the other counsel. So let
16 me just wrap up and say that in conclusion, Your Honor, the
17 service has developed a matrix of proposed actions that we
18 believe will protect the delta smelt over the next year. We
19 think it's supported by the science, that it's appropriately
20 flexible, give the operators the flexibility they need to both
21 protect the smelt and respond to conditions on the ground.
22 And that it makes the best use of water that we have, which is
23 important not just for other reasons, but because it will help
24 us in future years with smelt and other listed species. And
25 for that reason, it is narrowly tailored and it is the

1 appropriate injunctive relief.

2 THE COURT: And as I understand it, your position is,
3 for the federal defendants, remand without vacatur
4 implementing the protective conditions that are proposed in
5 the five point action matrix?

6 MR. MAYSONETT: Yes, Your Honor. That's correct.
7 That's what we advocate.

8 THE COURT: Thank you. Mr. Lee for the state.

9 MR. LEE: Your Honor, I just want to begin to say I
10 support that position of federal government. And I just want
11 to get that out of the way so we can go into the basis of the
12 statement.

13 Your Honor, all parties before this Court recognize
14 that the delta smelt are in a state of significant decline.
15 The California Department of Water Resources does not doubt
16 that this Court has repeatedly stated that business as usual
17 is not an option for the delta smelt or for the California
18 State Water Project.

19 At this end, the Department of Water Resources
20 embraced with two minor modifications the delta smelt action
21 matrix for water year 2008 prepared by the US Fish & Wildlife
22 Service and attached to the July 3rd, 2007 declaration of Cay
23 Goude. The Department of Water Resources takes this step
24 fully aware of the water supply consequences of this decision.

25 As the testimony of John Leahigh has disclosed,

1 adoption of a modified US Fish & Wildlife Service proposal
2 could cost the communities of this state that rely on Central
3 Valley Project and State Water Project water, as much as 1.4
4 acre feet of water in an average year and as much as 415,000
5 acre feet of water in a dry year.

6 Nonetheless the Department of Water Resources
7 recognizes that protection of the delta smelt at this time in
8 this proceeding is a first order priority for the state.

9 THE COURT: Let me ask one more question of Mr.
10 Maysonett because you reminded me of it.

11 MR. MAYSONETT: Yes, Your Honor.

12 THE COURT: Do you accept or reject the proposed
13 modification that Mr. Leahigh discussed this morning?

14 MR. WILKINSON: Negative 300 cfs instead of zero.

15 MR. MAYSONETT: It's not part of the service's
16 proposal, Your Honor, I think it's something that we would
17 have to evaluate. I don't know if the service has had a
18 chance to review it.

19 THE COURT: Between now and five p.m., I suggest that
20 you evaluate and have the Court an answer.

21 MR. MAYSONETT: Thank you, Your Honor. I'll get
22 right on that.

23 MR. LEE: Hopefully that came out of the federal
24 government's time, Your Honor.

25 THE COURT: Thank you, Mr. Lee, as always.

1 MR. LEE: In sorting out the appropriate protective
2 measures, I would like to focus on three categories of smelt
3 protection relating to three lifestages that were addressed by
4 the testimony before this Court.

5 One, what new measures are necessary to protect
6 pre-spawning adult smelt during that late winter period.

7 Two. What measures are necessary to protect juvenile
8 and larval smelt in the winter through spring period.

9 And three, is the plaintiffs' fall action designed to
10 impose the salinity level in the western Delta justified based
11 upon evidence that is before this Court.

12 Let's go straight to that first issue, Your Honor.
13 The protection of pre-spawning adults during the winter and
14 early spring period. As the testimony shows, beginning
15 roughly in December, adult delta smelt began to move upstream
16 from the confluence of the San Joaquin River and Sacramento
17 River into the Delta.

18 The Department of Water Resources supports two
19 actions to protect the smelt during this important lifestage.

20 First, the Department of Water Resources supports the
21 US Fish & Wildlife action number one. This action would
22 commence on or after December 25th or upon the occurrence of
23 certain turbidity events. For a ten-day period, negative
24 flows at Old and Middle River could not exceed negative 2,000
25 cubic feet per second.

1 Now, in reviewing the testimony over the last six
2 days, the primary dispute as to this action appears to be the
3 competing proposal of the plaintiffs in their action four.
4 The plaintiffs' action four proposes a zero negative flow
5 value for this period.

6 However, Ms. Cay Goude of the US Fish & Wildlife
7 Service testified that based upon the advice of her
8 biologists, biologist colleagues at the US Fish & Wildlife
9 Service, quote, negative 2,000 cfs would be sufficient for
10 this period." And that can be found in her August 23rd
11 testimony on pages 161 through 162.

12 This position is also reinforced by the testimony
13 today of Mr. John Leahigh, who indicated the very practical
14 problems given tidal and atmospheric conditions and other
15 diversions of meeting a zero flow requirement. DWR is not
16 aware of any contrary testimony directly disputing the
17 adequacy of the negative 2000 cfs value in action one and we
18 would therefore urge the Court to adopt this measure.

19 The second part of action one involves a separate
20 kind of action. DWR endorses this modified version
21 characterized -- I'm sorry -- in US Fish & Wildlife Service
22 action number two. The US Fish & Wildlife Service recommends
23 that upon onset of spawning, that the daily net upstream flow
24 of old Middle River not exceed negative 4,500 cfs for a 14-day
25 running average and a negative 5,000 cfs for a seven-day

1 running average.

2 The Department of Water Resources would recommend
3 modifying this measure, and this is one of the two modest
4 modifications, to negative 5,500 cfs for a 14-day running
5 average, and negative 6,000 cfs for a seven-day running
6 average at Old and Middle River.

7 Now, what is the scientific basis for this? Because
8 that is -- in the end is where we are at. The Department of
9 Water Resources bases its modification after reviewing the
10 only scientific data presented to this Court on statistical
11 relationship between project salvage of smelt and the Old and
12 Middle River flows.

13 One, the graph prepared by Dr. Pete Smith contained
14 in Figure 8 of the July 23rd 2007 declaration of Dr. Swanson,
15 that would be Plaintiffs' Exhibit 11. And 2, Exhibits B and C
16 attached to the July 9th, 2007 declaration of Jerry Johns, DWR
17 Exhibit G.

18 Let's go to the Pete Smith declaration. Excuse me.
19 The Pete Smith figure. As both plaintiffs' experts Dr. Moyle
20 and Dr. Swanson have affirmed in their testimony, Dr.
21 Smith's -- Dr. Smith's graph contains altered data points.
22 This concession can be found on Dr. Moyle's testimony on
23 August 21st at page 119 and Dr. Swanson's testimony on August
24 23rd.

25 Dr. Moyle testified that the practice of altering

1 data and preparing a regression analysis was not consistent
2 with acceptable scientific practice. And that it was his
3 estimate that the R-squared value would decline if erroneous
4 data points were removed. That again can be found in Dr.
5 Moyle's August 21st testimony.

6 Moreover, Dr. Swanson testified that she was aware
7 that Mr. -- that Dr. Smith's graph contained altered data
8 before she prepared and submitted her declarations to this
9 Court. But explained -- but failed to explain that fact to
10 this Court in her declarations.

11 Given these circumstances, the Department of Water
12 Resources submits that this Court should not -- should not
13 give any weight or very little weight to Dr. Smith's
14 regression analysis. The submittal of an analysis based upon
15 altered, dare we say falsified data, even for a noble purpose,
16 should not be encouraged by this Court.

17 Now, to the contrary, the graphs contained in
18 Exhibits B and C of Jerry Johns' July 2007 declaration do not
19 contain any altered data points. That can be found at DWR
20 Exhibit G. A review of these graphs disclosed that for the
21 months of January and February, smelt take significantly
22 increases at the point where Old and Middle River flows exceed
23 negative 6,000 cfs. Plaintiffs contend that splitting data
24 between January and February somehow, quote, "distorts," end
25 of quote, the information.

1 However, when forced to move beyond the hypothetical
2 and to consider the actual real world data displayed in the
3 graphs, the plaintiffs have not been able to point to any real
4 world data example of how splitting the data between the two
5 months had any policy consequences for recommended negative
6 flows in Old and Middle River. Exhibits B and C to Jerry
7 Johns July declaration therefore represents the best available
8 science regarding the relationship between project salvage and
9 Old and Middle River flows.

10 In summary, the testimony before the Court supports
11 the US Fish & Wildlife Service action number one and supports
12 action number two as modified by Exhibits B and C to the Johns
13 declaration.

14 If I can move on now to the second lifestage that I'd
15 like to talk about, which is the protection of juvenile and
16 larval smelt during the winter through spring. Here, Your
17 Honor, we have two clear choices. Do you want to rely upon
18 the US Fish & Wildlife Service as they have proposed in their
19 actions three and four of their matrix to assess real time
20 data from sources such as temperature data, Kodiak Trawl
21 Surveys, Particle Tracking Models, salvage data and the 20
22 millimeter survey, and to make flow decisions within a
23 designated range of flows based upon this data or do you want
24 to adopt the plaintiffs' inflexible flow requirements that
25 would mandate specific flows regardless of what the real time

1 data would tell you. These are the two choices that the
2 plaintiffs and the defendants have presented with regard to
3 their competing remedy proposals.

4 Now, plaintiffs have objected to the US Fish &
5 Wildlife Service's actions three and four on the grounds they
6 are triggered by allegedly unreliable monitoring data. So I
7 would urge the Court to go back and look at the testimony,
8 both of Dr. Moyle and Dr. Swanson. They contend that the
9 unreliability derives from the unreliability of the 20
10 millimeter survey and that it does not adequately detect
11 larval smelt.

12 Let us assume that's true, Your Honor. The review of
13 Attachment A to the US Fish & Wildlife Service matrix
14 discloses that the matrix relies on multiple sources for real
15 time data. Not just the 20 millimeter survey. And that would
16 be DWR Exhibit A.

17 Both Dr. Moyle and Dr. Swanson testified that
18 temperature data and the Kodiak survey data provided reliable
19 information regarding spawning adult smelt and therefore
20 provided a reliable predictor of the likely presence of smelt
21 larvae one to two weeks later. This can be found in the
22 August 21st testimony of Dr. Moyle and the August 22nd
23 testimony of Dr. Swanson.

24 So notwithstanding the plaintiffs' assertion,
25 reliable tools for detecting larval smelt do exist and have

1 been applied.

2 However, Your Honor, there's a bigger dispute here
3 than a simple quibble over the efficacy of monitoring. The
4 heart of the plaintiffs' objection to the US Fish & Wildlife
5 Service's action three and four is the plaintiffs simply
6 believe that the US Fish & Wildlife Service cannot and should
7 not be trusted to choose among the range of flows for this
8 time period based upon sound biological science.

9 Now, if this Court believes that the US Fish &
10 Wildlife Service cannot be trusted to make these judgments,
11 then I cannot see any other conclusion than having the Court
12 side with the plaintiffs and reject actions three and four.

13 THE COURT: Well, let's look at the evidence and you
14 can respond to this. I specifically asked questions of the
15 operator, at least the federal operator, for that very
16 purpose. Because in light of conditions that caused the
17 experts who had been constituted under the Biological Opinion
18 DSRAM to do exactly that, they made recommendations. Those
19 recommendations were certainly considered. They were neither
20 implemented nor followed. So in terms trusting the agency,
21 that's exactly what that speaks to.

22 MR. LEE: Your Honor, may I respond directly to that?

23 THE COURT: That's what I'm asking you to do.

24 MR. LEE: I think that rather proves or supports the
25 point that I'm trying to make rather than contradict it. The

1 profound and dividing distinction between the DSRAM that was
2 in the 2005 Biological Opinion and the US Fish & Wildlife
3 Service matrix presented is as Ms. Goude said, the service in
4 the matrix makes the final call. That was never clear from
5 the DSRAM process and it is clear certainly to the Department
6 of Water Resources' position that the final call for measures
7 that are adapted in the matrix will be made not by a
8 collective group such as the WOMET, not by service heads, but
9 by -- not by agency heads, but by the service and the service
10 alone.

11 I might say this is sort of difficult for a lawyer
12 for the State of California to say in a federal court, but in
13 this situation, we agree that the federal agency, the US Fish
14 & Wildlife Service is where the buck stops. And that is a
15 material difference from the DSRAM process, Your Honor.

16 Now, to the contrary, the plaintiffs' flow regime for
17 this time period are based upon what we would submit is
18 uncertain science. The plaintiffs have grounded their flow
19 recommendations for this time period on the 2006 PowerPoint of
20 Dr. William Bennett. The presentation that has been
21 colorfully called the Big Mama theory.

22 However, Dr. Moyle, in his own testimony, repeatedly
23 characterized the Bennett presentation not as settled
24 scientific consensus view, but as a, quote, "hypothesis," end
25 of quote.

1 As noted by most of the testimony, Dr. Bennett's
2 hypothesis has not yet been reduced to writing and it appears,
3 from the testimony of Dr. Miller, that Dr. Bennett has not
4 been willing to even share the PowerPoint presentation or its
5 underlying data with others. We submit that this is a very
6 slender reed to support a fish action that may cost the
7 projects hundreds of thousands of acre feet solely based upon
8 a preliminary hypothesis.

9 With one minor modification, the Department of Water
10 Resources supports the US Fish & Wildlife Service action. As
11 has been noted earlier, the action has a zero to negative
12 4,000 cfs range.

13 Based upon the testimony of John Leahigh, which we
14 heard this morning, the Department of Water Resources would
15 submit that hydrologic justification submits for upping the
16 low end from zero to negative 1500. But in all other
17 respects, the Department of Water Resources supports that
18 measure.

19 THE COURT: And leave the upper end at negative 4
20 ,000?

21 MR. LEE: Yes, Your Honor. Last point, Your Honor.
22 The fall measures for habitat protection. I first wanted to
23 put aside a straw --

24 THE COURT: This is number ten.

25 MR. LEE: Yes, this is fall action number ten, Your

1 Honor. First of all, I want to put aside a straw man argument
2 raised by plaintiffs, which is that the claim that -- the
3 matrix by the US Fish & Wildlife Service does nothing for
4 smelt habitat. We can argue repeatedly what the matrix says,
5 but we would ask the Court to look at the testimony of Dr.
6 Moyle on August 21st, 2007 on page 108 of the transcripts.

7 "Question: If the projects were, in fact, to reduce
8 pumping and minimize or reduce the amount of negative
9 flow in the San Joaquin or Old and Middle Rivers,
10 would that have a beneficial effect on the smelt's
11 habitat in the south Delta?

12 "Answer: Yes. I think it would."

13 So the issue is not whether the plaintiffs' proposal
14 addresses habitat issues and the US Fish & Wildlife proposal
15 ignores them, the issue is which habitat measures are
16 supported by the best available science. DWR would submit
17 that the best available science is -- does not justify the
18 fall action suggested by the plaintiffs.

19 I want to move quickly through this, simply to
20 comments related to Feyrer paper, which appears to be the only
21 source of data that has not been established to be
22 statistically insignificant. The Feyrer article should be
23 read alongside the recommendation for the Delta Smelt Working
24 Group, who have considered this issue on numerous occasions.

25 On page 732 of the Feyrer article, this will be

1 Plaintiffs' Exhibit 5, the authors conclude, quote, "The
2 degree to which EQ could be used for management purposes
3 remains unclear."

4 In its August 21st, 2006 delta smelt meeting notes,
5 the delta smelt group addressed the fall X2 issue and
6 concluded, quote, "It did not recommend it because 7,000 cubic
7 feet per second is not enough flow to detectably change
8 physical habitat quantity and quality for the delta smelt."
9 That's Plaintiffs' Exhibit Number 10.

10 On page 732 of the Feyrer piece, the article states,
11 "For the water quality" -- "that for the water quality data to
12 be most effect tough for species management, additional
13 information is needed." End of quote.

14 The delta smelt Working Group's August 21, 2006
15 meeting notes similarly state that there is need for further
16 experimentation to test this hypothesis.

17 Thus the two non-advocacy biological experts who have
18 offered opinions in this case agree that there is no need for
19 fall salinity action today and there is need for additional
20 study. This is not surprising since the authors of the delta
21 smelt -- of the Feyrer paper and the members of the Delta
22 Smelt Working Group overlap.

23 In conclusion, DWR would recommend that the interim
24 remedy, the US Fish & Wildlife Service matrix with the
25 modifications be adopted. It is the intent of the Department

1 of Water Resources to follow such a modified matrix as a first
2 order of protection for the smelt. Where consistent with this
3 matrix, the Department of Water Resources would otherwise
4 continue to operate the State Water Project as described in
5 the 2005 BiOp, including the continuation of the EWA.

6 We are now very close to the end of a very long
7 period for all of us. We ask this Court to adopt a remedy
8 that we think is both -- that we think is protective, that we
9 think is feasible and that we think is fair. That remedy, we
10 submit, is the modified US Fish & Wildlife Service matrix as
11 we've described it.

12 THE COURT: Thank you, Mr. Lee. We're going to do
13 one more before we break.

14 MR. WILKINSON: Thank you, Your Honor.

15 THE COURT: Mr. Wilkinson.

16 MR. WILKINSON: Your Honor, I'm going to dispense
17 with the preliminaries. I don't think you need them and I
18 don't have the time. I'm going to start by going through the
19 actions in the order in which they would take effect. I'd
20 like to give you then our comments on those as they would
21 occur.

22 THE COURT: Well, just tell me where -- the
23 fundamental position the State Water Contractors have. Tell
24 me where you are.

25 MR. WILKINSON: Our fundamental position is that Dr.

1 Hanson's tier one, tier two and tier three measures are the
2 ones we believe the Court should impose.

3 I'm going to start, though, with Dr. Swanson's action
4 ten, which is proposed to begin tomorrow. We believe the
5 evidence is insufficient to support that measure. No one,
6 including Dr. Swanson or Dr. Moyle, could tell us whether or
7 by how much smelt abundance could increase if that measure was
8 implemented. And there has been absolutely no demonstration
9 that this action is needed.

10 Instead, the evidence is uncontradicted that the
11 state project and federal project are already meeting water
12 quality objectives that will provide suitable salinities for
13 the smelt and particularly for the sub-adult delta smelt and
14 will continue to do so through the fall. Those salinities,
15 Your Honor, that will result at Kilometer 80 are well within
16 the salinity tolerance of the species.

17 Now, as Mr. Maysonett mentioned, Dr. Swanson's action
18 would require about half a million acre feet of water to
19 implement. Because of that, we think it's important to ask
20 what is it based on. The answer is it is based on a single
21 article whose authors have already indicated that the extent
22 to which their work can support management actions is unclear,
23 that there is no statistically significant relationship
24 between their EQ measure and smelt abundance at Kilometer 80
25 and that more information is needed to understand the

1 mechanisms that may underlie an EQ abundance relationship.

2 And as was mentioned by Mr. Lee, two of the authors
3 of that article sit on the Delta Smelt Working Group, Mr.
4 Nobriga and Mr. Sommer. And when that group considered a fall
5 action, Mr. Nobriga was on the group and the group declined to
6 recommend the action.

7 They did so because they concluded that releasing a
8 rate of water, about 70,000 cfs, very similar to that proposed
9 by Dr. Swanson, would not be sufficient to make any detectable
10 change in physical habitat quality or quantity. And also that
11 it would not likely change the distribution of the overbite
12 clam and the -- I guess it's the underbite clam, the fresh
13 water clam.

14 And it's -- as I think Mr. Maysonett mentioned, the
15 Pelagic Fish Action Plan was another indication, another
16 instance where the fall action measure was not recommended.

17 Simply put, we believe that Dr. Swanson's action
18 number ten is built on insufficient science, is supported by
19 no one other than Dr. Swanson and would impose enormous water
20 supply costs to achieve unknown impacts on smelt abundance.
21 It should not, we believe, be part of any remedy that the
22 Court imposes.

23 Now, the next action that would come up in
24 chronological order would be Dr. Hanson's tier one measure.
25 This action would commence on December 1 of this year. That's

1 almost a month earlier than Dr. Swanson's action number four
2 and a month earlier than the Fish & Wildlife Service's action
3 matrix.

4 Dr. Hanson's tier one measure is intended to maintain
5 a positive net westerly flow in the lower San Joaquin River in
6 order to push young smelt out of the influence of the projects
7 and prevent the intrusion of turbidity.

8 And Your Honor, it is costly. According to Mr.
9 Leahigh's testimony this morning, it would require about
10 300,000 acre feet to implement if 2007 or 2008 are dry or
11 average. It is not by any means or any stretch of the
12 imagination business as usual. And it would not put the smelt
13 at risk at all. There is no downside for the species by
14 implementing Dr. Hanson's tier one measure.

15 The upside for those who rely on the projects, and
16 the reason we are willing to bet almost 300,000 acre feet of
17 water on it, is that we believe it will work and it will avoid
18 the need for more restrictive measures to be implemented in
19 the winter and spring. And Your Honor, if it doesn't work, we
20 have Dr. Hanson's tier two measure, a modification of the Fish
21 & Wildlife Service's matrix to rely on.

22 Now, the next actions chronologically that would come
23 up as the calendar proceeds would be Dr. Swanson's action
24 number four and the Fish & Wildlife Service's action number
25 two. Both actions would commence about Christmas Day.

1 Dr. Swanson's action four would require the
2 management of Old and Middle River flows to achieve a target
3 negative 3500 cubic feet per second from about Christmas Day
4 to the end of February or the onset of spawning. The only
5 science cited by Dr. Swanson to support her measure number
6 four is the Pete Smith graph that attempted to plot delta
7 smelt salvage against reverse flows in Old and Middle River.

8 But we do know that Dr. Smith altered the data in his
9 graph. We also know that Dr. Smith has now decided that his
10 graph is not final, it is, quote, "preliminary" and, quote,
11 "subject to modification."

12 In addition, Your Honor, we know that Sheila Greene
13 of the Department of Water Resources reanalyzed the same data
14 that was used by Dr. Smith and found that the salvage of
15 pre-spawning delta smelt shows no significant increase below
16 Old and Middle River flows of negative 6,000 cfs.

17 Now, the difference in allowing Old and Middle River
18 flows of negative 6,000 cfs instead of negative 3500 cfs is
19 enormous in terms of the water supply impacts. It is 5,000
20 acre feet of water per day or 150,000 acre feet per month or
21 300,000 acre feet over the two month period that Dr. Swanson's
22 action number four is proposed to be in effect.

23 Now, not only does Dr. Hanson's tier two measure and
24 action number three of the Fish & Wildlife Service matrix
25 offer more flexibility in adjusting project operations to real

1 time circumstances, they are more protective than Dr.
2 Swanson's actions since they allow for lower as well as higher
3 Old and Middle River flows if the circumstances warrant.

4 Now, we do have concerns, however, with the action
5 number three in the Fish & Wildlife Service matrix and I think
6 Your Honor has identified those. The low end of the Fish &
7 Wildlife Service range of Old and Middle River flows is zero.
8 This --

9 THE COURT: Or negative 15 --

10 MR. WILKINSON: No, it's zero. The negative 1500 is
11 the DWR modification.

12 THE COURT: Modification. That's right.

13 MR. WILKINSON: Correct. That's right. We believe
14 that modification is appropriate. Certainly the Fish &
15 Wildlife Service action number three is more protective than
16 Dr. Swanson's negative 3500, but we believe it's too low.

17 THE COURT: Let me ask you a legal question.

18 MR. WILKINSON: Yes, sir.

19 THE COURT: We've had strenuous objection from San
20 Luis and Delta Mendota and Westlands to the Court's authority
21 to do anything immediate. In effect what they say legally is
22 that the Court has no jurisdiction to tell the agency to do
23 anything. What's your legal position?

24 MR. WILKINSON: What is my position on that?

25 THE COURT: Yes. The State Water Contractors. What

1 is the legal position of the State Water Contractors?

2 MR. WILKINSON: Your Honor, we have not taken the
3 position that the Court has no authority. We do believe that
4 the Court needs to narrowly tailor any release that it does
5 grant. We believe that the Court, if it is presented with
6 multiple remedies, each of which would prevent jeopardy and
7 avoid adverse modification, that the Court not only may, but
8 should and is obligated to choose the measure which is the
9 least damaging. And here we think that is the case with
10 regard to this question about zero or negative 1500 cfs.

11 As Mr. Milligan testified when Your Honor questioned
12 him, it would be extremely difficult for the projects to meet
13 that flow. Because even if they completely shut down, there
14 are others within Old and Middle River who divert. And those
15 diversions cause reverse flows.

16 So by requiring projects to mitigate those reverse
17 flows, to bring them down to zero, the service's matrix in
18 effect is obligating the projects to make up for the impacts
19 caused by those who are not project water users. We think
20 that's not only unfair, but it's probably illegal. We don't
21 think that authority extends that far.

22 So we believe that both Dr. Hanson's tier two measure
23 and the modification of the matrix proposed by the Department
24 of Water Resources is highly appropriate in these
25 circumstances because it would tailor the remedy to the damage

1 caused by the projects in terms of reverse flows.

2 THE COURT: Is the answer to my question that if the
3 agencies consent, then the authority exists?

4 MR. WILKINSON: I think I could support that view.

5 THE COURT: You may proceed.

6 MR. WILKINSON: I want to talk next, Your Honor,
7 about Dr. Swanson's actions five, six and seven. These
8 actions are intended to mimic the low end of the VAMP export
9 rates. In their entirety, they are based upon work by Dr.
10 Bennett that is unpublished, that has not been peer reviewed
11 and that is not publically available. There is not a single
12 party to these proceedings who has been able to see anything
13 other than the PowerPoint presentation mentioned by Mr. Lee.
14 Dr. Bennett has issued no paper. He has not made his
15 underlying data available to anyone.

16 To impose that measure, those measures based upon
17 that underpinning, we believe would be not only inconsistent
18 with the principles of scientific method, but would be
19 incompatible with the legal requirements of the Endangered
20 Species Act itself. This is not science that is available as
21 the Act requires. And this is a significant matter.

22 Those actions five, six and seven that have been
23 proposed by Dr. Swanson would target flows at Old and Middle
24 River at negative 1500 cfs for the entire period of time from
25 February through early to mid July. It's a long period of

1 time.

2 Now, by contrast, the Fish & Wildlife Service matrix
3 would manage flows during that period to a range from zero to
4 4,000, negative 4,000 cfs. If the flows are at negative 4,000
5 cfs, the difference between Dr. Swanson's measures, based upon
6 this Bennett unpublished work versus the matrix could be up to
7 5,000 acre feet a day. Again, that would be 150,000 acre feet
8 a month or about 300,000 acre feet over the period that Dr.
9 Swanson proposes to implement her measures.

10 THE COURT: And doesn't DWR want these modified as
11 well, these flows?

12 MR. WILKINSON: DWR is content, I believe -- and Mr.
13 Lee correct me -- to go with the zero to 4,000. We believe,
14 during this period of time, that the flows should be negative
15 1,000 to negative 6,000 cfs. And Mr. Lee, am I correct about
16 that, in terms of the department's position?

17 MR. LEE: Are you talking about -- excuse me, are you
18 talking about action three?

19 MR. WILKINSON: Yes, it's over the period of time.

20 THE COURT: No, we're in five, six and seven now.

21 MR. WILKINSON: Swanson's five, six and seven,
22 states --

23 MR. LEE: As I understand it, Swanson's five, six and
24 seven are in the same time period as three and four.
25 We -- the range here would be consistent with your

1 understanding, which would be negative 1500 cfs to 4,000.

2 MR. WILKINSON: Thank you.

3 MR. LEE: That would be our modest modification to
4 this particular element of the matrix.

5 MR. WILKINSON: Our modifications over that period,
6 Your Honor, are about the same on the low end, they go a
7 little higher on the upper end to negative 6,000. As the
8 testimony indicated, that modification would be based on the
9 work of Sheila Greene. That was the sort of L shaped curve
10 that you saw in a couple of graphs that indicated the
11 uptake --

12 THE COURT: That is the zone of danger, negative
13 6,000 --

14 MR. WILKINSON: 6,000. Right. And so we believe
15 that the upper end of that range should not be 4,000, but
16 should be 6,000 based on the work done by Ms. Greene.

17 Now, the next action that would take effect
18 potentially would be Dr. Hanson's tier three measure. This is
19 the only proposal before the Court, the only one, that
20 provides for an immediate curtailment of project operations in
21 the event that project pumps are found to be taking a
22 significant number of delta smelt. This proposal would shut
23 down the project pumps in that event and would give the
24 agencies the time to decide what should be done to further
25 protect the smelt.

1 THE COURT: We can't, as we learned in June, have a
2 complete shut down because that disables the pumps.

3 MR. WILKINSON: It could potentially do that.

4 THE COURT: At least disables the federal system's
5 pumps.

6 MR. WILKINSON: It could potentially do that. And
7 Dr. Hanson's measure, I think the question was asked
8 yesterday, are there triggers for that action. There are
9 triggers, Dr. Hanson testified that he would rely on the
10 Kodiak trawl, the fall midwater trawl data and the Particle
11 Tracking Model to implement that tier three measure.

12 So in that sense, our proposal goes beyond those of
13 any of the other parties. We think it may be appropriate --
14 we would be content, frankly, Your Honor with the Fish &
15 Wildlife Service action matrix if the lower end of that zero
16 to 4,000 range was increased to negative 1500 and if the upper
17 end of the range was increased to negative 6,000 to correspond
18 with the data from Sheila Greene.

19 To conclude, Your Honor, all of the proposals that
20 you have heard are going to prevent jeopardy to the delta
21 smelt and will prevent adverse modification to the critical
22 habitat. Dr. Swanson's proposal, we believe, is enormously
23 consumptive of water resources. The testimony this morning
24 was that it could take up to 60 percent of the combined yield
25 of both projects. And we think it largely ignores real time

1 data and that that is inappropriate in the circumstances
2 facing the smelt.

3 These real time data around which the matrix is
4 constructed of the Fish & Wildlife Service, the modified
5 matrix of DWR and our proposal are the best available science.
6 And they are integral to both those matrices and ours.

7 Because Dr. Hanson's modifications are the most
8 narrowly tailored remedy, we believe, we think that remedy
9 should be the one that you adopt.

10 THE COURT: Thank you, Mr. Wilkinson.

11 MR. WILKINSON: Thank you, Your Honor.

12 THE COURT: Now, what, Mr. O'Hanlon, Mr. Buckley,
13 what are you going to do with regard to your arguments?

14 MR. O'HANLON: Your Honor, I have a few comments. I
15 have significantly reduced the scope of my comments in
16 response to the Court's direction, but I would like to
17 make --

18 THE COURT: I haven't directed you to reduce them at
19 all. I've only asked questions so that the questions could be
20 addressed. I didn't in any way suggest that you attenuate or
21 limit the arguments you will present.

22 MR. O'HANLON: I understand, Your Honor. I didn't
23 mean to say direction. I meant to say Court's comments. I
24 changed the focus of my comments in response to the Court's
25 comments.

1 THE COURT: And can you address the issues I've
2 raised about your client's positions in the litigation?

3 MR. O'HANLON: Yes, Your Honor, I can address issues
4 that the Court has indicated are still relevant. In terms of
5 a remedy proposal, I don't have an alternative remedy proposal
6 to make and we do not endorse any of the remedy proposals made
7 by the other parties.

8 THE COURT: Understood. Mr. Buckley, what's your --

9 MR. BUCKLEY: Yes, Your Honor, I think as you know, I
10 sat quietly through most of the proceedings here.

11 THE COURT: Yes, you have.

12 MR. BUCKLEY: I would like to make a closing argument
13 of approximately six or seven minutes. We do have a position
14 with respect to the remedy proposals. We will, in a qualified
15 way, endorse one of them. I would like to address some of the
16 comments plaintiffs have made about the cause of this problem,
17 which I don't think, on behalf of my client, I can leave
18 unanswered.

19 THE COURT: All right.

20 MR. BUCKLEY: I but I don't think it will take more
21 than six or seven minutes.

22 THE COURT: Thank you. Mr. Wall, are you planning on
23 making a rebuttal?

24 MR. WALL: Your Honor, there are a few specific
25 factual assertions have been made that I do feel I need to

1 respond to.

2 THE COURT: Can you do it in five minutes?

3 MR. WALL: I will -- I'll tailor it to five minutes.

4 THE COURT: Thank you. All right. Let's stand in
5 recess until 15 minutes before five.

6 (Recess.)

7 THE COURT: Please be seated, ladies and gentlemen.
8 We're going to proceed with closing arguments. Mr. O'Hanlon.
9 You may proceed.

10 MR. O'HANLON: Thank you, Your Honor. We
11 respectfully disagree with the Court's decision to impose an
12 order against project operations. The Court has indicated
13 that it found the evidence does not preponderate in our favor.
14 I will not try to further argue that evidence now.

15 The Court has explained that it will consider the
16 impacts of the remedy for limited purposes. I will address
17 that. I cannot overstate the seriousness of the impacts that
18 these proposals would impose. The farmers in the CVP service
19 area south of the Delta are already perpetually short of
20 water. These impacts would be on top of those impacts. They
21 will feel these measures directly and acutely. In a sense,
22 they are in peril too.

23 Now, Mr. Leahigh calculated the combined export
24 reductions for the CVP and the SWP. We submitted the
25 declaration of James Snow, two declarations, that translate

1 those delivery reductions for the CVP into the delivery
2 reductions for CVP contractors taking into account two
3 factors. One, the application the CVPIA Section 3406(b)(2)
4 and, two, the differing priorities among CVP contractors.

5 Mr. Snow, in his declaration, calculated the delivery
6 reductions as follows: For ag service contractors south of
7 the Delta, in an average year, their current base supply is 55
8 percent contract entitlement. Under the plaintiffs' proposal,
9 they will receive a zero allocation. In a dry year, their
10 base allocation is 30 percent. Under the plaintiffs'
11 proposal, they again will receive zero allocation. No water
12 under the plaintiffs' proposal.

13 The US Fish & Wildlife Service matrix actions are a
14 bit better, but still very severe. Instead of a base supply
15 of 55 percent in an average year, their deliveries will be
16 reduced to 20 to 40 percent. In a dry year, under the Fish &
17 Wildlife proposal, deliveries would be reduced to five to 25
18 percent of the contract entitlement.

19 Under the DWR revised proposal, in an average year,
20 from the base of 55 percent contract entitlement, they will
21 receive 25 to 45 percent. And in a dry year, 20 to 30 percent
22 of their contract supply. And these figures, Your Honor, are
23 set forth in San Luis Exhibit I at paragraphs 9 and 10 and San
24 Luis Exhibit J at paragraphs 7.

25 For municipal and industrial contractors, CVP

1 contractors south of the Delta, in an average they would go
2 from a base supply of 80 percent to a 50 percent supply under
3 the plaintiffs' proposal. And the same number for a dry year.
4 And that, Your Honor, can be found in San Luis Exhibit J in
5 paragraphs 5 and 7.

6 The declarations of Russ Freeman, Westlands Water
7 District, San Luis Exhibit L; William Harrison, San Luis
8 Exhibit M; and Daniel Nelson, San Luis Exhibit K, translate
9 those shortages into the fiscal impacts within the CVP service
10 area.

11 Mr. Freeman's declaration describes how the loss of
12 CVP water within Westlands would affect the lands within
13 Westlands. As he explains, it would be a much increased
14 reliance on groundwater with risk of subsidence, land will be
15 fallowed, with all the consequent impacts, including dust
16 emissions.

17 Mr. Harrison's declaration describes the impacts in
18 the Del Puerto Water District. As he describes, there are
19 23,000 acres of row crops within his district. Under
20 plaintiffs' proposal and zero allocation, there will be no
21 water for that land.

22 Finally, Mr. Nelson, who was executive director of
23 the San Luis and Delta-Mendota Water Authority declares that
24 similar impacts will be felt throughout the remaining service,
25 ag service districts.

1 There's municipal industrial impacts which are
2 described in declaration of Joan Maher, the State Water
3 Contractors exhibit. In a word, Your Honor, the impacts of
4 plaintiffs' proposals in particular would be brutal within the
5 CVP service area. The other measures are not much better.
6 And again, pose severe, severe shortages.

7 I'll briefly address the measures to limit
8 entrainment at the project pumps. There's been lots of debate
9 about what the levels reverse flows should be allowed. In all
10 the analyses, though, one important factor was left out. Both
11 in the analyses by the DWR and the analysis put forth by the
12 plaintiffs by Dr. Pete Smith. That is none of those analyses
13 considered abundance in their calculations. And accordingly,
14 they overstate the effect of reverse flows on salvage.

15 With respect to action number ten, in the plaintiffs'
16 proposal, fall outflow requirement, Dr. Miller did what we
17 think is a very practical and sensible analysis, which is to
18 ask whether in past years of high fall outflow more delta
19 smelt were produced.

20 So he analyzed whether, in those high outflow years,
21 the fall midwater trawl index went up, either within the same
22 year or in the subsequent year. And the answer is no.
23 There's no relationship. And that's in San Luis Exhibit F.

24 And I won't respond further to counsel's comments
25 about Dr. Miller other than to say to his analogy, tomatoes do

1 not eat gloves.

2 There's uncertainty under all of these proposals. If
3 anything characterizes the basis for these actions, it is
4 uncertainty. There is no quantification of the benefit that
5 each measure will provide in terms of increased abundance of
6 delta smelt. There's been no comparison, even, of what the
7 abundance will be with and without the measures.

8 Plaintiffs at least say no one can estimate how many
9 delta smelt there are or how many there need to be to ensure
10 their long-term survival.

11 I disagree with counsel that this case is like TVA
12 versus Hill. It is not anything like TVA versus Hill. In
13 that case, it was undisputed that completion of the dam would
14 cause the extinction of the snail darter.

15 Here, what the projects are, what the benefits of
16 their proposed measures will be are very much in dispute and
17 very uncertain.

18 The Court asks about vacatur of the Biological
19 Opinion. We would urge the Court not to vacate the Biological
20 Opinion. The Court has concern about the incidental take
21 statement in that Biological Opinion, that it's outdated, that
22 it doesn't reflect current abundance levels.

23 Our suggestion would be that in its order of remand
24 without vacatur, the Court could set a time for the Fish &
25 Wildlife Service to develop a new incidental take statement.

1 There is some time to do that before take would occur again as
2 a result of project operations.

3 THE COURT: Let me ask Mr. Maysonett. Is that
4 feasible?

5 MR. MAYSONETT: Your Honor, an incidental take
6 statement is written as part of the Biological Opinion. It's
7 an issue that the service is going to be developing as it
8 develops a new Biological Opinion. Until the analysis, the
9 opinion is complete, I don't know that it makes sense to
10 require the service to write a separate interim incidental
11 take statement.

12 THE COURT: Thank you. You may proceed, Mr.
13 O'Hanlon.

14 MR. O'HANLON: Thank you, Your Honor. Plaintiffs'
15 counsel said that the federal government has the burden of
16 proof here. I disagree. The cases that plaintiffs cite all
17 involve circumstances where the action agency was found to be
18 in violation of its obligations under Section 7(a)(2) as the
19 Thomas v Peterson case and the Washington Toxics case.

20 This Court in its summary judgment ruling did not
21 find that reclamation is in violation of its obligations under
22 Section 7(a)(2). Those cases are inapposite. The burden is
23 on the plaintiffs and it is their burden to prove that the
24 Bureau of Reclamation's assessment of its obligations are
25 arbitrary and capricious.

1 With respect to a remedy proposal, Your Honor, I
2 cannot in good conscience endorse on behalf of my clients any
3 of the remedy proposals currently before the Court.

4 As the Court knows, we do not believe that the
5 projects are the cause of the decline of the delta smelt,
6 including particularly the recent decline since 1999. We do
7 not believe that imposing further restrictions on the projects
8 will provide any benefit to the delta smelt. However, those
9 measures will impose severe impacts as I described.

10 Your Honor, this phase of the case is certainly not
11 the end of this case. No doubt there will be further
12 consideration of what is causing the decline of the delta
13 smelt and what is necessary to address that. Every biologist
14 that came before the Court agreed that the decline of the
15 delta smelt has many causes. Invasive species, toxics, food
16 limitations, in-Delta diversions, there's a lengthy list.

17 But repeatedly, and for years, all of the focus has
18 been on the projects. The measures imposed on the projects
19 benefit the smelt and look where that what has gotten us.
20 Look where that has gotten the delta smelt. Look where that
21 has gotten those who depend on the projects for their water
22 supply.

23 What must happen is that the same focus that has been
24 put on the projects must be brought to bear on the other
25 factors that are affecting the delta smelt. And we will

1 continue to advocate for that. And we may come to this Court
2 at a later time for assistance with that. Thank you, Your
3 Honor.

4 THE COURT: Nobody has commented on Dr. Miller's
5 suggestion that the food supply be studied. Seems to me like
6 that's an excellent selection. I don't know why you wouldn't
7 do it, but there apparently is no discussion of it. His
8 proposal that a preserve be established with a million here
9 and a million there sounded a little ambitious to a
10 non-biologist. And so I'm not clear whether that would be
11 feasible or not feasible. But certainly there are more issues
12 to look at.

13 MR. O'HANLON: Yes, there are, Your Honor.

14 THE COURT: Thank you, Mr. O'Hanlon.

15 Mr. Buckley, now is your time.

16 MR. BUCKLEY: Thank you, Your Honor. Your Honor,
17 particularly given the lateness of the hour, I appreciate the
18 opportunity to address the Court. I'd like to start off by
19 making three very basic points and then expand a bit.

20 First of all, based on the evidence presented by Dr.
21 Miller, and we think worked on by others, we don't believe
22 that any restrictions on pumping, even a total shut down of
23 the projects, is going to make a difference in the long run
24 for the delta smelt.

25 We do not believe that the projects are appreciably

1 increasing jeopardy to the survival of the delta smelt. Which
2 we believe is the issue. We believe that the fate of the
3 delta smelt is going to be determined by how other factors are
4 resolved, particularly the food supply factor to which Your
5 Honor alluded a moment ago. However, Your Honor has indicated
6 an intention to implement a remedy.

7 THE COURT: Well, I'll tell you why. How can it be
8 denied that the Old and Middle River flows, reverse flows
9 don't have an impact on the smelt and don't move the fish to
10 their extinction or at least extinguishment. I'm not talking
11 about the species. That I think is indisputably established
12 by the evidence. There isn't anybody who says that doesn't
13 happen.

14 MR. BUCKLEY: Well, Your Honor, I think there's a
15 distinction. I don't think anybody said that fish are not
16 entrained at the pumps. And I didn't hear anybody say that
17 the flow problem at Old and Middle Rivers doesn't have an
18 impact on that.

19 The real question, however, is whether, even if
20 entrainment occurs, it has any effect at the end of the day on
21 the abundance of the species. And we think --

22 THE COURT: Oh, I heard Dr. Hanson say that you would
23 take a quarter of the population that's in the central Delta
24 in its migratory phase and essentially push it into the south
25 Delta where we know it's either going to die or be salvaged.

1 MR. BUCKLEY: But the -- but when you analyze the
2 question whether the abundance of the smelt has been affected
3 by any of these things, X2, outflows, entrainment, the exports
4 generally, the answer is always no.

5 And Dr. Miller is not an outlier, he's not a crack
6 pot. He's not somebody who is rounded up to come in here and
7 make these representations. Other people, as he testified,
8 have tried to make the same correlation, have tried to
9 determine whether any of these factors have an effect on
10 abundance and nobody has been able to do it.

11 And our position basically is that given all of the
12 correlations that have been done, even when -- even when the
13 smelt were close to the pumps, Dr. Miller took the worst
14 years, the years when it could be established that the smelt
15 were closest to the pumps, and looked for an impact on the
16 abundance of the species as measured by the fall midwater
17 trawl and found nothing.

18 So, you know, our view is that regardless of the
19 extent of entrainment, the problem with the species is not
20 being affected -- that the well being of the species is not
21 being affected at the end of the day by the projects, but by
22 other things.

23 The -- let me just move on and make my second point
24 because I'd like to kind of get back to the cause issue. You
25 asked, I think, each of us to come to a view as to whether we

1 would support a remedy or had a view on a remedy and what our
2 view was. Speaking for the Farm Bureau, and understanding
3 that Your Honor intends to implement a remedy, we -- and
4 understanding the impact that any remedy the Court enters is
5 going to have, as just described by Mr. O'Hanlon, we would
6 support the remedy that has been proposed by the Fish &
7 Wildlife Service as amended by the suggestions made by the
8 Department of Water Resources.

9 Understanding that Your Honor is going to enter a
10 remedy, implement a remedy, we believe that that's a remedy
11 that is overly protective, particularly given our view that
12 the projects are not, at the end of the day, going to affect
13 the well being of the species one way or the other. And also
14 given the tremendous --

15 THE COURT: You understand the doctrine of
16 contributing cause?

17 MR. BUCKLEY: I do, Your Honor, but the question
18 is --

19 THE COURT: Tort law. And you're telling me, as Mr.
20 O'Hanlon did, that the operation of the projects are not a
21 cause?

22 MR. BUCKLEY: I'm telling Your Honor that my -- our
23 view is that the operation of the projects is not appreciably
24 increasing the jeopardy to the survival of the species, that's
25 right. And we do not see any evidence that that's the case.

1 Everybody who's looked for evidence that that's the case has
2 failed to find it.

3 There's no question that fish are dying at the pumps.
4 There's no question that we don't have an accurate count of
5 that. There's no question that the fish dying are not just
6 sub-adults and adults, but also juveniles who are so small
7 that they can't be found and measured. But at the end of the
8 day, every analysis aimed at finding an impact on --

9 THE COURT: We had the analysis by Dr. Miller, but we
10 may have been in different courtrooms.

11 MR. BUCKLEY: Well, but, Your Honor, Dr. Miller
12 testified he's not the only one who's tried to do this. He
13 mentioned other people. He mentioned Dr. Manly, who's one of
14 the foremost statisticians, ecological statisticians in the
15 world. He mentioned Dr. Kimmerer, who hasn't appeared in this
16 courtroom on behalf of anyone.

17 It's not Dr. Miller alone who has made an effort to
18 find the correlation between the project and abundance. And
19 he testified he looked every way he could. He used every
20 analytic technique he could think of, he used every
21 combination of years he could think of and he couldn't find
22 anything. And he said -- he testified that other people have
23 made the same effort he's made and no one has been successful.

24 THE COURT: There's one last point I'm going to make.
25 I'm not arguing with you, but I want you to understand. You

1 aren't the only parties here. The party who has
2 responsibility under the law of protecting the species is
3 here. That's the federal government through its Department of
4 Interior and the action agency, the Bureau of Reclamation.

5 And what I do see and what the evidence does show the
6 Court is that there is more to be done than they are doing.
7 Now, that doesn't have anything to do with you, but it does
8 impact you. And the impacts are extreme and severe. There's
9 no question about it.

10 MR. BUCKLEY: Well, I think a question that has been
11 addressed at considerable length here is whether the projects
12 are doing enough. And I've sat now through at least two
13 hearings and listened to Your Honor, and I think I know what's
14 concerning the Court.

15 The concern is whether the Bureau of Reclamation is
16 going to do what it's supposed to do. Whether when certain
17 triggers are reached, indicating that there may be a problem
18 at the pumps, the Bureau of Reclamation is going to take the
19 action its own triggers, if you will, indicate it should take
20 or whether it's going to rationalize away somehow the need to
21 do that. Whether it's in the interest of exports or for some
22 other reason.

23 I think that was probably what bothered Your Honor
24 with the DSRAM process. It was too discretionary and Your
25 Honor was concerned that there was some evidence in the record

1 that it wasn't being used in an objective way to protect the
2 species.

3 And so I think I understand where you're coming from
4 and I do understand that you intend to implement a remedy.

5 THE COURT: I'm not being facetious because I have
6 the utmost respect for Mr. Milligan and I very much
7 appreciated his testimony and I learned a lot from his
8 testimony. But in a way it does sound like DSWG, those are
9 the scientists, they meet, they study, they recommend, the
10 WOMT then looks at it, it's complicated, there are so many
11 competing issues, they're impossible decisions to be made, so
12 then it goes to the department heads or the agency heads and,
13 again, I'm not being disrespectful, sounds to me like the
14 agency heads get on planes and head to Washington. And here
15 we are.

16 MR. BUCKLEY: I recognize that, Your Honor. And I
17 think I would expect that Your Honor is considering some ways
18 of dealing with that. Time limits, other ways of
19 strengthening the process so that an objective result is
20 reached in the interest of the species. The problem is that
21 if you hardwire a solution which doesn't allow for the
22 dynamics in the system and the permutation and combinations of
23 things that can happen --

24 THE COURT: I'm going to be getting to this, but the
25 law doesn't permit me to hardwire anything.

1 MR. BUCKLEY: I agree, Your Honor.

2 THE COURT: I can't interfere with the agency's
3 discretions, I can't run the projects. I suppose in a
4 theoretical sense I can tell them what to do. But that's
5 neither my inclination nor what the law provides for.

6 MR. BUCKLEY: I recognize that, Your Honor, and I
7 agree with that.

8 Let me just sum up my discussion of the causation
9 point by saying that, as I might have said a moment ago, given
10 all the work that's been done to determine whether the
11 projects have an impact on the abundance of the species, you
12 would expect that somehow somebody somewhere would have found
13 a correlation between any of these projects involving the
14 factors of the abundance of the species. And that really
15 hasn't happened.

16 I'd like to turn to one other thing. And that
17 is -- well, if it isn't the projects, what is it? And Your
18 Honor, I think heard Dr. Miller yesterday and alluded to the
19 food problem today. And I'd like to touch on that briefly.
20 We know, not because of any statistical analyses really but
21 because of data collected that species have transformed the
22 Delta's ecosystem.

23 As Dr. Miller testified yesterday, if you ran a net
24 through the Delta's waters, 95 percent of the fish you catch
25 are alien species. We know that the summer abundance of the

1 zooplankton Eurytemora crashed in or about 1986 coincident
2 with the arrival of two clams, Corbula and Corbicula, which
3 Your Honor has heard a great deal, fresh water clam and salt
4 water clam. Why did this crash occur? Because these clams
5 eat zooplankton, including Eurytemora. We know that
6 Eurytemora was replaced when it crashed in 1986 by another
7 zooplankton, Pseudodiaptomus, which is an alien.

8 THE COURT: And two more species that we heard about
9 in the rebuttal testimony from Dr. Swanson, not mentioned by
10 anybody. So I think on that score that that's an uphill --

11 MR. BUCKLEY: Well, I want to get to that, Your
12 Honor, let me deal with it right now. Dr. Miller did testify
13 yesterday that he -- the reason he chose those two species to
14 study was because he talked to a lot of biologists and was
15 told that those two species were the principle food source for
16 the -- for the delta smelt. And so he used them. He wasn't
17 told that Limnithona was a principle food source, he was told
18 that Eurytemora and Pseudodiaptomus were. So those were the
19 species he used.

20 Furthermore, Dr. Swanson's testimony to the effect
21 that there are other species, there are other species of
22 zooplankton that the delta smelt eats doesn't explain away the
23 very tight, almost overwhelming correlations that have been
24 developed with respect to the abundance of the delta smelt and
25 the abundance of those two species. It's an unbelievable fit.

1 It has an R-squared of way over 80 percent.

2 So you can say, well, there are other -- there are
3 other things that the fish eat. But when you look at it, when
4 you statistically analyze it, you see a clear relationship
5 between the abundance of those two zooplankton species and the
6 abundance of the delta smelt.

7 We think that Dr. Miller has established a very
8 powerful correlation between those factors. It's a
9 correlation that leaves less than a one in 25,000 likelihood
10 that the correlation was achieved by chance. He did the same
11 thing with longfin smelt and achieved an even tighter
12 correlation. And I would add that I think, as Dr. Miller
13 testified in response to the questions from the Court
14 yesterday, it's not as though he's totally out there a voice
15 in the wilderness. He was the first person to get on this.
16 But in recent months, I think it would be fair to say, that
17 this finding is achieving traction and it's starting to be
18 discussed.

19 Dr. Moyle, for example, testified on the first day of
20 the proceedings, and I refer Your Honor to page 61 of the
21 transcript of the first day, that he agreed that inadequate
22 food supply was a cause of the decline in delta smelt
23 abundance. Dr. Miller established that it wasn't just a
24 cause, it was the overwhelming cause. We -- I'm sorry, Your
25 Honor, go ahead.

1 THE COURT: I'm not meaning to be inattentive, but
2 even with my questions, you're way beyond seven minutes that
3 you had --

4 MR. BUCKLEY: All right. Your Honor, I'll just sum
5 up by saying that I recognize the projects are essentially the
6 only knob you have to turn. But in view of -- at least in our
7 view, that the projects --

8 THE COURT: Let me ask you one rhetorical question.

9 MR. BUCKLEY: Yes.

10 THE COURT: Why is it, do you suppose, that given
11 what we're facing here, the consequences for everybody, that
12 the action agencies, both the state and the federal, didn't
13 essentially come in and say it's the food supply? It's other
14 causes, it has nothing to do with our projects and we cannot
15 be accountable for this. They didn't do it.

16 MR. BUCKLEY: I think if I were asked that question,
17 Your Honor, on direct examination, I'd probably -- or somebody
18 would probably object to it because I'd be getting into the
19 minds of the government. I don't know the answer to that
20 question. But --

21 THE COURT: Well, there is something you could draw
22 an inference by, but I think we're out of time to do it.

23 MR. BUCKLEY: I would just ask, Your Honor, in
24 turning the knob I know you intend to turn, you take into
25 account the significant impacts that will result.

1 THE COURT: Thank you very much, Mr. Buckley.

2 MR. BUCKLEY: Thank you, Your Honor.

3 THE COURT: Mr. Wall, are you going to reply?

4 MR. WALL: Hit a few key points very quickly.

5 First, Your Honor, the defendants have tended to
6 agglomerate the Fish & Wildlife action three and four.
7 They're very different. Action four is a process. It doesn't
8 have any hard sideboards on flow.

9 Second, when asked, the operator, Mr. Milligan said
10 this morning that ultimately the operators, he means the
11 bureau, had the final say on how to implement or whether to
12 implement proposals.

13 Third, Dr. Swanson's tier one measure has as its
14 apparent basis particle tracking modeling. Tier one is
15 supposed to protect adult smelt. Adult smelt do not behave
16 like particles. Of course, his Particle Tracking Modeling has
17 never been presented even at a scientific format let alone
18 published. So I'm hard pressed to understand counsel's
19 criticism of Dr. Swanson's reliance on Dr. Bennett's research.

20 Fourth, Dr. Hanson has proposed a rather wide range
21 in his declaration of minus 1,000 to minus 6,000. But at
22 trial, he said in light of the new evidence about the
23 abundance of delta smelt, he would recommend operating at the
24 low end of that range.

25 He says, and this is at page 100 of the 8-29

1 transcript, "With the lower number of delta smelt in the
2 population, it would strongly urge that more protective
3 actions, hence operating at the lower ends of the ranges Old
4 and Middle River flows, would be an appropriate action in the
5 event that there's evidence that delta smelt are at risk of
6 salvage mortality."

7 And of course that's when he's implementing his tier
8 two, when there's risk of salvage mortality. He is
9 testifying -- he does it again at page 149, that he thinks you
10 need to operate at the low end of this range. Well, Dr.
11 Swanson's proposal is at the end low end of the range. Minus
12 6,000 cfs is not.

13 THE COURT: Where is his low end?

14 MR. WALL: Minus 1,000. You know, he would have been
15 somewhere closer to minus 1,000 than minus 6,000, I suppose.

16 With respect to the Feyrer article, I think this has
17 been repeatedly mischaracterized. They did find a
18 relationship between habitat quality and delta smelt
19 abundance. They found that one complement of habitat quality,
20 salinity, accounted for 19 percent of delta smelt abundance.

21 There is this caveat at the end, it says, "For the
22 water quality data to be most effective for species
23 management, additional information is needed to better define
24 the mechanisms for the effects of water quality variables on
25 aquatic organisms."

1 But nonetheless, they found this relationship and we
2 know that improved habitat improves the opportunities for
3 delta smelt to survive. There is no dispute about that.

4 There was a question about the US Fish & Wildlife
5 Service's acceptance of the proposed modifications before the
6 DWR and I do not know the government's position. But I would
7 refer the Court to Ms. Goude's testimony, both in her
8 declaration and at trial, where she says that the various
9 actions identified in her proposal are expected to provide the
10 minimum in protective actions necessary to protect delta
11 smelt.

12 She said that in her August 3rd declaration at
13 paragraph 9 and she said that again in her August 23rd
14 declaration -- or testimony at page 220.

15 If the Fish & Wildlife Service were now to conclude
16 that these proposals were not the minimum action based on the
17 few minutes of hallway consultation, I would submit it's the
18 world's faster Section 7 consultation and directly
19 inconsistent with her prior testimony, sworn testimony to this
20 Court.

21 There is also some discussion of the Delta Smelt
22 Working Group rejection of a fall action. The Delta Smelt
23 Working Group looked at a fall action that had a lower flow
24 level than Dr. Swanson's and found that it would not move the
25 salinity point out far enough. Dr. Swanson took that into

1 account and proposed a higher outflow level that would move
2 the salinity point out far enough.

3 Lastly, I want to just address the issue of
4 protection of salmon very quickly. There has been no
5 calculation that the available water supply at the different
6 reservoirs, including New Melones, which is over its historic
7 average, is insufficient to protect salmon if these measures
8 are implemented.

9 I'm sure the Court is aware that my clients are also
10 interested in protection of salmon. We would not be proposing
11 this measure if we had any reason to believe that it would
12 harm that species.

13 That's it, Your Honor. Thank you.

14 THE COURT: Thank you very much, Mr. Wall. Mr.
15 Maysonett.

16 MR. MAYSONETT: Your Honor, I have an answer to the
17 question you posed to the federal defendants before about
18 whether or not the federal defendants accept the modifications
19 to the service's matrix.

20 THE COURT: Yes.

21 MR. MAYSONETT: Your Honor, short answer is no. The
22 slightly longer answer is that, you know, the proposed
23 changes, Your Honor, would be this movement from -- I'm
24 looking at DWR Exhibit L, in action two from negative 4500 to
25 negative 5500 and then, in action three, from a floor of zero

1 to a floor of negative 1500.

2 THE COURT: All right. Thank you very much.

3 MR. MAYSONETT: And I would just say, Your Honor,
4 that, well, the short answer is no. The long answer is that
5 the service's proposal is grounded in the other assumptions
6 that are set out in the service's proposal. For example, use
7 of a 14-day running average and the process for setting this
8 level is described in the attachments. I think those to some
9 degree address some of the concerns with those lower flow
10 levels. If these numbers were taken out of this proposal, the
11 service's -- the position of the federal defendants might
12 change.

13 THE COURT: Thank you very much, Mr. Maysonett.
14 Is the matter submitted?

15 MR. WILKINSON: Yes, Your Honor.

16 MR. WALL: Yes, Your Honor.

17 MR. LEE: Yes, Your Honor.

18 MR. O'HANLON: Yes, Your Honor.

19 MR. MAYSONETT: Yes, Your Honor.

20 THE COURT: All right. I'm going to start by
21 reviewing the law that applies in this proceeding. And as I
22 have said, based on the recent amendment by way of supplement
23 to the complaint, we have action that is alleged to be
24 unlawful or omission by an agency of the United States, the
25 DWR. I'm sorry, the Bureau of Reclamation as well as the

1 Department of the Interior. That the way in which the Central
2 Valley Project is being operated is both presenting present
3 jeopardy to the survival and recovery of the species and that
4 it is also impairing the critical habitat of the species.

5 And the ESA prohibits agency action that is likely to
6 jeopardize a continued existence of any listed species, and in
7 this case, the delta smelt is listed as a threatened species.
8 And the regulations, that's 16 United States Code, Section
9 1536(a)(2) referred to as Section 7 of the ESA, 7(a)(2)
10 violation.

11 And the regulations that are at 50 CFR, Section
12 402.02 provide that this law prohibits any agency action that
13 reasonably would be expected, directly or indirectly, to
14 reduce appreciably the likelihood of both the survival and
15 recovery of a listed species in the wild.

16 The word "jeopardize" or "jeopardy" as it is used in
17 the act means to engage in an action that reasonably would be
18 expected, directly or indirectly, to reduce appreciably the
19 likelihood of both the survival and recovery of a listed
20 species in the wild by reducing the reproduction numbers or
21 distribution of that species.

22 The complaint also sought and a summary judgment in
23 the case has been entered that essentially found the 2004/2005
24 Biological Opinion that covered the operation of the OCAP for
25 the, if you will, day-to-day running of these coordinated

1 projects and operations of the State Water Project and the
2 Central Valley Project. That finding was that the Biological
3 Opinion was unlawful, arbitrary and capricious for the reasons
4 that are stated and they don't need to be stated now because
5 that has already been decided.

6 The further finding was that the decision of, in
7 addition to the Biological Opinion, that the remedial action
8 measures that had been adopted as part of that decision and
9 belated actions and also a take limit that has been
10 established as required by the Endangered Species Act was also
11 invalid.

12 After those findings, the Court set, in consultation
13 with the parties, this evidentiary hearing, which has now
14 consumed eight full court days, to determine what remedies, if
15 any, should be imposed by the Court to address the unlawful
16 actions by the Department of the Interior and the Bureau of
17 Reclamation, the latter is the action agency.

18 The State Department of Water Resources, which is a
19 coordinated operator of the State Water Project, which is
20 operated in tandem and cooperatively with the federal project
21 and, as the parties all know, the federal project has state
22 permits for its water entitlements that are used to perform
23 its operations both of water service, that is performed under
24 contract to water districts, who in turn have members who
25 contract for water.

1 And we have consti tuenci es here, not only San Lui s
2 and Del ta-Mendota Water Authori ty, Westlands Water Di stri ct,
3 Del Puerto Water Di stri ct, Glenn-Col usa Irrigati on Di stri ct.

4 We have the State Water Contractors, who include not
5 only contracting di stri cts, but also muni ci pal and i ndustri al
6 agenci es who provide water servi ce that i sn' t for agri cul tural
7 purposes, i t i s for muni ci pal purposes.

8 And addi ti onal to those parties are the Farm Bureau,
9 who we have j ust heard from.

10 In addressi ng the remedial approach to the case, the
11 plai nti ffs have sought i ni ti al ly for the i nvali dat i on of the
12 Bi ol o gi cal Op i ni on and a vacatur of the take standards and al l
13 aspects of the Bi ol o gi cal Op i ni on. Today i n argu ment, they
14 offered that i f -- and I i nterpret the offer as a condi ti onal
15 offer, the condi ti on bei ng that i f the Court were to pronounce
16 and apply the remedies that are i n the revised recommended
17 i nterim protecti on actions for del ta smel t that Dr. Swanson
18 has authored, i f al l of those are adopted as a remedy i n the
19 case pendi ng the reconsul tati on, remand and, i f you wi ll, the
20 correcti on and/or repromul gati on of a lawful Bi ol o gi cal
21 Op i ni on, that that woul d be acceptabl e to the plai nti ffs.

22 The federal defendants have, after taki ng the i ni ti al
23 posi ti on that there was no enti tlement to rel i ef because there
24 were no vi ol ati ons of law, they haven' t waived those
25 posi ti ons, say that i f there are remedies to be imposed, that

1 for all the reasons that have been stated by their witnesses,
2 primarily Cay Goude, that the five featured action matrix
3 should be pronounced by the Court to be a remedy that is to be
4 operative in the interim period between today and the time
5 that a lawful Biological Opinion is issued concerning the OCAP
6 for the Central Valley Project and the State Water Project.

7 The Department of Water Resources, as intervenor,
8 essentially for the reasons stated by Mr. Lee, agrees with the
9 proposed action matrix of the Fish & Wildlife Service and
10 would modify to make, if you will, less stringent the flow or
11 water consumption requirements.

12 The State Water Contractors, without waiving their
13 position that the original BiOp was lawful and that no
14 remedies are needed, have proposed an alternative three-tiered
15 remedial approach. And they do not agree with the Fish &
16 Wildlife Service, I'm just going to call it the federal
17 defendants' proposed remedy and/or the modification to that
18 remedy proposed by the Department of Water Resources.

19 The Delta-Mendota Water Authority and Westlands Water
20 District intervenors, one, do not believe the BiOp is
21 unlawful, have not waived that position. They, joined by the
22 Farm Bureau, take the essential position that the evidence in
23 this proceeding, through Dr. Miller's testimony, has
24 established that there are a number of causes for the decline
25 of the delta smelt, including but not limited to toxicity,

1 predation, the disappearance or reduction of the food supply
2 caused in material part by the invasion of alien species,
3 primarily two types of clam that filter the planktonic
4 organisms that are the food supply to the smelt, among others.

5 They also believe that In-Delta actions by other
6 diverters, who are not under the direct control or operation
7 of either the state agencies and meteorological conditions,
8 such as storms, winds, temperature changes and the like, all
9 have effects on the movement, the existence, the location and
10 the health of the species.

11 And so the San Luis and Westlands defendants agree to
12 nothing and essentially do not support any remedy. They say
13 there should be no remedy because the projects have no causal
14 relation that is significant to any of the problems the smelt
15 is now encountering or has encountered.

16 The Farm Bureau takes the same position, but
17 arguendo, if a remedy is going to be imposed, support the
18 federal defendants' five point action matrix as modified by
19 the Department of Water Resource proposals.

20 This case is also brought under Title 5 United States
21 Code, Section 702, et seq. United States Administrative
22 Procedure Act and it addresses action by an agency of the
23 United States that is arbitrary, capricious or unlawful, which
24 requires the intervention of Court to make such a finding.

25 And Mr. Wall was very accurate in his recitation of

1 the law. It is not the function nor necessarily the
2 jurisdictional authority. It might be the prerogative, but in
3 the eyes of this Court, deference is required by law to an
4 agency that has the expertise, the competence and the legal
5 charge that is essentially invested by the elected
6 representatives of the people who make the laws and then
7 charge experts in the executive branch to carry out the
8 functions of the agency, here the operation of the projects.

9 And so a judge, who is neither a scientist, a
10 biologist, an administrator or elected by the people,
11 ordinarily is confined to determining the legality of actions
12 and, if necessary, and appropriate -- and here, I take it that
13 because of the alternative positions that are taken by the
14 governments, and I'm more concerned with that of the federal
15 defendants because by their consent and waiver of any Eleventh
16 Amendment immunity, the state is here, they have acquiesced to
17 the jurisdiction and authority of the Court, thereby removing
18 the jurisdictional objection.

19 My understanding is that by the position that the
20 United States has taken, they are in effect impliedly, if not
21 expressly consenting to the imposition of a remedy,
22 particularly one without waiving their legal position as to
23 the propriety and legality of their actions as to the BiOp.

24 And also with respect to any finding on the issues of
25 remand, vacatur and the status of the take limits, as I

1 understand the government position, their preference is to
2 consent to a remedy rather than face a remand with vacatur
3 where there will be no effective Biological Opinion or take
4 limits.

5 And we have looked for some time now at the law and
6 we have asked the parties to provide the law, and no party has
7 provided the law that says that the 1995 Biological Opinion,
8 which has obviously been superseded by the government's
9 2004/2005 BiOp. The Court has no understanding that it would
10 have the authority to, if you will, resurrect what is a
11 superseded and obviously outdated, and, if the current one is
12 unlawful, it has to be more unlawful than the current BiOp,
13 recognizing that the take limits in the '95 BiOp were 55,227
14 up to 224,409 delta smelt per year in a dry year.

15 The current incidental take limit was 70,500 and, as
16 the parties all know, nobody knows what the population of the
17 species is, but the '05 BiOp could approach it and the '95
18 take limit very well could exceed it.

19 We have uncontradicted testimony of some experts on
20 the plaintiff side, Dr. Swanson, Ms. Goude, Dr. Hanson, even
21 Dr. Miller told us that the species is in a critical state.
22 It could become extinct within a year and it could become
23 extinct if everything that anybody's asked for here was
24 implemented, it could still become extinct if we put all these
25 measures into effect.

1 It appears to the Court, based on the facts most of
2 which have been discussed by counsel, that the most
3 responsible and the most prudent decision is -- and there's no
4 question that the BiOp has to be remanded and consultation has
5 been reinitiated for repromulgation in lawful form. And so
6 that is one of the remedies that the Court is going to order.

7 The next issue is whether the BiOp is remanded with
8 or without vacatur. And that then presents the Court with the
9 question do we leave the status quo, because the temporary
10 restraining order in this case was not granted and the
11 voluntary pumping cessation, or reduction would be the better
12 description, ended in June.

13 Do we leave the status quo where the agency is left
14 to manage the projects without any intervention by the Court
15 or does the Court impose, with the express or implied consent
16 of the action agencies, remedies that will address the Section
17 7(a) issues of the jeopardy to the species, its survival and
18 recovery, and the impairment or alteration of its critical
19 habitat.

20 And in looking at this question, I asked the parties
21 to consult among themselves and to determine if there was a
22 result they could reach that we could all be proud of. And
23 that effort apparently has not been one that has come to
24 fruition.

25 And so it devolves to the Court to determine what the

1 result should be now with regard to the issue of vacatur or
2 non-vacatur. And in the final analysis, the Court is
3 persuaded by science, which it must be, because the law
4 requires that the best available science be brought to bear on
5 the issues that are presented.

6 As the Court noted and the plaintiffs in their brief
7 on remedies repeated, the law doesn't give the Court a choice.
8 If the Court sees that agency action or inaction not only
9 threatens, but doesn't have to bring it to extinction, but has
10 that potential, then the law requires intervention. There
11 must be action taken by the Court.

12 In this case, given the history, which I have alluded
13 to earlier, that the approach the agencies were taking and
14 here the Court believes that the evidence shows that the
15 Department of Water Resources of the state essentially
16 deferred to the Bureau of Reclamation and Department of the
17 Interior for it to implement the delta smelt Recovery Action
18 Plan and the Delta Smelt Working Group, Water Operations
19 Management Team and the agency heads have certainly addressed,
20 they have spent time on and they have endeavored to remediate
21 the present jeopardy which has been defined as critical.

22 And that was agreed to by the operator, Mr. Milligan,
23 as well as the scientists. And that effort, all those
24 efforts, have been unsuccessful because we see continuing
25 declines and every survey that comes in that we have been

1 furnished in the last two years so shows that the condition of
2 the species is worsening.

3 And so contrary to -- and I do think it is a
4 selective study that was done by Dr. Miller. I'm not
5 criticizing his competence, his ability or the application of
6 his science as an engineer or water engineer, or Dr. Manly's
7 competence or renown as an ecological statistician. But as
8 has been indicated, the correlative studies that were
9 undertaken by those experts certainly provide a major issue
10 about cause. But I think that the answer I got from Mr.
11 Buckley is telling. The law recognizes concurrent causes,
12 even though it's a doctrine that has its origins in the law of
13 torts.

14 But here the Court can't find that the sole cause is
15 the food supply and that the absence of a statistical
16 correlation in the studies that Dr. Miller performed explains
17 the jeopardy of the species when there is indisputable
18 evidence of entrainment, of salvage, the pumps grind these
19 fish up. That's caused by, in some cases, the natural
20 migration of the fishes, it's caused by flow conditions in the
21 central Delta at the confluence of the Sacramento and San
22 Joaquin Rivers, it's caused going east from there, going north
23 from there, going south from there, and those are to the south
24 and into the Clifton Court Forebay areas of hazard.

25 And the evidence is uncontradicted. There isn't any

1 question about it, that these project operations move the
2 fish. Of course we don't know how many. But the fact is it
3 happens. And the law says that something has to be done about
4 it by the action agency.

5 Now, the Court from that concludes that it is under a
6 legal duty to provide a remedy. And if it is in the form of
7 an injunction, there would be two standards, the traditional
8 injunctive relief standard and the ESA standard.

9 The traditional standard looks at the likelihood of
10 success on the merits, it balances hardships, it looks at the
11 public interest; and the ESA standard essentially evaluates
12 the threat of harm to the species and discounts hardships of
13 an economic or other nature, except for human health and
14 safety.

15 And the Court recognizes that, as I said earlier
16 today, that that isn't just emergency water supplies for
17 schools, for hospitals, for fire departments. That can
18 include the absence of water if the supplies to contractors
19 are zero and land is fallowed, subsidence from groundwater
20 pumping which contributes to the fallowing or the absence of
21 water creates air pollution conditions. Those are threats to
22 human health and the environment, just as the absence of
23 emergency water service is.

24 How this is going to be accomplished is something
25 that the Court cannot prescribe. Because the law doesn't

1 permit it. I'm not going to tell the Bureau of Reclamation
2 how to run its agency, how its scientists should think, what
3 conclusions they should reach, what recommendations they
4 should make or how they should be implemented. But I do have
5 proposals that the parties are offering, and I'm going to use
6 those proposals they are offering to do the best in what the
7 Court views as an impossible situation.

8 In one of these water cases that have been going on
9 for over 30 years in the Eastern District of California
10 involving water supplies to the Central San Joaquin Valley and
11 the Sacramento and central Delta areas, and most of the
12 agencies that are involved in this litigation, Judge Trotter,
13 in one of the decisions said -- this was in the drainage
14 case -- that sometimes problems are so intractable, they're so
15 difficult that they're beyond the competence of the judiciary,
16 they are matters that need to be left to the legislative
17 branch for the legislature to address.

18 Well, it would be very nice if I could do that. But
19 I can't. Because the law requires otherwise. And I am going
20 to formulate an order and I am going to need the assistance of
21 the parties with this -- to not vacate the 2005 Biological
22 Opinion, but I am going to put into effect a preliminary
23 injunction.

24 And I recognize the difference between a mandatory
25 injunction and the law's preference for a prohibitory

1 injunction. And therefore I'm going it to phrase my
2 injunctive relief in prohibitory terms. I'm not playing a
3 game here in trying to exalt form over substance, but rather
4 I'm trying to comply with the law.

5 And the Court is going to order that Bureau of
6 Reclamation and the State Department of Water Resources take
7 no actions that are inconsistent with or that violate the
8 following remedial prescriptives.

9 First, there will be year round monitoring actions
10 that fully implement all current surveys that are being
11 conducted for the delta smelt, which will include but not be
12 limited to the Spring Kodiak survey, the 20 millimeter survey,
13 the Summer Townet Survey and the fall MWT.

14 There was a proposal in what is the second remedial
15 action which would increase the frequency of sampling for
16 entrained fish at the CVP protective facilities to a minimum
17 of 25 percent of the time, which is a minimum of a 15-minute
18 count per hour.

19 I'm going to also include within that, the measure
20 that was proposed by Dr. Swanson that steps be taken to
21 evaluate presence and condition of larval or juvenile delta
22 smelt that are in the sub-20 millimeter size range,
23 recognizing that there are difficulties in doing that. But as
24 the Court understood it, it's entirely feasible based upon the
25 type of seine or net the interval that would be within the

1 physical test device itself.

2 I do recognize that at least two of the experts said
3 that any sampling could be further jeopardizing to the
4 species. But it appears that all parties, with the exception
5 of the San Luis and Delta-Mendota parties, agree that sampling
6 needs to continue and that it is feasible.

7 The trigger for this that was proposed by the Fish &
8 Wildlife Service was an increase in Delta outflow where the
9 Sacramento River flow at Freeport reached 25,000 cfs or in the
10 San Joaquin River more than 10 percent over a three-day
11 average. And in the fall midwater trawl and/or Kodiak survey
12 data on delta smelt, where fish are moving upstream of the
13 confluence and into the Delta or by January 15th of the water
14 year, whichever comes first.

15 The next remedial action that will be implemented
16 is -- and I think that I have already in effect adopted action
17 number three of the Fish & Wildlife Service, which was to
18 implement a monitoring program for the protection of larval
19 delta smelt with the trigger that is prescribed. I don't see
20 any reason to modify or to, if you will, change that. And I
21 should correct myself. I'm actually using, at this point, the
22 plaintiffs' remedial actions.

23 As to the remedial action number three that is
24 submitted by the Fish & Wildlife Service as proposed to be
25 modified by the DWR, the parties can correct me if I'm wrong,

1 but an area of -- and Dr. Hanson spent a lot of time on this.
2 For determining the upstream Old and Middle River flows,
3 rather than adopting a zero cfs as the lower range of that, I
4 remember a lot of discussion about a negative 750 to a
5 negative 2250 range. I recognize that this was not
6 necessarily addressing only larval and juvenile smelt, but the
7 Court is going to adopt the low end of that low range
8 at -- for the third proposed action by the Fish & Wildlife
9 Service at negative 750 to a negative 5,000 cubic feet per
10 second. And the Court thinks that 6,000 is an acknowledged
11 and undisputed area of jeopardy and recognizing that it's
12 easier to -- less consumptive to achieve, the Court is
13 concerned by what it believes are the legitimate reasons given
14 by Dr. Swanson. And in the interest of time, I'm going to let
15 the parties submit findings, which will document the reasons
16 for these choices of remedies.

17 Now, the fifth action is the same as the plaintiffs'
18 actions, which were, if I have them correctly, and the parties
19 can help me here, was it six and seven where we have the head
20 gates at the --

21 MR. ORR: Eight and nine, Your Honor.

22 MR. WALL: Plaintiffs' eight and nine.

23 THE COURT: Eight and nine. All right. Eight and
24 nine are the same, I think, all the parties have acknowledged
25 as Fish & Wildlife Service measure number five. So that would

1 be the next remedial.

2 If you want to do them as two, because I'm going to
3 ask for the parties to prepare an order that is faithful to
4 the decision that I am now announcing. So those remedies are
5 going to be also prescribed.

6 Now, in turning to the plaintiffs' action number four
7 and the triggers, the Court has determined that -- let me have
8 one -- Mr. Maysonett, if you would repeat, please, the
9 objection to plaintiffs' four so I have the basis for it. Or
10 Mr. Lee, either one of you can do that. Mr. Lee was most
11 specific about it. Do you want to address that right now, Mr.
12 Lee?

13 MR. LEE: Number four, as I understand it, is
14 designed to protect pre-spawning adults. I'm talking about
15 revised number four set forth in plaintiffs' proposal
16 contained in the August 13th, 2007.

17 THE COURT: That is correct.

18 MR. LEE: And that proposal would start out -- is
19 multi-part, as I understand it. They would have a zero cfs
20 requirement for a minimum ten days and then -- and then
21 following that, there would be a requirement that would have
22 Old and Middle River flows between 2750 and 4250 cfs.

23 We had objected to the zero flow because we did not
24 believe there was any science in the record to support it.
25 The zero flow, as I understand this requirement, is roughly of

1 the same nature as in action number one in US Fish & Wildlife
2 Service measure. And that had a negative 2,000 cfs, which we
3 believed science fully supported.

4 So we would have recommended that the Court adopt
5 action number one for that time period for -- under the US
6 Fish & Wildlife proposal.

7 As to the follow-on proposals, we submitted that,
8 first of all, the five-day running average was inappropriate,
9 it should be a 14-day running average or seven-day running
10 average subject to some bans and constraints.

11 But most importantly, we were of the view that the
12 range of flows was too narrow, that the flows should be,
13 according to our view, not in excess of -- sorry, make sure I
14 got right -- negative 5500 for a 14-day running average or
15 negative 6,000 for a seven-day running average. As you can
16 see, as the running average days get shorter, the band gets
17 larger. As the running average days get longer, the band, the
18 level of authorized exports, gets lower. So that was our
19 proposal for the protection of pre-spawning adults.

20 And our objection to action number four is we did not
21 believe it was supported by the regression analysis submitted
22 to the Court which we discussed in closing argument. Is that
23 clear?

24 THE COURT: That is clear. But you did have a
25 proposal that covered in part this time period?

1 MR. LEE: Yes, we did, Your Honor. The two -- the
2 two-part proposal, one would be action one in the US Fish &
3 Wildlife Service proposal. The other would be a modification
4 of action two of the US Fish & Wildlife proposal. And that
5 modification would read -- and I would just look at action two
6 and put in the State's modifications -- the daily net upstream
7 Old and Middle River flow not to exceed 5500 cfs. The low
8 will be a 14-day running average simultaneously, the seven-day
9 running average will not exceed 6,000 cfs. That would be the
10 proposal for this lifestage of the smelt, which is the
11 pre-spawning adult smelt.

12 THE COURT: And the State Water Contractors have
13 proposed that this start December 1st. I'm going to leave it
14 at December 25th. I'm going to essentially reduce those flows
15 from 6,000 on the seven-day running average to 5,000 cubic
16 feet per second. And there was objection to the 14-day
17 running average -- well, you had proposed a 14-day running
18 average. Leave it at the seven-day running average and don't
19 do a 14-day running average.

20 MR. LEE: So, in effect, Your Honor, you're adopting
21 one-half of action two of the US Fish & Wildlife proposal?
22 They have a 4500 cfs average for a 14-day running average and
23 a 5,000 cfs for a 7-day running average. Are we abandoning
24 the 4500 cfs.

25 THE COURT: What does it add?

1 MR. LEE: I'm sorry?

2 THE COURT: What does it add?

3 MR. LEE: I would probably defer to the US
4 biologists. They are --

5 THE COURT: Do you know, Mr. Maysonett?

6 MR. MAYSONETT: Your Honor, my understanding is that
7 the targets of 4500, negative 4500 negative flow in the Old
8 and Middle River is 14-day average and that by -- the 14-day
9 average, of course, allows certain ebbs and flows of the tides
10 and the other influences that is hard for the projects to
11 operate to eliminate entirely.

12 The seven-day average at negative 5,000 would help to
13 limit the highs and lows a bit. So my understanding is that
14 the two work in tandem to ensure that flow levels remain in
15 certain -- within a certain range.

16 THE COURT: All right. Well, I'm going to order the
17 prescription that I've just described. And if we have to
18 adjust the language, we will.

19 As to action measure number ten. The Court is not
20 persuaded that the evidence preponderates here to support this
21 action. It was very well explained by Dr. Swanson. The
22 justifications were very articulately presented. It does not
23 appear to me that there is support necessarily in peer
24 reviewed or analysis by others who are studying this issue.

25 The Court certainly recognizes that water quality and

1 the improvement of habitat has the potential to increase
2 benefit to the species. But I am very impressed by the fact
3 that the Delta Smelt Working Group, one or two of whom
4 essentially were presented with this proposal in a different
5 form, in a different context, but didn't support it.

6 And because of the material uncertainty that is
7 described by reviewing scientists about the benefit at a very,
8 very large commitment and a -- resource commitment, the Court
9 does not believe that the evidence preponderates to justify
10 this measure and therefore it will not be included in the
11 remedies.

12 And so if I have it, then, we have those that I've
13 just gone over. And I'll now invite the parties to -- action
14 nine is the same as, I believe, five of the Government's Fish
15 & Wildlife Services, that is to prohibit installation at the
16 Head of Old River Barrier in connection with the triggers and
17 the end of the actions. Those are agreed on. And the other
18 management of the gates, which was, I'm going to
19 indicate -- well, I don't see it.

20 I don't see, Mr. Orr, number six, that's implementing
21 the Vernalis Adaptive Management Plan river flow and
22 enhancement, I am going to order that as a prescriptive
23 remedy.

24 And so I believe I have addressed the remedies that I
25 intend be prescribed as part of the injunctive relief. If

1 anybody wants to address anything now that you believe has
2 either been overlooked or not addressed, now is the time to do
3 it.

4 MR. WALL: Your Honor, I have a couple of clarifying
5 questions.

6 THE COURT: Yes.

7 MR. WALL: If I might. The first half of plaintiffs'
8 four parallels the Fish & Wildlife Service one and I didn't
9 hear if the Court was doing anything with that.

10 THE COURT: I'm adopting it.

11 MR. WALL: Fish & Wildlife Service one?

12 THE COURT: Yes.

13 MR. WALL: Okay. And the -- you were also adopting
14 the plaintiffs' eight and nine, which are the same as
15 plaintiffs' Fish & Wildlife Service five?

16 THE COURT: Yes. And six, that were agreed to by all
17 the parties except Mr. O'Hanlon's clients.

18 MR. LEE: Your Honor, just for the clarity of the
19 record, we did not agree to action six. The reason why
20 we -- oh, let's see. The reason why we did not agree to it is
21 because action six is basically the implementation of the
22 Vernalis Adaptive Management Plan. And that is mandated
23 already on the projects by water right decisions. We had
24 noted in our, I believe it was cross examination, that this
25 was unnecessary.

1 THE COURT: Well, it might be redundant, but out of
2 an abundance of caution, we have it. Let's include it in the
3 order.

4 MR. WALL: Your Honor, if I could, one other
5 clarifying matter. The Fish & Wildlife Service had action
6 four, which is post VAMP, and we had an action seven, which is
7 post VAMP. Did the Court intend anything for the post VAMP
8 period?

9 THE COURT: I thought that there was a -- let me have
10 what the Fish & Wildlife Service's proposal was on post VAMP.
11 It is number --

12 MR. WALL: Number -- Fish & Wildlife Service action
13 four.

14 THE COURT: Four. I had ordered that. And I had
15 not -- I modified it to take the low flow from zero to minus
16 750. Negative 750.

17 MR. LEE: Your Honor, it is my understanding that
18 action four, in its original format with the US Fish &
19 Wildlife Service, was intended to have flows similar to those
20 in action three. And we've mentioned that in, I believe,
21 footnote I, was that not the case? Of attachment B. If the
22 Court's view is that action four should simulate action three,
23 then --

24 THE COURT: The flow levels would be the same.

25 MR. LEE: The flow levels would be the same. Is that

1 your desire?

2 THE COURT: That is what I was attempting to
3 describe.

4 MR. WALL: So action three would be extended to last
5 until the end of -- the end date for action four? Basically
6 action three would continue on?

7 THE COURT: That is correct.

8 MR. WILKINSON: And Your Honor, those flows again
9 were a range of negative 750 to negative 5,000; is that
10 correct?

11 THE COURT: That is correct.

12 MR. LEE: Your Honor, mixing the two charts a little
13 bit sometimes leaves me a little lost. We have certain end of
14 action timings that are in the US Fish & Wildlife Service
15 proposal, and they are clearly not identical to those that are
16 in --

17 THE COURT: That is correct. And what I'm going to
18 suggest that you do is that you now reduce to writing the
19 orders that I have pronounced. The court reporter will
20 provide you the transcript. I'd prefer for there to be a
21 joint submission, but if you can't agree on it, then you can
22 submit competing proposed orders. And I'll resolve any
23 differences.

24 MR. LEE: All right.

25 THE COURT: All right? I intend for this injunctive

1 relief to be binding upon the United States Department of the
2 Interior, its Bureau of Reclamation, the State Department of
3 Water Resources, their agents, officers and employees and
4 those acting for, under and in concert with them and anybody
5 in those agencies who has actual notice of this order.

6 The order is to remain in effect pending entry of
7 final judgment in this case or further order of the Court.

8 Is there anything further?

9 MR. LEE: Your Honor, I think we'd like to look at
10 the transcripts and work on them.

11 THE COURT: You may. And the one other thing I'm
12 going to do is I'm going to ask for the parties to submit
13 proposed findings of fact and conclusions of law that support
14 this judgment that I have pronounced.

15 MR. LEE: What time frame, sir, are you talking
16 about?

17 THE COURT: It would be my preference that they
18 obviously be joint. You give me a reasonable time frame. I
19 think that there is concern that the order go into place. But
20 because we will not be starting any of the remedies September
21 1st, we don't have that level of urgency.

22 MR. LEE: Okay.

23 THE COURT: So what is reasonable?

24 MR. LEE: May we consult just for a moment on the
25 timing?

1 (Discussion among counsel, not reported.)

2 MR. LEE: Your Honor, I've had a chance to consult
3 with the United States, with San Luis and Delta-Mendota, with
4 the Farm Bureau and State Water Contractors, and given our
5 delayed vacations, Your Honor, we would like 60 days to get
6 the order -- get the findings of fact and conclusions of law
7 and the orders to you. That should give us time to consult
8 and see whether we can do something joint. If we can't, to
9 prepare alternate orders and findings of facts.

10 THE COURT: What's the plaintiffs' timetable?

11 MS. POOLE: Your Honor, we would propose something
12 much shorter than that. We were thinking more in the order of
13 two weeks.

14 THE COURT: Well, the court reporter is going to need
15 time to produce the transcript. And so she can give us her
16 transcript estimate now, as to what time.

17 THE REPORTER: I'd need 30 days.

18 THE COURT: She needs 30 days to produce the
19 transcript.

20 MS. POOLE: And Your Honor's order regarding the
21 rough transcripts, you'd like us to rely on the finals.

22 THE COURT: I will if -- I think we should have a
23 final official transcript for the preparation of the judgment.
24 At least the remedial aspect of the judgment that has been
25 announced today. And so, yes, let's do that. And my estimate

1 is that you at least need 20 days after you have the
2 transcripts in hand. And so that would be 50 days.

3 For findings and fact and conclusions of law, there's
4 going to have to be an official transcript. So let's make the
5 period 50 days. When is that? October 22nd, 2007.

6 Is there anything further?

7 MR. LEE: That's fine with the date, Your Honor.

8 MS. POOLE: We very much appreciate --

9 MR. WILKINSON: Thank you, Your Honor.

10 MS. POOLE: -- the time and effort you've devoted to
11 this, Your Honor.

12 THE COURT: Thank you very much. Thank the Court
13 staff, please, they're the ones who have had to stay way, way
14 past their hours of operation.

15 MR. LEE: Thank you.

16 THE COURT: Everybody have a good weekend. We will
17 stand in recess.

18 MR. MAYSONETT: Thank you, Your Honor.

19 MR. WALL: Thank you, Your Honor.

20 MR. O'HANLON: Thank you, Your Honor.

21 MR. BUCKLEY: Thank you, Your Honor.

22 (Off the record.)

23 THE COURT: I'd should add that the Department of
24 Water of Resources, the Bureau of Reclamation and the
25 Department of the Interior shall be reserved the right on

1 reasonable notice to deviate from the prescriptive remedies,
2 if necessary to protect public health, safety and the human
3 environment.

4 (The proceedings were concluded at 6:11 p.m.)

5
6 I, KAREN L. LOPEZ, Official Reporter, do hereby
7 certify that the foregoing transcript as true and correct.

8
9 DATED: _____
10 _____ KAREN L. LOPEZ
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EXHIBIT 14

1
2 **RONALD J. TENPAS, Acting Assistant Attorney General**

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10 Attorneys for the Federal Defendants

11
12 **UNITED STATES DISTRICT COURT**
13 **EASTERN DISTRICT OF CALIFORNIA**

14 NATURAL RESOURCES DEFENSE COUNCIL,)
15 CALIFORNIA TROUT, BAYKEEPER & ITS)
16 DELTAKEEPER CHAPTER, FRIENDS OF THE)
17 RIVER, and THE BAY INSTITUTE, all non-profit)
18 organizations,)

19 Plaintiffs,)

20 v.)

21 DIRK KEMPTHORNE, in his official capacity as)
22 Secretary of the Interior, and H. DALE HALL, in his)
23 official capacity as Director of the U.S. Fish and)
24 Wildlife Service,)

25 Defendants.)

Case No.: 05-CV-01207 OWW LJO

DECLARATION OF KIRK C. RODGERS

26 SAN LUIS & DELTA MENDOTA WATER)
27 AUTHORITY, WESTLANDS WATER)
28 DISTRICT, CALIFORNIA FARM BUREAU)
29 FEDERATION, GLENN-COLUSA)
30 IRRIGATION DISTRICT, et al., CALIFORNIA)
31 DEPARTMENT OF WATER RESOURCES, STATE)
32 WATER CONTRACTORS; and KERN COUNTY)
33 WATER AGENCY.)

34 Intervenor/Defendants.)
35
36
37
38

39 I, Kirk C. Rodgers, declare as follows:

- 40 1. I am the Director of the United States Bureau of Reclamation (Reclamation), Mid-Pacific
41 Region. In my capacity as Regional Director, I have overall responsibility for the various
42 functions of the Mid-Pacific Region, which includes the operations of the Central Valley
43 Project (CVP).
44

1 2. Reclamation understands that during the pendency of the reinitiated Section 7
2 consultations on ongoing CVP/State Water Project (SWP) operations that section 7(d) of
3 the Endangered Species Act (ESA) applies to its actions.

4 3. As committed to in my declaration of July 13, 2006, Reclamation will not execute long
5 term water service or repayment contracts with the CVP contractors listed in that
6 declaration during the pendency of the Section 7 consultation on ongoing CVP/SWP.

7 4. As described in my declaration to this Court filed in October, 2006, Reclamation
8 identified several longer term actions that were scheduled to reach approval or
9 implementation during the pendency of the ongoing reinitiated Section 7 consultations.
10 Reclamation will use the process outlined in that declaration to determine if approval or
11 implementation of those actions remain appropriate in light of Reclamation's obligations
12 under Section 7(d), however, Reclamation will not approve or implement the following
13 actions analyzed in the 2005 Biological Opinion issued by the U.S. Fish and Wildlife
14 Service: (1) South Delta Improvements Program, (2) Delta Mendota Canal/California
15 Aqueduct Intertie Program, (3) Lower American River Flow Standards and (4) Long
16 Term Environmental Water Account.

17 5. In my previous declaration submitted in October, 2006, Reclamation committed to
18 operate Tracy Pumping Plant (now called Jones Pumping Plant) within existing historic
19 levels as a 7(d) measure.

20 6. In my declaration submitted in October, 2006, Reclamation committed to using its
21 authorities and available funding to implement additional measures during the pendency
22 of the consultation. Reclamation did just that during May and June of this year to
23 implement several actions aimed at reducing entrainment of delta smelt at Jones Pumping
24 Plant. Reclamation held pumping to 850 cfs or one unit at Jones Pumping Plant for
25 approximately three weeks at the end of the Vernalis Adaptive Management Plan pulse
26 flow period. Additionally, Reclamation spent approximately \$5.2 million to acquire
27
28

1 35,000 acre feet of water for release on San Joaquin River tributaries to supplement flows
2 on the San Joaquin River and improve Old and Middle River flows. These actions have
3 been explained to this Court in more detail in the declarations filed in this case by Ronald
4 Milligan, Manager of the Central Valley Operations Office. Reclamation is committed to
5 using the authority granted to Reclamation by Congress to take actions that are protective
6 of delta smelt.

7 I declare under penalty of perjury under the laws of the State of California and the
8 United States, that the foregoing is true and correct.

9 Dated this 5th day of July, 2007.

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11 Kirk C. Rodgers, Director
12 Mid- Pacific Region, U.S. Bureau of Reclamation
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5 Attorneys for the Federal Defendants

6 **UNITED STATES DISTRICT COURT**
7 **EASTERN DISTRICT OF CALIFORNIA**

8 PACIFIC COAST FEDERATION OF)
FISHERMEN'S ASSOCIATIONS/INSTITUTE FOR)
9 FISHERIES RESOURCES, THE BAY INSTITUTE,)
BAYKEEPER AND ITS DELTAKEEPER)
10 CHAPTER, CALIFORNIA TROUT, FRIENDS OF)
THE RIVER, NATURAL RESOURCES DEFENSE)
11 COUNCIL, NORTHERN CALIFORNIA COUNCIL)
OF THE FEDERATION OF FLY FISHERS, and)
12 SACRAMENTO RIVER PRESERVATION)
TRUST, all non-profit organizations; and the)
13 WINNEMEM WINTU TRIBE,)

14 Plaintiffs,

vs.

Case No. 1:06-CV-00245 OWW LJO

15 CARLOS M. GUTIERREZ, in his official capacity)
as Secretary of Commerce, WILLIAM T.)
16 HOGARTH, in his official capacity as Assistant)
Administrator for Fisheries, National Marine)
17 Fisheries Service, National Oceanic and Atmospheric)
Administration, DIRK KEMPTHORNE, in his)
18 official capacity as Secretary of the Interior, and)
WILLIAM E. RINNE, in his official capacity as)
19 Acting Commissioner, United States Bureau of)
Reclamation,)
20

**DECLARATION OF KIRK C.
RODGERS**

21 Defendants,

and

22 SAN LUIS & DELTA MENDOTA WATER)
AUTHORITY, WESTLANDS WATER)
23 DISTRICT, CALIFORNIA FARM BUREAU)
FEDERATION, GLENN-COLUSA)
24 IRRIGATION DISTRICT, et al., and STATE)
WATER CONTRACTORS, et al.)
25

26 Intervenor/Defendants.
27
28

NATURAL RESOURCES DEFENSE COUNCIL,
CALIFORNIA TROUT, BAYKEEPER & ITS
DELTAKEEPER CHAPTER, FRIENDS OF THE
RIVER, and THE BAY INSTITUTE, all non-profit
organizations,

Plaintiffs,

v.

DIRK KEMPTHORNE, in his official capacity as
Secretary of the Interior, and H. DALE HALL, in his
official capacity as Director of the U.S. Fish and
Wildlife Service,

Defendants.

SAN LUIS & DELTA MENDOTA WATER
AUTHORITY, WESTLANDS WATER
DISTRICT, CALIFORNIA FARM BUREAU
FEDERATION, GLENN-COLUSA
IRRIGATION DISTRICT, et al., CALIFORNIA
DEPARTMENT OF WATER RESOURCES,
STATE WATER CONTRACTORS; and KERN
COUNTY WATER AGENCY.

Intervenors/Defendants.

Case No.: 05-CV-01207 OWW LJO

**DECLARATION OF KIRK C.
RODGERS**

I, Kirk C. Rodgers, declare as follows:

1. I am the Director of the United States Bureau of Reclamation (Reclamation), Mid-Pacific Region. In my capacity as Regional Director, I have overall responsibility for the various functions of the Mid-Pacific Region, which includes the operations of the Central Valley Project (CVP).
2. Reclamation understands that during the pendency of the reinitiated consultations on ongoing CVP/State Water Project (SWP) operations that section 7(d) of the Endangered Species Act (ESA) applies to its actions.
3. For this reason, and for the reasons outlined in my declaration of July 13, 2006, Reclamation will not execute long term contracts with the contractors listed in that declaration during the pendency of the Section 7 consultation on ongoing CVP/SWP operations.

- 1 4. Reclamation is reviewing all longer term actions associated with CVP/SWP operations^{1/}
2 that are scheduled to reach the approval or implementation stage during the Section 7
3 consultation to determine if approval or implementation of each action remains
4 appropriate given the obligations of the ESA. The review of each of these actions will
5 include determinations on (1) whether there is a sufficient analysis of effects on
6 threatened and endangered species to ensure that the action will not jeopardize any listed
7 species, either through the revised Biological Opinions on CVP/SWP operations or
8 project specific Biological Opinions or concurrence letters, and (2) whether the action
9 would constitute an irreversible or irretrievable commitment of resources that would
10 foreclose the formulation or implementation of any reasonable and prudent alternatives.
- 11 5. During the pendency of the consultation, Reclamation will operate the Tracy Pumping
12 Plant within recent historic pumping levels. These pumping levels were included in the
13 2004 Biological Assessment and analyzed in the Biological Opinions.
- 14 6. The 2004 Biological Assessment contains conservation measures to benefit species.
15 These conservation measures will continue to be implemented during the pendency of the
16 consultation. One example of a conservation measure included in the Biological
17 Opinions is the Vernalis Adaptive Management Program (VAMP). VAMP is one of the
18 highest priority actions that benefits delta smelt and salmonids, and involves both
19 increased flows and export reductions. Additionally, depending on the water year and
20 the take at the pumps, we may take actions in the winter to reduce entrainment of adult
21 delta smelt. A third example is maintaining fall flows at a level to benefit the salmon
22 using CVPIA section 3406(b)(2) water. As mentioned in the delta smelt section VAMP
23 will be done in April and May with flows and export reductions at the CVP and SWP.
- 24 7. In addition to the actions to ensure compliance with the ESA described above,
25 Reclamation is considering actions to supplement the operations described in the project

26
27 ¹ These actions would include, but are not limited to, the South Delta Improvements Program Stage
28 1, Delta Mendota Canal/California Aqueduct Intertie Project, Yuba Accord, Sacramento Valley Water
Management Program, the Lower American River Flow Standards and the Long Term Environmental Water
Account Program.

1 description in Reclamation's 2004 Biological Assessment for the Operations Criteria and
2 Plan (OCAP) that will provide benefits for listed species during the pendency of the
3 consultation. These actions will include, but may not be limited to, the actions described
4 below.

5 **Delta Smelt**

6 8. Since the discovery of the decline in pelagic organisms in the Bay-Delta, Reclamation has
7 worked with other federal and state agencies to determine the causes for the decline.
8 Reclamation has committed substantial resources and staff to this effort and will continue
9 to do so for as long as necessary.

10 9. During the pendency of the consultation, Reclamation is prepared to implement
11 additional measures to benefit delta smelt that may be recommended to the extent they are
12 consistent with Reclamation's authority and available funding.

13 10. Reclamation has the following water assets available at this time to implement
14 recommended actions for the next water year:

15 a. 2006 CVPIA section 3406(b)(2) water (b(2) water): Reclamation has banked
16 approximately 195,000 acre feet of unused b(2) water from the 2006 water year to
17 be used in the 2007 water year, consistent with the pilot banking study. Interior
18 has experimented with banking unused b(2) water for the last two water years, in
19 accordance with the revised 2003 policy on implementation of CVPIA section
20 3406(b)(2). This water may be used for actions for delta smelt as recommended
21 by the FWS,

22 b. EWA Purchased Water: Reclamation has a contract to purchase up to 25,000 acre
23 feet of water for EWA during the 2007 water year. Reclamation is in negotiations
24 with other willing sellers to secure potential assets. These assets will be
25 combined with assets acquired by the State of California for the EWA program.

26 c. CVPIA section 3406(b)(1), (b)(2), (b)(3): Reclamation will continue to operate
27 consistent with CVPIA section 3406(b)(1), (b)(2), (b)(3). CVPIA Section
28 3406(b)(1) provides for modification of the CVP operations to meet the fishery

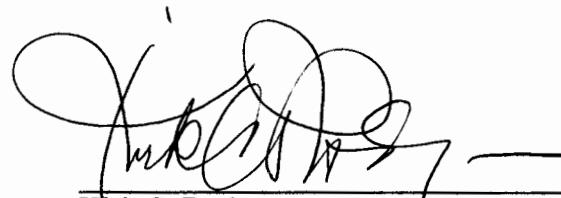
1 restoration goals of the CVPIA, so long as the operations are not in conflict with
2 the fulfillment of the Secretary's contractual obligations to provide CVP water for
3 other authorized purposes. CVPIA section (b)(2) provides for the dedication of
4 800,000 acre feet of CVPIA yield for the purposes articulated in that section.
5 Additionally, Interior is currently authorized to acquire water to supplement
6 (b)(2) water, pursuant to Section 3406(b)(3).

7 **Salmonids**

- 8 11. As stated above, the 2004 Biological Assessment contains conservation measures to
9 benefit species which will continue to be implemented during the pendency of the
10 consultation. As an example,
11 12. In addition to the actions described in the Biological Assessment, Reclamation intends to
12 address salmonid passage issues in the Sacramento River by continuing its environmental
13 review of the Red Bluff Diversion Dam. Reclamation will be recirculating a draft EIS for
14 public comment by the end of this year.
15 13. The water assets described in paragraph 8 above are also available for actions to benefit
16 salmonids. Reclamation will continue to work with FWS, the National Marine Fisheries
17 Service, the California Department of Water Resources and the California Department of
18 Fish and Game through the Water Operations Management Team to determine the best
19 use of these assets given the needs of the multiple listed species.

20
21 I declare under penalty of perjury under the laws of the State of California and the United States,
22 that the foregoing is true and correct.

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Kirk C. Rodgers
Director, Mid-Pacific Region, U.S. Bureau of
Reclamation

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EXHIBIT 15

Interagency Ecological Program 2006-2007 Work Plan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary

January 12, 2007

Prepared by: Chuck Armor (DFG), Randall Baxter (DFG), Rich Breuer (DWR), Mike Chotkowski (USBR), Steve Culberson (CBDA), Marty Gingras (DFG), Bruce Herbold (EPA), Anke Mueller-Solger (DWR), Matt Nobriga (CALFED), Ted Sommer (DWR), and Kelly Souza (DFG)

Executive Summary

Abundance indices calculated by the Interagency Ecological Program (IEP) through 2005 suggest recent marked declines in numerous pelagic fishes in the upper San Francisco Estuary (the Delta and Suisun Bay). Although several species show evidence of long-term declines, the recent low levels were unexpected given the relatively moderate winter-spring flows of the past several years.

In response to these changes, the IEP formed a Pelagic Organism Decline (“POD”) work team to evaluate the potential causes. The product of this effort was a 2005 study to provide insight into the best lines of inquiry for 2006-2007 studies. The major findings through 2005 were synthesized using two conceptual modeling approaches. First, we developed species matrix models. We used the matrix models to examine which stressors (entrainment, toxic effects on fish, toxic effects on fish food items, harmful algal blooms, clam *Corbula* effects on food availability, and disease and parasites) were most likely to be important. Here we use importance to mean either stressors supported by the available data or stressors which could not be ruled out based on the available data. Secondly, we constructed narrative explanations for the recent step decline in abundance of pelagic species in the context of their long term trends or previous patterns. Narratives have been developed for the major components: 1) *previous abundance levels*, which describes how continued low abundance of adults leads to juvenile production; 2) *habitat*, which describes how water quality variables (including contaminants and toxic algal blooms) affect estuarine species; 3) *top-down effects*, which posits that predation and water project entrainment affect mortality rates; and 4) *bottom-up effects*, which focuses on food web interactions in Suisun Bay and the west Delta.

The overall approach for 2006-7 is intended to evaluate and refine the evidence for the conceptual models. To address the matrix models, the study design is based on *temporal*, *spatial* and *species* contrasts for selected fish and zooplankton. For each contrast, the variables to be evaluated include: abundance, growth rate and fecundity; and feeding success, condition factor, parasite load and histopathology (fish only). To the extent possible, these data will be collected simultaneously to help evaluate the relative importance of different stressors. The narrative model, on the other hand, posits linkages among different stressors and their possible pathways to produce the observed declines of more than one species. The work plan elements that are based on the narrative model, therefore, emphasize analyses of the proposed linkages among stressors.

The proposed studies represent an interdisciplinary, multi-agency effort including staff from DFG, DWR, USBR, USEPA, USGS, CBDA, SFSU and UCD. Project components were selected based on their ability to evaluate the conceptual models, and their feasibility in terms of methods, staffing, costs, timing and data availability. The proposed work falls into three general types: 1) an expansion of existing monitoring (five expanded surveys); 2) ongoing studies (17 studies); and 3) new studies (25 studies). None of the work will affect the mandated monitoring currently under performed by IEP. The initial cost estimate for 2007 is approximately \$3,260,000 annually.

The program will be run by the existing IEP Project Work Team (Pelagic Organisms Decline – “POD PWT” to develop, direct, review and analyze the results of the effort. The program will yield a range of products and deliverables including management briefs, publications and reports, web-based monitoring data, and presentations at conferences, workshops and meetings.

Introduction

In the last several years, the abundance indices calculated by the Interagency Ecological Program (IEP) Fall Midwater Trawl survey (FMWT) and Summer Townet Survey (TNS) showed marked declines in numerous pelagic fishes in the upper San Francisco Estuary (the Delta and Suisun Bay) (IEP 2005a,b). The abundance indices for 2002-2004 include record lows for delta smelt and age-0 striped bass and near-record lows for longfin smelt and threadfin shad. In contrast, the San Francisco Bay Study did not show significant declines in its catches of marine/lower estuary species. Based on these findings, the problem appears to be limited to fish dependent on the upper estuary.

While several of these declining species - including longfin smelt and juvenile striped bass have shown evidence of long-term declines - there appears to have been a precipitous “step-change” to very low abundance by at least 2000 (IEP 2005a,b). Moreover, the record or near-record low abundance levels are remarkable in that winter-spring river flows into the San Francisco Estuary were moderate during this period. Many estuarine organisms including longfin smelt and striped bass typically produce poor year classes in dry years (Jassby et al. 1995); delta smelt abundance is generally lowest in very wet or very dry years (Moyle et al. 1992). Thus, we expected the moderate hydrology during the past three years to support modest production.

In response to these changes, the IEP formed a Pelagic Organism Decline (“POD”) work team to evaluate the potential causes. The product of this effort was a 2005 work plan, which provided an overview of the problem, a conceptual model, and description of a “screening level” study to examine some of the suspected major causal factors (IEP 2005a). Note that the 2005 work was not designed to “prove” which stressor(s) was responsible for the observed trends. Instead, this effort was intended to provide insight into the best lines of inquiry for the 2006-2007 studies. Highlights of the 2005 results included the following initial results. More details are available in IEP (2005b).

Pelagic fishes. 1) In 2005, the highest spring outflow conditions since 2000 failed to improve fish abundance; 2) there was no evidence of a recent decrease in the amount of “physical habitat” for delta smelt or juvenile striped bass; 3) there was no evidence of a recent major decline in apparent growth rates for delta smelt, longfin smelt, or striped bass; 4) in 1999 and 2004, delta smelt in Cache Slough had higher residual growth/condition than other locations; 5) striped bass age-fecundity relationships in 2005 did not differ substantially from relationships developed in the 1970s and 1980s; and 6) otolith analyses indicated that in 1999 delta smelt spawned throughout the upper estuary recruited to the adult population, whereas in 2004, only fish spawned in the Delta recruited.

Food web/exotic species. 1) Reanalysis of the zooplankton data revealed that there was no recent step-change in calanoid copepods; however, we are still determining whether regional e.g. Suisun Bay, declines occurred; 2) there has been no recent major decline in chlorophyll *a* (an index of phytoplankton biomass); however, we are still determining whether regional e.g. Suisun Bay, declines occurred; 3) the toxic blue-green alga *Microcystis* was present throughout the Delta at substantially higher levels in summer 2005 than in summer 2004; 4) although there has been a recent expansion in the range of the clam *Corbula*, recent occurrence is comparable to the 1987-

1992 drought; and 5) changes in sediment composition and benthic assemblages occurred estuary-wide in 1999-2000.

Toxics. 1) Studies on contaminants found that there have been changes in the patterns of use for herbicides and pyrethroid pesticides. It is plausible, but unclear if these changes pose serious risks for aquatic species; 2) significant acute or chronic toxicity to the amphipod, *Hyaella azteca*, was detected at four out of ten sampling sites, however the cause(s) was not identified; 3) no significant toxicity to the cladoceran, *Ceriodaphnia dubia*, the delta smelt or the juvenile striped bass was observed during the study period; 4) delta smelt are more sensitive to copper than previously reported and are 10-12 times more sensitive than juvenile striped bass; and 5) delta smelt from 2003 and 2005 (limited) showed more liver lesions at two locations representing general regions in Suisun Marsh (near and in Nurse Slough) and the Sacramento River at Cache Slough and the Sacramento Deepwater Ship Channel.

Water Project Operations. 1) There have been changes in the input flows to the Delta in recent years, including a slight increase in average Sacramento River flow since 2001 and a substantial reduction in peak San Joaquin flows since 1999. 2) There was no evidence of a recent major change in residence time, consistent with the lack of change in chlorophyll *a*. 3) Increases in the pattern of wintertime salvage are consistent with hydrodynamic changes occurring each winter since 2001. 4) Nonconsumptive water use by Contra Costa and Pittsburg power plants may reach 3200 cfs (both facilities combined). The fish population impacts of these diversions have not been evaluated since the early 1980s, but given their location and the potentially large cooling water flux through them, the impacts could be substantial.

Conceptual Model

Initial Conceptual Model

Based on the initial hypothesis that fish abundance declined abruptly by 2002, we developed an initial conceptual model (IEP 2005a). Specifically, we proposed at least three general factors that may have been acting individually or in concert to lower pelagic productivity: 1) toxic effects; 2) exotic species effects; and 3) water project effects (Figure 1). The conceptual model used these categories to illustrate the potential pathways by which pelagic species in the Delta could be affected (Figure 1). For each group of “boxes” shown in the model, one or more examples are provided in italics. The arrows represent the potential mechanisms for changes. Note that not all of the organisms shown in each box are necessarily responsible for each of the mechanisms. Some of the rationale for these components is described below.

Toxins could affect fishes directly or indirectly by reducing lower trophic level quantity or quality. Herbicides could directly affect phytoplankton, zooplankton and fishes, while insecticides are most likely to affect zooplankton and fish. Toxic effects at lower trophic levels may reduce food supply for fishes and/or their invertebrate prey. Blooms of the blue-green alga (cyanobacteria) *Microcystis aeruginosa* have been observed in the Delta since 1999 (Lehman and Waller 2003, Lehman et al. 2005). This species complex often produces toxic metabolites collectively known as microcystins. Microcystins are cancer-causing to humans and wildlife, including fish (Carmichael 1995), and reduce feeding success in zooplankton (Rohrlack et al.

2005). Microcystins have been found in Delta zooplankton and clam tissue and could impact organisms at higher trophic levels through bioaccumulation (Lehman et al. 2005). The switch from organophosphate to pyrethroid pesticides increased substantially through the 1990s (see Oros and Werner report in Attachment A of 2005 POD Synthesis Report). Pyrethroid pesticides have been shown to be less harmful to humans and terrestrial wildlife but more harmful to aquatic organisms. The rising use of organic herbicides and copper-based compounds to control nuisance aquatic weeds and algal blooms in the Delta may also pose a threat to desirable aquatic organisms.

The negative effects of invasive exotic species in the estuary have been well-established. Some notable examples were the substantial declines in lower trophic level productivity that followed the introduction of *Corbula amurensis* (Nichols et al. 1990; Kimmerer and Orsi 1996; Jassby et al. 2002, Kimmerer submitted) and the reduced abundance of native nearshore fishes associated with proliferation of *Egeria densa* and centrarchid fishes along Delta shorelines (Brown and Michniuk in review; Nobriga et al. 2005). At this time, we have limited information about quantitative aspects of the estuarine food web needed to estimate *Corbula* grazing rates or predict whether nearshore and pelagic food webs are coupled in ways relevant to the production of pelagic fishes.

Kimmerer (2002a) showed that water project operations have resulted in lower winter/spring inflow and higher summer inflow to the Delta. As noted previously, the actions by the CALFED implementing agencies have restored some spring inflow, but have also increased summer inflows to meet increasing summer export demands. Winter exports have also increased by about 50% in recent years. These shifts were implemented based on the assumption that it would be more protective to sensitive early life stages of key estuarine fishes and invertebrates. However, it is possible that high export during summer-winter months has unanticipated food web effects by exporting biomass that would otherwise support the estuarine food web. Other possible mechanisms include increased entrainment of fishes during the summer-winter months, or a reduction in habitat quality downstream (e.g. less area of the appropriate salinity). Total annual exports have continued to increase. It is also possible that the total volume diverted on an annual basis influences estuarine productivity (Livingston et al. 1997, Jassby et al. 2002).

Delta Pelagic Species Conceptual Model

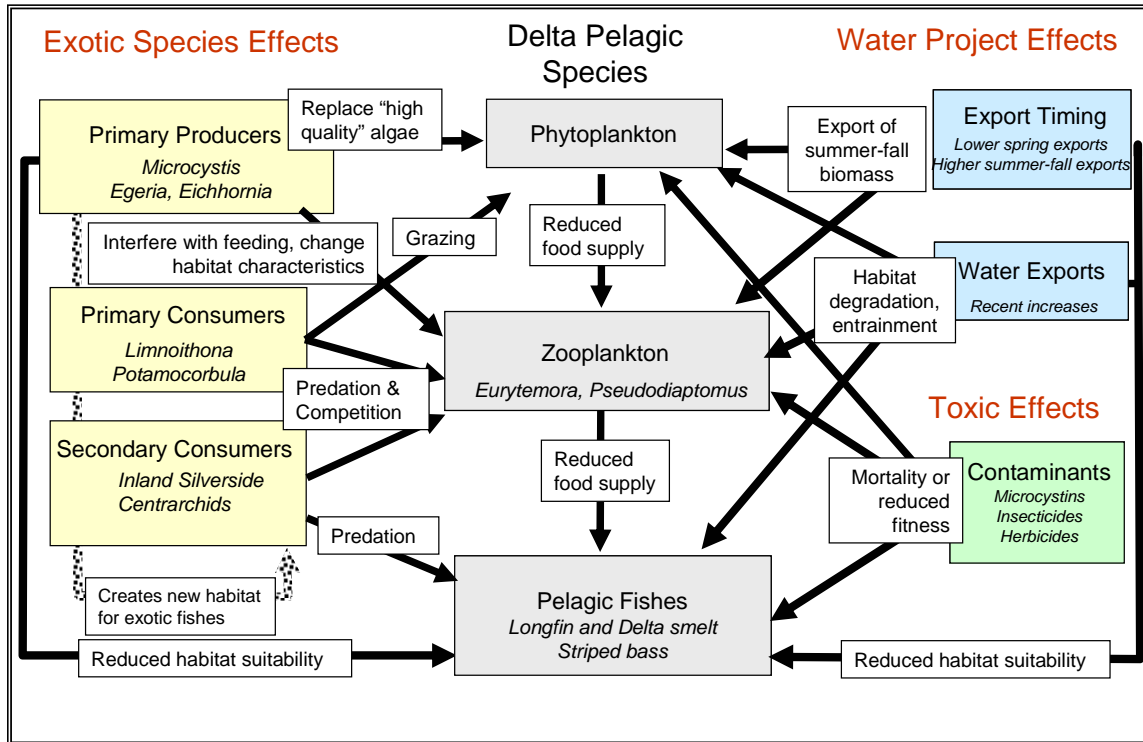


Figure 1. Delta pelagic species conceptual model

Revision of 2005 Conceptual Model

We had planned to use the initial conceptual model (Figure 1) as the basis of the synthesis. However, this conceptual model was based on earlier data showing a system-wide decline in calanoid copepods, which a re-examination of the data in 2005 did not support. Moreover, we found that the model did not adequately reflect spatial and temporal variation in the stressors on pelagic organisms. Initial results from 2005 also suggested that some stressors might act independently of the estuarine food-web that was central to our conceptual model. Though the model provided a useful basis to design the 2005 study program, we chose a somewhat different approach for the 2006-2007 effort.

The 2006-2007 models represent an improvement over the 2005 model, but it is important to recognize that there are still potentially numerous limitations (IEP 2005b). Much of the 2005 data is preliminary or unavailable at this writing and has not yet been peer-reviewed, so the new models should be considered equally preliminary. Moreover, we acknowledge that our models may have been influenced by potential biases in the sampling programs. Several changes in the size and distribution of the target species have the potential to change our perceptions of trends in abundances and distributions. This, in turn, has the potential to affect our conceptual models. Finally, it is important to recognize that the recent step decline in pelagic fish species is superimposed over long term declines for several of them and long term relationships of these fish with other environmental factors.

The major findings through 2005 were synthesized in two general ways (IEP 2005b). First, we developed species matrices to examine which stressors were most likely to be important based on the available data or which could not be ruled out because we had no data to base such a conclusion. Secondly, we constructed narrative explanations for the recent step decline in abundance of pelagic species in the context of their long term trends or previous patterns. Note that both types of models were specifically developed for the purposes of designing the work plan for 2006 and beyond—they were not intended to be the basis of setting resource management priorities.

Matrix Model for Species and Stressors

Matrix models were developed for the four target fish species (delta smelt, longfin smelt, threadfin shad and juvenile striped bass) to summarize the potential role of various stressors in the recent decline. The matrices depict our current consensus of whether or not each stressor impacted each species-life stage during 2002-2004, possibly influencing the decline. The level of information used to support our consensus is also ranked. Though we attempted to develop information on most of the stressors listed, there are numerous cases where data are unavailable or have not been analyzed. In such instances we indicate no information, but have an expectation that information will be available soon to refine the models. The stressors evaluated are listed below:

- Mismatch of larvae and food. This stressor focuses on the separation of larval fish and food items in time and geographical space. If young fish are not co-located with food, they will starve or have increased vulnerability to predation (Cushing 1990). For the purposes of the matrices, the stressor is considered to apply only to larvae—it is considered separate from fish that can swim strongly enough to search large areas to locate food.
- Reduced habitat space. Amount of open-water habitat as defined by physical and chemical parameters that limit the distribution of species.
- Adverse water movement/transport. Changes in Delta hydrodynamics that direct fish to unsuitable areas due to water project operations. Transport refers to movement of a life stage as influenced by Delta hydrodynamics which can be altered by water project operations (i.e. exports, gate operations, reservoir releases, barriers). Delta hydrodynamics affects transport through its effects on migratory cues, habitat quality or hydrologic resident times. This stressor specifically excludes entrainment, but may include thermal effects of power plant effluent.
- Entrainment. Mortality of pelagic fishes caused by loss to water diversions for exports, in-Delta uses, and power plant cooling.
- Toxic effects on fish. Acute and chronic effects sufficient to increase mortality and/or reduce fecundity of pelagic fishes.

- Toxic effects on fish food items. Acute and chronic effects sufficient to increase mortality and/or reduce fecundity of pelagic fish food items.
- Harmful *Microcystis* blooms. Acute and chronic effects of *Microcystis* sufficient to result in one or more of the following in pelagic fishes: increase mortality; reduce fecundity, reduced feeding; or habitat avoidance.
- *Corbula* effects on food availability. *Corbula* decreases phytoplankton and zooplankton, which is reflected in the production of larger zooplankton, invertebrates or fish especially in early lifestages.
- Disease and parasites. Disease or parasites that result in reduced survival or fecundity of pelagic fishes.

The species matrices are included as Figures 3-7. Annotations for the matrices are provided in Appendix A. Columns represent key times of the year, with reference to the corresponding life stages. The rows describe the relationships between life stages and the major stressors. Within each cell is an idealized “map” containing sub-cells to represent the major regions of the upper estuary (Figure 2). The various regions of the Delta have been described differently by different authors. For aquatic organisms, we believe the tidal nature of the estuary overrides many of the geographic features. Thus, in our discussion of the areas of the Delta, we intentionally use overlapping areas to better account for the fact that water frequently moves from area to area while still bearing in mind that the stressors and processes in different areas are different. This overlap is most pronounced in discussing “Suisun Bay” and the “Northern Delta” (i.e. the blue and green areas in Figure 2). Marine influences, including X2 position can have impacts up the axis of the estuary as far as Decker Island, while significant factors, such as sediment plumes from the Yolo Bypass are at times prominent downstream to at least Chipps Island. Similarly, the San Joaquin River is not representative of a single area’s influences but rather the southern limit of Central Delta processes and the northern limit of South Delta processes. Therefore, we have included the San Joaquin River within both areas in our delimitation of the Delta. The actual areas of overlap may also be taken to represent the tidal excursions in each area, such that areas of overlap are much longer in the western regions than in the more upstream locales. Overall, we are concerned with identifying the areas where stressors and processes originate and less concerned with their exact locations of impact.

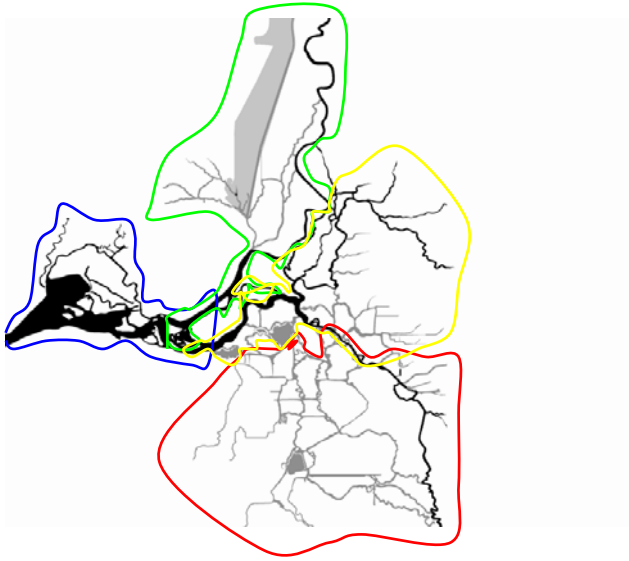


Figure 2. Map of the Delta to identify the regions specified in the matrix.

The geographic boundaries roughly correspond to: Suisun Bay (Suisun Bay, river confluence area downstream of Decker Island and Big Break); Central Delta (South of Rio Vista, North of Franks Tract); North Delta/Lower Sacramento River; South Delta/San Joaquin River (Franks Tract and south/east Delta). The symbols within the “map” are designed to reflect a binary potential for the impact of each stressor (described below) and the degree to which available data support our assertions. Additional details about the logic for each symbol are provided as annotations in Appendix B in 2005 POD Synthesis Report.

Impact

Plausible Impact = The factor (stressor) is likely to have a substantial influence on lifestage survival (*Large Symbol*).

No Likely Impact = The factor (stressor) is unlikely to have a substantial influence on lifestage survival (*Small Symbol*).

Information

Strong = Substantial information exists for directly addressing the stressor influence on the specific lifestage (*Dark Symbol*)

Limited = Either available information or current data analysis is too limited to support strong conclusions regarding stressor) influence on the specific lifestage (*Grey Symbol*).

None = Either information is not available, or no available data have been appropriately analyzed, to address stressor influence on the specific lifestage (*Clear Symbol*).

Figure 3. Legend for Matrix Models

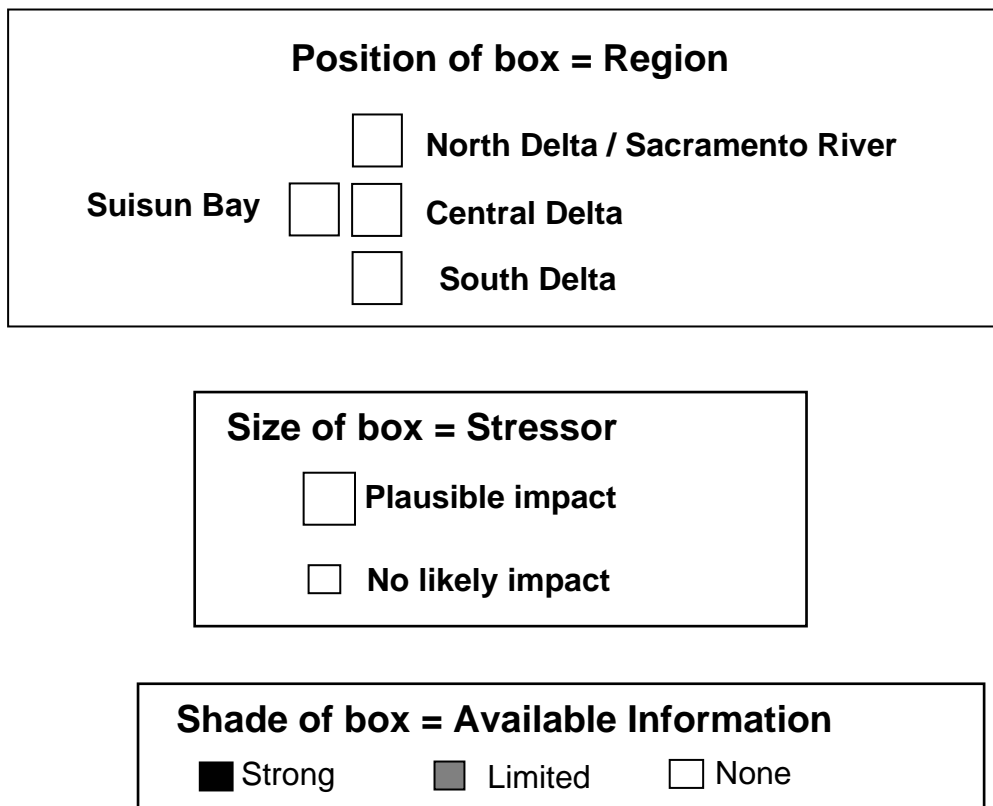


Figure 4. Longfin smelt matrix model

Longfin smelt				
Stressor	Winter Dec-Feb adults, larvae	Spring Mar-May larvae, juveniles	Summer Jun-Aug juveniles	Fall Sep-Nov juveniles
Mismatch of larvae and food				
Reduced habitat space				
Adverse water movement				
Entrainment (water projects and power plants)				
Toxic effects on fish				
Toxic effects on fish food items				
Harmful Microcystis blooms				
Corbula effects on food availability				
Disease and parasites				

Figure 5. Threadfin Shad matrix model

Threadfin shad				
Stressor	Winter	Spring	Summer	Fall
	Dec-Feb adults, juveniles	Mar-May adults, larvae	Jun-Aug adults, larvae, juveniles	Sep-Nov adults, juveniles
Mismatch of larvae and food				
Reduced habitat space				
Adverse water movement				
Entrainment (water projects and power plants)				
Toxic effects on fish				
Toxic effects on fish food items				
Harmful Microcystis blooms				
Corbula effects on food availability				
Disease and parasites				

Figure 6. Striped Bass matrix model





































Striped bass				
Stressor	Winter Dec-Feb juveniles	Spring Mar-May larvae, juveniles	Summer Jun-Aug larvae, juveniles	Fall Sep-Nov juveniles
Mismatch of larvae and food				
Reduced habitat space				
Adverse water movement				
Entrainment (water projects and power plants)				
Toxic effects on fish				
Toxic effects on fish food items				
Harmful Microcystis blooms				
Corbula effects on food availability				
Disease and parasites				

Figure 7. Delta Smelt matrix model

Stressor	Delta smelt			
	Winter Dec-Feb adults	Spring Mar-May adults, larvae	Summer Jun-Aug juveniles	Fall Sep-Nov juveniles
Mismatch of larvae and food				
Reduced habitat space				
Adverse water movement				
Entrainment (water projects and power plants)				
Toxic effects on fish				
Toxic effects on fish food items				
Harmful Microcystis blooms				
Corbula effects on food availability				
Disease and parasites				

Narrative Model

Guided by available results, we developed a narrative model to describe possible mechanisms by which a combination of long-term and recent changes in the ecosystem could produce the observed declines in catch of pelagic fish species. The model is based on the simple schematic shown in Figure 8. The major components contained in the narrative model are as follows: 1) *prior fish abundance*, which describes how continued low abundance of adults leads to juvenile production; 2) *habitat*, which describes how water quality variables (including contaminants, disease and toxic algal blooms) affect estuarine species; 3) *top-down effects*, which posits that predation and water project entrainment affect mortality rates; and 4) *bottom-up effects*, which focuses on food web interactions in Suisun Bay and the west Delta. These narrative model components are described in detail in the following sections.

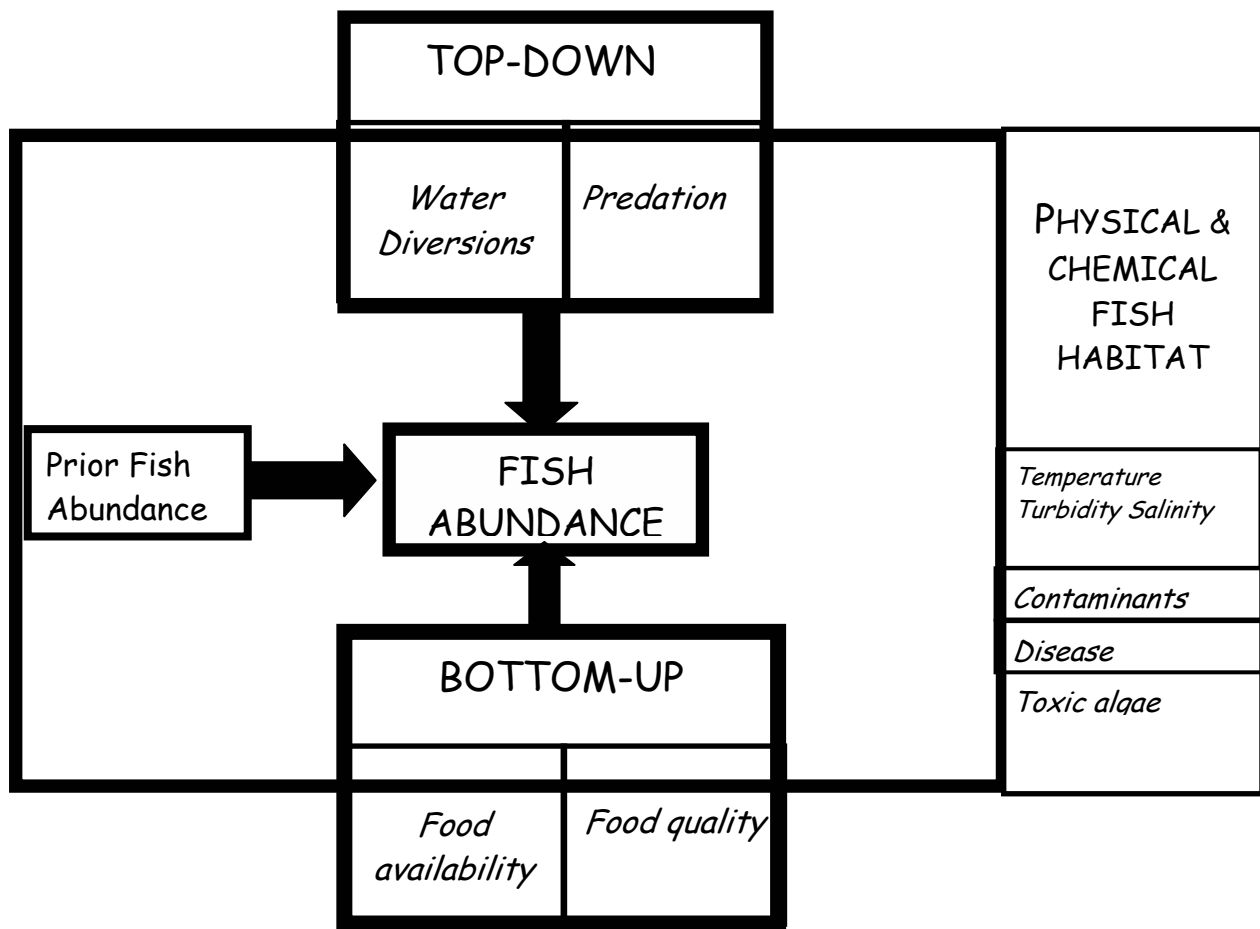


Figure 8: Components of the narrative model for the pelagic fish decline in the upper San Francisco estuary.

Note that these narrative model components are not exclusive of other explanations for the observed changes in fish abundance, nor are they intended to suggest priorities for resource management. Instead, they were intended as examples of how the different stressors may be regionally linked. Moreover, no single narrative component can explain the declines of

all four species though both in tandem plausibly could. The narrative models will be developed and refined as data become available. In the meantime, we believe that the two initial narrative models provide a useful basis for the development of more detailed hypotheses and studies for 2006-2007.

Previous Abundance Narrative

The relationship between numbers of spawning fish and the numbers of young subsequently produced are known as stock-recruit relationships. Stock-recruit relationships have been described for many species and are a central part of the management of commercially and recreationally fished stocks. Different forms of stock-recruit relationships are possible, including density-independent, density-dependent, and density-vague types. The latter refers to situations where there is not a statistically demonstrable stock-recruit relationship observable in available data. Of particular importance for the POD is that adults are needed to make young, so in any form of a stock-recruit model, there is likely a point at which low adult stock will result in low juvenile stocks even under favorable environmental conditions while the stock ‘rebuilds’ itself. Currently, the adult striped bass stock is not very low, so the previous abundance narrative does not apply to striped bass. However, it may apply to the other three species. It is not currently known what level of abundance index would represent a “point of no return”, or a point of slow return. This is partly due to the density-vague nature of delta smelt stock-recruit relationships (see Bennett 2005).

Habitat Narrative

Aquatic habitats are the suites of physical, chemical, and biological factors that species live in (Hayes et al. 1996). The maintenance of appropriate habitat quality is essential to the long-term health of aquatic resources (Rose 2000; Peterson 2003). In our narrative model, a key point is that habitat effects occur on all other components of the model (Figure 8). Hence, changes in habitat can not only affect pelagic fishes, but also their predators and prey. Moreover, we expect that this habitat is especially vulnerable to future climate change.

Pelagic Fish Habitat: Habitat for pelagic fishes is water. More specifically, it is water with suitable concentrations of natural physical-chemical properties such as salinity, turbidity, and temperature; suitably low levels of contaminants, and suitably high levels of prey production to support growth. The four POD fishes use a variety of tidally-assisted swimming behaviors to maintain themselves within open-water areas where water quality and food resources are favorable (Bennett et al. 2002). The four POD fishes also distribute themselves differentially along the estuarine salinity gradient (Dege and Brown 2004), so at any point in time, salinity is a major factor affecting these fishes’ geographic distributions. Water clarity is also an important factor influencing the distribution of young-of-year striped bass and delta smelt (Nobriga et al. 2005; Feyrer et al. accepted manuscript). Water temperatures are important to spawning windows for the POD fishes, but do not appear to exert strong influence on population distributions during summer-fall.

The San Francisco Estuary is a tidal river estuary (also known as a river-dominated estuary). In tidal river estuaries, habitat quality varies rapidly because the sizes, shapes, and general

suitability of nursery areas change as river flow changes (Stoner et al. 2001; Manderson et al. 2002). In the SFE, pelagic habitat quality is thought to be indexed by changes in the location of the 2 psu isohaline because the abundance of numerous taxa increases when flows into the estuary are high and the 2 psu isohaline is pushed seaward (X2; Jassby et al. 1995). Recent research has shown that X2 is a close surrogate for fall habitat quality for the POD fishes, but only a weak surrogate for summer habitat quality. Recent research has also shown that the *Corbula amurensis* invasion in the late 1980s changed the X2-abundance relationships, at least for longfin smelt (Kimmerer 2002) and young-of-year striped bass (IEP unpublished data). This is strong evidence that the present-day food web responds differently to flow than the pre-*Corbula* food web did. Food web changes also may have affected delta smelt (Bennett 2005). All of these analyses strongly suggest that a biologic aspect of pelagic fish habitat (food availability) has been degraded. Recent results of POD investigations also show that fall habitat suitability has declined due to increased salinity and water clarity in Suisun Bay and the Delta, respectively.

The IEP monitoring data show a trend toward increasing water clarity in the Delta (Jassby et al. 2002). The most likely reasons for this trend are decreasing sediment supply from the Sacramento River basin (Wright and Schoellhamer 2004) and proliferation of *Egeria densa* (Brazilian waterweed; Brown and Michniuk in press). We do not know whether *Egeria* continues to spread into new areas or whether it has filled all suitable shallow water habitats. In lakes, high densities of *Egeria* and similar plants can mechanically filter suspended sediments from the water column (Scheffer 1999). Increased water clarity may be detrimental to at least two of the POD species, young-of-year striped bass and delta smelt because these species/life stages appear to avoid water that is not very turbid.

In addition to habitat changes from salinity, turbidity and invasive species, contaminants can change ecosystem function and productivity through numerous pathways. The trends in contaminant loadings and their ecosystem effects are not as well understood as the natural water quality and zooplankton trend effects on pelagic fish habitat quality. We are currently evaluating general toxicity and *Microcystis* toxicity looking both for direct toxic effects on the POD fishes and evaluating indirect contaminant effects such as inhibition of prey zooplankton production.

Habitat for Other Aquatic Organisms: Much of the previous discussion about how physical conditions and water quality affects pelagic fishes is also relevant to other aquatic organisms including plankton and the benthos. Particularly for planktonic species, the residence time of water must also be considered. Lower residence time generally results in lower plankton biomass, but also may reduce cumulative entrainment effects. In contrast, higher residence time may result in higher plankton biomass build-up and increased food availability for planktivorous fishes; however, it may also promote high temperatures, invasion by *Egeria*, and nonnative fishes, *Microcystis* blooms, etc., and subject small fishes to increased cumulative entrainment. Recent particle tracking modeling results for the Delta show that San Joaquin River residence times are much lower than residence times in the Sacramento River, indicating differences in habitat conditions along a north-south gradient.

Climate Change Effects on Habitat: Climate change may have substantial influences on pelagic habitat in the long-term. There are several mechanisms by which climate change could degrade

habitat quality for one or more POD fishes. First, there has been a trend toward more Sierra precipitation falling as rain. This increases the likelihood of floods and may further change Central Valley hydrographs. Altered hydrographs interfere with pelagic fish reproduction, which is usually tied to historical runoff patterns (Moyle 2002). Second, there is the potential for sea level rise. Sea level rise will increase salinity intrusion unless sufficient freshwater resources are available to repel the seawater. This will shift fish distributions upstream and possibly reduce habitat area for some species. Third, climate change is projected to result in warmer temperatures in Central California. As stated above, water temperatures do not currently have a strong influence on POD fish distributions. However, summer water temperatures throughout the upper estuary are fairly high for delta smelt. The lethal temperature limit for delta smelt is 25°C (Swanson et al. 2000). Median July water temperatures in the upper estuary are typically 20-23°C (IEP unpublished data). If climate change resulted in median temperatures in the upper estuary reaching 25°C, delta smelt would have little chance of maintaining viable populations.

Top-Down Narrative

This narrative component proposes that the most recent fish declines can be envisioned as the result of the interactive, top-down influence of two kinds of “predators”; piscivorous fishes, and water diversions. The ‘top-down’ narrative is predicated on the hypothesis that consumption or removal of fish biomass by piscivores (principally striped bass) and water diversions (SWP/CVP exports; power plant diversions) mattered more after the late 1990s because several bottom-up mechanisms interactively reduced the potential of the low-salinity zone and Delta to produce pelagic fish biomass.

Predation Effects: We hypothesize that striped bass predation on pelagic fish biomass had increased in all water year types by the latter 1990s due to an increase in the age-1 and older striped bass population during the 1990s. In the San Francisco estuary, adult striped bass have been at very high population levels in recent years (DFG, unpublished data), potentially exerting an unusually high predation pressure on smaller pelagic fishes.

A change in predation pressure may, in part, be an effect of interactions between biotic and abiotic conditions. Natural, co-evolved piscivore-prey systems typically have an abiotic production phase and a biotic reduction phase each year (e.g., Rodriguez and Lewis 1990). Changing the magnitudes and durations of these cycles greatly alters their outcomes (e.g., Meffe 1984). Generally, the relative stability of the physical environment affects the length of time each phase dominates and thus, the importance of each. Biotic interactions like predation will have stronger community-structuring influence in physically stable systems (e.g., lakes). Historically in the estuary, winter-spring flow variation was the abiotic production phase and the biotic reduction phase probably increased in importance during low-flow periods in summer-fall. Multi-year wet cycles probably increased (and still do) the overall ‘abiotic-ness’ of the estuary; drought cycles likely increased the estuary’s ‘biotic-ness’ (e.g., Livingston et al. 1997). Our managed system has reduced flow variation much of the time and in some locations more than others. This has probably affected the magnitudes and durations of abiotic and biotic phases (e.g., Nobriga et al. 2005). In other words, reduced flow variability in the estuary may have exacerbated predation effects.

High river flow generally increases fish carrying capacity in the upper estuary (Jassby et al. 1995; Kimmerer 2002). This ‘fundamental’ relationship has been affected by overbite clams for most of the POD species, but not for all fishes responding to flow (e.g., American shad, splittail; Kimmerer 2002). Thus, because there are more prey fish available in wet years, we hypothesize that flow still increases carrying capacity for piscivorous (age-1 and older) striped bass even though it no longer improves age-0 striped bass carrying capacity. If this is true, the string of wet years between 1993 and 2000 likely allowed the adult striped bass population to rebound even though age-0 production declined. Note that juvenile striped bass also were stocked during this period. We hypothesize that this upsurge of piscivorous striped bass may have interacted with increased entrainment (see below) to reduce POD species abundance. This is analogous to long-term dynamics in cannibalistic fish populations where periods of high adult abundance result in low juvenile production until adult mortality reduces predation pressure on younger cohorts (e.g., Henderson and Corps 1997).

Entrainment: Major water diversions in the delta include the SWP and CVP export facilities, power plants, and agricultural diversions. Of the three, the patterns of agricultural diversions are the least likely to have changed during the pelagic fish decline. As a consequence, our narrative focuses on power plant and export effects.

The two power plants of concern are located in the western delta at Antioch and Pittsburgh. Nonconsumptive water use by the power plants may reach 3200 cfs, which may be enough to create a substantial entrainment risk for fishes residing in that region of the estuary. Studies in the late 1970s indicate that losses of pelagic fishes can be very high. The recent effects of the diversions are unknown; however, the distribution of some pelagic fishes including delta smelt is centered near the diversions. There may also be some risk to fishes created by thermal pollution or residual chlorine from antifouling activities. The magnitude of these risks is unknown.

Dramatic increases in winter CVP and SWP salvage occurred contemporaneously with recent declines in several pelagic fish species. These unexpected increases in salvage density coincide with the step decline of pelagic fishes by at least 2000. The changes in export timing following the Bay-Delta Accord also have the potential to increase entrainment of longfin and delta smelt larvae during late winter and early spring and threadfin shad larvae during summer. The ***Winter Adult Entrainment Hypothesis*** posits that these events are causally linked. Evidence for the hypothesis includes the following. Additional details are available in IEP (2005b).

- (1) Since at least 2001, there appears to have been a step increase in salvage density of most pelagic fishes.
- (2) During the same time period, similar increases in salvage have also been observed for many non-pelagic fishes including centrarchids and inland silverside.
- (3) There appears to have been a step decrease in the Fall Midwater Trawl indices of adult delta smelt, threadfin shad, and longfin smelt between 2001 and 2002.
- (4) Winter exports from the CVP and SWP have increased since the late 1990s.
- (5) Since 2000, San Joaquin River inflow has decreased, while Sacramento River has increased.

Increased winter entrainment of delta smelt, longfin smelt and threadfin shad represents a loss of the pre-spawning adults and all potential progeny. The altered fall-winter hydrodynamics

(salinity intrusion, export to inflow ratios, Old and Middle river flows) also may result in more fish spawning in regions where their larvae are vulnerable to entrainment before protective measures begin in April. This means on a per capita basis loss of each adult fish may be equivalent to the loss of hundreds or even thousands of juveniles later in the year. Entrainment impact specifically affecting adult fishes has the potential to be strong, so we regard finding an explanation for this coincidence a high priority.

The main explanations for why winter salvage densities may have increased since 2001 include: (1) the source of exported water has been changed to an area where more of these fishes occur during the winter; (2) the affected fishes have moved to areas from which exports are drawn; and/or (3) winter exports have increased past a hydrodynamic threshold below which fish were better able to avoid entrainment.

We have only just begun to examine the data on wintertime salvage, but they reveal a consistent pattern across species that corresponds with the period of fish declines. Three main areas of explanation must all be considered. Three main questions need to be considered. Are the recent salvage trends reliable, or the result of data error? Assuming data are correct, why did salvage levels increase? Finally, do increases in salvage result in population-level effects? Some of these factors can be rapidly assessed with data already in hand or that can be gathered in the coming months. Assessing the population impacts will be a difficult task since reliable numbers for the number of fish entrained or in the source population are available. If it can be shown that a large part of the field sampled populations are within the range of entrainment that is probably the most compelling argument for a population level impact of entrainment.

Bottom-Up Narrative

Suisun Bay/Marsh has historically been a major rearing habitat for striped bass, delta smelt and longfin smelt (Stevens and Miller 1983; Steven et al. 1985; Moyle et al. 1992; Matern et al. 2002). The marshes and other adjacent shallow habitats are also used by threadfin shad (Matern et al. 2002; Nobriga et al. 2005). Pelagic productivity was reduced and trophic linkages were altered in Suisun Bay coincident with the invasion of the clam *Corbula amurensis* (Kimmerer and Orsi 1996; Jassby et al 2002, Feyrer et al. 2003; Kimmerer submitted manuscript). The **bottom-up hypothesis** posits that, particularly in drier years, *Corbula* depresses phytoplankton and zooplankton production in Suisun Bay, resulting in decreased availability of food for larval and juvenile striped bass, longfin smelt, and delta smelt. In addition to changes in food availability, changes in food quality due to shifts in phytoplankton and zooplankton species composition may also impact pelagic fish species. Evidence for the hypothesis includes the following.

1. Pelagic productivity in the upper San Francisco estuary is poor relative to other estuaries.
2. Phytoplankton densities and productivity are especially low in the Suisun region.
 - There has been a significant long-term decline in phytoplankton (chlorophyll a) to very low levels in the Suisun region and the lower Delta, with no significant recovery (but also no further declines) over the most recent decade (Jassby et al 2002, Jassby et al in prep.).

- In contrast, phytoplankton did not decline significantly at the upstream Delta monitoring stations and actually significantly increased at the southern-most Delta monitoring stations over the last decade.
3. Phytoplankton species composition has changed more in the Suisun region than elsewhere.
 - Coincident with changes in phytoplankton abundance in the upper estuary, there were also shifts in phytoplankton species composition from more diatom to more flagellate dominated communities (Lehman 1996).
 - This shift was more pronounced in the Suisun region than elsewhere (Jassby et al. in prep).
 4. The Suisun region experienced dramatic changes in zooplankton densities and composition.
 - The Suisun region experienced more pervasive long-term declines in the densities of three calanoid copepod species (*Eurytemora affinis*, *Sinocalanus doerri*, and *Pseudodiaptomus forbesi*) than the Delta (Mueller-Solger et al in prep.). These zooplankton species are important food organisms for pelagic fishes.
 - *P. forbesi* continued to decline in the Suisun and confluence regions over the last decade, while its numbers increased in the southern Delta. These trends may be related to increasing recruitment failure and mortality in the Suisun region due to inadequate food supplies, *Corbula* predation on copepod nauplii, and insufficient replenishment from more productive upstream regions (Durand et al in prep, Kimmerer et al in prep, Mueller-Solger et al in prep).
 - Coincident with the decline in *P. forbesi* abundance in the Suisun region, densities of a more recent invader, the cyclopoid copepod *Limnoithona tetraspina* significantly increased in the Suisun region. It is now the most abundant copepod species in the Suisun and confluence region, but does not occur in the freshwater upper Delta. (Kimmerer et al in prep, Mueller-Solger et al in prep.) This zooplankton species is thought to be inferior food for pelagic fishes including delta smelt.
 - *Acartiella sinensis*, a calanoid copepod species that invaded at the same time as *L. tetraspina*, also reached considerable densities in the Suisun region over the last decade, but not in the upper Delta. Its suitability as food for pelagic fish species remains unclear.
 5. Benthic grazing may be a major mechanism for both the long-term and recent changes in the Suisun food web.
 - *Corbula* abundance and distribution in the Suisun region during 2001-2004 was higher than during the 1995-1999 wet period but similar to the 1987-1992 drought (IEP 2005, Vayssieres et al in prep.).
 - There is evidence that benthic changes have major effects on the pelagic food web and fishes (Kimmerer 2002).
 5. Indicators of growth and condition support the hypothesis that there is food limitation in pelagic fishes in the Suisun region (IEP 2005).
 - In 1999 and 2004, residual delta smelt growth was low from the Sacramento-San Joaquin confluence through Suisun Bay relative to other parts of the system.
 - In 2005, delta smelt collected from the Sacramento-San Joaquin confluence and Suisun Bay had high incidence of liver glycogen depletion.
 - In 2003 and 2004, striped bass condition factor decreased in a seaward direction from the delta to the bay.
 6. There is less evidence for other types of habitat changes in Suisun Bay (IEP 2005).

- Suisun Bay ambient water bioassays in the summer of 2005 were not toxic to *Hyalella azteca*, *Ceriodaphnia*, juvenile striped bass, or delta smelt.
- *Microcystis* biomass was low in the Suisun Bay region in the summer of 2004 and 2005.

Thus far, there is little evidence that the unusually poor growth rates, health, and condition of fishes in the Suisun Bay region is due to the effects of toxic contaminants or other adverse chemical or physical habitat conditions. Therefore, our working hypothesis is that the poor fish growth and condition in this region are due to food limitation. If fishes are food limited in Suisun Bay during larval and/or juvenile development, then we would expect greater cumulative predation mortality, higher disease incidence, and consequently poorer abundance indices at later times. Slower growth rates might also distort trawl abundance indices if large numbers of fish do not grow large enough to be sampled efficiently by annual surveys.

Note that there are some inconsistencies that make this hypothesis unlikely as a single mechanism for the recent pelagic organism decline. Specifically, it is unclear why there has been a substantial recent decline in some Suisun Bay calanoid copepod species, but not in phytoplankton chlorophyll *a* concentration. Second, recent *Corbula* levels are not unprecedented; they are similar to those found during the 1987-92 drought years, so it is unclear if and why benthic grazing would have a greater effect on the Suisun Bay food web during the POD years than during the earlier drought years. It is possible that shifts in phytoplankton and zooplankton community composition and perhaps related changes in the microbial food web in the Suisun region could provide a more consistent mechanism

Study Approach

The overall approach recommended by the POD PWT in 2005 was a “triage” model to better define the degree to which toxics, exotic species and water project operations may be responsible individually, in sequence, or in concert for the apparent long-term fish abundance declines and step-changes. Based on the work in 2005 and on previous information, the following represents the proposed approach for 2006-2007. A key difference is that the work is based on entirely different conceptual models (see previous section). In addition, we have developed a more integrated strategy to evaluate contaminant effects, an issue that has not been evaluated extensively by IEP or the 2005 POD effort.

Approach to Address Matrix Models

Many of the studies described in the next section are designed to address questions arising from the matrix models. Much of the rationale for the study design is based on *temporal*, *spatial* and *species* contrasts for selected fish and zooplankton. For each contrast, the variables to be evaluated include: abundance, growth rate and fecundity; and feeding success, condition factor, parasite load and histopathology (fish only).

Temporal Contrasts. Temporal contrasts will be made seasonally and interannually. Analyses of monitoring data and additional samples will identify if there are specific times of the year in

which stressors are most pronounced. To the extent possible, these results will be contrasted with historical data or samples to determine if current observations are consistent with earlier years. For example, the hydrology in 2005 provided an excellent opportunity for a “natural experiment”—flow conditions were consistently high throughout the spring, which typically results in good abundance levels for many pelagic species (Jassby et al. 1995). Kimmerer (2002b) updated analyses that suggest these relationships have remained reasonably consistent through 2000, despite the invasion of the clam *Corbula*. As noted previously, pelagic fishes did not increase substantially in 2005, so we have more confidence that the apparent step change is real.

Working Hypotheses for 2006-2007:

- The response of pelagic species to flow will continue to deviate from relationships with abundance developed prior to the recent step change.
- Stressor effects have increased relative to historical data.

Spatial Contrasts: Monitoring data and new samples will be thoroughly evaluated to determine whether there is a specific region(s) of the estuary where stressor effects are strongest and to the extent possible, whether regional effects have changed in recent years. For example, one of the key spatial contrasts is whether fish and zooplankton show similar responses (e.g. growth, survival, fecundity, toxicological indicators) in the Delta and Napa River because some key stressors (*Microcystis*, waterweed treatment compounds) appear to be largely absent from the latter.

Working Hypotheses for 2006-2007:

- Pelagic species will show the strongest responses to stressors in specific regions of the estuary.
- Stressor effects have increased in specific regions of the estuary relative to historical data.

Species Contrasts: Fish species (delta smelt, striped bass, longfin smelt, threadfin shad and inland silverside) will be the focus of the 2006-2007 effort. These species were selected because they form convenient contrasts: The first four are declining in abundance – striped bass and longfin smelt over the long-term, delta smelt and threadfin shad more recently, while the last is increasing. Our rationale is that contrasts among these species will help to clarify the relative importance of different stressors.

Working Hypotheses for 2006-2007:

- The more recent invaders (inland silverside) will show less response to stressors.
- Nearshore fishes (e.g. inland silverside) will show less response to stressors.

Approach to Address the Narrative Model

The matrix models highlight the stressors in each season and each geographical area that might affect each species. Work based on the matrix models ask fundamentally qualitative questions; is the stressor likely to have an effect? The narrative model posits linkages among different stressors and their possible pathways to produce the observed declines of more than one species.

The work plan elements that are based on the narrative model, therefore, emphasize analyses of the proposed linkages among stressors. Questions addressed by the narrative model are much more quantitative; to what degree do these stressors affect the species of concern? The basic narratives comprising the model are shown in Figure 8. The approach to address each narrative component is described below. Table 1 provides a coded list of studies that will be used to address each of the narratives. Finally, we include a synthesis section to summarize the studies that will be used to integrate the effects of each of the model components, thereby addressing the ultimate question in the POD studies--what is the population level effect of each of the stressors?

An important point regarding the narrative model approach is that each of the component narratives should be considered as an integrated program, not as “stand-alone” programs. As one example, much of the data on abundance and other population measures (e.g. growth, origin) collected in the first narrative model element, “Previous Abundance and Current Abundance”, will be used as part of the evaluations in all of the other narrative model elements. Similarly, the “Habitat” narrative element will collect data on hydrology, water quality, and other habitat measures that will be used as the basis for analysis by all of the other narrative elements.

Previous Abundance and Current Abundance

This narrative element will collect a variety of monitoring data that can be used by all of the other narrative elements, and the synthesis efforts. However, the data will also be used specifically to evaluate the role of previous abundance (i.e. adult stock) play in long-term population dynamics of the POD fishes. The major tasks are as follows: Two major types of data will be collected: 1) trends in fish abundance and population size; and 2) trends in other measures of population status.

Trends in fish abundance and population size will be evaluated using the following study elements:

- Summer Townet Survey (2007-007; DFG). This component provides a juvenile abundance index for striped bass and delta smelt.
- Fall Midwater Trawl Survey (2007-003; DFG). This component provides a juvenile abundance index for striped bass and longfin smelt, and adult abundance estimates for delta smelt and threadfin shad.
- Gear Efficiency Studies (2007-086; DFG). This element will explore potential limitations to interpretation of fisheries monitoring datasets that may limit their ability to be used for population abundance estimates.
- Estimation of Pelagic Fish Population Sizes (2007-043; DFG/USFWS-Ken Newman). This component will explore the ability of current IEP data to develop population abundance estimates for POD fishes.
- Threadfin Shad Data Analysis and Population Dynamics (2007-039; DWR). This component will take the first comprehensive look at long-term datasets for threadfin shad.
- Trends in fish biomass (2007-119; DWR). Building on previous estimates by Wim Kimmerer (SFSU), this component will use population data to develop regional estimates of trends in fish biomass.

- Historical population dynamics (2007-084; USBR). Consultant Bryan Manly will continue work with USGS staff on historical population dynamics to assess temporal and special trends in different fish species and communities.

A variety of other studies will collect fish for the evaluation of other useful measures of population health and status:

- Directed Field Collections (2007-089; DFG). This component provides additional fish samples for the elements listed below on an as-needed basis.
- Evaluation of Apparent Growth Rates (2007-051; DFG). This component provides a long-term time series of plausible growth trajectories for POD fishes.
- Delta Smelt Otolith Microchemistry (2007-060 and 2007-040; UCD). This component provides an empirical check of delta smelt growth rates in recent years.
- Delta Smelt Histopathology Investigations (2007-061; UCD). This component provides a basic health assessment for delta smelt to evaluate mechanisms for growth rate changes.
- Striped Bass Health Investigations (2007-042; UCD). This component provides a basic health assessment for young-of-year striped bass to evaluate mechanisms for growth rate changes.
- Disease as a Factor in the POD (2007-036; FWS). FWS will conduct surveys of disease occurrence in delta fishes.

Habitat Effects

This narrative element will collect a variety of physical, chemical and biological data that can be used by all of the other narrative elements, and the synthesis efforts. The data will also be used specifically to evaluate several habitat-specific questions: 1) what are the trends in basic habitat variables? 2) what changes in habitat quantity and quality affect pelagic fishes? 3) what changes in habitat quantity and quality affect other organisms in the estuary? 4) how do toxics, disease and toxic algal blooms affect the previous two groups of organisms? Although the last question is essentially a subset of the second and third, we have chose to include it separately because we have relatively little baseline information on this issue as compared to other water quality measurements.

Trends in basic habitat variables: General patterns in estuarine habitat will be assessed with water quality and hydrological data.

- Environmental Monitoring Program (2007-072; DWR). This component provides simultaneous water quality and relevant non-fish data (e.g., zooplankton, *Corbula*) throughout the year.
- Changes in Water Project Operations (2007-097; USGS). One result of this “data mining” effort will be to describe trends in the hydrology of the delta and its tributaries.
- CASCADE (2007-081; USGS) The potential effects of climate change on estuarine habitat will be addressed through a computational assessment of scenarios.

Effects of changes in habitat quantity and quality on pelagic fishes: The goal of this series of studies is to characterize trends in pelagic fish habitat suitability. We will pursue the following

questions: Has the surface area of suitable habitat changed for one or more of the POD species? Does interannual variation in estuarine hydrology influence the spatial extent of pelagic fish habitat? What factors have affected the spatial extent of pelagic fish habitat? What are the trends in physical habitat area in the Delta versus Suisun Bay? Do the previous findings differ when the availability of zooplankton prey are factored into the analysis? How do flow changes alter the size and/or shape of pelagic fish habitat zones? Two main study elements are proposed:

- Evaluation of Changes in Pelagic Fish Habitat Quality using the IEP Long-Term Monitoring Data (2007-066; DWR). This element is a continuation of earlier work by DWR based on analyses of Fall Midwater Trawl and Summer Townet Survey data.
- Spatial Analysis of Habitat and Fish Co-occurrence (2007-120; TBD). The goal of this study element is to use GIS methods to evaluate short time-scale changes in habitat shape in relation to fish distribution and life history needs.

Effects of habitat quantity and quality on other organisms: The approach to evaluating the effects of habitat on other organisms involves several elements intended to improve our understanding of large-scale ecosystem changes.

- Evaluation of Changes in Pelagic Fish Habitat Quality using the IEP Long-Term Monitoring Data (2007-066; DWR). While this study focuses on fish effects (see above), the investigation will also include similar analyses for key zooplankton species, and to the extent possible, for Corbula.
- Corbula Salinity Tolerance and Grazing Rates (2007-076; SFSU). In a new study element, SFSU will use laboratory methods to analyze Corbula salinity tolerances, and the effect of salinity on clam grazing rates.
- Submerged Aquatic Vegetation (SAV) abundance and distribution (2007-102; UCD/USGS). The negative effect of SAV on native fishes in the Delta is now well-established in the literature (Grimaldo et al. 2004; Nobriga et al. 2005; Brown and Michniuk in press). Thus, our primary SAV study question is: Is the distribution of SAV continuing to expand through the Delta? The importance of turbidity as a necessary component of young striped bass and delta smelt habitat also is now recognized, so a second study question is: How much does SAV contribute to increased water clarity in the Delta?
- Delta and Suisun Bay Particle Tracking Investigations (2007-031; DWR). Residence time represents a key variable affecting planktonic organisms. This component will use the DWR DSM-2 model and its particle tracking model to evaluate trends in modeled particle transit times through the Delta. We expect this element to provide data pertinent to larval transport and entrainment of prey resources originating in the San Joaquin River.

Effects of contaminants, disease, and toxic algal blooms: The 2005 findings did not clearly support or eliminate contaminants as a possible significant cause or additive stressor in the POD. The toxicity work in 2005 was limited due to spatial and temporal restrictions on the sampling and analyses. The focus on pyrethroids and aquatic herbicides investigations was based on the overall hypothesis of a step decline coinciding with a major change in contaminant loading due to a change in land use coinciding with the decline. Research into these two areas was in the form of white papers, and did not include field level work. Though aquatic toxicity to *Hyaella*

was observed in the Delta in 2005, there was little evidence from the review of aquatic herbicide application data indicating this is a source of toxicity.

Although there is a relative lack of information about contaminant effects, we recognized the need to develop an integrated strategy to make the best use of the available resources for contaminant studies. To summarize briefly, the approach for 2006-2007 is to expand the toxicology testing to additional sites over a greater period of time. Toxicity tests will be run on *Hyalella*, since this organism has established TIE procedures. Delta smelt and striped bass will be tested with water samples from some of the sites: if toxicity is observed, analyses will advance to TIE procedures to try and isolate the compound. Fish exhibiting toxicity will be submitted for histopathology to be compared with hatchery fish to characterize organ effects. These results will provide a useful comparison with field and archived fish samples that would be analyzed for histopathology. Additional information about potential toxic effects will be gleaned from histopathological analyses of recent and archived fish samples collected from the field. Biomarkers may also be used to help identify specific causes, although more work is needed to identify the most appropriate assays. Moreover, related studies on trends in contaminant use and *Microcystis* bloom location and toxicity will help to illuminate the mechanisms responsible for observed effects.

The components of the contaminant approach are discussed below, with additional detail in the Study Components section. The relationships among these components are shown below in Figure 9.

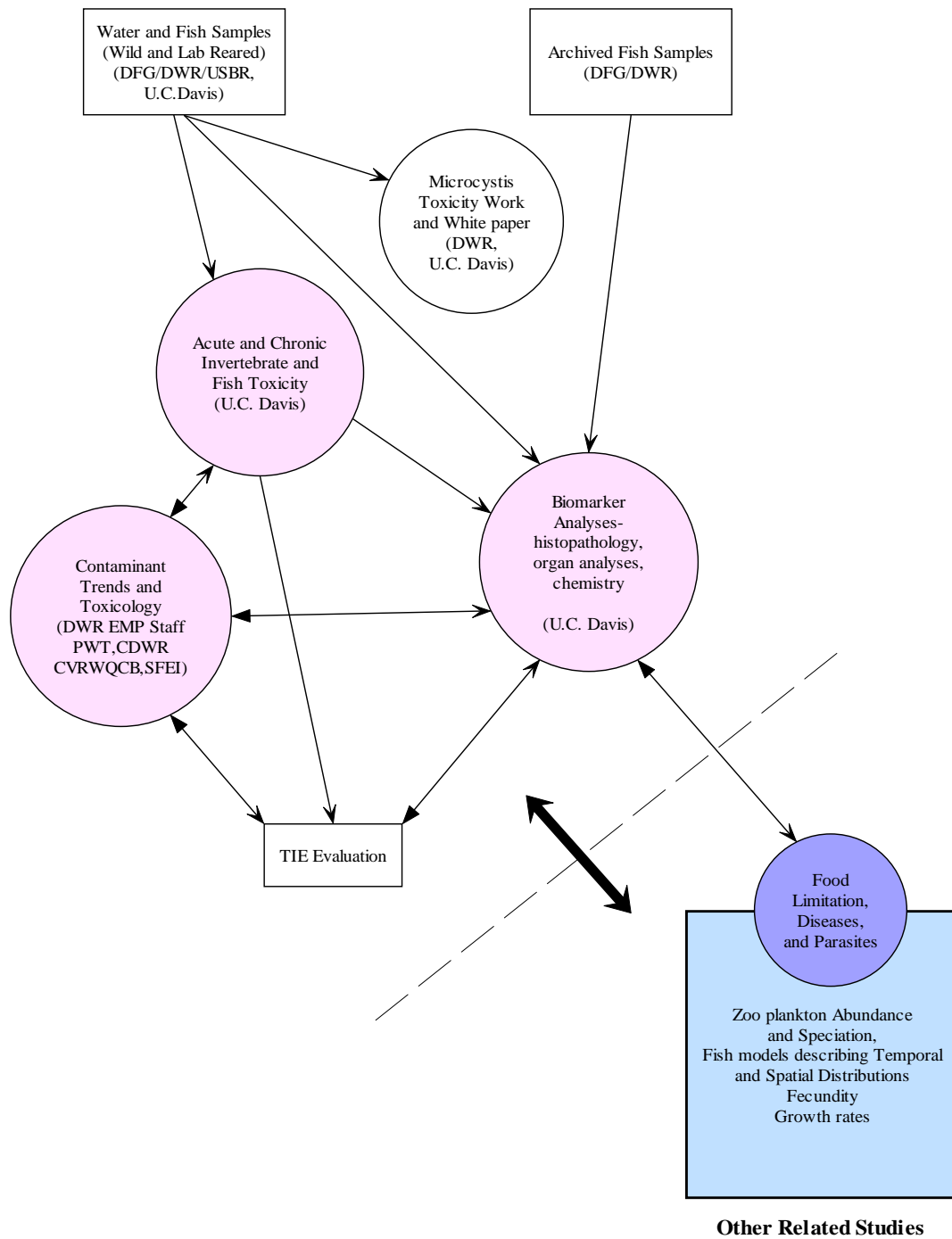


Figure 9. Relationship between components of the POD contaminant investigations.

Water and Fish Samples: Work in 2006-07 will consist of a spatially and temporally expanded sampling for toxicity testing program. As part of this effort, Directed Field Collections (2007-089; DFG) will follow the 2005 pilot program, and additional sites will be sampled in accordance with the prevalent distribution patterns of fish species of concern. A subset of these samples will also be used for *Microcystis* studies. Additional analyses will be conducted using archived samples of fish held by DFG (delta smelt) and UCD (striped bass).

Acute and Chronic Invertebrate and Fish Toxicity Tests/TIE Process: As noted above, the 2006-2007 toxicity work includes a substantial expansion of the 2005 effort (2007-063; UCD). The indigenous amphipod species, *Hyalella azteca*, will be used for routine toxicity testing throughout the year. This species is resident in the Delta, sensitive to contaminants, and routinely used in toxicity testing programs throughout the Nation. Moreover, it can be used to identify the causative agents of toxicity through Toxicity Identification Evaluation (TIE) procedures. If toxicity is observed at a site through initial screening, TIEs will be initiated immediately. Adequate quantities of water will be collected to proceed with TIEs in case toxicity is observed.

Two fish species of concern (delta smelt and striped bass) will be used to test water samples from selected Delta sites, from larval to juvenile stages during periods when the respective life stages are rearing in the Delta. Fish from these tests will be preserved for biomarker and histopathological analyses. These laboratory tests will identify sites that are acutely toxic to larval/juvenile stages of delta smelt and striped bass, and help differentiate the effects of toxic contaminants from the effects of food depletion (fish will be fed during the laboratory trials), and natural stressors such as water temperature and/or oxygen depletion (laboratory tests are performed at constant temperature and water is oxygenated).

Histopathology/ Biomarkers: Histopathological analysis of fish tissues can identify a variety of tissue lesions resulting from exposure to environmental stressors such as contaminants, disease and food limitation. Histopathological lesions often manifest themselves over longer periods of time, and therefore integrate the effects of multiple stressors. It is a useful tool to identify affected organs and can help identify certain groups of contaminants with known mechanism of action (e.g. carcinogens, endocrine disruptors) and target organs (e.g. liver, gonads). Histopathologic studies therefore play an important role in directing and focusing special studies.

The main study elements include POD studies 2007-042 and 2007-061 (UCD), and 2007-036 (FWS). Work in 2006-07 will focus on the examination of fish exposed to water samples or collected from sites where: 1) 2005 results indicated that fish were affected by environmental stressors; 2) where invertebrate toxicity tests indicate the presence of toxic compounds. Lesions in fish from laboratory studies should be compared to lesions observed in fish from field sites, but keeping in mind that actual exposure duration may differ between laboratory-exposed and field-collected fish. Additionally, wild fish may be exposed to natural stressors (water temperature, oxygen levels, and food depletion). IEP staff also will collaborate with EPA staff on a pilot endocrine disruptor study (2007-112).

Additional analyses may be conducted with biomarkers, the molecular, biochemical, physiological and histological changes inside an organism which are indicative of exposure to and/or the effects of environmental stressors (2007-121; DWR). For the POD program, it is important to identify and apply biomarkers that can be applied to the fish species of concern, and help differentiate and quantify stressor groups. Not all biomarkers that are presently being explored in research labs fulfill these requirements, and careful consideration should be given to a work plan for future POD work involving biomarkers. A “Fish Biomarker Task Force” consisting of experts in this field could provide state-of-the-art information on biomarkers. This task force should examine and describe 1) available biomarkers according to a number of criteria including specificity and cost; 2) identify which biomarkers are applicable to Delta fish species of concern and what information they can provide; 3) identify research objectives and timelines for developing specific biomarker tools for Delta fish species of concern.

Microcystis aeruginosa Bloom Biomass and Toxicity: Field surveys will be conducted to measure *Microcystis aeruginosa* bloom biomass and toxicity (2007-079; DWR). The 2006 surveys will build on the 2004-2005 survey and be closely coordinated with the fish surveys (Summer Townet Survey and Fall Midwater Trawl) and toxicity assays. Sample collection at fish survey stations will help elucidate the link between *Microcystis* biomass and toxicity and its direct effect on zooplankton and fish. Zooplankton, benthos, and fish toxicity will be evaluated based on microcystin content in whole animal (zooplankton and benthic) or liver and muscle tissue (fish). Animals for these analyses will be collected during fish surveys.

Top-Down Effects

Predation: The predation portion of the top-down study approach will focus on two major questions: 1) what are the status and trends of the major predators? and 2) what are the effects of changing predation pressure? The first question will be examined using the following suite of studies:

- Status and Trends of Predators in the Delta (2007-118; DFG). Several IEP fish surveys will be analyzed to evaluate the trends in predators, particularly adult striped bass, and largemouth bass. Because most surveys do not effectively sample littoral communities or subadult stages of striped bass, the effort will include exploratory analyses of SWP/CVP salvage, FWS beach seine, and delta bass fishery CPUE data.
- Data from standard Peterson methods will be used to update adult striped bass population estimates for the estuary (2007-116, DFG).

Evaluation of the effects of predation of fish communities is expected to be a more complicated effort, involving some methods that have not traditionally been used for IEP studies.

- Modeling Striped Bass Predation in the Delta (2007-115; DWR). Population estimates developed from the first question will be used as the basis for a bioenergetic model (Fish Bioenergetics 3.0) that will evaluate trends in predation pressure in the delta. The general approach will be to combine age-specific data on growth and abundance of striped bass with bioenergetics modeling to estimate the consumption demand of the striped bass

population through time. We will try similar analyses for largemouth bass if sufficient population age structure and growth data are available.

- Modeling of Predator Population Dynamics (2007-116; DFG). Population estimates from the previous study element will be used to model compensatory population mechanisms in the striped bass population. Specifically, the model will examine the likelihood that the present high abundance of adult bass may suppress earlier life stages.

Entrainment and other Facility Impacts: Our overall approach to address the entrainment hypothesis is to focus on the following three the major questions: 1) are the salvage trends valid, or are they an artifact of data error or changes in fish facility operations? 2) assuming that the data are valid, what is the mechanism for the increase in winter salvage? 3) what are the effects of power plant diversions on pelagic fishes.

The study approach includes two studies to address the first question, salvage data quality. Some of these factors can be rapidly assessed with data already in hand or that can be gathered in the coming months.

- Fish Facility History (2007-107; USBR and DFG). One component of this study element will evaluate whether changes that have occurred at the state and federal fish facilities since 1956 have substantially impacted the reported number of salvaged fish
- South Delta Studies (2007-015, -016, and -17; DWR and USGS): The South Delta studies will include a component to examine whether the salvage data are consistent between the SWP and CVP facilities, and whether the salvage changes occurred in winter rather than other months. The logic is that if both observations are true, then it is unlikely that the observed increases in winter salvage are invalid.

To evaluate the second question (Why Did Salvage Increase?), we have identified three primary mechanisms (1) the source of exported water has been changed to an area (e.g. west Delta) where more of these fishes occur during the winter; (2) the affected fishes have moved to areas from which exports are drawn; and/or 3) winter exports have increased past a hydrodynamic threshold below which fish were better able to avoid entrainment. With regard to the second mechanism, a shift in distribution may have occurred because south Delta habitat conditions were attractive (e.g. food), or because habitat conditions deteriorated in some regions of the Delta (e.g. contaminants, toxic algae). By analyzing these potential mechanisms at local and region scales, we hope to differentiate the major pathway(s).

- South Delta Hydrodynamic Effects (2007-015, 2007-016, and 2007-017; DWR and USGS). A major focus of the south Delta studies is to determine the effect of hydrodynamics and physio-chemical variables near the SWP on fish behavior and entrainment during relatively short time scale (i.e., hours and days) events.
- Particle Tracking Modeling (2007-031; DWR, USGS and SFSU). Particle tracking using the model DSM2 will be used to evaluate the entrainment risk for different export/inflow scenarios and historical conditions. An additional task will be to model adult delta smelt migratory “behaviors” to evaluate potential entrainment risk during late fall and early winter.

- Changes in Water Project Operations (2007-068; USGS). One result of this “data mining” effort will be to describe any recent changes in water project operations that may have influenced entrainment rates.
- Statistical Effects of Environmental Conditions on Salvage (2007-084; USBR). Consultant Bryan Manly’s work USGS staff on historical population dynamics will include statistical analyses of factors affecting entrainment rates.
- Regional indicators of habitat quality, described in detail in earlier sections on Prior Abundance and Habitat. Examples include:
 - Regional comparisons of fish health, growth and origin (2007-060, -061, -062, -018, -036, -121; UCD, DFG, FWS). These studies are designed to evaluate the origin of fish in the south Delta, and whether they show different health, growth or condition than other regions. This should allow us to determine whether there is evidence that environmental factors made fish more vulnerable to entrainment.
 - Regional comparisons of toxicity (2007-063; UCD). Regional toxicity testing will allow us to determine whether water toxicity was different in the south Delta than other areas.
 - Microcystis studies (2007-079; DWR, UCD). Regional sampling will evaluate whether toxic algal blooms were more prevalent in the south Delta than in other regions.

Our study approach to address the third question, the extent of power plant impacts, will be at a much more fundamental level than for the SWP and CVP. Because there have not been detailed studies on power plant entrainment since 1979, much of the focus of this study element will be to collect basic information about species loss, abundance and time. These issues will be addressed in a single study element, “Investigation of power plant impacts” (2007-087; DWR).

Bottom-Up Effects

The approach for to address the bottom-up narrative will focus on factors that may be disrupting the food web for pelagic fishes. Much of the emphasis will be on the greater Suisun Bay region, where it appears that pelagic productivity was reduced following the invasion of the clam *Corbula amurensis*. The major study questions to be addressed are: 1) What are the trends in plankton? 2) What factors influence food availability for pelagic fishes? 3) Are there regional or temporal differences in food quality for pelagic fishes?

Studies in support of the first question will be a continuation of work initiated in 2005. These include the following:

- Trends in Delta Phytoplankton. (2007-045; UCD). This UCD-study will evaluate long-term patterns and trends in phytoplankton production and biomass and other water quality variables in different Delta subregions.
- Zooplankton Trends (2007-072; DWR). As part of analyses for the IEP Environmental Monitoring Program, DWR staff will continue analyses of the zooplankton database to evaluate long-term and regional trends in zooplankton community structure.
- Zooplankton Fecundity and Population Structure (2007-044; SFSU). This new POD element will evaluate whether there are changes in zooplankton fecundity and population structure that may have influenced the pelagic food web.

The second question, food availability, will be addressed by evaluating food web linkages, particularly benthic effects. Several new studies are included.

- Food Web Disruption (2007-082; SFSU). In this CALFED-funded POD element, SFSU will lead an effort to evaluate how the food web has changed in recent years.
- Benthic Biomass and Abundance (2007-065; DWR). This POD element will continue to develop estimates of benthic abundance and biomass.
- Fish Diet and Condition (2007-062; DFG). To help develop an understanding of pelagic fish feeding ecology, DFG will continue with diet analyses of the primary pelagic fishes.
- Food Match/Mismatch (2007-122; DFG). This POD study element will use larval fish and zooplankton data from the 20 mm trawl survey to evaluate whether there is a mismatch between the locations of young pelagic fish and their zooplankton prey.

In addition to food quantity, there is substantial evidence in the literature that food quality can also play an important role in growth and survival of pelagic fishes. Because IEP has little experience with this issue, we are proposing an exploratory effort to identify whether food quality is likely to be an issue in the San Francisco estuary. As a first step, we intend to identify biomarkers that have been found to indicate the nutritional quality of fish diets. This will be combined with identification of biomarkers for contaminant exposure.

- Biomarkers of Contaminant Exposure and Food quality (2007-112; DWR). A new POD study will organize an expert panel to develop a suite of biomarkers that could be used as indicators of contaminant exposure or food quality.

Synthesis for the Narrative Model

The ultimate question for each of the stressors in the narrative model is the degree to which each has population-level effects. This question will be difficult to determine since population estimates are currently unknown. The gap will be addressed, in part, by one of the POD study elements to develop population estimates (see below); however, we acknowledge that the estimates may not be available until late in the study. To avoid delaying synthesis activities, synthetic study elements will emphasize modeling approaches that do not necessarily require absolute population estimates.

- Population modeling of delta smelt and striped bass (2007-041 and 2007-038; UCD, SFSU, LSU). These projects will include both age-structured matrix models and individual-based models that will help to evaluate the effects of each of the stressors on pelagic fishes. The striped bass effort will include a dose-response model to evaluate contaminant effects.
- Statistical analyses of pelagic fish abundance data (2007-084; USBR, consultants). Statistician Bryan Manly will continue his efforts to analyze the environmental factors that affect variation in pelagic fish abundance.
- Population estimates for pelagic fishes (2007-043; USFWS, USBR). Statistician Ken Newman will be working with IEP staff to determine whether existing trawl data could

be used for population estimates. As noted above, this issue is an important first-step in the evaluation of the population effects of different stressors.

- Analyses of historical abundance trends (2007-084; USBR). Consultant Bryan Manly's work with USGS staff on historical population dynamics will include statistical analyses of environmental factors affecting abundance trends.
- Comprehensive synthesis (2007-046; USFWS, USGS, DWR, DFG). Much of the synthesis effort for the POD program will be led by National Center for Environmental Analyses and Synthesis (NCEAS), who will organize a series of work teams of IEP and outside experts.

Study Components

Linkages among work plan elements: All work plan elements relate to the narrative and matrix models. Identifying these linkages ensures that all stressors are pursued; linkages among stressors and studies are identified and should help in future syntheses of the POD results. The following table allows easy identification of the justification for each work plan element

Table 1. Relationships among POD work plan elements and narratives.

1. Expanded Monitoring		Narrative model connection	Matrix model link	
PEN¹ #	Title		Main stressors	Minor stressors
2007-003	Fall Midwater Trawl	Both	1-9	
2007-007	Summer Towntnet Survey	Suisun	1-9	
2007-072	Environmental Monitoring program	Suisun	1,2	6,7,8
2006-089	Directed field collections	Both	5-7,9	
2007-096	Larval Fishes Survey	Suisun	1,3,4,5,9	

2. On-going work

PEN #	Title			
2007-015, 2007-016, 2007-017	South Delta fisheries and hydrodynamic studies	Salvage	3,4	
2007-031	Delta and Suisun Bay particle tracking investigations	Both	3,4	1
2007-042	Striped bass health investigations	Suisun	5,6,9	
2007-045	Phytoplankton primary production and biomass	Suisun	1,8	3,6,7
2007-051	Apparent growth rates of pelagic fishes	Suisun	1	2,4-9
2007-060	Evaluation of delta smelt otoliths	Both	1	2,4-9
2007-061	Pelagic fish liver histopathology	Both	5,9	1,4,6-8
2007-062	Fish diet and condition	Both	1	2,4-9
2007-063	Acute and chronic invertebrate and fish toxicity tests	Suisun	5,6,7	2,9
2007-065	Trends in benthic macrofauna abundance and biomass	Suisun	8	1,2
2007-066	Evaluation of changes in pelagic fish habitat quality	Both	2	1,7,8
2007-068	Analysis of recent changes in water operations	Both	2,3,4	8
2007-078	Retrospective analysis of long-term benthic data	Suisun	8	1,2
2007-079	Field survey of Microcystis bloom biomass and toxicity	Both	7	2
2007-084	Analysis of historical population dynamics	Both	1-9	
2007-087	Investigation of power plant impacts	Suisun	4	

3. New work

PEN #	Title	Conceptual model connection	Main stressors	Minor stressors
2007-018	Striped bass disease and contaminant loads	2D	5,9	1,6,7,8
2007-036	Disease as a factor in the POD	2D	5,9	1,6,7,8
2007-038	Development of striped bass and longfin smelt models	5	1-9	

2007-039	Analysis of threadfin shad data - population dynamics	1A	1-5,7,9	
2007-041	Modeling delta smelt populations in the S.F. Estuary	5	1-9	
2007-043	Estimation of pelagic fish population sizes	1A	1-9	
2007-044	Zooplankton fecundity and population structure	4A	1,2,6	6,7,8
2007-046	Overlap/Synthetic analyses of fish and zooplankton	5	1-9	
2007-076	Corbula salinity tolerance	2C	8	1,2
2007-081	CASCadE	2A	2	3,4,8
2007-082	Food web support for delta smelt and other estuarine fishes	4B	1,8	2,4,5,6,7
2007-086	Gear Efficiency Studies	1A	1-9	
2007-097	Hydrologic changes and Suisun Bay increased salinity	2A, 3A	3	2
2007-102	SAV abundance and distribution	2C	2	
2007-107	Fish facility history	3A	4	
2007-108	Delta smelt culture facility	2D, 3	3,4,5	
2007-112	Biomarkers Workshop	2D,4B	5,6	
2007-115	Striped bass bioenergetics	3B	1,2	
2007-116	Striped bass adult population dynamics	1A, 1B	1,2	
2007-118	Data mining for status and trends of predators	3A	1,2	
2007-119	Delta fish biomass estimation	1A	1-9	
2007-120	Relationship between habitat and distribution	2B	1,2	1,7,8
2007-121	Endocrine disruptor study	2D	5,6	1,7,8
2007-122	Food match-mismatch study	4B	1,2, 3	6, 8
¹ Program Element Number				

Stressor number and Stressor	
1	Food-fish mismatch
2	Habitat space
3	Adverse water movement
4	Entrainment
5	Toxic effects on fish
6	Toxic effects on fish food
7	Harmful algae
8	Corbula
9	Disease

Conceptual Model Components	
1	Prior and current fish abundance
1A	Abundance trends
1B	Trends in other population indicators
2	Habitat effects

2A	Habitat changes
2B	Habitat effects on pelagic fishes
2C	Habitat changes for other organisms
2D	Disease and contaminants
3	Top down effects
3A	Water Diversions
3B	Predation
4	Bottom up effects
4A	Food availability
4B	Food quality
5	Synthesis

Expanded Monitoring

Expanded monitoring in 2006-2007 emphasizes gathering life-stage specific information on the target fish species, but effort will also include expanded collection of introduced jellyfish and a newly introduced shrimp, *Exopalaemon modestus* and updated distribution and abundance analyses. Jellyfish in the San Francisco Estuary are known to feed on copepods and rarely larval fish, and anecdotal evidence suggests that introduced species have recently increased in abundance in the upper estuary (Rees and Kitting 2002). The distribution and seasonal abundance of jellyfish has been investigated (Rees and Kitting 2002, Moreno 2003), but until recently data for trend analyses has been absent. Starting in the early 2000s the San Francisco Bay Study and the Fall Midwater Trawl Survey began identifying and counting jellyfish (Honey et al. in prep). These data will be summarized and additional collections started (see Summer Townet Survey below) to investigate whether jellyfish might be a factor in the pelagic fish decline. The freshwater shrimp, *Exopalaemon modestus*, has dramatically increased in abundance since it was first documented in the estuary in 2000 (Brown and Hieb in prep). Based on the diet of a similar species (Sitts 1978, Siegfried 1982), this shrimp could affect abundance of mysids, amphipods and copepods within its range. We plan to update and expand abundance and distribution information summarized in Brown and Hieb (in prep). Additional revisions are summarized by elements below.

I. Expanded Monitoring

Fall Midwater Trawl (FMWT)

IEP 2007-003

Point person: Randy Baxter (DFG)

Lead Agency: DFG

Questions: What is the relative abundance (via abundance index) of striped bass, delta smelt and other pelagic fishes of the upper estuary? Can these data be used to estimate apparent mortality?

Description: This survey targets age-0 striped bass and other pelagic species 30-150 mm in length using a midwater trawl towed through the water column for 12 minutes in a stepped oblique manner (Stevens and Miller 1983). There are 116 stations located from San Pablo Bay upstream through Suisun Marsh and Bay and into the Delta. In September 2005 a zooplankton tow at 32 selected sites was conducted, and for a subset of 10 sites, water was collected for invertebrate toxicity tests (Werner, 2005 3e). Delta smelt and striped bass heads and bodies were

preserved separately for otolith and histopathological analyses, respectively (Bennett 2005 3a and Teh 2005 3b) or fish were preserved intact for diet and condition analyses (Gartz and Slater 2005 3c). In 2006, sampling continued as described above, except that water collections for toxicity testing (2007-063) will employ a separate boat and crew, longfin smelt, threadfin shad, and inland silversides will be collected for diet and condition, zooplankton sampling will take place only in September and October.

Time period: Sampling is conducted monthly from September through December and takes 2 weeks to complete.

Resources required

Cost: The IEP FMWT budget is \$328,000. An additional \$3,000 required to do this work was already obtained in 2006 from POD sources.

PI(s): Randy Baxter (DFG) and Dave Contreras (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: The field component of this project requires 1 boat operator, 1 biologist, and 1 scientific aide. The laboratory component requires numerous personnel for preseason preparation, fish identification, data validation, diet and condition procedures, and stomach content analysis.

Equipment: A boat with davits and hydraulics appropriate to pull a midwater trawl net, (such as the *R/V Scrutiny*), laboratory facilities, warehouse space, formalin, ethanol, and suitable containers for sample collection and preservation.

Deliverables and dates: Survey by survey indices will be calculated and checked by the end of each month and annual indices for POD fishes will be complete by the first of the new year. An article is completed each spring for the Status and Trends edition of the IEP Newsletter. Also trends in distribution and abundance of jellyfish will be examined for data collected since 2001. Zooplankton identification and CPUE calculation will be completed at the end of the year, and will contribute to the fish and food-item match –mismatch analysis (2007-122).

Comments: The FMWT Survey collected delta smelt and striped bass for otolith and histopathology investigation, but did not collected sufficient numbers of either to support all the projects in 2005, so additional field collections were necessary. A similar circumstance is expected for 2006 and 2007. This survey currently reports annual abundance indices for 6 fishes and has collected count data on jellyfish since 2001. The ratio of same-year FMWT to TNS indices for age-0 striped bass is used as an index of summer survival (Stevens et al. 1985). This survey is mandated in the 2004 OCAP Biological Opinion for delta smelt.

Summer Townet Survey

IEP 2007-007

Point person: Randy Baxter (DFG)

Lead Agency: DFG

Questions: What is the relative abundance (via abundance index) of striped bass and delta smelt? Can these data be used to estimate apparent mortality? How are juvenile striped bass and delta smelt distributed in relation to potential food items? Is the density of food items related to fish condition, growth rate or health indices?

Description: The Summer Townet Survey (TNS) has collected juvenile fishes in the range of 20 to 50mm since 1959 (Turner and Chadwick 1972). Samples are collected using a conical net

with a 1.5 m² mouth and 12.7-mm (½ in) stretched mesh nylon lashed to a hoop frame and mounted on skis. Three, 10-minute oblique tows are made against the current at each of 32 stations located from eastern San Pablo Bay to Rio Vista on the Sacramento River and Stockton on the San Joaquin River. This survey was expanded in 2005 to include simultaneous zooplankton sample from each station, water collections for invertebrate toxicity tests (Werner, 2005 3e) at a subset of 10 stations, and a water quality profile at every station. The water quality measurement was be conducted with a YSI 6600 Sonde that collects temperature, depth, dissolved oxygen, turbidity, chlorophyll *a*, conductivity, salinity, pH, date, and time. Also, delta smelt and striped bass heads and bodies were preserved separately for otolith and histopathological analyses, respectively (Bennett 2005 3a and Teh 2005 3b) or were preserved for diet and condition analyses (Gartz and Slater 2005 3c). In 2006, sampling continued as described above, except that: water collections employed a separate boat and crew; due to time and equipment limitations, only bottom and surface water quality measures were taken; longfin smelt, inland silverside and threadfin shad were collected along with delta smelt and striped bass for diet and condition; and numeric and volumetric estimation of jellyfish abundance did not begin.

Time period: Every other week from June through August.

Resources required

Cost: The IEP TNS budget is \$273,000. The POD TNS budget is \$23,000. An additional \$60,000 required to complete this work was already obtained in 2006.

PI(s): Randy Baxter and Jason Dubois (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: The field component of this project requires 1 boat operator, 1 biologist, and 1 scientific aide. The laboratory component requires numerous personnel for preseason preparation, larval fish identification, zooplankton identification, data validation, length weight procedures, and stomach content analysis.

Equipment: A boat with an A-frame and hydraulics appropriate to pull a sled-mounted tow net (such as the *R/V Scrutiny or Munson*), laboratory facilities, warehouse space, formalin, ethanol, and suitable containers for sample collection and preservation.

Deliverables and dates: Survey indices for striped bass (38-mm Index) and delta smelt will be produced by September 1 of each sampling year and reported to all Agencies through the POD Management Team. These indices will be part of any conference abundance-trend updates for CALFED Science or IEP, and will be published the following spring in the Status and Trends edition of the IEP Newsletter. Also trends in distribution and abundance of jellyfish will be examined for data collected since 2001. Zooplankton identification and CPUE calculations will be completed at the end of the year and will contribute to the fish and food-item match – mismatch analysis (2007-122).

Comments: The TNS collected delta smelt and striped bass for otolith and histopathology investigations, but did not collect sufficient numbers of either to completely support those projects in 2005, so additional field collections were necessary and were added in 2006. A similar circumstance is expected for 2007. TNS catch data are used to calculate the striped bass 38.1 mm index (Turner and Chadwick 1972) and an annual abundance index for juvenile delta smelt (Moyle et al., 1992). This survey is part of the long-term monitoring carried out by IEP and is mandated in the 2004 OCAP Biological Opinion for delta smelt.

Environmental Monitoring Program

IEP 2007-072

Point person: Randall Baxter (DFG)

Lead Agency: DWR and DFG

Questions: How well is abundance (density) of microzooplankton estimated by the historical and alternative methods for common and uncommon taxa? What can be inferred about the effectiveness of historical methods and data from these results? Can microzooplankton data be used to estimate mortality rates and construct a vertical life table? What changes in protocol are recommended for the future long-term monitoring?

Description: As part of the environmental monitoring program (EMP), water quality, chlorophyll a, benthos and three types of zooplankton samples are taken monthly at up to 21 locations distributed from eastern San Pablo Bay upstream into the Sacramento and San Joaquin rivers. Since 1972, microzooplankton samples have been collected by lowering a 15 L/min pump from the surface to the bottom and back to the surface two times, capturing the discharged water in a large carboy and taking a 1.9 L subsample of this mixture preserved with formalin to examine completely for zooplankton. The accuracy and precision of resulting density estimates has been questioned, so a study commenced in fall 2005 to compare traditional methods and gear including: 1) examination of a larger sample volume collected with the same pump and 2) examination of a much larger sample volume collected using a higher capacity pump. In the latter 2 cases, sub-sampling methods will be used, which were not necessary with the low volume of traditional sampling. The 3-types of pump samples will be collected and examined from each sampling location monthly through at least June 2006. Initially, only a fall and spring subset of samples will be examined to identify the optimal gear and method and additional samples archived. If analyses indicate increased volume or the new pump substantially improves accuracy and precision, then the program will adopt the new method or pump and 2006 samples collected in the selected manner will be completely examined.

Time period: Sampling has been concluded in 2006. Sample and data analysis will continue in 2007.

Resources required

Cost: The POD EMP budget is \$122,000. The IEP EMP budget is \$3,034,000.

PI(s): Dean Messer, Anke Mueller-Solger (DWR)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: A single supervising laboratory assistant identifies organisms from all samples. EMP staff at DWR is responsible for data analysis.

Equipment: Lab equipment available at the DFG lab in Stockton.

Deliverables and dates:

Comments: Recommendations for changes in sampling derived from this investigation will likely be incorporated into Program protocol. This program is mandated by Water Rights Decision 1641.

Directed field collections

IEP 2007-089

Point person: Randy Baxter (DFG)

Lead Agency: DFG and DWR

Questions: There are no questions related to the Directed Fish Collections effort. Questions are listed under the project description that the fish are being collected for (2007-040, 2007-042, 2007-060, 2007-061, 2007-062, and 2007-063).

Description: Directed, short-term field collections. In 2005 and 2006 directed collections were used to increase the number of delta smelt and striped bass available for otolith analyses and histopathology, and to collect inland silversides for diet and condition. Directed collections were also used to collect water for fish toxicity tests. In 2007, directed collections will be used to collect water for both invertebrate and fish toxicity tests (see 2007-063) and they may be used for some gear efficiency tests, if time permits. Regular once or twice monthly sampling efforts were made to enhance POD fish collection and to allow time for field examination of larval and young juvenile fishes. As staff and boat time permits, directed sampling will continue to be used to enhance collection of target fishes.

Time period: As needed and when staff and boats are available. For water collections, sampling will take two weeks per month.

Resources required

Cost: The 2007 IEP budget for Directed Field Collections is \$75,000 from POD sources. \$143,000 required for this work was already obtained in 2006.

PI(s): Inge Werner (UCD), Swee The (UCD), Bill Bennett (UCD), David Ostrach (UCD), Steven Slater and Randy Baxter (DFG).

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Water sampling - one boat operator and one crew member from participating research group; Fish sampling - one boat operator, one scientific aid or biologist and 1-3 researchers from participating research group. In addition, the point person contributes substantial time coordinating logistics for PIs and field crews.

Equipment: Water sampling – 20-32 ft. vessel with sufficient deck space for 8-10 large coolers. Fish sampling – 25-42 ft. vessel capable of deploying trawl gear targeting late stage larvae through juveniles; vessel and gear will change as life stage of fishes progress.

Deliverables and dates: See specific project descriptions listed above for this information.

Comments:

Larval Fish Survey

IEP 2007-096

Point person: Randy Baxter

Lead Agency: DFG

Questions: In 2006, we addressed the question – “Can the distribution of larval delta smelt be effectively determined using surface-oriented plankton nets when compared to catches from traditional ichthyoplankton gear and methods?” – and found the answer to be no. For 2007

Description: Using 2005-2006 sampling data, this survey compared catches of delta smelt larvae and those of other species between surface-towed nets and nets retrieved in the traditional oblique manner (IEP 1987; Rockriver 2004, Dege and Brown 2004) to determine if surface catch is sufficient to effectively document species distribution. Two field seasons of data collection (2005-2006) were planned as the basis for evaluating the surface oriented nets. If surface-oriented larva tows prove sufficient (they may not, see Rockriver 2004), then concurrent larva

and 20mm Survey sampling could take place to simultaneously target larva and post-larva to small juveniles. The alternatives of conducting two oblique tows in succession or two separate surveys for larva and 20mm fish are not feasible with current staff and boats. In 2006, sampling will begin in January to facilitate capture of larval longfin smelt, will include collection of zooplankton samples and will cover the 41 20-mm Survey stations plus 3 additional locations in the main channel of central and eastern San Pablo Bay.

Time period: Every other week from January through early July.

Resources required

Cost: The POD DSLS budget is \$97,000. The IEP DSLS budget is \$177,000. An additional \$80,000 required to do this work was already obtained in 2006.

PI(s): Kevin Fleming (DFG) and Julio Adib-Samii (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: The field component of this project requires 1 boat operator and 2 scientific aides. Numerous lab personnel are associated with preseason preparation, lab processing of samples, zooplankton and larval fish identification.

Equipment: This project requires the use of the *RV Munson* since it is the only boat equipped with fore-mounted larval nets. It also requires wet lab space to process approximately 400 quart jar samples that are collected throughout the field season.

Deliverables and dates: Completion of data analysis is planned for fall 2006.

Comments: The 2005 and 2006 surveys replaced the North Bay Aqueduct monitoring on a pilot basis as required by the USFWS 2005 OCAP Biological Opinion for delta smelt. The Delta Smelt Workgroup designed this survey as a two year trial. Protocol and methods developed in 2005 were used in 2006. Surface tows proved ineffective for larval delta smelt (Mayfield in prep.) so the USFWS asked the Delta Smelt Workgroup to modify the sampling design for 2007. The timing and locations of delta smelt larva sampling in 2007 will be guided by catches of ripe and spent adult delta smelt caught in the Spring Kodiak Trawl Survey (Kevin Fleming, DFG, pers. comm.).

II. On-going Studies

Larval fish behavior study

IEP 2007-017

Point person: Ted Sommer

Lead Agency: USBR, USGS and DWR

Questions: What are the behaviors of larval fishes in the south Delta and how is behavior likely to affect entrainment risk under different hydrologic conditions?

Description: This is part of the separately-funded South Delta Hydrodynamics and Fisheries investigation that was initiated in 2004. Its goal is to develop a behavioral model of larval fish behavior to support estimation of entrainment risk in the south Delta under differing hydrologic and operations scenarios.

Time period: The second phase of field data collection was completed during spring 2005; a summary report should be available shortly. Further work will be ongoing through 2007.

Resources required

Cost: This element is funded by non-POD sources.

PI(s): Lenny Grimaldo (DWR)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel:

Equipment:

Deliverables and dates: The second phase of field data collection was completed during spring 2005; a summary report should be available shortly. Further work will be ongoing through 2007.

Comments:

Delta and Suisun Bay hydrodynamics investigations relying on particle tracking models

IEP 2007-031

Point person: Ted Sommer (DWR)

Lead Agency: DWR and USBR

Questions: How does the spatial distribution of entrainment risk vary under different hydrologic (flows and exports) and operations (DCC, south delta barriers) scenarios? How does risk of (power plant) entrainment in Suisun Bay and environs vary with environmental conditions and power plant operations? How does risk of exposure to adverse physical or chemical conditions created by power plant operations vary with environmental conditions and power plant operations? What geographical areas do samples taken at IEP trawl stations actually represent?

Description: This is a three-pronged element. The first prong shares the goals of the South Delta Hydrodynamics and Fisheries studies: to understand the transport of fishes through the delta and to determine whether adjustments to water project operations may allow a useful reduction in entrainment of protected fish species. For the foreseeable future this work will be conducted using DSM2 and the DSM2 particle tracking model. While this part of the element is fish-oriented, we plan to adapt the investigation if possible to couple model outputs with distribution data and production models for lower trophic level organisms to assess the likelihood that water diversions could significantly influence regional productivity under certain circumstances. The second prong of the element is an investigation that will consist of particle tracking studies of Suisun Bay and surrounding waters to support the power plant operations element of the work plan. The intent will be to estimate entrainment risk and risk of exposure to high temperatures and/or chlorine produced by the Pittsburg and Contra Costa power plants. Initial work will rely on DSM2 and its PTM, but we plan to replace it with more sophisticated 3-D tools during the study period. The third prong is PTM support for development of population size estimation in the IEP field surveys. We plan to use reverse-PTM to help estimate the boundaries of sampling regions represented by fixed stations in the surveys. This work will rely on DSM2 and its PTM.

Time period: Follow-up 2005 PTM studies underway. Other applications will be ongoing through 2007.

Resources required

Cost: \$49,000 from POD sources. Use of 3-D technologies will require contracting with an outside entity and the cost of this is unknown at present.

PI(s): The key staff includes Mike Mierzwa, Ted Sommer and Bob Suits (DWR) and Mike Chotkowski (USBR).

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel:

Equipment:

Deliverables and dates:

Comments: Additional study questions will be developed by the POD Flows and Operations PWT.

Striped bass health investigations

IEP 2007-042

Point person: Marty Gingras (DFG)

Lead Agency: UCD, support from DFG

Questions: Does the condition of adult or larval striped bass suggest that contaminants and diseases could be depressing the populations of striped bass in the estuary? If present, have these effects increased in recent years? What life stages are most critical?

Description: This work will assess the health status of larval, juvenile, and adult female striped bass collected from selected locations in the Bay Delta using morphometric, histopathological, otolith (aging, growth and microgeochemical analyses) and biochemical metrics. Comparison with archived samples will allow for estimation of the contribution of this type of stressors to the long vs. short-term declines in abundance of young striped bass.

Time period: Analysis of archived samples can begin as soon as contracts are in place. Gravid females will start arriving on the spawning grounds in April and May, and be sampled by DFG as part of their normal operations.

Resources required

Cost: \$416,000 from POD sources.

PI(s): David Ostrach (UCD)

Contract needed / in place: In place.

Contract manager: Ted Sommer (DWR)

Term of contract: Through September 14, 2007.

Personnel:

Equipment:

Deliverables and dates: Reports on results of the adults and larvae are due by March 30, 2007 and September 14, 2007.

Comments: The investigator has a great deal of experience and unpublished information on this topic. Transforming new and accumulated data and information into peer-reviewed literature must be an essential part of this element. The additional laboratory and modeling work proposed by the investigator would cost another \$240 but may not be available separately in 2007. The additional proposed work not funded in 2006 is more experimental and may not be as conclusive as the work proposed for funding.

Phytoplankton primary production and biomass in the Delta

IEP 2007-045

Point person: Anke Mueller-Solger

Lead Agency: UCD, DWR-DES

Questions: What are long-term patterns and trends in phytoplankton production and biomass and other water quality variables in different Delta subregions and at specific locations? How do they compare to Delta-wide trends? What factors may be responsible for these patterns and trends?

How may the Delta food web be affected by these patterns and trends? Have changes in water exports affected phytoplankton in different Delta areas? Do the previous questions differ when only “nutritious” algae are considered? Can monitoring data be used to evaluate benthic grazing rates?

Description: This is an extension of an ongoing data analysis project with CALFED-ERP funding granted to Dr. Alan Jassby at UC Davis and collaborators at DWR-DES. The full title is “Primary Production in the Delta: Monitoring Design, Data Analysis and Forecasting.”

Phytoplankton production is at the base of the pelagic food web leading to the zooplankton and fish species currently experiencing rapid declines. One goal of this ongoing project is to analyze available historical data on chlorophyll *a* concentrations and other water quality variables in Delta sub regions or at specific long-term monitoring stations in order to determine processes underlying changes in primary production and biomass. This is an extension of similar analyses conducted at the Delta-wide scale (Jassby and Cloern 2000; Jassby et al. 2002). Results from this study will help assess the potential for sub-regional and local bottom-up food web effects on pelagic zooplankton and fish, effects of changed export patterns on phytoplankton production in different Delta areas, etc.

Time period: Ongoing through 2007.

Resources required

Cost: \$50,000 per year from POD sources.

PI(s): Dr. Alan Jassby (UCD), in collaboration with DWR-DES staff (Anke Mueller-Solger & Marc Vayssières)

Contract needed / in place: In place

Contract manager: Ted Sommer (DWR)

Term of contract: Through June 30, 2008.

Personnel:

Equipment:

Deliverables and dates: An IEP newsletter article, progress report, and a presentation (CALFED or IEP) are due by June 30, 2007. By June 30, 2008, the deliverables will be an IEP newsletter article, a final report (an IEP technical report is intended), and at least one peer-reviewed journal article.

Comments:

Apparent growth rates of pelagic fishes and relationship to abundance

IEP 2007-051

Point person: Randy Baxter (DFG)

Lead Agency: DFG

Questions: Have species’ apparent growth rates or year-end mean lengths declined, particularly those of 2001-2004 versus previous years? Are environmental factors, such as X2 position or zooplankton abundance, predictive of apparent growth rates or year-end mean size?

Description: Complete growth rate analyses based on existing length frequency data from the trawl surveys to determine if the apparent growth rates of target pelagic fishes have changed over the long-term and/or recently (2002-2004).

Time period: We are examining various data sets for these analyses and propose to complete analyses by March 2007.

Resources required

Cost: The 2007 POD budget for this element is \$38,000 from POD sources. \$39,000 required to complete this work was already obtained in 2006.

PI(s): Randy Baxter, Kathy Hieb, Kevin Fleming, (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Existing IEP staff and funds can be redirected to this analysis.

Equipment: There are no field or laboratory requirements for this project.

Deliverables and dates: Two progress reports; March and August 2007.

Comments:

Evaluate delta smelt otolith microstructure and microchemistry

IEP 2007-060 and 2007-040

Point person: Randy Baxter (DFG)

Lead Agency: UCD

Questions: Do growth rates of delta smelt vary seasonally or geographically? When and where in the estuary are delta smelt produced?

Description: Analysis of otoliths from delta smelt to determine daily growth rate and area of origin. Analysis of otoliths that includes microchemical work can provide detailed information on fish origin and growth that can be related to histopathology analyses and potentially to ambient water toxicity for 2005 and 2006. This work has been done successfully on delta smelt (Bennett submitted). Fish samples for this element will be collected by TNS and FMWT surveys, with supplemental sampling based on availability of boats and crew. In addition IEP has archived delta smelt samples from 1995 through 2005 that might be added to these analyses.

Time period: Work should be started as soon as practical and continue for at least one year.

Resources required

Cost: Estimate is \$350,000 to process approximately 500-600 samples per year. Funding to come from a CALFED ERP grant. \$76,000 funding for J. Hobbs is from CALFED – Sea Grant.

PI(s): Dr. Bill Bennett (UCD) and James Hobbs (UCD)

Contract needed / in place: In place

Contract manager: Steven Rodriguez (DFG)

Term of contract:

Personnel: Field personnel are supplied by DFG Towner, Fall Midwater Trawl and 20-mm surveys, and targeted sampling.

Equipment:

Deliverables and dates:

Comments: This work will be an extension of the delta smelt work (Bennett submitted) and striped bass work carried out by Dr. Bill Bennett and colleagues (Bennett et al. 1995). This work would be most effective if coupled with the histopathology work (2007-061) and diet/condition work (2007-062) to provide a comprehensive timeline of the relative condition of the fish that we could compare to timing of potential stressors.

Delta smelt histopathology investigations

IEP 2007-061

Point person: Randy Baxter (DFG)

Lead Agency: UCD

Questions: Does fish histopathology suggest recent increases in toxic exposures and/or food limitation? Does the histopathological condition vary in severity by life stage within or among species and/or geographic regions? What percentage of fish is affected by environmental stressors? What are the target organs of these stressors, and can the observed effects lead to population declines? What are the stressors affecting the fish?

Description: Histopathological examination of fish. Work in 2006-07 will focus on the examination of fish exposed to water samples or collected from sites where 1) 2005 results indicated that fish were affected by environmental stressors; 2) where invertebrate toxicity indicate the presence of toxic compounds. Lesions in fish from important studies should be compared to lesions observed in fish from field sites, but it is important to keep in mind that actual exposure duration may differ between laboratory-exposed and field-collected fish, and that wild fish may additionally be exposed to natural stressors (water temperature, oxygen levels, and food depletion.)

Time period: 2006-2007.

Resources required

Cost: \$350,000 from CALFED ERP grant

PI(s): Dr. Swee Teh (UCD)

Contract needed / in place: In place

Contract manager: Steven Rodriguez (DFG)

Term of contract:

Personnel: Field personnel are supplied by DFG Townet, Fall Midwater Trawl and 20-mm surveys, and targeted sampling.

Equipment: Field sampling vessels and nets, as well as laboratory supplies needed for storage and preservation of specimens are supplied by DFG. Laboratory analysis is conducted at UCD.

Deliverables and dates:

Comments: Histopathological analysis of fish tissues can identify a variety of tissue lesions resulting from exposure to environmental stressors such as contaminants, disease, and food limitation. Histopathological lesions often manifest themselves over longer periods of time, and therefore integrate the effects of multiple stressors. It is a useful tool to identify affected organs and can help identify certain groups of contaminants with known mechanism of action (e.g. carcinogens, endocrine disruptors) and target organs (e.g. liver, gonads). Histopathological studies play an important role in directing and focusing special studies.

Quantitative analysis of stomach contents and body weight for pelagic fishes

IEP 2007-062

Point person: Randy Baxter (DFG)

Lead Agency: DFG

Questions: Is there evidence of reduced feeding success during specific times of the year or in certain parts of the estuary? If so, are these changes associated with changes in growth rate, relative weight or liver condition? Do stomach content, condition (weight at length) or histopathology vary between salvaged fish and fish collected elsewhere?

Description: Food habit studies have been done on many of the fish and zooplankton found in the estuary (IEP 1987; Orsi 1995; Lott 1998; Nobriga 2002; Feyrer et al. 2003); however, many of these studies were done more than 10 years ago and the feeding habits of the local inland silverside and threadfin shad populations have only been studied in a limited geographical range

(Grimaldo 2004). As evidence that feeding success may be an important issue for survival, initial studies by BJ Miller suggest that delta smelt survival in different parts of the estuary was linked to whether there was co-occurrence of prey. The only previous evaluation of parasite load was an evaluation of cestode infection in striped bass (Arnold and Yue 1997). However, information on gut parasites can be collected quickly during the processing for stomach contents analysis. Parasite load can influence susceptibility to other stressors (Moles 1980). In 2003, IEP started a study of fish length-weight relationships needed to estimate species biomass and to develop a program to monitor trends in relative weight. Work on diet and condition will be continued in 2006 and 2007, and be expanded to include longfin smelt among the target species and the periodic collection of all target fishes (delta smelt, striped bass, longfin smelt and threadfin shad) from Salvage. In 2006, examination of parasite load was transferred to researchers conducting histopathological investigations (2006-061, 2006-042).

Time period: 2006 and 2007

Resources required

Cost: The 2007 POD budget is \$11,000. \$66,000 required to do this work was already obtained from POD sources in 2006.

PI(s): Randy Baxter and Steve Slater (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Field collection is conducted by all long-term fish monitoring surveys. Fish are retained after reaching quotas for otolith and histopathology samples; all POD fishes are retained by Bay Study for condition and diet analyses. Laboratory personnel (3 scientific aids and part time Sr. Lab Assistant) are directed in sample processing by a Biologist.

Equipment: Current long-term monitoring vessels and gear will be employed; some gear modification may occur for directed sampling. Laboratory equipment is currently available at DFG Stockton.

Deliverables and dates: Posters for CALFED Science Conference, October 2006. Oral progress report, December 2006. Poster and oral presentation for IEP Asilomar Workshop, February 2007. Fish length-weight and diet databases will be added to until the start of 20mm Survey redirects lab staff in March of each year. Additional specimens will be archived for future investigation or increased sample size when staff time permits.

Comments: DFG staff will collect samples and process diet information. The IEP has extensive experience with these techniques, but lost staff leading part of this work. Lab work was delayed substantially in 2006 by the loss of a biologist and long delays in hiring Scientific Aides and Senior Lab Assistants.

Acute and Chronic Invertebrate and Fish Toxicity Tests

IEP 2007-063

Point person: Randy Baxter (DFG)

Lead Agency: UCD

Questions: Is water in the Delta and the Napa River toxic to pelagic fish and fish food organisms? If yes, where and when? How does fish and zooplankton distribution and abundance compare to bioassay results? What is the spatial and temporal distribution of water column toxicity in relevant areas of the Delta? What are the primary toxicants?

Description: Work in 2006-07 will consist of a spatially and temporally expanded sampling and toxicity testing program. Spatial distribution of Delta sampling sites will follow the 2005 pilot program, and additional sites will be sampled in accordance with the prevalent distribution patterns of fish species of concern. The indigenous amphipod species, *Hyalella azteca*, will be used for routine toxicity testing throughout the year. This species is resident in the Delta, sensitive to contaminants, and is routinely used in toxicity testing programs throughout the Nation. Moreover, it can be used to identify the causative agents of toxicity through Toxicity Identification Evaluation (TIE) procedures. If toxicity is observed at a site through initial screening, TIEs will be initiated immediately. Adequate quantities of water will be collected to proceed with TIEs in case toxicity is observed.

Two fish species of concern (delta smelt and striped bass) will be used to test water samples from selected Delta sites, from larval to juvenile stages during periods when the respective life stages are rearing in the Delta. Fish from these tests will be preserved for biomarker and histopathological analyses. These laboratory tests will identify sites that are acutely toxic to larval/juvenile stages of delta smelt and striped bass, and help differentiate the effects of toxic contaminants from the effects of food depletion (fish will be fed during the laboratory trials), and natural stressors such as water temperature and/or oxygen depletion (laboratory tests are performed at constant temperature and water is oxygenated).

If multiple stressor effects are suspected to play a role (e.g. food limitation plus contaminants), laboratory experiments could help quantify the combined effects. Fish could be reared in the laboratory under a normal and a food-limited regime, examined for resulting histopathological lesions, then exposed to water from different Delta sites, or to specific contaminants identified as toxicants present in the Delta.

Time period: 2006-2007

Resources required

Cost: \$644,000 from POD sources.

PI(s): Inge Werner (UCD)

Contract needed / in place: Yes

Contract manager: Ted Sommer (DWR)

Term of contract: Through December 2007.

Personnel: Field water collection will be facilitated by a DFG boat operator; otherwise, UC Davis personnel will conduct all preparation and processing.

Equipment: Field collection via a 20-32 foot research vessel supplied by DFG. Bioassay and TIE equipment currently available at UC Davis Aquatic Toxicology Lab.

Deliverables and dates: Quarterly progress reports to Contract Manager; oral progress reports to IEP project work teams by September 2006 and September 2007; oral progress report at the IEP Annual Workshop in February 2006; peer-reviewed professional journal article and/or report in the summer 2007 IEP Newsletter.

Comments: In addition, information will be gathered on land use (e.g. PUR) to ascertain the potential class of toxicant(s) that could potentially be present at the sampling sites (see contaminant trends). This will aid in the TIE process, and also direct focused studies on timing and duration of potential toxic effects.

If TIE work identifies specific contaminants as toxicants of concern, focused laboratory studies should be designed and performed to expand our knowledge of the specific effects and biological effect levels of these toxicants. Specific biomarker responses can then be selected for identifying the effects of these toxicants in field studies

Trends in benthic macrofauna biomass

IEP 2007-065

Point person: Anke Mueller-Solger (DWR)

Lead Agency: DWR

Questions: At central & northern Delta locations, what are the long-term trends in biomass, production, and grazing rates of benthic species? How are these changes related to physical-chemical gradients? How do changes in benthic functions such as production and grazing affect the pelagic food web?

Description: Over the past three decades, the Interagency Ecological Program (IEP) Environmental Monitoring Program (EMP) has collected benthos community composition and abundance information at 22 sites, including four long-term monitoring stations. Trends at the four long-term stations are the subject of an ongoing investigation. Though it is presently recognized that biomass data are crucial in determining the role of benthic organisms in the ecosystem, (especially the feeding potential of various functional groups, potential availability and transmission of contaminants bioaccumulated in benthos, and trends in production as well as the ecological significance of changes in benthic community composition and abundance) measurements of benthic macrofauna biomass have never been conducted by the EMP. Fortunately, the EMP has developed a comprehensive plan to analyze archived benthos samples dating back to 1975 which can be used for biomass estimation using a simple wet-weight method. The objective for 2006 was to measure and examine the biomass of benthic organisms collected quarterly from 1975 – 2004 at two long-term stations located in the central and northern Delta. Data analysis is conducted as part of work plan element IEP 2007-078 and other ongoing EMP data analyses. This work will continue in 2007.

Time period: 2006-2007

Resources required

Cost: Redirected staff from the EMP (2007-072) will be used to accomplish this work. Additional funding for an expansion of this project has recently been granted by the CALFED Science Program. This funding will likely become available by the end of 2007 or early in 2008.
PI(s): Dean Messer (DWR), Karen Gehrts (DWR), Wayne Fields of Hydrobiology would provide identification help and Dr. Janet Thompson, USGS, would provide additional expertise.

Contract needed / in place:

Contract manager:

Term of contract:

Personnel: Scientists: 365 hours = \$31,400; 1 Scientific Aide: 550 hours = \$21,110; Wayne Fields: 30 hours = \$3000.

Equipment: Supplies: \$10,000

Deliverables and dates:

Comments: Investigation does not depend on the availability of new field data. Special analytical techniques that are required are well-known.

Evaluation of changes in pelagic fish habitat quality using the IEP long-term monitoring data

IEP 2007-066

Point person: Ted Sommer (DWR)

Lead Agency: DWR and DFG

Questions: Has the surface area of suitable striped bass and/or delta smelt habitat changed? Does interannual variation in estuarine hydrology influence the spatial extent of striped bass and/or delta smelt habitat? Have export changes affected the spatial extent of striped bass and/or delta smelt habitat? What are the trends in physical habitat area in the Delta versus Suisun Bay? Do the previous findings differ when the availability of zooplankton prey are factored into the analysis?

Description: Long-term monitoring data are being used to characterize physical habitat for delta smelt and striped bass and to test the hypothesis that there has been no long-term change in the amount of physical “habitat” for these pelagic fishes. The basic approach used in 2005 was similar to instream flow methods (IFIM) that have been applied to rivers and streams. First, we developed habitat criteria to define the physical and chemical conditions that were suitable for striped bass and delta smelt. Second, we divided the study region into smaller area units based on the location of sampling (TNS and MWT) stations. Third, we applied the habitat criteria (step 1) to long-term water quality monitoring data for each station to determine which stations provided suitable habitat. Finally, we summed the area units (step 2) representing suitable habitat to provide an estimate of total suitable area. Note that a major difference between our approach and traditional IFIM methods is that we relied on actual water quality monitoring data at sampling stations to calculate suitable habitat, while IFIM typically uses model simulations to generate data for each station. In 2006-2007 we propose to: 1) Complete the initial analyses of habitat area for the TNS and MWT; 2) submit results to a peer-reviewed journal for publication; 3) evaluate the results based on trends in physical habitat for major geographical areas (e.g. delta vs. Suisun Bay); and 4) evaluate the feasibility of using zooplankton prey availability as an additional habitat suitability criterion.

Time period: 2006-2007

Resources required

Cost: \$184,000 from POD sources

PI(s): Matt Nobriga, Fred Feyrer, and Ted Sommer (DWR)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Two Environmental Scientists at 25% time. Additional assistance of redirected IEP staff may also be needed.

Equipment: There is no field or lab component to this study.

Deliverables and dates: Two peer-reviewed journal articles will be prepared by June 30, 2007.

Comments: This study component is a continuation of the successful 2005 effort.

Recent changes in water project operations

IEP 2007-068

Point person: Rich Breuer (DWR)

Lead Agency: DWR

Questions: This element will address two major questions: 1) how have water project operations changes in recent years; and 2) what is the cause of fall salinity increases in the delta?

Description: This project will use hydrologic data from the delta and upstream areas to identify changes that have occurred in water project operation during the pelagic fish decline.

Time period:

Resources required

Cost: There are no additional funds required to accomplish this work.

PI(s): Lenny Grimaldo (DWR)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Existing staff members will be redirected to accomplish this task.

Equipment:

Deliverables and dates:

Comments:

Retrospective analysis of long-term benthic community data

IEP 2007-078

Point person: Anke Mueller-Solger (DWR)

Lead Agency: DWR & USGS

Questions: At the 4 core sites, how do benthic community assembly and structure change over time? How are these changes related to physical-chemical gradients? Can spatial or physical thresholds be identified for benthic macrofauna, especially for species of concern such as invasive species, species with important trophic effects, (e.g. *Corbicula fluminea* and *Corbula amurensis* which act as a sink for suspended organic particles), and other benthic species that are important prey items for higher trophic levels such as bird, fish and mammals? What is the environmental significance of changes in species assemblage?

Description: This is an ongoing data analysis project with IEP and CALFED-Science funding. The goal of this project is to investigate long-term trends and ecological processes involving benthic organisms from historical data collected by the IEP Environmental Monitoring Program (EMP) at its four long-term benthos monitoring stations. Specifically, this analysis seeks to uncover historical trends in community composition in relation to environmental variability, hydrology, and exotic species invasions.

Time period: ongoing through 2007

Resources required

Cost: Existing staff will be redirected to accomplish this task.

PI(s): Key staff includes Heather Peterson (USGS), Marc Vayssieres (DWR), and Dr. Janet Thompson (USGS).

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel:

Equipment: No equipment is required.

Deliverables and dates:

Comments:

Field survey of *Microcystis aeruginosa* Bloom Biomass and Toxicity

IEP 2007-079

Point person: Rich Breuer (DWR)

Lead Agency: DWR-DES, DFG

Questions: Is *Microcystis* biomass or toxicity increasing over time in the Delta? Does *Microcystis* bloom biomass or microcystins toxicity occur in areas important to pelagic fish

species in the Delta? Is there a relationship between bloom biomass and toxicity with zooplankton and fish abundance? Is there a relationship between the bloom biomass, microcystins in algal tissue or microcystins dissolved in the water column, and microcystins toxicity in zooplankton, benthic, epibenthic and fish tissue? Do regions of high zooplankton and benthic tissue microcystins toxicity coincide with high microcystin tissue content, lower density and poor health of planktonic feeding fish? Are dissolved microcystins produced during the decomposition phase of the bloom sufficiently toxic to impact fish and zooplankton survival and health based on densities at sampling stations and toxicity bioassays? What are the origins of the *Microcystis* blooms?

Description: Field surveys to measure *Microcystis aeruginosa* bloom biomass and toxicity. The 2006 surveys will build on the 2004-2005 survey and be closely coordinated with the fish surveys (TNS, FMWT) and toxicity assays. Sample collection at fish survey stations will help elucidate the link between *Microcystis* biomass and toxicity and its direct effect on zooplankton and fish. Water samples for *Microcystis* biomass and both algal tissue and dissolved microcystins toxicity will be collected monthly by DWR-DES staff at selected fish survey and zooplankton and fish toxicity assay stations, as well as stations with high *Microcystis* biomass identified in the 2004 survey. Zooplankton, benthos, and fish toxicity will be evaluated based on microcystin content in whole animal (zooplankton and benthic) or liver and muscle tissue (fish). Animals for these analyses will be collected during fish surveys. Epibenthic and benthic organisms will be collected by Ponar dredge or box sampler (C. Messer, personal communication) as a part of the bloom sampling effort or fish survey as appropriate. Environmental conditions associated with the bloom biomass and toxicity will be measured at each station with an YSI 6600 Sonde and by water samples for a suite of discrete water quality measurements including nutrient concentration. Qualitative observations of *Microcystis* surface blooms will be recorded by fish survey staff during all fish survey dates and at all sites.

Time period: Summer and fall 2006-2007.

Resources required

Cost: 250,000 from CBDA Prop 50 Science Program PSP.

PI(s): Peggy Lehman (DWR) and Dan Riordan (DWR).

Contract needed / in place: In place.

Contract manager:

Term of contract:

Personnel: This work would be conducted by redirected and additional hired temporary DWR-DES staff including a boat operator; microcystins toxicity analyses by Dr. G. Boyer at State University of New York.

Equipment:

Deliverables and dates:

Comments: Toxicity analysis will be done by Dr. G. Boyer of the State University of New York, an expert on cyanobacterial toxicity. His group has extensive experience in determination of cyanobacterial toxins and routinely analyzes samples for NOAA, CDC, and departments of health and conservation for several states. They also participated in the previous surveys. Future analyses may be possible at DFG's Water Pollution Control Laboratory.

Analysis of historical population dynamics

IEP 2007-084

Point person: Mike Chotkowski (USBR)

Lead Agency: USBR

Questions: The examination will extend the 2005 analysis of FMWT and Bay Study data to include other fish datasets, including the FWS JFMP seine dataset. This will include the evaluation and search of, (i) long-term trends, (ii) discernable epochs in the data, (iii) notable point or short-duration events, and (iv) coordinated or contemporaneous changes in multiple species that suggest a common explanation. We will also examine relevant historical data to evaluate historical support for the two “narrative” hypotheses developed in 2005.

Description: These investigations were a component of the 2005 investigations. Based on results to date, we believe continuation is warranted to complete work already started, complete work that could not begin in 2005 due to unavailable data, and to extend the investigation in ways intended to comport with reviewer recommendations.

Time period: Ongoing through 2007.

Resources required

Cost: The 2007 budget is \$62,000 from POD sources. Some funds may be required for contracts with external parties in the future.

PI(s): Mike Chotkowski (USBR) and Dr. Bryan Manly

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Personnel other than the CO-PI’s are not required.

Equipment: There is no field or lab equipment associated with this project.

Deliverables and dates: In 2006 we will submit at least two manuscripts for publication. One will be a methods paper dealing with the new regime change analysis developed by Bryan Manly; the other will be an account of the 2005 analysis of FMWT and Bay Study data, and what the findings imply.

Comments: Statistician Bryan Manly has agreed to assist. San Luis Delta Mendota Water District has generously agreed to support Dr. Manly’s work. Other outside assistance may be required in the future.

Power Plant Operations

IEP 2007-087

Point person: Ted Sommer (DFG)

Lead Agency: DWR and others

Questions: What are the characteristics of the cooling water diversions associated with the Contra Costa and Pittsburg power plants, and what effects might they have on pelagic fishes? Have there been recent increases in pelagic fish entrainment?

Description: This study was previously a component of the 2005 work element, “Analysis/summary of recent changes in delta water operations”. Based on the initial data review, we believed that the issue warranted a focused study. The purpose of this element is to closely examine power plant operations to identify whether there were effects strong enough to contribute to the long-term and recent apparent step change in pelagic fish abundances.

Time period: Ongoing through 2007.

Resources required

Cost: Any additional costs for agency work will be absorbed by existing DWR personnel.

PI(s): Randall Mager and Stephanie Sparr (DWR)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel:

Equipment:

Deliverables and dates:

Comments: Although we were unable to obtain detailed data on recent project operations and fish entrainment for the 2005 synthesis report, we have had new and promising contacts regarding power plant data.

III. New studies

Contaminant loads in pelagic fish eggs

IEP 2007-018

Point person: Randy Baxter

Lead Agency: DFG, UCD

Questions: Has there been a change in amount and/or type of contaminants contained in striped bass eggs since 1999.

Description: Striped bass are long-lived predatory fish with the potential to accumulate toxic materials either through food or across the gill surface. Their high fat content makes eggs likely physiological targets for toxic effects of fat-soluble contaminants. Unpublished work on egg and larval health of striped bass provides strong grounds for concern. This project will assess the contaminant load of striped bass eggs collected in 2005 and compare that to work done in 1999 and 2000 following the methods developed by David Ostrach. The shorter-lived smelt and shad are less likely to display “maternal gift” impacts, so this work focuses on striped bass. This work will complement and fit in with that described in element 2007-042.

Time period: Chemical analyses of archived samples will take place as soon as DFG water pollution lab can process the samples and analysis of the results will follow soon thereafter.

Resources required

Cost: \$10,000 required to conduct this work was obtained in 2006.

PI(s): David Ostrach (UCD)

Contract needed / in place:

Contract manager: Ted Sommer (DWR)

Term of contract: See Element 2007-042.

Personnel:

Equipment:

Deliverables and dates: See Element 2007-042.

Comments:

Preliminary investigations of disease as a factor in the POD

IEP 2007-036

Point person: Randy Baxter (DFG)

Lead Agency: DFG, USFWS, and UCD

Questions: What are the incidences and severities of indicators of disease or parasites for each target fish species? What can be inferred from these data about the impacts of disease and parasites on POD fish populations?

Description:

Time period: In addition to the collection of striped bass and delta smelt for histopathology in 2006, sampling will be augmented to allow collection and as needed on-board processing of fresh specimens of all four target fishes for several time periods. Sampling will be repeated in 2007 with enhanced effort for some or all target species.

Resources required

Cost: \$24,000 from POD sources.

PI(s): Scott Foot (USFWS)

Contract needed / in place: In place

Contract manager: Ken Lentz (USBR)

Term of contract:

Personnel:

Equipment:

Deliverables and dates:

Comments: This work is moderately feasible and will depend upon our ability to supply field crews at the proper time, coordinate field assistance with diverse PI's and collect sufficient specimens in a limited number of field days.

Development of striped bass life cycle models

IEP 2007-038

Point person: Ted Sommer

Lead Agency: UCD, SFSU-RTC, LSU, and consultants

Questions: What factors are the dominant drivers of striped bass population dynamics? What are the best management strategies for each of these species?

Description: Life cycle models are need for both striped bass and longfin smelt, but we will pursue a model for striped bass first. Significant information exists and for striped bass some existing models may be able to be modified to meet these purposes. Synthetic modeling capabilities are a very powerful means of evaluating the interactive influences of multiple stressors on fish population dynamics (Rose 2000).

Time period: 2006-2007

Resources required

Cost: \$224,000 required to conduct this work was obtained in 2006 from POD sources.

PI(s): Frank Loge (UCD) and Kenny Rose (LSU)

Contract needed / in place: In progress

Contract manager: Ted Sommer (DWR)

Term of contract: TBA

Personnel:

Equipment:

Deliverables and dates:

October 2006 - 1st progress report and CALFED Science Conference presentation.

April 2007- 2nd progress report, IEP Newsletter article, and IEP Workshop presentation.

October 2007 - 3rd progress report and CALFED Science Conference presentation.

April 2007- 4th progress report, IEP Newsletter article, and IEP Workshop presentation.

June 2008 - Submission of 3 peer-reviewed manuscripts addressing description, calibration, hypothesis testing, and comparison of a) dose-structured population dynamics, b) IBM, and c)

matrix models. Additionally, computer codes for each model and supporting documentation explaining use, inputs, and outputs.

Comments:

Threadfin shad data analysis and population dynamics

IEP 2007-039

Point person: Ted Sommer (DWR)

Lead Agency: DWR

Questions: What are the seasonal and spatial trends in threadfin shad abundance? What factors affect their abundance and distribution? Do salvage estimates seasonally or cumulatively appear related to the longer term relative abundance of threadfin shad?

Description: In 1959, threadfin shad were introduced into reservoirs in the Sacramento and San Joaquin drainages, and from these introductions the species expanded throughout the freshwater portions of the system. Little is known about their population dynamics within the delta and until about 2002 even their abundance trends were not regularly reported (e.g., their absence IEP Newsletter 2001 (2)). We propose to continue the examination of the distribution and abundance patterns of threadfin shad within the Delta and expand analyses to include investigation of fish entering from upstream.

Time period: 2006-2007

Resources required

Cost: \$57,000 from POD sources.

PI(s): Fred Feyrer (DWR)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: 2 Scientific, 1 Environmental Scientist, and 1 boat operator are needed.

Equipment: Equipment: \$1,000, Toxicity analysis: \$20,000.

Deliverables and dates: Poster presentation at CALFED, October 2006; Oral presentation at IEP Annual Workshop, February 2007.

Comments: Substantial catch, length and distribution data exists in state and federal survey databases that can be used to address the study questions.

Modeling the delta smelt population in the San Francisco Estuary

IEP 2007-041

Point person: Randy Baxter (DFG)

Lead Agency: USGS, SFSU-RTC, LSU and consultants

Questions: What are the best management strategies for this species?

Description: This element is a CALFED Science PSP grant that will use three different modeling approaches for looking at delta smelt population dynamics.

Time period: 2006-2008

Resources required

Cost: \$332,000 per year for 3 years. Total is \$997,000.

PI(s):

Contract needed / in place:

Contract manager:

Term of contract: 3 years, beginning in 2006

Personnel:
Equipment:
Deliverables and dates:
Comments:

Estimation of Pelagic Fish Population Sizes

IEP 2007-043

Point person: Mike Chotkowski (USBR)

Lead Agency: DFG, DWR, USBR, consultants and contractors.

Questions: What are the most efficient regions (strata) for each target species sampled by the TNS, MWT and Kodiak surveys? Do fixed sampling stations in a highly tidal system approximate random distributions? What are the population sizes for each of the target pelagic species? Should strata variance be calculated based upon a normal distribution? What are the most efficient regions (strata) for each target species sampled by the TNS, MWT and Kodiak surveys? Do fixed sampling stations in a highly tidal system approximate random distributions? What are the population sizes for each of the target pelagic species? Should strata variance be calculated based upon a normal distribution or another type of distribution? her type of distribution?

Description: Except for adult striped bass, the status of pelagic fish populations has primarily been assessed using relative abundance indices. IEP has been reluctant to translate these data into population sizes because of sampling selectivity (i.e., non-random site selection), gear efficiencies are unknown for each of the sampling programs and fish tend to be patchy, likely adding substantial variability. Other approaches for pelagic fish population estimation are unreasonable (e.g., direct counts, mark-recapture, and change in ratio). However, the POD effort would benefit greatly from at least crude population estimates, allowing calculation of mortality rates and population modeling. The development of mean-density expansion estimators based upon stratified random trawl sampling represents the most practicable alternative. As initial steps to estimate population size, Bennett (2005) has used the TNS and MWT data, and Miller (2005) has analyzed the Kodiak trawl data. This element will build on those earlier efforts to develop population estimates for as many of the target pelagic species as possible. Refinements of their efforts may include the use of known salinity and temperature effects on target species distributions, updated bathymetry and the particle tracking models to: 1) post-stratify survey data (i.e., set more efficient region boundaries); 2) improve habitat volume estimates represented by fixed stations and regions for each of the surveys; and 3) test the assumption of randomness in the data.

Time period: Ongoing through 2007.

Resources required

Cost: \$42,000 required to conduct this work was obtained in 2006 from POD sources.

PI(s): Ken Newman (USFWS)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Ken Newman (USFWS)

Equipment:

Deliverables and dates:

Comments: Although there are substantial obstacles to measurement of population sizes, the recent efforts of Bennett (2005) and Miller (2005) provide a reasonable foundation for future work.

Zooplankton fecundity and population structure

IEP 2007-044

Point person: Anke Mueller-Solger (DWR)

Lead Agency: SFSU-RTC

Questions: Has there been a downward shift in egg production and/or nauplius survival that resulted in lowered ratios of copepodites to adults? Has there been a change in copepodite survival?

Description: This is an analysis of *Pseudodiaptomus forbesi* and *Eurytemora affinis* life stage structure and fecundity from archived zooplankton samples (1996-2005) and associated water temperature data. The goals are to determine whether the recent increase in *Corbula* abundance was associated with an increase in mortality of sub-adult (i.e., copepodite stage) *P. forbesi* and *E. affinis*, and/or a reduction in adult *P. forbesi* and *E. affinis* fecundity.

Time period: 2006-2007

Resources required

Cost: \$80,000 from POD sources.

PI(s): Wim Kimmerer

Contract needed / in place: In progress

Contract manager: Ted Sommer

Term of contract: Through December 30, 2008.

Personnel:

Equipment:

Deliverables and dates: See Element 2007-076.

Comments: Feasibility is high because the samples have already been collected and pilot work indicates the methods are appropriate to answer the study questions.

Overlap/Synthetic analysis of POD data

IEP 2007-046

Point person: Randy Baxter (DFG)

Lead Agency: USGS, DFG, DWR

Questions: Specific questions and working groups have not been determined at this time. More discussions with NCEAS members need to occur before determining the most valuable questions to pursue.

Description: The overall goal for the proposed NCEAS working groups is to conduct and/or guide the integration, analysis, and synthesis of POD and other relevant data and information in a more efficient, sophisticated, unbiased, and synergistic manner than would be possible with local resources alone. The focus of the NCEAS working group should be identification of and testing of hypotheses about individual and interacting stressor(s) associated with the observed POD trends, the linkages among these stressors, and the mechanistic pathways leading to the observed trends. Continuous analysis of POD data will help to examine overlap in space and time of pelagic species, food organisms, toxicants, toxic algae, and diversions. Effort will tie together and analyze field data, environmental data, operations information and information from otolith, histopathological and bioassays.

Time period:

Resources required

Cost: The 2007 POD budget for this element is \$656,000; an additional \$290,000 was already obtained in 2006 from POD sources.

PI(s): Larry Brown (USGS), and Gonzalo Castillo (USFWS)

Contract needed / in place: In process.

Contract manager: Kim Webb will manage the NCEAS contract.

Term of contract: Scientifically sophisticated approaches and defensible conclusions require substantial time. We envision the IEP/POD-NCEAS interaction to continue beyond the term of this contract and at this time would like to establish a working relationship through the end of 2008, with the possibility of an extension.

Personnel: Other key staff members include Fred Feyrer (DWR) and Randy Baxter (DFG).

Equipment:

Deliverables and dates: Fall 2007: Draft synthesis report authored by NCEAS POD working team members, perhaps with the help of an NCEAS postdoc. A comprehensive synthesis report would follow one year later. Additionally, scientific presentations and presentations geared at lay audiences would be authored by individual POD or NCEAS working group members.

Comments: Existing staff members from the above agencies are being redirected to work closely with NCEAS to participate in the synthesis of IEP data as it relates to the POD.

Corbula salinity tolerance, distribution and grazing rates

IEP 2007-076

Point person: Ted Sommer (DWR)

Lead Agency: DWR, USGS and SFSU

Questions: What is the salinity tolerance of *Corbula amurensis*? How well do salinity tolerances explain the distribution of *Corbula*? What are regional trends in benthos and grazing rates?

Description: A central part of the “Bad Suisun Bay Hypothesis” is that *Corbula* distribution has changed, perhaps in response to recent salinity increases during autumn. To better evaluate this hypothesis, we need to develop salinity tolerance information for the clam. This will be performed in a controlled laboratory setting, likely at SFSU Romberg Tiburon Center. To provide additional insight into the “Bad Suisun Bay Hypothesis”, we need better fine-scale regional data on the distribution and grazing rates of benthic organisms. Towards this end, field surveys will be performed by EMP staff in 2006 and 2007. Two spatially intensive (~250 samples/event) surveys will be performed each year to assess the distribution, abundance, size (and therefore grazing rate) of benthic bivalves.

Time period: Mid-2006 through 2008.

Resources required

Cost: The 2007 POD budget is \$65,000, however \$117,000 is the total amount for laboratory studies of salinity tolerances through the contract period. No additional costs for the field surveys and data analyses.

PI(s): Jonathan Stillman and Wim Kimmerer (SFSU)

Contract needed / in place: In place

Contract manager: Ted Sommer

Term of contract: July 2006 through December 2008

Personnel: Key staff includes Marc Vayssieres and Karen Gehrts (DWR), Dr. Janet Thompson and Heather Peterson (USGS).

Equipment:

Deliverables and dates:

October 2007: Submit Year 1 progress report to IEP. This will be provided as one or more IEP Newsletter articles or manuscripts, depending on the results to date.

February 2008: Present preliminary results at Asilomar.

December 2008: Final reports, which will comprise draft manuscripts for submission to journals or the IEP Newsletter, as appropriate.

Comments:

CASCaDE computational assessment of scenarios

IEP 2007-081

Point person: Steve Culberson (CALFED)

Lead Agency: USGS

Questions: This study will establish a model-based approach for placing quantitative bounds on water resource and ecosystem responses to a plausible range of future changes in the Bay-Delta Rivers and Watershed system – critical information that will allow resource agencies to anticipate changes and develop flexibility in their strategic planning to accommodate those changes before they occur. While this project has broad relevance to many goals of the CALFED Science Program, it is most directly relevant to the third priority research topic identified in the 2005 Science Program PSP, which solicits “analytical frameworks that will support assessments and refined predictions of how likely future changes such as population or climate-related hydrological shifts may affect water operations, ecosystem processes, and CALFED projects”.

Description: The goals of this project are to develop and apply a model-based approach of ecological forecasting (Clark 2001) to project future states of the Delta ecosystem under prescribed scenarios of change, and to communicate the outcomes of those scenarios to resource managers. Specific objectives include: 1) Develop/refine/calibrate/verify a set of mechanistic numerical models of climate, watershed hydrology, Bay-Delta hydrodynamics, sediments and geomorphology, and water quality; 2) Link these models to project system dynamics from prescribed forcings, beginning with the climate system (including sea level) and then cascading to the watershed (water, sediment, contaminant runoff), river system (flow, heat, sediment and contaminant transport), and Delta-Bay (hydrodynamics, water temperature, salinity, primary productivity, suspended sediments, geomorphology); 3) Compare projections under prescribed scenarios of within-Delta habitat change and catastrophic levee failures; 4) Apply model projections to assess changes in water and habitat quality, potential habitat expansion of key alien species (*Egeria*, *Corbicula*, *Potamocorbula*), incorporation of contaminants such as mercury and selenium into food webs, and qualitative population responses of native fishes, and; 5) Work in collaboration with CBDA agencies and interested stakeholders to develop flexible strategic plans based on a range of plausible, quantitative depictions of the Bay-Delta Rivers and Watershed system as it changes during the 21st century.

Time period: 2006-2008

Resources required

Cost: \$554,000 per year. This is a CALFED Science PSP-funded study through contract with the USGS.

PI(s): Jim Cloern

Contract needed / in place: In place

Contract manager: Michelle Shouse

Term of contract: 3 years

Personnel:

Equipment:

Deliverables and dates:

Comments:

Food-web support for delta smelt and estuarine fishes in Suisun Bay and upper Estuary

IEP 2007-082

Point person: Steve Culberson (CALFED)

Lead Agency: SFSU-RTC

Questions: Within the Low-Salinity Zone of the northern estuary:

1. How do benthic grazing, available solar irradiance, and the concentrations of and composition of nitrogenous nutrients interact to influence the species composition and production of phytoplankton?
2. How does bacterial production respond to changes in particulate and dissolved organic carbon (POC & DOC) delivered primarily through river flow?
3. What is the role of the microbial food-web in supporting higher trophic levels?
4. To what extent is copepod production dependent on these alternative energetic pathways (phytoplankton and bacterial production)?

Description: This is a CALFED Science Program-funded study focused on two related topics:

Topic 1: The threatened delta smelt (*Hypomesus transpacificus*) is now the principal species of concern for management of freshwater flow and diversions in the Sacramento-San Joaquin Delta, and the principal target for restoration in the upper San Francisco Estuary. The abundance of this federally-listed threatened species has been low since the early 1980s, and it has not recovered to the point where it can be considered for delisting; indeed, the 2004 abundance index was the lowest on record. Potential reasons for its low abundance are many, but evidence points to the direct and indirect effects of export pumping of freshwater in the south Delta, toxic substances, and low food supply as likely contributing factors. We believe that the feeding environment of delta smelt may be implicated in the continued low abundance of this species. Delta smelt feed for their entire lives on zooplankton, principally copepods, mainly in the brackish waters of the western Delta and Suisun Bay. As outlined in the submitted proposal, copepod abundance is depressed in this region.

Topic 2: Previous work on the responses of the estuarine ecosystem to interannual variation in freshwater flow has demonstrated a decoupling between the abundance of lower trophic levels and that of fish and shrimp (Kimmerer 2002a, b, 2004). This decoupling may imply that variability in food-web support is unimportant to variability of higher trophic levels, but there are some important pieces missing from the puzzle. Chief among these is the fact that the supply of labile organic matter from freshwater to the LSZ varies with freshwater flow, and this flux has not been accounted for in analyses of the estuarine food-web.

The funded proposal includes efforts aimed at understanding and possibly improving the food-web supporting delta smelt and other estuarine species.

Time period: 2006-2008

Resources required

Cost: \$390,000 per year. This is a CALFED Science PSP-funded grant.

PI(s): Wim Kimmerer

Contract needed / in place: This is a CALFED Science grant

Contract manager: Ladd Lougee

Term of contract: 3 years

Personnel:

Equipment:

Deliverables and dates:

Comments:

Gear Efficiency Studies

IEP 2007-086

Point person: Randy Baxter (DFG)

Lead Agency: DFG

Questions: What is the retention efficiency (fish in the net that remain held) of trawl nets and how does it vary by fish species and individual size? What is the capture efficiency of trawl nets for target species? With this information, can existing monitoring data be used to estimate fish population sizes?

Description: Trawl fishing gear is selective for fishes inhabiting open water or a relatively smooth bottom. In addition, trawl dimensions and mesh sizes affect the size of fishes enclosed and retained. We propose to review existing information, conduct data analyses and plan new experiments to show the effective retention size range(s) for fishes and estimated capture efficiencies of trawl nets currently used by DFG long-term fish monitoring. Review and planning will probably take most of 2006, and field experiments commence in 2007. One step was taken in September 2005 with the addition of a 1/8" mesh cover to the cod-end of the Fall Midwater Trawl (FMWT) net to document the sizes of fishes retained and of those that passed through the net during sampling. Concern about the additional cod-end material on the behavior of the net in the water (slower decent at deployment), lead to limited experimentation during 2005 FMWT sampling. We intend to develop field studies for 2007 to examine retention and capture efficiencies.

Time period: As time becomes available during 2007.

Resources required

Cost: \$10,000 required to do this work was obtained in 2006.

PI(s): Staff time to complete this task has not been identified.

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Staff time to complete this task has not been identified.

Equipment:

Deliverables and dates:

Comments: The feasibility for this element is moderate for 2007 assuming improved staffing. Literature review can be accomplished with temporary personnel and some permanent time.

Hydrologic changes and Suisun Bay Salinity

IEP 2007-97

Point person: Ted Sommer (DWR)

Lead Agency: USGS

Questions: This work will investigate what hydrologic or climatic changes have resulted in increased fall salinity in the western Delta. Watershed events such as reservoir operations, rice field flooding, and sea level rise will be used to help answer this question.

Description:

Time period:

Resources required

Cost: The \$62,000 required to conduct this work was obtained in 2006.

PI(s): Cathy Ruhl (USGS)

Contract needed / in place: In place

Contract manager: Erwin Van Nieuwenhuysse

Term of contract: N/A

Personnel:

Equipment: No equipment is required.

Deliverables and dates: A summary report has already been produced and a finalized report will be delivered in the second quarter of 2007.

Comments:

SAV abundance and distribution

IEP 2007-102

Point person: Bruce Herbold (EPA)

Lead Agency: USGS and UCD

Questions: Has Submerged Aquatic Vegetation (SAV) increased in the Delta? Has SAV altered the habitat to effect fish populations? Has SAV increased retention of suspended solids to create a less turbid environment, which is less hospitable to Delta Smelt?

Description: Using hyperspectral imagery, this project will provide annual acreage calculations of submerged aquatic vegetation (SAV) and quantify SAV regional distribution trends in the Delta for the past four years (2003-2006).

Time period: 2006-2008

Resources required

Cost: \$204,000 required to conduct this work has already been obtained 2006.

PI(s): Susan Ustin (UCD) and Dave Schoellhamer (USGS)

Contract needed / in place: Yes

Contract manager: Ken Lentz (USBR) and Fred Feyrer (DWR)

Term of contract:

Personnel:

Equipment:

Deliverables and dates: Fall 2007-progress report as part of Fall 2007 Synthesis. Write up by February 2008.

Comments:

Fish Facility History

IEP 2007-107

Point person: Marty Gingras (DFG)

Lead Agency: DFG, USBR

Questions: What changes have occurred at the state and federal fish facilities that would change the reported number of salvaged fish?

Description: This project will identify changes that have occurred at the state and federal fish facilities from 1956 to 2006 that may have impacted the reported number of salvaged fish. However, this investigation will not report potential items that may have impacted the retention of fish in the holding tanks (holding tank screen size changes) or survival of fish once counted (debris loads in holding tanks and impacts on released fish).

Time period: 2006 and 2007

Resources required

Cost: The 2007 POD budget for this element is \$26,000; an additional \$26,000 required to complete this work was obtained already obtained in 2006 from POD sources.

PI(s): Jerry Morinaka (DFG) and Brent Baskerville-Bridges (USBR)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: 3 months of each PI's time, spread out over 6 – 9 months.

Equipment: No equipment is required for this analysis.

Deliverables and dates:

Comments:

Delta smelt culture facility

IEP 2007-108

Point person: Rich Breuer (DWR)

Lead Agency: UCD

Questions: Reliable supplies of all life stages of delta smelt are valuable to management and scientific communities for a number of reasons. Cultured delta smelt provide specimens with known rearing history, required for toxicological experiments; aids research and design of fish screen efficiency, and pre-screen losses; allows investigations into basic biology with application to wild populations; and enables the development of a formal delta smelt refugia population.

Description: This program will collect sub-adult broodfish via purse seine from the wild each year, and spawn and rear all life stages of delta smelt in the following year in accordance to the Delta Smelt Culture Manual (Baskerville-Bridges et al. 2005). Delta smelt would be housed and reared at the newly expanded Fish Conservation and Culture Laboratory (FCCL) located on Department of Water Resources (DWR) property near DWR's Skinner Fish Facility in Byron, CA.

Time period: This money will be used to produce F1 generation delta smelt from broodstock collected in December 2006.

Resources required

Cost: \$165,000 from USBR Tracy operations, and \$165,000 from POD sources.

PI(s): Drs. Raul Piedrahita, Joan Lindberg and Bradd Baskerville-Bridges

Contract needed / in place: Needed

Contract manager: Rich Breuer

Term of contract: TBD – Needs to be in place by July 1, 2007.

Personnel:

Equipment:

Deliverables and dates: 5,000 adults (>50mm) and 10,000 juvenile (20-50 mm) delta smelt specimens for 2007, and a Production Report.

Comments: A scope of work was submitted to IEP.

Biomarkers Workshop

IEP 2007-112

Point person: Rich Breuer (DWR)

Lead Agency: CALFED

Questions: Do biomarkers currently being evaluated for the pelagic organisms indicate a population level effect from stressors? Are current biomarker analyses techniques being used for POD adequate to discern the stressor source? C

Description: For the POD program, it is important to identify and apply biomarkers that can be applied to the fish species of concern, and help differentiate and quantify stressor groups. Not all biomarkers that are presently being explored in research labs fulfill these requirements, and careful consideration should be given to a work plan for future POD work involving biomarkers. A “Fish Biomarker Task Force” consisting of experts in this field would provide state-of-the-art information on biomarkers. This task force would examine and describe 1) available biomarkers according to a number of criteria including specificity and cost; 2) identify which biomarkers are applicable to Delta fish species of concern and what information they can provide; 3) identify research objectives and timelines for developing specific biomarker tools for Delta fish species of concern.

Time period: Summer 2007

Resources required: POD PI's conducting Biomarker work and solicited experts in biomarkers. CALFED would solicit experts and organize a workshop where currently applied Biomarker analyses for POD would be discussed, as well as emerging biomarker analyses and their applicability to Delta fish.

Cost: \$13,000 (USBR → CALFED) required to conduct this work was already obtained in 2006.

PI(s): Steve Culberson (CALFED)

Contract needed / in place: In place.

Contract manager: Steve Culberson

Term of contract:

Personnel:

Equipment:

Deliverables and dates: Fall, 2007: Findings from task force on biomarker applicability to discern population level effect stressors in the Delta.

Comments:

Striped bass bioenergetics evaluation

IEP 2007-115

Point person: Ted Sommer (DWR)

Lead Agency: DWR and DFG

Questions: What are the trends in estimated population consumption demand of age-1 and older striped bass? Has age-1 and older striped bass consumption demand decreased more slowly than prey relative abundance/relative biomass?

Description: This element will couple bioenergetics analyses to data provided by element 2007-116 (Adult striped bass population dynamics) to estimate the long and short-term (i.e., POD years) trends in consumption demand of piscivorous striped bass.

Time period: Calendar year 2007; assuming the population demographic data are available in early 2007.

Resources required:

Cost: \$23,000 for an Environmental Scientist 25% time.

PI(s): Marty Gingras (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Matt Nobriga and DFG staff to be determined.

Equipment: None required – this is a data mining/data analyses effort.

Deliverables and dates: Draft manuscript for publication by December 2007.

Comments:

Adult striped bass population dynamics

IEP 2007-116

Point person: Marty Gingras (DFG)

Lead Agency: DFG

Questions: What are the age-specific estimates of annual abundance, harvest rate, survival rate, and growth rate among striped bass aged ≥ 3 years?

Description: Estimate the age-specific annual abundance (including confidence intervals), harvest rate, survival rate, and growth rate among striped bass aged 3 years and older.

Abundance will be estimated using a modified Peterson calculation, data from fish tagged during spring, and data from fish observed during a year-long creel survey. Ages will be determined primarily from interpretation of marks on scales known to be made annually but will be estimated using an age-length table as needed. Harvest rate will be determined using returns from a high-value reward tagging program. Survival rate will be determined from changes in the return-rate of tags from each of the two years following application of tags to a cohort and by analysis of the catch-curve of fish captured during tagging. Growth rate will be determined from mark-recapture data and from analysis of length-frequency distributions.

Time period: Through December 2007.

Resources required:

Cost: No increase over base budget.

PI(s): Kyle Murphy (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Kyle Murphy; Nina Kogut; Mike Harris; Mike Donnellan (DFG).

Equipment:

Deliverables and dates: An IEP Technical Report, an IEP Status and Trends article, and an IEP Quarterly Highlights submission.

Comments:

Data mining for status and trends of predators

IEP 2007-118

Point person: Larry Brown (USGS)

Lead Agency: USGS

Questions: Have populations of predators that prey upon pelagic fishes increased in recent years in either a relative (in relation to populations of other fishes) or an absolute (total number) sense?

Description: The questions about population sizes will mainly be address through summarization and integration of recent analyses of IEP data sets and possible some data analysis of other pertinent existing data. These data will be used by a companion study for the construction of an individual based bioenergetics model for striped bass and then applying the model to the striped bass population.

Time period: To be determined.

Resources required:

Cost: Remaining funding in a CALFED contract to L. Brown. Other analyses will be conducted with redirected staff effort.

PI(s): Larry Brown (USGS) and Fred Feyrer (DWR)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Brown and Feyrer

Equipment: N/A – this is a data mining effort.

Deliverables and dates: Progress report by November 2007

Comments:

Delta Fish Biomass estimation

IEP 2007-119

Point person: Ted Sommer (DWR)

Lead Agency: DWR and DFG

Questions: What are the trends in fish biomass in the San Francisco estuary? Are there specific changes in biomass that coincided with the POD years?

Description: The questions about biomass will mainly be address through summarization and integration of recent analyses of IEP data sets and possible some data analysis of other pertinent existing data. The work will largely be based on initial biomass estimates by Wim Kimmerer. The present study will update Wim's work through 2006.

Time period: Calendar year 2007.

Resources required:

Cost: This work will be conducted with redirected staff.

PI(s): Fred Feyrer (DWR) and Randy Baxter (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Feyrer, Baxter, and Kimmerer

Equipment: N/A

Deliverables and dates: Progress report by November 2007.

Comments:

Relationship between habitat and distribution

IEP 2007-120

Point person: Bruce Herbold (USEPA)

Lead Agency: TBD

Questions: Have temporal-spatial shifts in the habitats required by pelagic fish reduced their likelihood of finding adequate amounts of different habitats? Have changes in the temporal-spatial distributions of habitats exposed them to new or more severe stressors?

Description: Habitat, as defined by studies of Feyrer and Nobriga of DWR, will be combined with physical data gathered throughout the estuary to allow GIS projections of suitable summer and fall habitats for delta smelt, threadfin shad and young of year striped bass. These habitats will be examined for several biologically important parameters: location, size, proximity to other habitat patches of the same sort, proximity to other sorts of habitat needed sequentially, and proximity to known or suspected sources of mortality or stress.

Time period: January through September 2007

Resources required:

Cost: \$100,000 (very approximate) from POD sources.

PI(s): TBD

Contract needed / in place: Needed, unless this can be covered under existing contracts or redirected IEP staff.

Contract manager: TBD

Term of contract: TBD

Personnel: TBD

Equipment: None.

Deliverables and dates: Draft report by September 15, 2007. Final report by October 15, 2007.

Comments: This work can probably best be done by USGS personnel or by consultants working in concert with DWR personnel.

In Situ Biomarker Study

IEP 2007-121

Point person: Rich Breuer (DWR)

Lead Agency: DWR/ EPA Office of Research and Development, Cincinnati Ohio

Questions: Do fathead minnows exposed to the Sacramento and San Joaquin Rivers show evidence of endocrine disrupters?

Description: For the POD program, it is important to identify and apply biomarkers that can be applied to the fish species of concern, and help differentiate and quantify stressor groups. Not all biomarkers that are presently being explored in research labs fulfill these requirements, and careful consideration should be given to a work plan for future POD work involving biomarkers. EPA-ORD and the DWR EMP program will conduct two one-month studies in November 2006 and February 2007. Batches of Fat Head Minnows will be exposed in a flow through system to Sacramento and San Joaquin River water. The minnows will be processed and sent to ORD where they will be analyzed for endocrine disruptors. The tissue will be preserved and future biomarker work for Organo-phosphates and Pyrethroids.

Time period: Fall 2006 -Winter 2007

Resources required

Cost: Funding required for this element will be absorbed from existing program costs.

PI(s): Dan Riordan (DWR)

Contract needed / in place: Not needed

Contract manager: N/A

Term of contract: N/A

Personnel:

Equipment:

Deliverables and dates: Fall 2007, findings from analyses.

Comments: CALFED would solicited experts and organize a workshop where currently applied Biomarker analyses for POD would be discussed, as well as emerging biomarker analyses and its applicability for Delta fish.

Food match mis-match

IEP 2007-122

Point person: Randy Baxter (DFG)

Lead Agency: DFG

Questions: Are spring mesozooplankton densities and proximity to/overlap with larval delta smelt and striped bass related to feeding success, fish body condition and eventual recruitment? Do environmental factors – temperature, turbidity, and salinity – have an apparent role in feeding success?

Description: Larval growth-rate variability can influence recruitment by affecting the duration of early life stages -- those most vulnerable to predation (Houde 1996). Growth-rate in turn is influenced by feeding success (Margulies 1988), which may be mediated by the overlap of larva preferred temperature and salinity zones with areas of highest prey concentration (North and Houde 2001). Here we examine the relationships between the geographical distributions of food-sized zooplankton and larval delta smelt and larval striped bass in conjunction with water temperature, turbidity, salinity, and relate those to fish feeding success, body condition (relative weight at length) and recruitment (fall abundance indices). We use historical paired zooplankton and fish samples from tandem-fished Clark-Bumpus (CB; zooplankton) and 20 mm Survey (or Townet) nets to obtain organism densities and select fish for condition and stomach content measures.

Time period: 2007 - 2008

Resources required

Cost: No additional cost, redirected DFG staff will be used to accomplish this analysis.

PI(s): Steve Slater and John Budrick (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: 3 laboratory staff for fish measurements and diet examination.

Equipment: Laboratory space, a balance and microscopes for length-weight measurements and diet examination.

Deliverables and dates: Tri-annual progress reports (April, August, December 2007); presentation Asilomar 2008, manuscript for submission to regional peer-reviewed journal summer 2008.

Comments: Personnel for this element have only recently (late fall 2006) become available. Sampling design and analyses have yet to be completely developed.

Feasibility:

The IEP consists of individuals in institutions, agencies and companies uniquely qualified for this study effort. Our program combines the experience and expertise of staff and researchers at multiple agencies including CDWR, CDFG, USFWS, USGS, USBR, USEPA and UC Davis.

The 2006-2007 study components have been carefully selected based on their feasibility and potential to help differentiate among potential stressors. As demonstrated by the successful 2005 effort, the research team has extensive experience with all of the proposed methods and sampling locations. The proposed monitoring component is a slightly expanded version of sampling that has been conducted for many years, some of which comprises field work that has been performed for 30 to 45 years. Focused data analyses have been proposed as a study component because of the extent of the long-term data sets, and because of the relatively low cost and efficiency. The extensive studies conducted by other groups including Department of Waterways and the Regional Water Quality Control Board will be a major additional asset for the contaminant analyses. To perform the data analyses, only modest redirection of IEP staff will be required. Obviously, the ongoing studies represent a highly feasible study component as these efforts are already underway—they have already been peer-reviewed and have secured funding from IEP or CBDA. Finally, the proposed new studies are based largely on proven field and laboratory methods. Most of these studies are essentially an extension of pilot-scale or shorter-term efforts during the past five years. Examples include otolith studies and histopathology (Drs. Bennett, Hobbs and Teh for 1999 samples) and *Microcystis* surveys (Dr. Lehman for 2004).

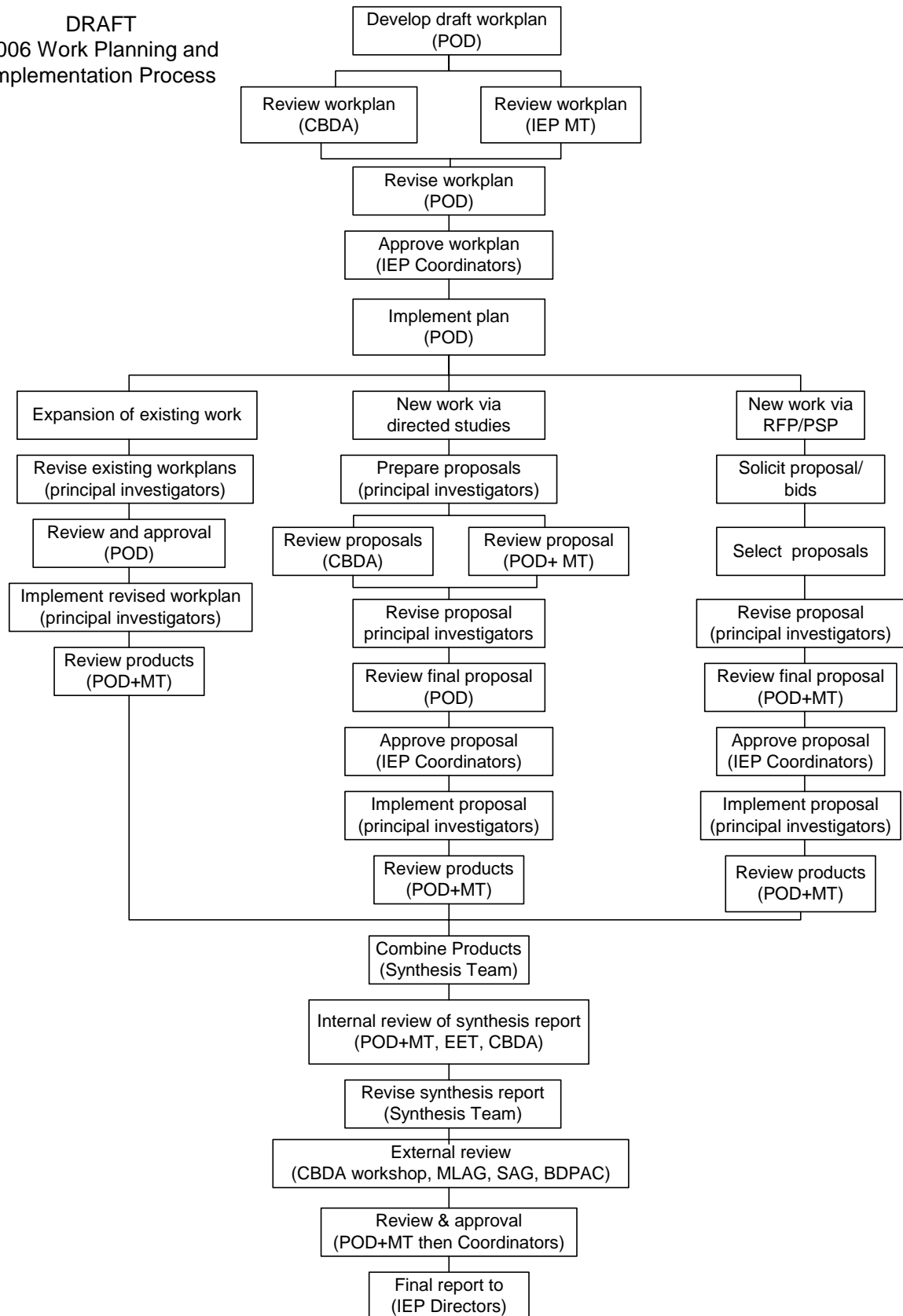
The studies will be completed using the existing Endangered Species Act “take” levels authorized by U.S. Fish and Wildlife Service and NOAA Fisheries. The expansion of sampling is relatively modest and should result in minimal change in “take” because smelt population levels are relatively low (i.e. low catch in sampling) and the sampling methods are unlikely to collect substantial numbers of winter- or spring-run Chinook salmon.

Adaptive Management:

An annual and intra-annual adaptive work planning process will be used for the investigations into the observed decline of the pelagic guild (Figure 9). The work in 2006 was designed to look at the range of possible causative factors from a broad perspective in an effort to remove some from consideration and to focus future efforts in the most appropriate directions. The results of the 2006 work will be used to define and focus the efforts needed in subsequent years. For example, if the statistical analysis of historical trends suggests other species or time period should be considered, they will be added to the 2007 program. Actions considered for 2006 may also include changes in water project operations as an adaptive experiment to evaluate effects on entrainment or food web production. Similarly, there may also be recommendations for adaptive regional efforts to reduce contaminant load, reducing populations of exotic species, or increasing food web inputs (e.g. habitat restoration). This effort would likely be coupled with hydrologic and perhaps biological modeling to help screen the range of alternatives. Within any year as information is developed and evaluated, changes in emphasis and direction may be needed. The POD PWT will provide this oversight and evaluation function.

Figure 9.

DRAFT
2006 Work Planning and
Implementation Process



Updated: May 25, 2005

Project Management, Coordination, and Oversight:

The study is exceptionally complex, including multiple agencies, research topics and principal investigators. Responsive management, close coordination among study participants, and some degree of oversight by independent experts will be critical to the successful completion of the study. We propose the components summarized below for project management, coordination, and oversight. Similar models have been used for IEP and CALFED projects in the past. We hope this level of coordination and oversight will assure the success of this study without overly burdening project staff.

Project Management Team: The project will be managed by a collection of State and Federal agencies: Chuck Armor (DFG), Randall Baxter (DFG), Rich Breuer (DWR), Mike Chotkowski (USBR), Pat Coulston (DFG), Steve Culberson (CBDA), Bruce Herbold (EPA), Anke Mueller-Solger (DWR), Matt Nobriga (DWR) and Ted Sommer (DWR). As in 2005 and 2006, the group will typically meet weekly to evaluate the progress of the effort. This is the same group that prepared this study plan.

POD Project Work Team: Project design, coordination, and discussion of preliminary results will occur in the newly formed POD PWT. This is a proven model that has been used for a variety of different interdisciplinary IEP studies. This is intended as the primary forum for all principal investigators, and will also be open to other parties, including other regional experts, provided they are willing to actively contribute to the effort. The PWT would meet a minimum of every 2 months, with project management team members alternating as meeting chair. Satellite PWT's would also be formed to allow more intensive communication about technical areas (see below).

POD PWT Satellite Teams: We expect that the parent POD will be fairly large, making it difficult to have detailed discussions about each component. To provide an opportunity for more intensive communication and planning, at satellite project work teams have been formed: 1) food web (Wim Kimmerer); 2) Contaminants (Swee Teh); 3) water exports (Ted Sommer and Mike Chotkowski); 4) sampling (Bill Bennett); and 5) geographical variability (Rick Sitts). At least one additional satellite team is being considered to handle data management and analysis. The lead person(s) from each subject area will routinely be in contact with the appropriate principal investigators and will conduct subject area meetings with principal investigators as needed. Subject area e-mail reflectors may also be set up to further facilitate communications.

Email reflector: Much of the communication for the project would be conducted via a new POD PWT email reflector. The reflector would primarily be used for communication and coordination among the principal investigators; however, it may also be a useful outlet for other scientists who wish to contribute.

Oversight: Project oversight will be provided by the project management team, the POD PWT and an additional group of regional and national experts on the various aspects of this study. These scientists will be part of IEP Science Advisory Group (SAG), with additional support from CALFED and other agency science advisors. This "POD-Science" group will oversee the scientific soundness of this project and provide recommendations for improvement. This group is invited to attend any of the meetings mentioned above and receive e-mails via the newly

established list serves. Meetings with POD PWT members may be arranged as needed. In addition, the POD-Science group will meet in the end of each year to discuss project results, synthesis, and further studies with POD PWT members.

Outreach: Various products and deliverables (see below) will be completed as part of the project. Staff will give a presentation at the numerous conferences (see below) to describe the status of the fish decline and the efforts to identify causes. In addition, the POD PWT will organize an IEP workshop by late 2007 to present preliminary results. A substantial portion of the 2006 and 2007 IEP Annual Meetings will provide opportunities to update the results and present key information.

Budget:

The initial cost estimate for 2007 is approximately \$3,260,000. CALFED grants that directly support various POD efforts or that will supply information useful to the POD effort are estimated at \$2,302,000 for 2007. Cost estimates for individual program components are provided in Table 2 and in the previous section as part of the project summaries. In some instances, money for 2007 work was obtained in 2006, therefore not reflected in the table below.

Table 2. 2007 POD Budget (amounts are in \$1,000)

	PEN ¹	POD Total	DWR POD	USBR POD	CALFED	Comments
I. Existing Monitoring						
Summer Townet Survey	7	\$23	\$23	\$0		
EMP - Water Quality Monitoring	72	\$122	\$96	\$26		
Field support for additional work	89	\$75	\$75	\$0		
Larval fish survey	96	\$97	\$97	\$0		
I. TOTAL for EXISTING MONITORING		\$317	\$291	\$26	\$0	
II. Ongoing Work						
Delta and Suisun Bay particle tracking investigations	31	\$49	\$49	\$0		
Delta smelt otolith geochemistry and stock structure	40	\$76	\$0	\$0	\$76	CBDA Science
Striped bass health investigations	42	\$416	\$416	\$0		
Phytoplankton primary production and biomass in the Delta	45	\$50	\$50	\$0		
Apparent growth rates of pelagic fish	51	\$38	\$38	\$0		
Otolith analysis of delta smelt fish	60	\$512	\$39	\$123	\$350	CALFED-ERP
Liver histopathology for pelagic fish	61	\$350	\$0	\$0	\$350	CALFED-ERP
Fish diet and condition	62	\$11	\$11	\$0		
Acute and chronic invertebrate and fish toxicity	63	\$644	\$0	\$644		
Changes in pelagic fish habitat	66	\$184	\$184	\$0		
Field survey of Microcystis bloom biomass and toxicity	79	\$250	\$0	\$0	\$250	CBDA Science
Analysis of historical population dynamics	84	\$62	\$0	\$62		

TOTAL for ON-GOING STUDIES		\$2,480	\$787	\$829	\$1,026	
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III. New Special Studies

Preliminary investigations of delta fish diseases	36	\$24	\$16	\$8		
Analysis of threadfin shad data	39	\$57	\$57	\$0		
Modeling delta smelt population in the SF Estuary	41	\$332	\$0	\$0	\$332	
Estimation of pelagic fish population sizes	43	\$0	\$0	\$0		
Zooplankton fecundity and population structure	44	\$80	\$80	\$0		
Overlap analyses of fish, zooplankton, etc. and NCEAS	46	\$656	\$96	\$560		
Corbula salinity tolerance, distribution and grazing rates	76	\$65	\$65	\$0		
CASCaDE computational assessments of scenarios	81	\$554	\$0	\$0	\$554	CBDA Science
Foodweb support for delta smelt and estuarine fishes	82	\$390	\$0	\$0	\$390	CBDA Science
Gear efficiency studies	86	\$0	\$0	\$0		
Fish facility history	107	\$26	\$0	\$26		
Delta smelt culture facility	108	\$165	\$165	\$0		
Biomarkers workshop and ORD study	112	\$0	\$0	\$0		
Striped bass bioenergetics	115	\$23	\$23	\$0		
Relationship between habitat and distribution	120	\$100	\$50	\$50		
Statistical support	123	\$0	\$0	\$131		
TOTAL for NEW STUDIES		\$2,472	\$552	\$644	\$1,276	

	Overall POD	DWR POD	USBR POD	CALFED
2007 POD TOTAL	\$5,562	\$1,630	\$1,630	\$2,302

Products and Deliverables:

The monitoring and assessment program developed by this multi-institutional collaboration will yield a range of products and deliverables. The POD PWT oversight team above is responsible for the timely completion of all deliverables and serves as the principal contact for IEP staff and other stakeholder groups. The deliverables can be grouped into four general categories:

Monitoring Data. As in previous years, all data collected from the monitoring elements of this study program will be uploaded to the Bay Delta and Tributaries (BDAT) Project Site (<http://bdat.ca.gov>). BDAT contains environmental data concerning the San Francisco Bay-Delta and provides public access to that data. Over 50 organizations contribute data voluntarily to this project. The database includes biological, water quality, and meteorological data that are used to gauge the health of the estuary and to manage water and environmental resources. Also zooplankton, macroinvertebrate and fish monitoring data will be available directly via the web (<http://www.delta.dfg.ca.gov>).

Conferences and Workshops. The results of the study will be presented at a special session at the IEP Annual Workshop each year during 2006-2008. A special CDBA workshop will also be considered to discuss the project's final report. Several members of the program will also present their results at a special POD session at the spring 2006 American Fisheries Society meeting. Similar group presentations will be made at the CALFED Science conference (October 2006) and the State of the Estuary Conference (autumn 2007).

Publications and Reports. The researchers in this effort all place high value on the publication of peer-reviewed information. In 2005, the short timeline and management importance of the study effort limited our ability to produce journal articles. For 2006, we propose to submit a minimum of four articles to peer reviewed journals on: 1) analysis of trends in estuarine species (2 articles); 2) trends in physical habitat (1 article); 3) particle tracking results (1 article). By 2007, we propose to submit an additional 4-5 articles on diverse topics including regional analysis of factors affecting primary productivity (Jassby, UCD), toxic effects (e.g. Teh and Werner UCD), and food limitation (e.g. Bennett, Hobbs and Teh UCD). If appropriate, a feature article or collection of articles on the results of the overall effort will be submitted to the IEP Newsletter by winter 2007.

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Appendix A

Annotations for the Species Matrix Models (Figures 3-7)

Longfin Smelt

Mismatch of larvae with food

In winter-spring larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no feeding data are available. In summer-fall young fish are beyond larval stage.

Reduced Habitat Space

The longfin smelt has a strong X2 relationship (Jassby et al. 1995) and the 20 mm survey shows its distribution is centered on X2 (Dege and Brown 2004). There is evidence that habitat space can vary with X2 for delta smelt; this may also apply to longfin smelt (See POD 2005 Synthesis Report Appendix A: 2g, Feyrer et al; 2g, Nobriga et al.). Beyond the winter and spring larval period, habitat extends to marine waters (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), so habitat limitation is less likely.

Adverse Water Movement

The increased amount of Sacramento River water pulled towards export facilities in winter (POD 2005 Synthesis Report Appendix A: 2h, Simi and Ruhl) could potentially increase false attraction to upstream migrating adults and the retention of their larvae. In north Delta and Suisun Bay, as well as summer and fall, fish are distributed away from major water project influence (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.).

Entrainment (Water Projects, Power Plants)

In winter-spring adults and larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al), and increased salvage has been observed during winter in recent years (See POD 2005 Synthesis Report Appendix A: 2h, Herbold et al.) In summer-fall young fish are beyond export facility influence. In addition, salvage rates are lower in wetter years, when survival is also higher (Jassby et al. 1995; Sommer et al. 1997). In Suisun Bay, effects from power plant operations are possible year-round (See POD 2005 Synthesis Report Appendix A: 2h, Matica and Sommer).

Toxics Effects on Fish

In winter-spring adults and larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). The juvenile and adult population is located downstream (Suisun and farther) in summer and fall. However, there is no current information on direct toxicity or histopathological evidence of toxicity.

Toxics Effects on Fish Food Items

Copepods and larger crustaceans are present throughout range of longfin (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Results to date, for summer only, indicate that toxicity to standard organisms (*Ceriodaphnia dubia* and *Hyaella azteca*) was sporadic in space and time (see POD 2005 Synthesis Report Appendix A: 3e, Werner).

Harmful Microcystis Bloom

There is no likely impact from *Microcystis* due to mismatch of summer algal blooms in the south and central Delta and longfin smelt habitat, which extends from the north Delta through central San Francisco bay at that time (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.; 3d, Lehman et al.).

***Corbula* Impacts on Food Availability**

Corbula reduces availability of zooplankton (Kimmerer and Orsi 1996), which may have declined in Suisun Bay and the west Delta with a recent rebound in clam abundance and distribution. Kimmerer (2002b) reported a step change in longfin smelt abundance following the introduction of *Corbula*. However, *Corbula* is still only abundant in Suisun Bay (See POD 2005 Synthesis Report Appendix A: 3g, Vayssieres and Peterson). Lower grazing rates are suspected to occur in winter.

Disease and Parasites

There is a plausible impact everywhere longfin smelt are present and throughout the year (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no current information on disease or parasites.

Delta Smelt

Mismatch of larvae with food

In spring larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.) with some feeding data available (Nobriga 2002). In other months young fish are beyond larval stage.

Reduced Habitat Space

There is evidence that habitat space can vary with X2 for delta smelt, but it does not show a strong relationship with abundance or a time trend (See POD 2005 Synthesis Report Appendix A: 2g, Feyrer et al; 2g, Nobriga et al.). There is some evidence that south Delta habitat has degraded seasonally (DFG, unpublished data); however, this is a long-term pattern (e.g. 1940s).

Adverse Water Movement

The increased amount of Sacramento River water pulled towards export facilities in winter (POD 2005 Synthesis Report Appendix A: 2h, Simi and Ruhl) could potentially increase false attraction to upstream migrating adults and the retention of their larvae. In north Delta and Suisun Bay, as well as in mid summer through fall, fish are distributed away from major water project influence (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al).

Entrapment (Water Projects, Power Plants)

In winter-spring adults and larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al), and increased salvage has been observed during winter in recent years (See POD 2005 Synthesis Report Appendix A: 2h, Herbold et al.) In Suisun and north Delta, young fish are beyond export facility influence. In addition, salvage rates are lower in wetter years (Sommer et al. 1997). In Suisun Bay, effects from power plant operations are possible year-round (See POD 2005 Synthesis Report Appendix A; 2h, Matica and Sommer).

Toxics Effects on Fish

Adults and larvae are present throughout region during winter-spring but the juvenile population is distributed away from central and south Delta in summer and fall (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). A single ambient water toxicity test in 2005 failed to show an impact to juvenile delta smelt (See POD 2005 Synthesis Report Appendix A: 3e, Werner), but limited histopathology analysis showed liver lesions, potentially indicators of toxics exposure (See POD 2005 Synthesis Report Appendix A: 3b, Teh).

Toxics Effects on Fish Food Items

Copepods are present throughout range of delta smelt (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Results to date for summer only indicate that toxicity to standard organisms (*Ceriodaphnia dubia* and *Hyalella azteca*) is sporadic in space and time (see POD 2005 Synthesis Report Appendix A: 3e, Werner).

Harmful Microcystis Bloom

There is no likely impact from *Microcystis* due to mismatch of dense summer algal blooms in the south and central Delta and delta smelt habitat, which extends from the north Delta through

Suisun Bay at that time (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.; 3d, Lehman et al.).

***Corbula* Impacts on Food Availability**

Sweetnam (1999), Bennett (2005) and Souza et al. (POD 2005 Synthesis Report Appendix A: 2b) report a decrease in size of delta smelt following the introduction of *Corbula*. Similarly, Teh (POD 2005 Synthesis Report Appendix A: 3b) reports a chronic depletion in liver glycogen levels, possibly a result of food limitation. *Corbula* reduces availability of zooplankton (Kimmerer and Orsi 1996), which may have declined in Suisun Bay and the west Delta with a recent rebound in clam abundance and distribution. However, *Corbula* is still only abundant in Suisun Bay (See POD 2005 Synthesis Report Appendix A: 3g, Vayssieres and Peterson). Lower grazing rates are suspected to occur in winter.

Diseases and Parasites

There is a plausible impact everywhere delta smelt are present and throughout the year (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no information on disease. A very low incidence of macroscopic internal parasites was detected in the 50 delta smelt examined in 2005 (POD 2005 Synthesis Report Appendix A: 3c, Gartz).

Threadfin Shad

Mismatch of larvae with food

In summer larvae are present throughout region except Suisun Bay (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no feeding data are available. In other months young fish are beyond larval stage.

Reduced Habitat Space

Threadfin shad are present everywhere, but less abundant in Suisun Bay (see POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no information was developed on habitat trends or criteria.

Adverse Water Movement

Present everywhere (see POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Mechanism unknown, but hydrodynamic effects likely regionally limited to central and south Delta

Entrainment (Water Projects, Power Plants)

Adults and larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Increased salvage has been observed during winter in recent years (See POD 2005 Synthesis Report Appendix A: 2h, Herbold et al.). However, north Delta is likely outside of entrainment influences. Threadfin shad are less abundant in Suisun, where effects from power plant operations possible year round (See POD 2005 Synthesis Report Appendix A: 2h, Matica and Sommer).

Toxics Effects on Fish

Adults and juveniles are throughout region, but less abundant in Suisun Bay (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). There is no current toxicology or histopathology information.

Toxics Effects on Fish Food Items

Copepods and cladocerans are present throughout range of threadfin shad (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Results to date for summer only indicate that toxicity to standard organisms *Ceriodaphnia dubia* and *Hyalella azteca* was sporadic in space and time (see POD 2005 Synthesis Report Appendix A: 3e, Werner).

Harmful Microcystis Bloom

Dense blooms are present in south and central delta during summer and fall, when threadfin larvae, juveniles and adults are also present, posing a plausible impact (See POD 2005 Synthesis Report Appendix A: 2a Baxter et al.; 3d, Lehman et al.).

***Corbula* Impacts on Food Availability**

There are no likely impacts at anytime. There is little distributional overlap between threadfin shad and *Corbula*. (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.; 3g, Vayssieres and Peterson).

Diseases and Parasites

There is a plausible impact everywhere longfin smelt are present and throughout the year (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but little current information on disease and parasites. A very low incidence of skin lesions was observed for threadfin shad in 2005 (POD 2005 Synthesis Report Appendix A: 3c, Gartz).

Striped Bass

Mismatch of larvae with food

In spring and summer larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), with some feeding data available (Bennett et al. 1995; Bryant and Arnold, In press). In other months young fish are beyond larval stage.

Reduced Habitat Space

Striped bass survival has a strong X2 relationship (Jassby et al. 1995) and 20 mm survey shows its distribution is centered upstream of X2 (Dege and Brown 2004). However, X2 has no time trend (Kimmerer 2002a). There is evidence that habitat space can vary with X2 for young striped bass, but it does not show a strong relationship with abundance or a time trend during summer and fall (See POD 2005 Synthesis Report Appendix A: 2g, Feyrer et al; 2g, Nobriga et al.).

Adverse Water Movement

Increased amount of Sacramento River water pulled towards export facilities in spring and summer (POD 2005 Synthesis Report Appendix A: 2h, Simi and Ruhl) could potential increase the retention of eggs and larvae. Sacramento River flow can also affect transport of eggs and larvae. Flows in the Sacramento River were relatively low in winter and spring of 2001, but increased during subsequent years (POD 2005 Synthesis Report Appendix A: 2h, Simi and Ruhl). In Suisun Bay, fish are away from major water project influence (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.).

Entrainment (Water Projects, Power Plants)

Striped bass are present throughout region at all times (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al), and increased salvage has been observed during winter in recent years (See POD 2005 Synthesis Report Appendix A: 2h, Herbold et al.). Jassby et al. (1995) found that exports may help to explain variability in striped bass survival. In Suisun Bay, effects from power plant operations are possible year-round (See POD 2005 Synthesis Report Appendix A: 2h, Matica and Sommer).

Toxics Effects on Fish

Juveniles are present throughout region at all times and larvae in late spring-summer (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Although earlier work showed some evidence of larval toxicity (Bennett et al. 1995), a pair of ambient water toxicity tests for striped bass in 2005 failed to show an impact to juveniles (See POD 2005 Synthesis Report Appendix A: 3e, Werner).

Toxics Effects on Fish Food Items

Copepods, larger crustaceans and small fishes are present throughout range of striped bass (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Results to date for summer only indicate that toxicity to standard organisms *Ceriodaphnia dubia* and *Hyalella azteca* was sporadic in space and time (see POD 2005 Synthesis Report Appendix A: 3e, Werner).

Harmful Microcystis Bloom

Dense blooms are present in south and central Delta during summer and fall, when juvenile striped bass also present, posing a plausible impact (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.; 3d, Lehman et al.).

***Corbula* Impacts on Food Availability**

Corbula reduces availability of zooplankton (Kimmerer and Orsi 1996), which may have declined in Suisun Bay and the west Delta with a recent rebound in abundance and distribution. A diet shift and decrease in abundance of striped bass occurred following the introduction of *Corbula* (Feyrer et al. 2003; Bryant and Arnold, in press; DFG unpublished data). However, *Corbula* is still only abundant in Suisun Bay (See POD 2005 Synthesis Report Appendix A: 3g, Vayssieres and Peterson). A lower grazing rate is suspected to occur in winter.

Diseases and Parasites

There is a plausible impact everywhere striped bass are present and throughout the year (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Recent evidence of disease and parasites has been found in young bass (POD 2005 Synthesis Report Appendix A: 3c, Gartz; 3h, Ostrach; Arnold and Yue 1997).