California Department of Fish and Game

Presentation to

National Research Council Panel

on

Sustainable Water and Environmental Management in the California Bay-Delta

Carl Wilcox

Chief, Water Branch

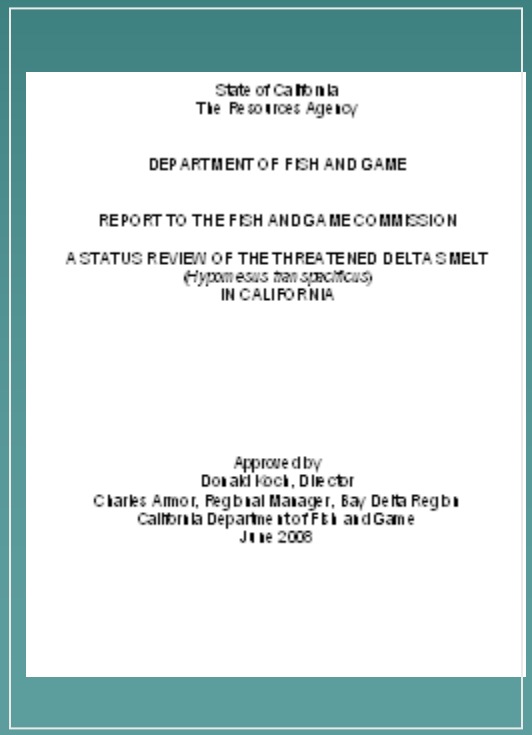
Ecosystem Conservation Division

Topics

- Status of species and State listing status
- California Endangered Species Act (CESA) Permitting
- Views on PEI
- Role of San Joaquin River flows
- Role of Habitat Restoration
- Efforts to improve our understanding of how habitat restoration in Delta supports ecosystem recovery

CESA Listing Reviews

- Delta smelt status review 2008
  - recommended up-listing to Endangered
- Longfin smelt status review 2009
  - recommended listing as Threatened



State of California
The Resources Agency

DEPARTMENT OF FISH AND GAME

REPORT TO THE FISH AND GAME COMMISSION

A STATUS REVIEW OF THE THREATENED DELTA SMELT
(Hypomesus transpacificus)
IN CALIFORNIA

Approved by
Donald Koch, Director
Charles Armor, Regional Manager, Bay Delta Region
California Department of Fish and Game
June 2008

State of California
The Resources Agency

DEPARTMENT OF FISH AND GAME

REPORT TO THE FISH AND GAME COMMISSION

A STATUS REVIEW OF THE LONGFIN SMELT
(Spirinchus thaleichthys)
IN CALIFORNIA

January 23, 2009

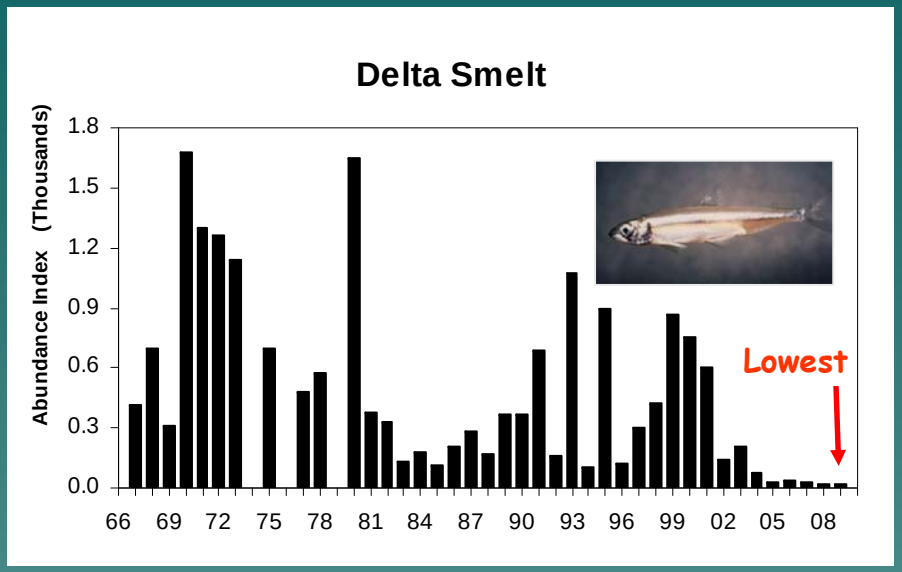
RESOURCES AGENCY
CALIFORNIA
DEPARTMENT
FISH&GAME

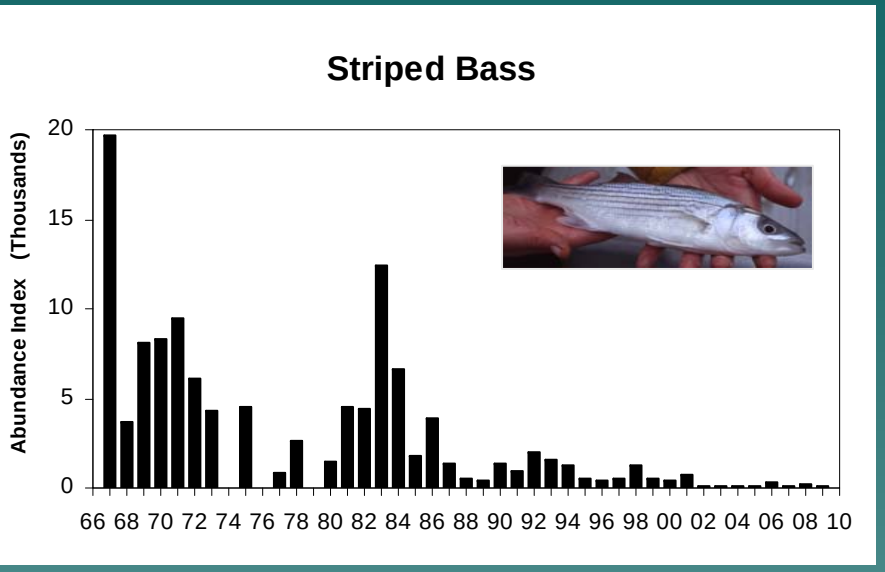
http://www.dfg.ca.gov/delta/projects.asp?ProjectID=LONGFINSMELT

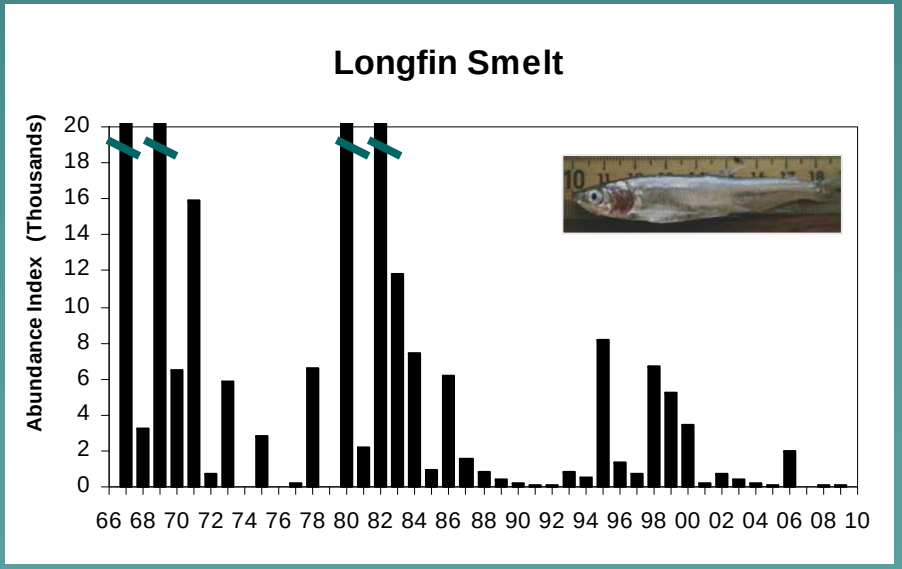
Both reviews cited similar factors leading to findings

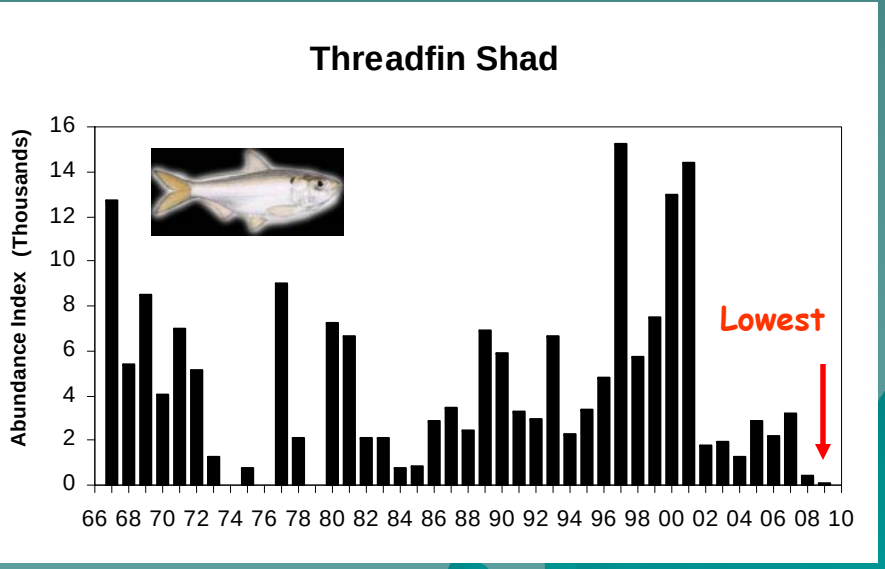
1. Water diversions
2. Habitat modifications, in particular salinity gradient changes with X2 higher in the estuary, and reduced turbidity
3. Increases in exotic species leading to increased competition (e.g., *Corbula* for both) and possibly predation
4. Possible link to toxics but few direct links

Upper estuary pelagic fish abundance continued very low in 2009









Source DFG 2009 Fall MW Trawl
No indices in 1974, 1976 and 1979

CESA Listed Species Affected by OCAP operations

- Delta smelt SE/FT
- Longfin smelt ST
- Winter-run Chinook salmon SE/FE
- Spring-run Chinook salmon ST/FT
- Central Valley steelhead FT
- Green Sturgeon FT

SE/ST – State Endangered/Threatened

FE/FT – Federal Endangered/Threatened

KEY DIFFERENCES BETWEEN THE STATE & FEDERAL ENDANGERED SPECIES ACTS

- California definition of “take” includes direct or indirect mortality but not “harm”. (Fish & G. Code, § 67.)
- In addition to avoidance and minimization measures, CESA requires “full mitigation” in take authorizations. Full mitigation measures must compensate for all impacts to the species resulting from authorized taking.
- Does not apply to Federal activities.

CESA Compliance for State Water Project Operations

- Permittee: DWR
- Incidental take permit for longfin smelt*
- Consistency Determination on FWS OCAP Biological Opinion on delta smelt**
- Consistency Determination for NMFS OCAP Biological Opinion on winter and spring-run Chinook salmon**

*** Includes habitat restoration requirement to meet full mitigation requirement in addition to avoidance and minimization actions similar to delta smelt B.O.**

**** Worked with DWR to include habitat restoration in the Project Description to meet CESA full mitigation requirements.**

Potential Entrainment Index (PEI)

- One possible tool for Smelt Working Group to manage salvage (observed take)
- Benefits
  - Rapidly integrates fish distribution and hydrodynamic modeling
- Limitations
  - Sampling uncertainty for an increasingly rare fish (increasing likelihood of incorrect fish distribution assumptions)
  - Predicts juvenile salvage (visible fraction of entrainment) better than cumulative entrainment of larvae and juveniles because it does not adjust for very low net efficiency for small larvae
  - Time step too short to resolve fates of many modeled fish
  - Information from one run not carried to next
- Needs
  - Peer review and calibration in relation to existing decision making process.

San Joaquin River Flows

- Flows at Vernalis (from SJR tribs) related to salmon smolt abundance at Chipps Island : more spring flow = more smolts out of tributaries and to Chipps Island.
- Combine SWP/CVP salvage of juveniles lower with increased Vernalis flows and decreased exports (SJRGA 2007)
- Escapement model developed in 2005
  - Tool to help identify flows and expected benefits for fish production
  - Can be used to test flow options and barrier effects
  - Peer review completed and model revised in 2008 and 2009
- Model has been provided to State Board for developing flow objectives for SJR at Vernalis.

Perspective on large-scale restoration of tidal aquatic habitat

- Adds to overall delta habitat complexity.
- Likely to produce services (e.g., food, shelter…) for many species.
- Currently trophic linkages to the smelts are uncertain.
- Water and its correlates and affects on transport, productivity, turbidity and salinity gradient, still the strongest influence on smelt abundance.

Benefits provided by tidal marsh habitat

Productivity

In upper San Francisco estuary, tidal marshes have the highest phytoplankton concentrations and support the greatest zooplankton growth rate.

Fish Use

Foraging success and growth rate - In many estuaries, fish with access to tidal marsh habitats have been shown to consume much more food and grow much faster than those without access.

Refuge from predators - Large piscivorous fish are rare in tidal marshes and low order tidal channels compared to deeper water habitats.

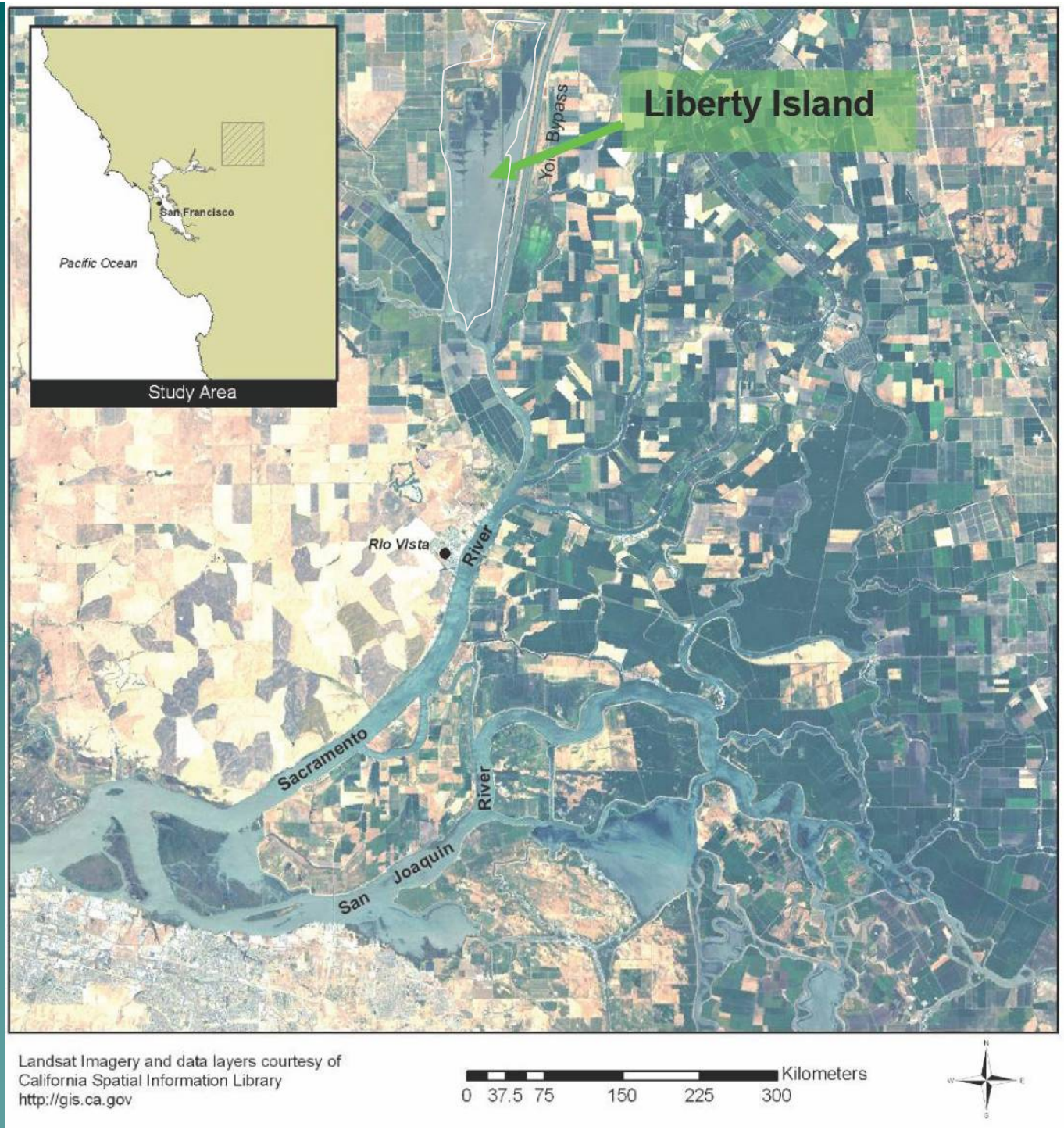
Life history diversity - Tidal marsh restoration in the Salmon River estuary has recovered life history diversity in Chinook salmon.

Reviewed in: Clipperton, N.W. & D.W. Kratville. 2009. Assessing the potential benefits of tidal marsh restoration in the Delta and Suisun. Manuscript submitted for publication.

What we know and what we need to know about habitat restoration for native fish

- Existing knowledge
- Delta Regional Ecosystem Restoration Implementation Plan (DRERIP) conceptual models
- BREACH III (Breached levee wetland studies)

Focus on Liberty Island and Cache Slough



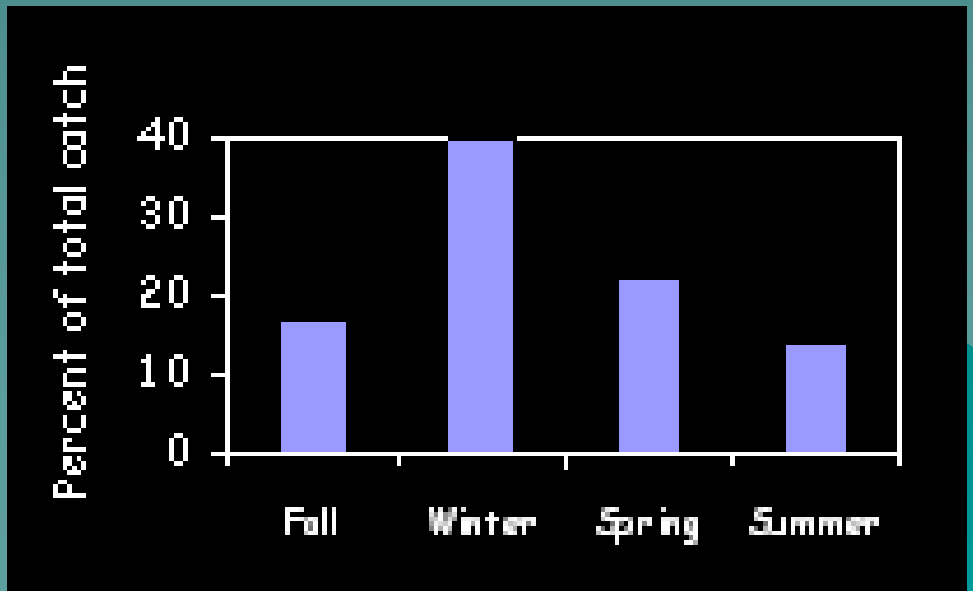
Existing knowledge

- Cache Slough/Liberty Island/Deep Water Ship Channel provide habitat for smelt spawning and rearing
- Have seasonally high food production
- Have high turbidity year-round
- Used year round by delta smelt
- Low density SAV and associated Centrarchid numbers
- Hydraulically dynamic dead-end slough habitat

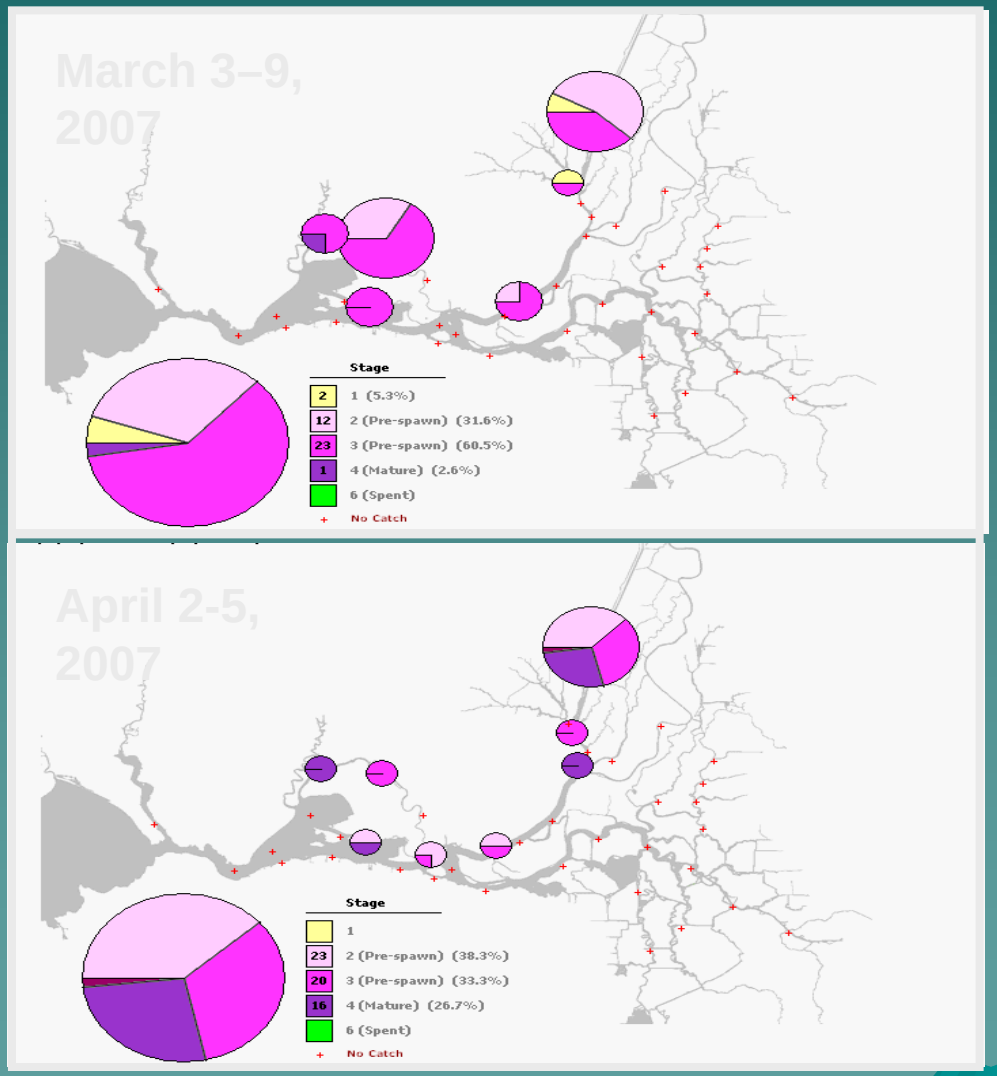
Delta Smelt Use of Liberty Island

- USFWS beach seine data Aug 2002-Oct 2004
- Summarized as percent of samples with delta smelt.

- Delta Smelt Can Be Found Year Round In Liberty Island

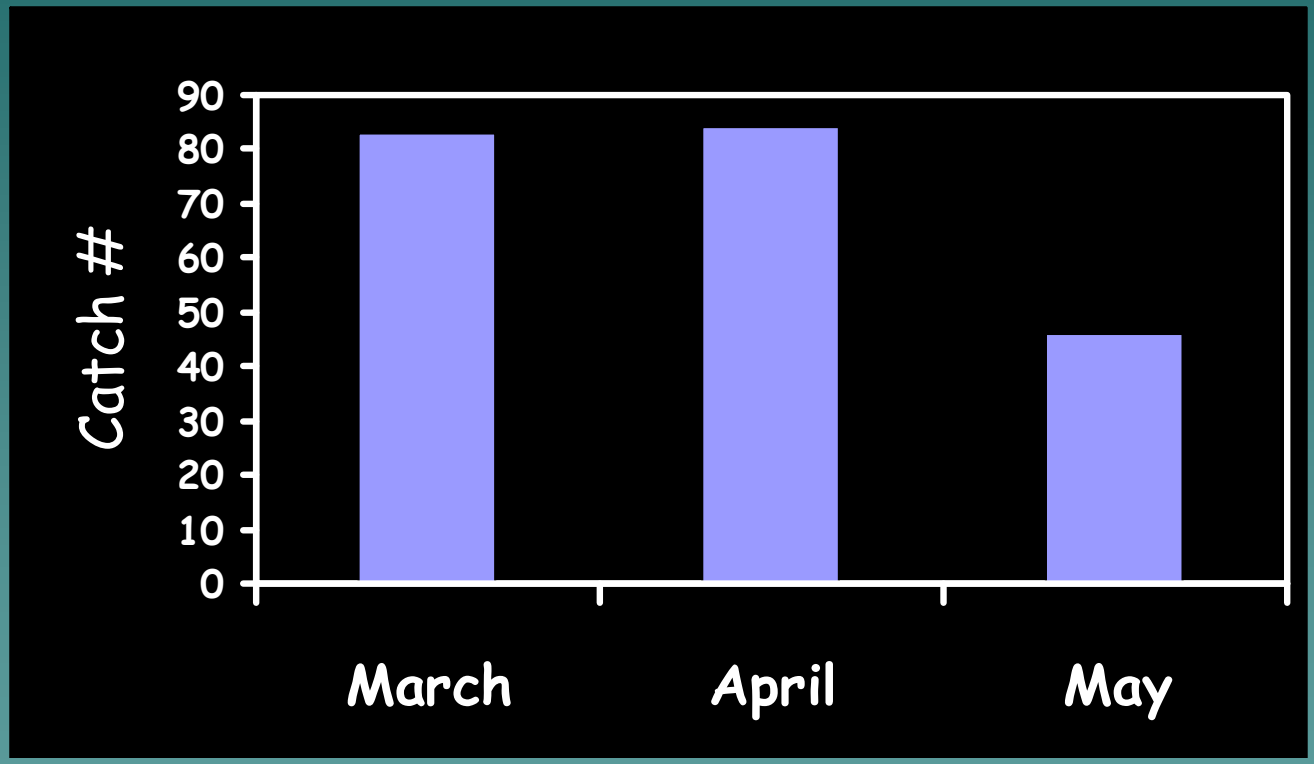


Delta Smelt Spawn in the Cache Slough Complex



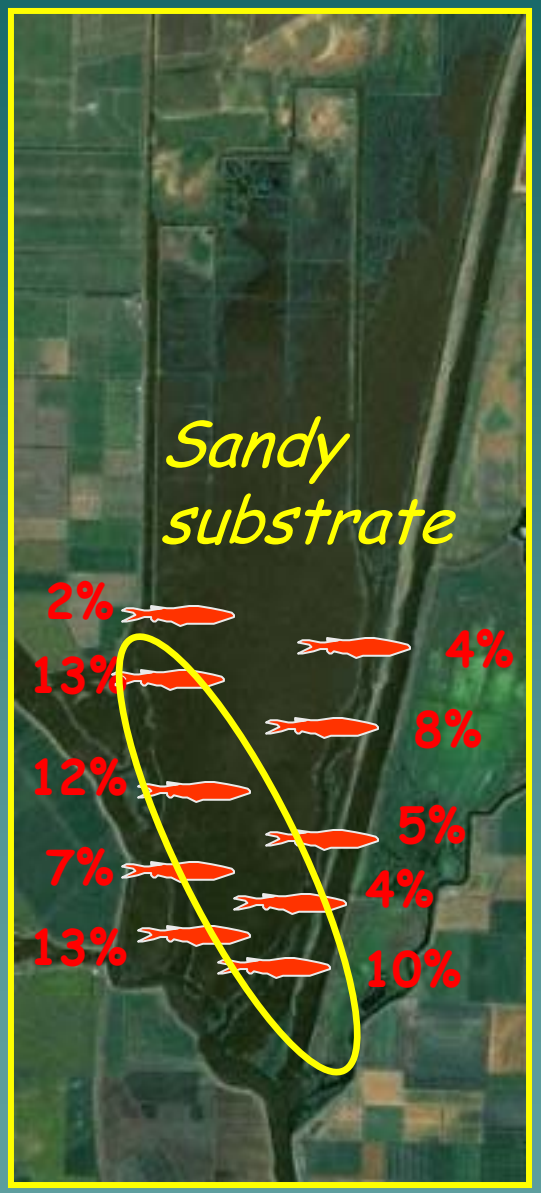
Source: http://www.dfg.ca.gov/delta/projects.asp?ProjectID=SKT

Evidence That Delta Smelt Spawn In Liberty Island

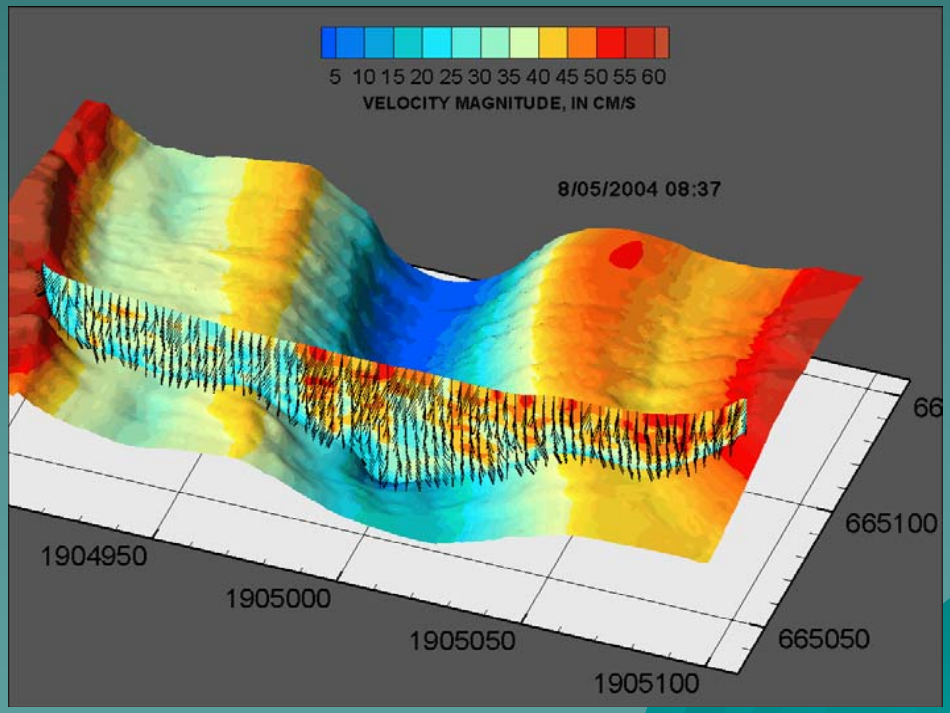


2003 FWS Light Trap Results For Larval Delta Smelt

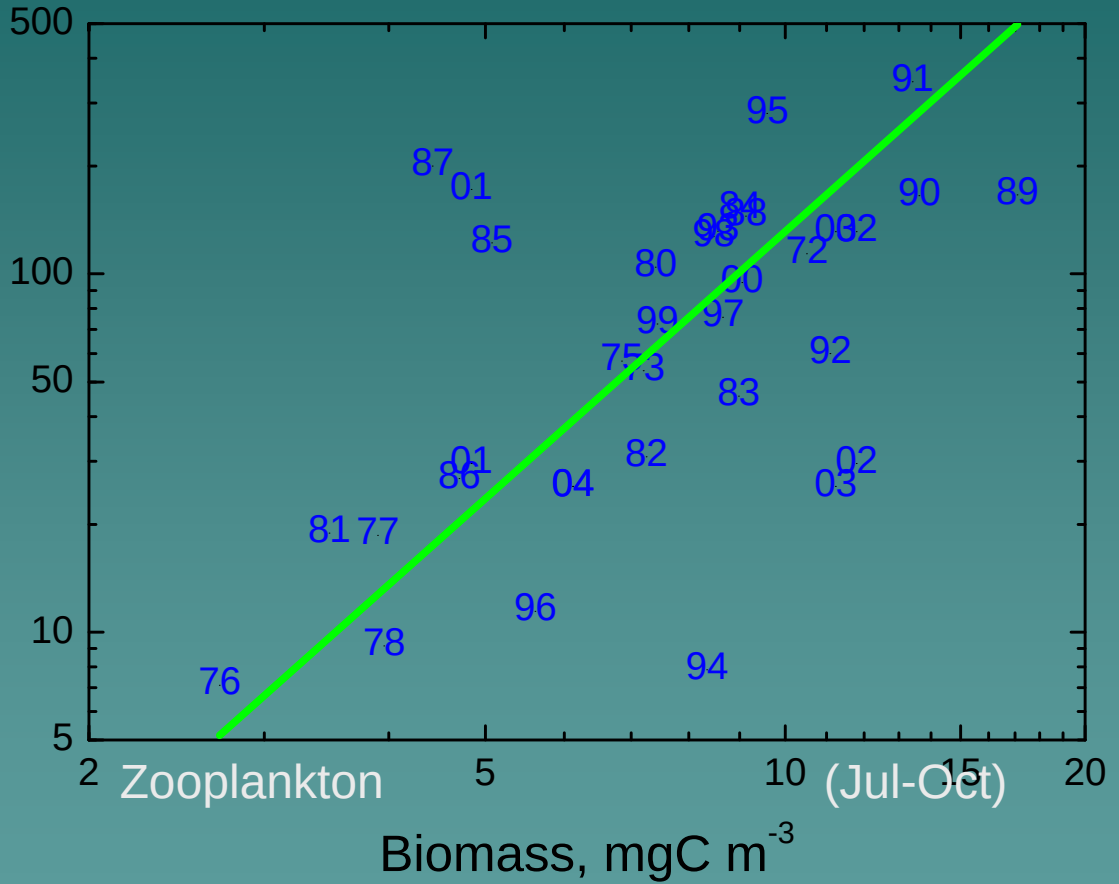
Importance of sandy substrates for spawning?



Shoals in the Ship Channel



Delta Smelt Survival in Relation to Food Availability



Source: Kimmerer (2008)

The Base of the Food Web is Declining

FEBRUARY 2008

SAN FRANCISCO ESTUARY & WATERSHED SCIENCE

Published by the California Bay-Delta Authority Science Program and the John Muir Institute of the Environment

Phytoplankton in the Upper San Francisco Estuary: Recent Biomass Trends, Their Causes and Their Trophic Significance

Alan Jassby
University of California, Davis*

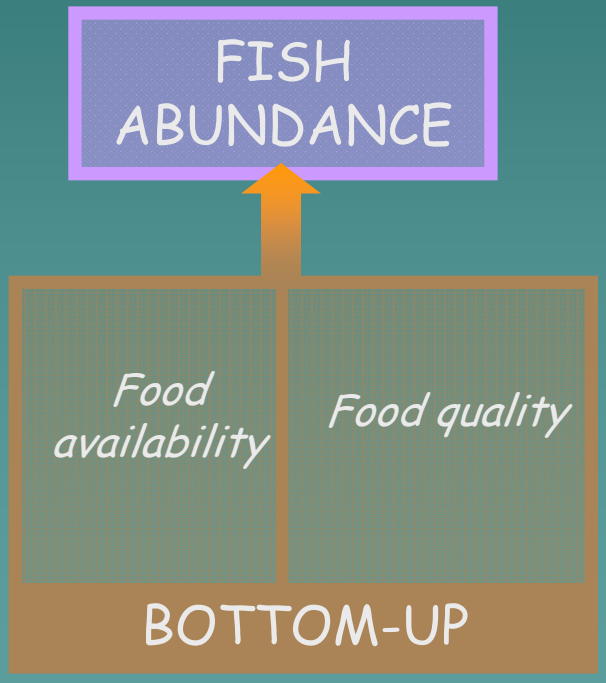
..But Lower Yolo Bypass Has High Productivity

Aquat Ecol
DOI 10.1007/s10452-007-9102-6

The influence of floodplain habitat on the quantity and quality of riverine phytoplankton carbon produced during the flood season in San Francisco Estuary

Peggy W. Lehman · Ted Sommer · Linda Rivard

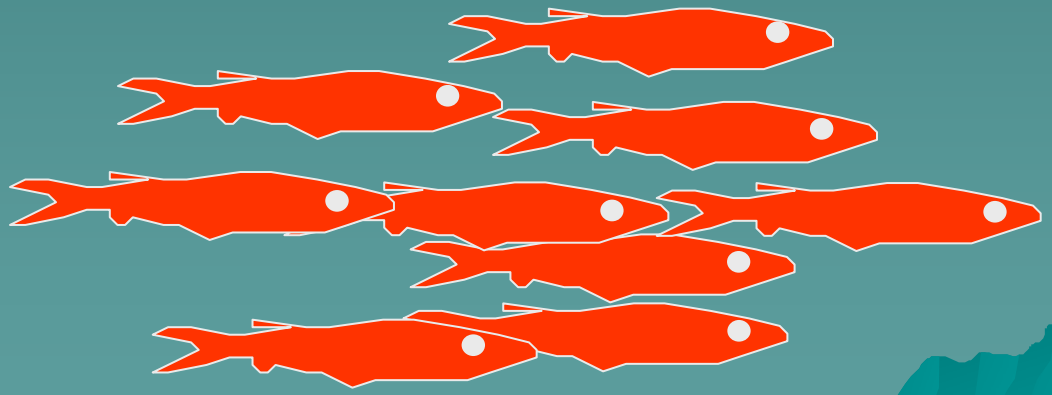
Emphasis on *Habitat Restoration* to Boost the Delta Food Web



Hydrodynamics of the Cache Slough complex

DWR and USGS

- Tides dominate this area.
- Liberty Island as a source of turbidity



Tidal Habitat Restoration

- Potentially a way of creating additional habitat for native fish species
- Large scale restoration changes physical and chemical fish habitat of the Delta
- Not flow independent

DRERIP: Key Uncertainties of Habitat Restoration

- Habitat use by native fish, particularly for rearing salmonids.
- Importance of productivity contributions from vegetated tidal marsh directly or indirectly to covered species.
- Relative benefits of vegetated tidal marsh vs. open water.
- Submerged Aquatic Vegetation
- Extent to which invasive clams may divert new primary production.
- Magnitude of suitable productivity (zooplankton and insects) exported from restoration areas.
- Effects on Predation + or -

BREACH III

- Large-scale interdisciplinary scientific study of the ecological response of native fish and wildlife species of concern to evolving wetland features at the landscape scale

- DRERIP Conceptual models
  - Builds on existing science
  - Fill information gaps
  - Address key questions/uncertainties

- Inform large-scale restoration planning of BDCP Conservation Strategy
  - value of intertidal and shallow subtidal habitat
  - habitat evolution projections
  - site characteristics that produce desirable attributes

Ecosystem Restoration Workshop Panel Report

Submitted to the CALFED Science Program December 16, 2009

By
John M. Teal, Delaware Bay Salt Marsh Restoration - Panel Chair
Nicholas G. Aumen, Everglades National Park
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Karen Rodriguez, US EPA Great Lakes Restoration Initiative
John A. Wiens, Chief Scientist PRBO Conservation Science

- **Recommendation 1**. The most important action is to get something(s) moving – substantially underway by the end of 2012. ….The people associated with the restoration area have a great deal of information and understanding of the Delta ecosystem; they will have little trouble selecting suitable projects as starting places for building toward the bold program of restoration necessary to sustain integrated ecological functions in this hyper-disturbed ecosystem.

Acknowledgments

- Ted Sommer – Dept. Water Resources
- Randy Baxter – DFG
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- Neil Clipperton - DFG