

Interagency Ecological Program for the San Francisco Estuary

Anke Mueller-Solger, IEP Lead Scientist, Delta Stewardship Council



Interagency
Ecological Program

COOPERATIVE ECOLOGICAL
INVESTIGATIONS SINCE 1970

1. Program Origins
2. Current Program
(Organization, Mission,
Questions, Activities, Products)
3. Program Future

Extra: IEP EMP 2001-2 Review

40 Years ago...

Testimony at 1969-70 SWRCB Water Rights Hearings:

- “Fish and wildlife problems” in the estuary
- SWP & CVP may contribute

Need studies to

- Understand fish and wildlife resource requirements
- Find ways to minimize SWP & CVP impacts

1970 IEP MOA

USBR

IN WITNESS WHEREOF, the parties hereto have executed this Memorandum
of Agreement on July 13, 1970.

U. S. BUREAU OF RECLAMATION
Region 2

By *R. J. Pappas*

CALIF. DEPARTMENT OF WATER RESOURCES

By *W. J. Gendall*

Approved as to legal form
and substance:
R. J. Tomlin

DWR

U. S. BUREAU OF SPORT FISHERIES
AND WILDLIFE, Region 1

By *John D. Findley*
JOHN D. FINDLEY
Regional Director

CALIF. DEPARTMENT OF FISH & GAME

By *[Signature]*

I hereby certify that all conditions for exemption set
forth in State Administrative Manual Section 1271.12 have
been complied with and this document is exempt from
review by the Department of Finance.

By *[Signature]*

USFWS

DFG

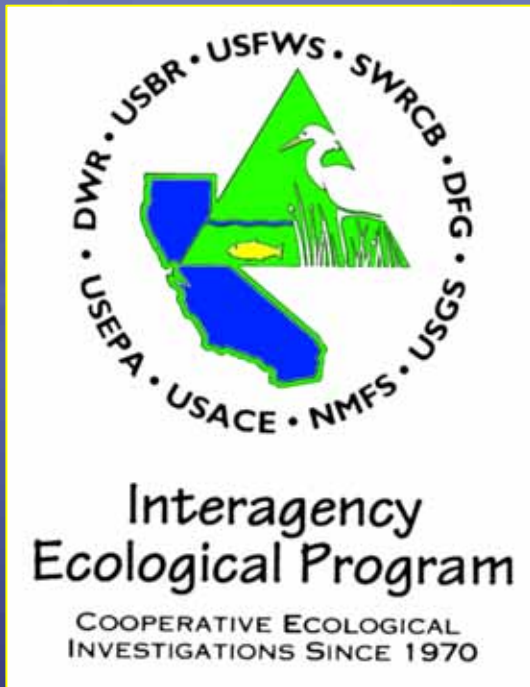
... to 2010: The IEP at 40



Interagency Ecological Program

COOPERATIVE ECOLOGICAL
INVESTIGATIONS SINCE 1970

1. 2000 MOU
2. 6 Federal & 3 State Agencies + SFEI, DSP, CVRWQCB, Academic Partners...
3. ~ \$30 M (mostly from DWR, USBR, DSP, SWRCB)



Current Mission:

Provide information on the factors that affect **ecological resources** in the Sacramento - San Joaquin Estuary that allows for more **efficient management** of the estuary.

Big Questions:

- What's happening? (Status)
- What happened? (Trends)
- Why is/did it happen? (Processes)
- What might happen if...? (Management Options, Forecasting)

... to 2010: The IEP at 40 - Organization



Program

Agency Directors

Direct, Decide

Agency Coordinators

Coordinate

Program Management Team(s)

Program Manager, Lead Scientist

Cooperate,
Communicate

Science

Program Elements (e.g. ...)

Project Work Teams (e.g. CWT)

Cooperate, Collaborate

Advice

Science Advisory Group

Stakeholder Group (MLAG)

... to 2010: The IEP at 40 - Organization

Communication



(Management Options)

Forecasting

Analysis
Synthesis
Review

Information

Modeling

Communication

Long-Term
Cooperation

*Dr. IEP Science ...
Does Science*

Processes

Monitoring

Research

Status & Trends

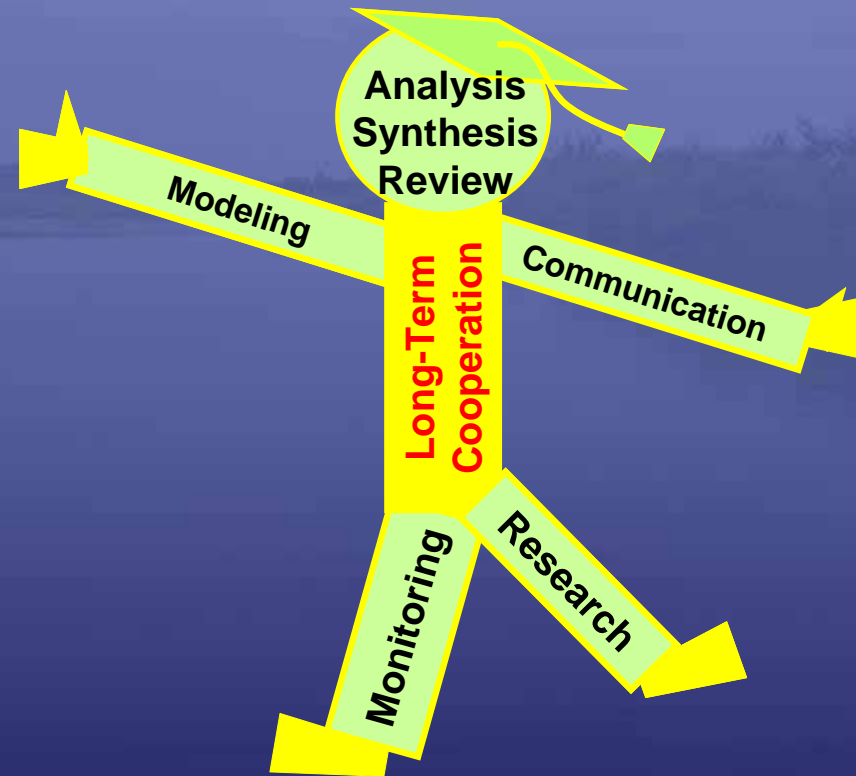


Current Monitoring:

- Long-term
- Cooperative
- Consistent
- Mostly Mandated
 - SFE, Delta & Suisun focus
 - Mostly channels & bays
 - Continuous to semi-annually
 - *Variables:*

EMP

- Fish
- Jellyfish
- Zooplankton
- Benthos
- Phytoplankton
- Nutrients, D.O., pH, Turbidity
- Salinity/EC, Temperature
- Flow



NOT:

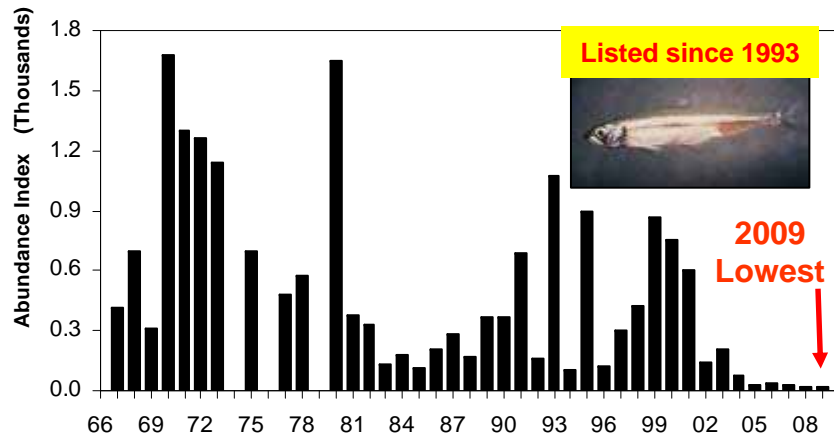
- Microbes*
- Toxicity & Contaminants*
- Wetlands
- Plants*
- Vegetated Edges/Shore*
- Fish Condition*

* Pilots with POD

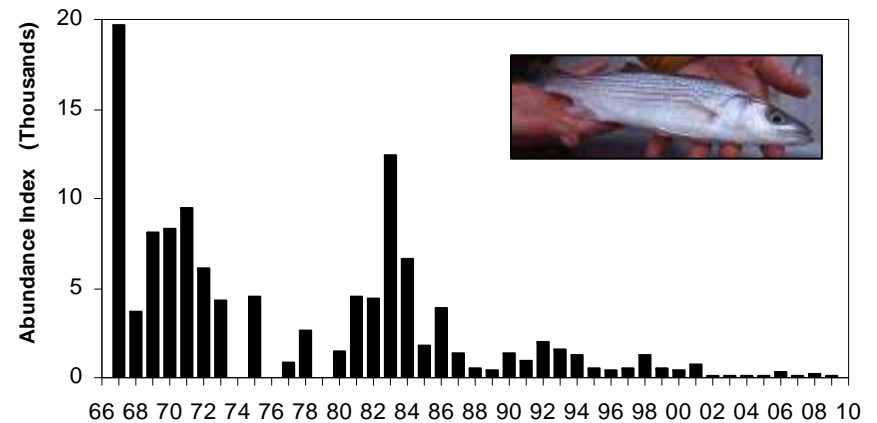
Long-term IEP Monitoring Shows Fish Declines

“Pelagic Organism Decline” (POD)

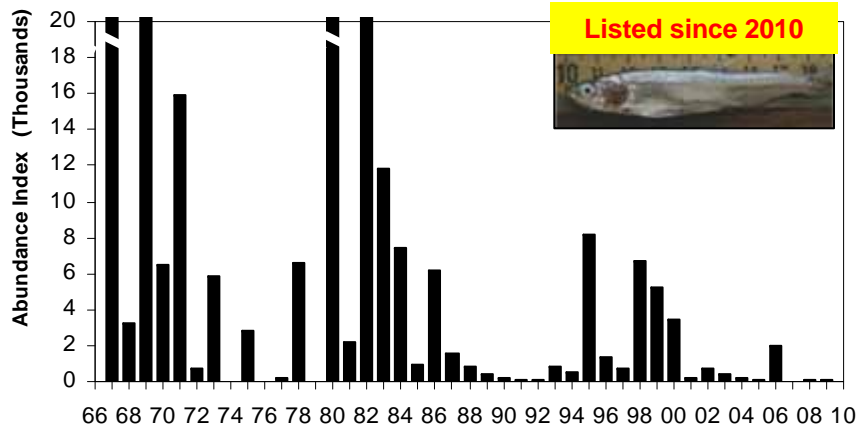
Delta Smelt



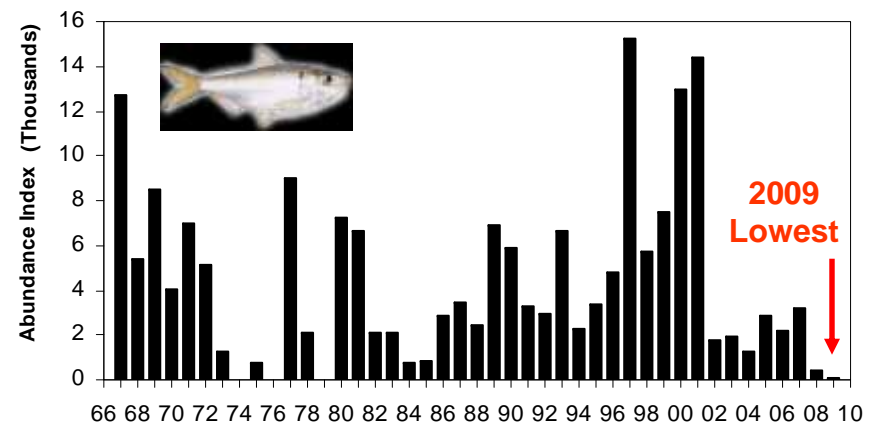
Striped Bass



Longfin Smelt



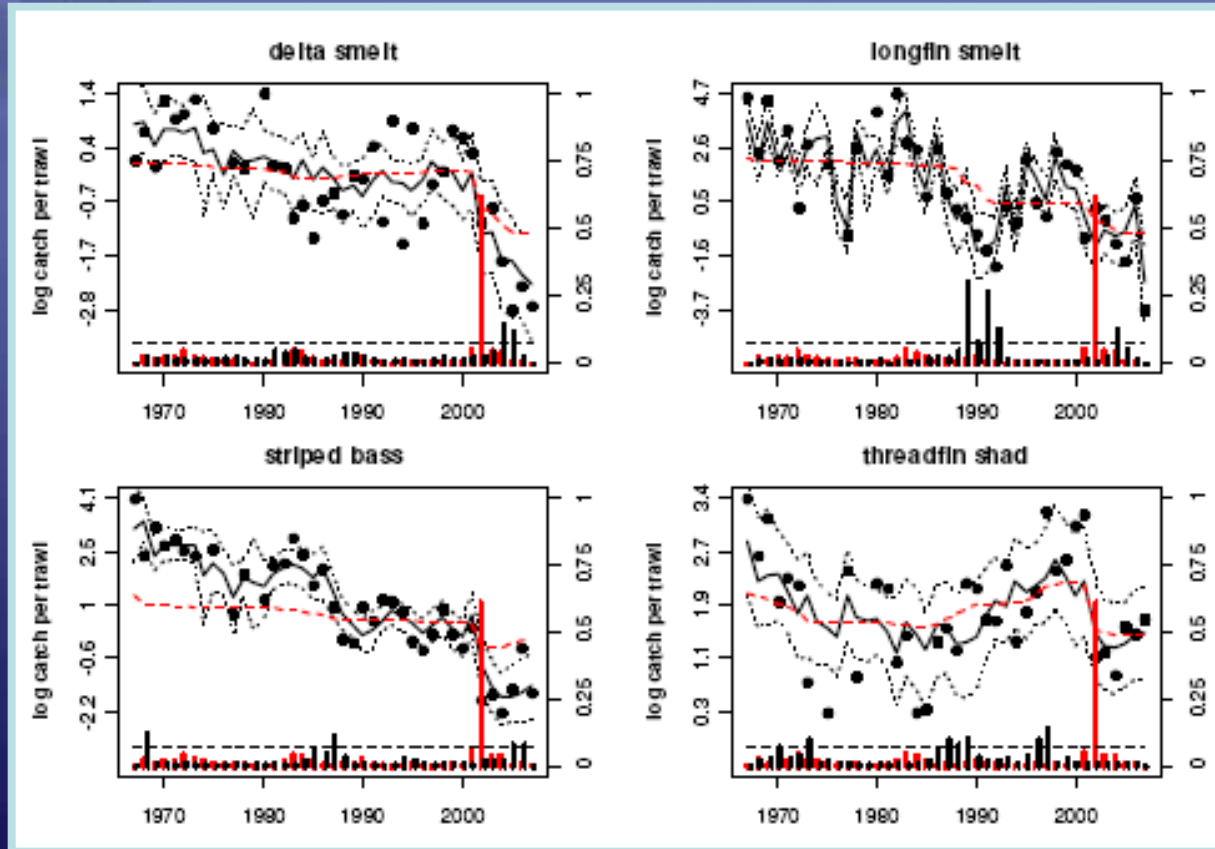
Threadfin Shad



Source DFG 2008 Fall MW Trawl - No indices in 1974, 1976 and 1979

Long-term IEP Monitoring Shows Fish Declines

POD Change Point in 2002 - Thomson et al. 2010



National Center for Ecological Analysis and Synthesis

$$\frac{\partial}{\partial t} (N^2 \psi) - \frac{\partial \psi}{\partial z} \frac{\partial}{\partial x} (N^2 \psi) - \frac{\partial \psi}{\partial x} \frac{\partial}{\partial z} (N^2 \psi) - v \nabla^2 (N^2 \psi) = g$$

2009

Public IEP Workshop
September 8-9, 2009
University of California Davis
September 8: Weisman Hall, Basement, Room 2
September 9: Memorial Union, 3rd Floor, Main Room

Modeling the Pelagic Organism Decline

Click here for more...

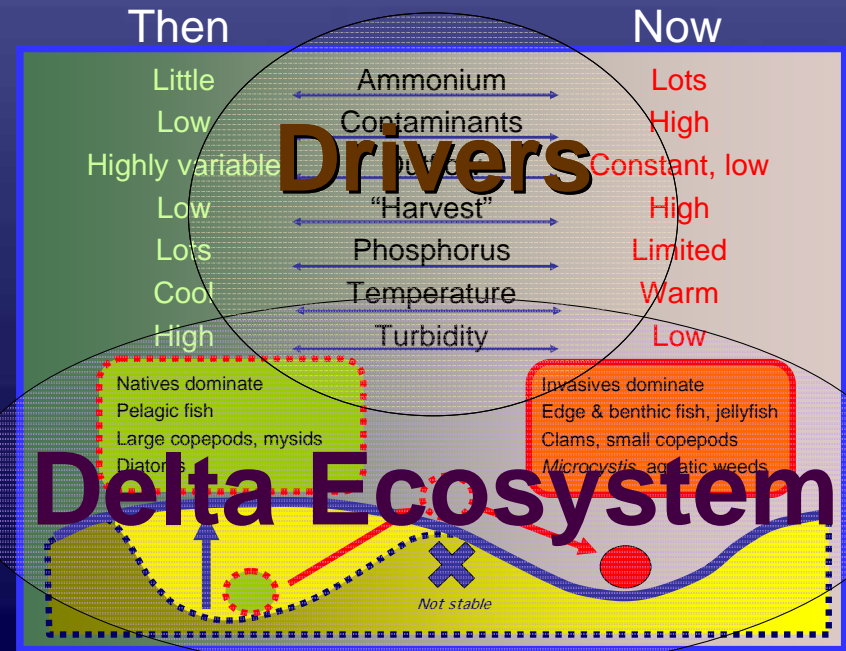
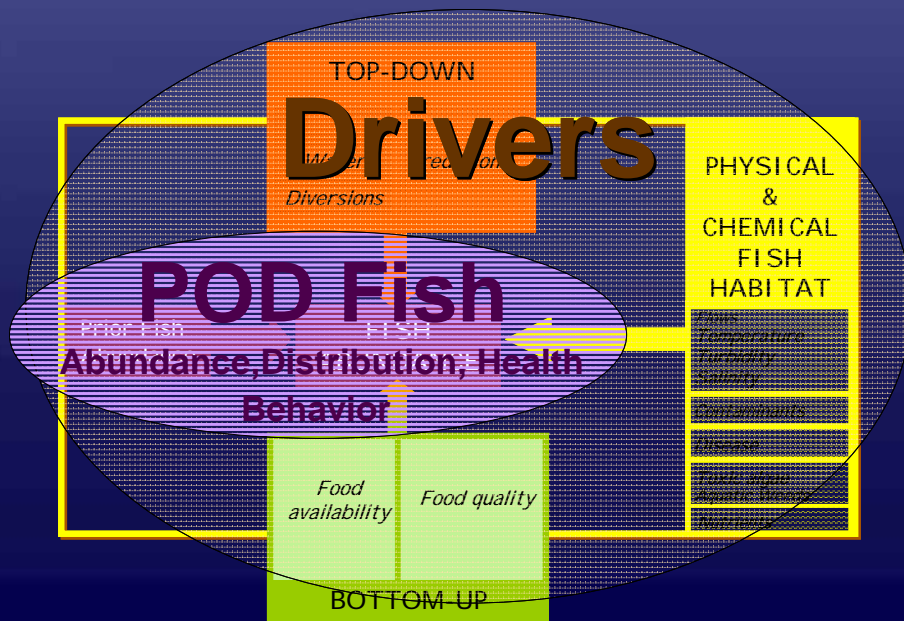
Ecological APPLICATIONS

Current POD Research: Science Informing Solutions

Focus on Multiple Drivers of Change

Old Conceptual Model:
What happened to the fish?

New Conceptual Model:
Ecological Regime Shift



Regime Shift Driver: Contaminants

- Available monitoring data not adequate for determining role in POD

- Poor documentation
- Analytical issues and QA/QC problems
- Shortcomings with the current monitoring approach
- Existing monitoring design limitations
- Inaccessible data

**POD
Synthesis
Analysis:
Lessons
Learned**

Source: T. Jabusch, SFEI,
and M. Sullivan, CVRWQCB

- Chronic/Sublethal Toxicity
- Pyrethroids

Regime Shift Driver: Nutrients

Food Quantity & Quality, Water Quality

A Framework for Research Addressing the Role of Ammonia/Ammonium in the Sacramento-San Joaquin Delta and the San Francisco Bay Estuary Ecosystem

Submitted to:

The CALFED Science Program
650 Capitol Mall, 5th Floor
Sacramento, CA 95814

4/2009

Public IEP Workshop

August 18-19, 2009

Central Valley Regional Water Quality Control Board,
Rancho Cordova, CA



Ammonia Summit

Assessing the Role of Ammonia/um
in the Delta & Suisun Bay Ecosystem

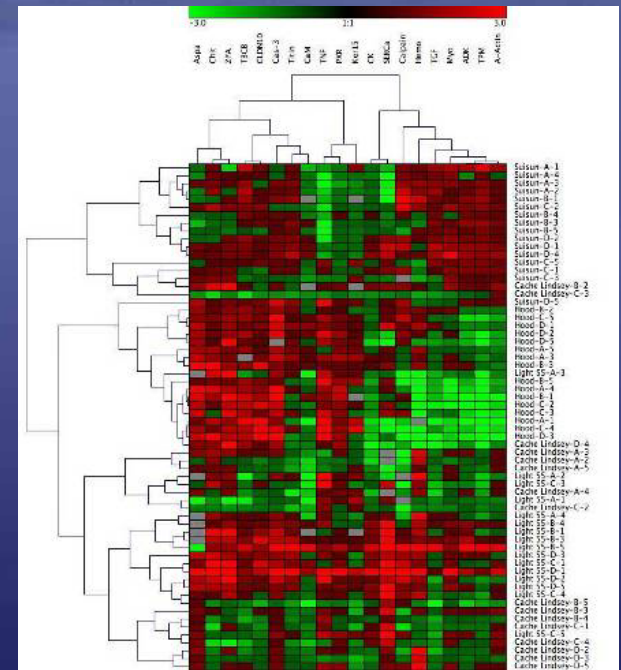


Click here to read more...

Next for Nutrients & Contaminants

(for 2010 POD Workplan see http://www.science.calwater.ca.gov/pod/pod_index.html)

- Pyrethroids in the North Delta and the American River
- Novel Genetic Biomarkers in Delta Smelt
- Ammonia Work
- *Delta RMP, CA WQMC*



Source: R. Connon, UCD



Source: T. Jabusch, SFEI, and M. Sullivan, CVRWQCB

Current IEP Products (Communication)

www.water.ca.gov/iep

Interagency Ecological Program
Cooperative Ecological Investigations
in the San Francisco Estuary since 1970

2010 IEP ANNUAL WORKSHOP

The 2010 IEP Workshop was held at CSU Sacramento on May 25 and 26, 2010. Anke Mueller-Solger, IEP Lead Scientist, is shown here with Agency Directors, moderating the session "Looking Forward Putting IEP into Perspective."
(Monday, June 21, 2010)
▶ [WORKSHOP AGENDA WITH LINKS TO PRESENTATIONS](#)

Please [click here](#) to take the IEP Data Users Survey

MONITORING
The annual "Status and Trends" issue of the IEP newsletter has been released.
[Read More...](#)

RESEARCH
Old school vs. new school: status of threadfin shad (*Dorosoma petenense*) five decades after its introduction to the Sacramento-San Joaquin Delta.
[Read More...](#)

WORKSHOPS AND EVENTS
Bay-Delta Science Conference. Sept. 27-29, 2010

IEP Home

ACTIVITIES

- » Monitoring
- » Research
- » Pelagic Organism Decline (POD) Investigations
- » Program Reviews
- » Workshops and Events

PRODUCTS

- » Data and Metadata
- » IEP Newsletter
- » Technical Reports
- » Journal Publications
- » Maps
- » Pictures

ABOUT

- » About the Estuary
- » IEP Teams

[Data & Metadata](#)

IEP Newsletter

Tech Reports

[Journal Pubs](#)

Maps

Pictures

PRODUCTS

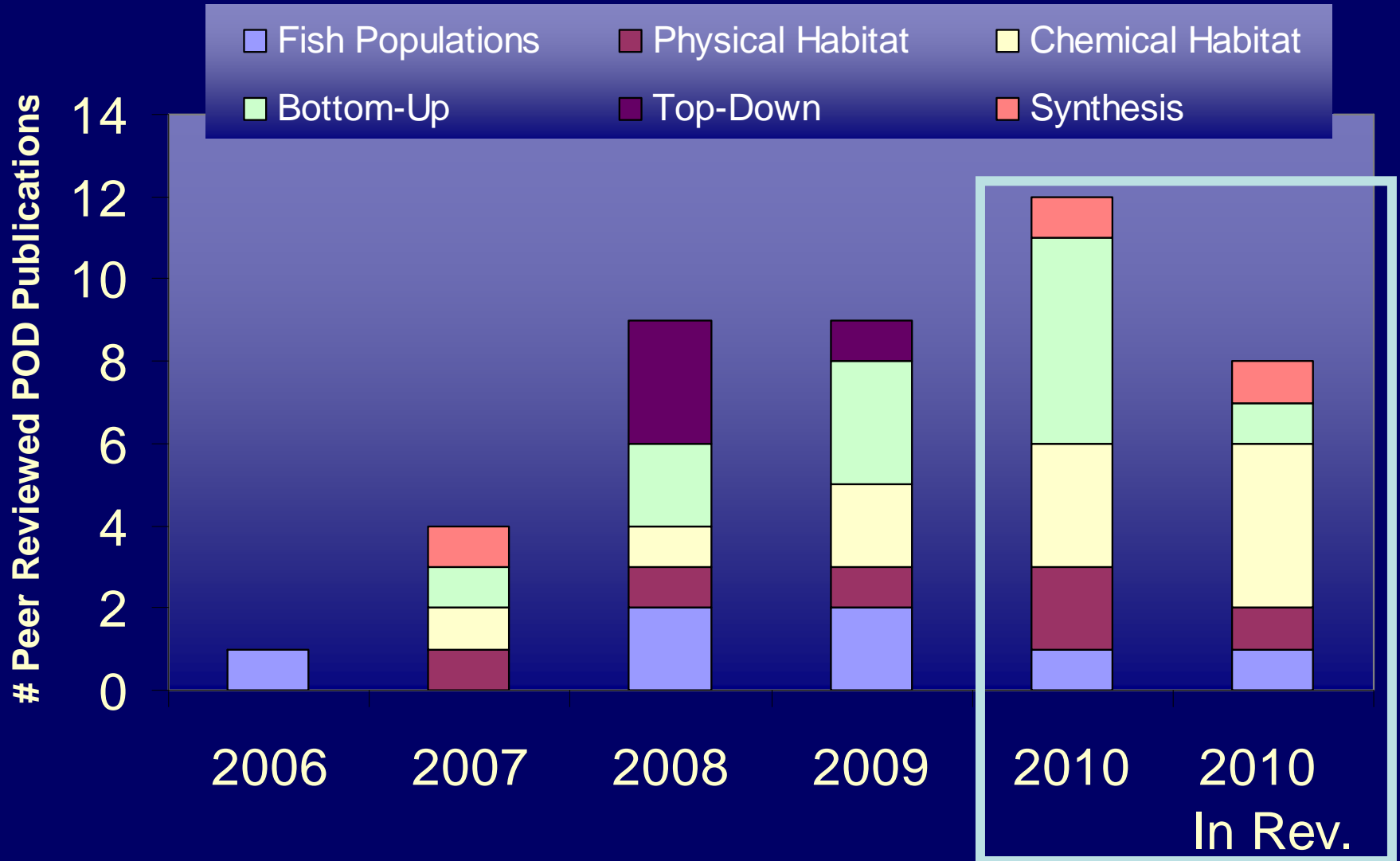
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POD Journal Publications

http://www.science.calwater.ca.gov/pod/pod_publications.html



Current Data Access: Interim Solution!



Please [click here](#) to take the IEP Data Users Survey

DATA AND METADATA

[BDAT](#)

[Dayflow](#)

[Suisun](#)

[DSM2PWT](#)

[I.E.P. HEC-DSS Time-Series Databases](#)

[DFG Data](#)

RELATED LINKS:

→ [CDEC](#)

→ [USGS \(sediments, flows, salinity\)](#)

DATA CONTACTS:

California Department of Water Resources

- Aquatic Ecological Studies:
 - Fish Data - Kevin Reece creece@water.ca.gov 916-376-9756

- Bay-Delta Monitoring and Analysis Branch:
 - Discrete Phytoplankton Data - Tiffany Brown tbrown@water.ca.gov 916-376-9723
 - Discrete Water Quality Data - Brianne Nobel bnobel@water.ca.gov 916-376-9723
 - Discrete Benthic Data - Dan Riordan driordan@water.ca.gov 916-376-9756
 - Vessel Calendar - Scott Waller swaller@water.ca.gov 916-376-9768

Links to existing databases, websites, and staff who can provide data sets

IEP Home

ACTIVITIES

- Monitoring
- Research
- Pelagic Organism Decline (POD) Investigations
- Program Reviews
- Calendar
- Workshops and Events
- Archive

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... IEP Metadata System Pilot at DWR



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ABOUT

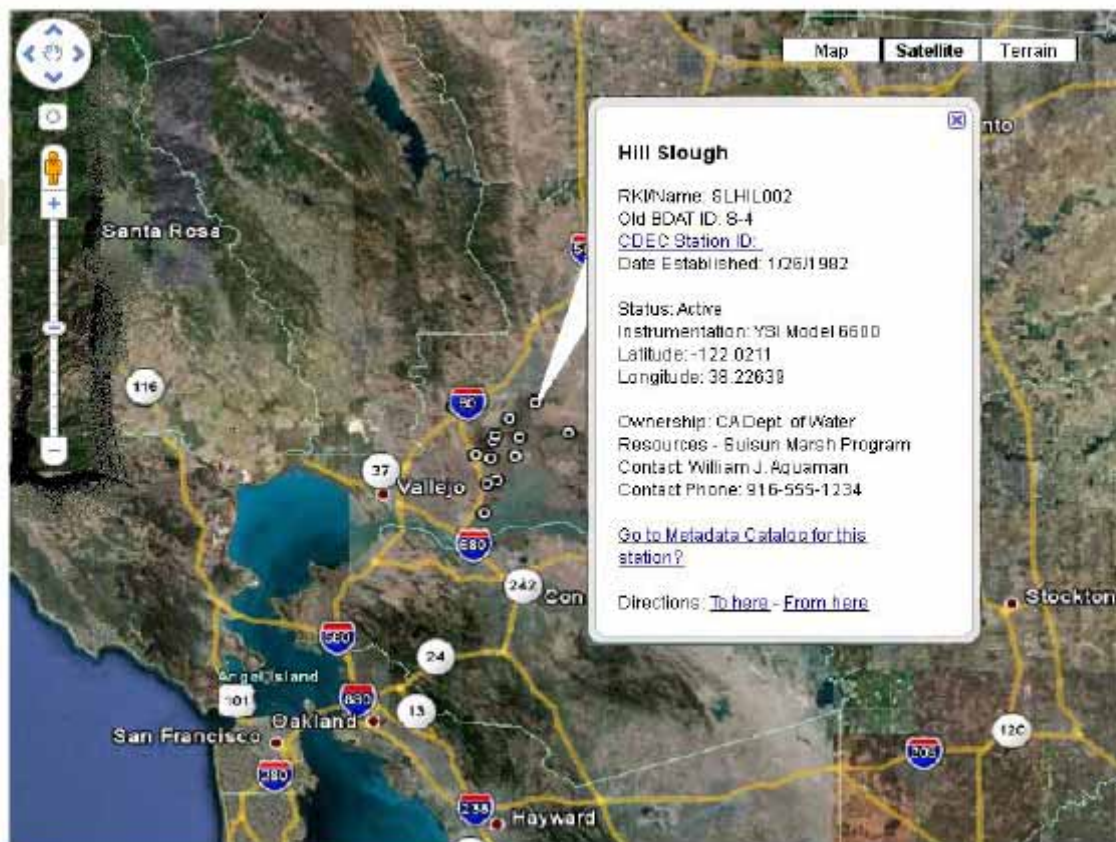
- About the Estuary

<http://www.cnrc.com/d/36192494>

Stations & Sites

- [Hill Slough](#)
EC
Temp
- [Green Valley Creek-59](#)
EC
- [Green Valley Creek-510](#)
EC
Temp
- [Suisun Creek](#)
EC
- [Sunrise Club](#)
EC
- [Calineville B](#)
EC
- [Teal Club](#)
EC
- [Covius](#)
EC
- [Morrow Island](#)
EC
- [Godfather II](#)
EC
- [Boynton Slough](#)
EC

IEP Metadata & Data Search



...with CERES et al:

The University of North Carolina in association with the
California State Archives and the
California Natural Resources Agency

**eLegacy: Engaging |
Participants in a Digital
Repository Service
Ecology**

(IEP as case study)

**Analysis
Synthesis
Review**

IEP

Modeling

Communication

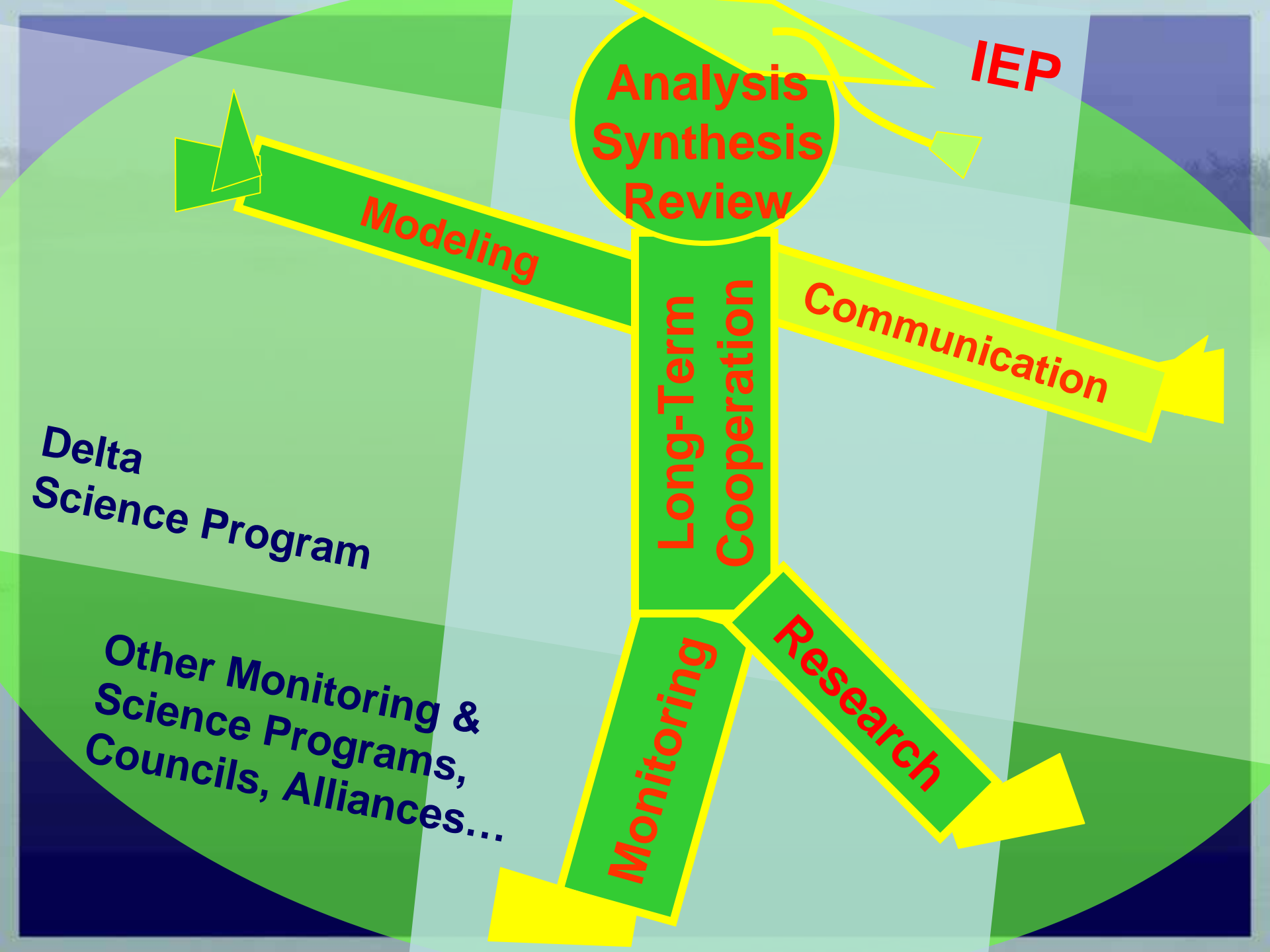
**Long-Term
Cooperation**

Monitoring

Research

**Delta
Science Program**

**Other Monitoring &
Science Programs,
Councils, Alliances...**



...with RMPs, CA WQM Council?

= California Estuaries Portal
focused on the SFE?

= Theme-specific Workgroup?

Home | Safe to Drink | Safe to Swim | Safe to Eat Fish | Ecosystem Health | Stressors & Processes | Contact Us

Estuaries | Lakes | Streams & Rivers | Ocean | Wetlands |

GOVERNOR SCHWARZENEGGER
Visit his Website

Home -> Aquatic Ecosystem Health

State & Regional Water Boards

AQUATIC HEALTH LINKS

- Stressors
- Laws, Regulations & Standards
- Regulatory Activities
- Enforcement Actions
- Research
- Monitoring Programs, Data Sources & Reports

Are Our Aquatic Ecosystems Healthy?

WETLANDS

Wetlands form along the shallow margins of deepwater ecosystems such as lakes, estuaries, and rivers. They also form in upland settings where groundwater or runoff makes the ground too wet for upland

ESTUARIES

Estuaries are unique habitats found where rivers and the ocean mix. They feature a diverse array of plants and animals adapted to life along the mixing zone. [More>>](#)

LAKES

California lakes, supporting deep water, wetlands, riparian woodlands, offer a quiet refuge for plants, animals and humans alike. [More>>](#)

... Into the Future

- 2010 MOU Renewal
- The Future of the IEP: Options for Adapting to New and Emerging Needs



Improve Immediately:

- Data management and accessibility
- Analysis, synthesis, assessment, and communication
- Modeling

Further consider:

- Geographic Scope
- BDCP Role
- Future Coordination Role (RMP, CA WQMC, DSP, etc.)



Thank You!

“Planning for the future without a sense of history is like planting cut flowers.”

Daniel Boorstin

Historian and Librarian of Congress



Results from a Programmatic Review of the Environmental Monitoring Program

*Presentation to
Central Valley Regional Water Quality Control Board
October 29, 2002*

2001-2002 EMP Review goal:

“Recommend a balanced, scientifically sound, implementable environmental monitoring program design to fulfill water right permit conditions and address the needs of current and potential users identified during this review.”

Multi-tiered Review Process

Date: 9/01 11/01 1/02 3/02 5/02 8/02

Subject Area Teams

- >> Small groups of local experts
- >> Complete subject area review
- >> Largest time commitment

SAT Reports

Big Meeting Participants

- >> Broader base of participants
- >> Provide input through meetings
- >> Increase process transparency
- >> Lowest time commitment

Review
Comment

Science Advisory Group

- >> Independent technical review
- >> Written critique of products
- >> Medium time commitment

Review
Comment

Core EMP Staff

- >> Provide info. & Materials
- >> Convene big meetings
- >> synthesize subject area reviews

Various materials,
presentations, & reports

General Review Considerations

- Customer needs
- Zero sum change to program costs
- Inclusiveness - experts, stakeholders, etc.
- Transparency
- Sound science
- Implementability
- Local expertise Vs. broader perspective
- Insider Vs. independent review

Lessons for future program reviews I:

- Dedicate lead personnel (\$!), “Core team”
- Clear strategy & (realistic) time plan
- Be inclusive, transparent, responsive
- Technical & management (& public) review
- Essential monitoring program review elements:
 - Program setting (opportunities & constraints!)
 - “Customers” and their data & information needs
 - Program aims (goals, objectives, questions)
 - Conceptual basis for program (re-)design
 - Implementation steps & needs (including funding, other resources, special studies, etc.)

EMP Review Synthesis

7 overarching issues:

- (1) EMP products - more “human intellectual investment”
- (2) EMP aims - clearer goals, objectives, questions

Next slides:

- (3) EMP sampling design
- (4) Integration of EMP elements
- (5) Relationship between monitoring and special studies - related but independent, plans for both
- (6) Program funding and resource allocations - zero sum game, apply for competitive funding for studies, free up \$ for benthos
- (7) System components not sufficiently monitored by any program in the upper estuary - SAV, microbes, contaminants: Calfed?

Proposed EMP sampling design:

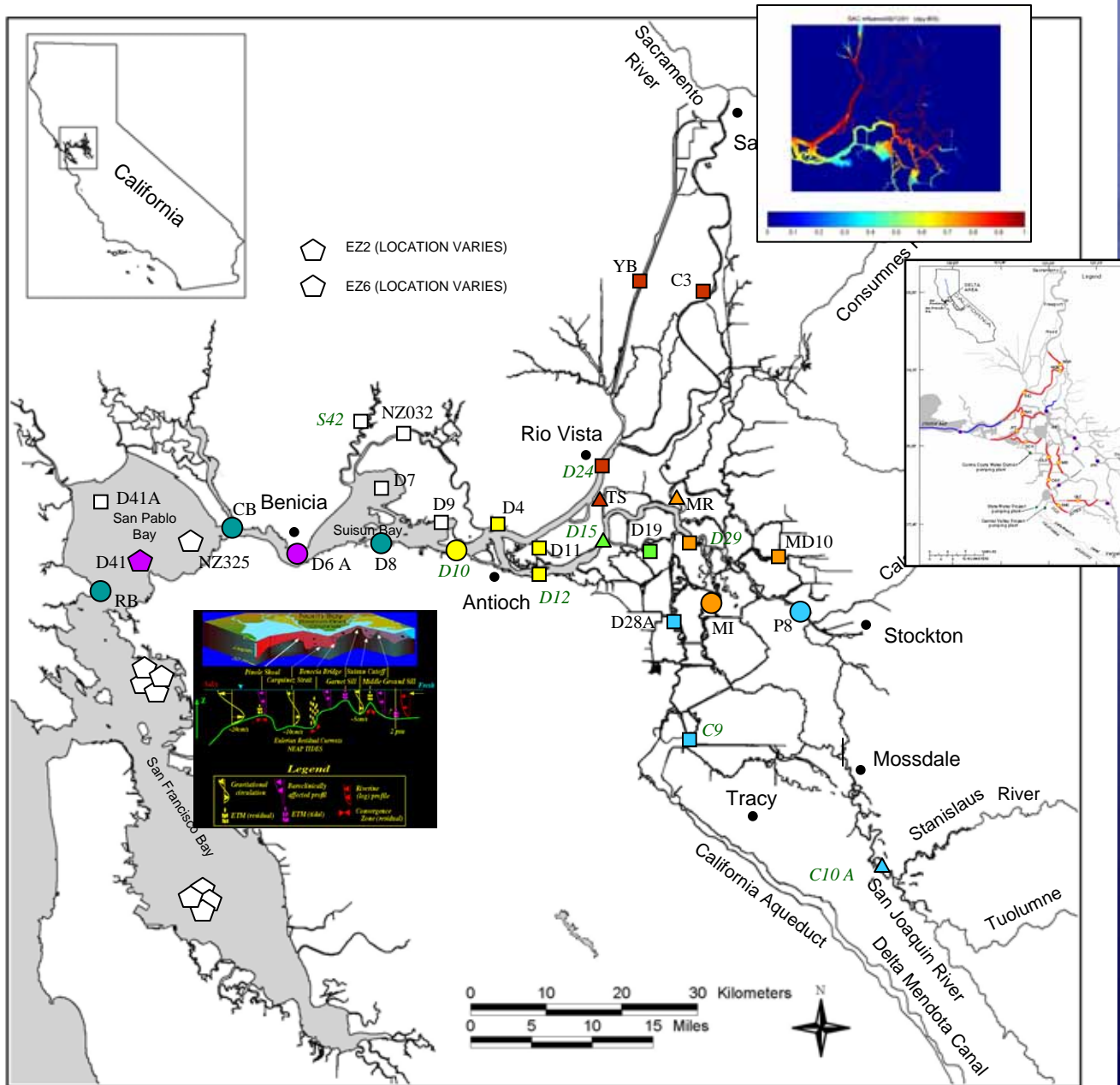
Raise effectiveness by creating a network of continuous monitoring stations located within a tidal excursion of each other; discrete sampling during sensor maintenance on alternating spring & neap tides. Benthos sampling: quarterly. Zooplankton sampling: extended into Bay (but not part of EMP?!).

Stratified sampling design, strata based on

- Physical system properties: Hydrology, geometry, and hydrodynamic transport processes (Zach)
- Ecology: habitat type
- Statistical separation of regions using EMP data

(3) EMP sampling design, cont.

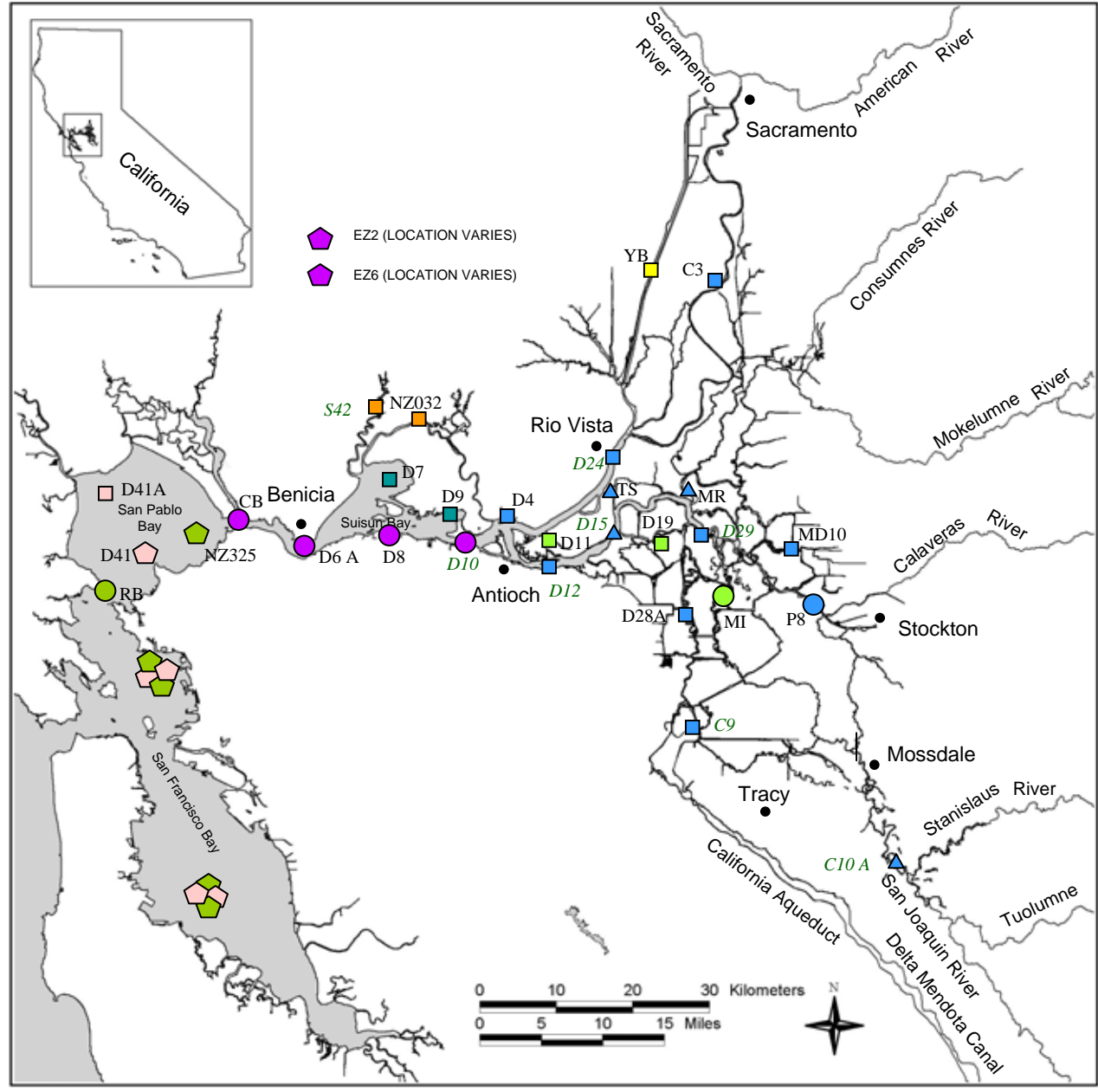
“Physical” regions



- Sacramento River
- Confluence
- Western Delta
- Central Delta
- South Delta
- Sill Station
- Cell Station
- Unassigned

(3) EMP sampling design, cont.

Habitats



Floodplain drainage channel

Flooded island (lake)

Tidal river channel

Tidal marsh slough

Estuarine channel

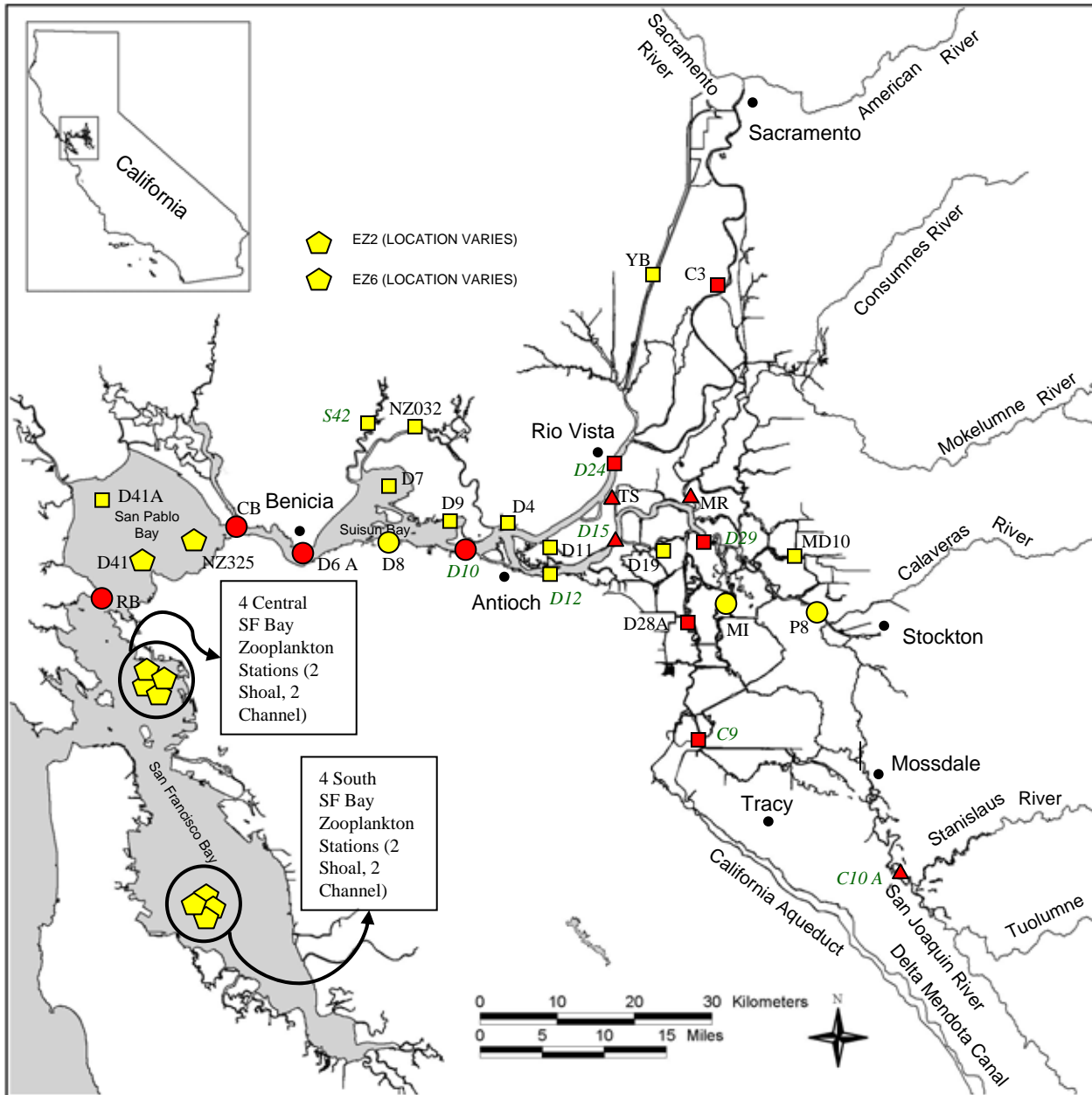
Estuarine embayment

Bay channel

Bay shoal

(3) EMP sampling design, cont.

26 Ambient & 13 Flux stations



Station IDs:

Compliance Station

Baseline Station

Symbols:

- Continuous, multi-depth
- Continuous, single-depth
- ◇ Discrete sampling only
- △ Continuous station not in EMP Review Draft II

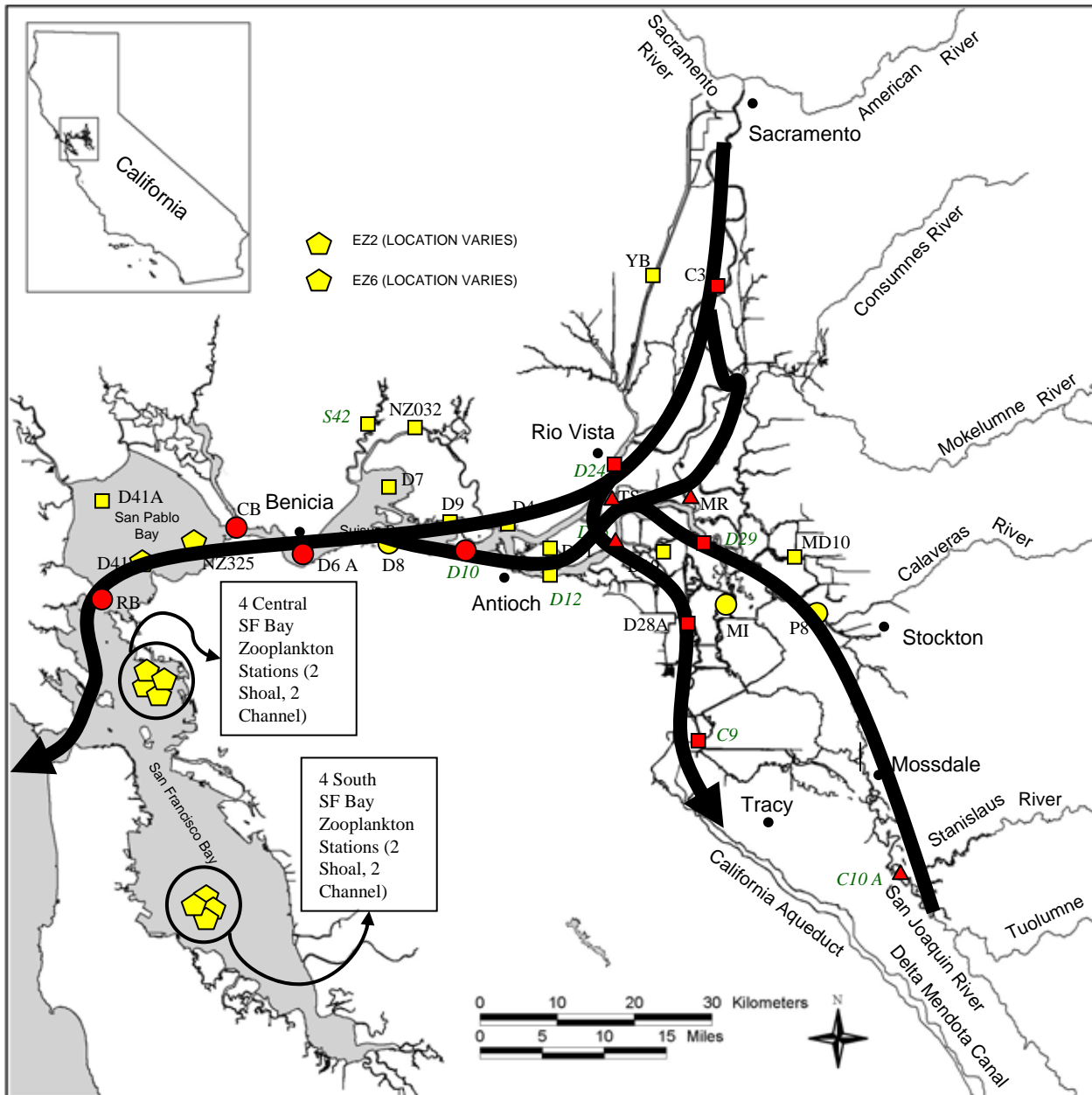
Symbol Fill Colors:

Flux station

Ambient station

(3) EMP sampling design, cont.

Constituent flux along major flow paths



Station IDs:

Compliance Station

Baseline Station

Symbols:

- Continuous, multi-depth
- Continuous, single-depth
- ◇ Discrete sampling only
- △ Continuous station not in EMP Review Draft II

Symbol Fill Colors:

Flux station

Ambient station

