The Draft Report has no definition of the problem.

The Draft Report has no goal.

SWRCB Biological Presentation

“Problem” Reduced flows and changes in natural flow regime impair fish and wildlife

Problem is that SJB adult escapement is highly variable with a generally downward trend

“Conclusion” Limiting factor [only one presented] is low survival at reduced flows since salmon and steelhead are "adapted" to natural flows

Unfamiliar with study suggesting that “the” limiting factor is related to “adaptation” to natural flows

Salmon can fit practical available water regime

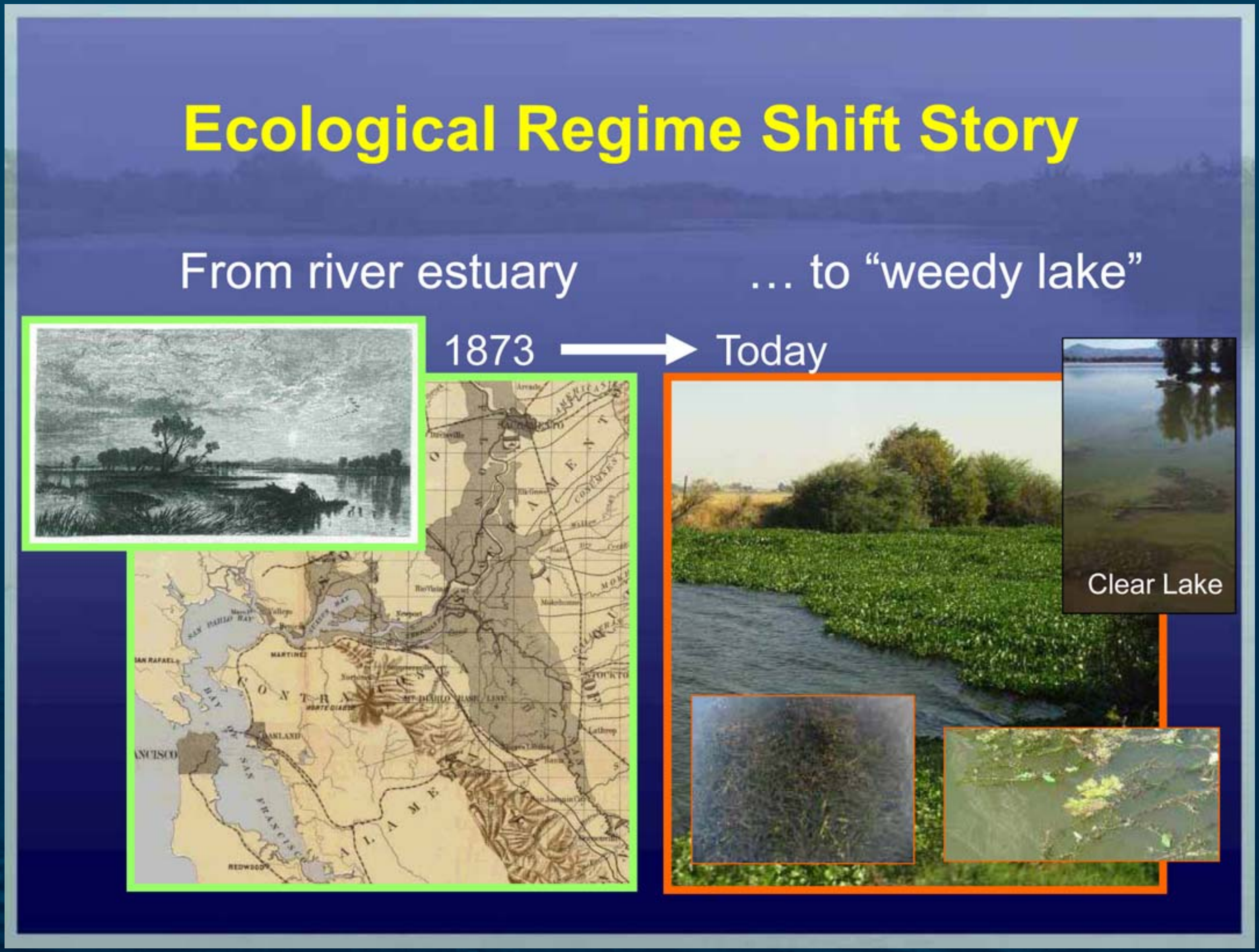
It is worth noting that a restored flow regime does not need to track exactly the historic flow regime of the San Joaquin River because the behavior of both fall and spring run Chinook can be manipulated through selection to fit a regime that is practical using available water.

Rebuttal Expert Report of Professor Peter B. Moyle: Upper San Joaquin River Spring-run Restoration

‘Re-establishment of some semblance of a natural system’

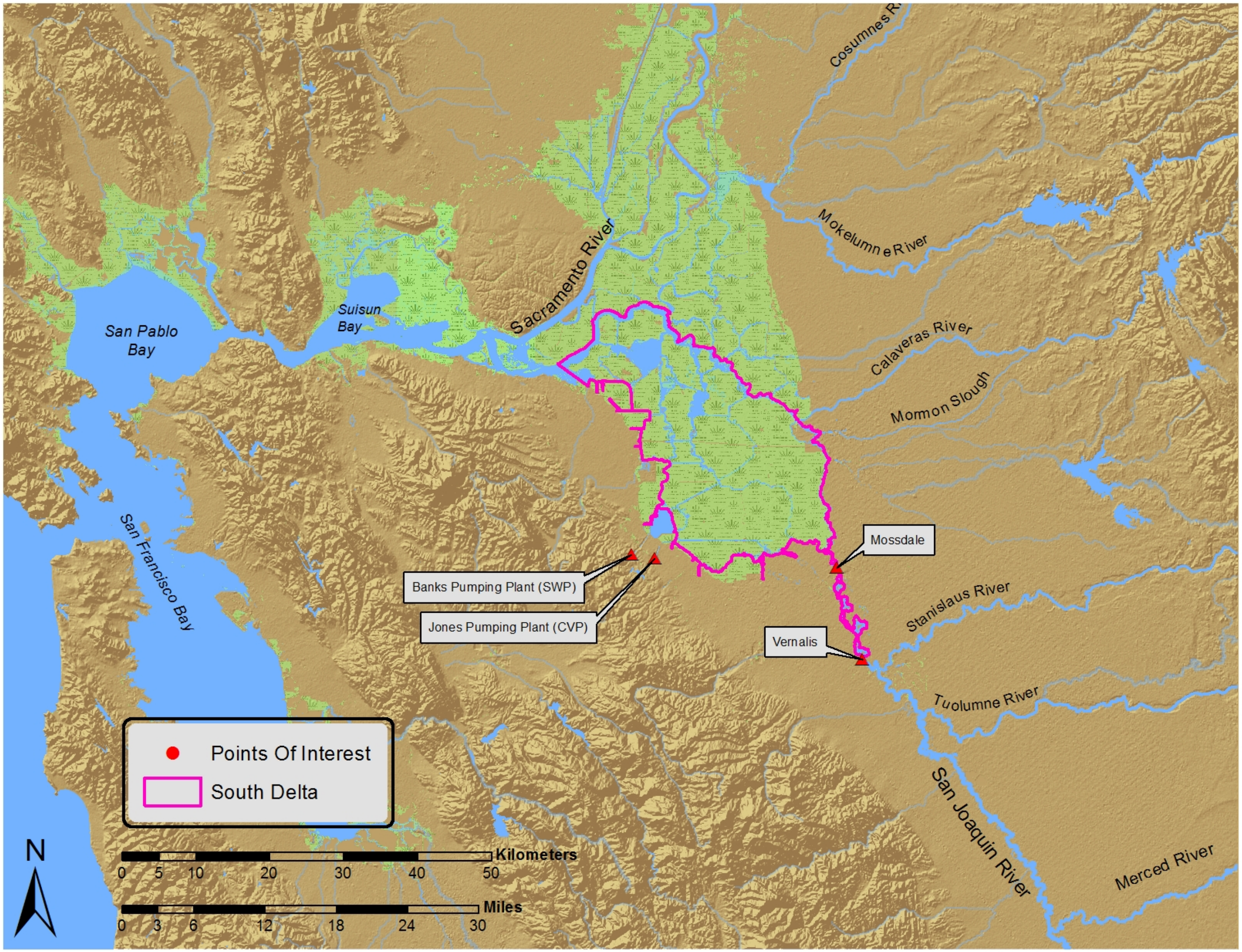
‘take action to protect’ salmon and steelhead

There's Nothing Natural About the South Delta

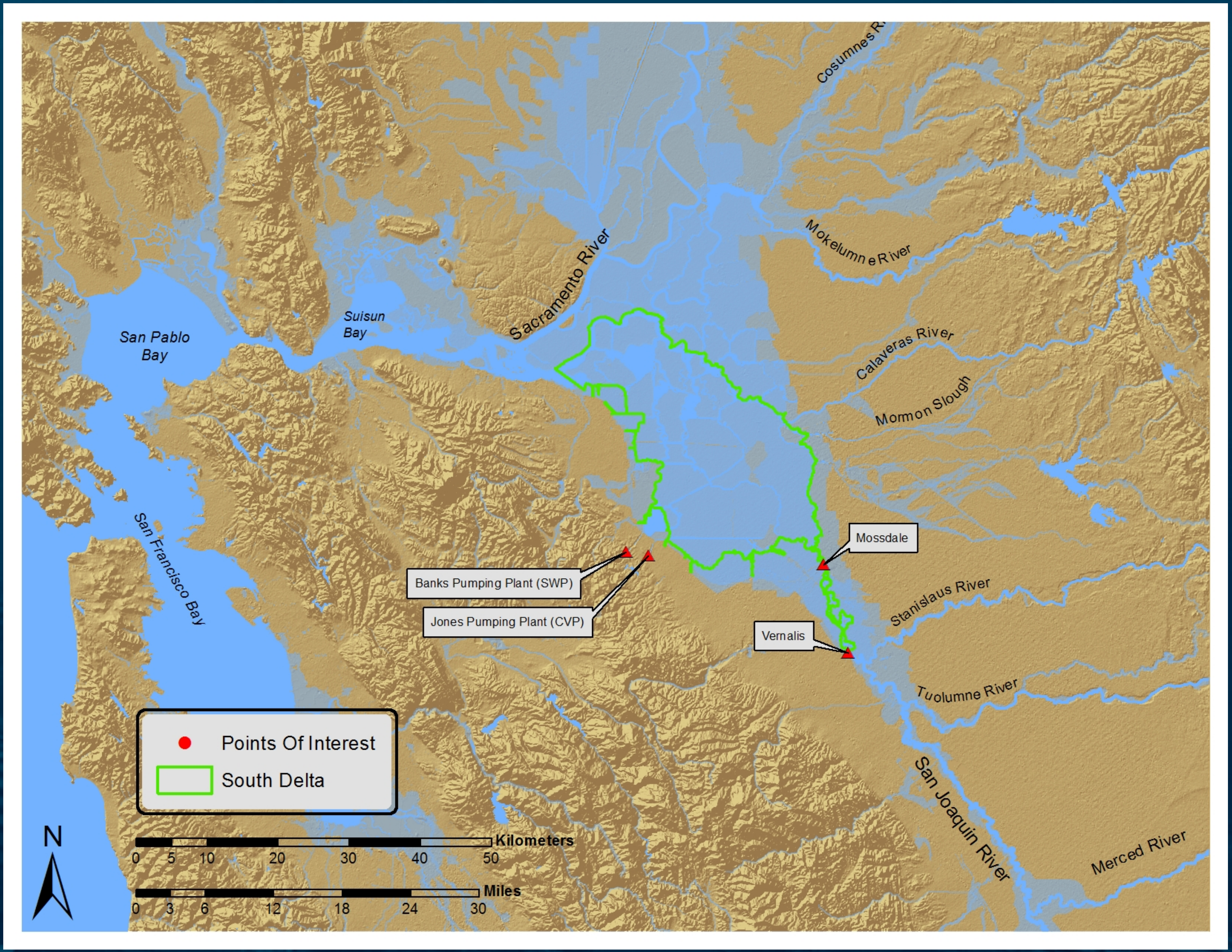


"Review of Stressors on the Delta Ecosystem" Title of IEP Lead Scientist Talk to NRC 12/8/2010
Interagency Ecological Program 2010 Pelagic Organism Decline Work Plan and Synthesis of Results

Historic Tidal Marsh Habitat Gone



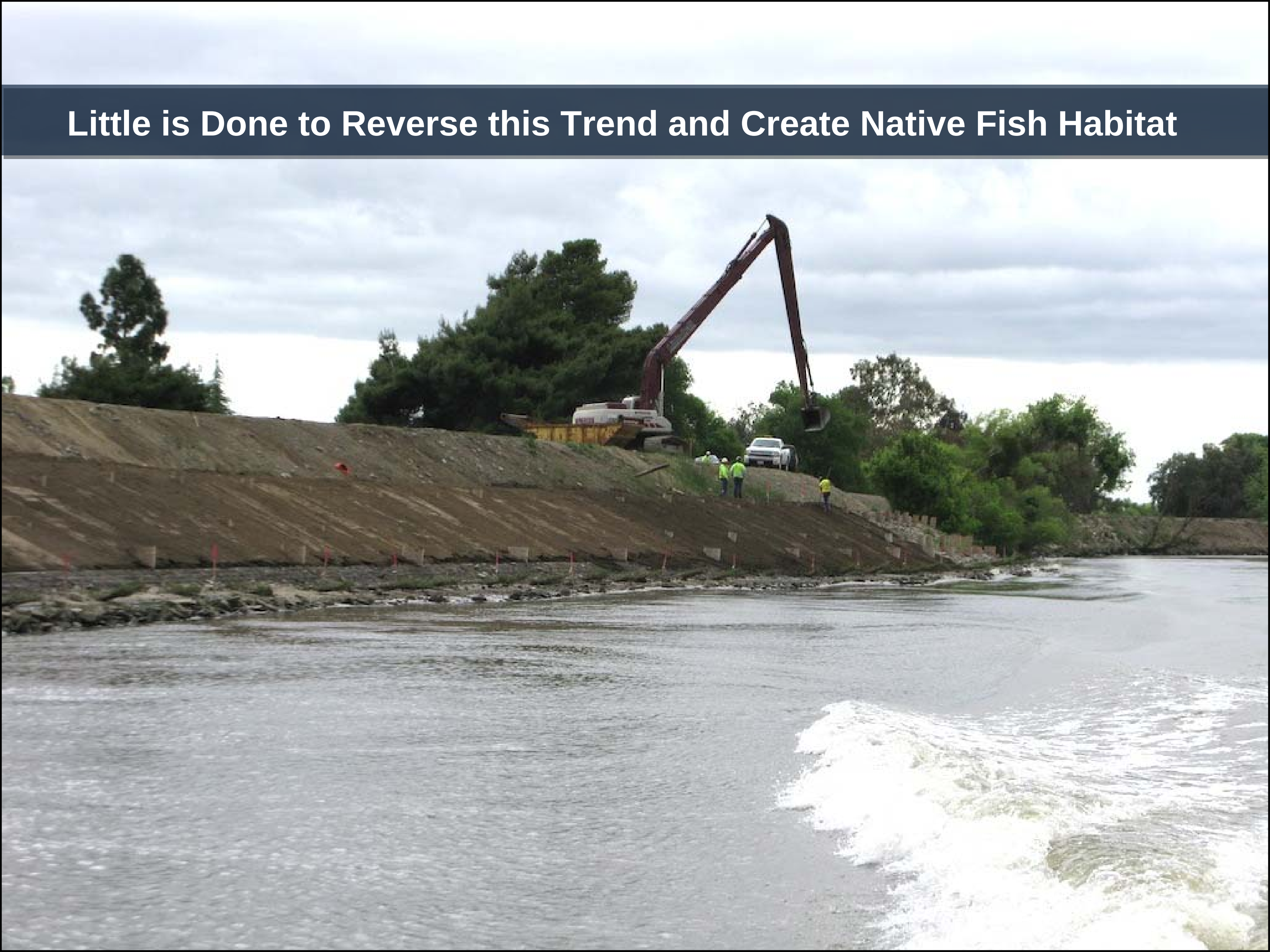
Historic Floodplain Habitat Gone



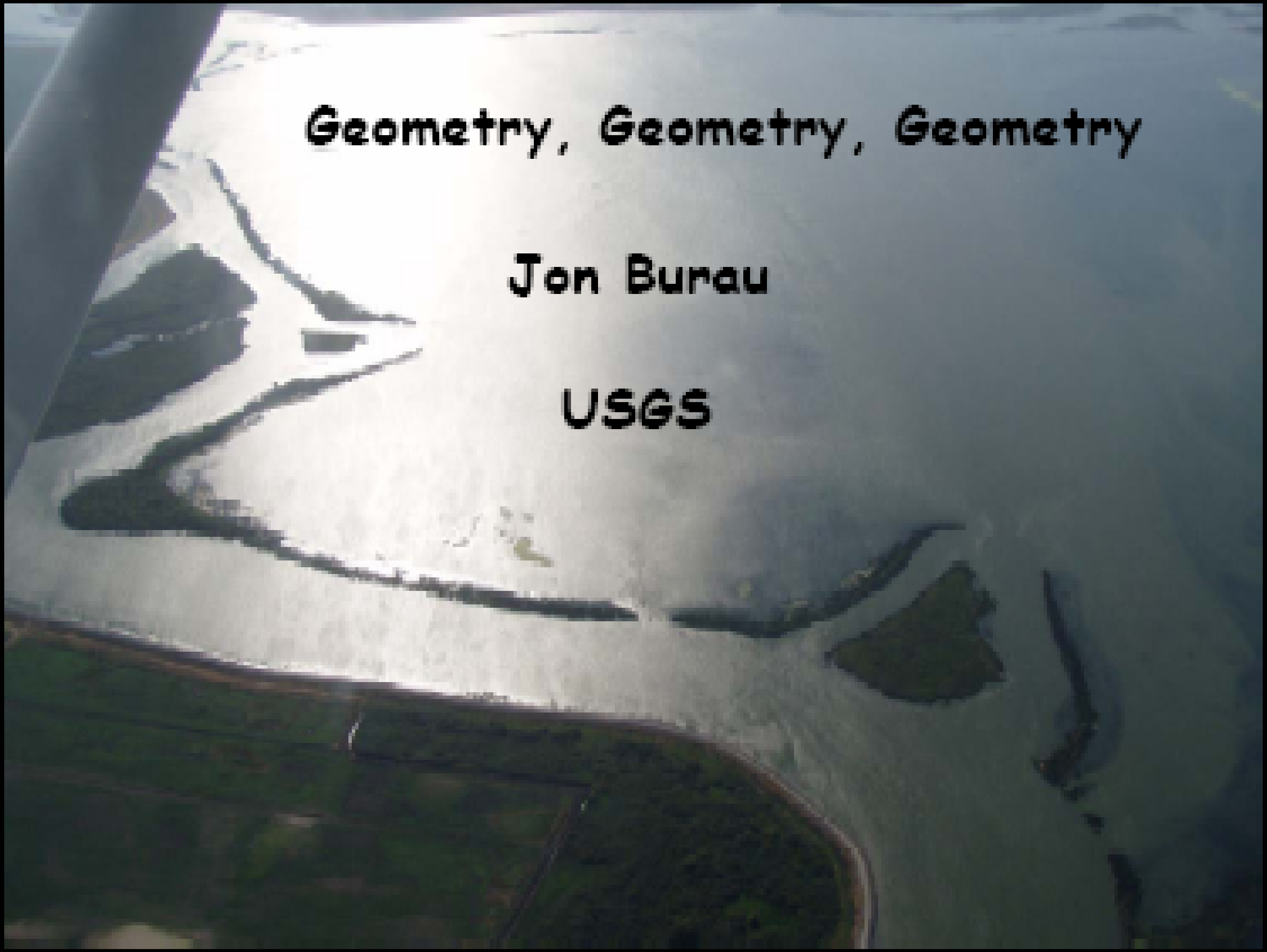
Over 95% of Delta Leveed and Removed From Floodwater Inundation

Simenstad and Bollens 2003

Little is Done to Reverse this Trend and Create Native Fish Habitat



Variable Delta – A Hydrodynamic Perspective

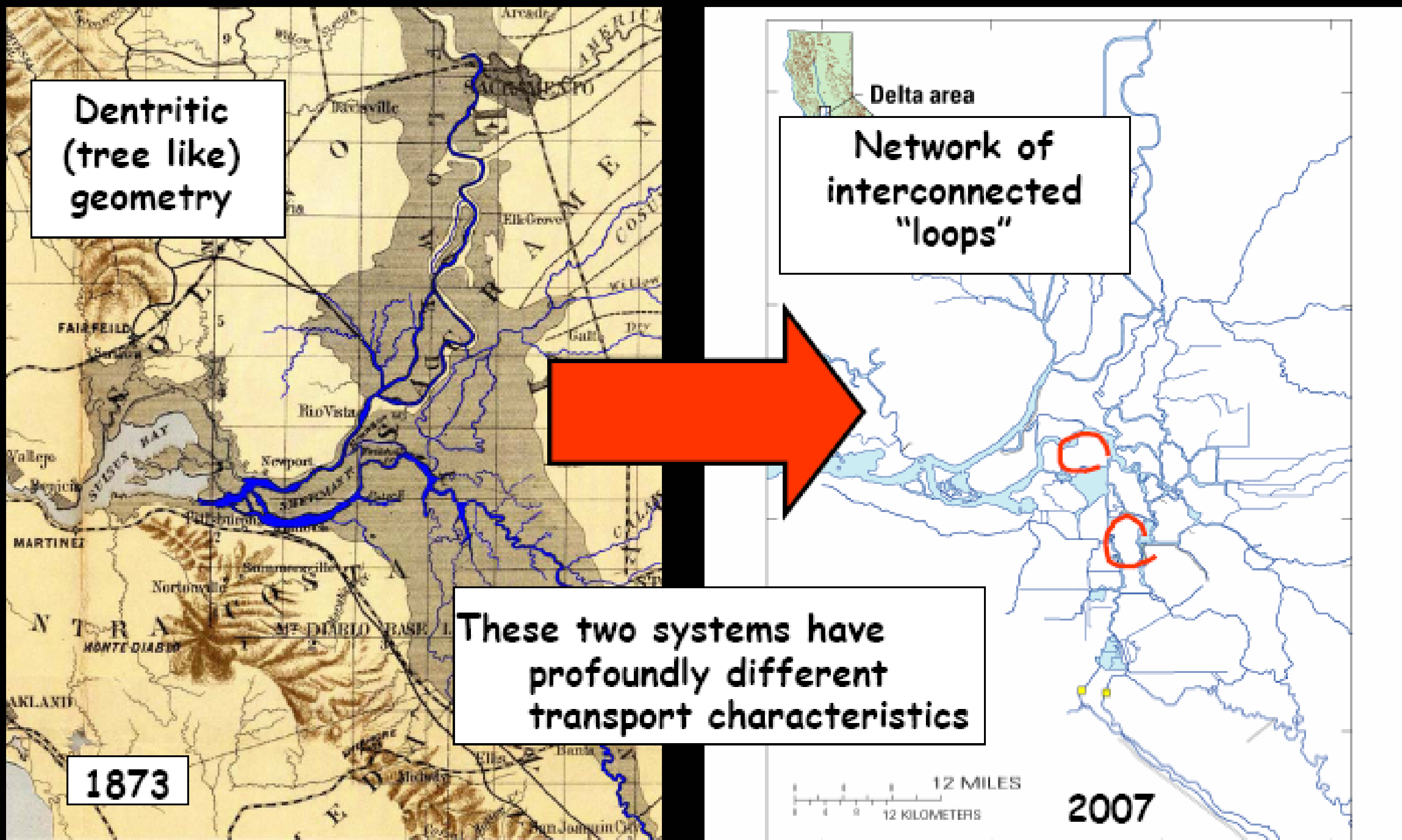


Slide from Jon Burau Presentation: Variable Delta - A Hydrodynamic Perspective

Burau's Historic Versus Current Habitat View

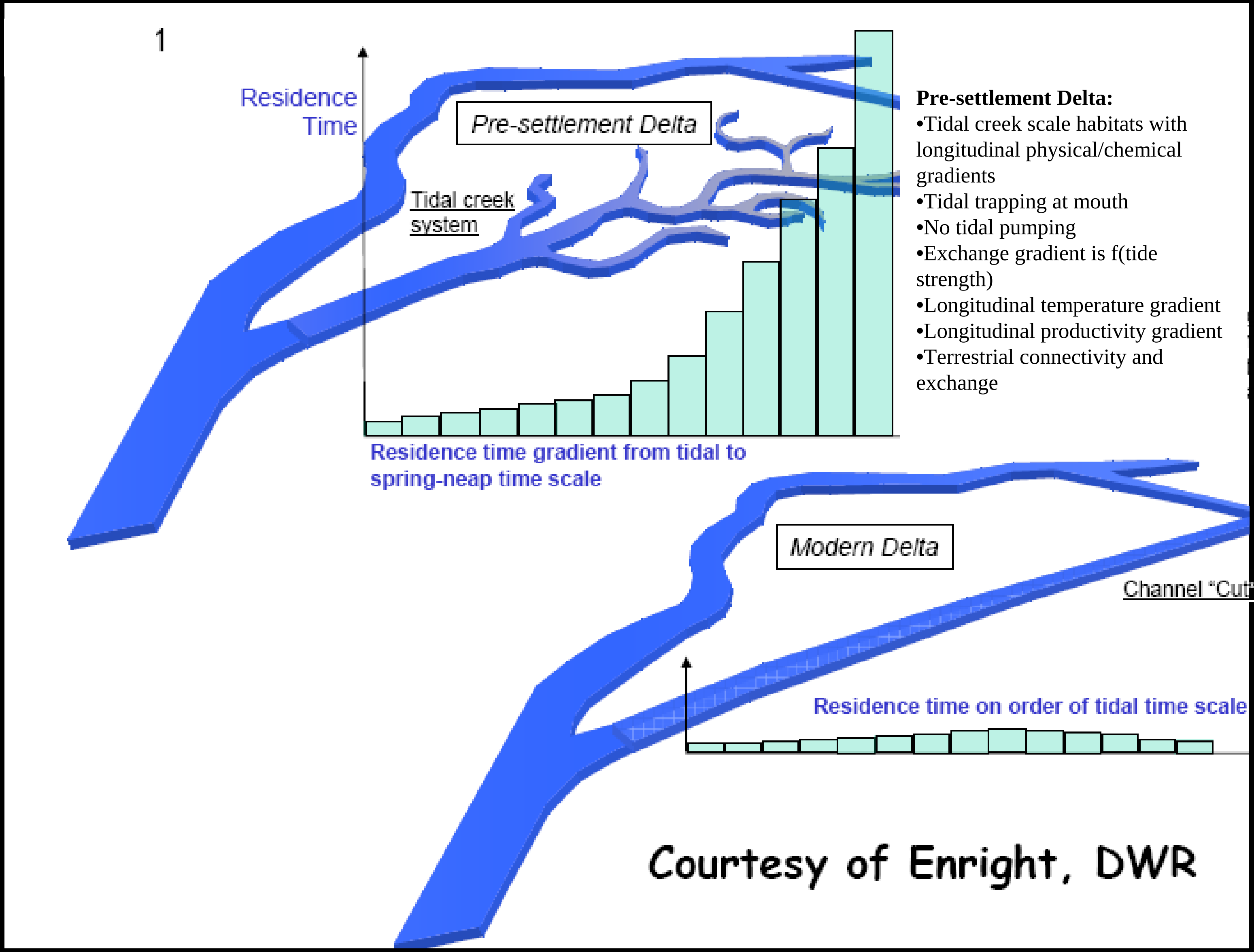
(1) Agricultural Reclamation

The geometry of the Sacramento/San Joaquin Delta has been incredibly manipulated by man



Slide from Jon Burau Presentation: Variable Delta - A Hydrodynamic Perspective

Homogenized and Connected Channels



Slide from Jon Burau Presentation: Variable Delta - A Hydrodynamic Perspective

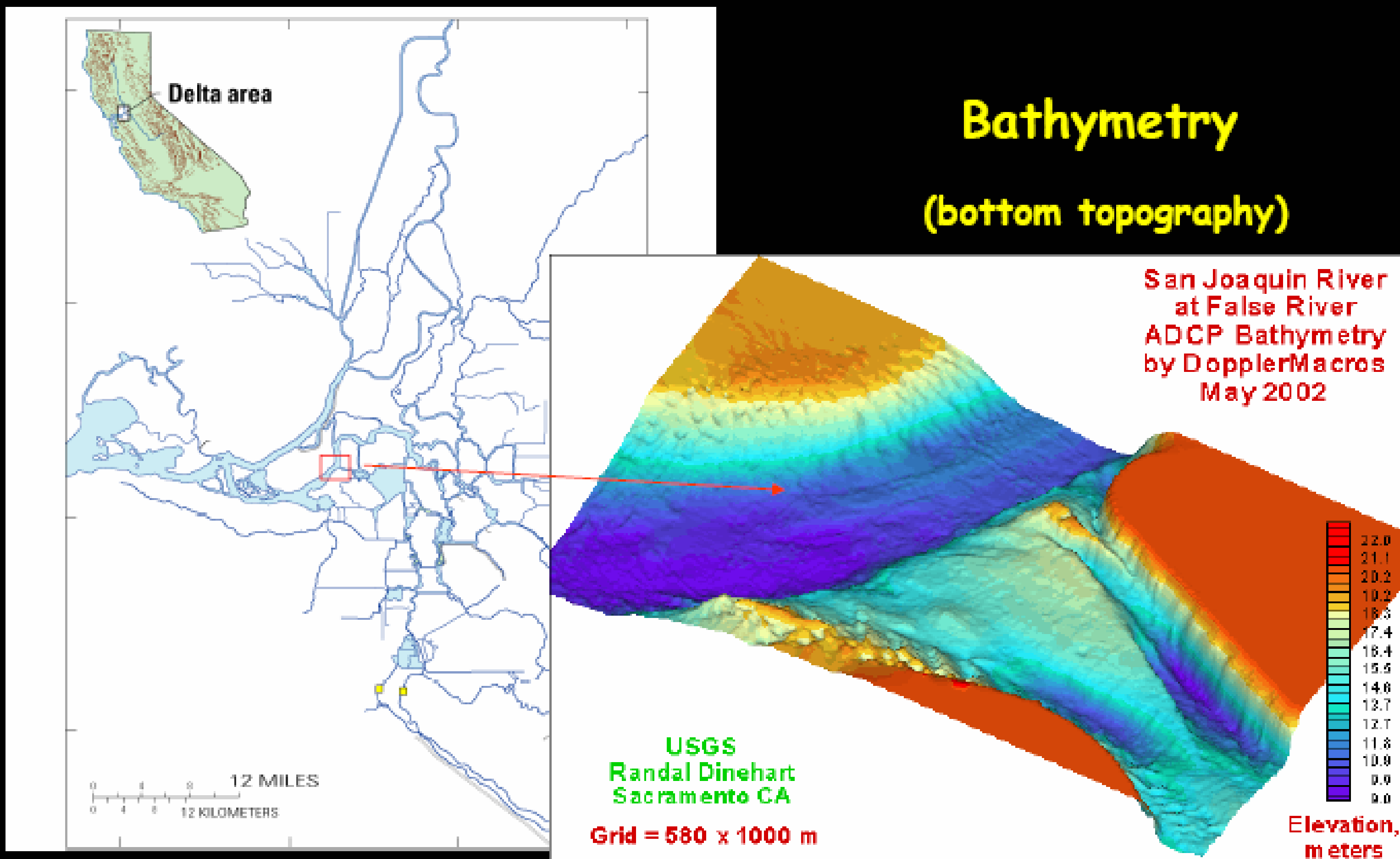
Most Common Delta Channel Shape

What do I mean by Geometry?

Horizontal Plan Form

Bathymetry

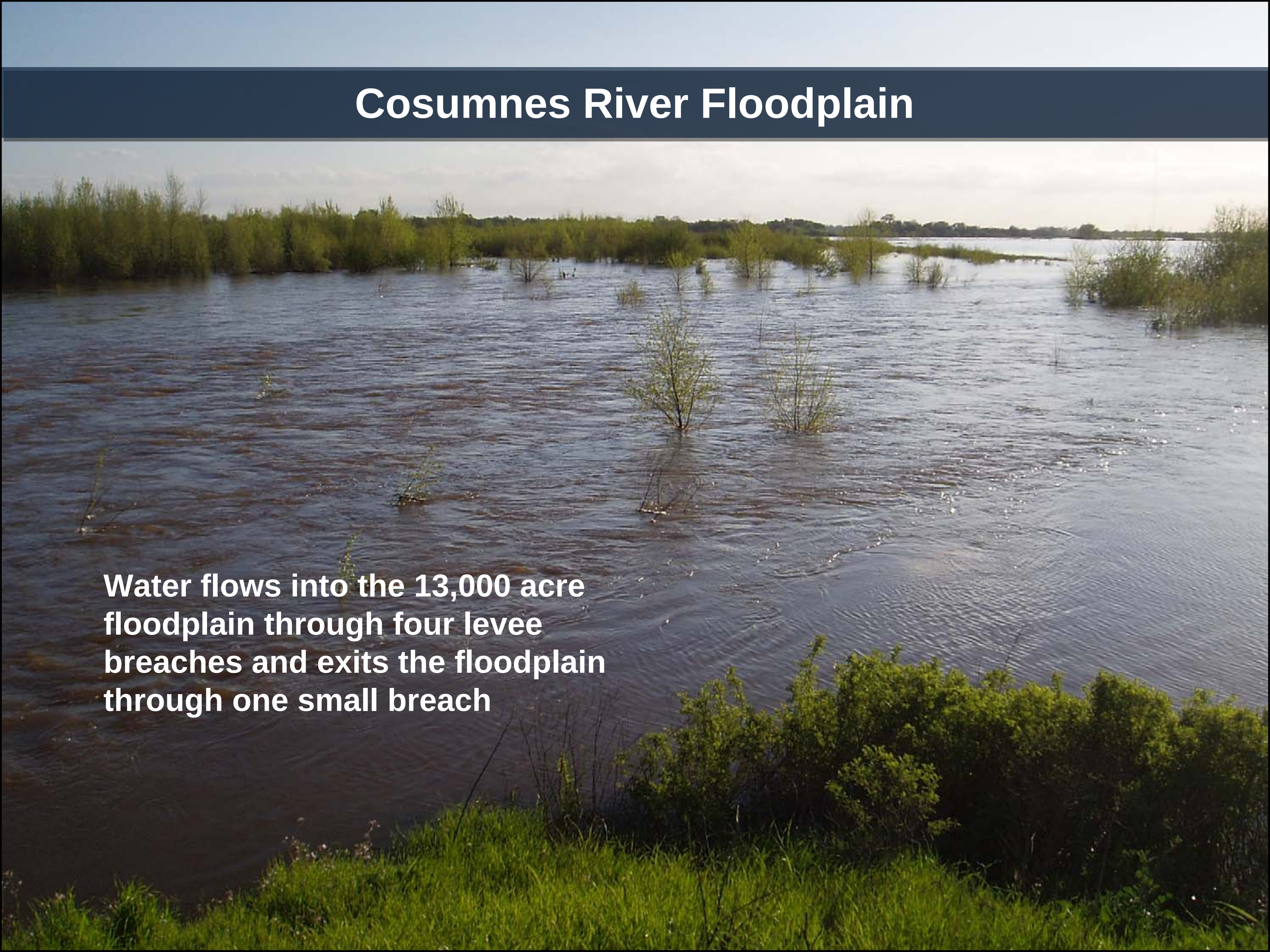
(bottom topography)



Slide from Jon Burau Presentation: Variable Delta - A Hydrodynamic Perspective

SWRCB "functions"

Cosumnes River Floodplain



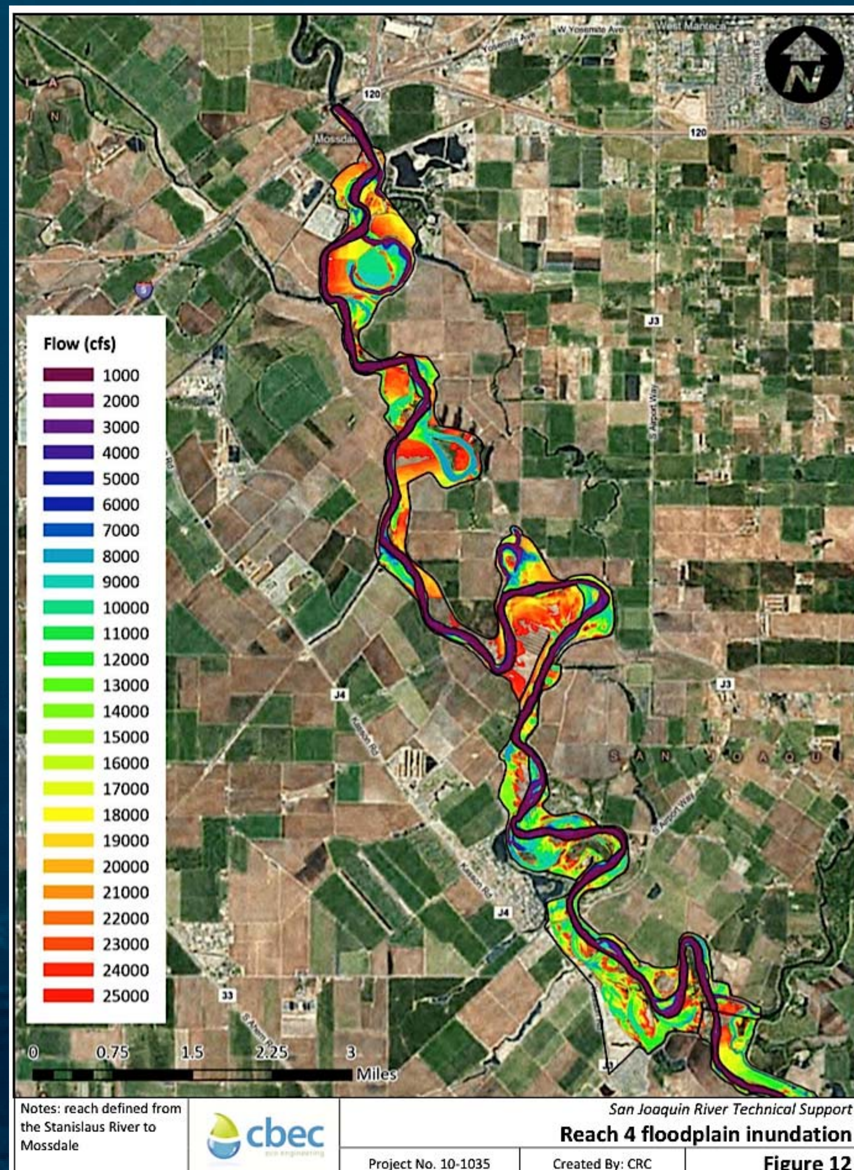
Water flows into the 13,000 acre floodplain through four levee breaches and exits the floodplain through one small breach

Yolo Bypass

Most water enters the bypass through Fremont Weir and flows 36 miles across 59,305 acres of cultivated and natural land

San Joaquin River has No Equivalent Habitat

San Joaquin River Floodplain Model



Higher Flows Don’t Make Floodplain Habitat

In absence of floodplain connectivity, the functions attributed to higher ‘pulse flows’ cannot be achieved as described by the Flood Pulse Concept

The flood pulse concept in river floodplain systems
Junk et al. 1989

The flood pulse concept: New aspects, approaches and applications – an update
Junk and Wantzen 2003

Velocity and Stage

Effect of Increased Flow in the San Joaquin River on Velocity and Stage

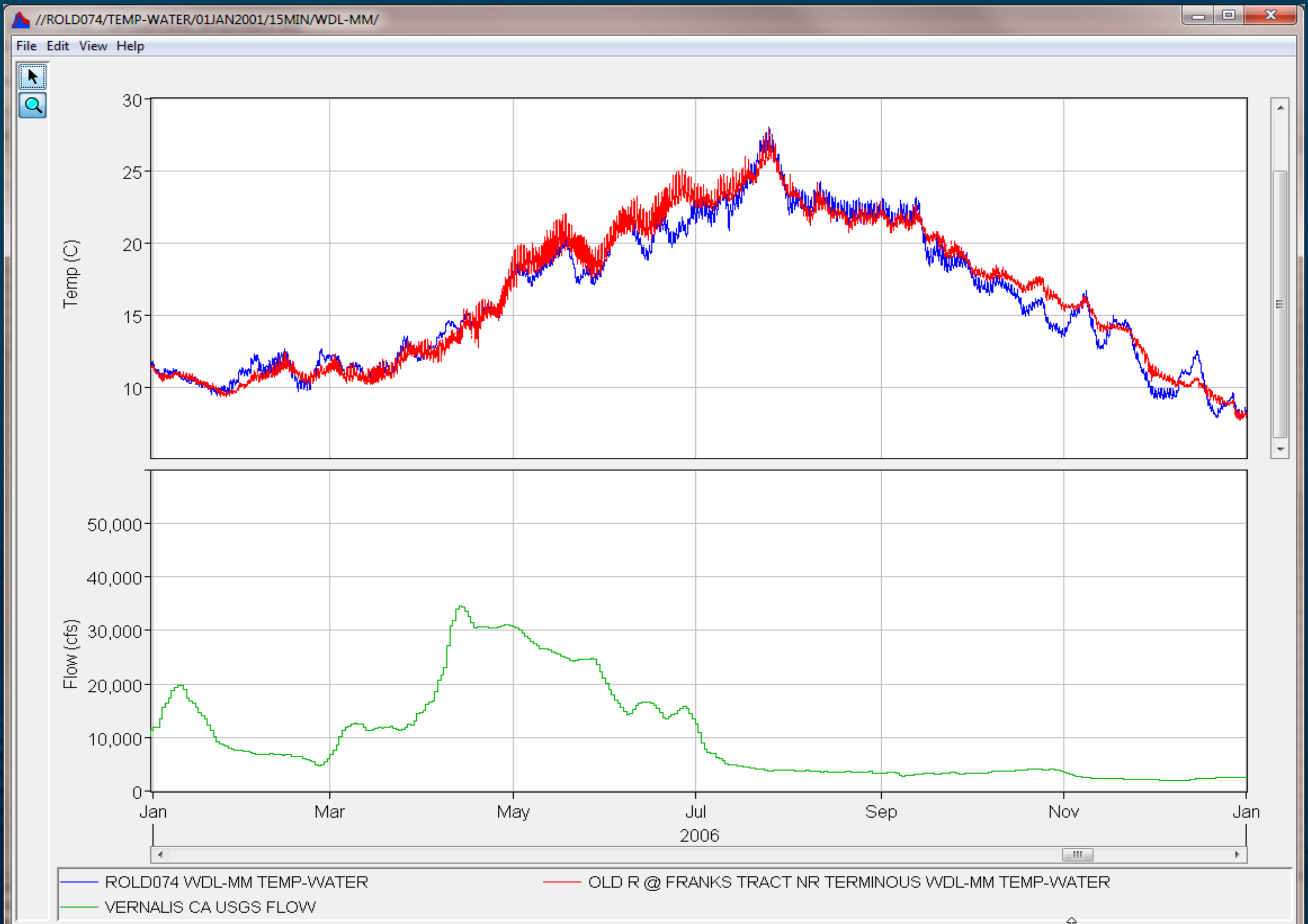
Modeling indicates that increased San Joaquin River flows have little influence over velocities and stage in the South Delta downstream of the Head of Old River.

Instead, tidal influence and exports dominate flows in the South Delta downstream of the Head of Old River.

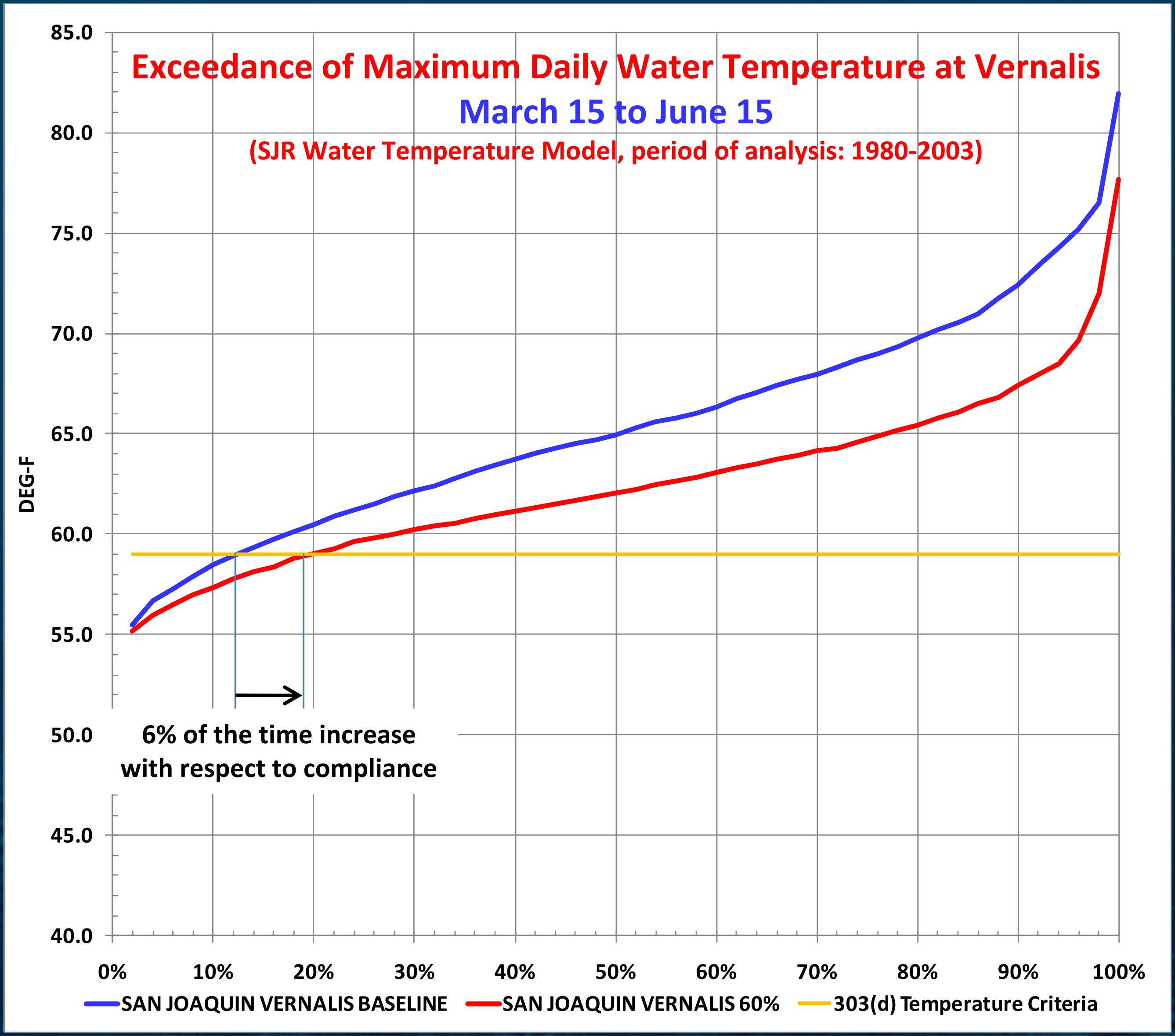
Effect of Increased Flow in the San Joaquin River on Stage, Velocity, and Water Fate, Water Years 1964 and 1988. *Paulsen et al. 2008*

Water temperature

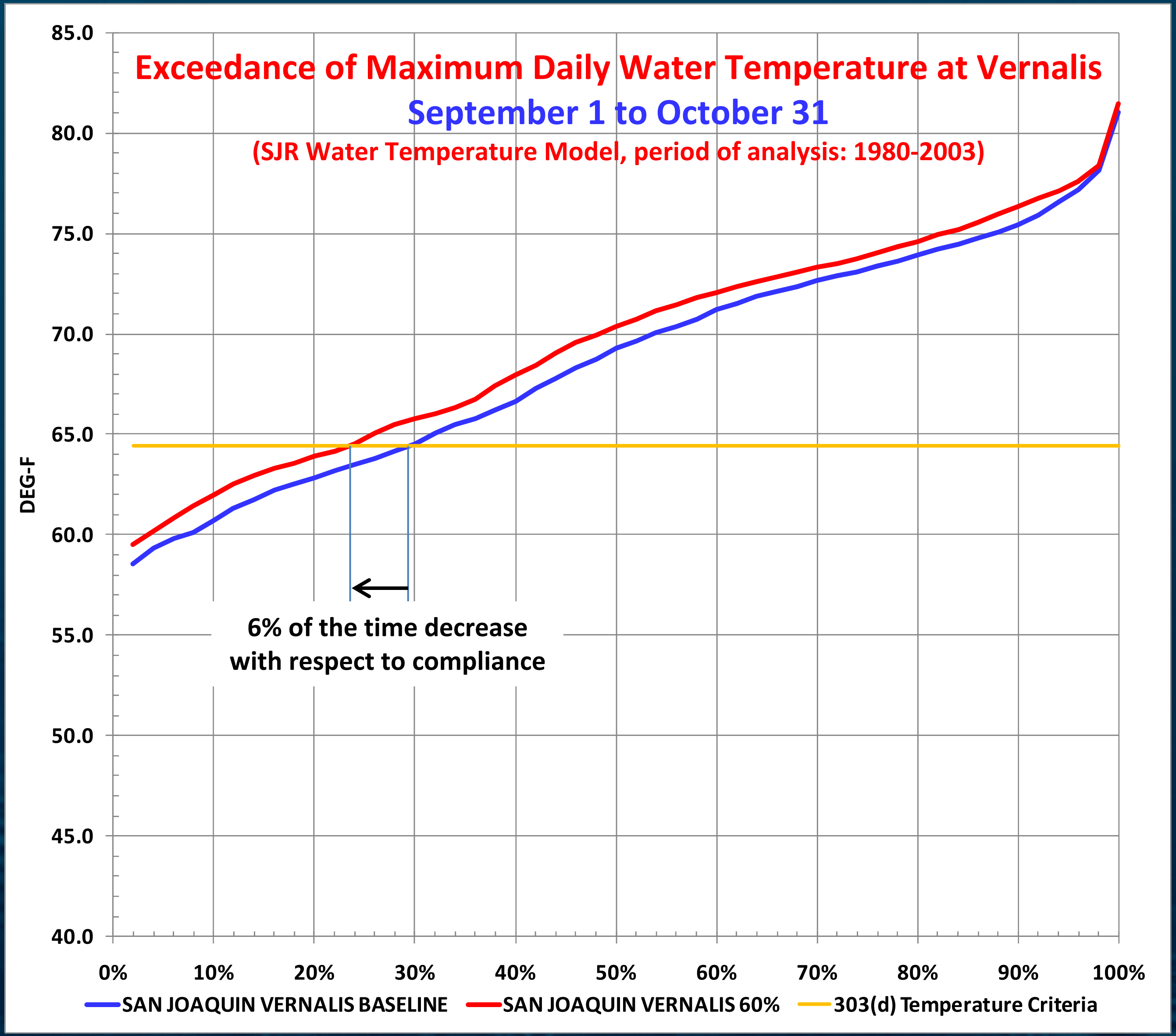
Central Delta vs SJR Water Temperatures



SJR Vernalis Maximum Daily Water Temperatures



SJR Vernalis Maximum Daily Water Temperatures



Single Temperature Standards Rarely Very Meaningful

Water temperature, while easy to measure, is not a simple factor from both a physical and biological perspective. Thus single temperature standards (e,g., 18ºC [64ºF] is often given as maximum permissible temperature for salmon waters) are rarely very meaningful.

The ability of individual salmon to survive, tolerate, or thrive at a particular temperature is the result of a combination of recent thermal history (i.e., acclimation), availability of thermal refuges, length of exposure time, daily temperature fluctuations, genetic background, life stage, interactions with other individuals and species, food availability, and stress from other factors (e.g., pollution).

Rebuttal Expert Report of Professor Peter B. Moyle: San Joaquin River what?

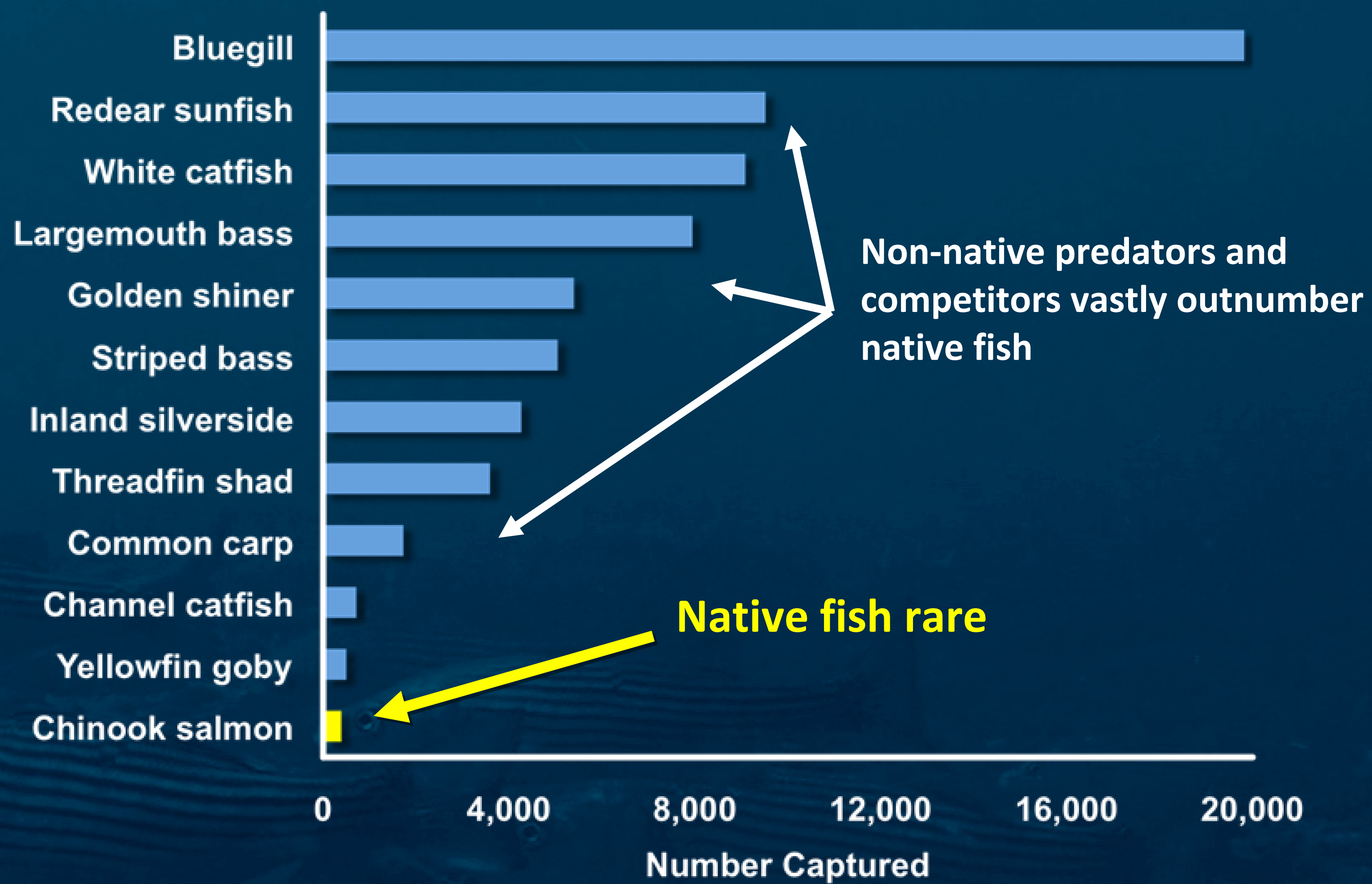
Contaminants

'Dilution is not the solution to pollution'

Which contaminants?

Factors outside your control

The Delta is Now Dominated by Non-native Species



Feyrer and Healey 2003

All non-native predators deliberately introduced

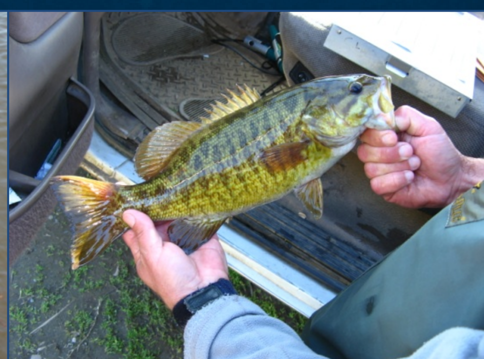
Striped Bass

Crappie

White Catfish

Channel Catfish

Largemouth



Smallmouth

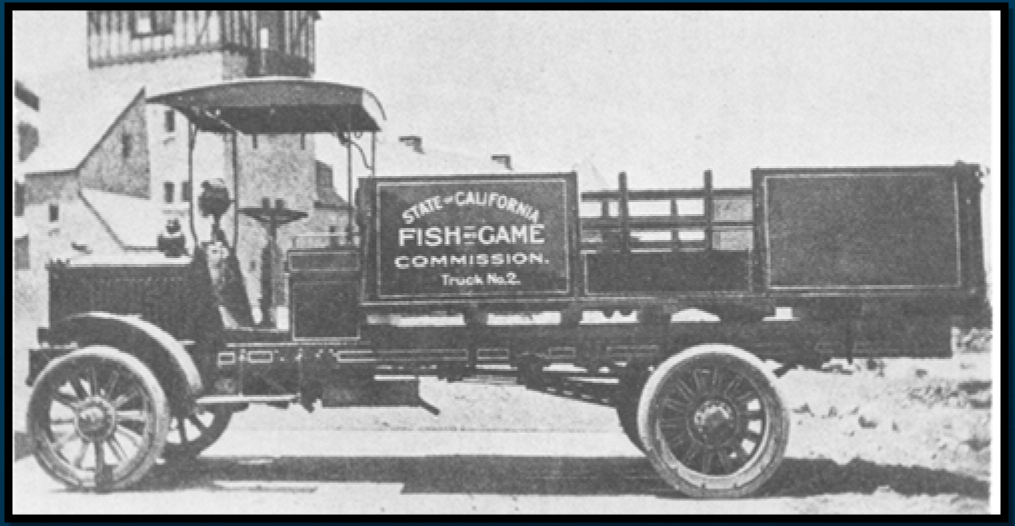
Redeye Bass

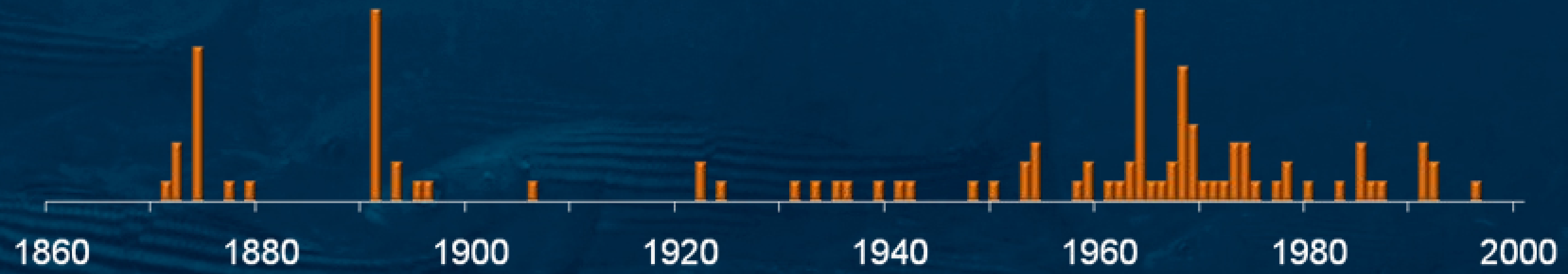
Spotted Bass

Moyle and Nichols 1974; Brown and Moyle 1993; Dill and Cordone 1997

Majority of non-native fish deliberately introduced by CDFG

The majority (69%) of California fish introductions were made by the California Fish and Game Commission and CDFG.





Non-native Fish Introduction Timeline

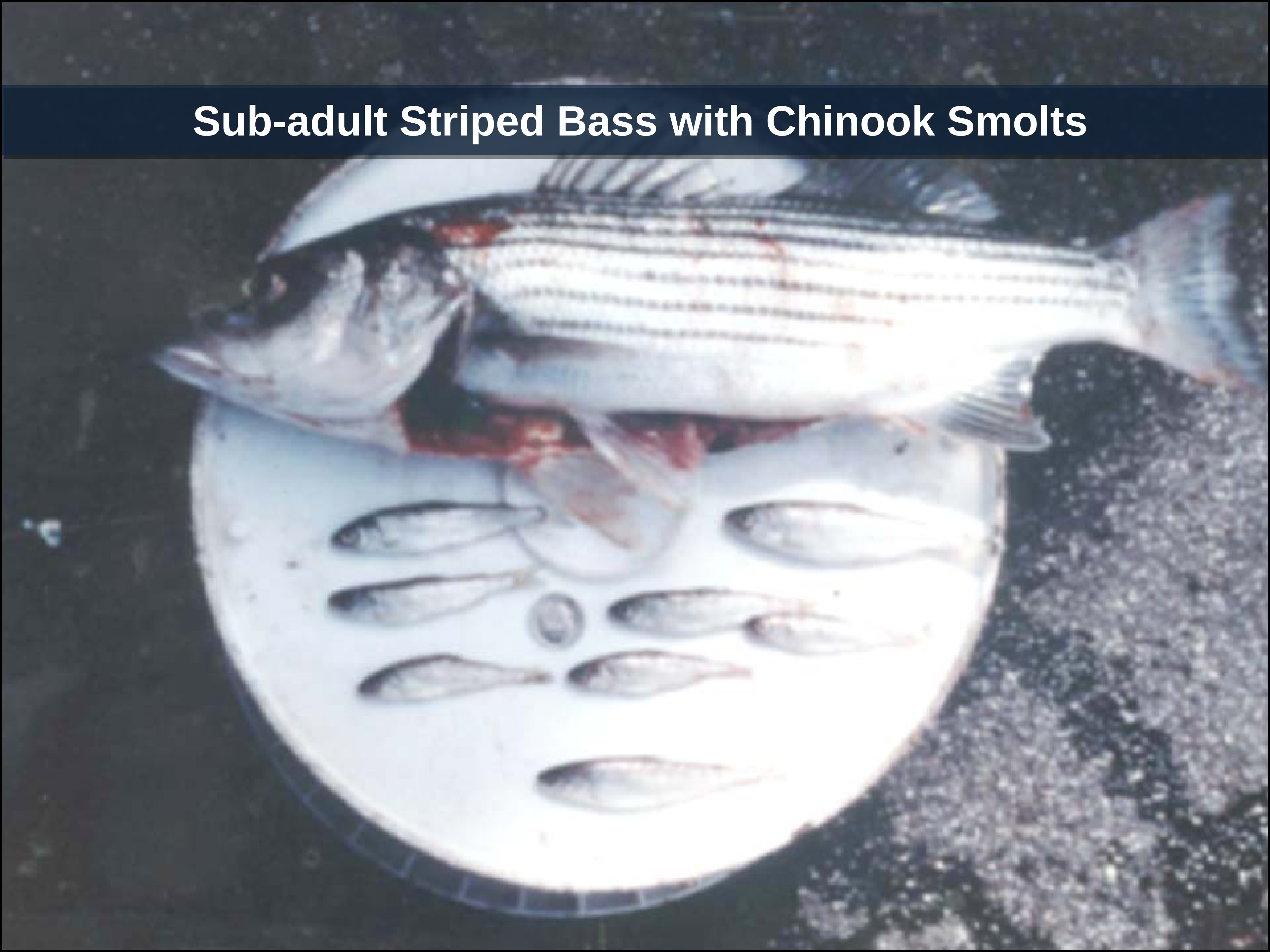
Cohen and Moyle 2004

Introduced Fish Threaten Native Species

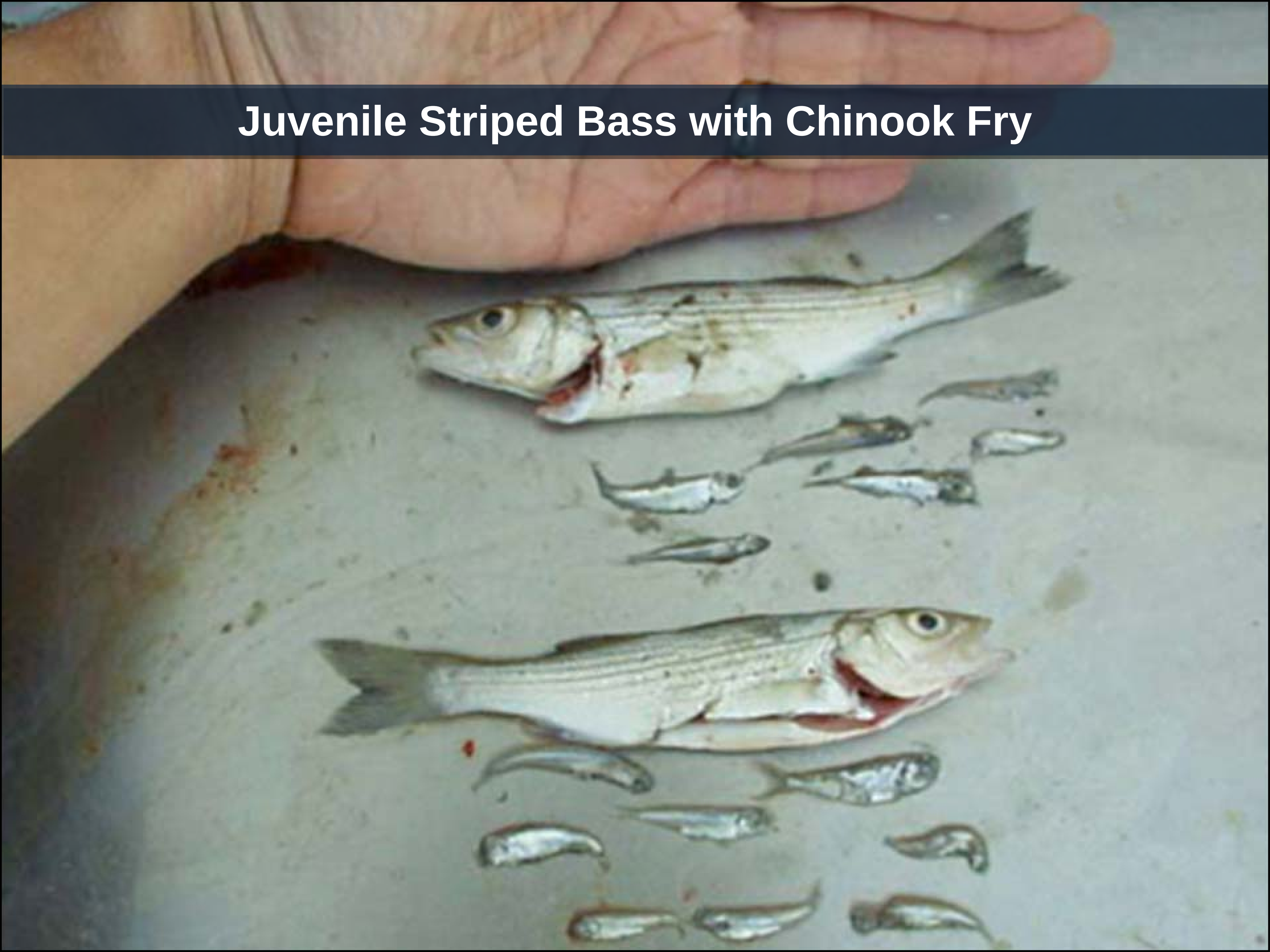
"Invasive species represent one of the most serious obstacles to preservation and restoration of listed native species."

Delta Ecological Principals
Michael Healey 2007

Sub-adult Striped Bass with Chinook Smolts



Juvenile Striped Bass with Chinook Fry



What does NMFS think?

(1) Predation on winter-run Chinook salmon is a "major stressor" with very high importance

(2) Restoration for salmonids will require, among other actions, "significantly reducing the nonnative predatory fishes that inhabit the lower river reaches and Delta"

(3) Reducing abundance of striped bass and other non-native predators must be achieved to "prevent extinction or to prevent the species from declining irreversibly"

NMFS draft Recovery Plan for Central Valley salmon and steelhead

Hanson 2009; NMFS 2009

Cheap, Easy, Effective, Immediate

Elimination of striped bass fishing regulations would result in a 60-70% reduction in the overall abundance of striped bass inhabiting the Bay-Delta.

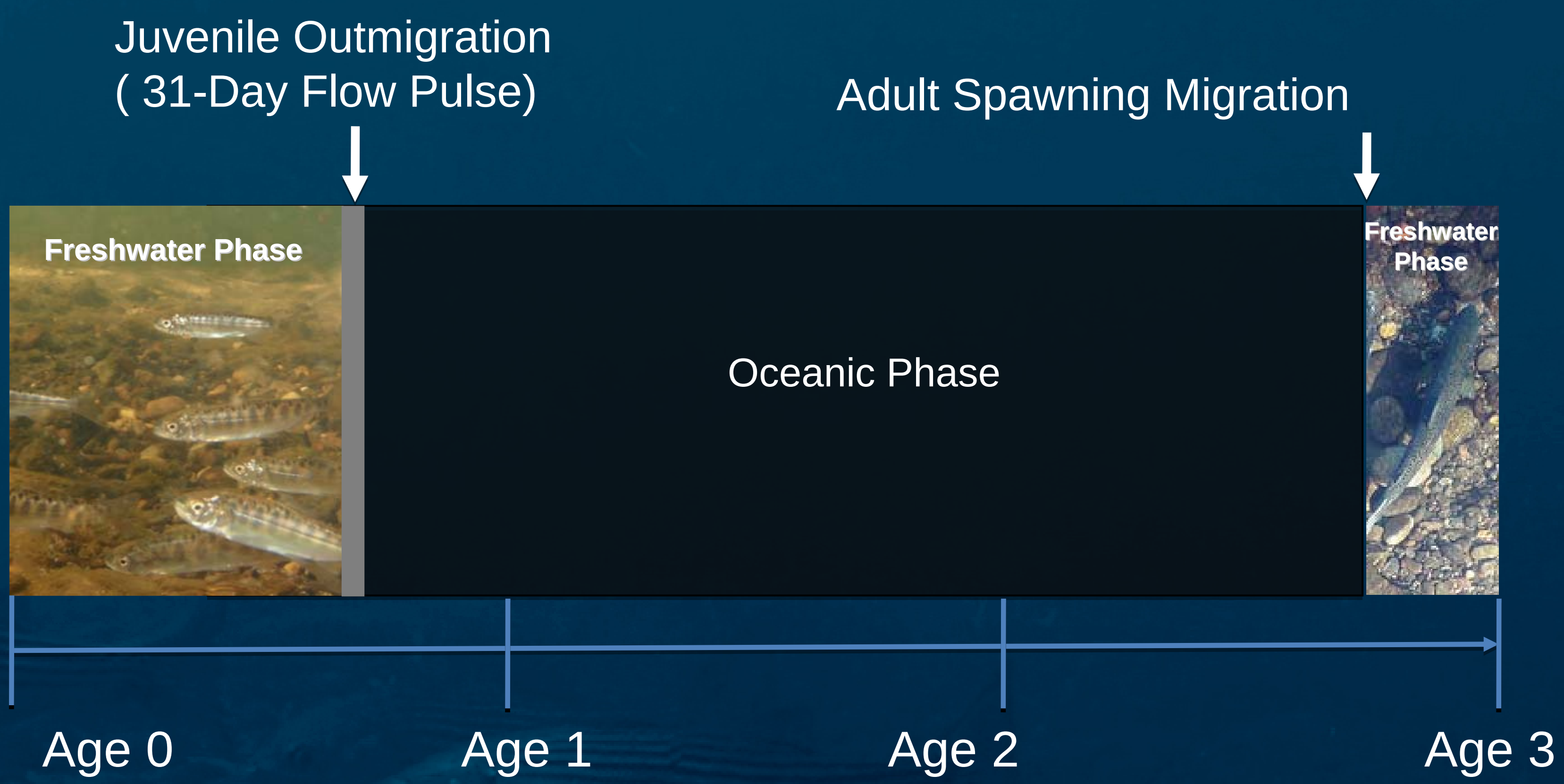
Expert Report of Dr. David H. Bennett Per Rule 26(a)(2).
Bennett 2009

Ocean Conditions

"The NMFS has determined that poor ocean conditions are a major factor of the low 2008 SRFC [Sacramento River Fall Chinook] abundance. The NMFS also expects these poor conditions to continue affecting subsequent years' SRFC escapements in the near future."

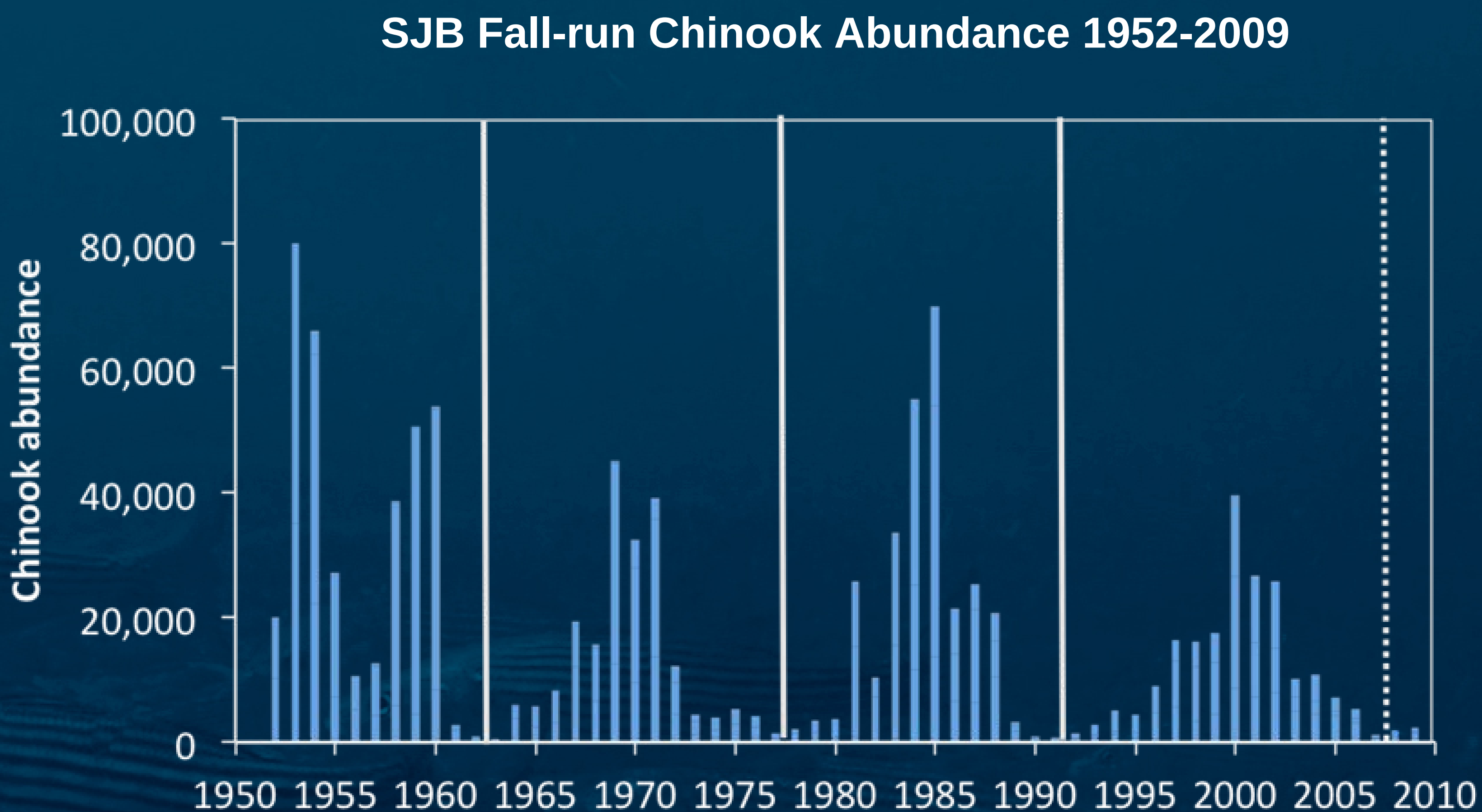
California Fish and Game Commission Statement of Proposed Emergency Regulatory Action, 2008

The *Black Box* Approach to Modeling and Management



Does the survival of SJR salmonids in the ocean affect returning adult abundance?
Does ocean survival vary annually?

"Boom and near-bust cycles"




HORB

Over a restricted set of flows measured at Vernalis when the HORB was in place . . . a strong positive relation between estimated survival rates and Vernalis flow was evident.

Summary Report of The Vernalis Adaptive Management Plan (VAMP) for 2000-2008

San Joaquin River Technical Committee. 2008

There is no statistically-significant relation between estimated CWT survival rates and Vernalis flow . . . when the HORB has not been in place.

Summary Report of The Vernalis Adaptive Management Plan (VAMP) for 2000-2008

San Joaquin River Technical Committee. 2008

SWRCB in 1995 and 2006 WQCP recognized the value of the HORB and directed it to be installed and operated.

HORB

Outmigrating smolts that enter Old River have lower survival than fish that remain in the San Joaquin River. VAMP studies have shown only 2% of smolts that enter Old River make it through the Delta and most of those are fish salvaged at the pumps and trucked.

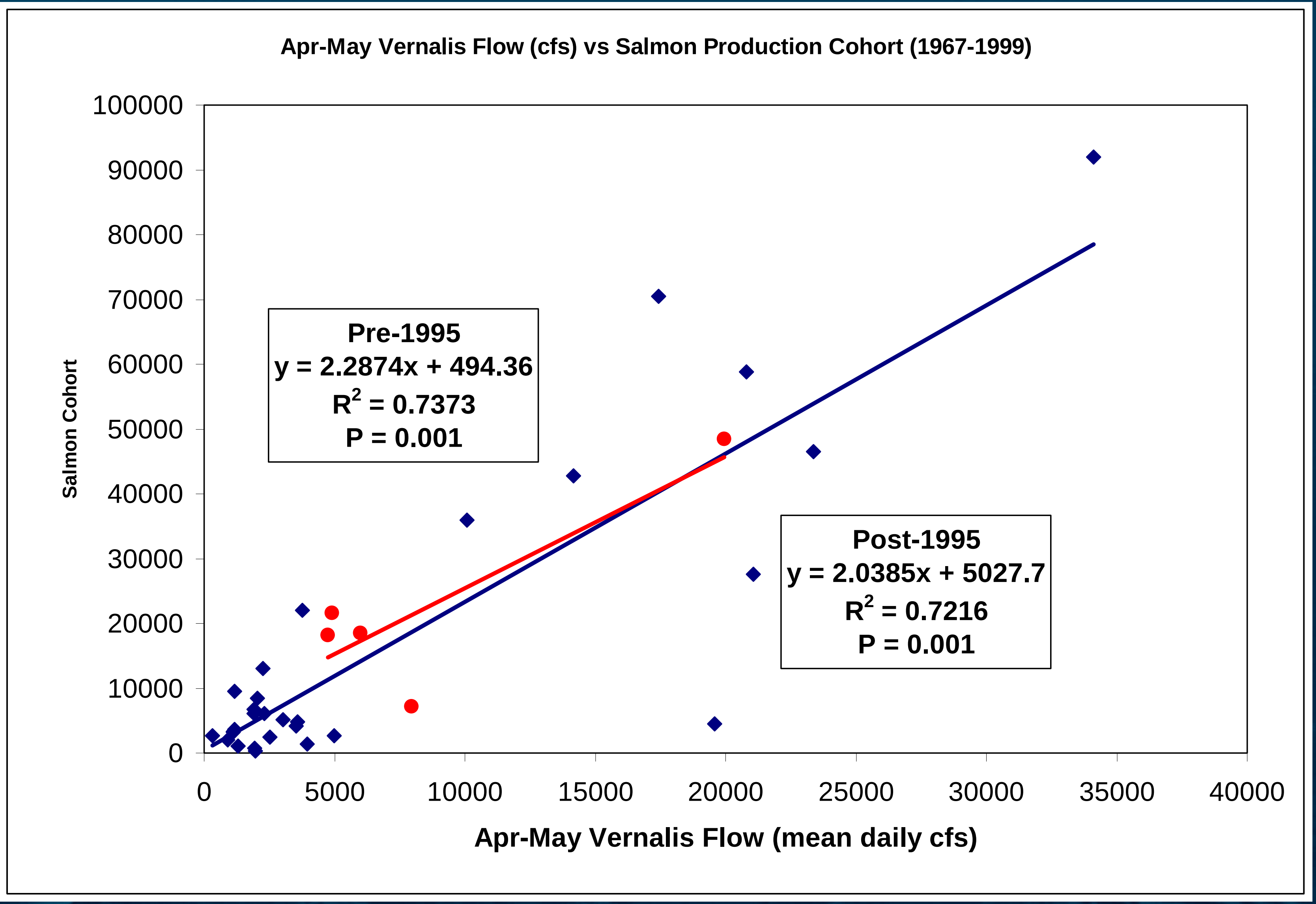
Without a fish barrier at HOR 67-78% of outmigrating Chinook become entrained in Old River.

Distribution and joint fish-tag survival of juvenile Chinook salmon migrating through the Sacramento-San Joaquin River Delta, 2008
Holbrook et al. 2009

If flow is so important to survival,

why isn't the relationship obvious?

More Flow = More Salmon



SWRCB Evidence for *More Water = More Fish*

Cited as Evidence in Draft Report	Baseline Data	Not appropriate for setting management goals because:	Peer-reviewed?
DFG 2005	Escapement and spring flows at Vernalis	Peer review indicated the analysis and recommendations were FLAWED	Yes, rejected
AFRP 2005	Escapement and spring flows at Vernalis	Used simple linear regression to predict fish abundance from average spring flow at Vernalis--the same approach taken by DFG and rejected by peer review	No
TBI/NRDC 2010	Escapement and spring flows at Vernalis	Used a logistic model that only considered flow; predicted that flows of 10,000 cfs are “likely” to double salmon production but DID NOT provide any definition of "likely" or quantify uncertainty surrounding this estimate	No
Baker and Morhardt 2001	Escapement and spring flows at Vernalis	The relationship between flow and survival was “not well quantified,” and the lack of relationship between flow and escapement was likely due to other factors	Yes

DFG Salmon Population Model History

Version	Date	Substance
1.0	March 2005	Intended to achieve the Narrative Salmon Doubling Goal. Peer Reviews were strongly negative: •Ignored a logical positive relationship between spawners, juvenile production, and escapement; •Non-flow factors could be just as important if not more important than flow (VAMP 2005 Report); •HORB was rarely installed during the 1967-2000 period; •Significant scatter in the relationship between striped bass and escapement, but no attempt to correlate the scatter plot; •DFG omitted 1989 from the regression analysis because that year was an outlier, with a much higher smolt estimate compared to similar years.
1.5	August 2008	Continued the empirical emphasis originating from model v1.0. Salmon Population Model was never provided for the public to examine. Again excluded year 1989.
1.6	May 2009	Addressed some, but not all of, prior criticisms: •No statistically significant difference between the regression lines with the HORB in and the HORB out; •Added hatchery augmentation; •Used historic tributary flow contribution to Vernalis flow to derive a relationship between tributary flow and Vernalis flow; •The year 1989 as an outlier is not addressed.
2.0	TBD	Is supposed to address peer review concerns regarding continued omission of factors such as exports, water temperature, early spring and fall flows, fry production, harvest rates, etc.

Any success of CDFG's plug and play model in predicting escapement is likely due to having previous year's escapement as input!

- **Each of the individual components' model suffers from *poor fits*: outliers, small coefficient of variation, small number of overly influential observations, non-robustness, non linearity (after nonlinear transformation), poor Q-Q plots, etc.**

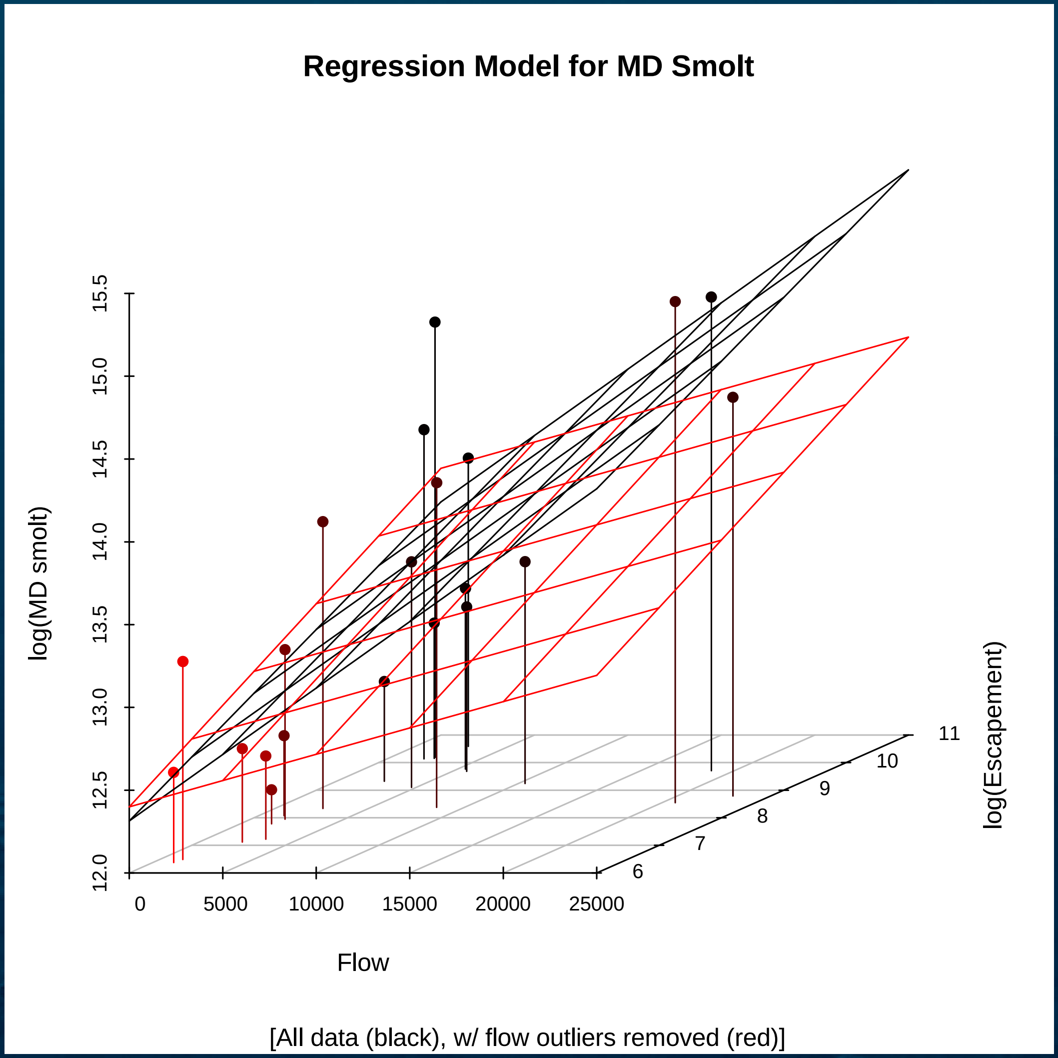
- **"Chaining" models *hides uncertainties at each level* and causes dependent errors**

- **Focusing on flow alone *ignores important sources of mortality* like ocean conditions, exports, predation, water temperature, etc.**

Component of CDFG's Plug and Play Model: Mossdale Smolt Production

(1)Weak relationship between flow and smolt production

(2)Small number of overly influential observations with high flow levels inflating "upward" trend. Fit changes dramatically when these are removed



Let’s review

2006 SWRCB WQCP Recommendation #10

The DFG, USFWS, and NOAA Fisheries, in coordination with the IEP and other interested parties, should ***compile information and conduct specific studies*** *to determine whether and what changes should be made to the Spring Flow Objectives to protect SJR Chinook salmon and steelhead, pelagic organisms and other applicable fish and wildlife species. These entities also should* ***conduct analyses to determine whether it is appropriate to revise the methodology for determining when the higher spring flow objectives apply,*** *to better reflect hydrologic condition within the SJB. In addition, these entities should* ***conduct modeling to determine the water cost*** *of the various flow proposals and the sustainability of such proposals given the current water storage capacities and consumptive use needs within the SJB. These entities should* ***present any available information from such studies during the SWB's workshop on the SJR flow issues.***

Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
December 13, 2006

"It is undisputed that application of a quantitative life cycle model is the preferred scientific methodology. Based on the preponderating expert testimony, FWS had the time and ability to prepare the necessary life-cycle model. FWS made a conscious choice not to use expertise available within the agency to develop one. . . In light of uncontradicted expert testimony that life-cycle modeling is necessary and feasible, FWS's failure to do so is inexplicable."

2006 SWRCB Finding

*"The San Joaquin River flow objectives are **not changed** in the 2006 Plan due to a **lack of scientific information** on which to base any changes."*

Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
December 13, 2006

Recommendation

1. ***Develop life cycle model in an open, collaborative process as set forth in SWRCB 2006 Order.***

2. ***If this Draft Report is sent for peer review, then send regression analysis/Fish & Game model as a separate component to be reviewed by statisticians.***

    - ***Has a causal relationship between flow and escapement/survival been well established statistically?***
    - ***Do the statistical analyses provide a reliable basis for setting flow policies to achieve quantitative goals***
    - ***How large are the margins of error in predictions based on the statistical models?***