Collaborative Adaptive Management Team
Investigations on Understanding Population Effects and Factors that Affect Entrainment of Delta Smelt at State Water Project and Central Valley Project

Delta Science Program Review
November 14th, 2014

Lenny Grimaldo (ICF International)
Rick Deriso (I-ATTC)
Edward Gross (RMA)
Josh Korman (Ecometrics)
Bryan Manly (Consultant)
Mark Maunder (I-ATTC)
Matt Nobriga (USFWS)
Pete Smith (USGS retired)

Key points to know about the proposals

- Guidance for proposal development provided through CAMT Progress Report and Workplan Element documents
  - Conceptual models, hypotheses, study questions

- Some proposed methods are subject to revision
  -Not every detail worked out yet

- Investigators are not tasked with identifying legal thresholds and/or actions

- Results and information generated from proposals are not expected to solve all uncertainties underlying delta smelt entrainment dynamics
  -Juvenile entrainment
  -Fall X2

Factors affecting Entrainment

Population consequences

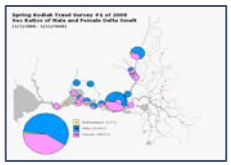
Existing Management Framework

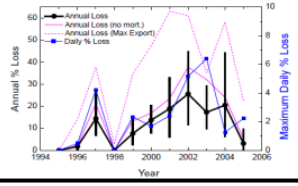
Assessment of impacts

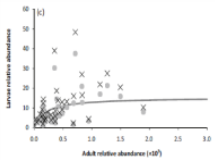
FWS RPA 1

Salvage

OMR







Identify high risk and low risk conditions from historical data

Evaluate entrainment risk for variable boundaries/ distributions

Calculate proportional losses

Determine when entrainment compromises population growth

Proposal I

Proposal II

Proposal III

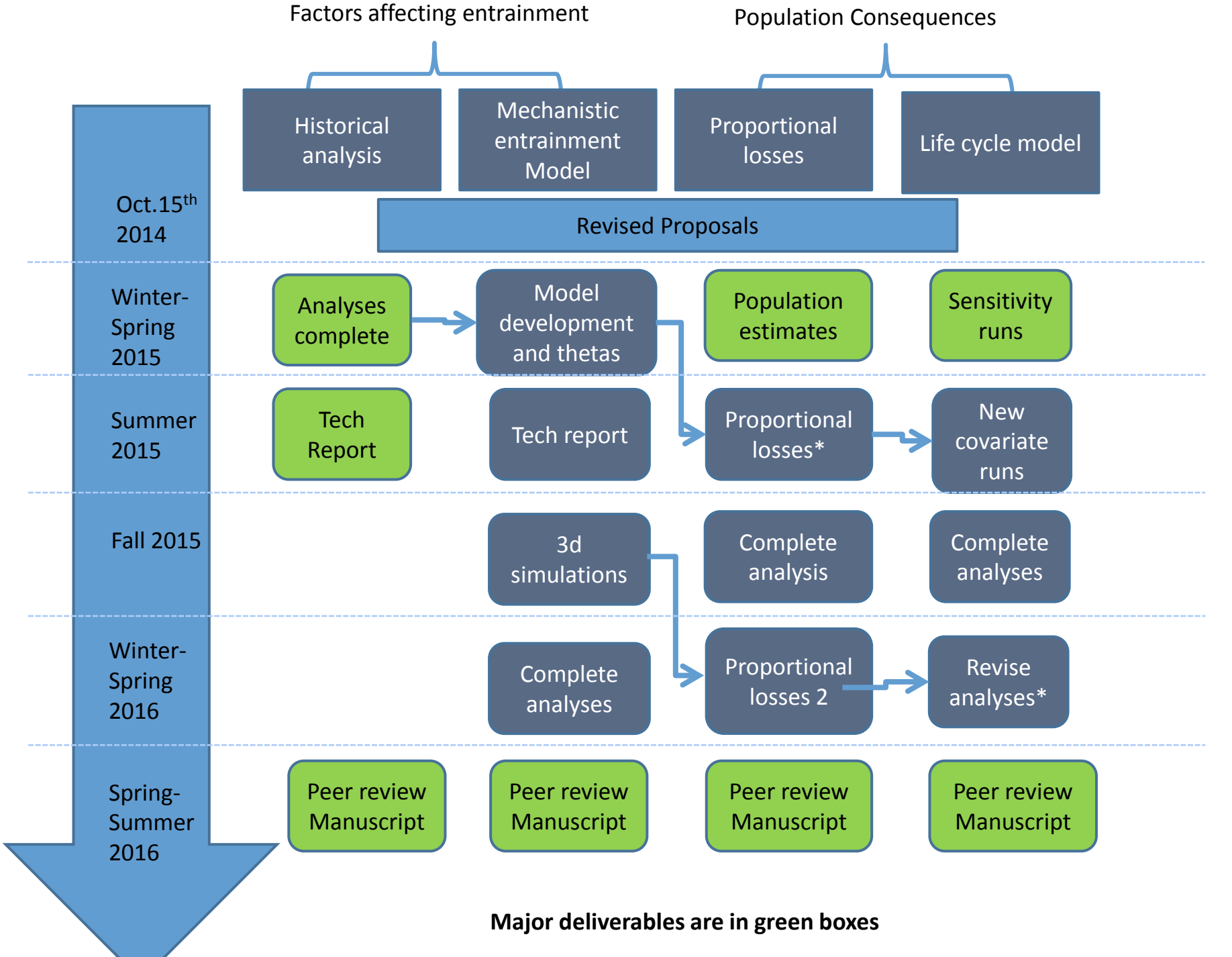
Proposal IV

Re-evaluate thresholds and triggers

Scoping Team Review

Re-evaluate Population Consequences

Elevate to CAMT

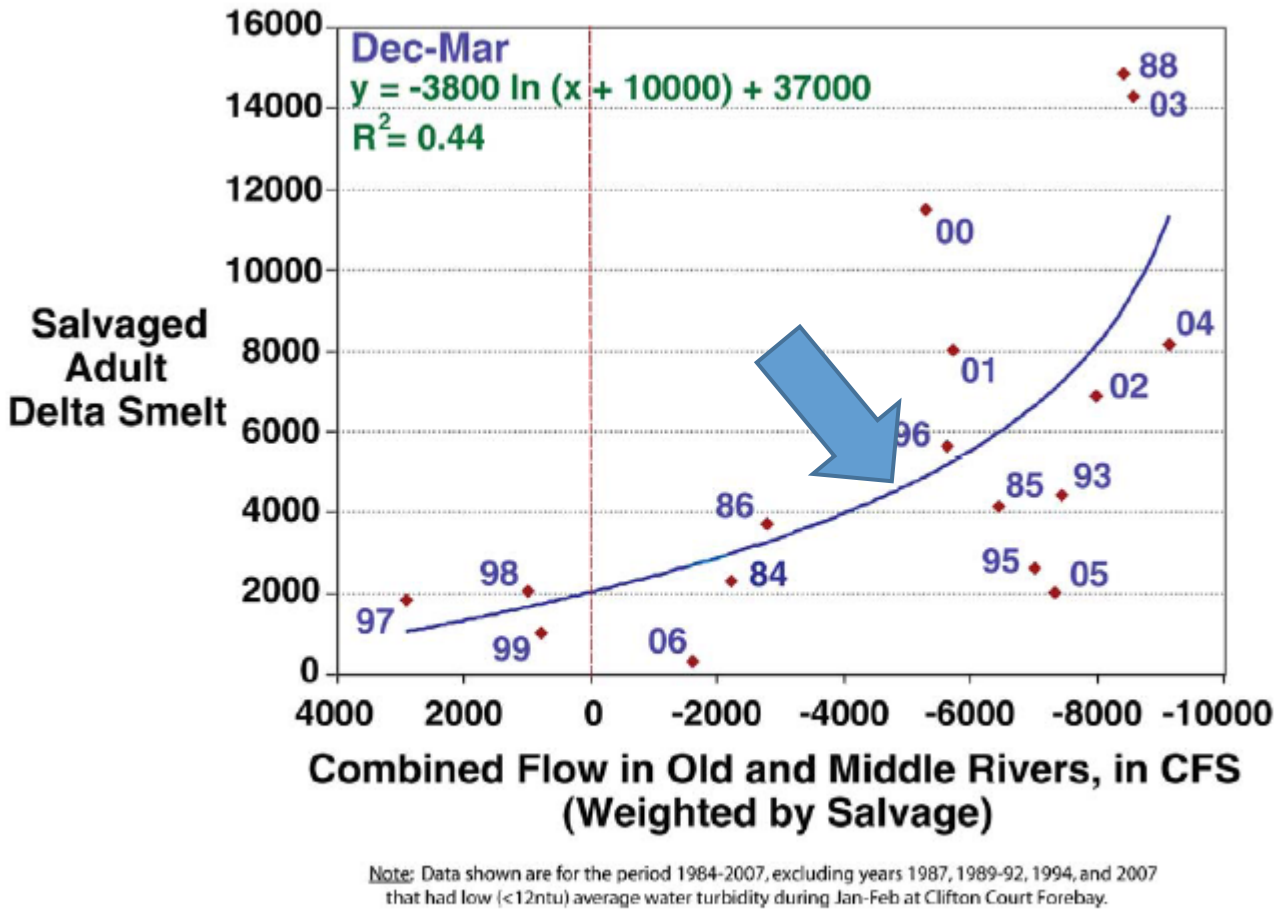

Factors affecting entrainment
Population Consequences
Historical analysis
Mechanistic entrainment Model
Proportional losses
Life cycle model
Oct.15th 2014
Revised Proposals
Winter-Spring 2015
Analyses complete
Model development and thetas
Population estimates
Sensitivity runs
Summer 2015
Tech Report
Tech report
Proportional losses*
New covariate runs
Fall 2015
3d simulations
Complete analysis
Complete analyses
Winter-Spring 2016
Complete analyses
Proportional losses 2
Revise analyses*
Spring-Summer 2016
Peer review Manuscript
Peer review Manuscript
Peer review Manuscript
Peer review Manuscript
Major deliverables are in green boxes

Major Challenges

- Results needed yesterday
- Funding not fully secured yet
- Keep momentum going

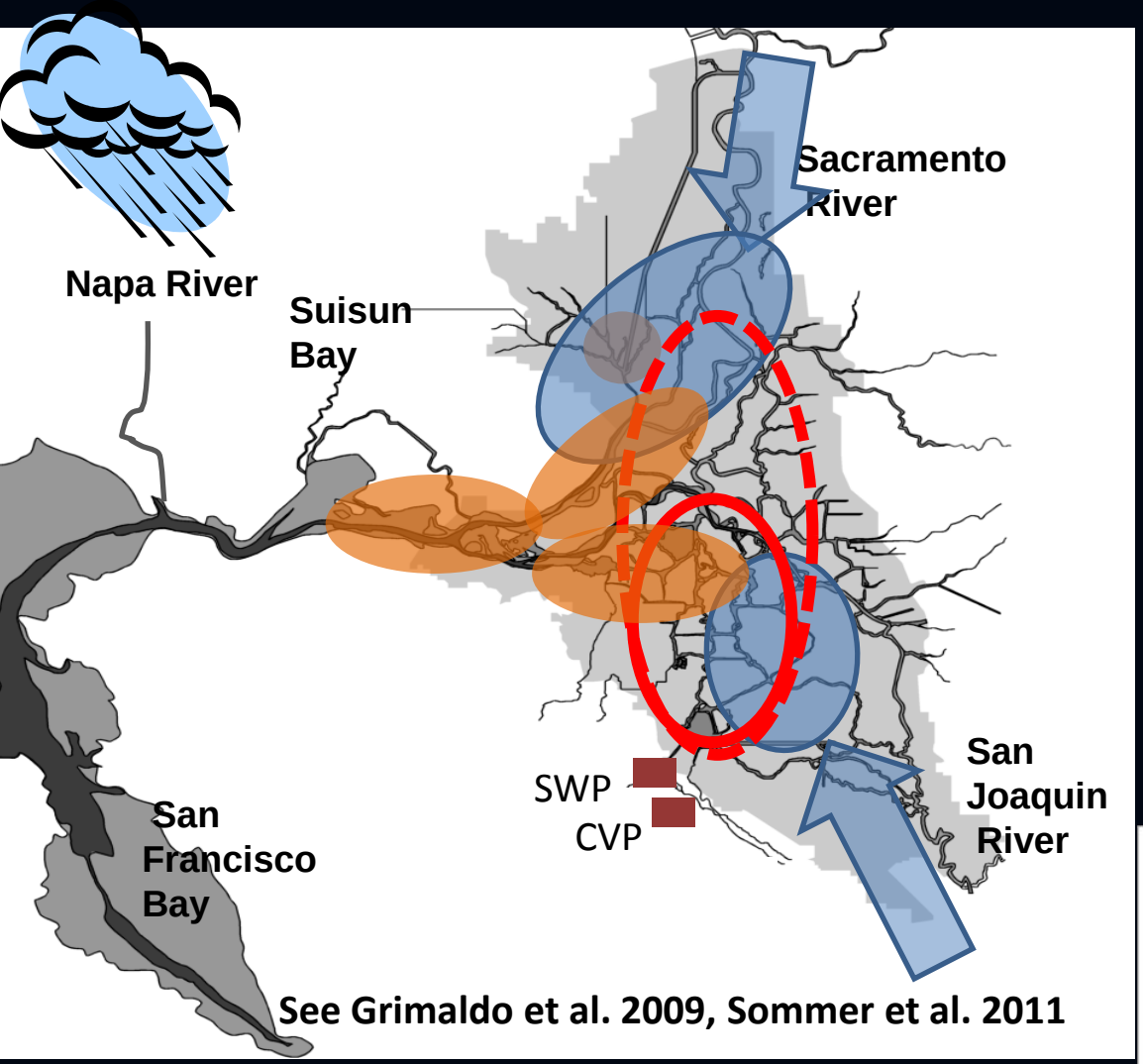
END

Existing RPA Action 2 Threshold



Note: Data shown are for the period 1984-2007, excluding years 1987, 1989-92, 1994, and 2007 that had low (<12ntu) average water turbidity during Jan-Feb at Clifton Court Forebay.

Figure B-13. OMR-Salvage relationship for adult delta smelt. (source, P. Smith). Data from this figure were the raw data used in the piecewise polynomial regression analysis.



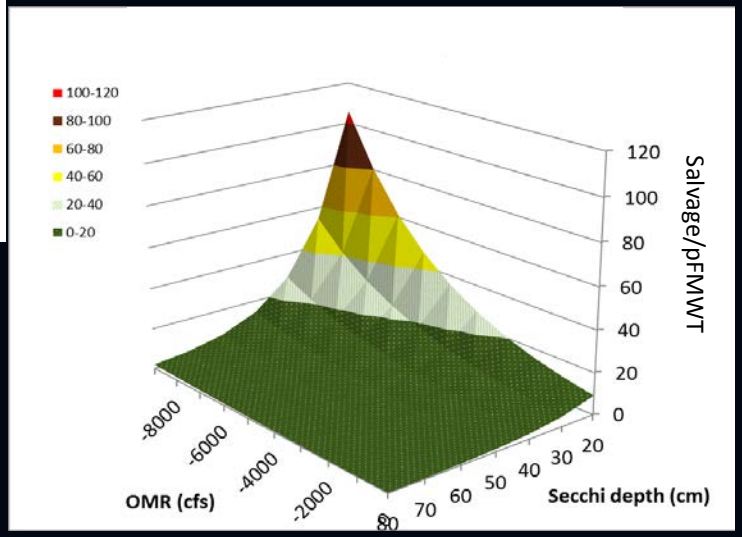
Turbidity

Distribution

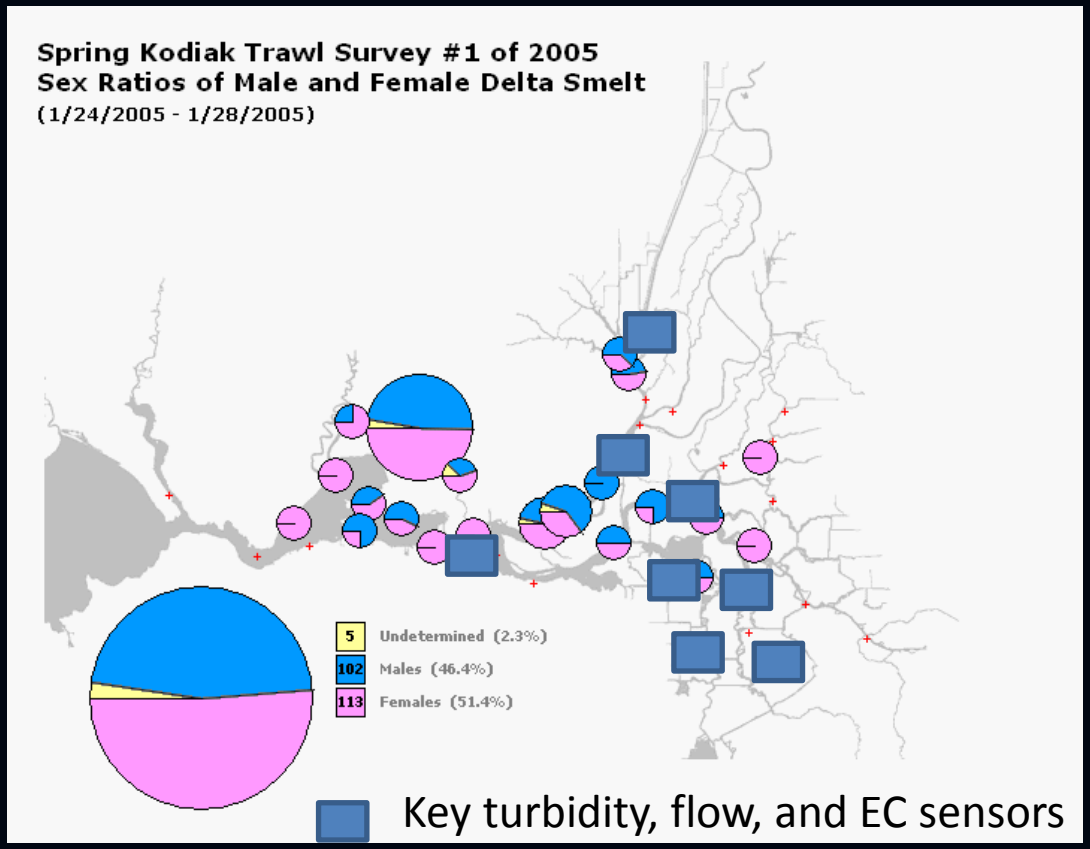
Proposal 1

Beat the historical data silly

-Turbidity
-Fish distribution (prior and current)
-X2, Outflow
-Previous FMWT abundance index value
-Others



Real-time management (evaluation of risk)



ACTION 2: ADULT MIGRATION AND ENTRAINMENT

Objective: An action implemented using an adaptive process to tailor protection to changing environmental conditions after Action 1. As in Action 1, the intent is to protect pre-spawning adults from entrainment and, to the extent possible, from adverse hydrodynamic conditions.

Action: The range of net daily OMR flows will be no more negative than -1,250 to -5,000 cfs. Depending on extant conditions (and the general guidelines below) specific OMR flows within this range are recommended by the SWG from the onset of Action 2 through its termination (see Adaptive Process in Introduction). The SWG would provide weekly recommendations based upon review of the sampling data, from real-time salvage data at the CVP and SWP, and utilizing most up-to-date technological expertise and knowledge relating population status and predicted distribution to monitored physical variables of flow and turbidity. The Service will make the final determination.

Timing: Beginning immediately after Action 1. Before this date (in time for operators to implement the flow requirement) the SWG will recommend specific requirement OMR flows based on salvage and on physical and biological data on an ongoing basis. If Action 1 is not implemented, the SWG may recommend a start date for the implementation of Action 2 to protect adult delta smelt.

Suspension of Action:

Flow: OMR flow requirements do not apply whenever a three day flow average is greater than or equal to 90,000 cfs in Sacramento River at Rio Vista and 10,000 cfs in San Joaquin River at Vernalis. Once such flows have abated, the OMR flow requirements of the Action are again in place.

Off-ramps:

Temperature: Water temperature reaches 12°C based on a three station daily average (Rio Vista, Antioch, Mossdale)

OR

Biological: Onset of spawning (presence of spent females in SKT or at either facility)

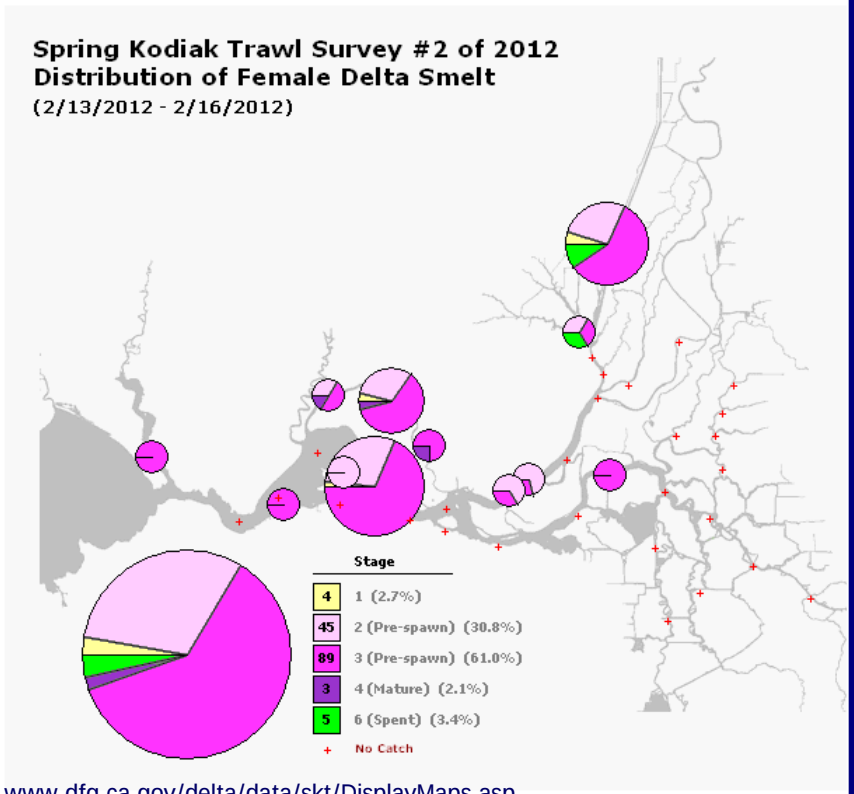
Clear water

Kodiak Trawl Survey and Particle Distribution Maps

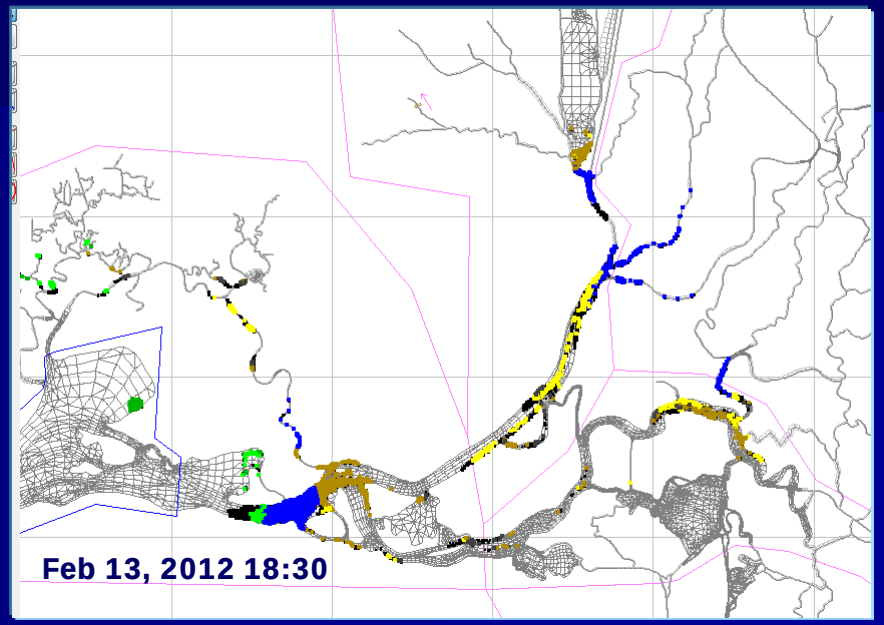
Delta Smelt Distribution Maps

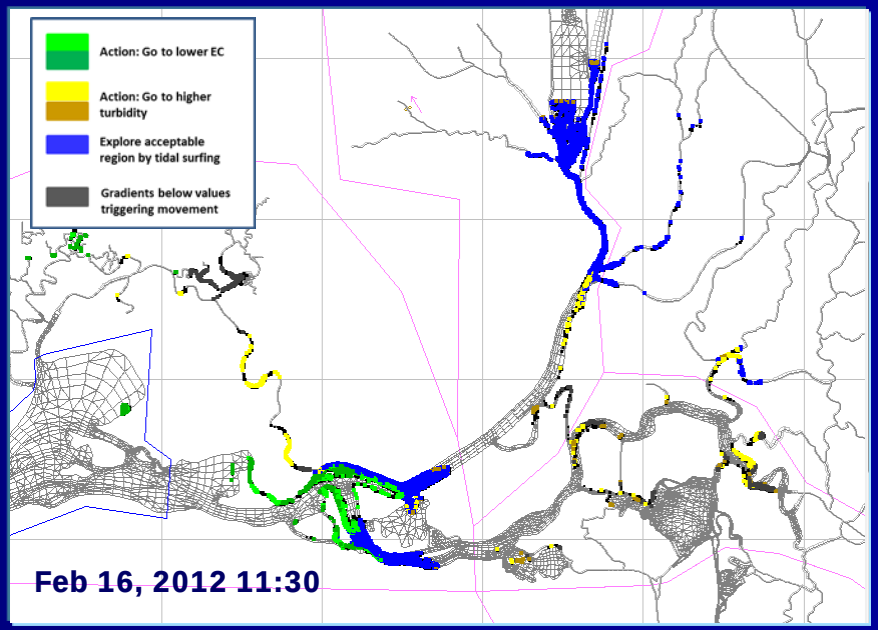
Year	Survey	Report Type	Show	Zoom	
2012	2	Females	Normal	1x (Normal)	Display Map

To view station details, move mouse over center of pie chart.

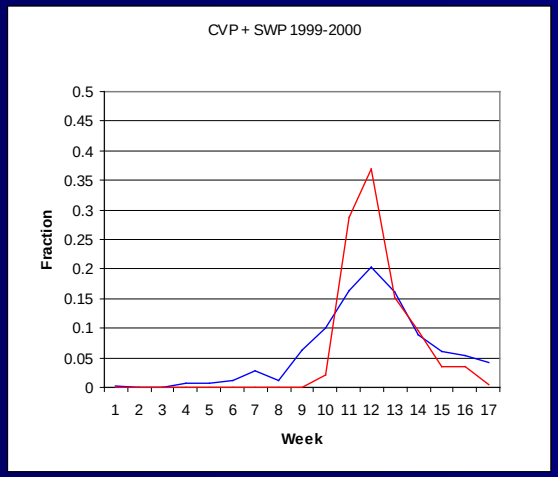


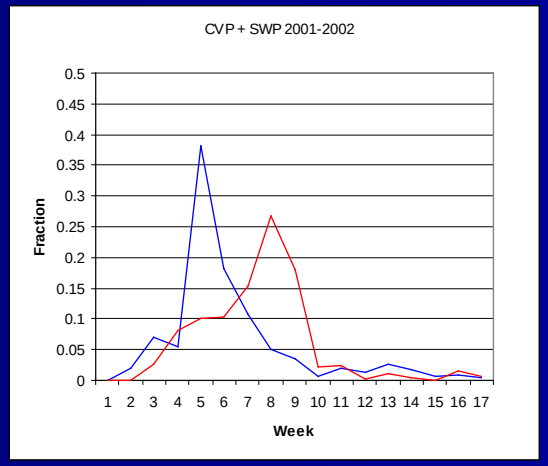
www.dfg.ca.gov/delta/data/skt/DisplayMaps.asp

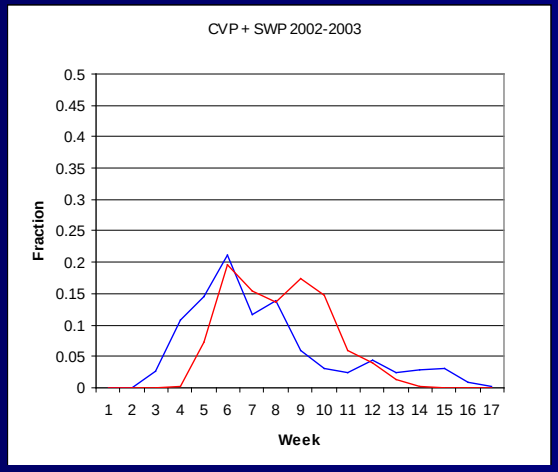


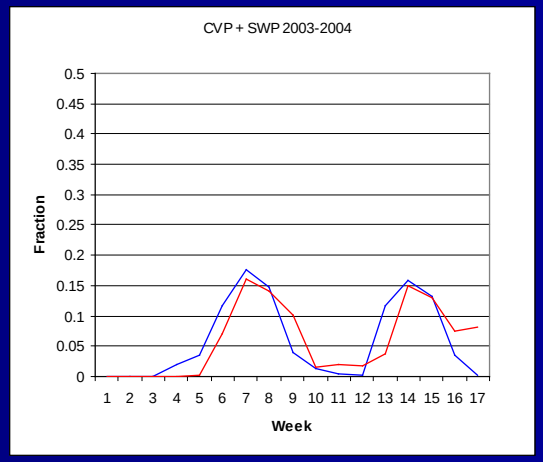


Comparison of Adult Delta Smelt Particle Entrainment (CVP+SWP) to Observed Salvage (Normalized Weekly counts)









Predicted Observed

Population consequences of entrainment are important to consider (Kimmerer 2008)

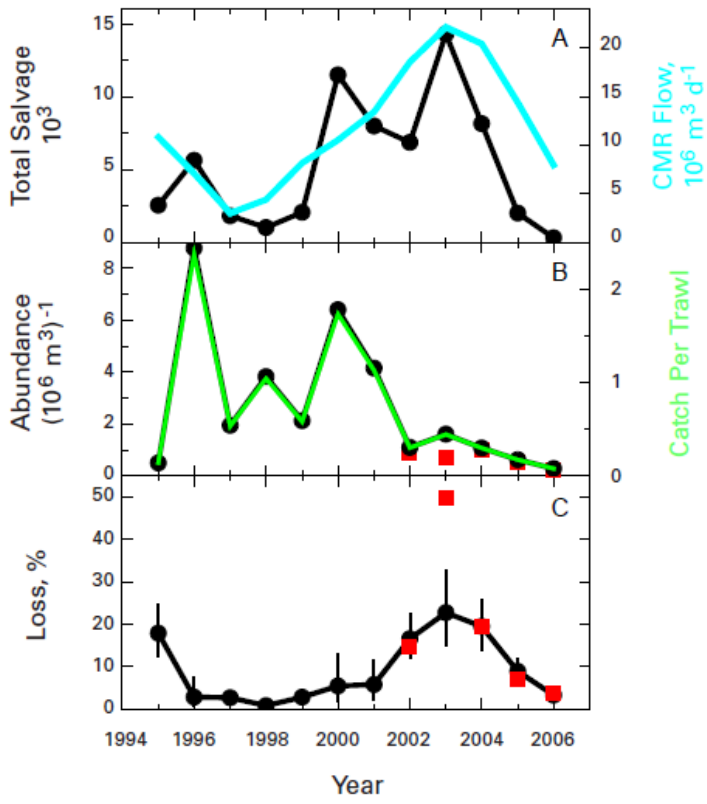


Figure 12. Reconstruction of export losses of adult delta smelt for 1995–2006. (A) Total salvage (line with circles) and Old and Middle River flow (line, right axis); (B) Predicted (line with circles) and measured (squares) population abundance, and mean catch per trawl for the fall trawl surveys in November and December (line, right axis); (C) Predicted (error bars, 5th and 95th percentiles) and measured (squares) proportional losses to export entrainment.

Population consequences of entrainment are important to consider (Kimmerer 2008)

Debate about best approach
t-Miller 2011, Kimmerer 2011

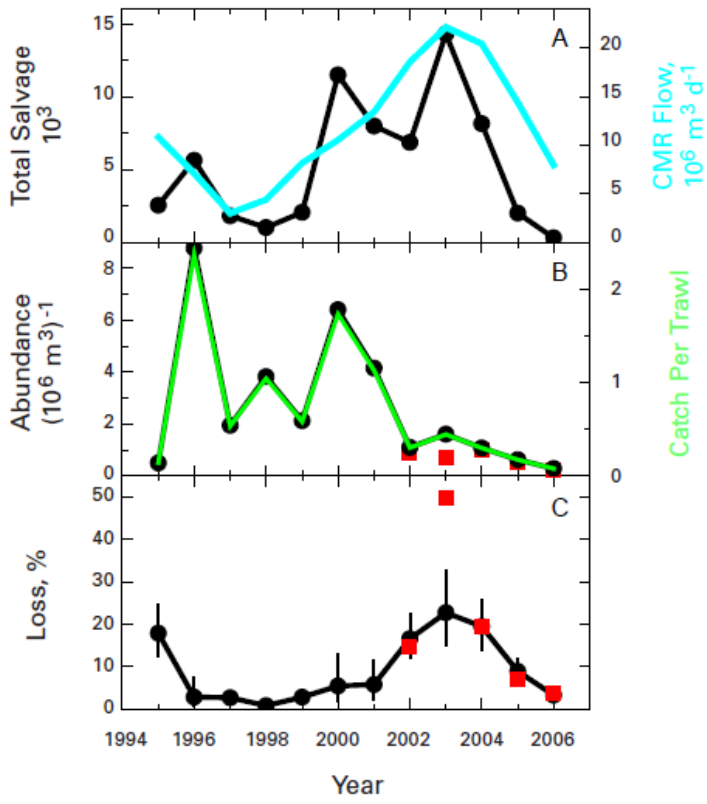
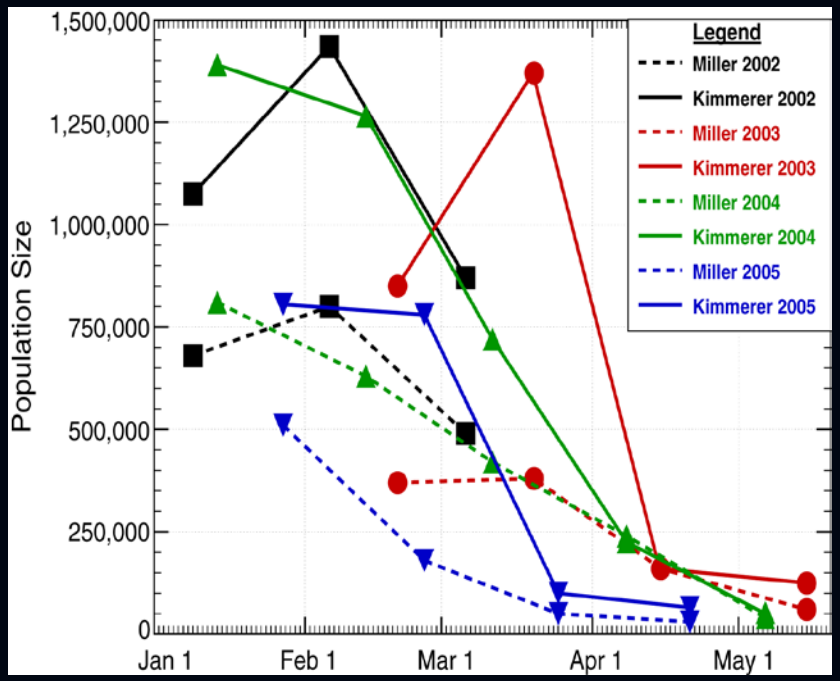
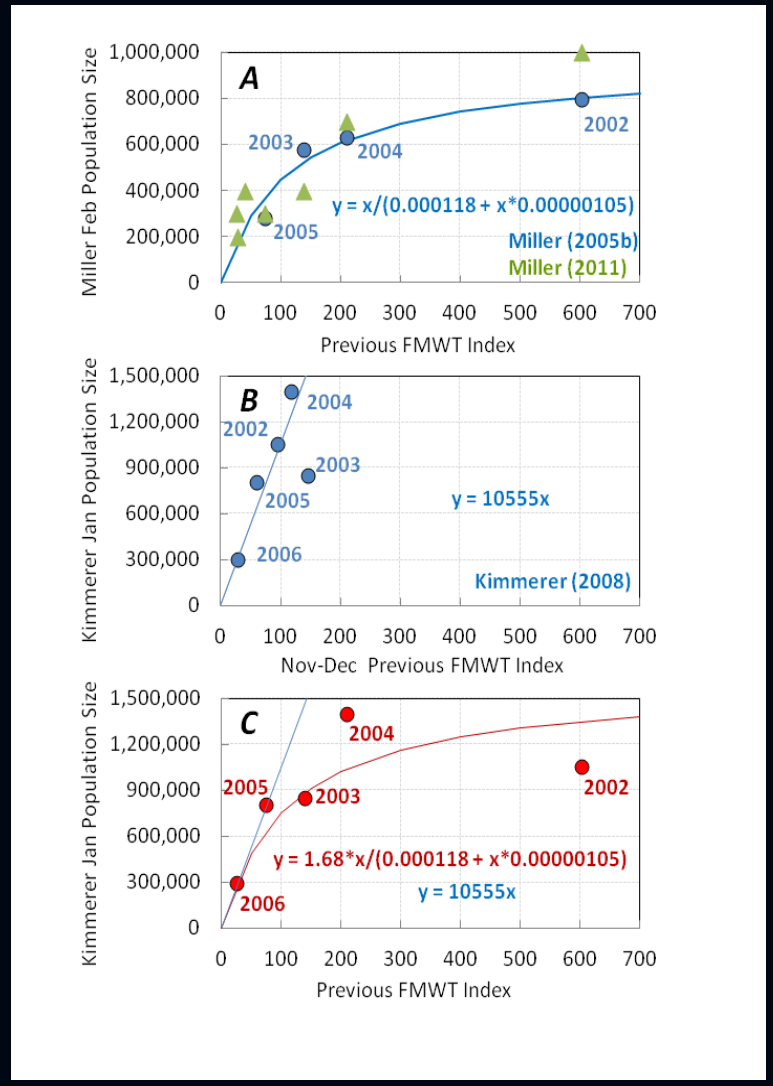


Figure 12. Reconstruction of export losses of adult delta smelt for 1995–2006. (A) Total salvage (line with circles) and Old and Middle River flow (line, right axis); (B) Predicted (line with circles) and measured (squares) population abundance, and mean catch per trawl for the fall trawl surveys in November and December (line, right axis); (C) Predicted (error bars, 5th and 95th percentiles) and measured (squares) proportional losses to export entrainment.

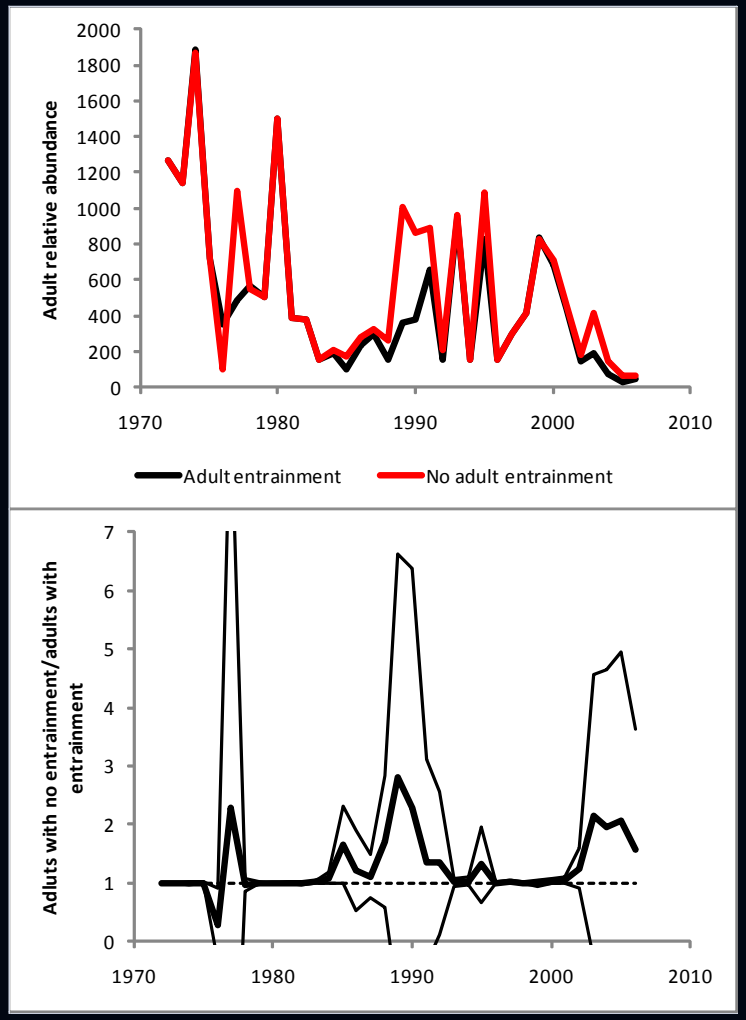
Revise population estimate calculations and proportional loss estimates





Impact analysis: entrainment

Lowest AICc
(adult entrainment as estimated)



Alternative
(adult and juvenile = 1)