Doug Demko – FISHBIO

2010 SWRCB Report - *Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem* - Rebuttal Testimony

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1. Impacts of 60% UIF flows on San Joaquin tributaries
2. Recent SJ Delta research relative to flow and other factors
3. Influence of ocean conditions on salmon production
4. Unsustainable ocean harvest rates thwart population growth
5. Hatchery practices mask declines in natural production and erode genetic integrity of salmon

Experience and Background

FISHBIO Inc – Research, monitoring, and conservation in U.S.
FISHBIO Laos Limited – Research, monitoring, and conservation in South East Asia
La Cuesta Roja S.A. – Costa Rican company established for freshwater and marine fisheries research
Roja Adventures S.A. – Costa Rican company established to promote ecotourism, education, and conservation
Mekong Fish Network – Developed and fund to promote data sharing and collaboration
Three Rivers – Developed and fund to promote primary school fisheries education

Experience

- CV fisheries research and monitoring since 1989; Stanislaus since 1991
- Extensive experience in SJB, including Stanislaus, Tuolumne, Merced, Mokelumne, Calaveras rivers
- Extensive international research, monitoring, and conservation experience
- Testified as fisheries expert before U.S. House of Representatives, California State Legislature, SWRCB

Partners and Clients Since Starting FISHBIO in 2006 (partial list)

U.S. State Department; World Wide Fund for Nature (WWF); Mohamed bin Zayed Species Conservation Fund; International Union for Conservation of Nature (IUCN), Laos, and Critical Ecosystem Partnership Fund (CEPF); The Asia Foundation; Sustainable Mekong Research Network (SUMERNET); International Crane Foundation; Fauna & Flora International, Myanmar; Theun Hinboun Power Company; Mekong River Commission; Nam Ngiep Power Company; The Agro Biodiversity Institute; University of Nevada Reno; USAID; Wildlife Conservation Society and Turtle Survival Alliance; Chiang Mai University and International Development Research Centre; Earth Systems Mekong; San Joaquin Tributary Authority; Modesto and Turlock irrigation districts, Merced Irrigation District; Oakdale Irrigation District; South San Joaquin Irrigation District; West Stanislaus Irrigation District; Banta-Carbona Irrigation District; Patterson Irrigation District; Stockton East Water District; South Valley Water Association; Exchange Contractors; River Partners; Nature Conservancy; NOAA Fisheries; U.S. Bureau of Reclamation; U.S. Army Corps of Engineers; California Department of Water Resources; Ducks Unlimited

Summary of DFCR

- Purpose - inform analyses for a change in the point of diversion of the State Water Project or the federal Central Valley Project

- Increased spring flows are portrayed by the DFCR to enhance survival of juvenile Chinook salmon to Chipps Island, increase survival to adulthood, boost escapement return to Central Valley rivers, and lead to achieving the CVPIA "doubling goal"

  (1) Spring flows of 5,000 cfs ***may*** represent a flow threshold to substantially improve juvenile salmon survival

  (2) Average spring flows of 10,000 cfs ***may*** provide conditions to achieve doubling of San Joaquin Basin FRCS

- However, the DFCR also noted that "*additional information should be developed to determine whether these flows could be lower or higher and still meet the Chinook salmon doubling goal in the long-term*" (p. 120)

DFCR Flow Criteria Relies on Questionable SalSim Model

- The DFCR references results from Version 1.6 of CDFW's SalSim model as a basis for San Joaquin River flow recommendations

- SalSim Version 2 received substantial criticism from peer review, including:
  - "much additional work is needed for SalSim to be management-ready"
  - no confidence that "the existing model has sufficiently realistic representations regarding the effects of flow and temperature in the freshwater life stages"

- SalSim Version 2 was used in Chapter 19 of the SWRCB Phase I WQCP/SED
  - Increases in adult FRCS production over the base scenario were low (9.7% in the 40% UIF, 7.6% in the 50% UIF, and 6.5% in the 60% UIF scenarios

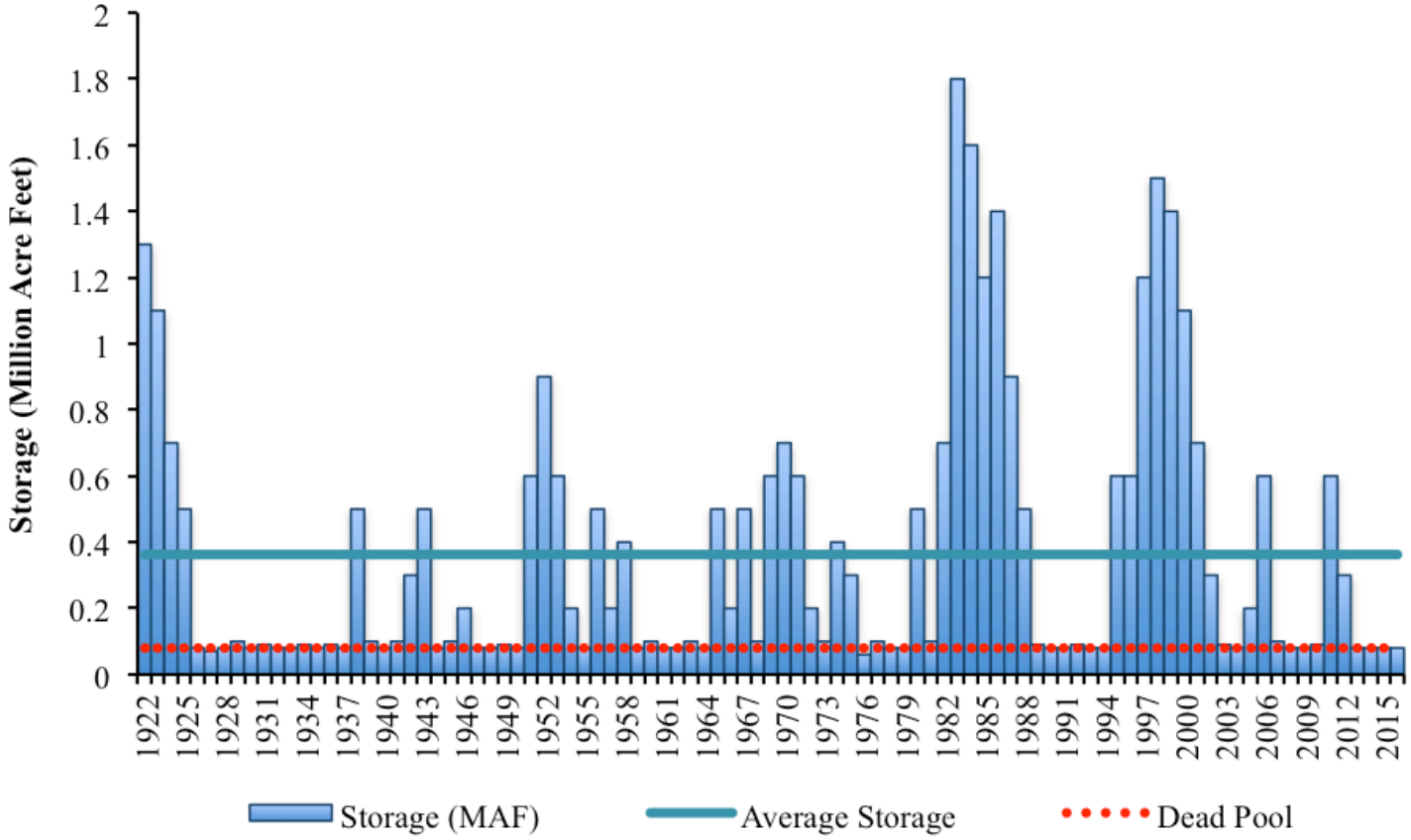
DFCR Target Flows Won't be Achieved

- Flows of 5,000 cfs and 10,000 cfs are currently not being met, and will not be met under the proposed Phase I WQCP (as per Mr. Steiner's testimony)
- The SWRCB's own analysis for the Phase I WQCP states that the percentage of time the 5,000 cfs and 10,000 cfs will be met is significantly lower than under the 60% UIF in the DFCR (as per Mr. Steiner's testimony)
- As a consequence, the substantial increases in salmon production or population doubling inferred in the DFCR will not occur

	Frequency	
Scenario	5,000 cfs	10,000 cfs
DFCR 60% UIF	85%	45%
Tributary only 60% UIF	60%	10%
Tributary only 40% UIF (Phase I WQCP)	35%	0%
Actual	41%	0%

Potential Detrimental Impacts of Increased Flows

Simulated end of September storage in New Melones Reservoir under the DFCR 60% UIF scenario



Data From Dan Steiner's Testimony

Potential Detrimental Impacts of Increased Flows

- The DFCR acknowledges "reservoir releases" as an important component, and states that

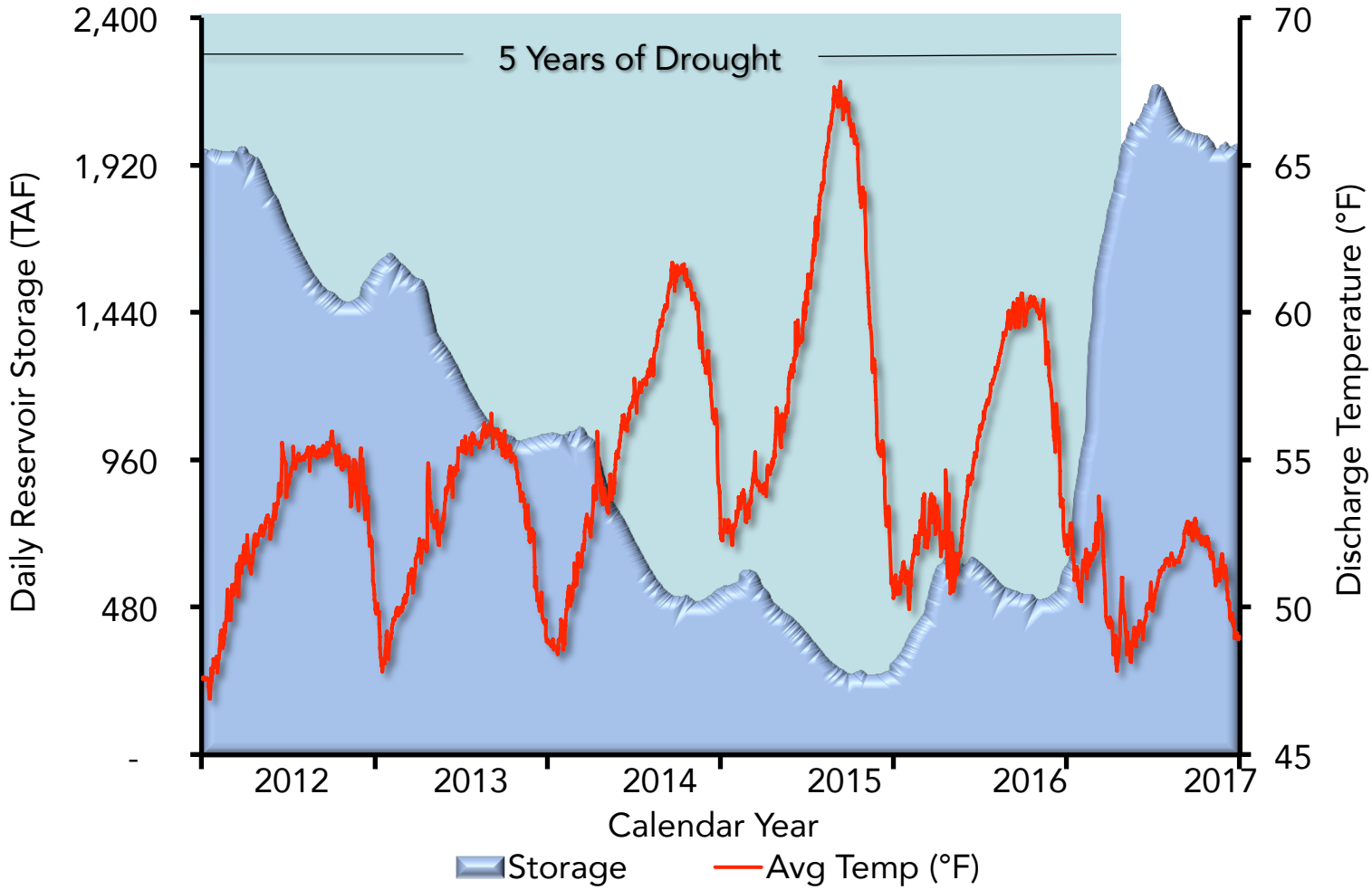
  > *"Temperature and water supply modeling and analyses* ***should be conducted*** *to identify conflicting requirements to achieve both flow and cold water temperature goals". (DFCR p. 6)*

- DFCR did not consider impacts of plan on coldwater pool storage in upstream reservoirs, which may jeopardize populations of salmonids, including threatened *O. mykiss*

- DFCR recommended flows will deplete coldwater storage

Potential Detrimental Impacts of Increased Flows

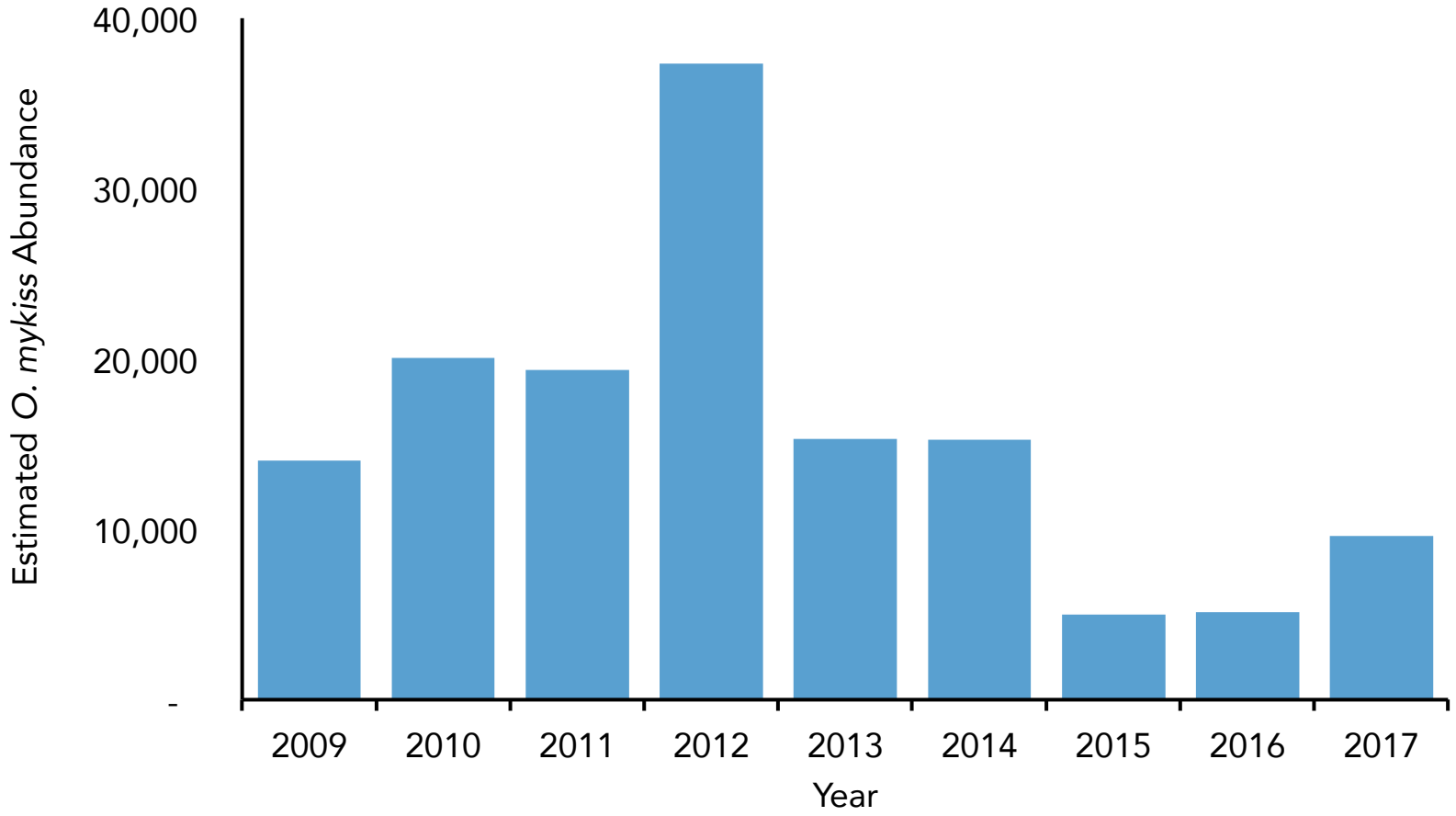
Average daily storage at New Melones Reservoir and mean daily water temperature below Goodwin Dam



Storage data is CDEC New Melones average daily storage. Temperature data is daily average from FISHBIO thermograph instream below Goodwin Dam.

Demonstrated Detrimental Impacts of Coldwater Pool Depletion

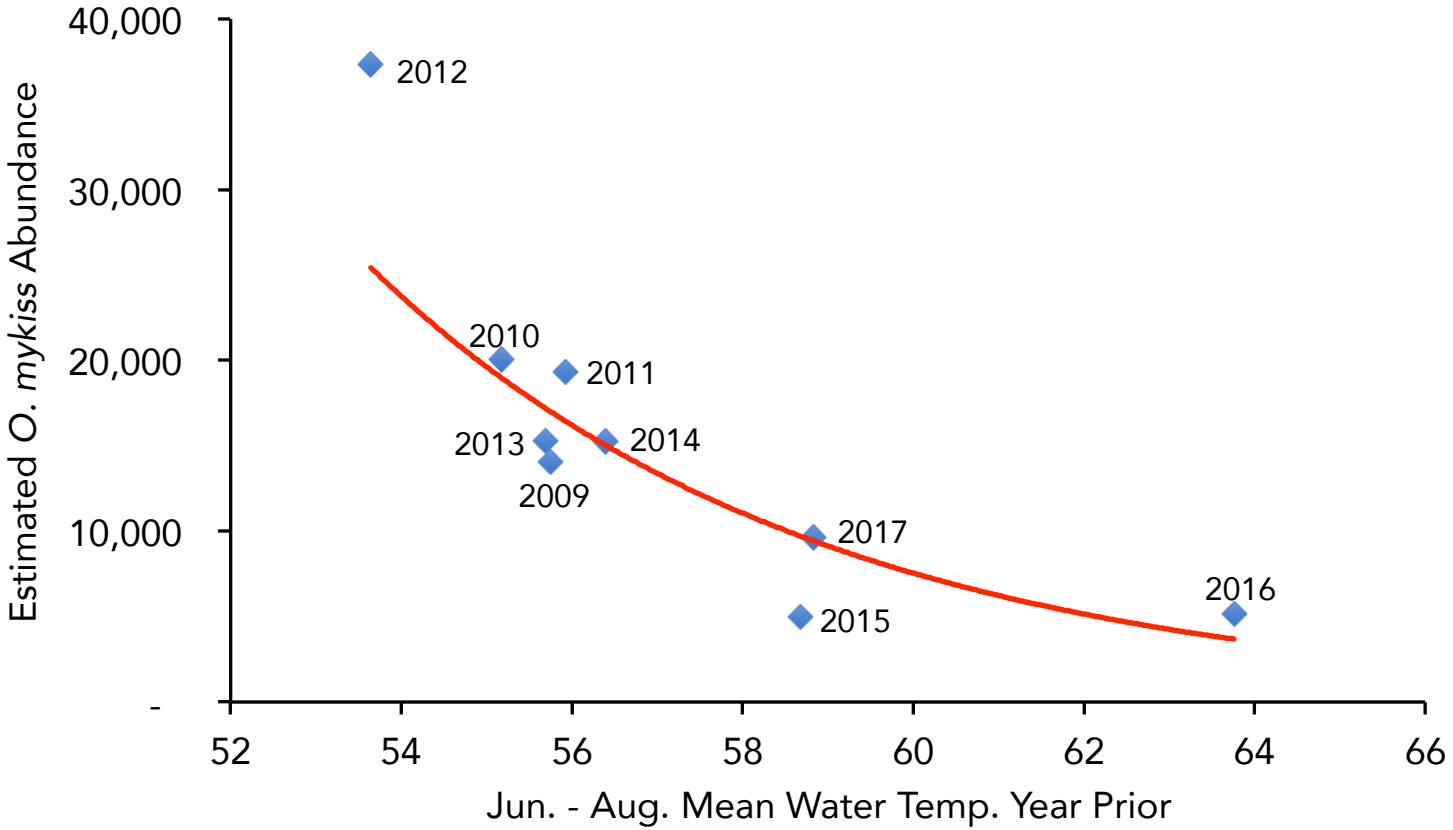
Annual *O. mykiss* abundance in the Stanislaus River 2009-2017



FISHBIO unpublished snorkel survey data

Demonstrated Detrimental Impacts of Increased Temperatures

Abundance of *O. mykiss* in the Stanislaus River relative to the mean summer water temperature the previous year (June – August at Goodwin Dam)



FISHBIO unpublished snorkel survey data

Recent Findings From SJ Delta Research

- Increased flows are not necessarily associated with increased survival (Buchanan et al. 2018)

- *"Panel members are in agreement that simply meeting certain flow objectives at Vernalis is unlikely to achieve consistent rates of smolt survival through the Delta over time."* (Dauble et al. 2010)

- Reliance on flow alone will not consistently improve survival rates of juvenile Chinook salmon in the San Joaquin River and Delta. The rationale for this conclusion was that, in recent years especially, survival rates at all flow levels was low. Since 2003, survival through the San Joaquin Delta has consistently been < 12%, while flows at Vernalis ranged between 2,000 cfs and 27,000 cfs. (Dauble et al. 2010)

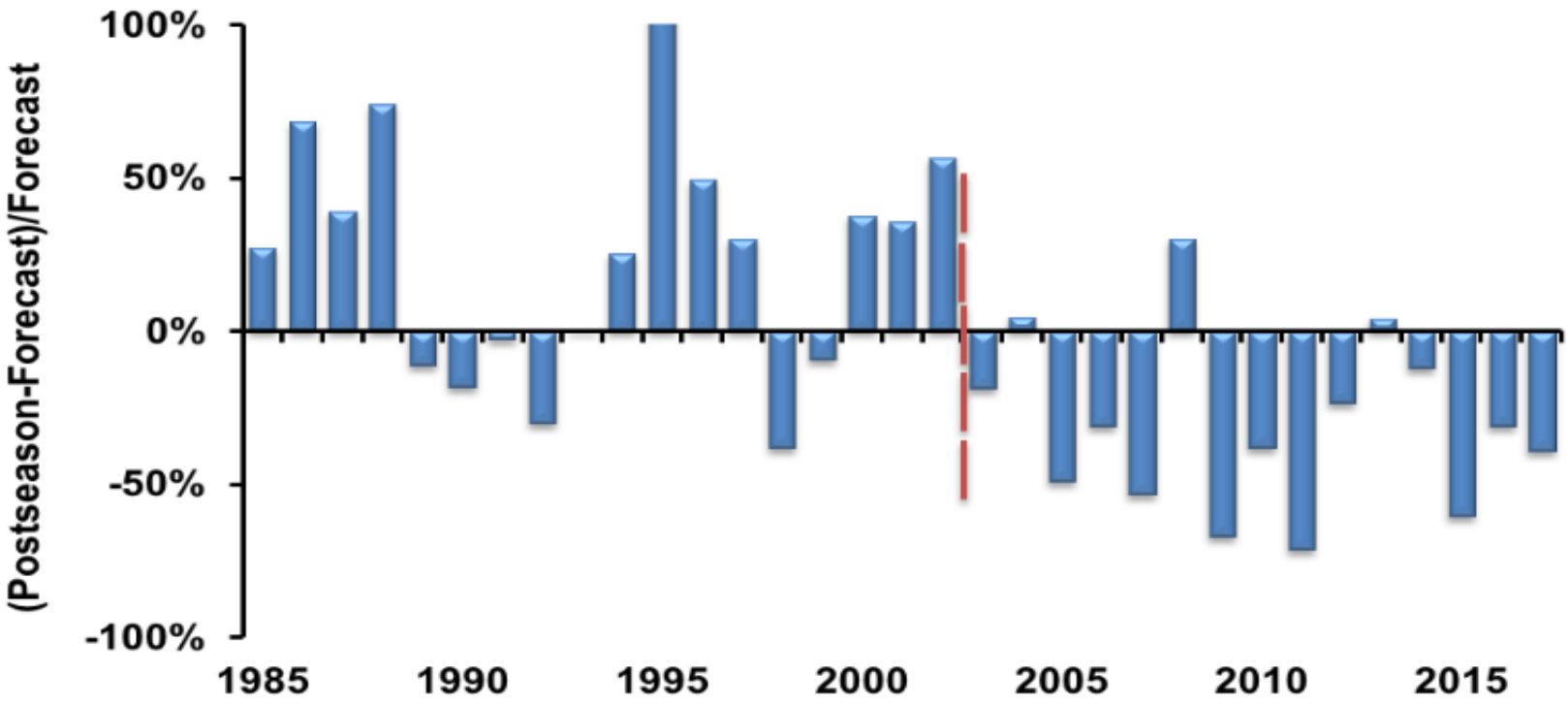
Poor Ocean Harvest Management Thwarts Salmon Population Growth

Deliberate harvest levels limit potential population growth

- If more adult salmon are available for harvest in the ocean, more harvest is allowed
- Ocean harvest allotments permit escapement of hatchery and natural spawners ranging between 122,000 and 180,000
- The mean relative proportion of escapement to the San Joaquin Basin is 5.8%
- This corresponds to a maximum escapement of 7,512 to 11,083 individuals to the San Joaquin River basin
- If more adults back to river = more eggs/juveniles, then ocean harvest explicitly prevents population recovery

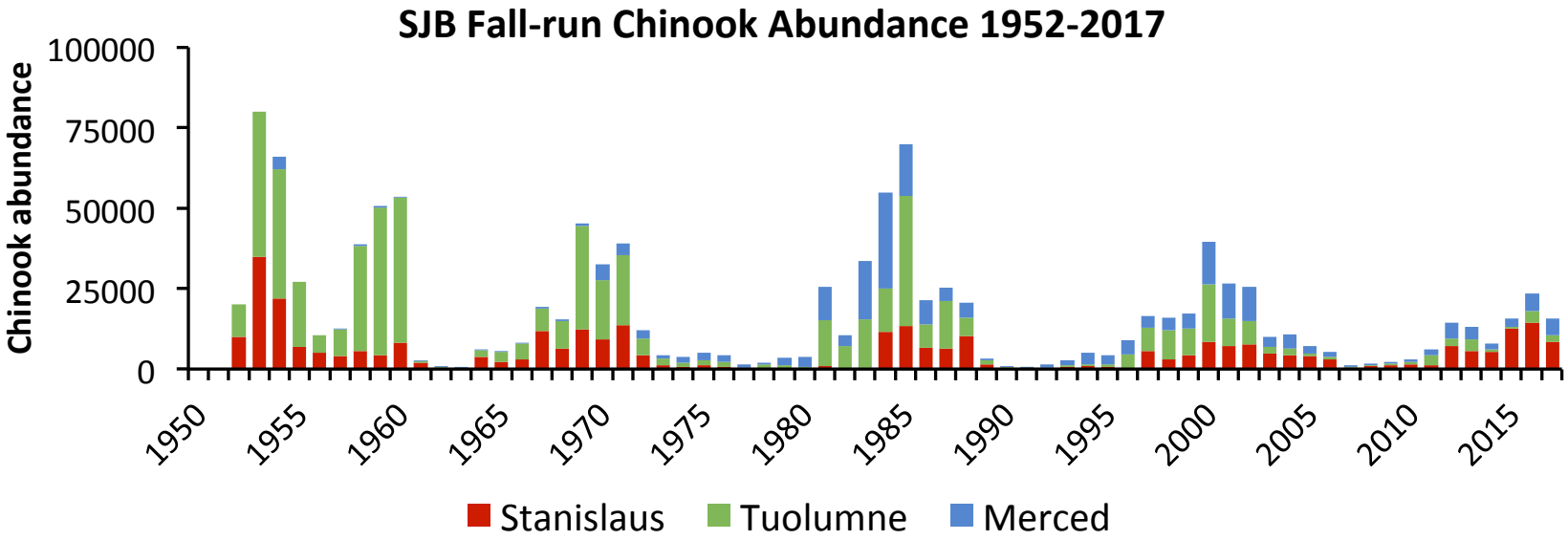
Inaccurate Ocean Population Estimates Result in Over-Harvest

Percent difference from PFMC average annual preseason forecast relative to the actual SI observed, 1985-2017



Boom or Bust SJB Salmon Population Cycle

- Ocean conditions can drastically impact adult returns - the most prominent example is the 2007/2008 collapse (Lindley et al. 2009)
- The DFCR and related exhibits failed to account for the underlying population dynamics of the San Joaquin River population of fall-run Chinook salmon
- SJB population is characterized by a pronounced cyclic nature with boom and bust cycles that occur approximately every 12 - 15 years



Inaccurate Representation of Doubling Goal

- DFCR and related exhibits (i.e., CDFW Exhibit #3) routinely imply that the proposed flow regime would result in 'doubling' of smolt production, which would meet State and Federal mandates under the Doubling Goal

> *"... improving SJR stream flow in the spring time period is necessary to accomplish the State and Federal salmon doubling goal by doub ling the juvenile (smolt) abundance at Chipps Island."* (CDFG/CDFW Exhibit 3; p. 1)

- Doubling smolt production is not the legal requirement specified in the CVPIA Doubling Goal, nor is doubling adult production in the San Joaquin Basin or any given tributary

Even 200,000 Additional Smolts Would not Achieve Adult Doubling Goal

- Modeled smolt production under the revised flows estimated that there would be 200,000 additional smolts at Chipps Island in 1993 (compared to the historical number; Figure 20 of CDFG Exhibit 3 or DFCR)

- To meet the doubling goal from 1992 to 2011 in any given year, roughly 750,000 fall-run Chinook salmon naturally produced in Central Valley streams would have to be harvested or return to spawn

- Therefore, even if 100% of the 200,000 additional smolts (in 1993) at Chipps Island survived to be harvested or returned to spawn, this increase would still be insufficient to meet the true intent of the doubling goal in that year, much less the more moderate improvement postulated for other years, or on average (1988-2004)

- It follows that the DFCR has no basis to claim that increasing flow on the San Joaquin River will double the natural production of Central Valley fall-run Chinook salmon

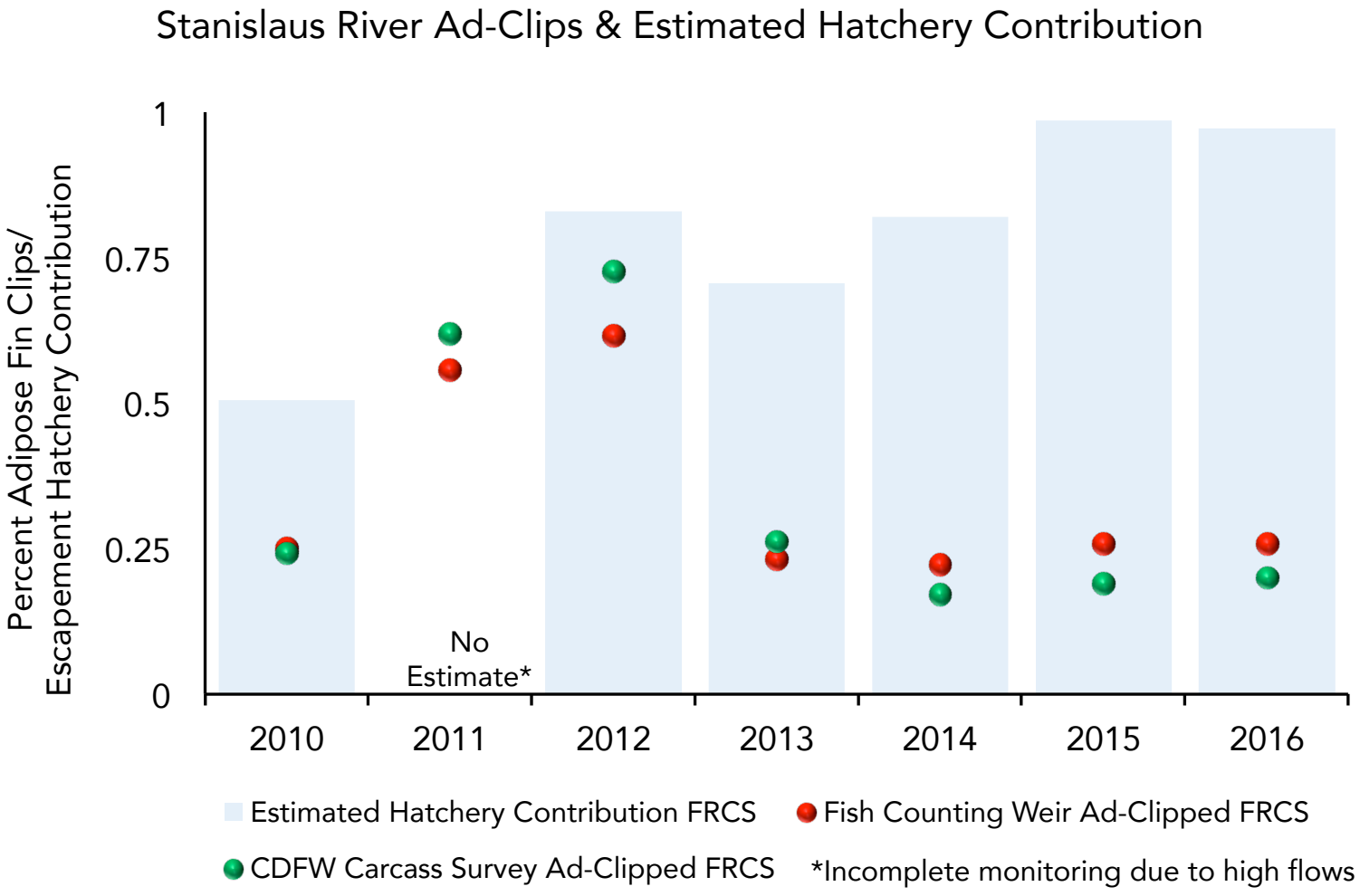
Poor Hatchery Management Confounds Salmon Management

- Detrimental impacts of CV hatchery system may be more severe than previously thought (i.e. synchronous population dynamics) and the masking of true declines in 'natural' Chinook stocks (Carlson and Satterthwaite, 2011; Johnson et al. 2012)

- Genetic studies on Central Valley fall-run observed genetic homogenization among wild and hatchery stocks, a direct result of the shortcomings in past (and, in some cases, current) hatchery operation. Rampant straying has resulted in genetic mixing across tributaries such that most genetic markers cannot be used to distinguish between fall-run stocks (Williamson and May 2005; Garza et al. 2008).

- Without properly accounting for the hatchery contribution to tributaries in the San Joaquin River, a reliable assessment of the effects of flow manipulations on Chinook salmon populations cannot be conducted

Hatchery Practices Confounding Management



CDFW (unpublished data); Fish counting weir data from FISHBIO.

Predation is the Most Significant Cause of Salmon Outmigration Mortality

- NMFS Draft Recovery Plan (2009) for Chinook salmon and Central Valley steelhead considers predation one of the most important stressors to the survival of juveniles.

- VAMP peer review panel concluded that: "high and likely highly variable impacts of predation, appear to affect survival rates more than the river flow." (Dauble et al. 2010)

- Recent research provides further evidence suggesting that predation, particularly in the lower reaches of the Delta, affects a large proportion of juvenile Chinook salmon, even in years when flows are high (e.g. 2011). During their study, upwards of 20% to 64% of study fish (depending on the year) were likely consumed by predators. (Buchanan et al. 2018)

Summary

- "*Additional information should be developed to determine whether these flows could be lower or higher and still meet the Chinook salmon doubling goal in the long-term.*" (DFCR, p. 121)

- *"Temperature and water supply modeling and analyses should be conducted to identify conflicting requirements to achieve both flow and cold water temperature goals."* (DFCR p. 6)

- Abandon use of SalSim for DFCR, as the model is not "management-ready"

- Incorporate other known critical stressors such as ocean conditions, predation, hatchery practices

- Address recent research suggesting more flow doesn't equate to higher survival