Pelagic Organism Decline Workshop

State Water Resources Control Board

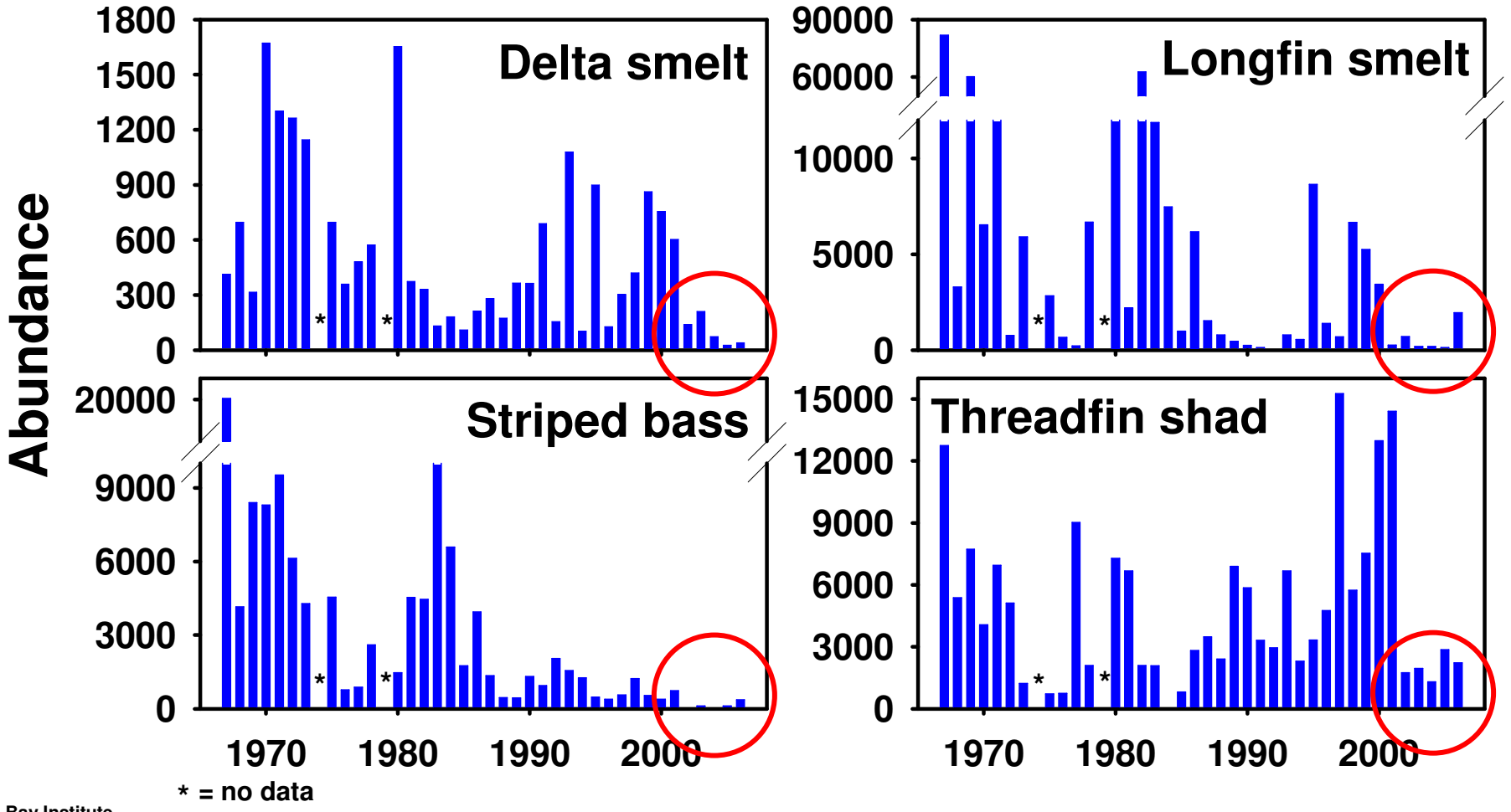
The Bay Institute

March 22, 2007

Summary

- **Pelagic organism decline is severe and undisputed**
- **POD research shows that exports, San Joaquin River flows, and Delta outflows are significant contributing factors**
- **Constraints on use of environmental water assets (eg, EWA) have limited agency response to POD**
- **SWRCB has sufficient information - and the authority - to adopt water rights orders and WQCP amendments to address POD**

Populations of four estuarine fish species decline in 2002. No improvement in five years (except longfin smelt). Delta smelt at risk of extinction.



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Data source: CDFG Fall Midwater Trawl Survey

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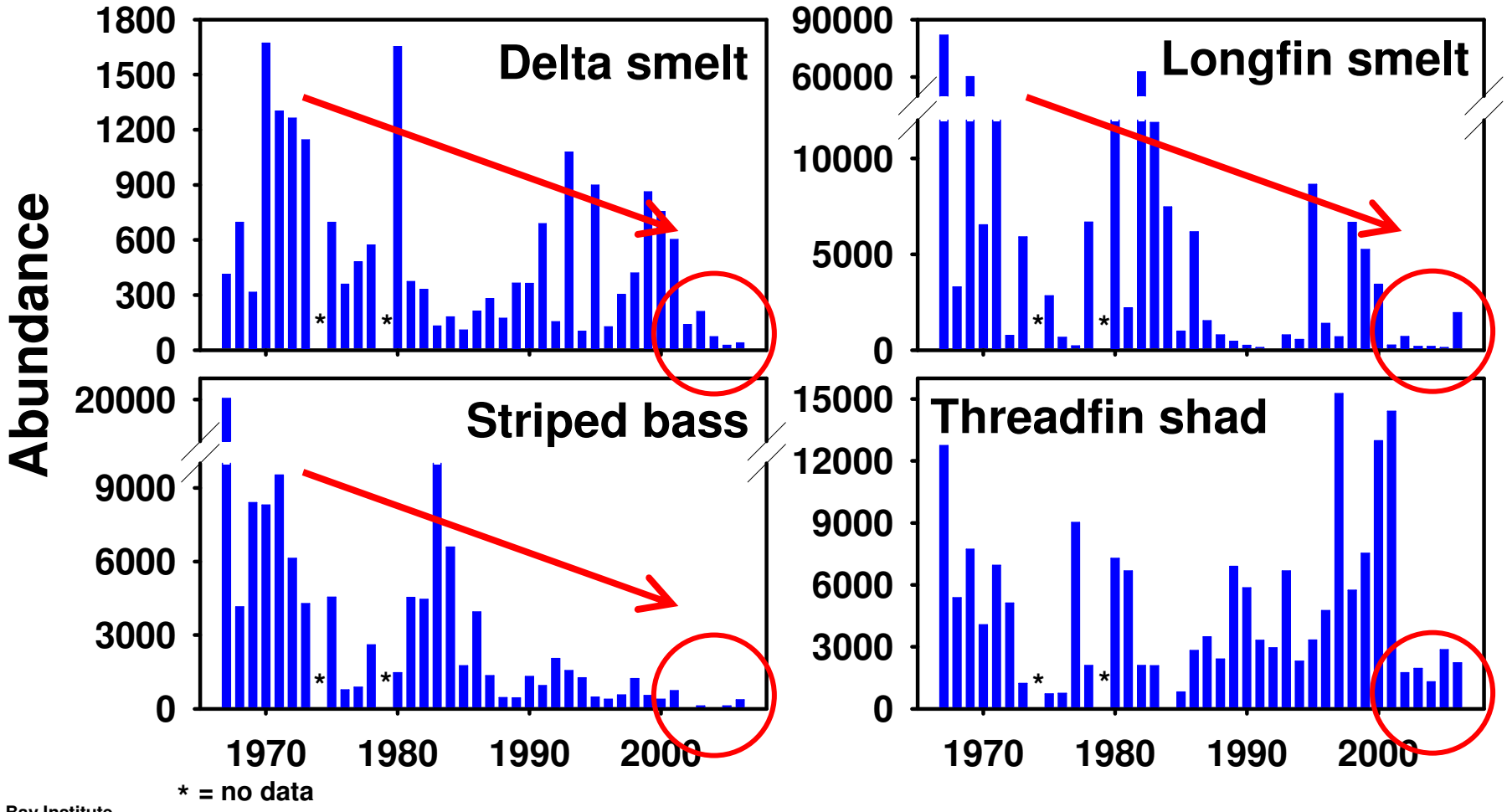

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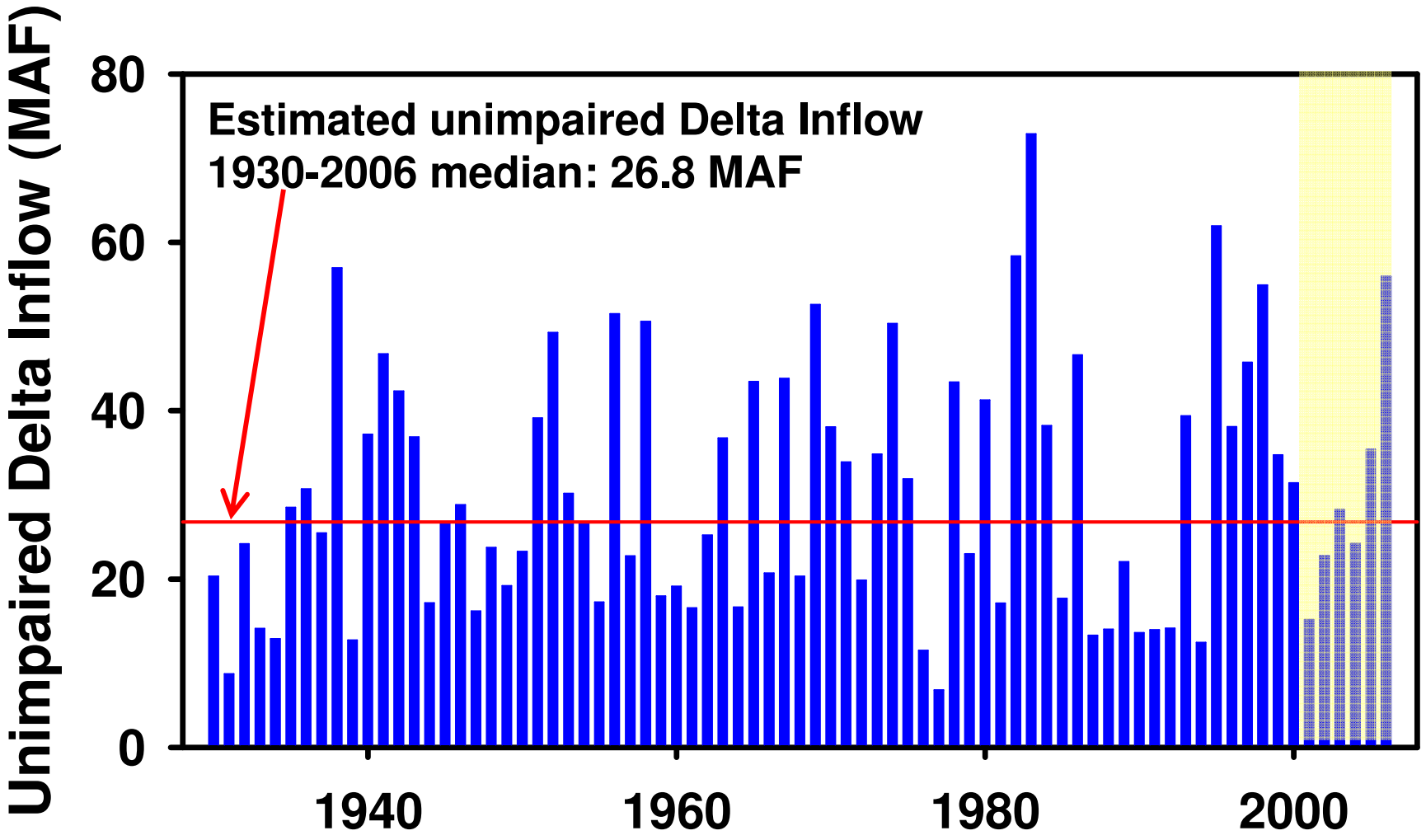
Data source: CDFG Fall Midwater Trawl Survey

Hydrology was moderate during 2000s



Data source: DWR unimpaired flows dataset, CDEC

Summer 2005: Pelagic Organism Decline (POD) research begins

Hypotheses: **Exports**

Toxics

Invasive species

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Hypotheses: Exports

Toxics

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October 2006-March 2007:

Preliminary conclusions:

- Exports ✓ (water management operations)
- Toxics ✓
- Invasive Species ✓

Effects: Direct and Indirect (ecosystem)

POD Findings Relevant to SWRCB-regulated Activities

Exports:
- Increased
- Disproportionately higher incidental take
- Adverse in-Delta hydrodynamics

San Joaquin River Flows:
- Decreased (below WQCP objectives)
- Adverse in-Delta hydrodynamics

In-Delta Hydrodynamics:
- Negative flows increased
- Mechanism for direct and indirect impacts

Delta Outflows:
- Decreased
- Ecosystem impacts
- Increasing direct impacts

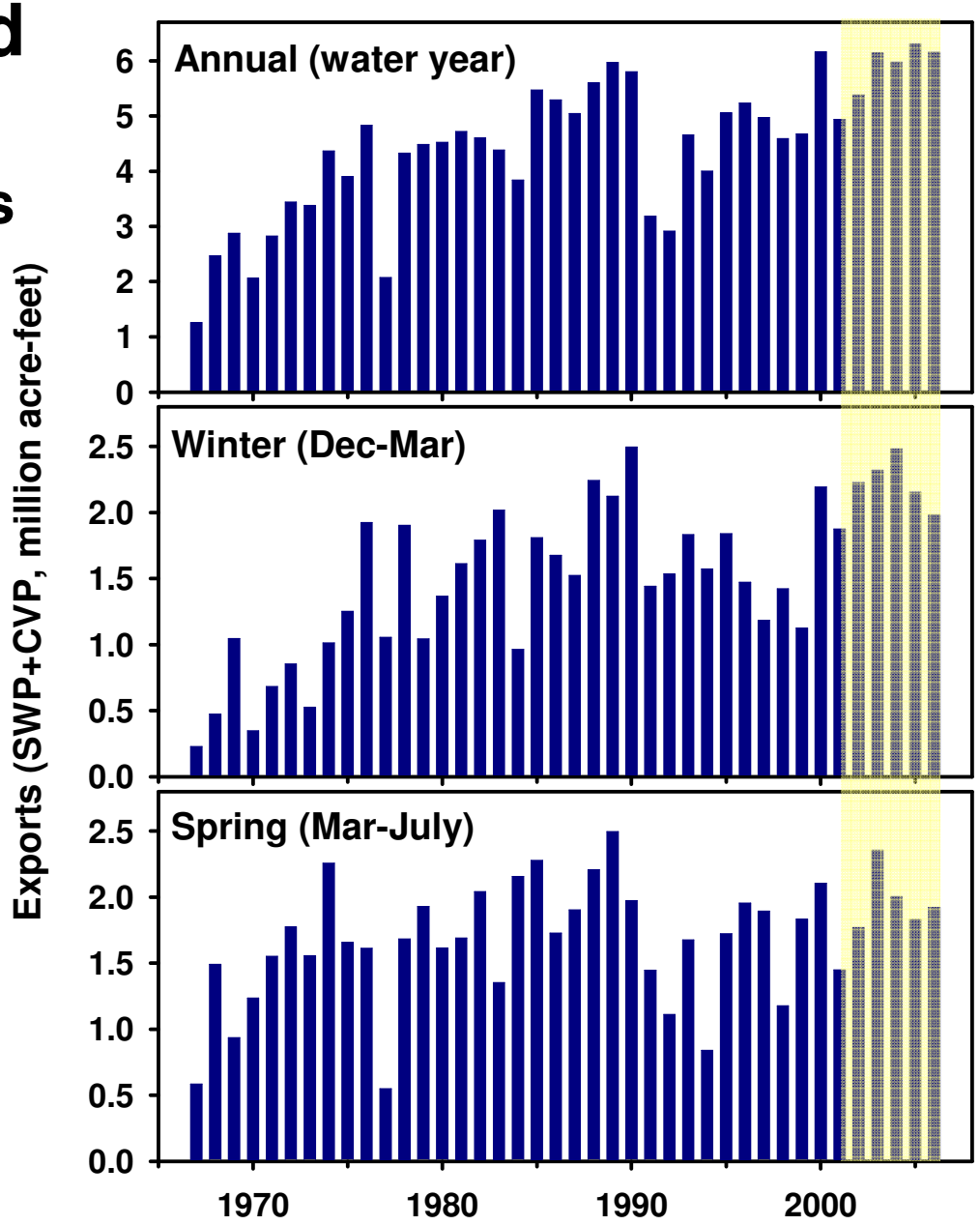
Exports have increased

Increase in SWP+CVP exports
1995-2000 ⟶ 2001-2006

Annual: 14%
701 TAF

Winter: 41%
633 TAF

Spring: 6%
107 TAF



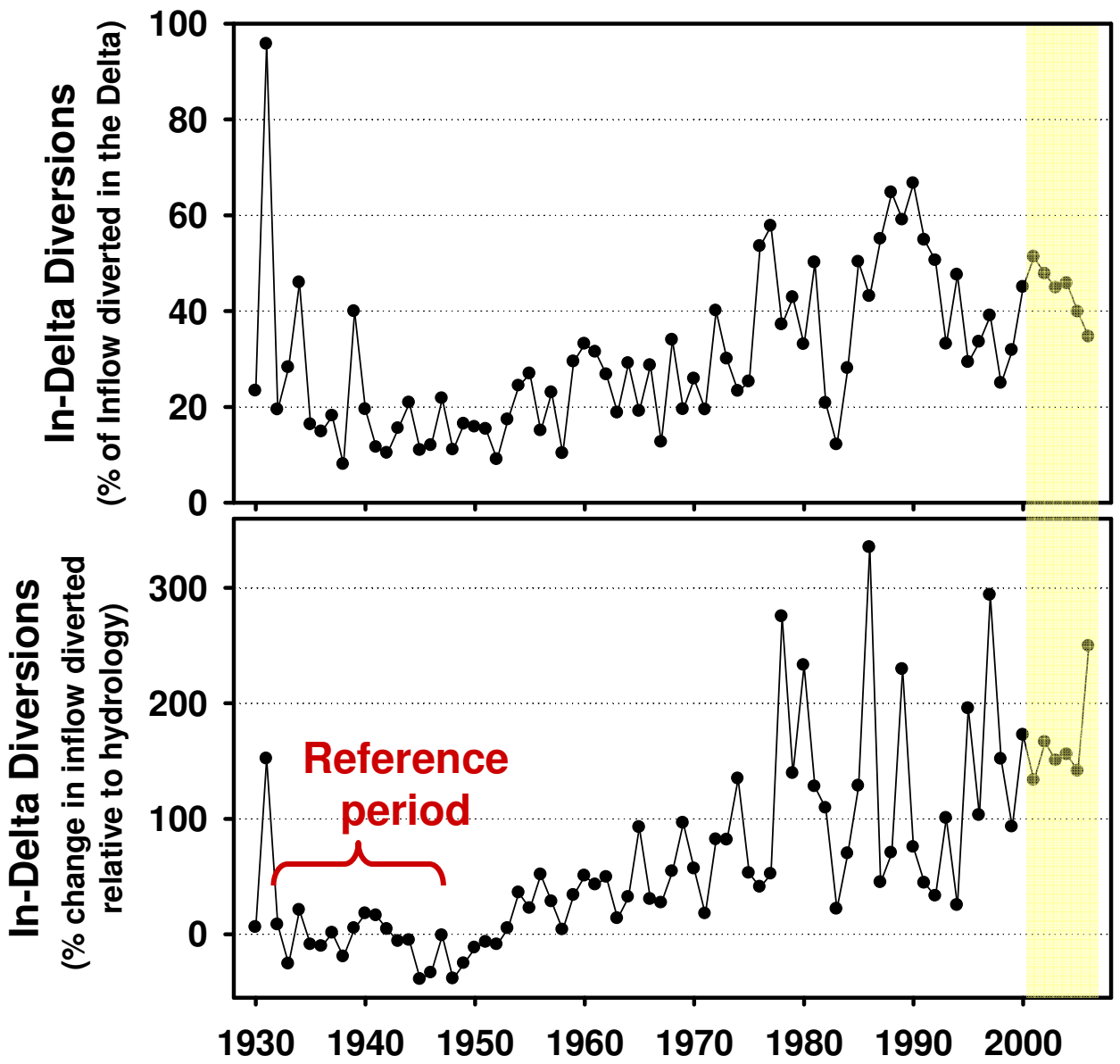
Data source: CDWR, Dayflow

Total Delta diversions in relation to inflow have increased

% of total Delta inflow diverted:

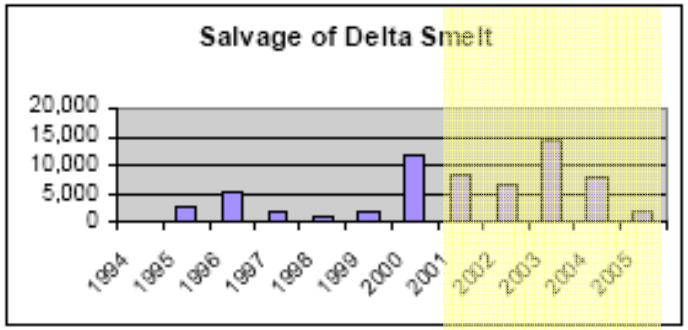
1995-2000: 34%

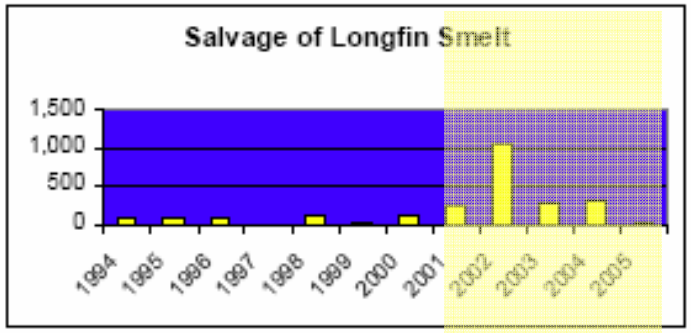
2001-2006: 44%

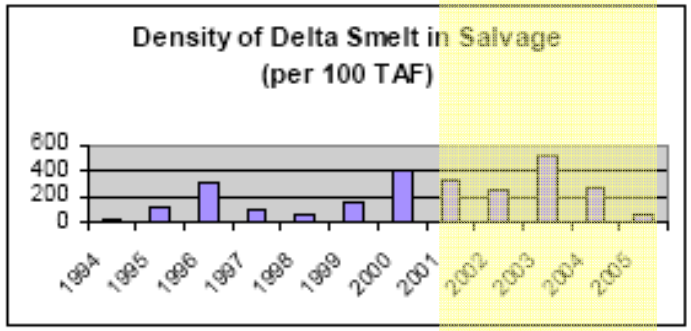


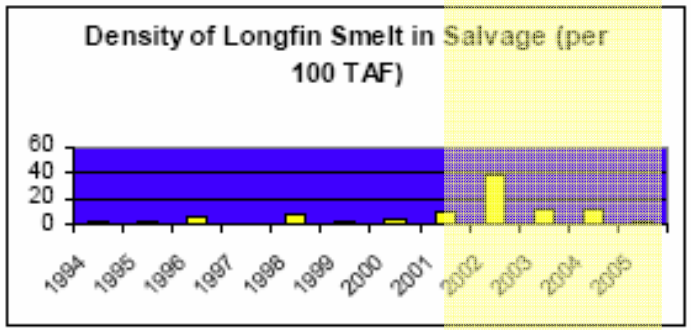
Data source: CDWR, Dayflow

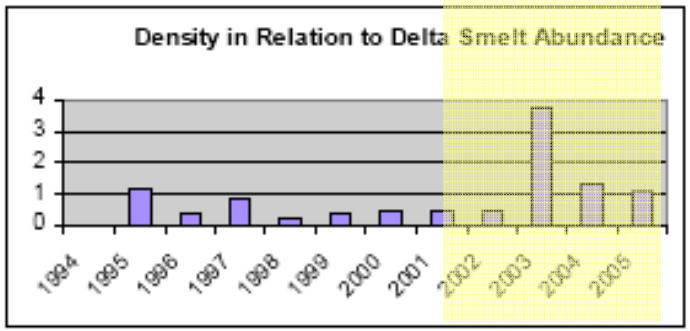
Incidental take disproportionately high in recent years

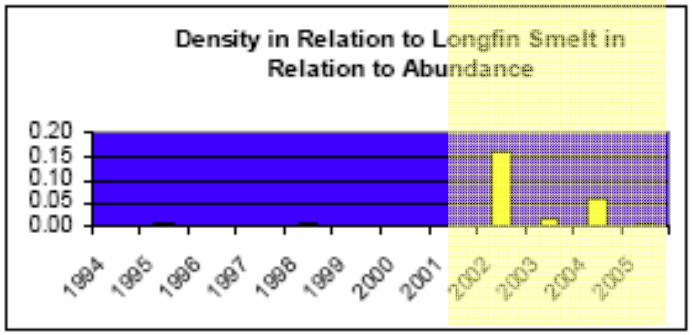










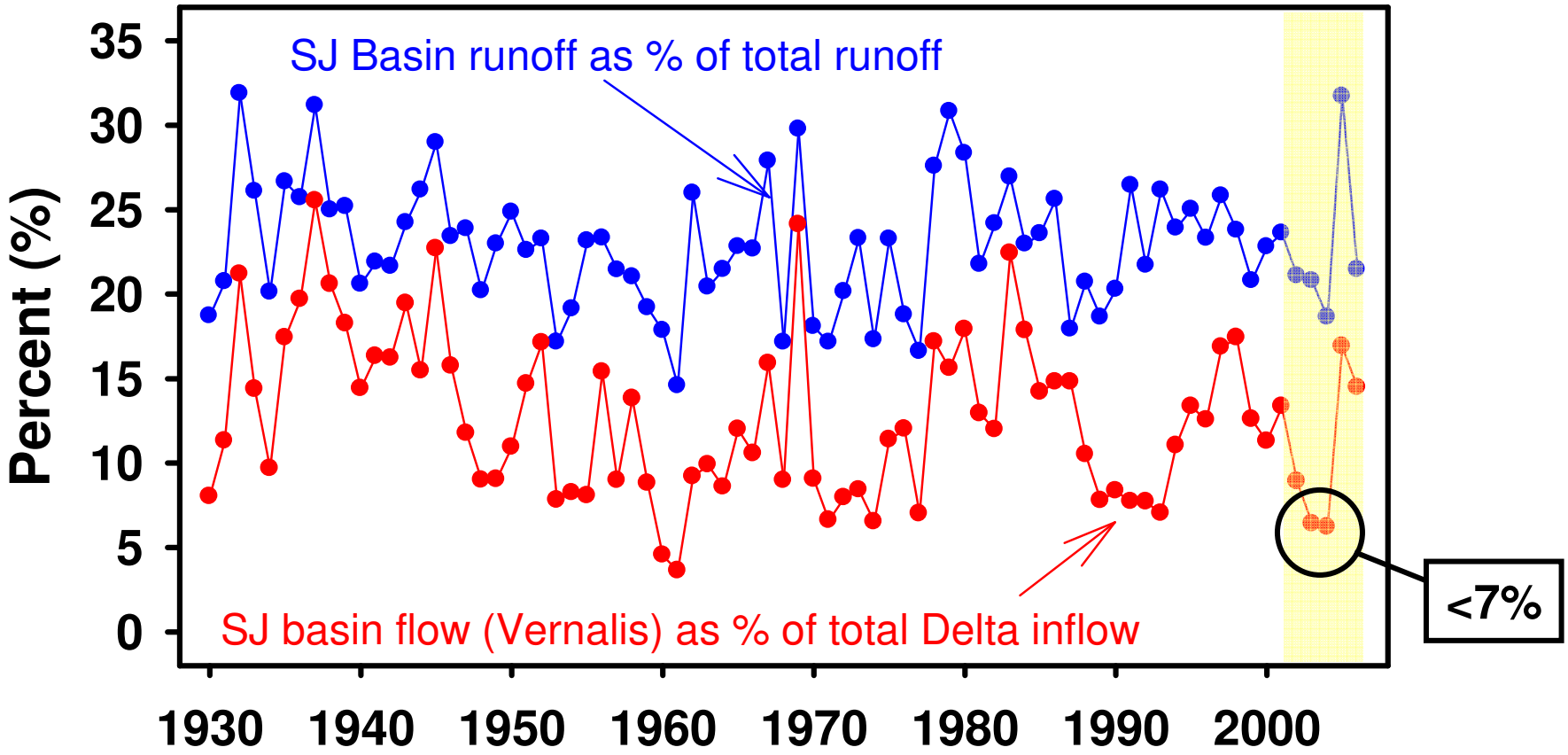


Season = winter (Nov-March)
Source: Herbold et al. 2005, POD studies

Freshwater inflow from the San Joaquin basin has decreased

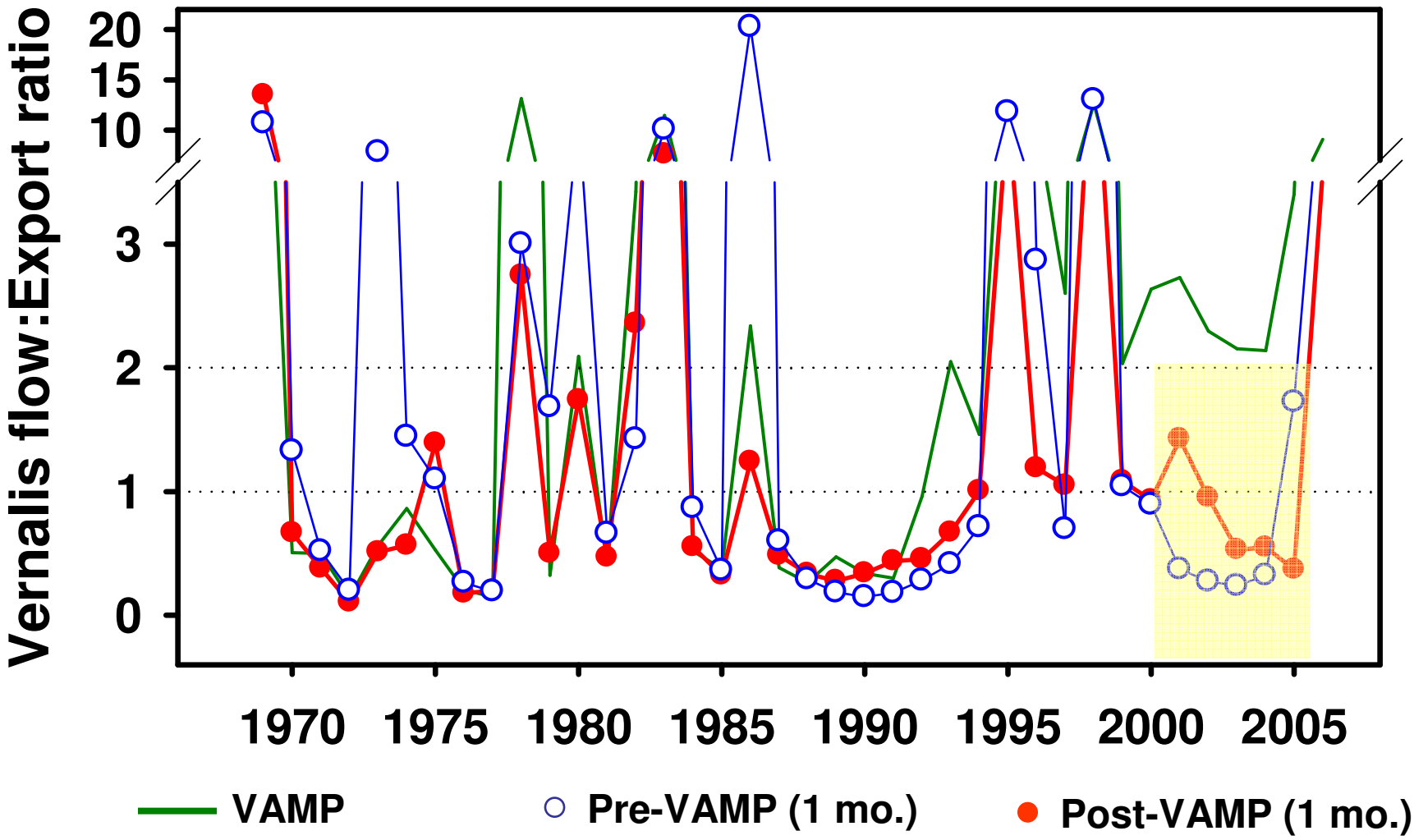
Inflow from SJ Basin as % of total inflow:

Historic: 23% **1995-2000: 14%** **2001-2006: 11%**



Data sources: CDWR, Dayflow and CDEC

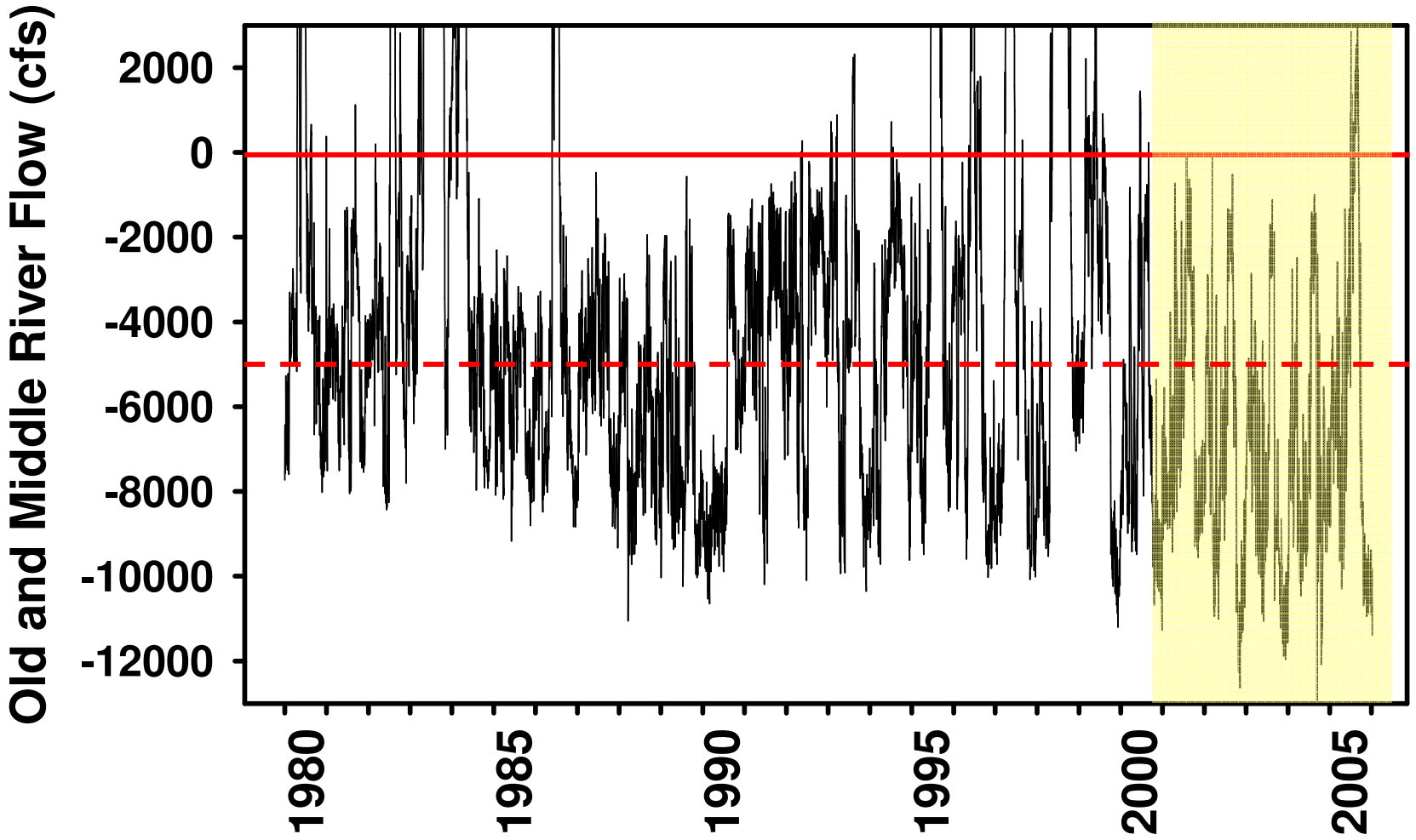
SJ flow:export ratio conditions before and after the 31-day VAMP are poor and worsening



Data source: CDWR, Dayflow

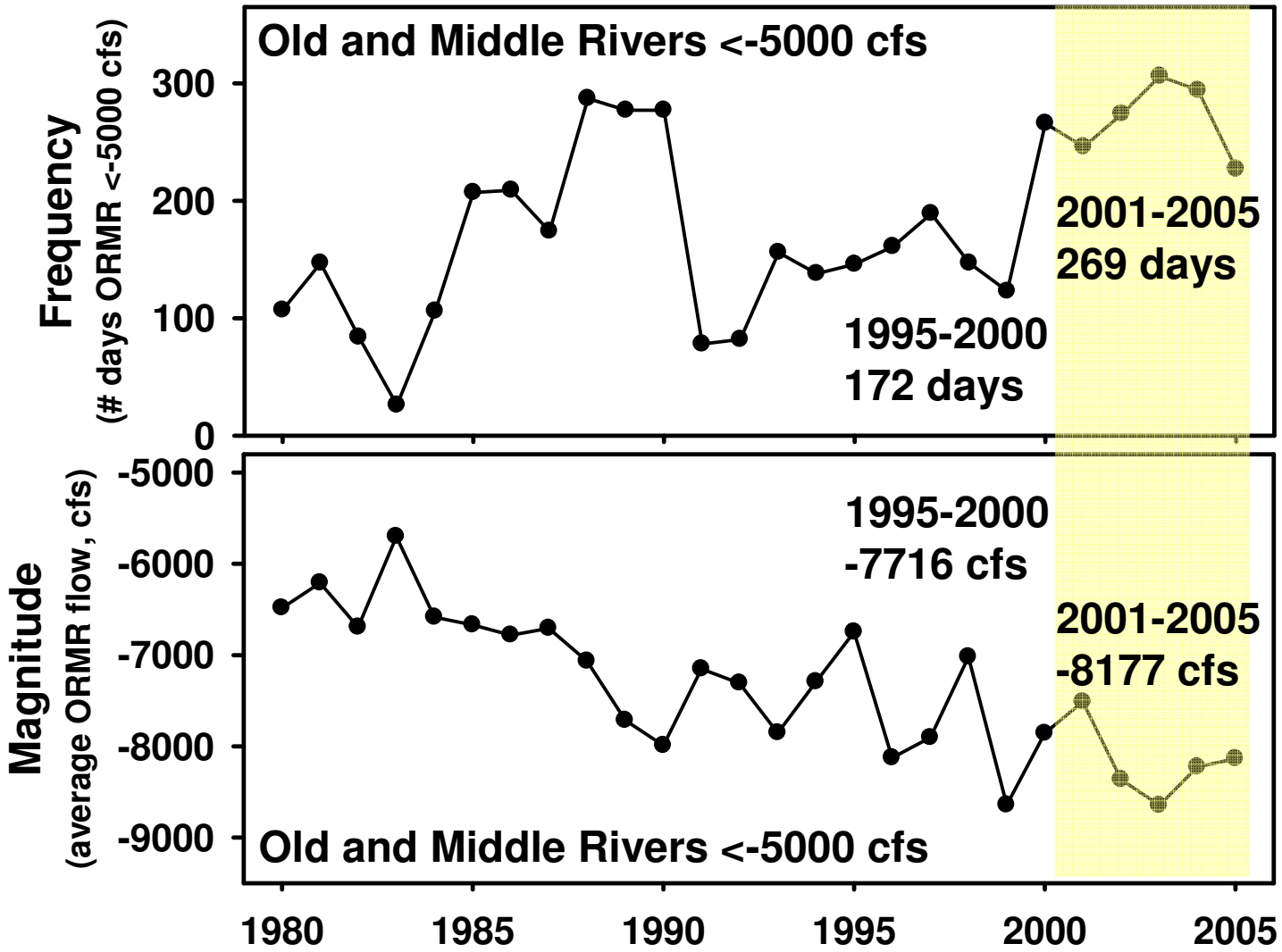
Negative flows on Old and Middle River worsening

- High incidental take
- Reduced downstream transport of fish and plankton



Data courtesy of CCWD

Frequency and Magnitude of adverse in-Delta hydrodynamic conditions increasing



Data courtesy of CCWD

Frequency and Magnitude of adverse in-Delta hydrodynamic conditions increasing

1995-2000

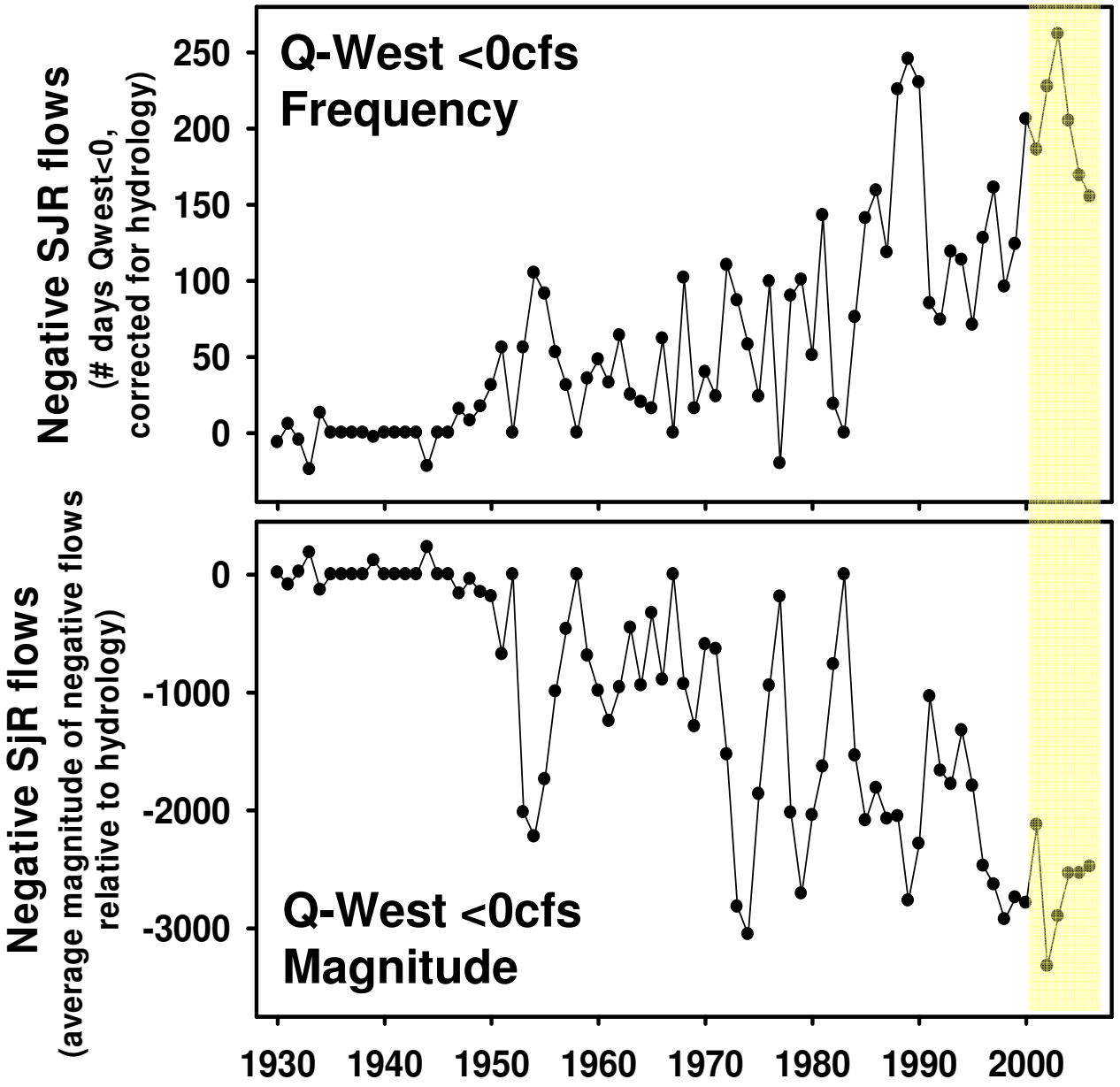
131 days

-2558 cfs

2001-2006

213 days

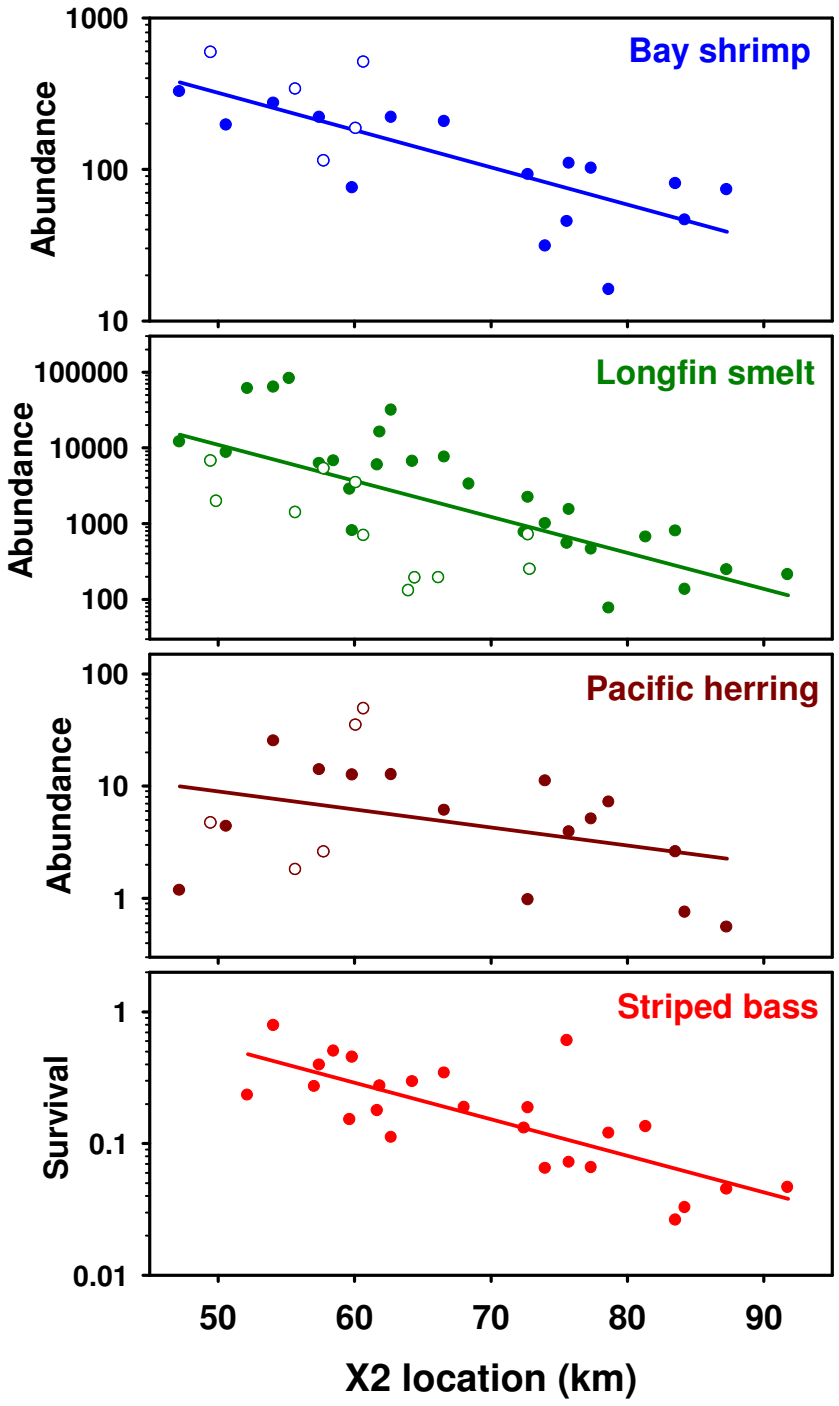
-2731 cfs



Data source: CDWR, Dayflow

Delta Outflow

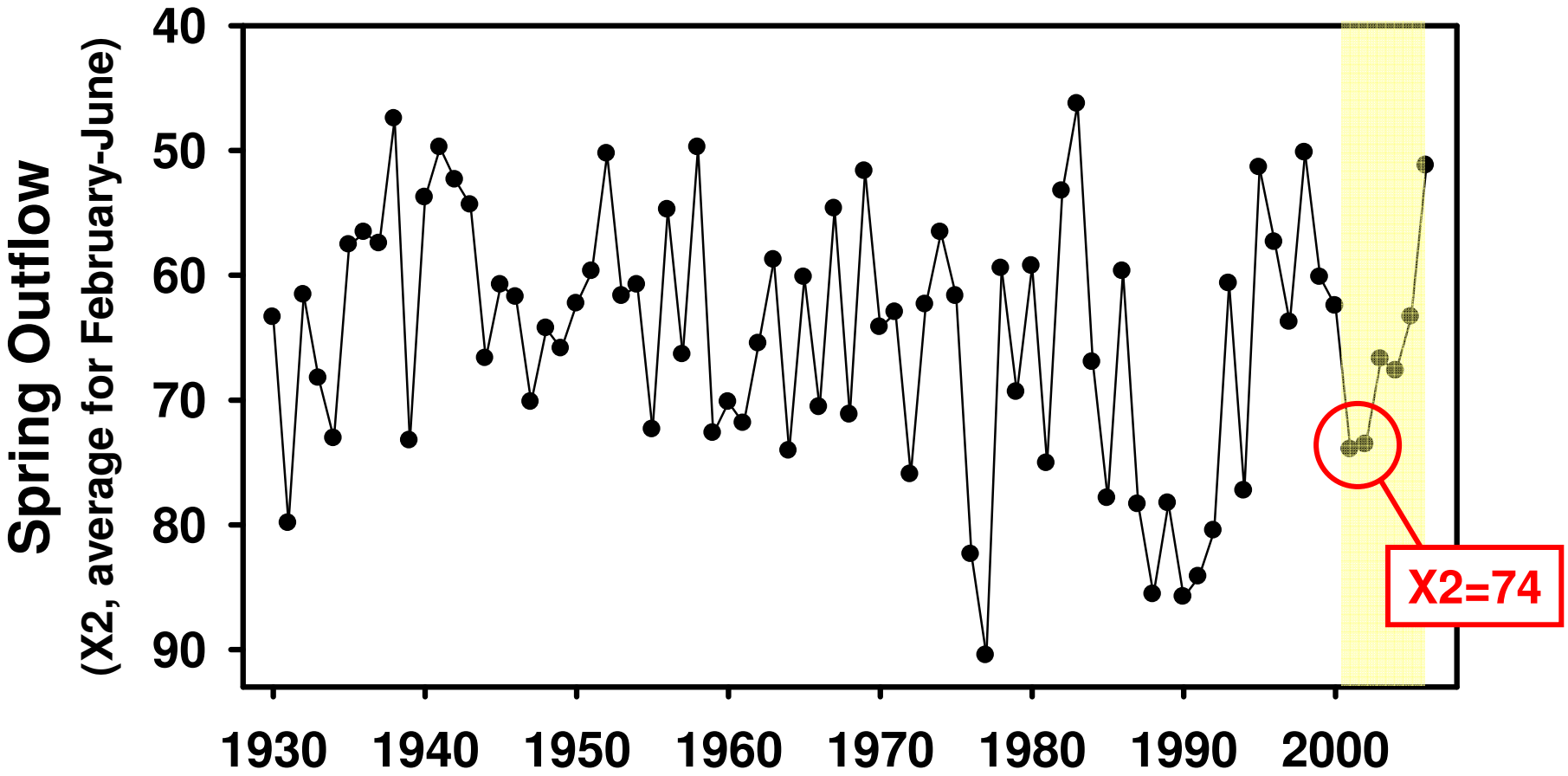
Higher fish abundance and/or survival with high spring outflow (=lower X2)



Data source: W. Kimmerer, SFSU; CDWR, Dayflow

Spring outflow conditions have not improved

Early "POD" years, Feb-June Delta Outflow objectives met but X2 conditions comparable to "critically dry" year.



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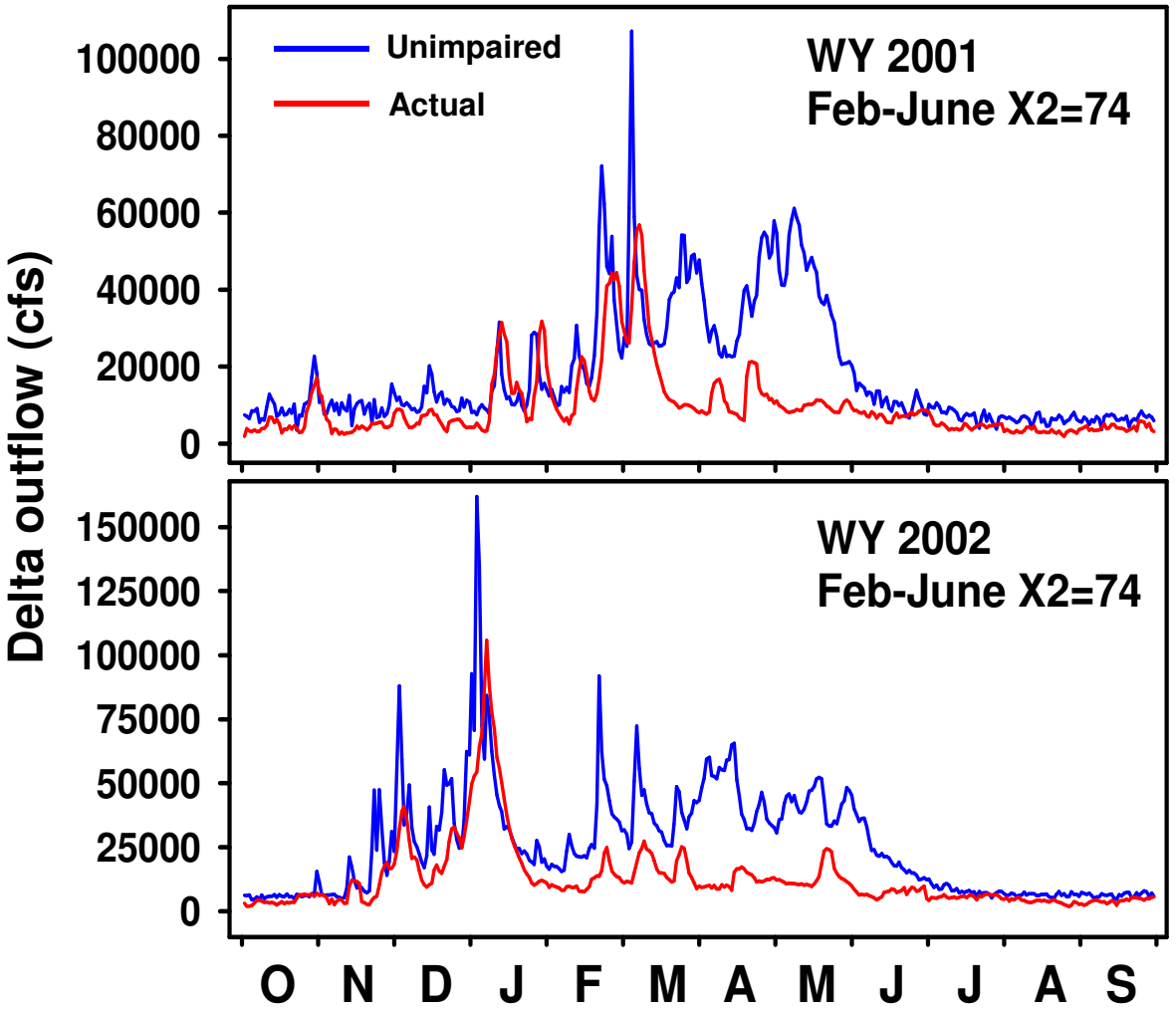

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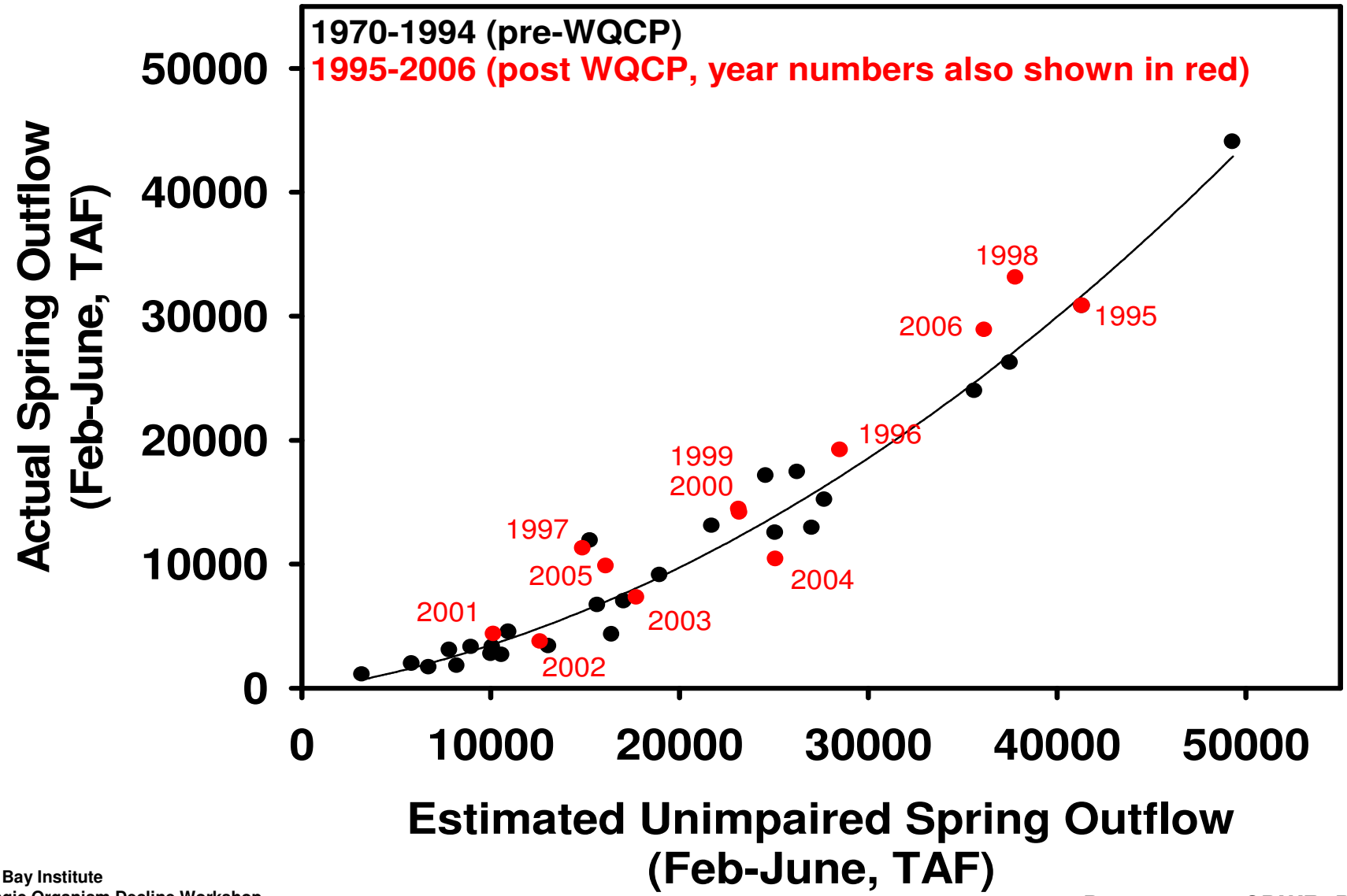
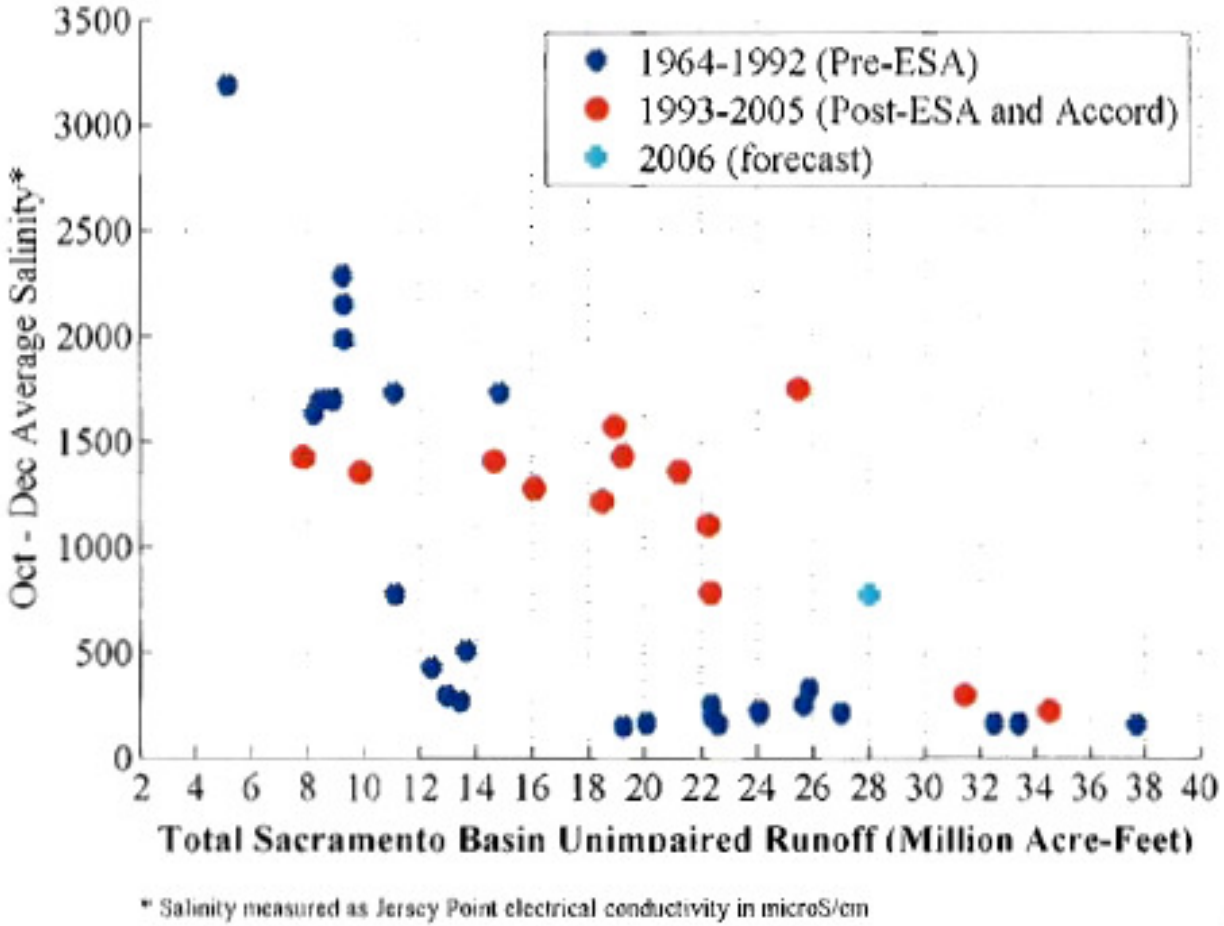


Data source: CDWR, Dayflow

Delta outflow during the fall has declined
Western Delta salinity has increased in the fall

Figure 2 – Fall western Delta salinity as a function of hydrology



* Salinity measured as Jersey Point electrical conductivity in microS/cm

vival6.ra
27-Nov-2006 lw

Source: CCWD comment letter to SWRCB

DWR analysis confirms lower fall Delta outflows degrade "habitat quality"

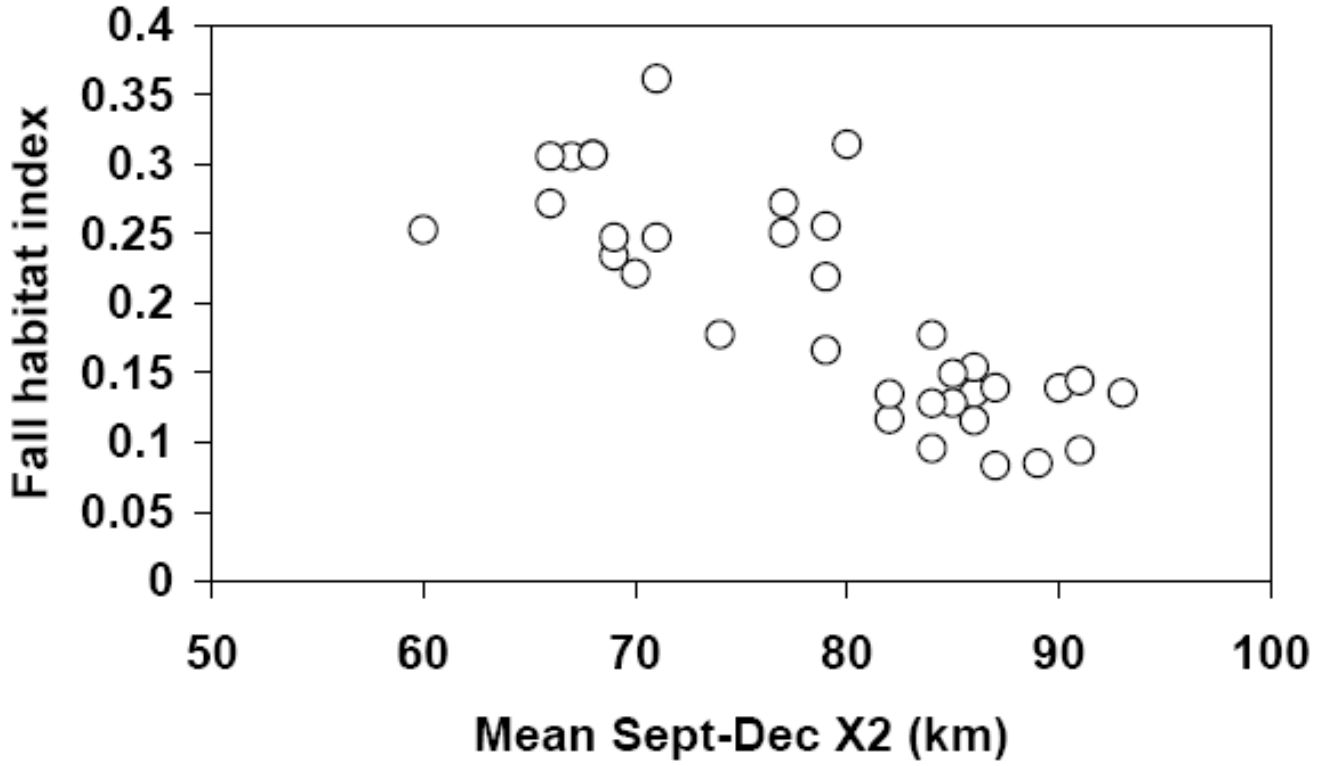


Figure 2. Relationship between fall X2 position and a delta smelt habitat index based on specific conductance, water clarity, and water temperature. Note that Chipps Island is approximately at X2 = 75 km and requires 11,400 cfs of Delta outflow to maintain its position there and higher flows to move it there from landward locations. Note that X2 was at approximately 85 km at the time of this meeting (August 2006).

Source: DSWG notes 8/21/06

DWR analysis confirms decline in fall "habitat quality"

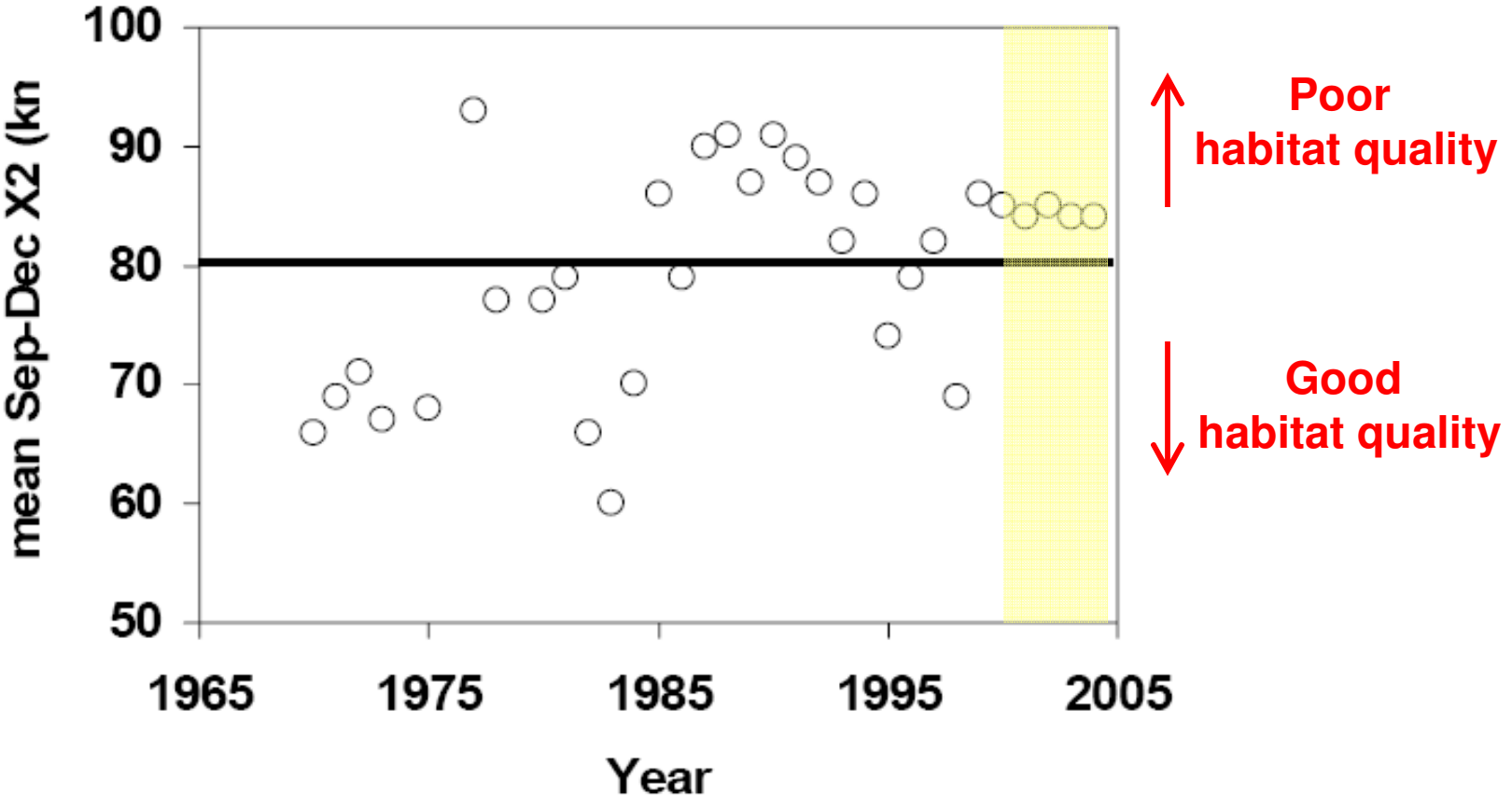


Figure 3. Time series of fall X2 positions for 1970-2004. The thick horizontal line denotes an X2 position near Broad Slough.

Source: DSWG notes 8/21/06

POD research results show that protection of estuarine habitat and fish and wildlife beneficial uses will require actions to:

- Reduce direct and indirect mortality associated with water management operations;
- Improve estuarine habitat by increasing outflows;
- Improve primary and secondary plankton production; and
- facilitate transport of food organisms from south and central Delta to confluence and Suisun Bay.

Federal and State agency scientists developed potential habitat and fish protection actions:

- **Delta Smelt Working Group (Oct 2004-present)**
- **Pelagic Organism Action Matrix (November 2006)**
- **Pelagic Organism Action Plan (March 2007)**

However

Agency reliance on the EWA and other limited environmental water assets has precluded adoption or limited implementation of numerous potential remedial actions.

Exports have increased

Increase in SWP+CVP exports
1995-2000 ⟶ 2001-2006

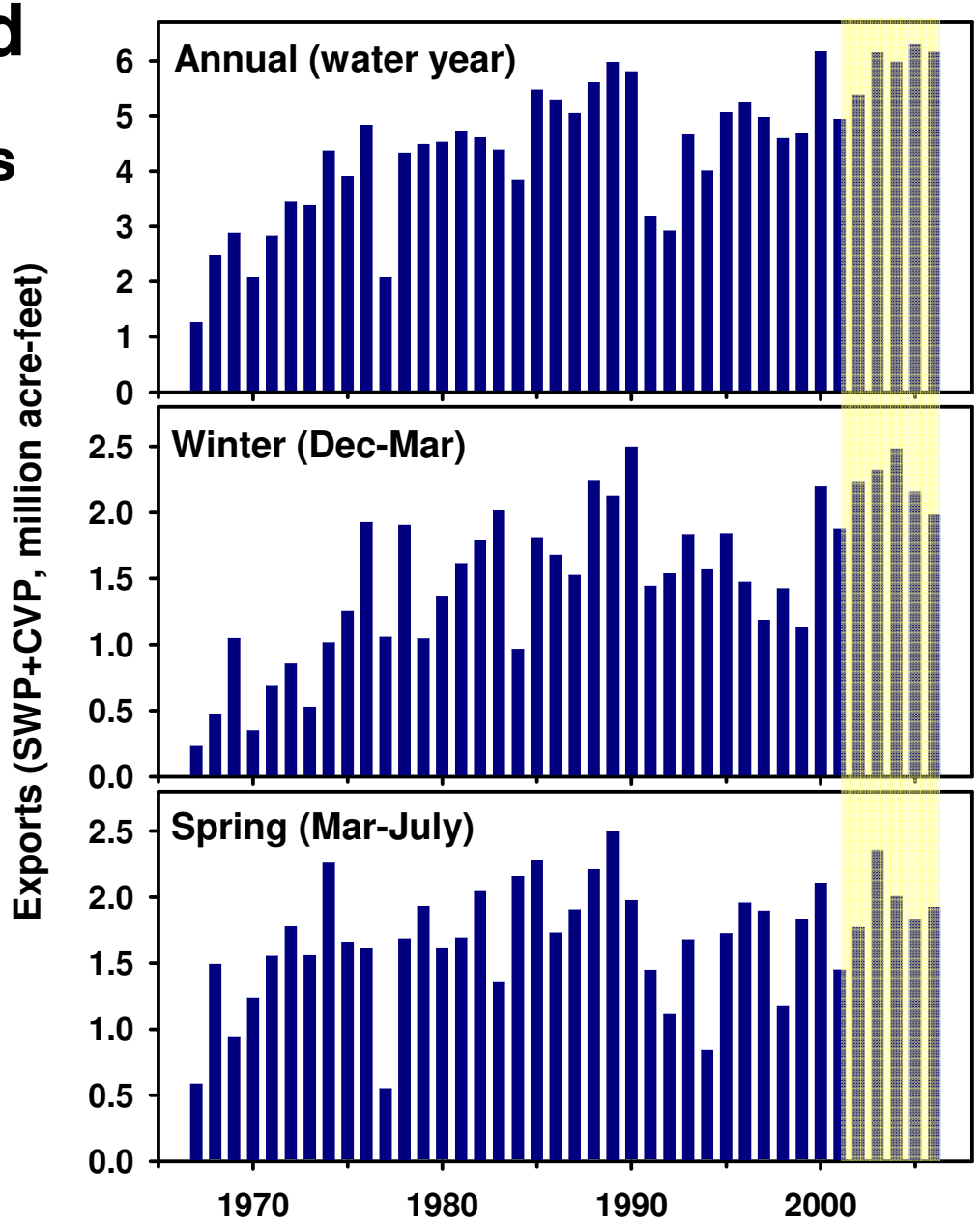
Annual: 14%
701 TAF

Winter: 41%
633 TAF

Spring: 6%
107 TAF

Compared to

EWA expenditures:
270 TAF av. (124-348 TAF)



Data source: CDWR, Dayflow

Examples (1):

February-March 2005 (3/10/05 DSWG notes)

- Curtail exports to protect adult delta smelt (incidental take exceeded “level of concern”)
- Recommended exports: 1500 cfs, 7 days
- Implemented exports: 3000 cfs, 4 days
- 2005 Delta Smelt FMWT Index=26

Examples (2):

August-September 2006 (8/21/06 DSWG notes)

- **Increase fall Delta outflow to improve habitat quality (significant correlation, some causation known, high likely successful implementation)**
- **"the amount of environmental water required to move X2 seaward of Chipps Island… is 3-4 times the annual EWA budget"**
- **Action not recommended (B2 water not considered)**
- **2006 Delta Smelt FMWT Index=41**

Current Conditions (February-March 2007):

- DSWG reported on 3/10/05 that Old/Middle River flows $\geq$0 cfs during delta smelt spawning season in dry years would be beneficial
- March 2007 - Delta smelt ready to begin spawning
- Recent PTM results: Proportion of Sacramento River particles (simulating delta smelt larvae spawned in north Delta) entrained at SWP+CVP increases from 14% at 0 cfs OR/MR to 28% at OR/MR -5000 – 0 cfs, to 68% at OR/MR< -5000 cfs (DSWG notes 2/9/07)
- Current OR/MR flows = -5000 cfs (as 5-day av.)
- EWA assets for 2007 nearly exhausted

Lessons from the POD and the Agency Response to Fish Declines

- Understanding of POD is sufficient to recommend specific changes to water management operations to protect beneficial uses.

- EWA and related programs have failed to prevent degradation of beneficial uses.

- SWRCB is obligated to protect beneficial uses under its Clean Water Act mandate and should not be constrained by agreements and decisions by resource agencies under their ESA permitting authority.

Recommendations (1): Increase Flexibility to Respond to POD

- Delete "no net water supply impacts" language from WQCP footnotes.

- Issue water rights orders requiring CVP and SWP to adopt and implement annual operations plans that include specific measures to address export, river flow, and outflow conditions contributing to decline of pelagic species - then review and revise subsequent plans based on monitoring and assessment.

- Establish a Bay-Delta Protection Fund.

Recommendations (2): Improve San Joaquin River Conditions

- **Decrease negative flows on Old and Middle Rivers to reduce entrainment mortality and facilitate downstream transport of plankton and larval fish.**
  - **≥ -4000 cfs February-April 15**
  - **≥ -4000 cfs May 16-October**

- **Increase San Joaquin River flows at Vernalis objectives during the winter and spring.**

Recommendations (3): Revise Export Criteria

- **Revise winter and spring export criteria to ensure central Delta hydrodynamic conditions that facilitate downstream transport of plankton and young fishes.**

Recommendations (4): Improve Delta Outflows

- **Maintain February - June Delta outflows flows and X2 location assuming a 1956-1968 level of development.**

- **Clarify "three ways to win" methodology to ensure desired location of X2 is achieved.**

- **Maintain fall (October-December) X2 downstream of 80 km to improve estuarine habitat quality and reduce the abundance and distribution of the invasive clam *Corbula*.**