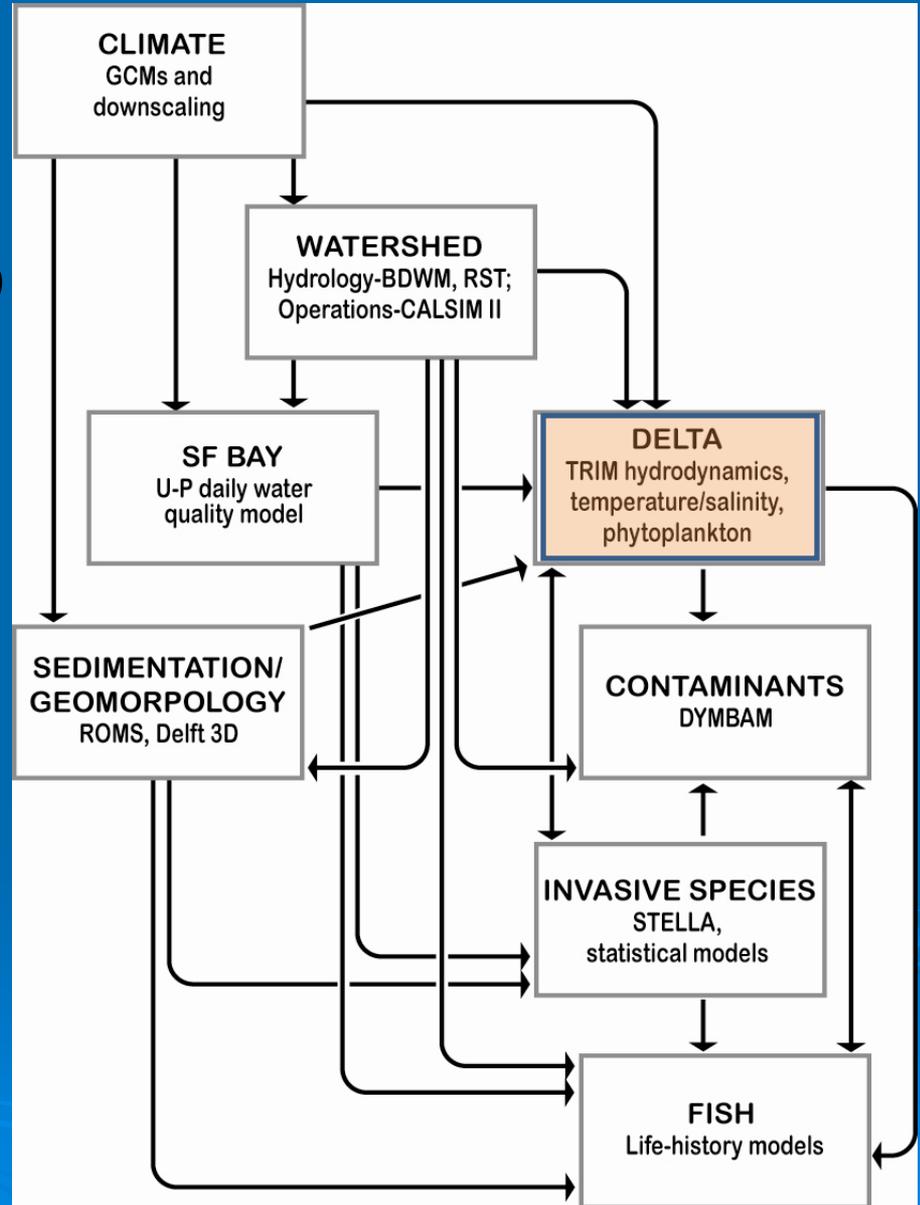


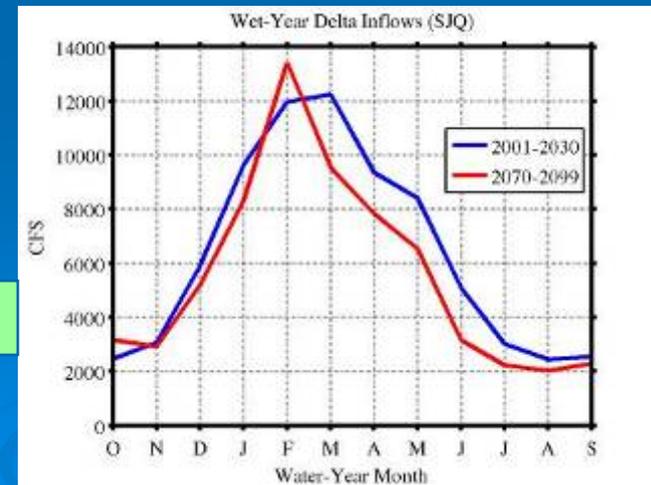
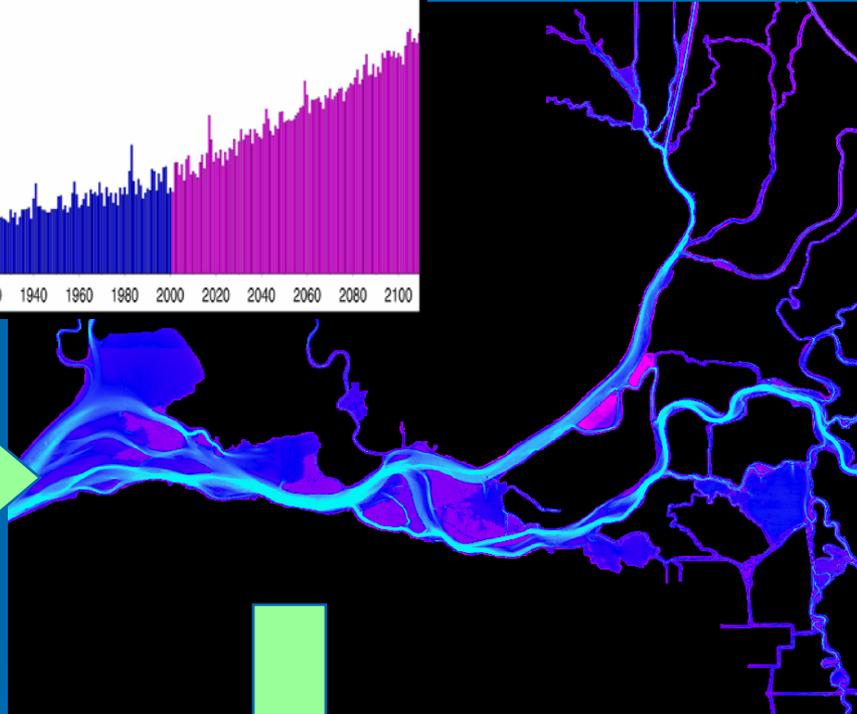
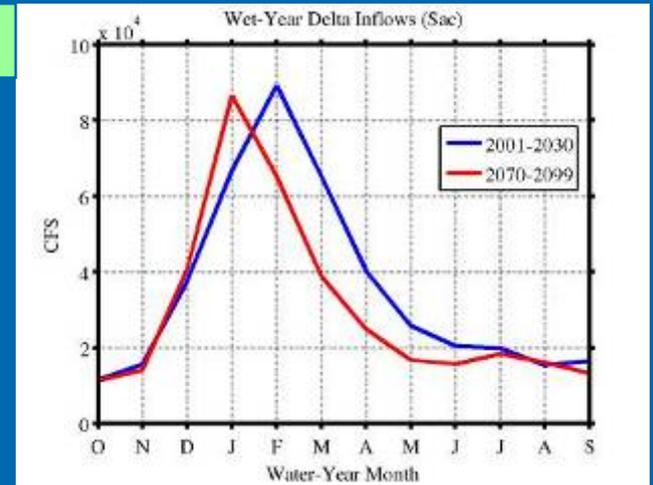
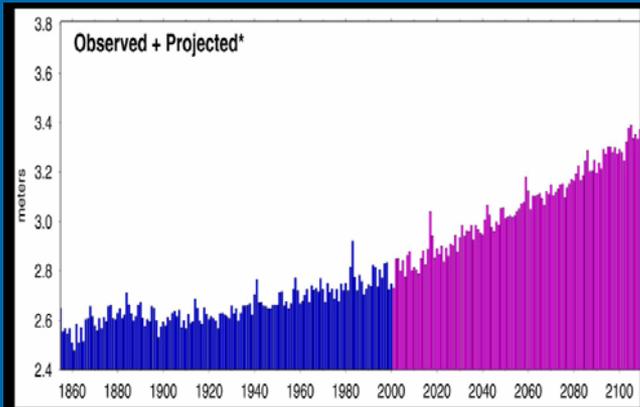
How do we apply what we learn from hydrodynamic models to ecosystem questions?

Nancy Monsen
USGS/Menlo Park
October 24, 2008

Funding source: CALFED Science Grant

Thank you to Vincenzo Casulli for use of the TRIM3D hydrodynamic code.





Ecosystem
Response

An Observation:

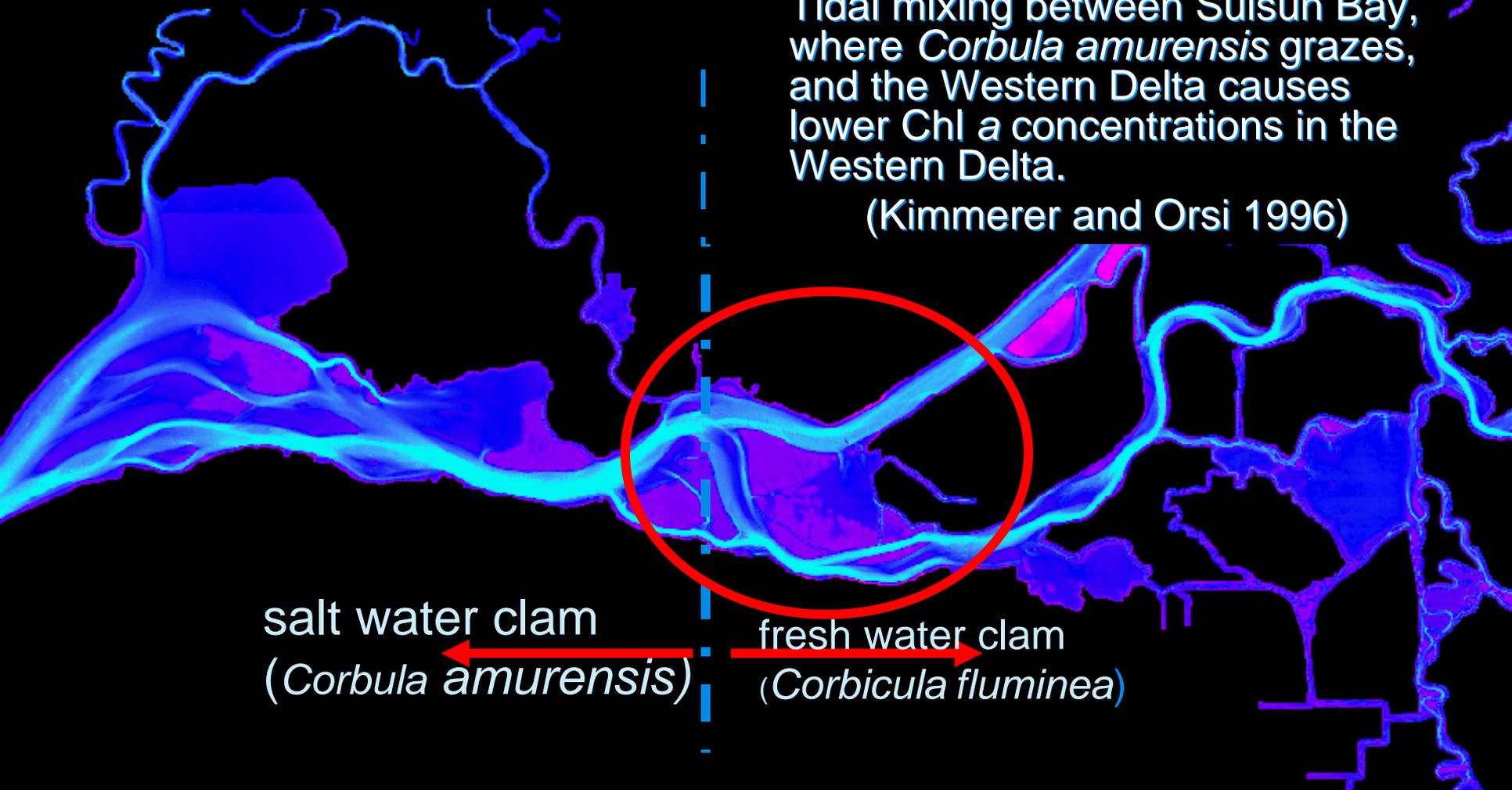
“The western Delta stations ... exhibit a larger suppression [of Chl a] after 1986 than the upstream stations.”

(Jassby et. al 2002)

The Working Hypothesis:

Tidal mixing between Suisun Bay, where *Corbula amurensis* grazes, and the Western Delta causes lower Chl a concentrations in the Western Delta.

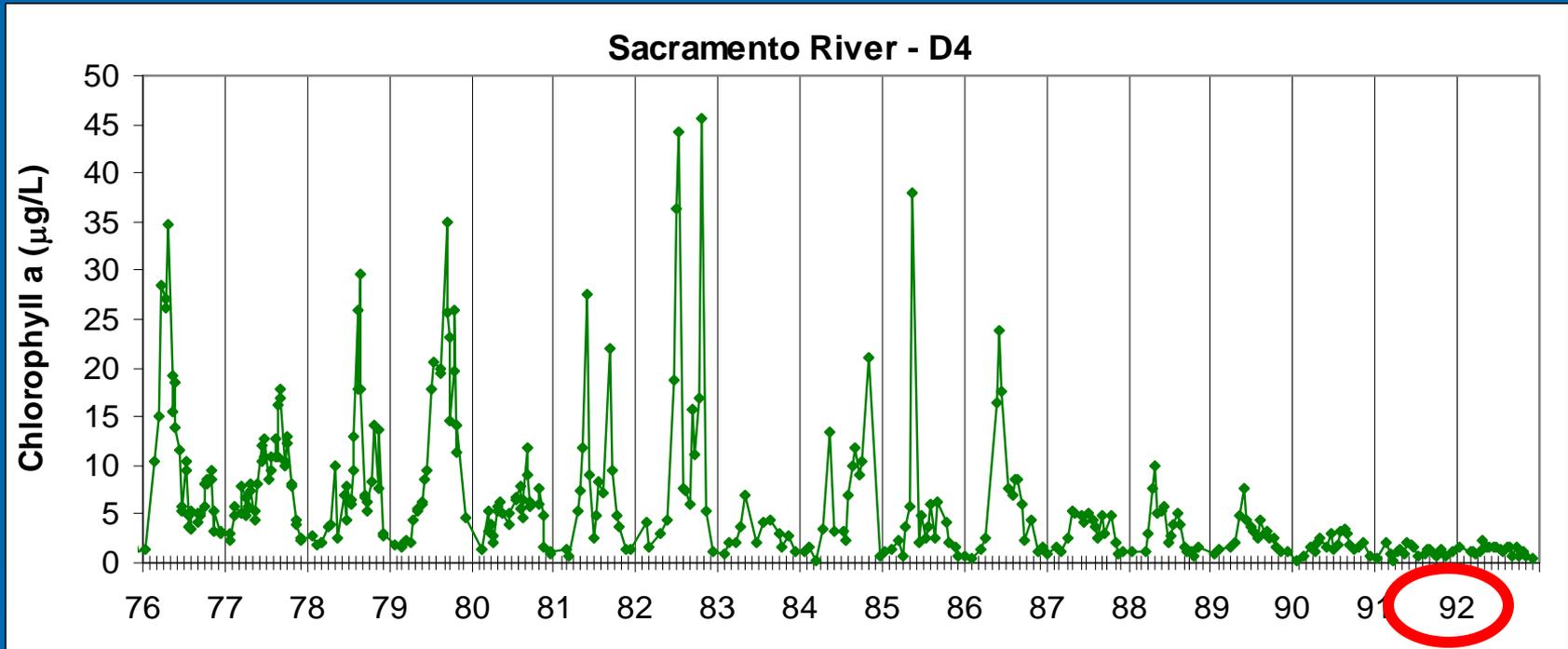
(Kimmerer and Orsi 1996)



The transport timescale questions related to this hypothesis:

- *How long* are water particles exposed to Suisun Bay where salt water clams reside?
- Is the period of exposure long enough (compared to the *filter rate* of clams) to filter phytoplankton (base of the food web)?
- After the water is filtered by the clams, *where* does it go next?

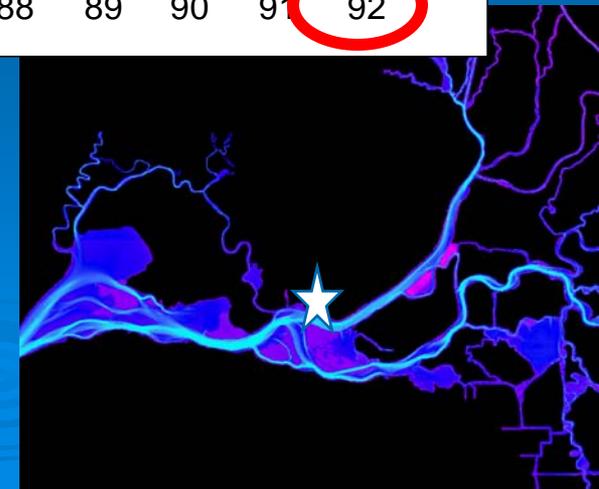
What we know about the clams:



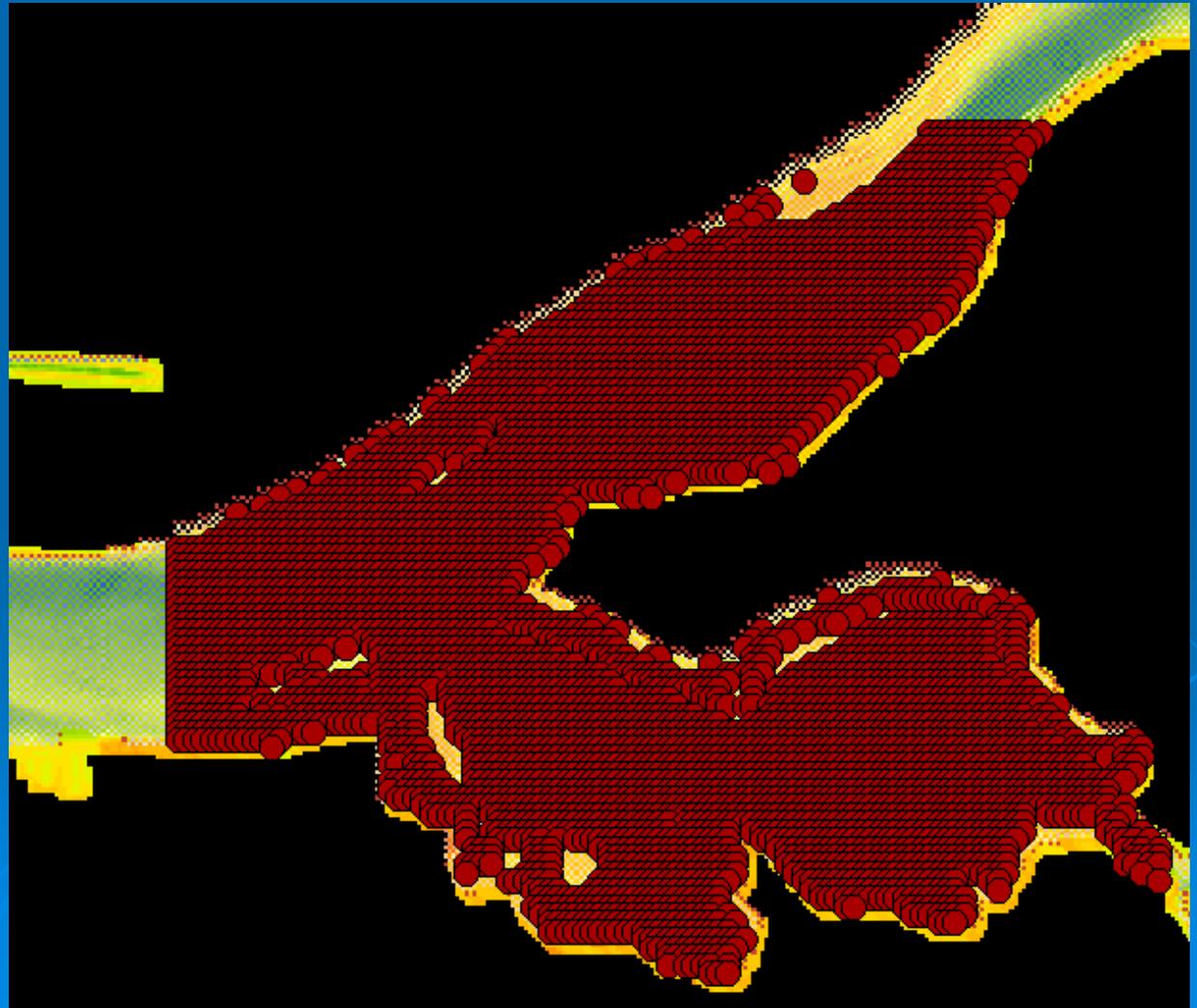
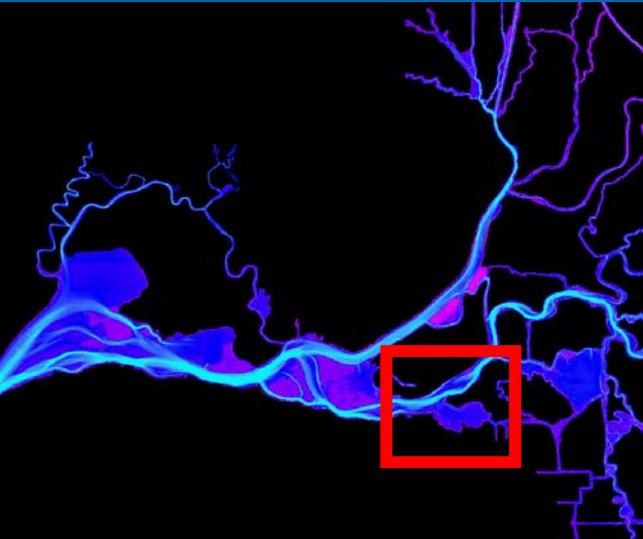
Channel station at Collinsville.

Source: Jan Thompson

Peaks in Chlorophyll a do not start until Summer/Early Fall in pre-corbula years.



Numerical “drogues” released at every grid cell (50 m x 50 m) in the Lower San Joaquin & Big Break region



August 1992 Animation: 18 days

Legend:

- + Never exposed to Suisun Bay
- + Exposed to Suisun Bay 1-24 hours
- + Exposed to Suisun Bay 24-48 hours
- + Exposed to Suisun Bay > 48 hours



Video Clip

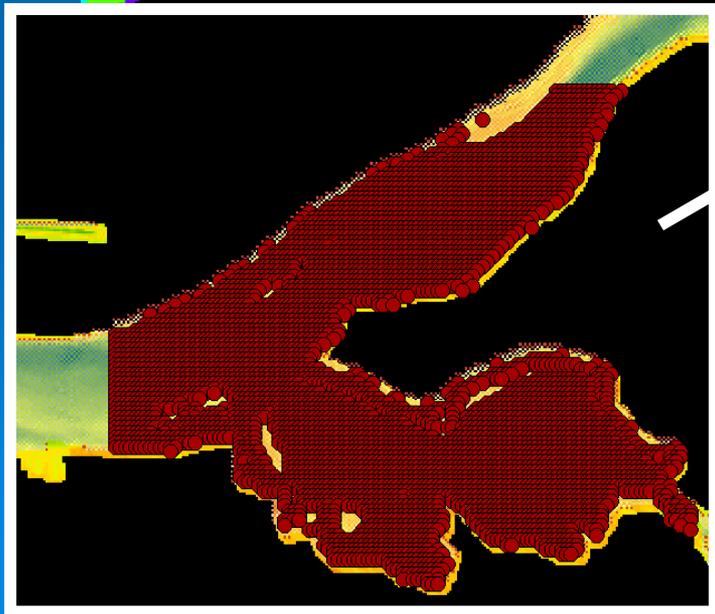
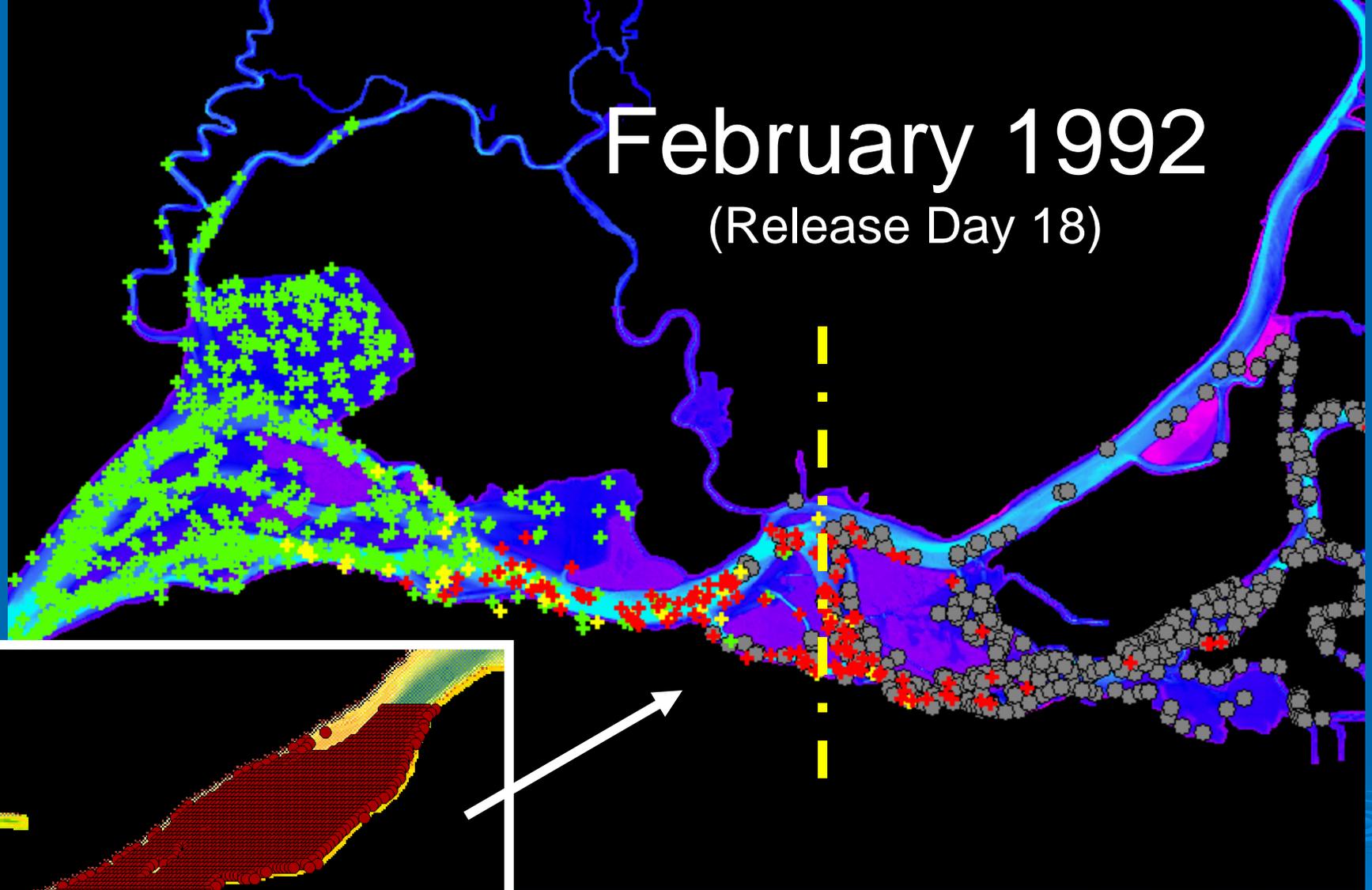


- February 1992
- August 1992



February 1992

(Release Day 18)



Sacramento Flow: $\sim 1200 \text{ m}^3/\text{s}$

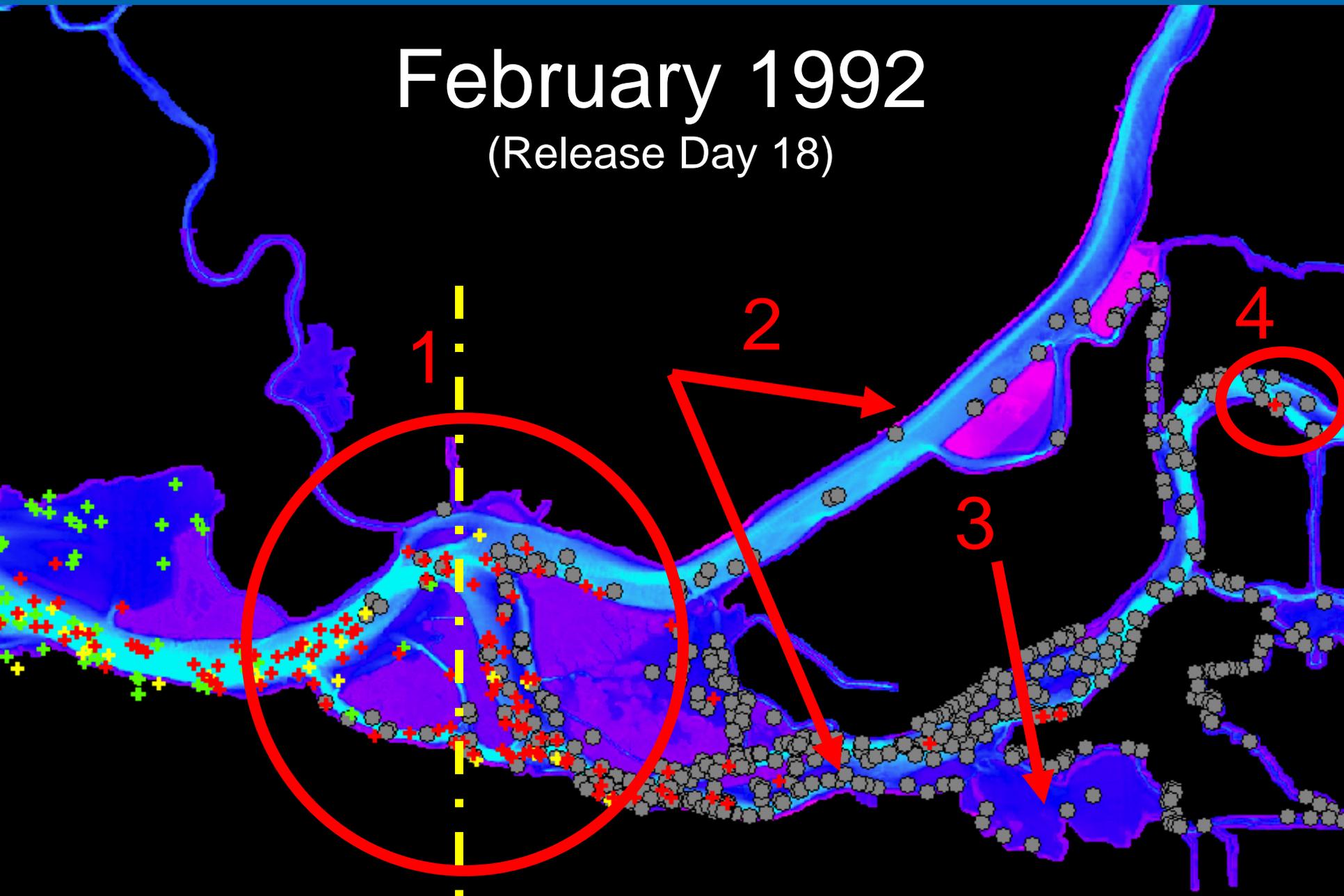
San Joaquin Flow: $\sim 100 \text{ m}^3/\text{s}$

Combined Export rate: $\sim 280 \text{ m}^3/\text{s}$

Status of Delta Cross Channel: Closed

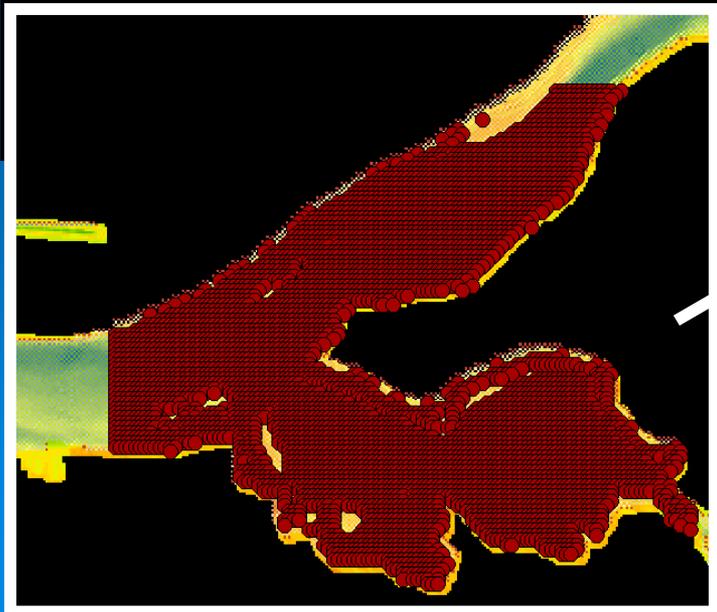
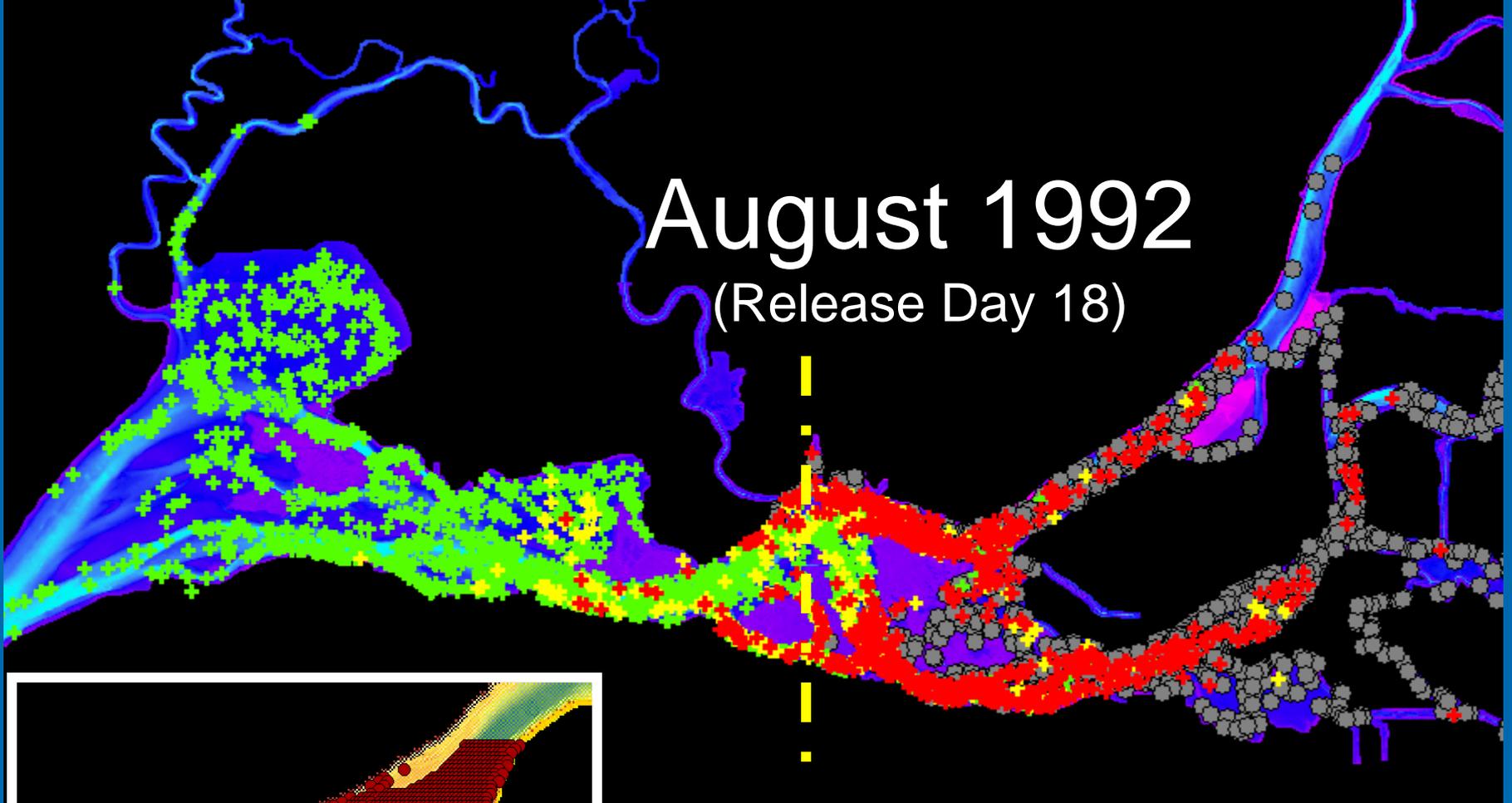
February 1992

(Release Day 18)



August 1992

(Release Day 18)



Sacramento Flow: $\sim 300 \text{ m}^3/\text{s}$

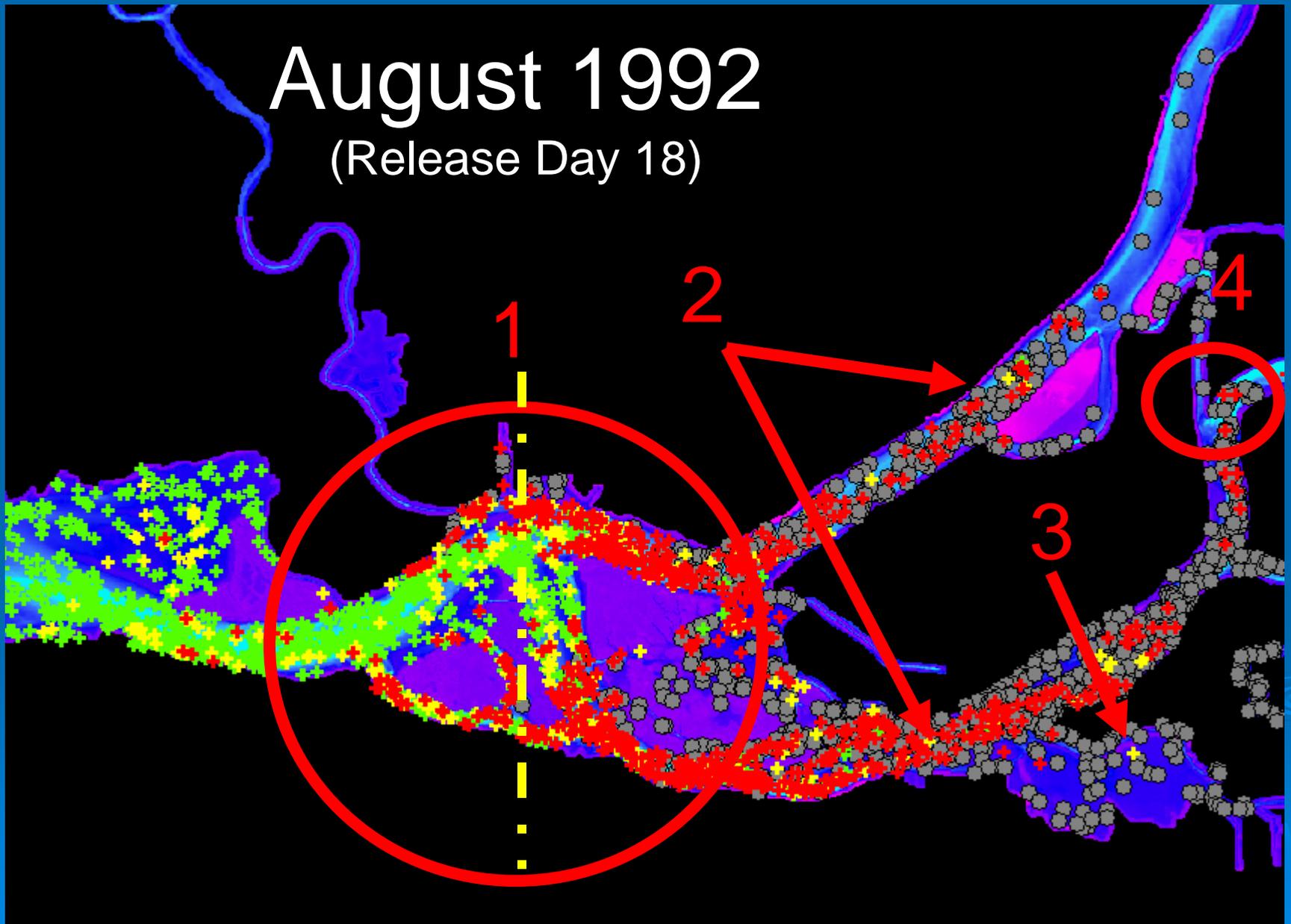
San Joaquin Flow: $\sim 15 \text{ m}^3/\text{s}$

Combined Export rate: $\sim 50 \text{ m}^3/\text{s}$

Status of Delta Cross Channel: Open

August 1992

(Release Day 18)



Take home lesson

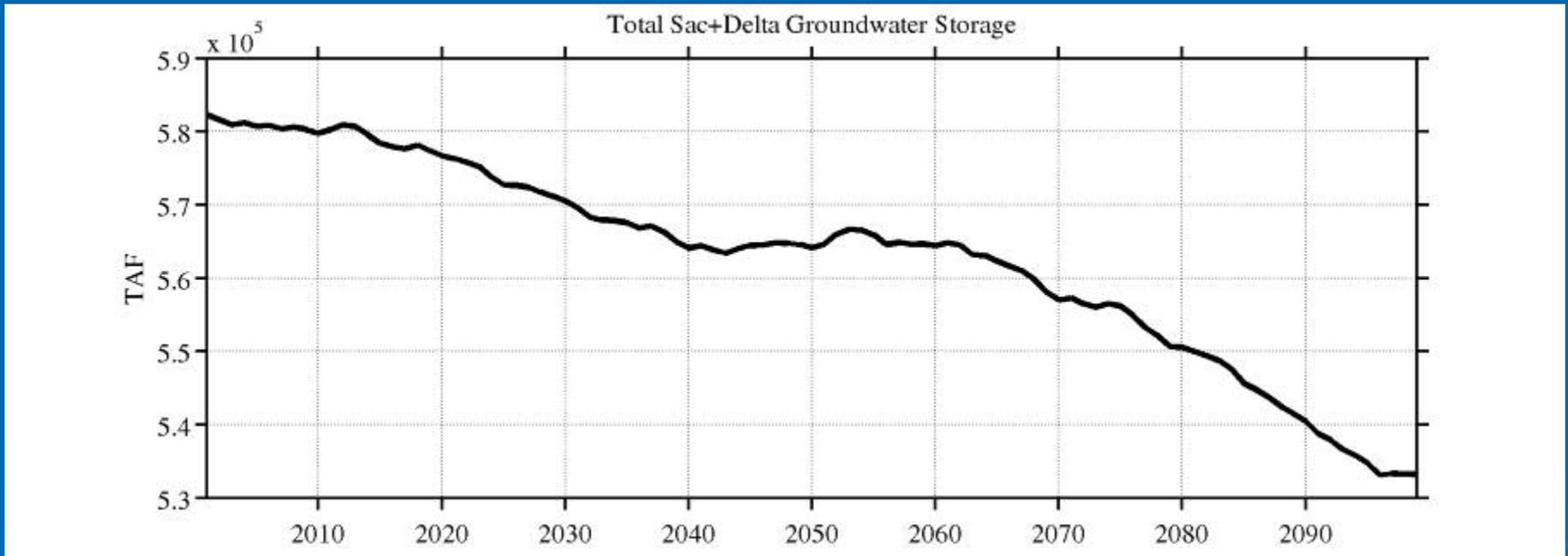
Conditions inside Suisun Bay have the potential to influence habitats upstream such as the western Delta.

This is a piece of the puzzle to support the hypothesis that clams in Suisun Bay may cause a reduction of Chl *a* in the Western Delta.



CALSIM: Unrealistic Groundwater Withdrawals?

GFDL-A2



The watershed model (Noah Knowles) provides river inflow for the Delta hydrodynamic model.

