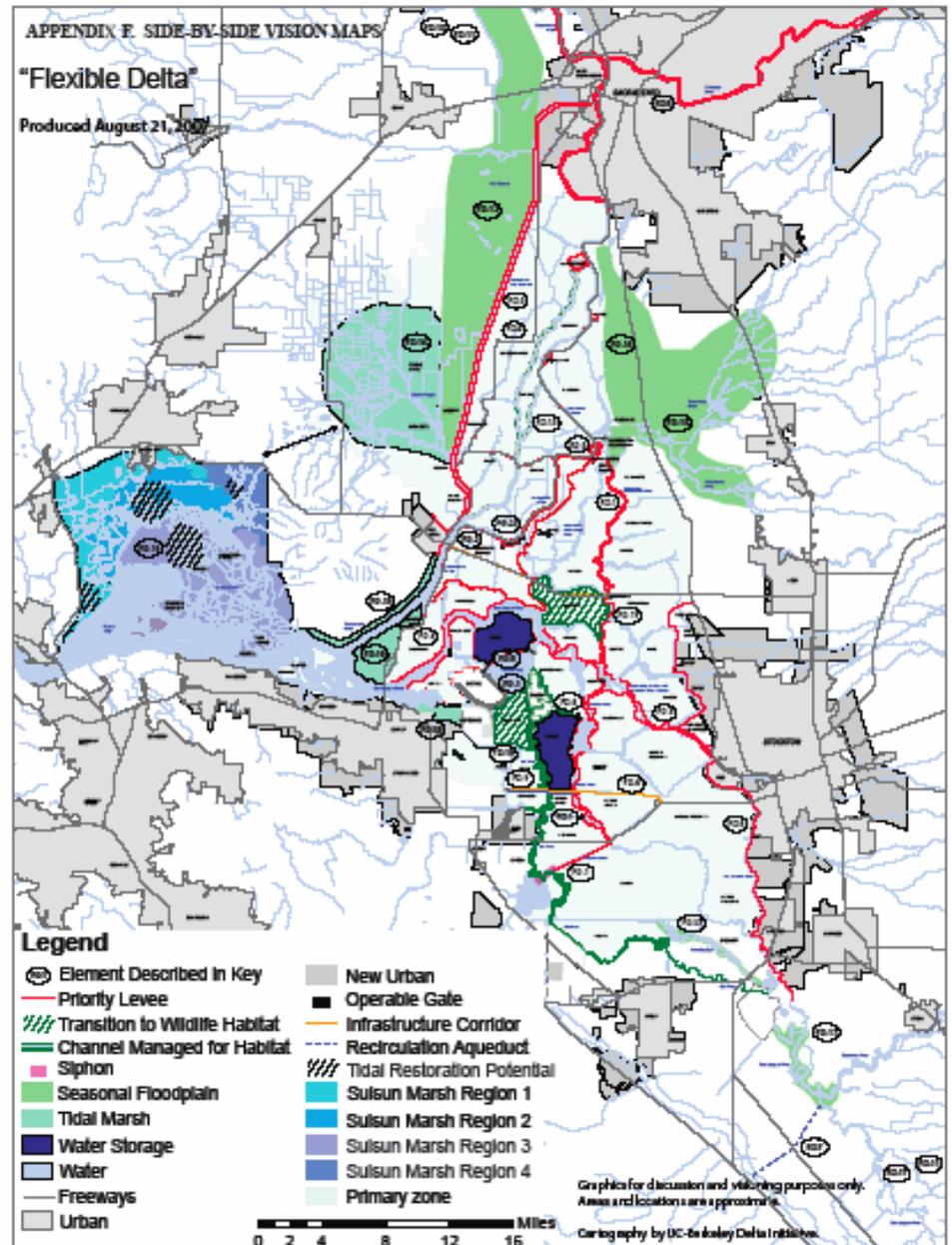


Using Eco-Design Principles To Establish A Framework For A More Sustainable Delta Ecosystem

“The Longest Journey
Begins With A Single
Step”



Some Design Principles

1. The Bay-Delta is not an island
2. The habitat mosaic of the Bay-Delta determines its overall performance
3. Flow is a main driver of the physical habitat mosaic for the aquatic community
4. Macrohabitat variables establish the capacity of the ecosystem to support species and services
5. Variability in time and space are important aspects of healthy functioning habitat mosaics

The Delta Is Not An Island

- Engage With Land Use Decisions
 - Urban Expansion
 - Corridor Protection
- Integrate With SF Bay Initiatives
 - BCDC
 - Baylands Ecosystem Plans

The Habitat Mosaic Determines Ecosystem Performance

- Support Land Acquisition
 - Marginal Wetlands
 - Antioch Dunes
- Address Land Subsidence on Islands
 - Reversing Subsidence
 - Changing Land Use

Macrohabitat Variables Affect Species And Ecosystem Services

- Address Ecotoxicity
 - Urban and Agricultural Runoff
 - Sewage Treatment
 - San Joaquin Flow Into the Delta

Temporal and Geographic Variability in Healthy Ecosystems

- Enhance Habitat Variability
 - Moveable, Removable Barriers to Assess Effects of Changing Flow Patterns
 - Fremont Weir and Yolo Bypass
 - San Joaquin Flow Augmentation
 - Old River Corridor
 - Bypass Development

Flow Drives Physical Template for the Aquatic Community

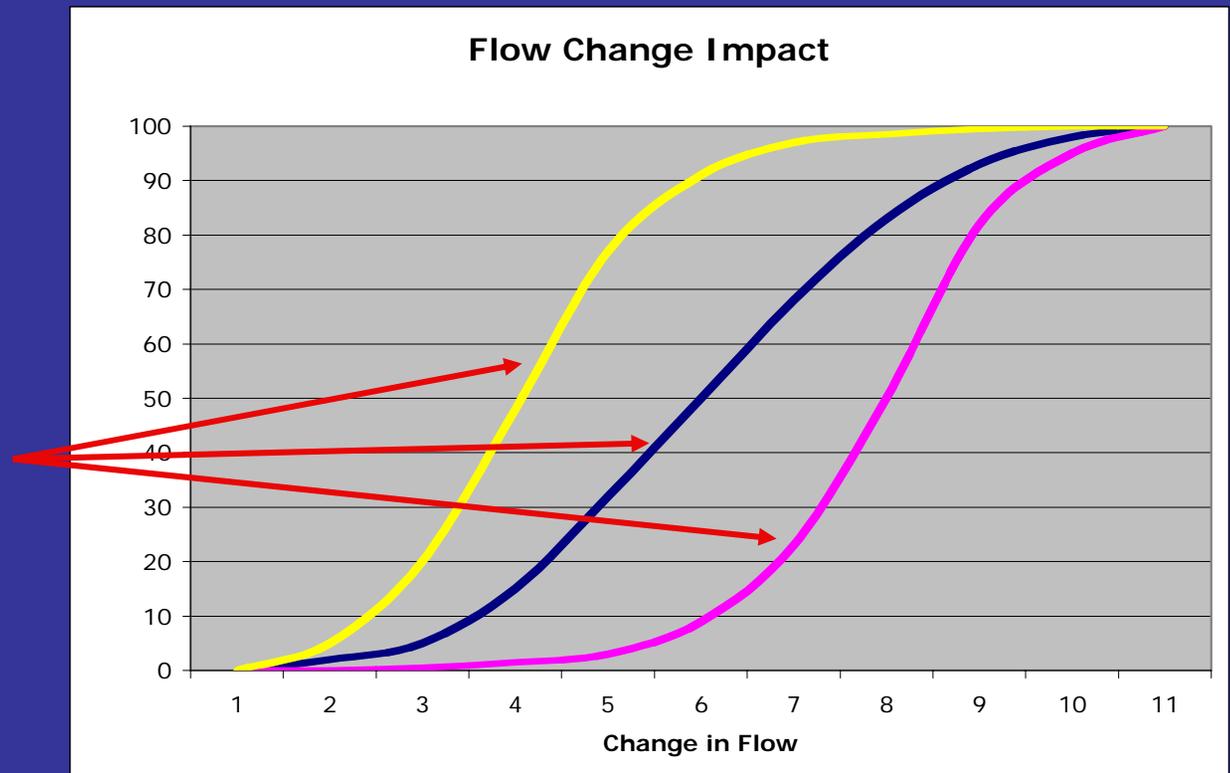
- What Do We Know About Flow and Habitat?
- What Do We **Not Know** About Flow and Habitat?
- Correlation Is a Weak Basis for Scientific Inference

There is no free lunch as far as flow is concerned

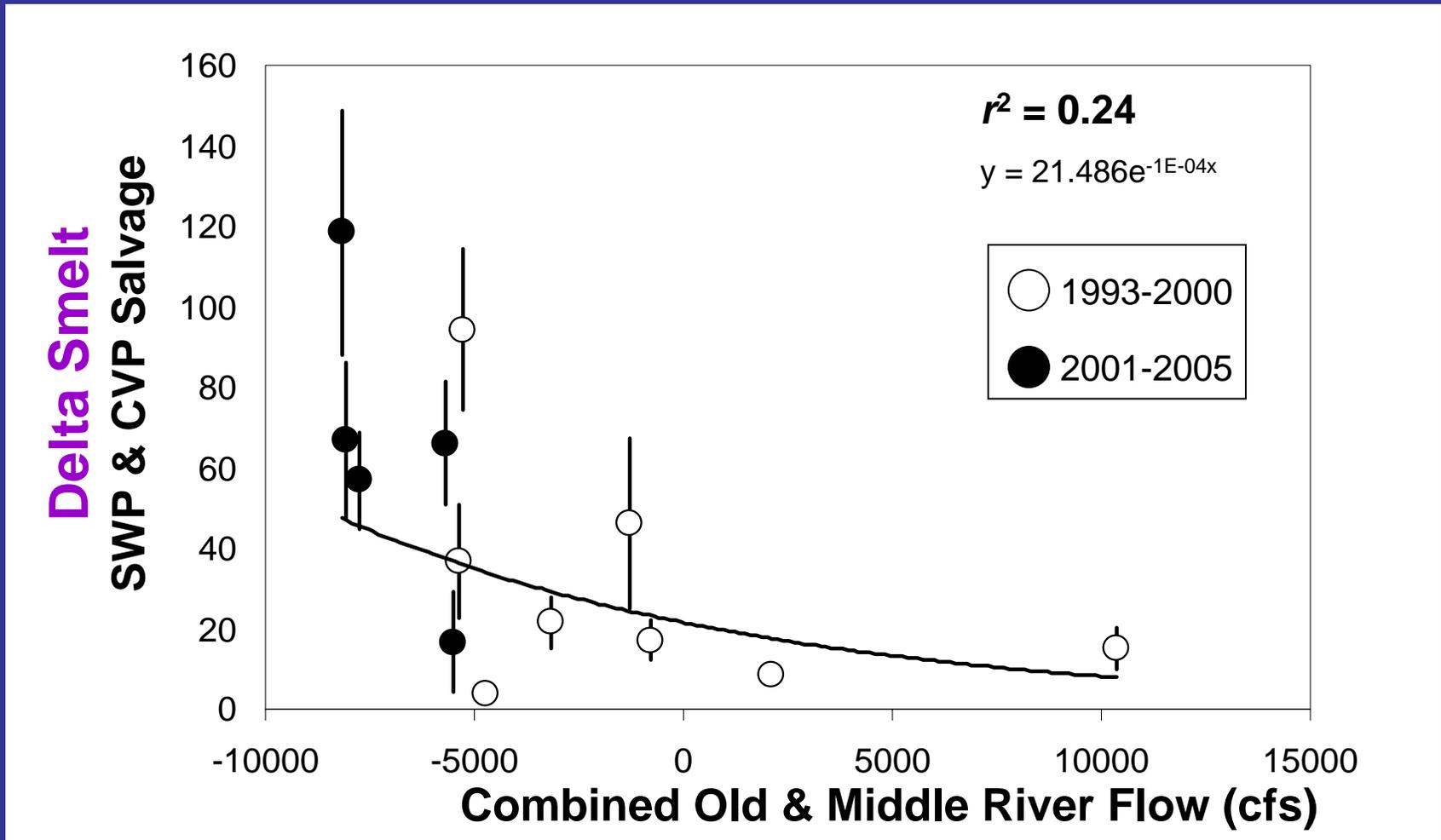
Flows (and tides) drive circulation, nutrient delivery, exchanges between land, freshwater, Ocean.

Different components of the system respond differently to changes in amount and pattern of Flow

Response is not linear but details are uncertain



Negative Old & Middle River Flows Apparently Increase Adult Delta Smelt Entrainment



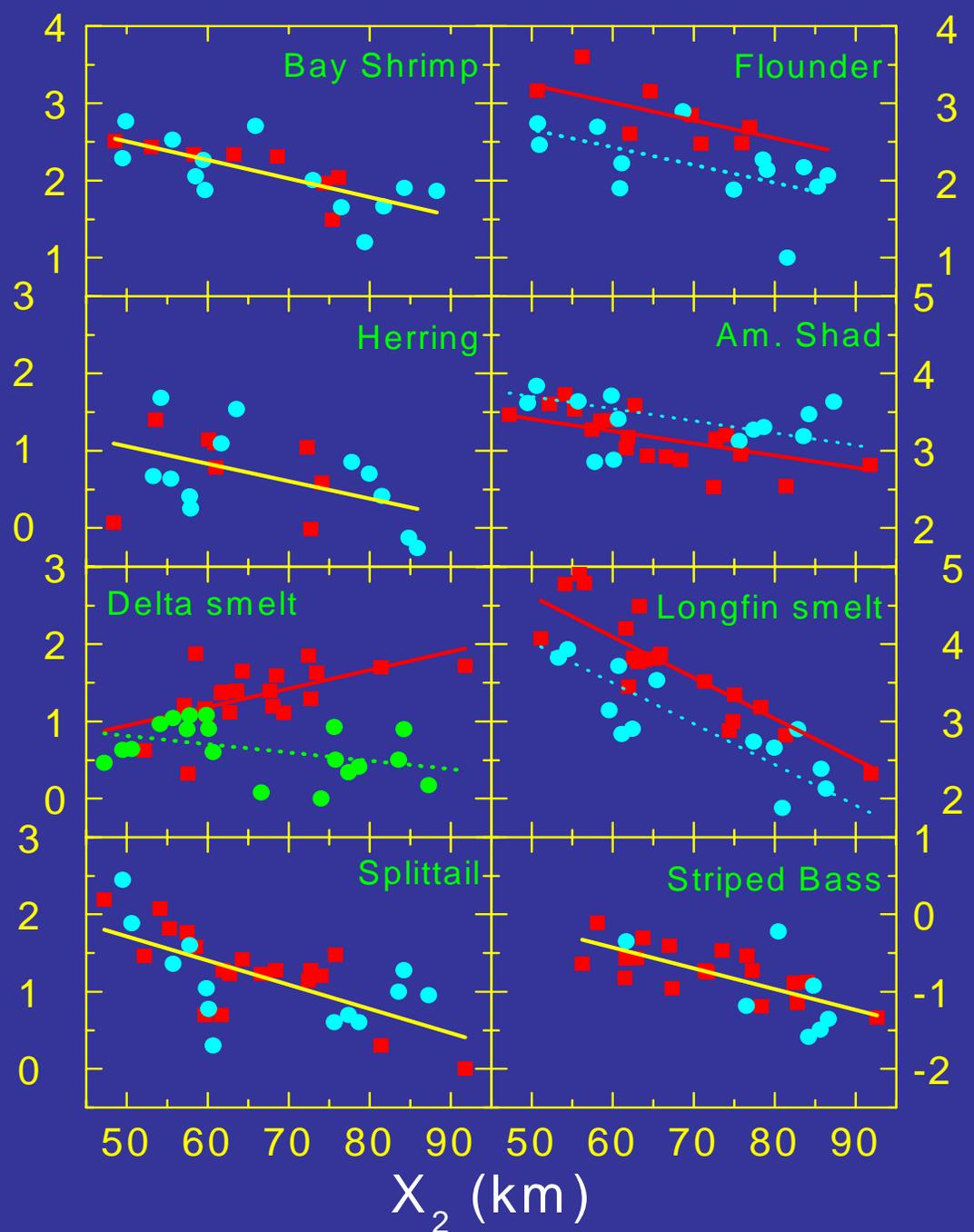
Mean Values for December-March
1993-2005

Source: Adapted from Pete Smith
(USGS)

Fish- X_2 Relationships From Kimmerer 2002



Log Abundance or Survival



Final Thoughts About Flow

- Altered Delta geometry and species invasions complicate predictions about flow changes
- Whatever is decided about flows for the Delta, we need to experiment with their delivery to understand how to make them work
- Experiments with flow and Delta hydrology should have a firm ecosystem basis; they should not be dictated entirely by concern for a particular species

The Framework for Ecosystem Restoration Should...

1. be based on sound ecological principles
2. accommodate sustainable human demands for land and water
3. be flexible and adaptable to absorb major drivers of change
4. recognize the intrinsic value of the Delta as a place where people and environment coexist