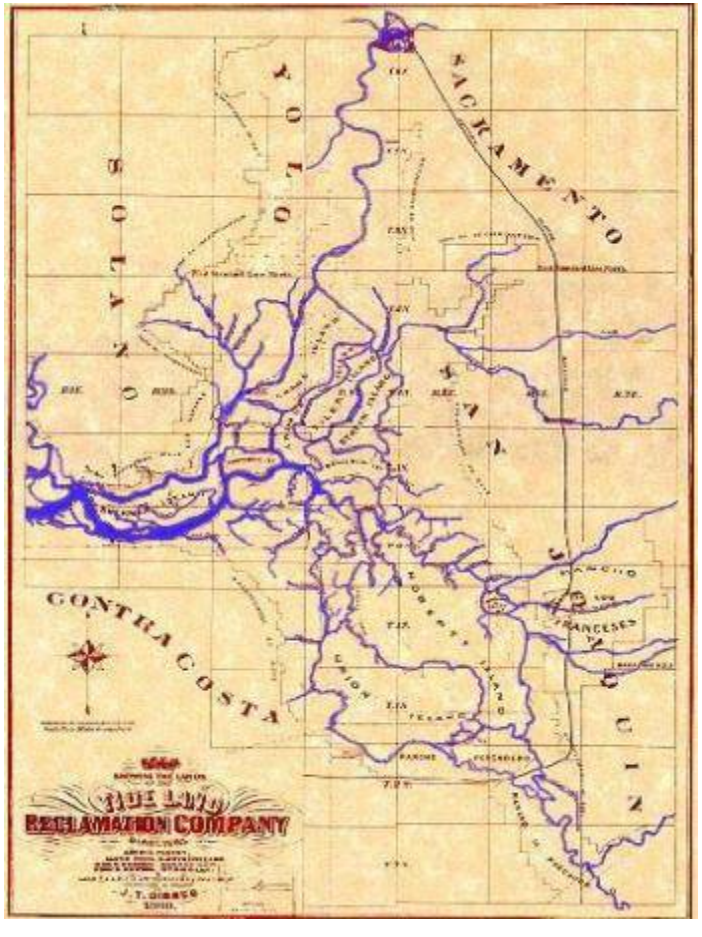
Managing Delta Ecosystem Reconciliation Adaptively

UCDAVIS
CENTER FOR WATERSHED SCIENCES
Delta Solutions



Jay Lund
University of California - Davis

Multiply stressed minds…

Ellen Hanak
PPIC
Economics

Jay Lund
UC Davis
Engineering

John Durand
UC Davis
Ecology

William Fleenor
UC Davis
Engineering

Brian Gray
UC Hastings
Law

Josué Medellín-Azuara
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Economics

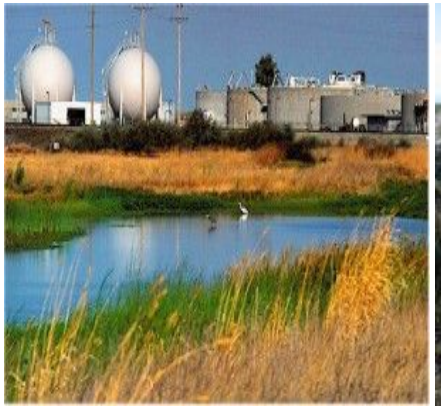
Jeffrey Mount
UC Davis
Geology

Peter Moyle
UC Davis
Biology

Caitrin Phillips
PPIC
Public policy

Buzz Thompson
Stanford University
Law

Five broad categories of ecosystem stressors — all related to human actions

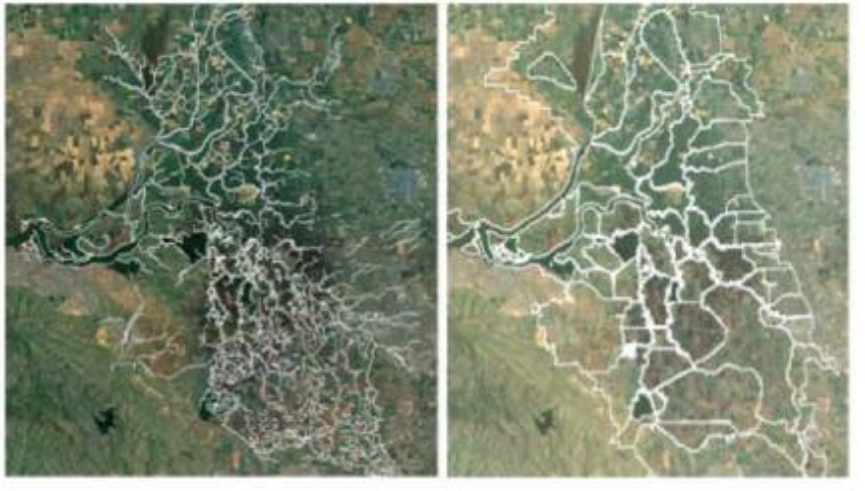


Discharges

Direct fish management

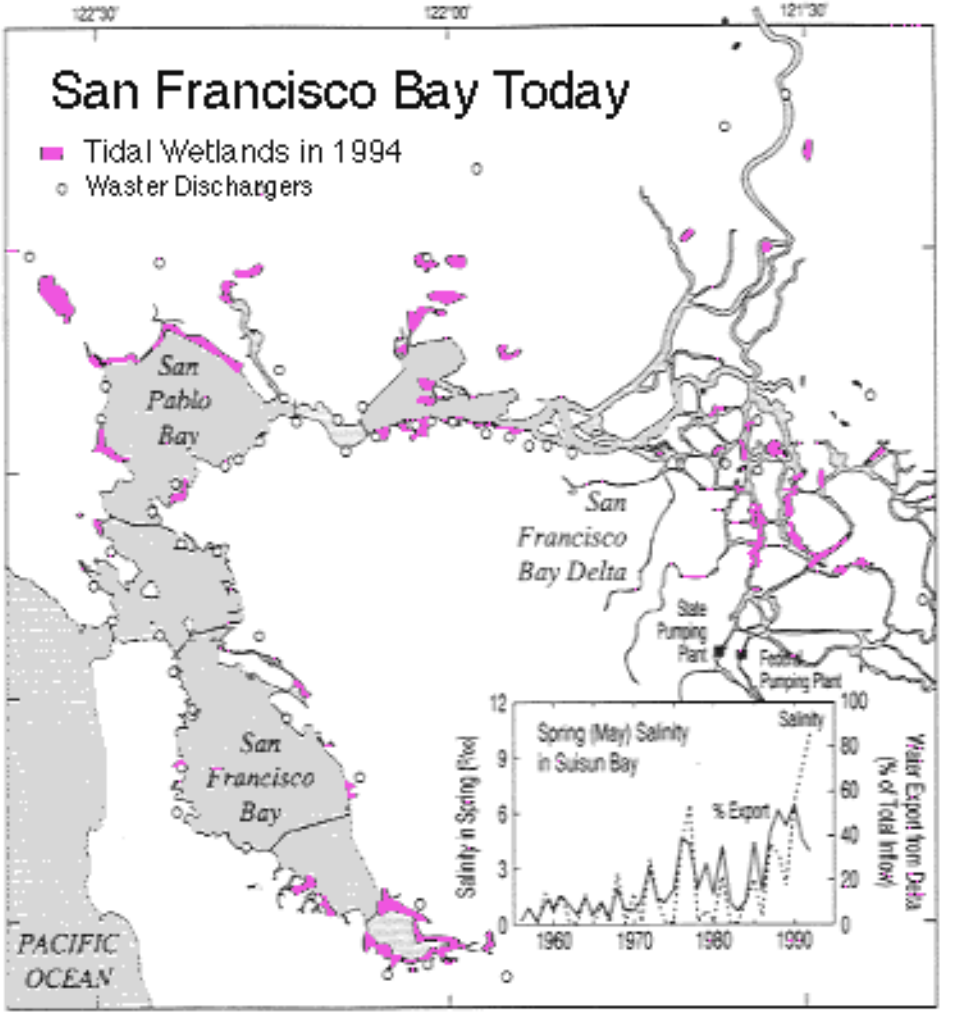
Flow regime change

Invasive species



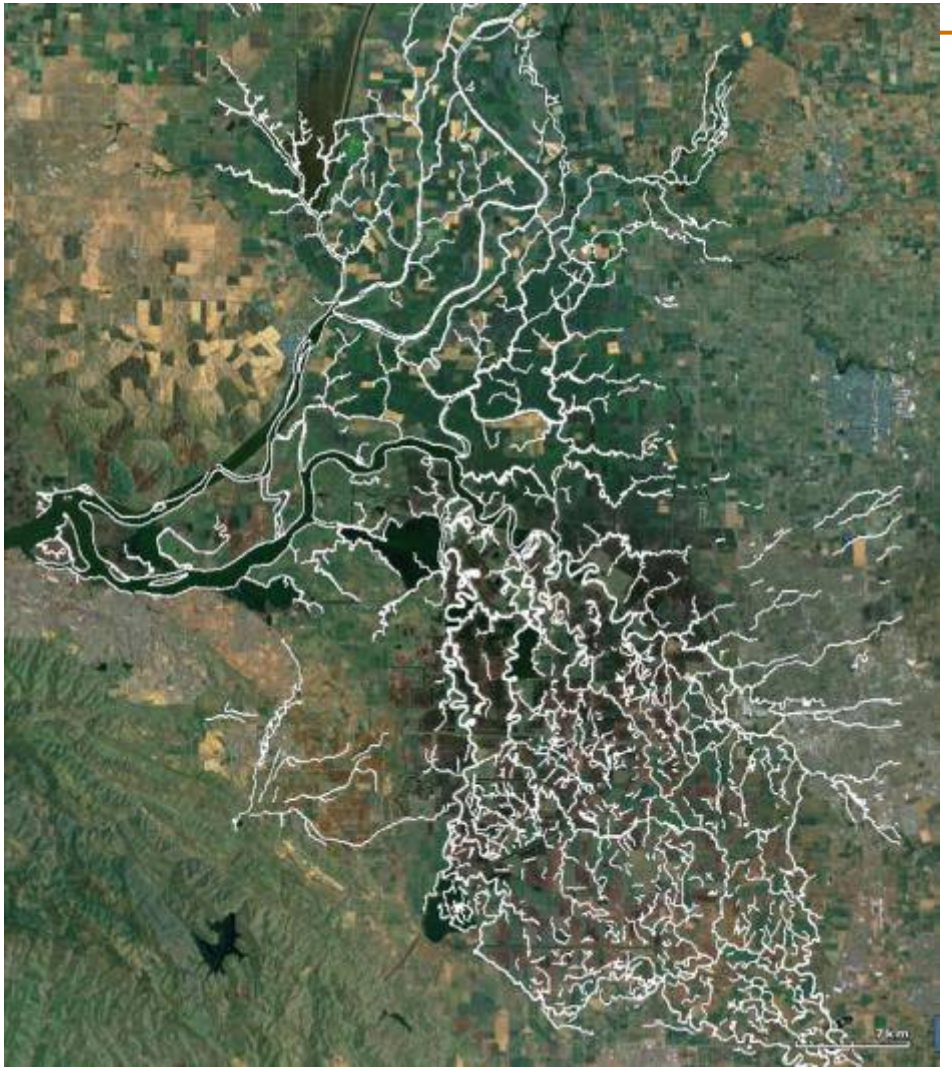
Physical habitat loss and alteration

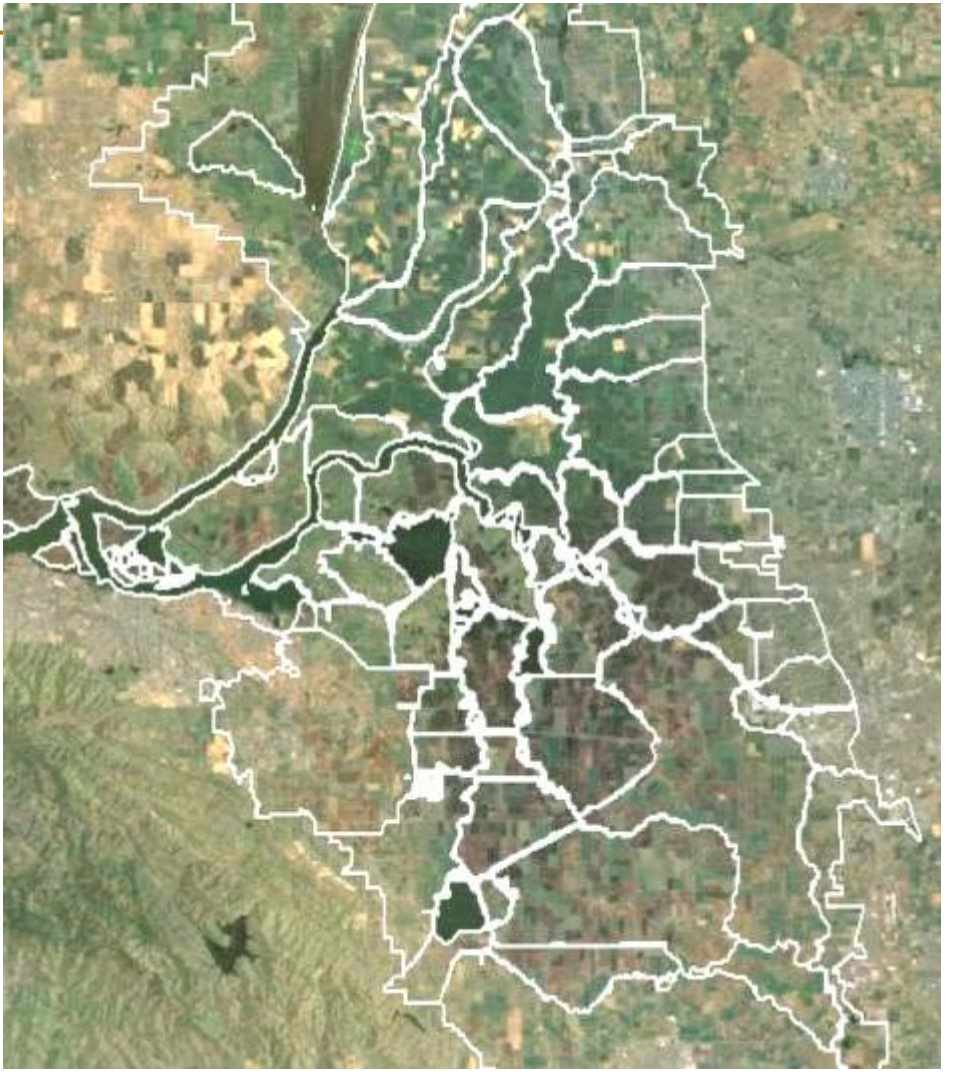
San Francisco Estuary and Delta: 1848 and today



http://sfbay.wr.usgs.gov/access/yearbook.html

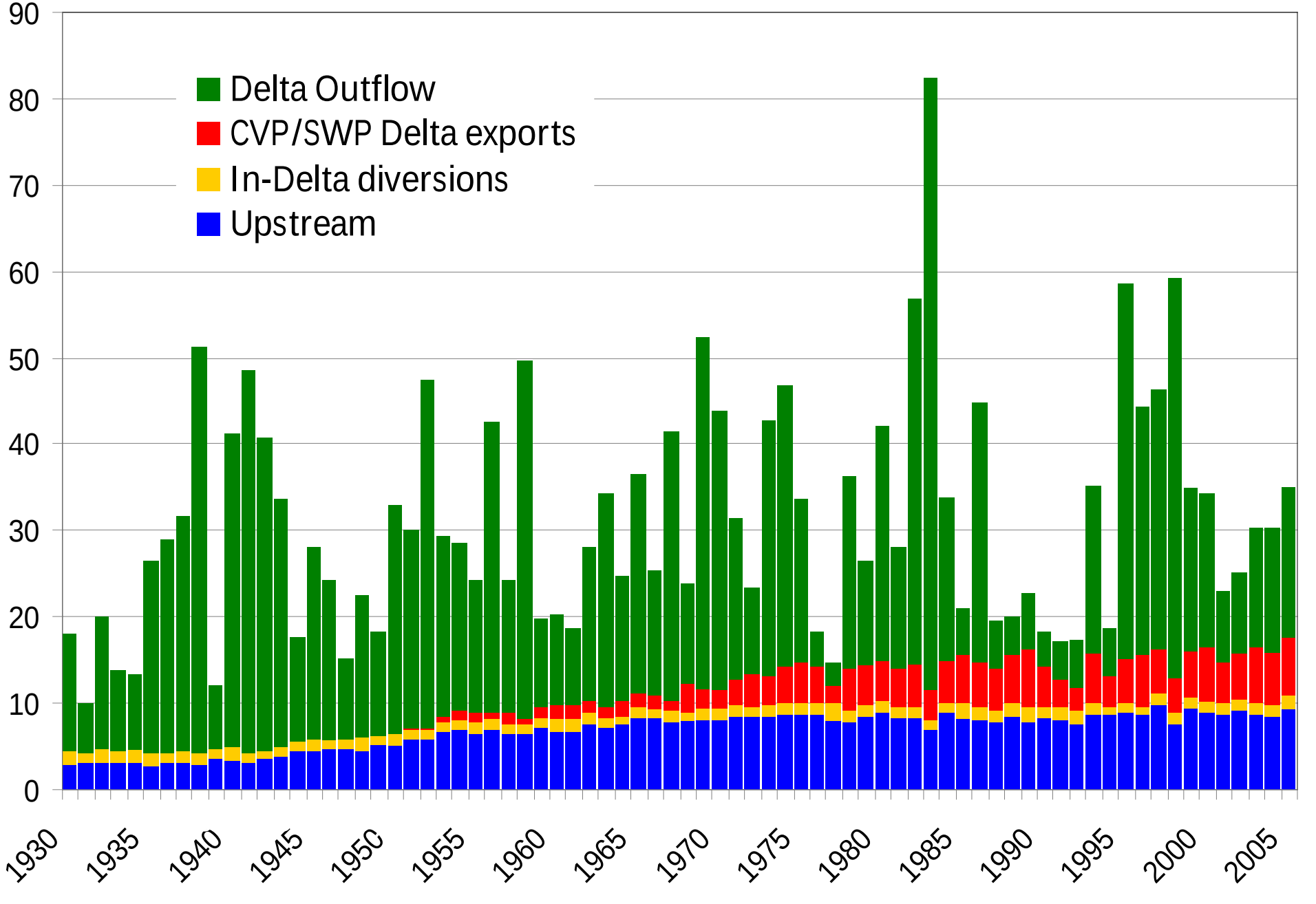
Poldering simplifies the Delta





See SFEI report – Whipple et al. 2012

Historical Water Use (annual in maf/yr)



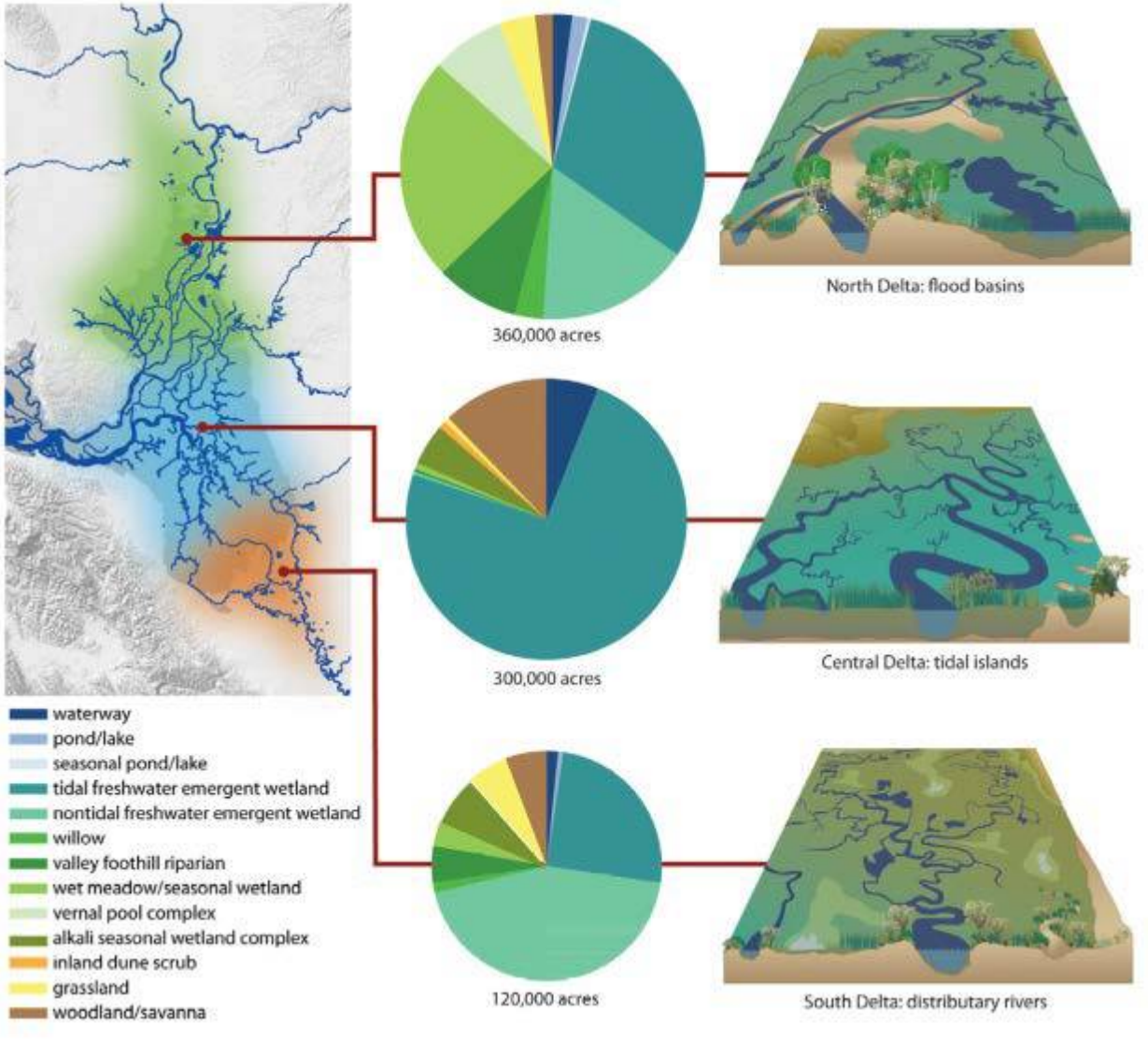
Our sorry state

1. Fragmented management and science
2. Disorganized public science leads to combat science
3. Poor development and use of science for policy and management

Past and future Delta diversity

The Delta has always been different places

Before the Delta was polderized:

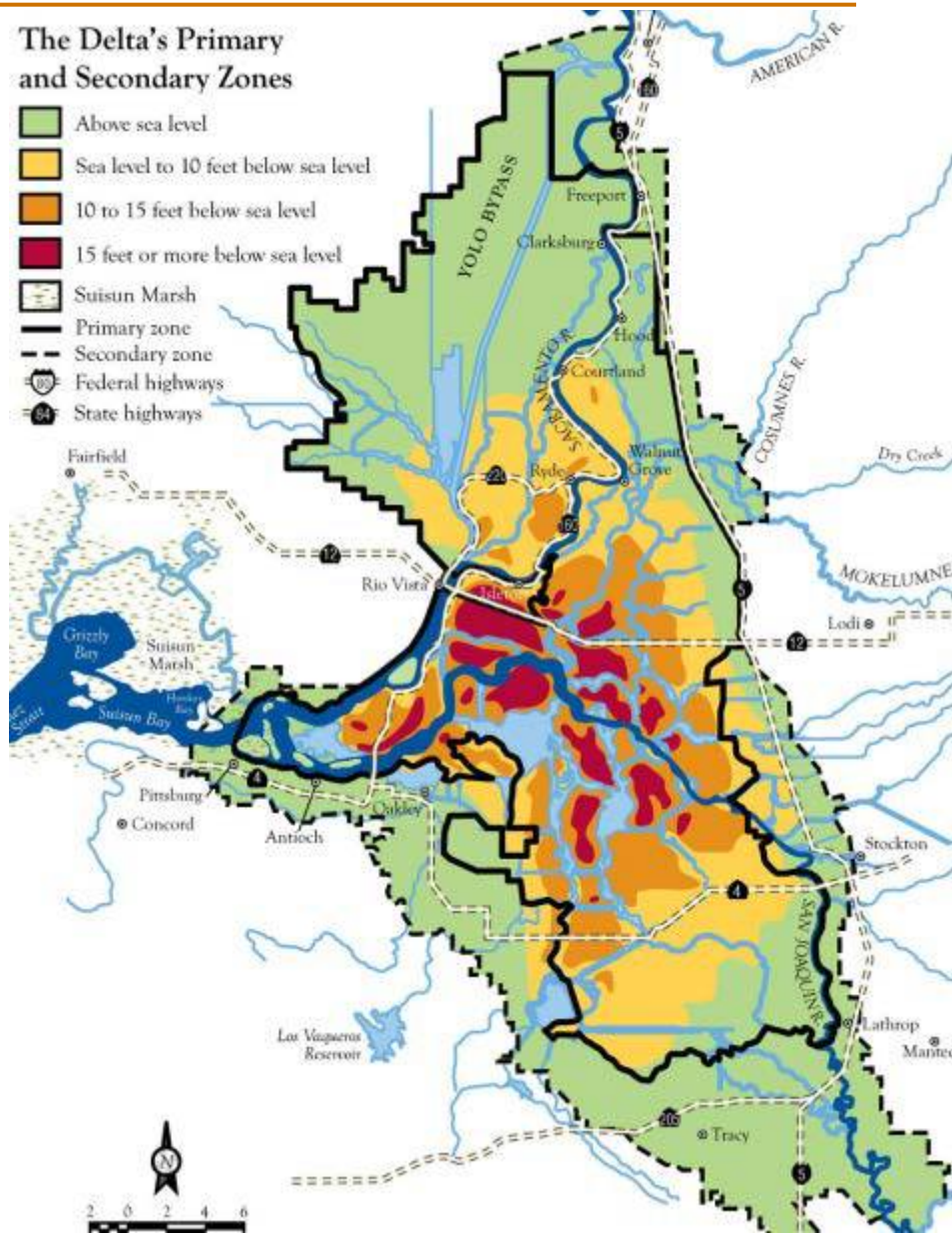


… with details changing with big floods and sea level rise

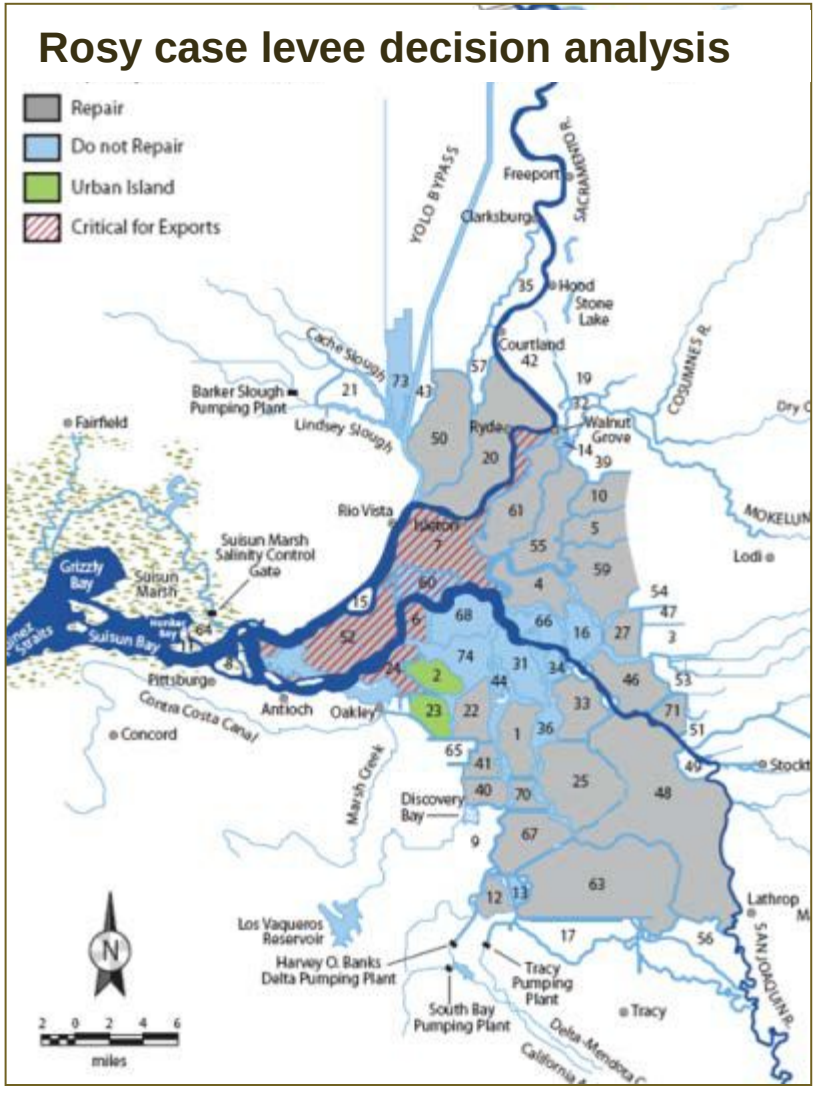
From Whipple et al. 2012

Continued drivers of change for the Delta

- Physical instability
  - Land subsidence
  - Sea level rise
  - Floods
  - Earthquakes
- Ecosystem instability
  - Habitat alteration
  - Invasive species
- Prohibitive costs for maintaining all islands
- Worsening water quality for agric. & urban users



Delta of Tomorrow Will be Different, No Matter What We Do

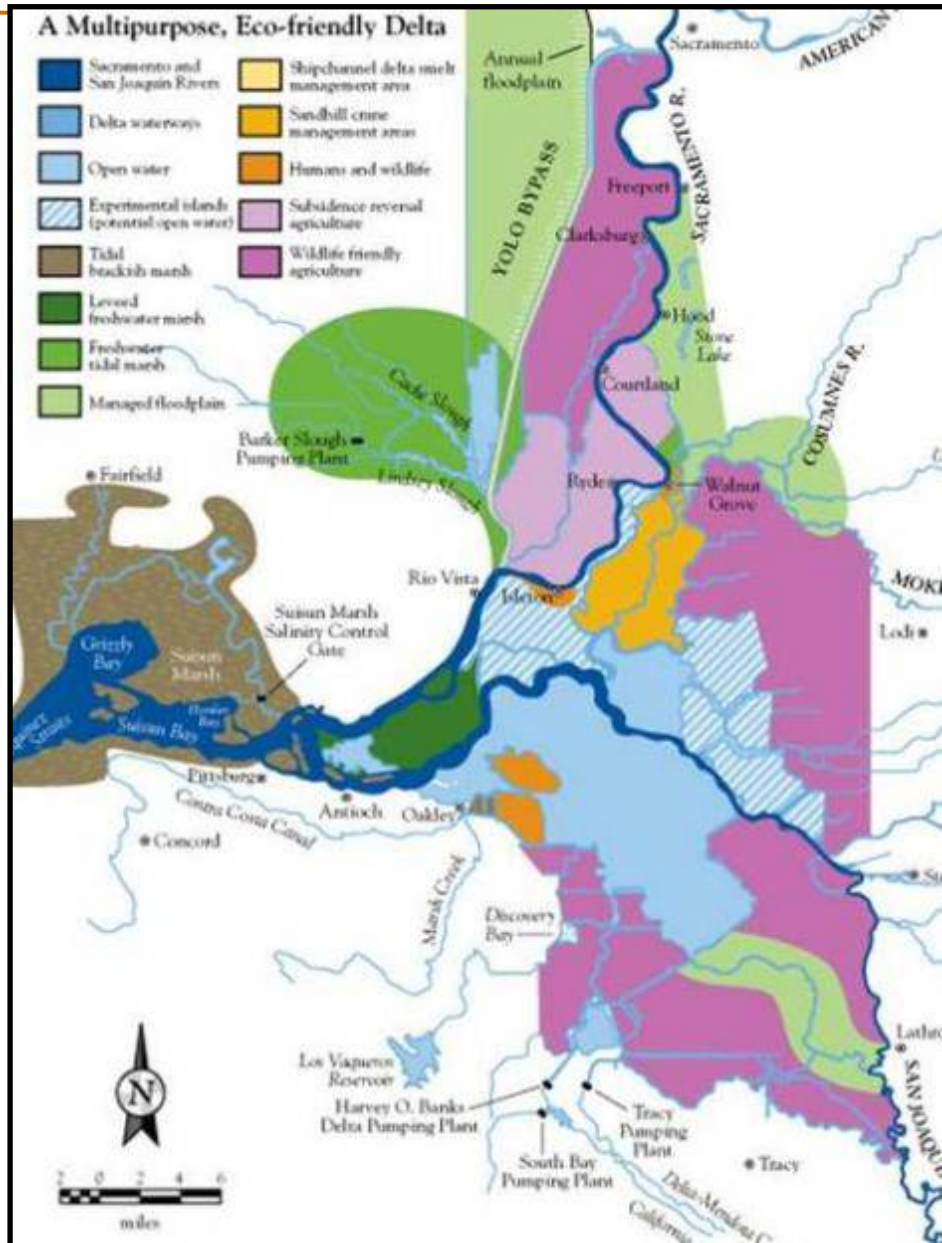


Based on economic value of land and assets, many islands not worth repairing after flooding (blue)

- Earthquake and flood risks ➔Large bodies of open water and higher sea level
- Losses of 10 - 20 islands where repair costs prohibitive
- Major changes in:
  - Water supply
  - Water quality
  - Delta land use

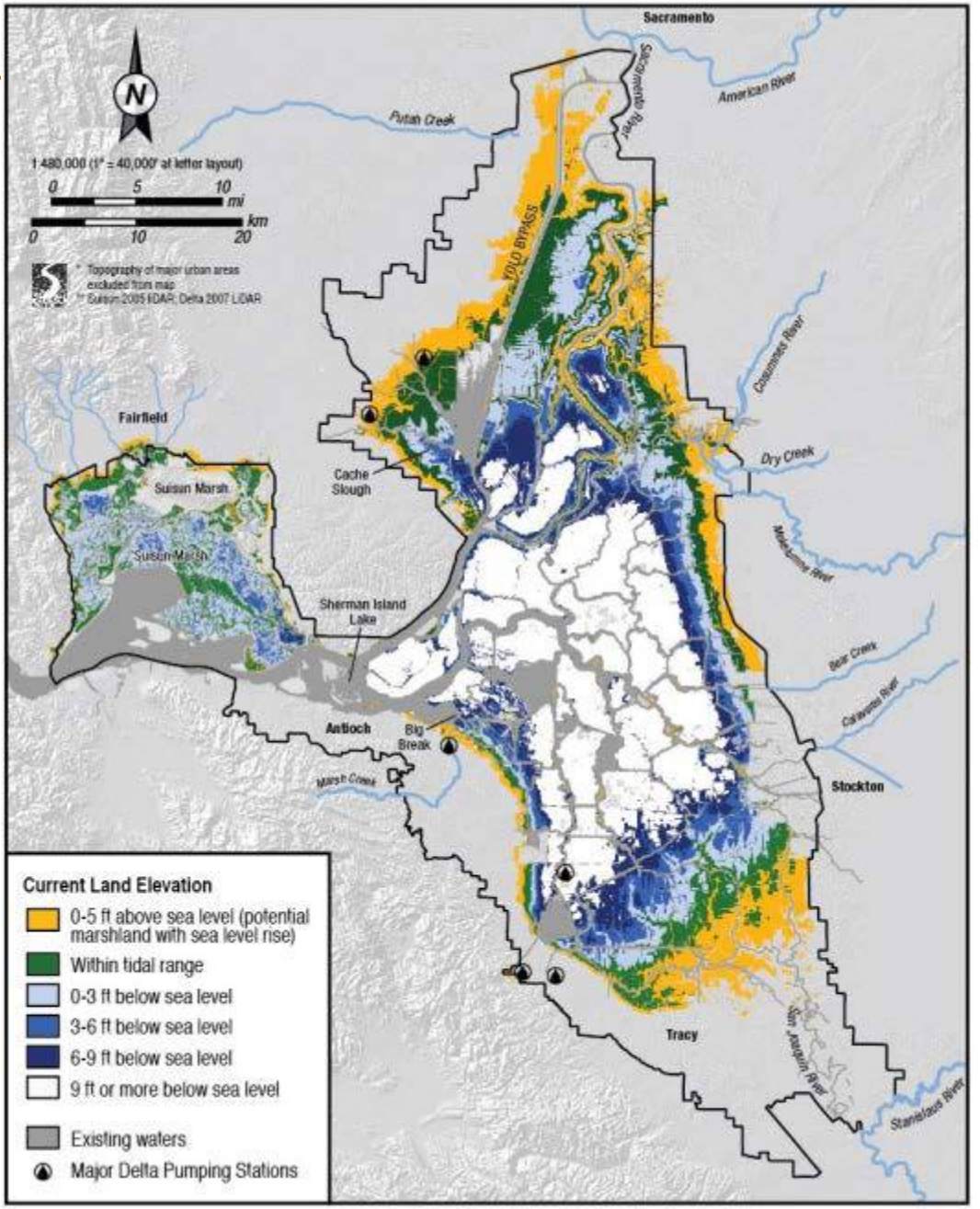
The New Delta – More diverse

- Island failure - more saline, more open water
- Levee policy?
- Worse for water users, but likely better for fish
- Water exports - change location or face extinction
- Less water exports?
- Better for fish & economy?



Elevation is destiny for habitat

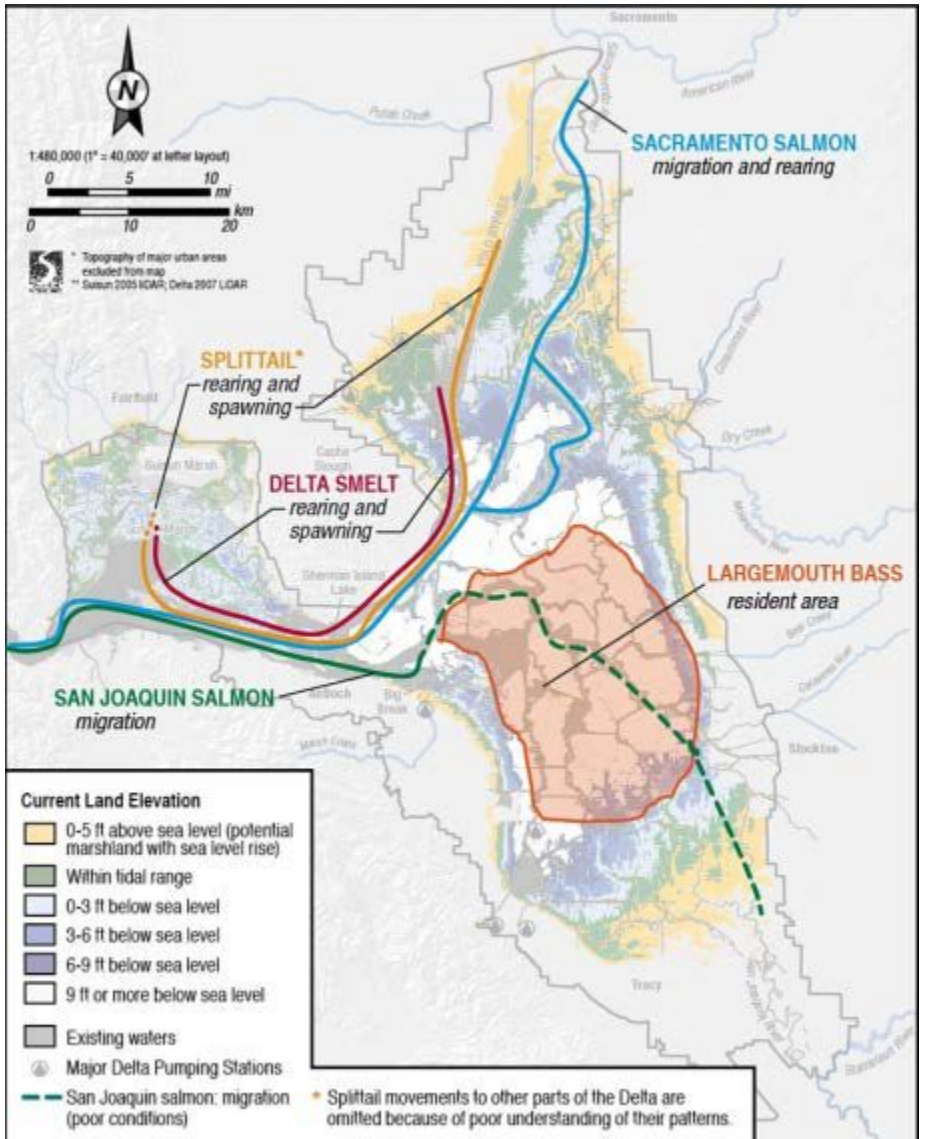
- Tidal marsh?
- Deep water/lake?
- Riparian?
- Floodplain?



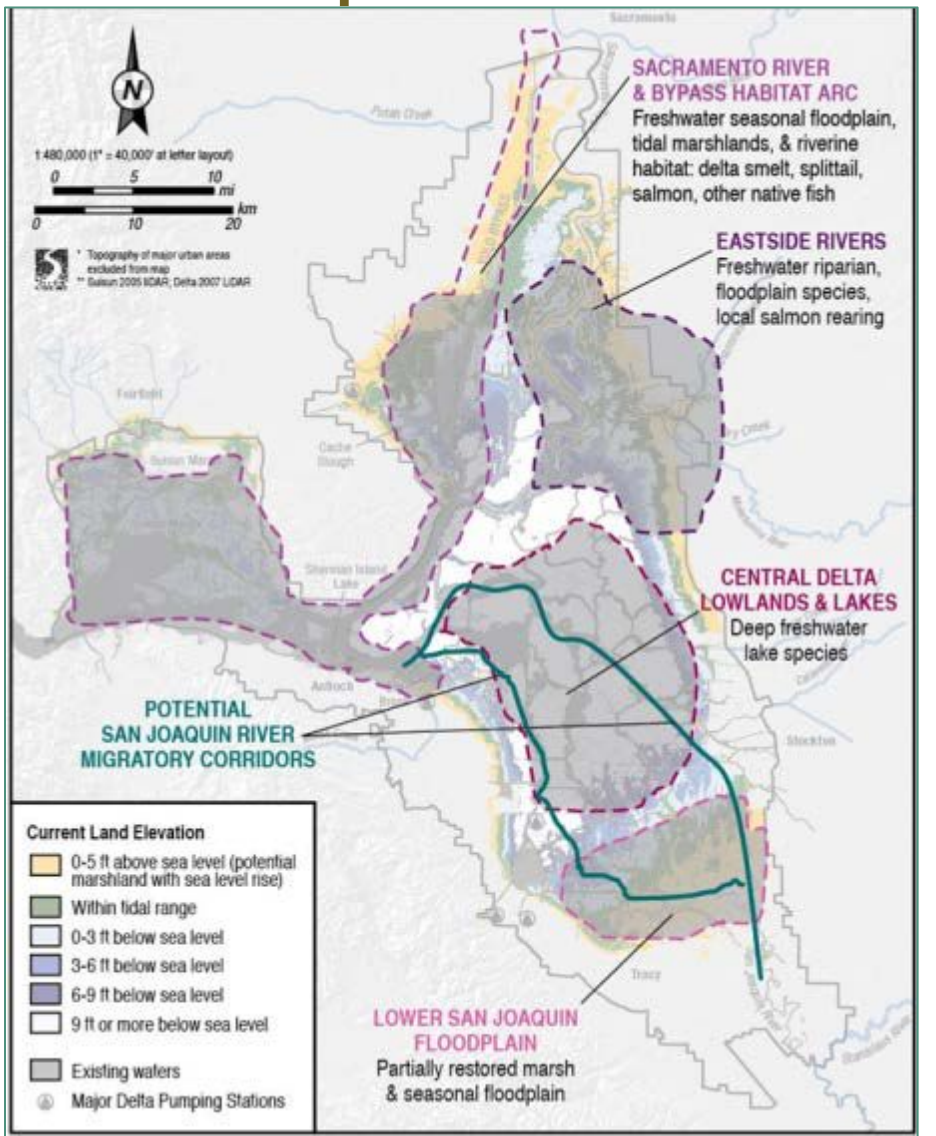
Managing for desirable diversity

Reconciliation Strategy: Specialize Areas for Human and Ecosystem Functions

Current fish habitat



Future specialized areas



Organize science and management **geographically** – local tailoring

- Upstream diversions, habitat, operations
- Statewide water demand, exports, quality
- North Delta Arc: Tides, North Bay Aqueduct diversion, Local floods, Habitat and water for native fish & waterfowl, Recreation
- Eastside Rivers: Local floods, Habitat and water for native fish & waterfowl, Recreation
- Central Delta: Tides, Local floods, Water Quality, Salmon passage, Sport fish, Recreation
- South Delta: Local floods, Water quality, Salmon passage, Sport fish, Recreation

Making it work?

Most adaptive management is local and management

DSC and friends

Delta-wide science

Delta-wide adaptive management

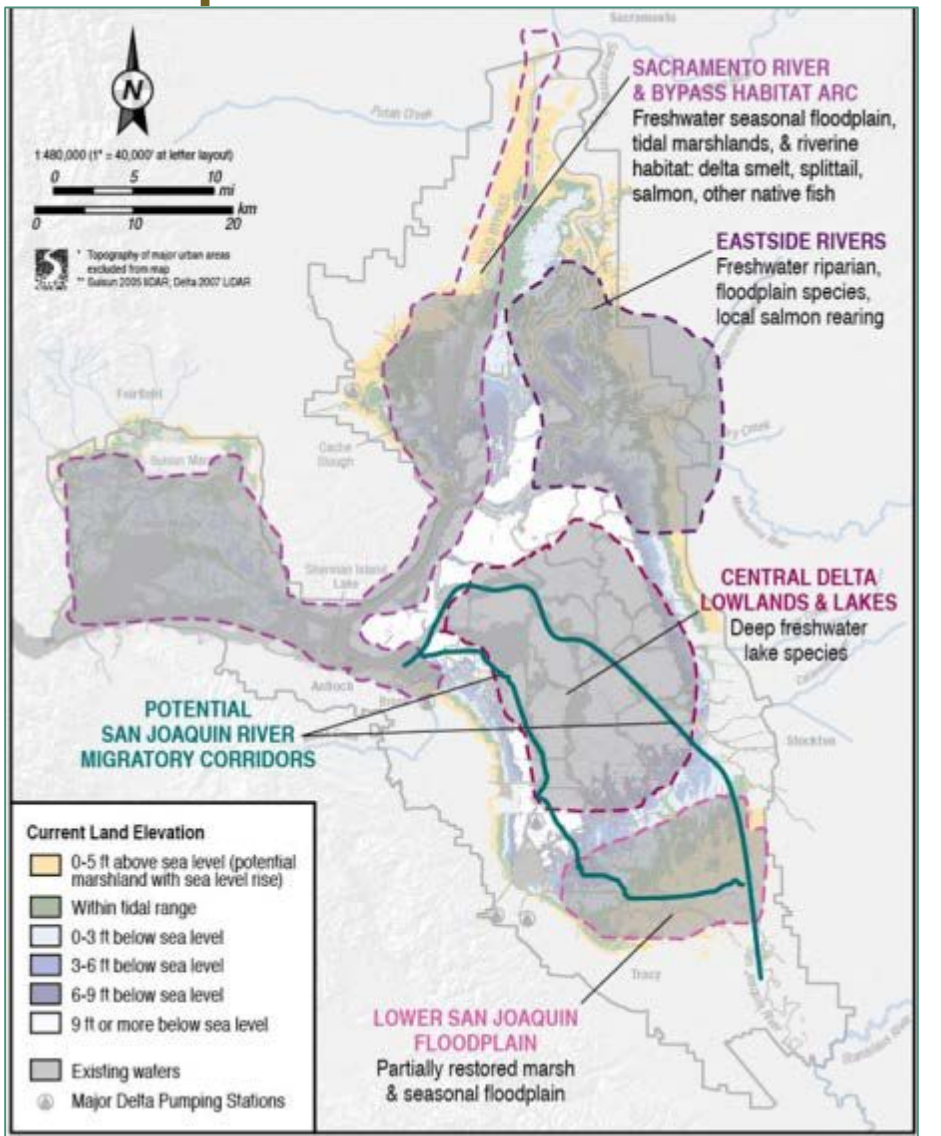
DISB

Specialized geographic area programs

Site scale projects

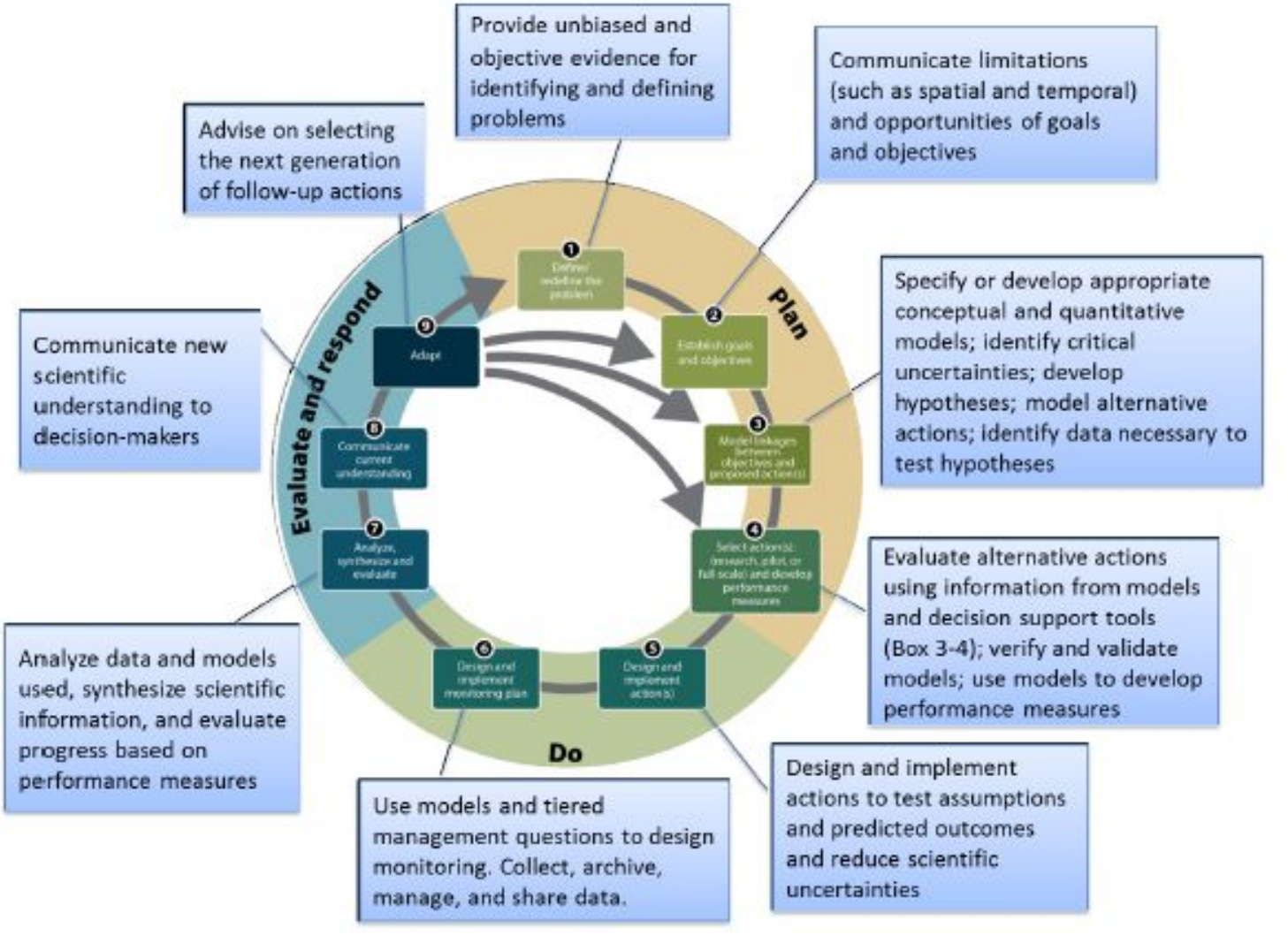
Must involve regulators

Specialized areas



Managing adaptively

Can this circle roll forward fast enough?



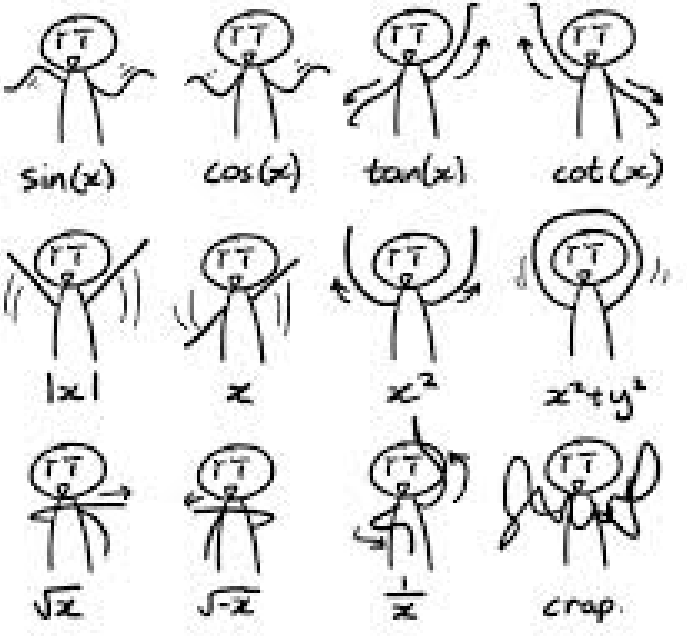
Some principles for science and A.M.

1. Adaptive management is mostly about management
2. Manage each Delta area for local conditions and objectives
3. One Delta science with local sub-programs
4. One Adaptive Management with local sub-programs
5. Delta regulatory framework needs to help lead

What's adaptive management look like?

1. Adaptive management is mostly about management
2. Field experiments are mostly local, rare at larger scales
3. Most larger scale experiments are numerical models
4. Delta regulatory framework needs to help adaptive management along
5. Break complex problems into solvable pieces in a larger framework

Can agencies science dance together?



Motivating Adaptive Science and Management

- People and agencies need a reason to work together
- Promise of greater effectiveness and $$$
- Regulatory requirements: DSC, SWRCB, and courts
- Fear of failure

Continued Halloween ecology if we fail?