

An aerial photograph of a river delta, showing a network of water channels and green fields. The water is a light blue color, and the fields are a vibrant green. The overall scene is a mix of natural and man-made elements, typical of a delta region.

California's Delta

Fixing Our Troubled Treasure

Lester Snow, Director
Department of Water Resources

August 21, 2007

California Water Systems



State, federal and regional projects move water from areas of abundance to areas of need.

Delta is hub for most major systems

- Major Rivers
- State Projects
- Federal Projects
- Local Projects

Obstacles and Options for Delta Fix



- Legacy of Change in the Delta
- Current and Future Drivers of Change
- Options for adaptation

Jeffrey Mount

UC Davis Center for Watershed Sciences

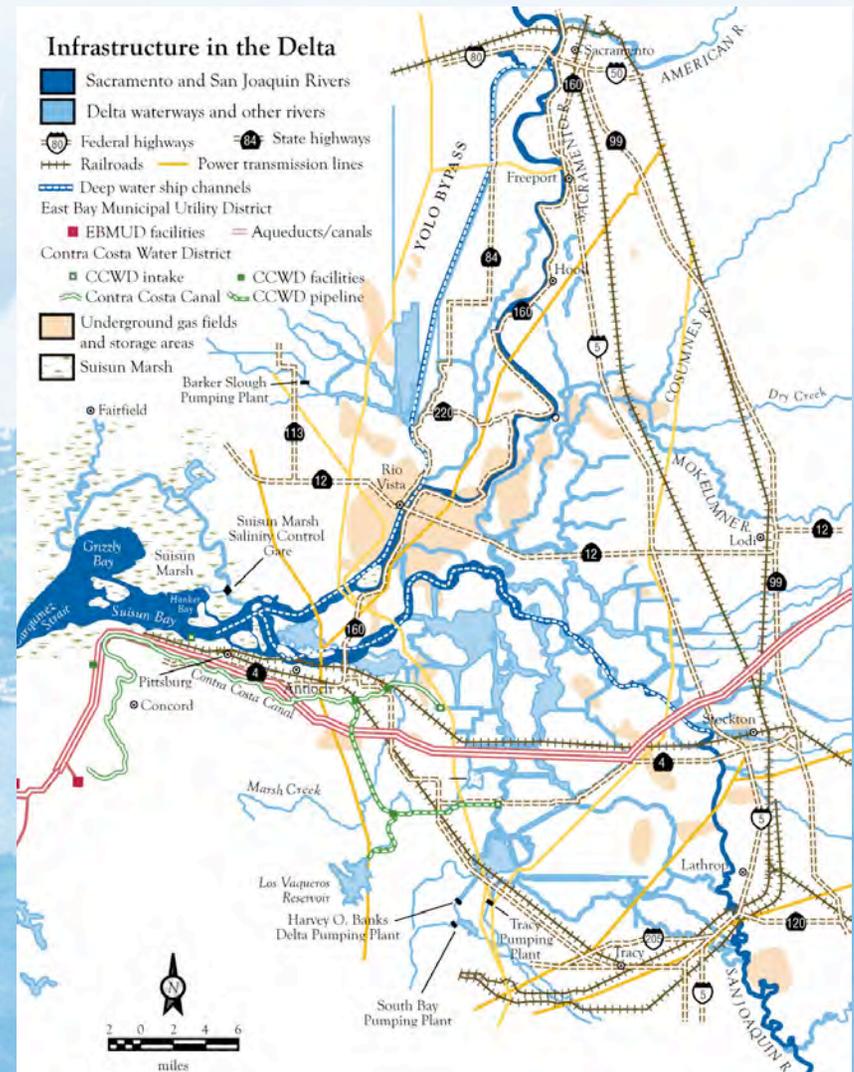
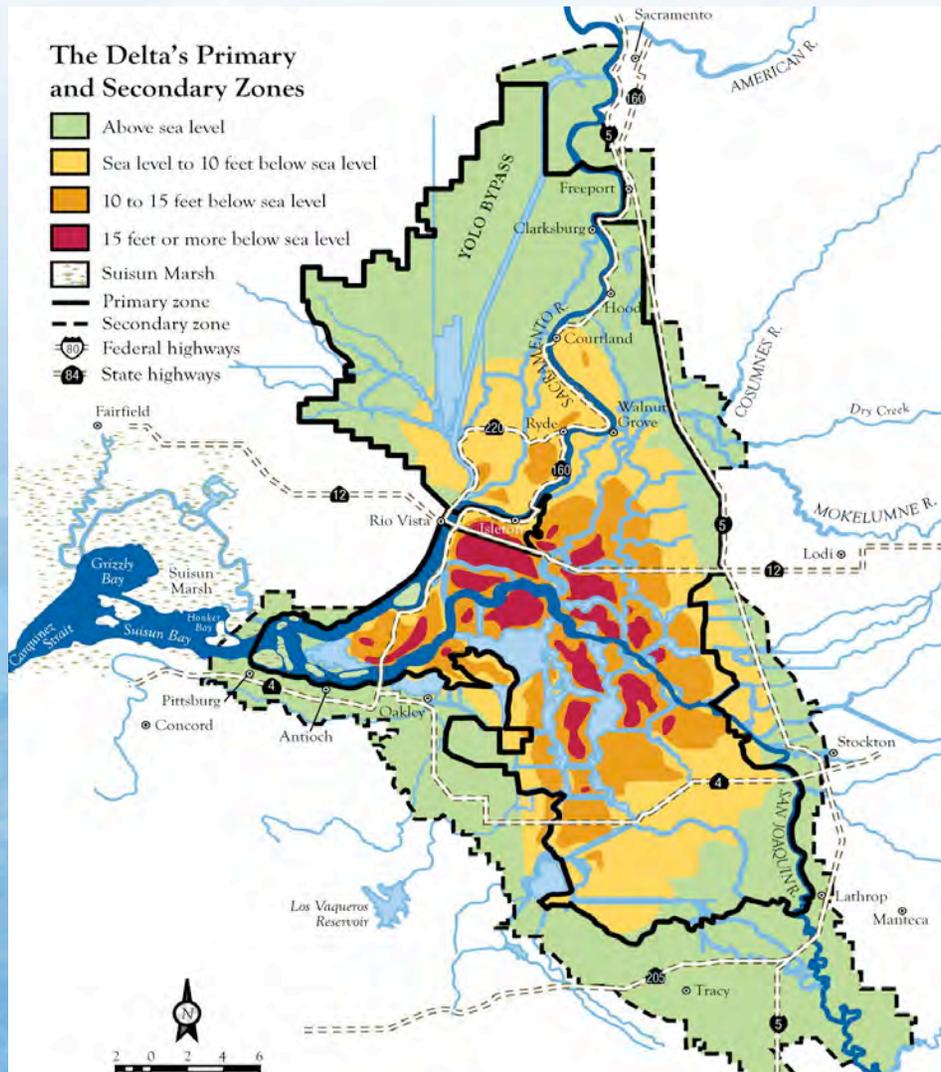
Chair, CALFED Independent Science Board

Legacy of Change

- Physical landscape changed through reclamation
- Fundamental changes in hydrology, water quality
- Introduction of wanted and unwanted new species
- Increasingly complex demands on ecosystem services

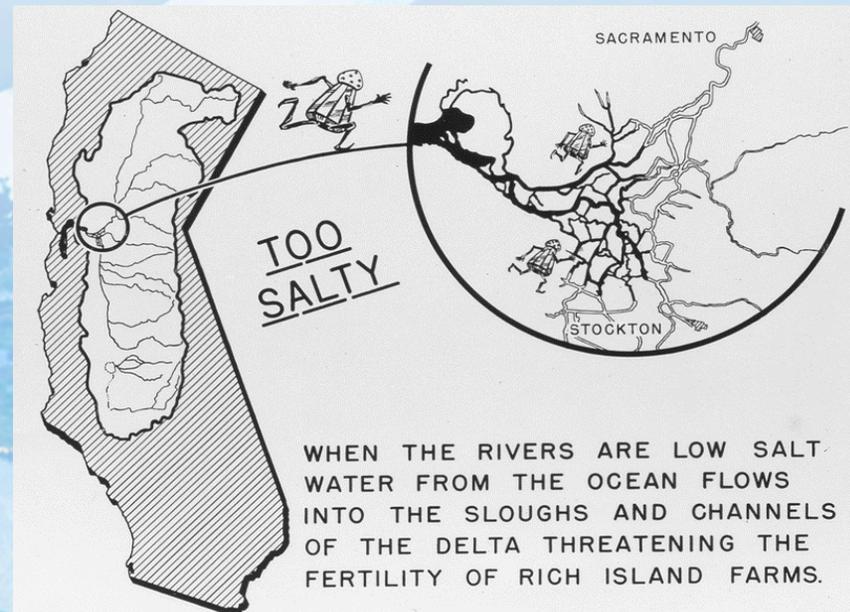


Legacy of Change



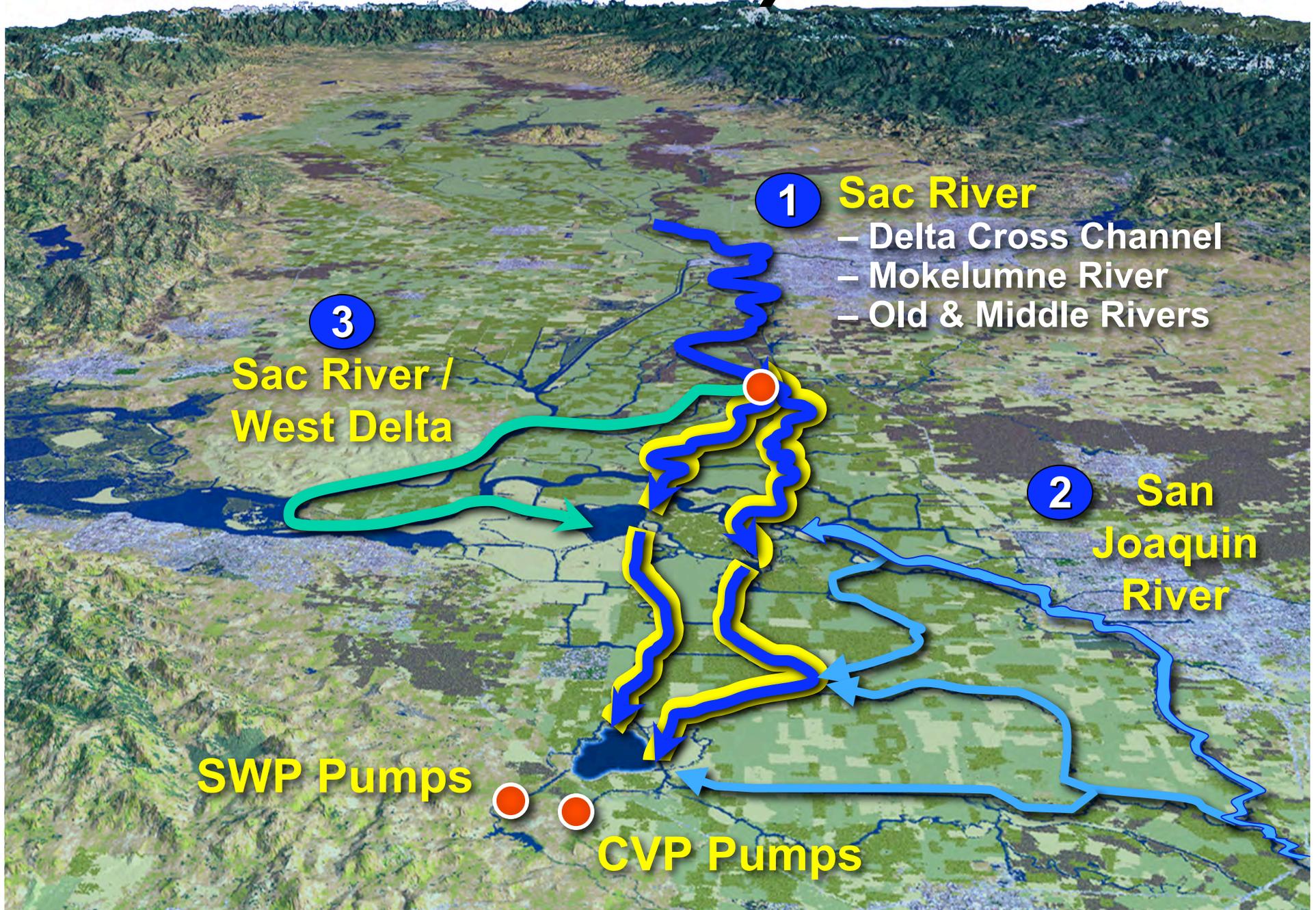
Current Policy

- Manage inflows and levees to keep Delta fresh
- Maintain Delta in current condition to support needs of all users



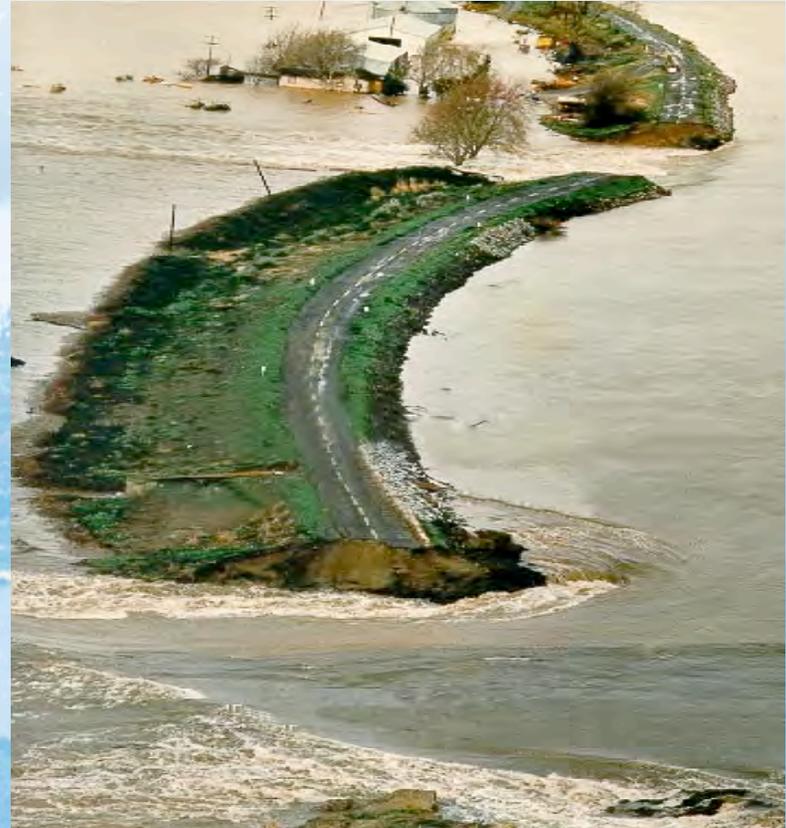
1945 USBR Report

How Delta Water System Works

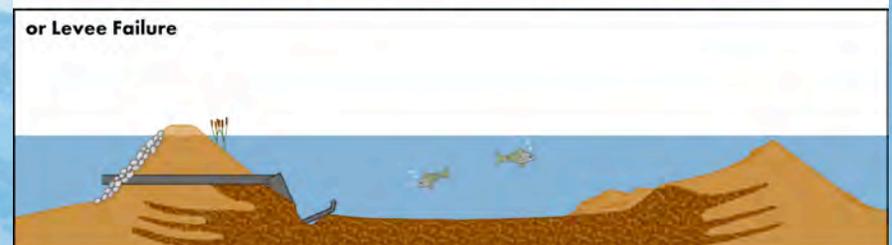
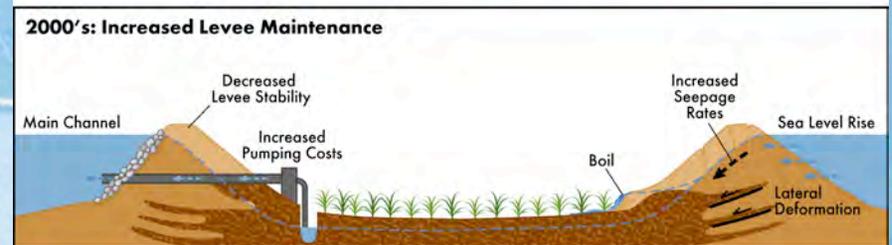
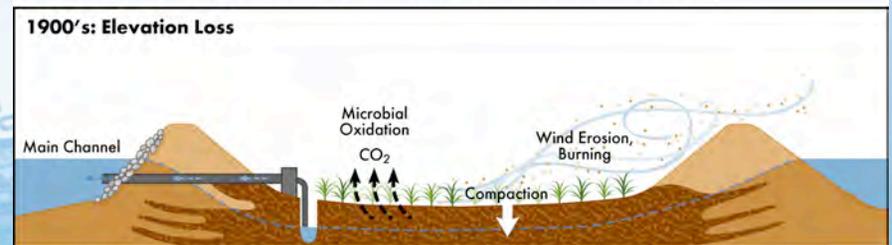
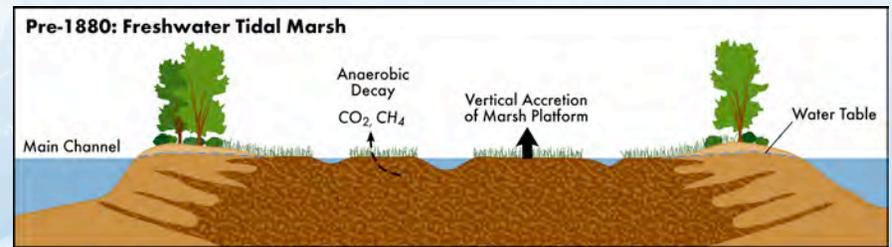
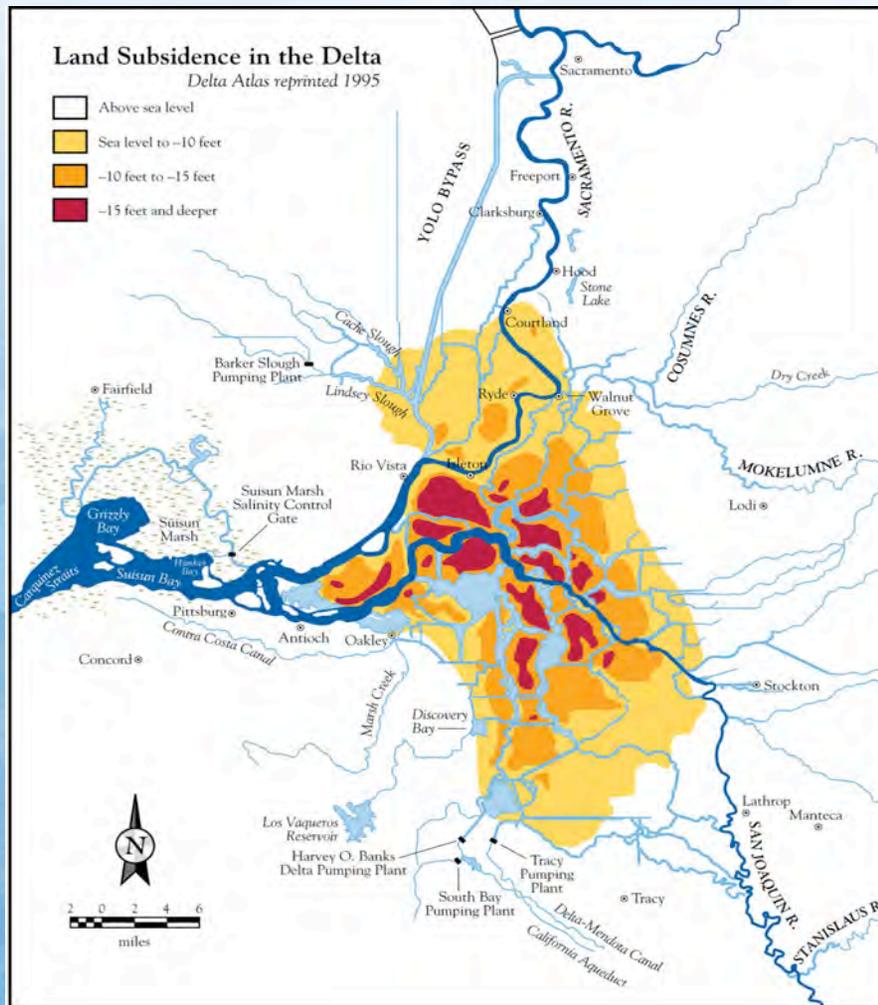


Drivers of Change in the Future

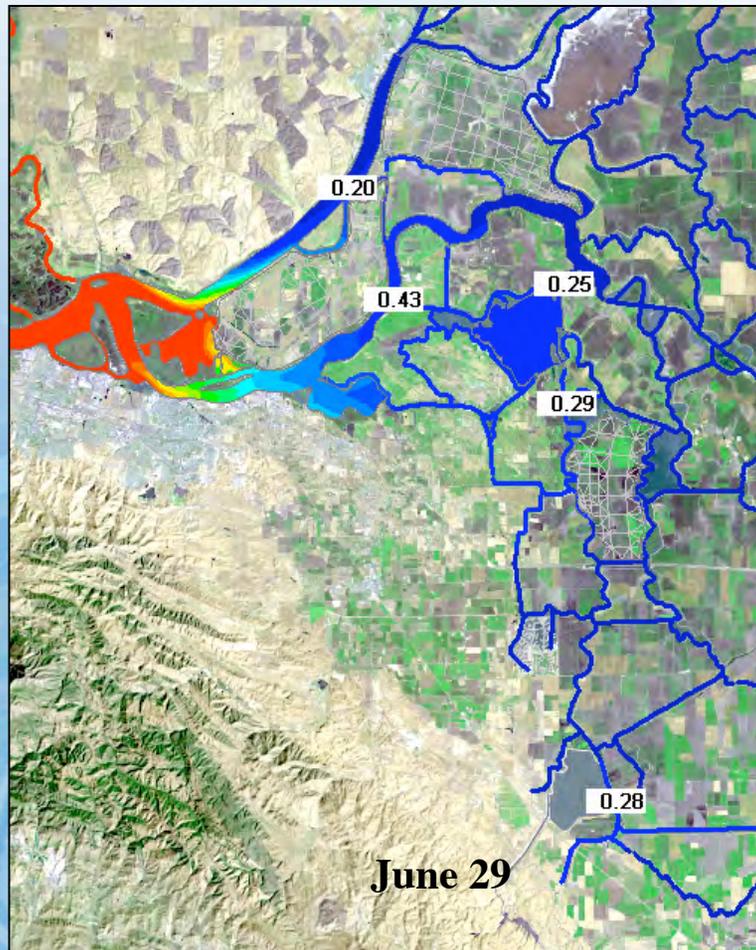
- Historic policy of static, fresh Delta increasingly difficult and expensive to sustain
- Six 'drivers of change' will impact Delta sustainability:
 - Subsidence
 - Sea Level Rise
 - Changes in Inflows
 - Seismicity
 - Invasive Species
 - Population Growth



1. Subsidence: past and future

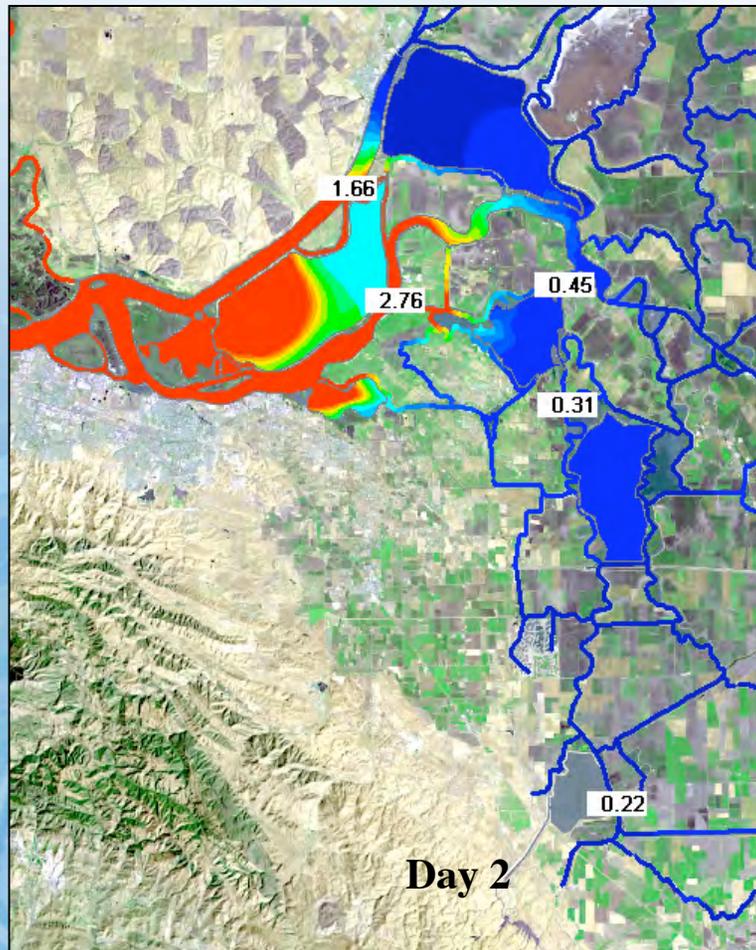


Impacts of Levee Failures



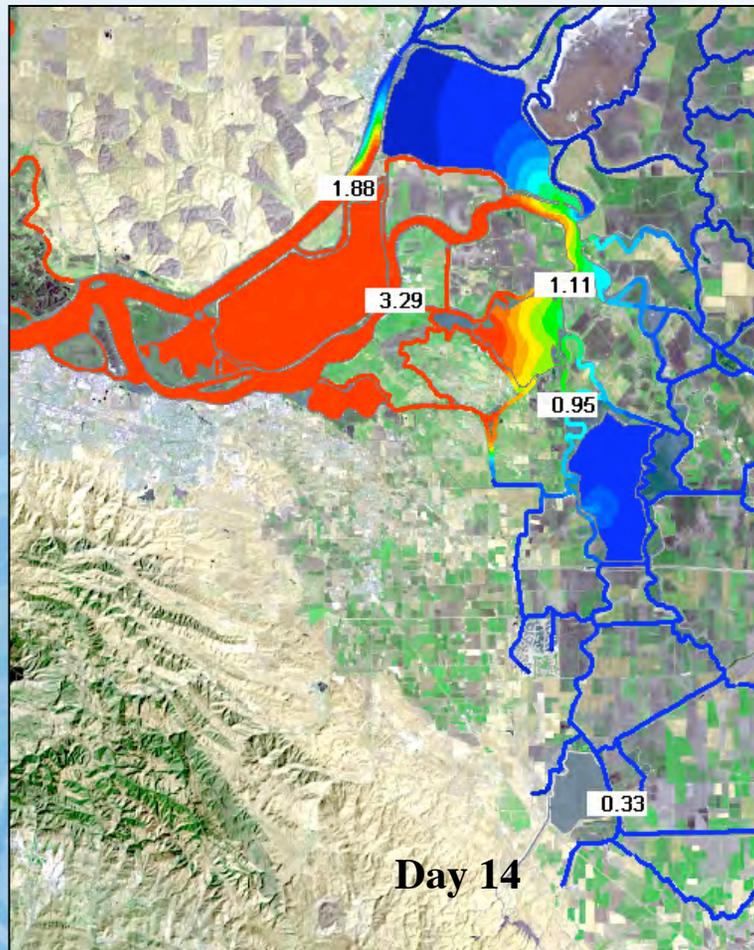
- Draws salt water into the Delta: Big Gulp
- Changes tidal prism, leading to further intrusion of salt water into Delta
- Shuts down the CVP, SWP and Contra Costa Canal
- Potential to disrupt all environmental services

Impacts of Levee Failures



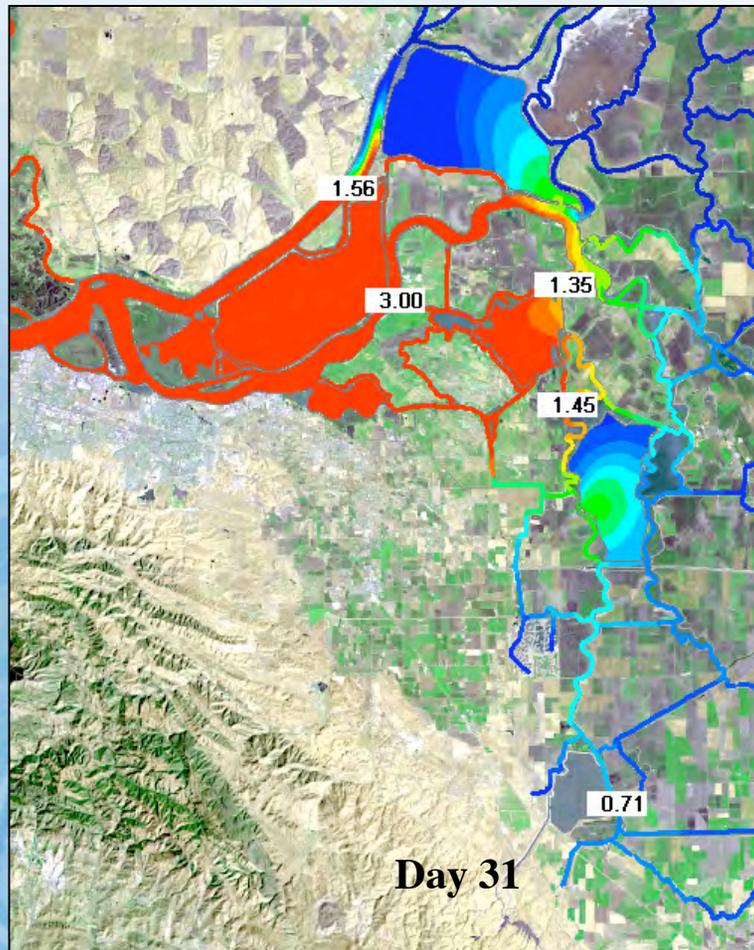
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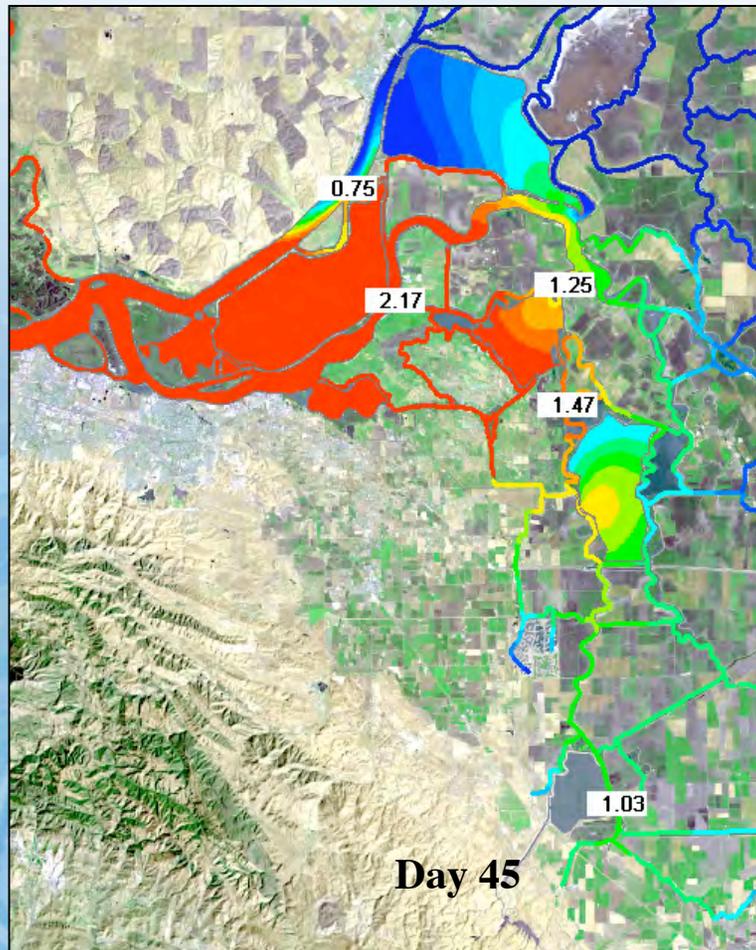
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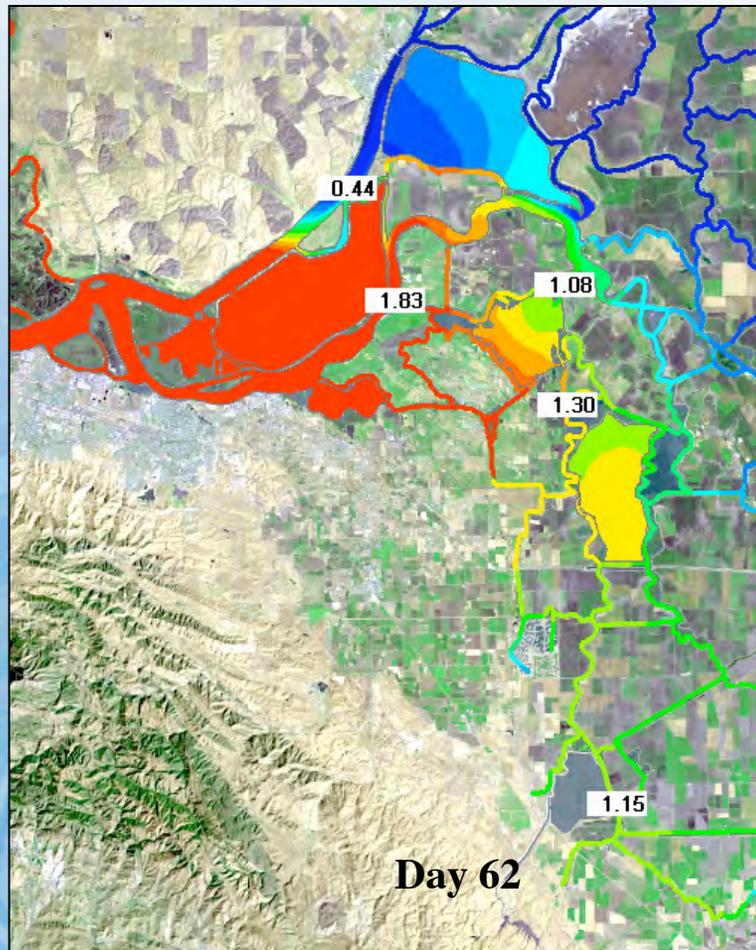
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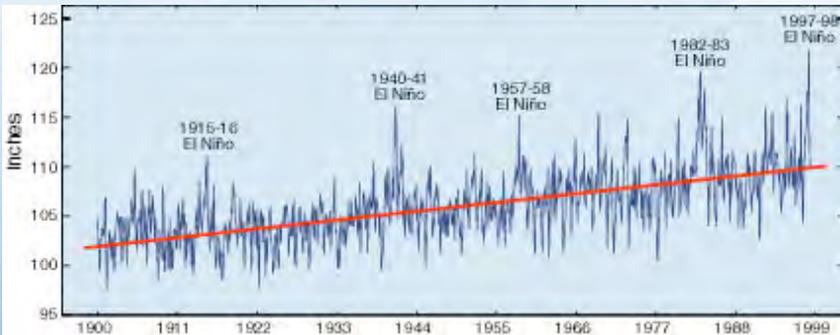
Impacts of Levee Failures



C. Schmutte

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2. Sea Level Rise

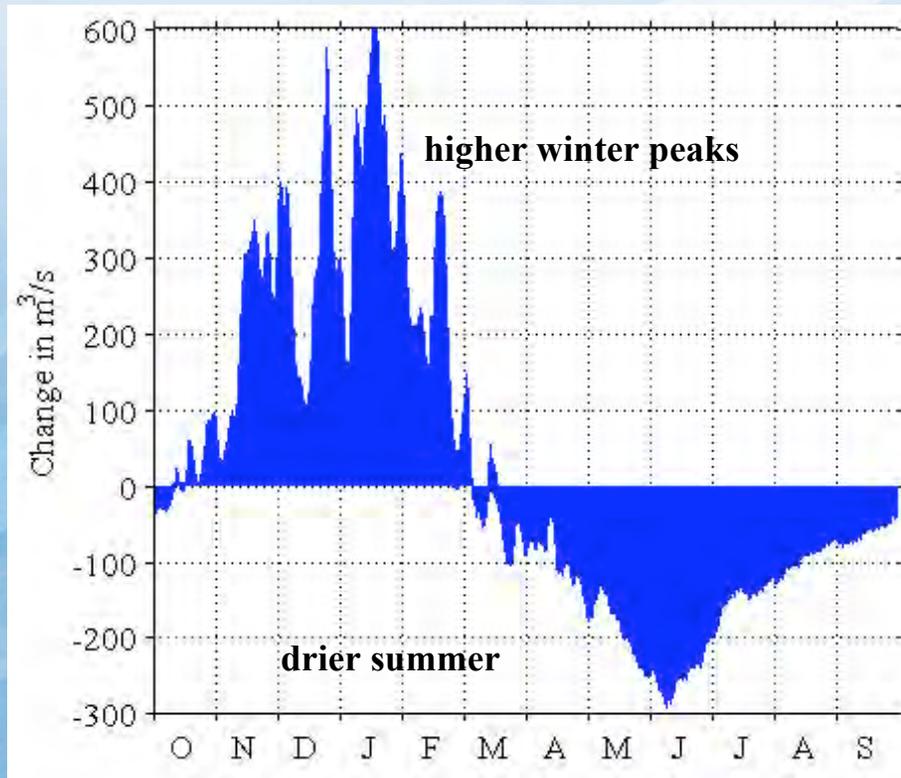


Ryan et al., 2005



- Character of Delta based on sea level
- All hydrodynamics, habitat conditions, levee heights tied to sea level
- Rate of sea level rise increasing
- A modest rise overwhelms current Delta levee network

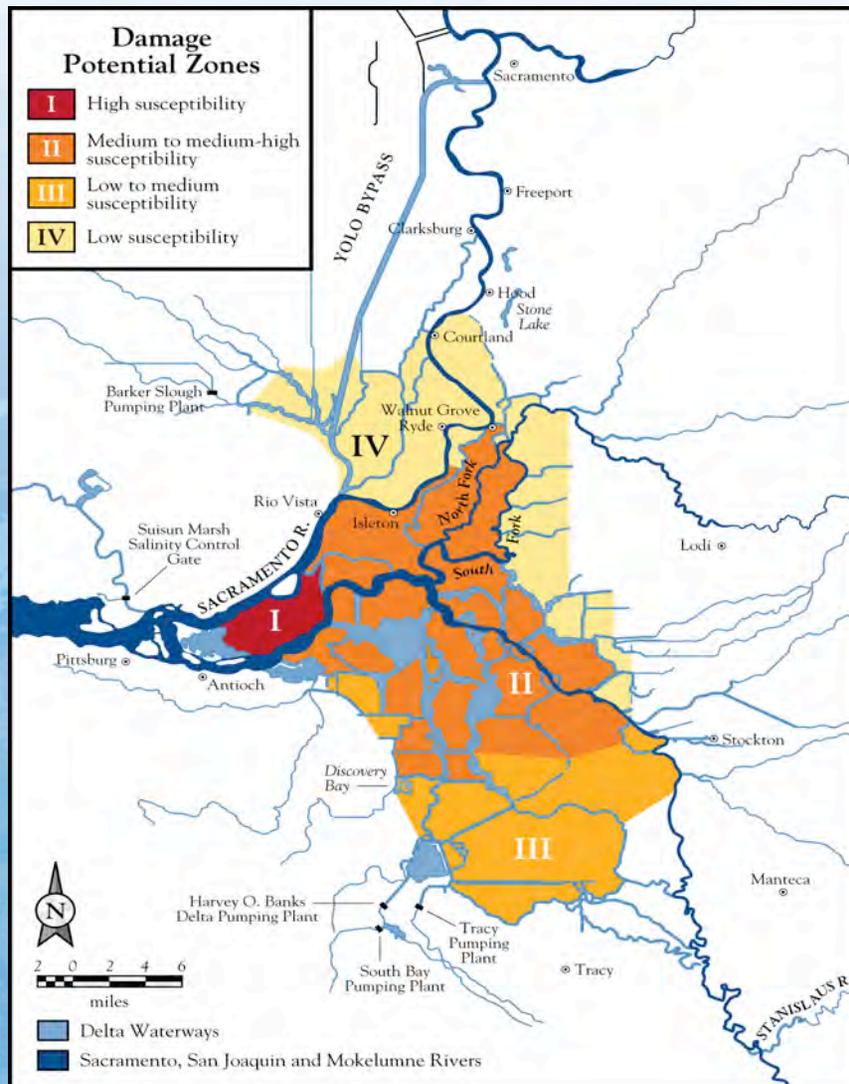
Driver 3: Climate change



- On-going shift in runoff timing toward winter, extending low-flow periods
- Increase in intensity and frequency of winter runoff events
- Compounded by increasing sea level (tides)

Change in inflows to Delta in 2060 (Knowles and Cayan, 2004)

4. Seismicity



- Risk of levee failure significant at any time scale
- Risk highest in western Delta
- Seismic risk increases with time

Seismic Risk Increases with Time



Bay Delta Region Major Faults

5. Invasive Species

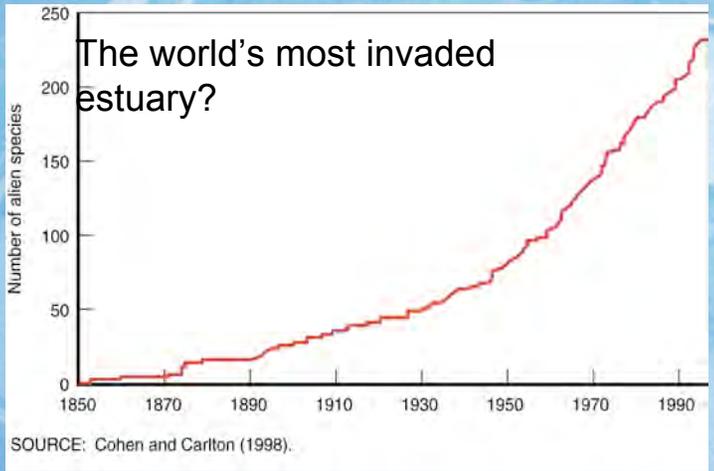
- Profound, on-going changes in food webs and physical habitat due to invasions
- Alien species do best with constant salinity (fresh or saline) and altered hydrology



Asiatic clam



Brazilian waterweed

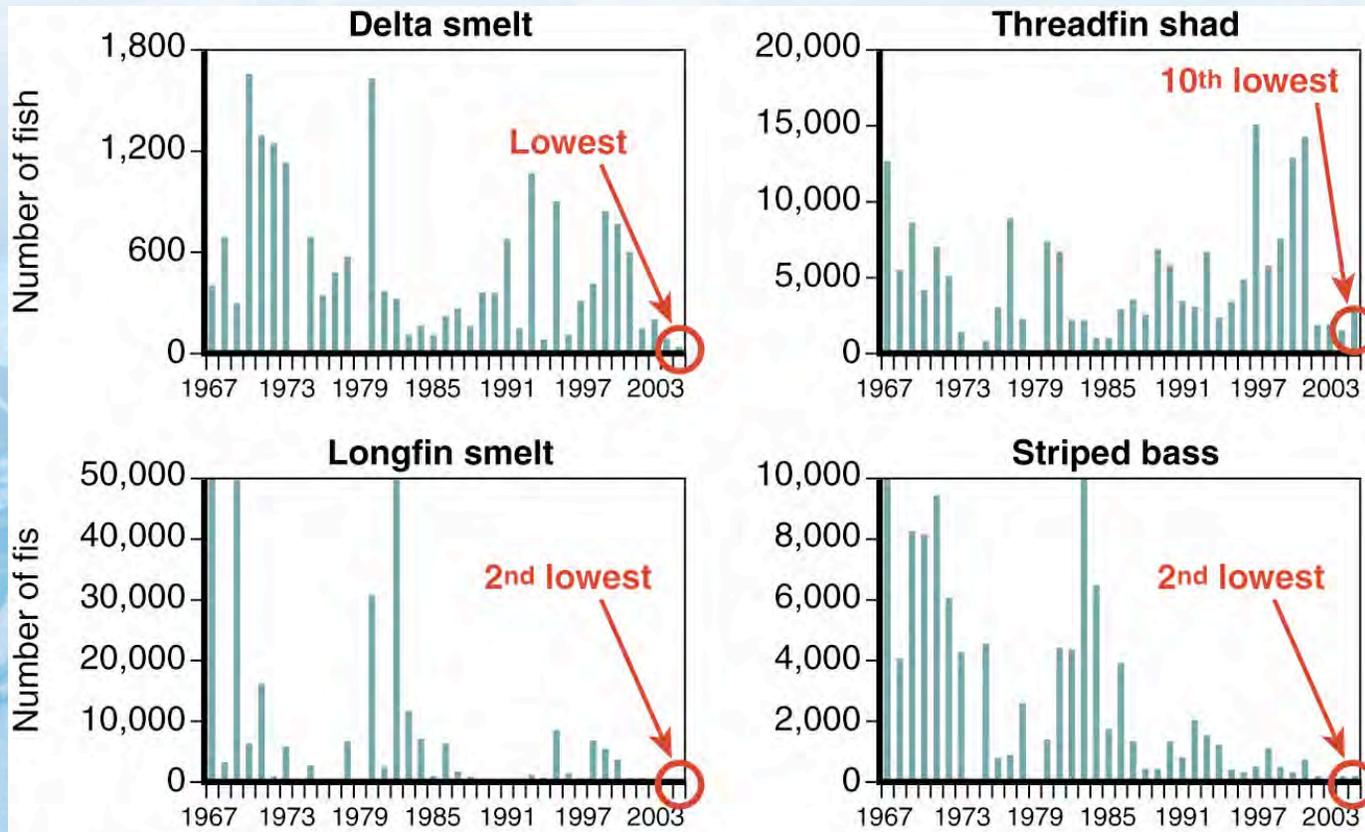


Quagga Mussel



Overbite clam

An Ecosystem in Crisis



SOURCE: California Department of Fish and Game.

NOTES: Graphs report the indices for the fall midwater trawl. Circles indicate the rank of indices in 2005. For delta smelt, longfin smelt, and striped bass, the recent indices represent low points in long-term declines of their populations.

6. Population Growth



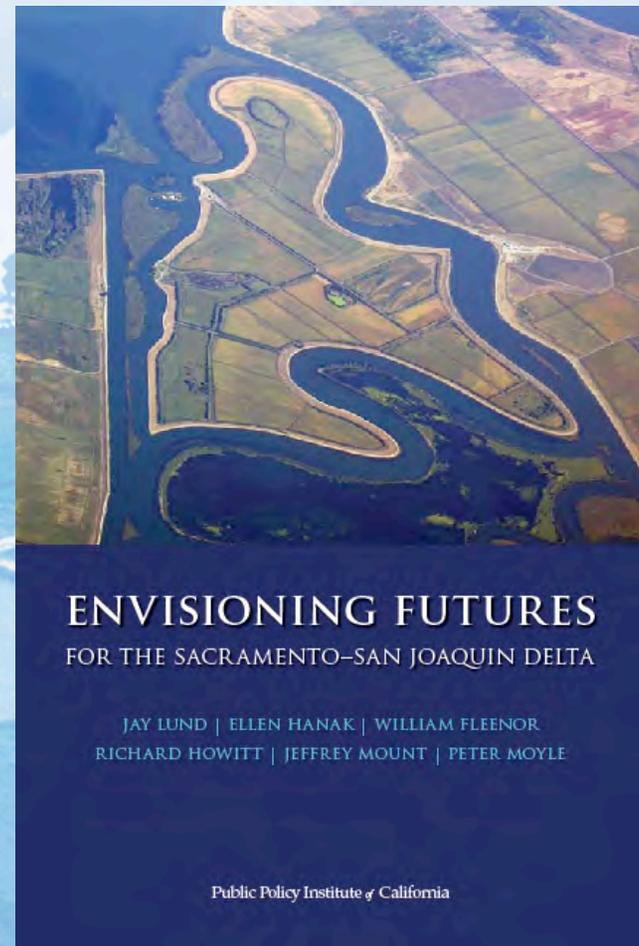
- Fast growing region
- Increasing water supply, urban discharge pressures
- Demand for conversion of the Delta to homes

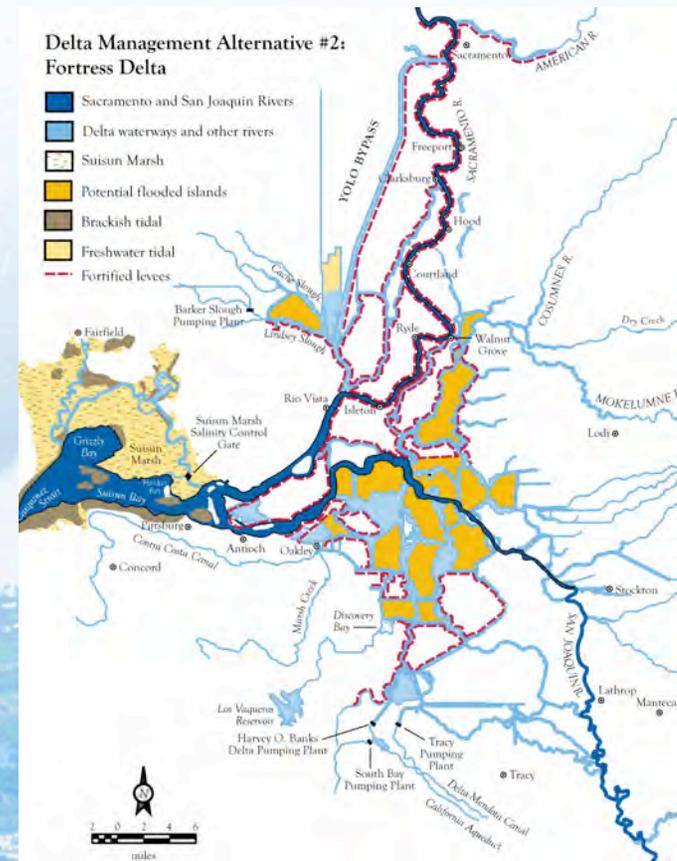
Policy Challenges

- Current policy focused on maintaining homogenous, freshwater Delta not working
- Current Delta not sustainable for all stakeholders
- Convergence of multiple factors point toward dramatic future changes
- However, an array of promising alternatives exist

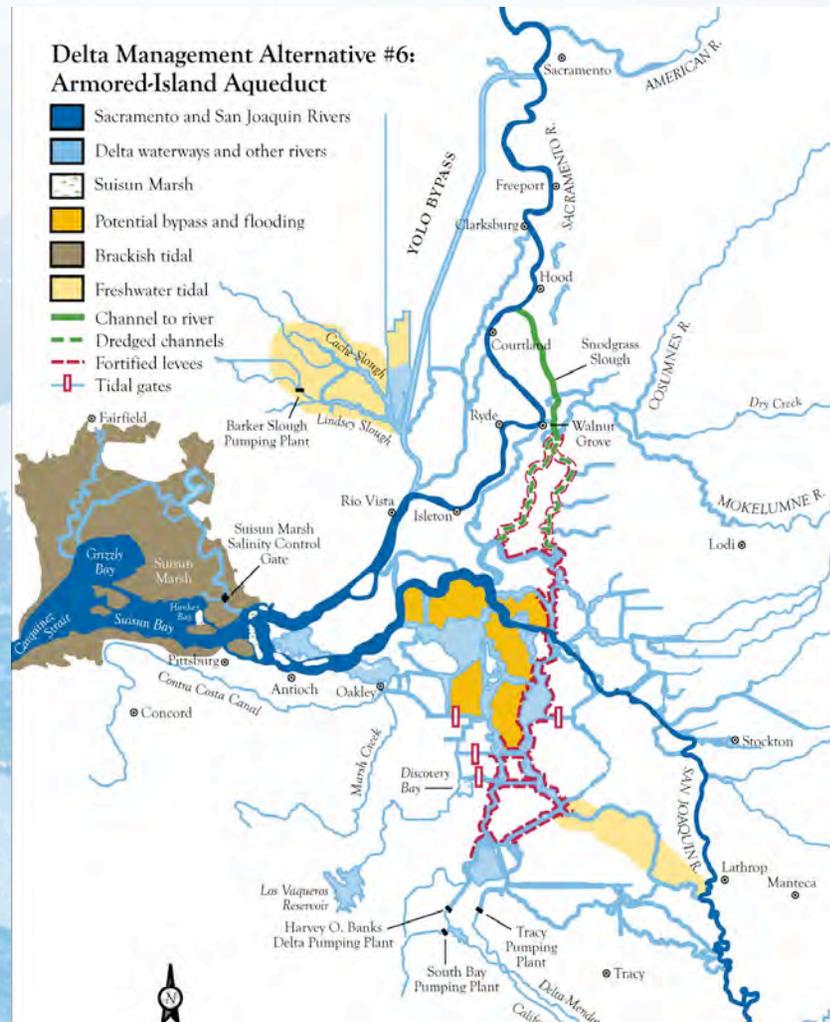
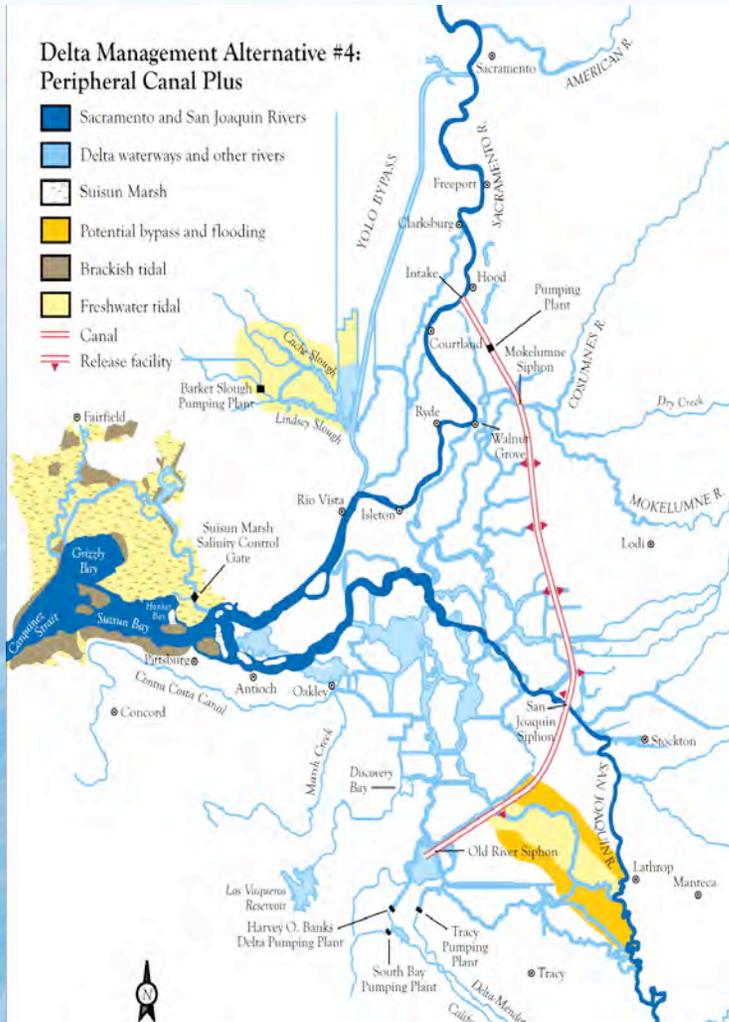
A Range of Alternatives

- Multiple efforts underway
- Most ideas captured in recent PPIC/UC Davis report
- Tough policy choices ahead, but adaptation possible

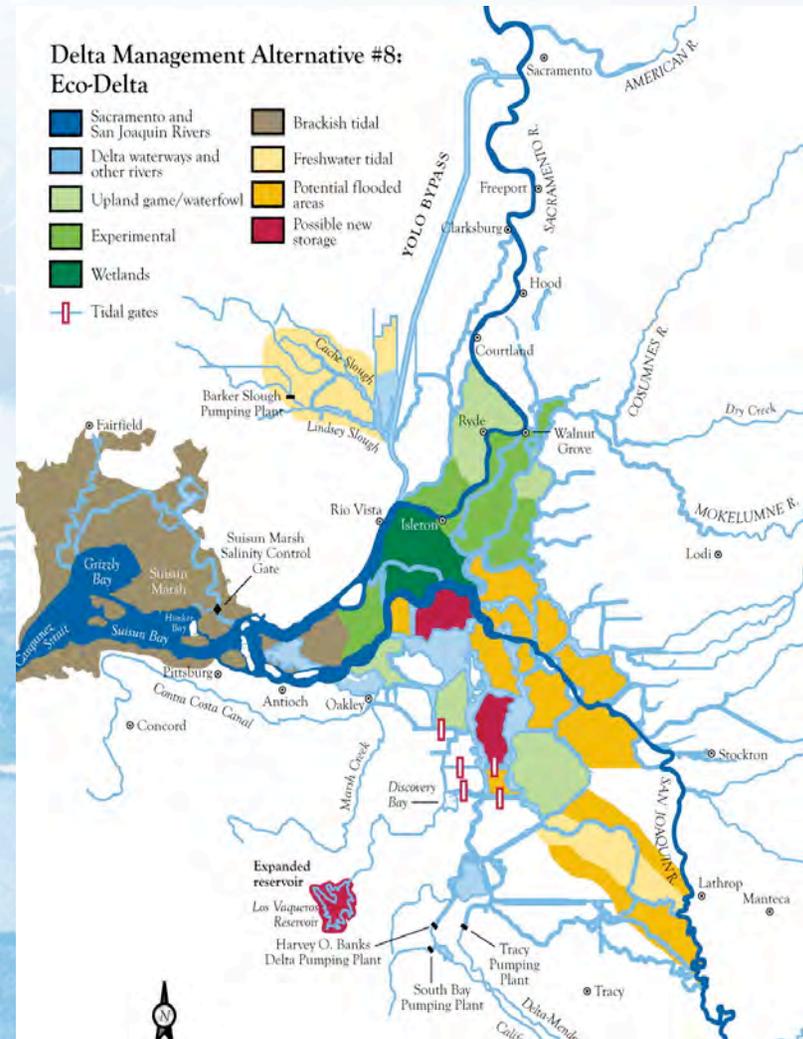
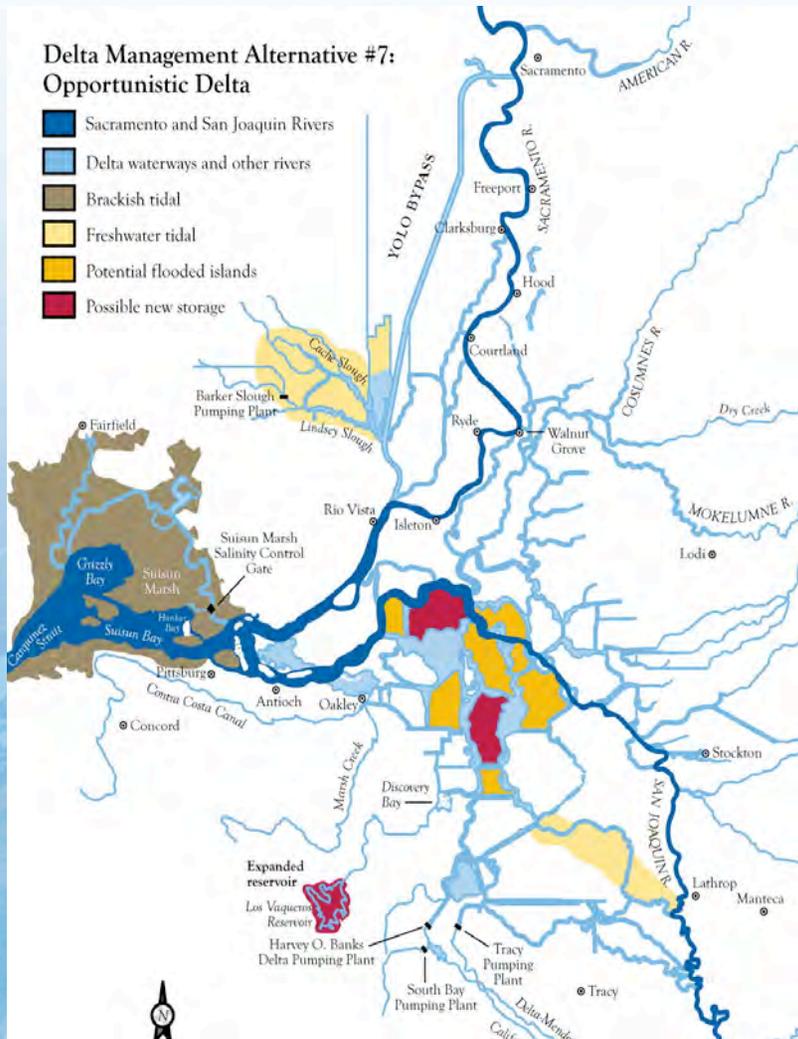




Static, freshwater alternatives perform poorly based on economic, environmental and water supply criteria



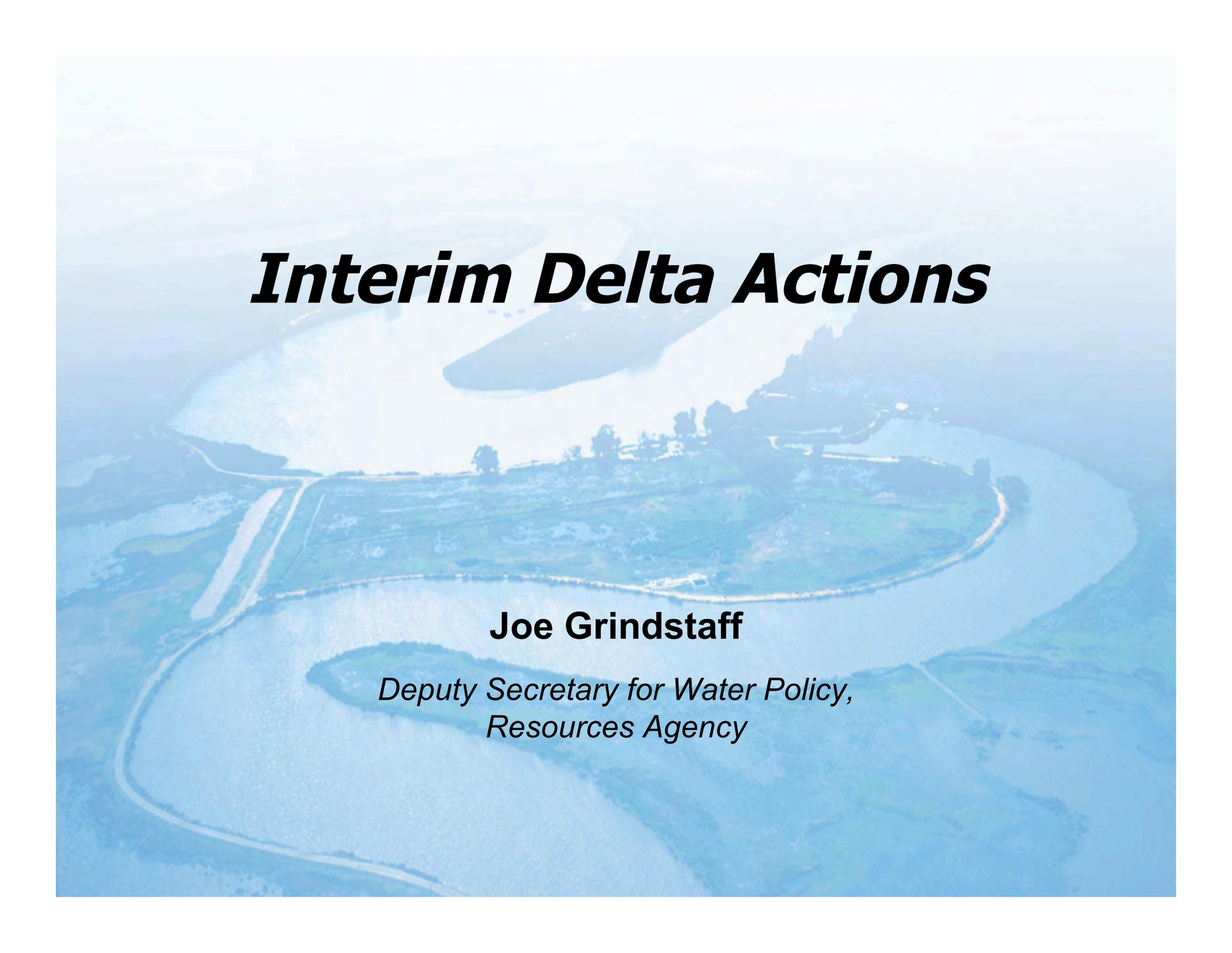
Peripheral Canal (isolated facility) and Armored Island Aqueduct (Middle River aqueduct) show promise, worth further analysis



Opportunistic Delta and Ecological Delta show promise, albeit with reduced water supply, worth further analysis

Key Conclusions

- Legacy of change and future changes make the Delta unsustainable for all stakeholders
- Dynamic Delta that adapts to future conditions makes economic and ecologic sense
- Array of promising alternatives exist
- Solutions will involve difficult trade-offs
- Delta cannot be fixed in Delta alone – requires comprehensive solutions

An aerial photograph of a river delta system, likely the Sacramento-San Joaquin River Delta. The image shows a large central island surrounded by waterways and smaller channels. The water is a light blue color, and the land is green with some brown patches. The overall scene is a complex network of water and land.

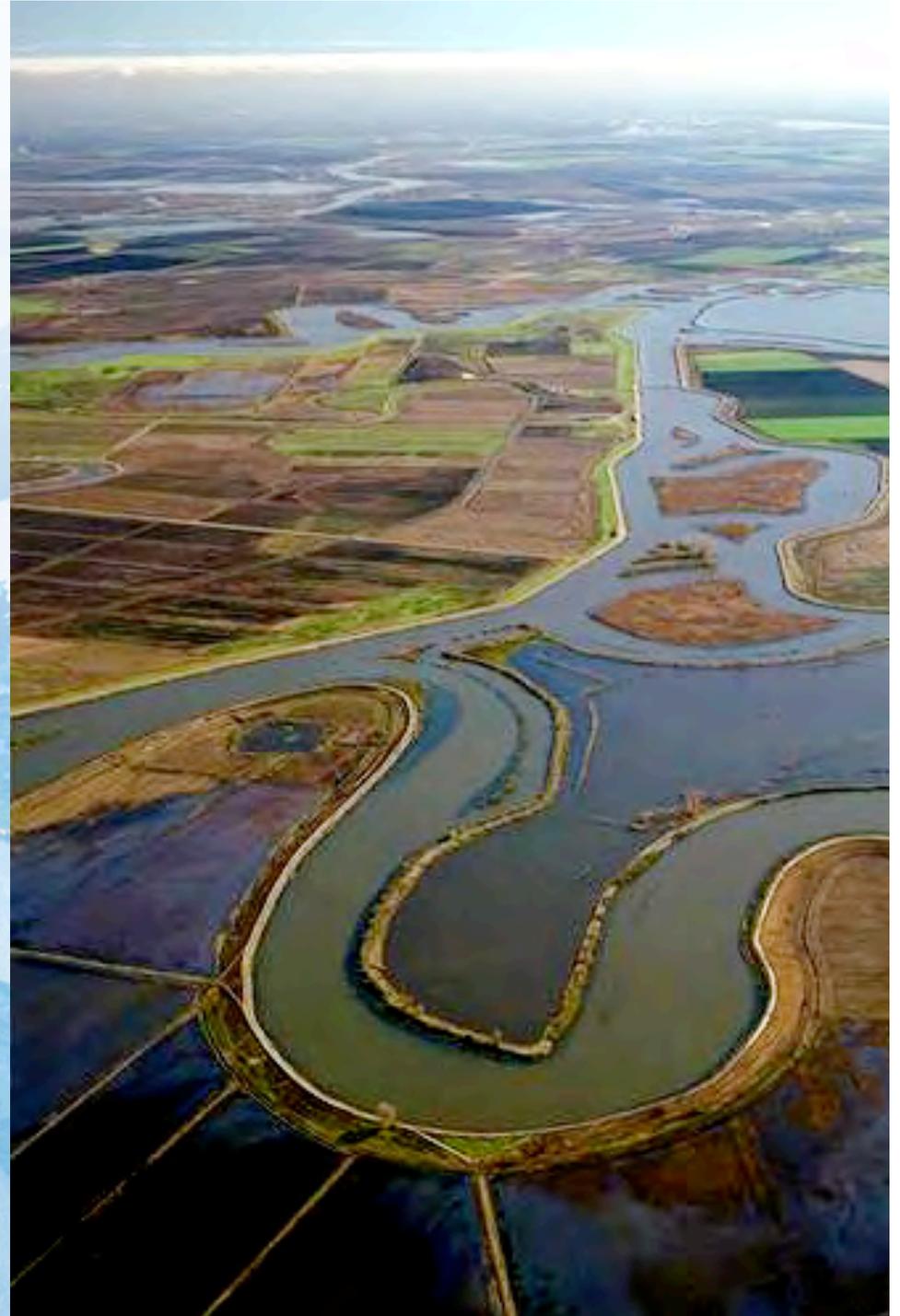
Interim Delta Actions

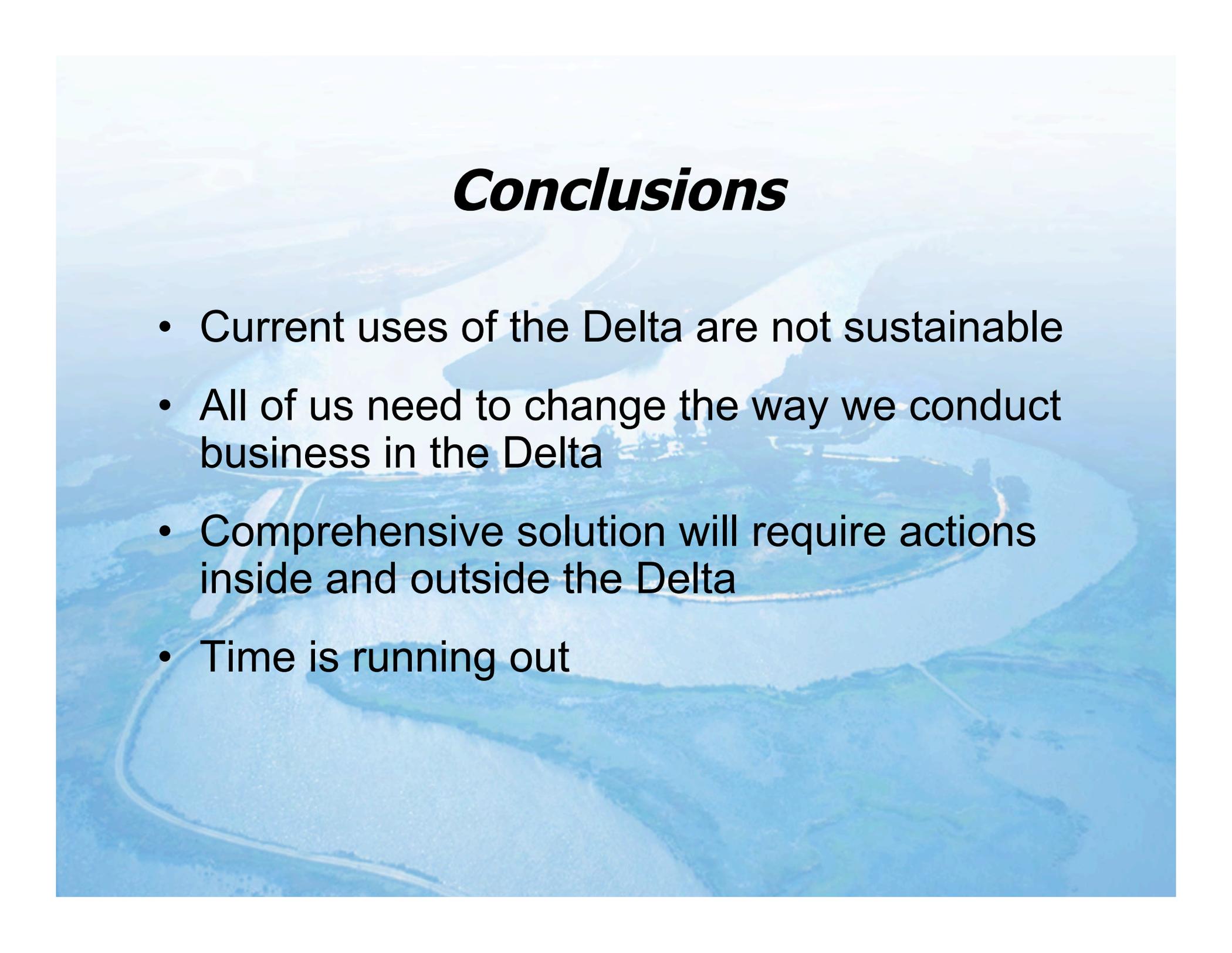
Joe Grindstaff

*Deputy Secretary for Water Policy,
Resources Agency*

Potential Actions

- Implement court-directed operational changes
- Preserve areas that might be needed for future habitat enhancement
- Enhance conservation to be key component of supply
- Develop strong captive breeding program for delta smelt
- Invest more in toxics research, science, subsidence reversal & levee improvements





Conclusions

- Current uses of the Delta are not sustainable
- All of us need to change the way we conduct business in the Delta
- Comprehensive solution will require actions inside and outside the Delta
- Time is running out