

# Hydrodynamic, Sediment and Water Quality Model Framework to Support Resource Management Planning for the Sacramento San Joaquin River Delta

5<sup>th</sup> National Conference on Ecosystem Restoration  
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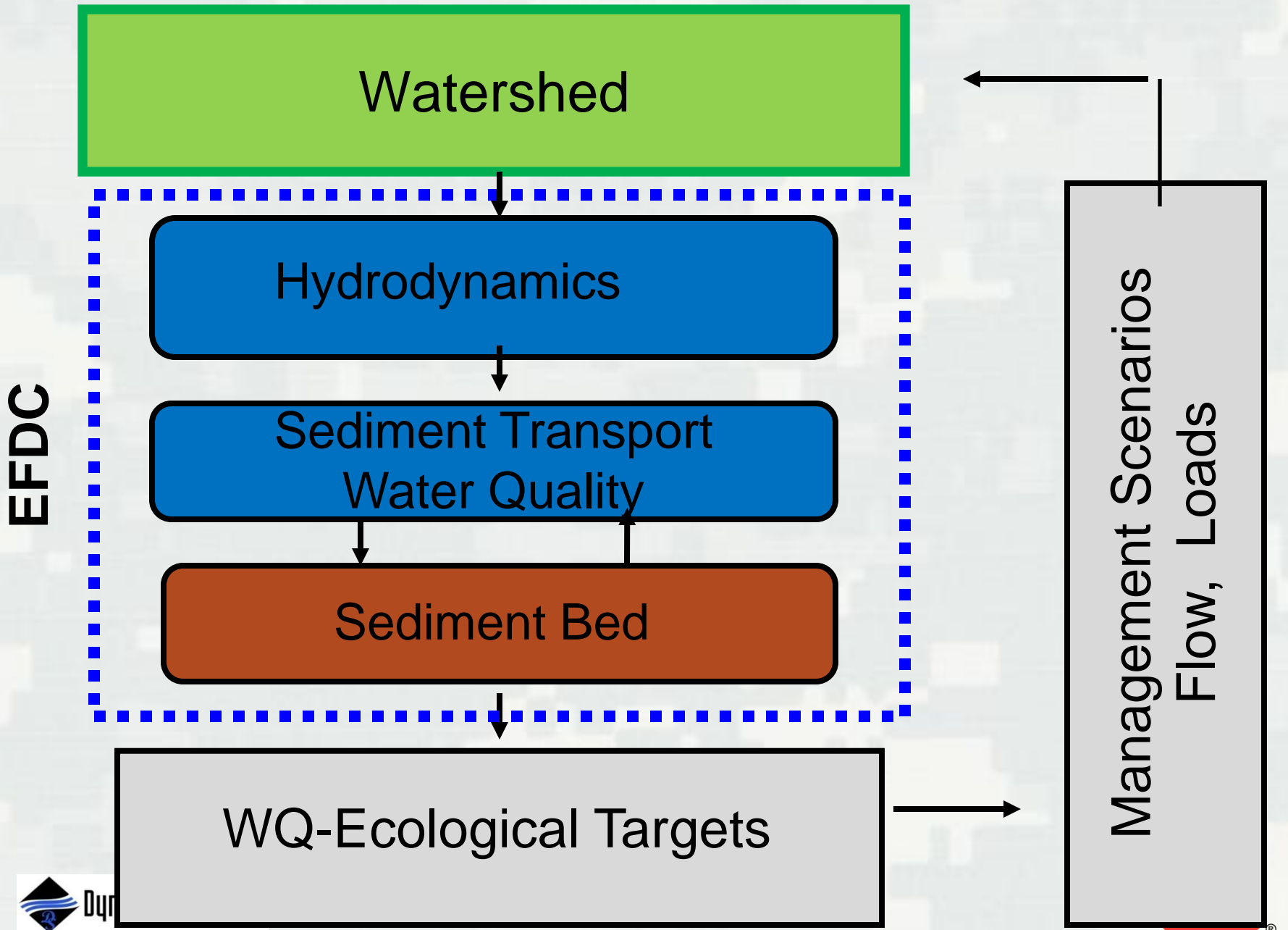


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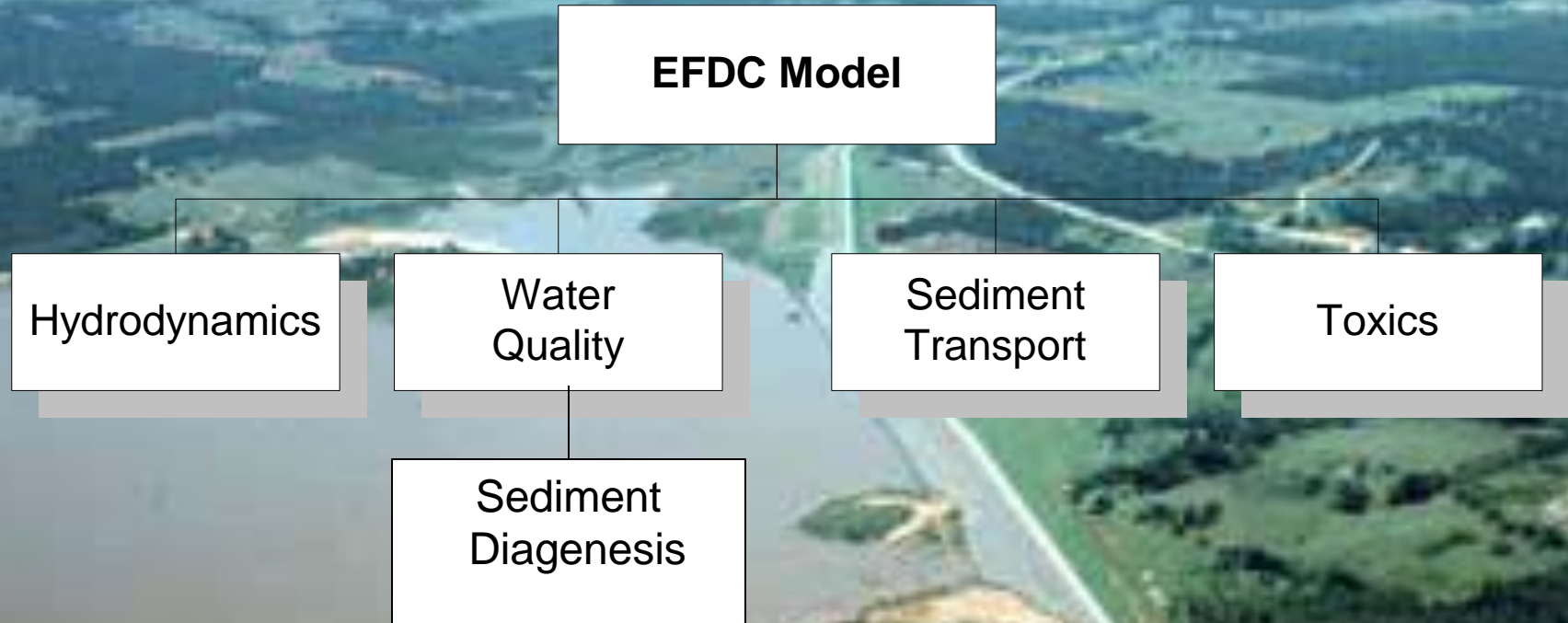
# Goals for Resource Management

- CALFED Act of 2007 directed USACE to address resource management issues in the Delta with California Department of Water Resources
- Surface water modeling framework developed to support planning efforts to meet co-equal goals for sustainable resource management
  - Ensure availability of abundant clean water supply for municipal and agricultural uses
  - Restoration and maintenance of ecological resources



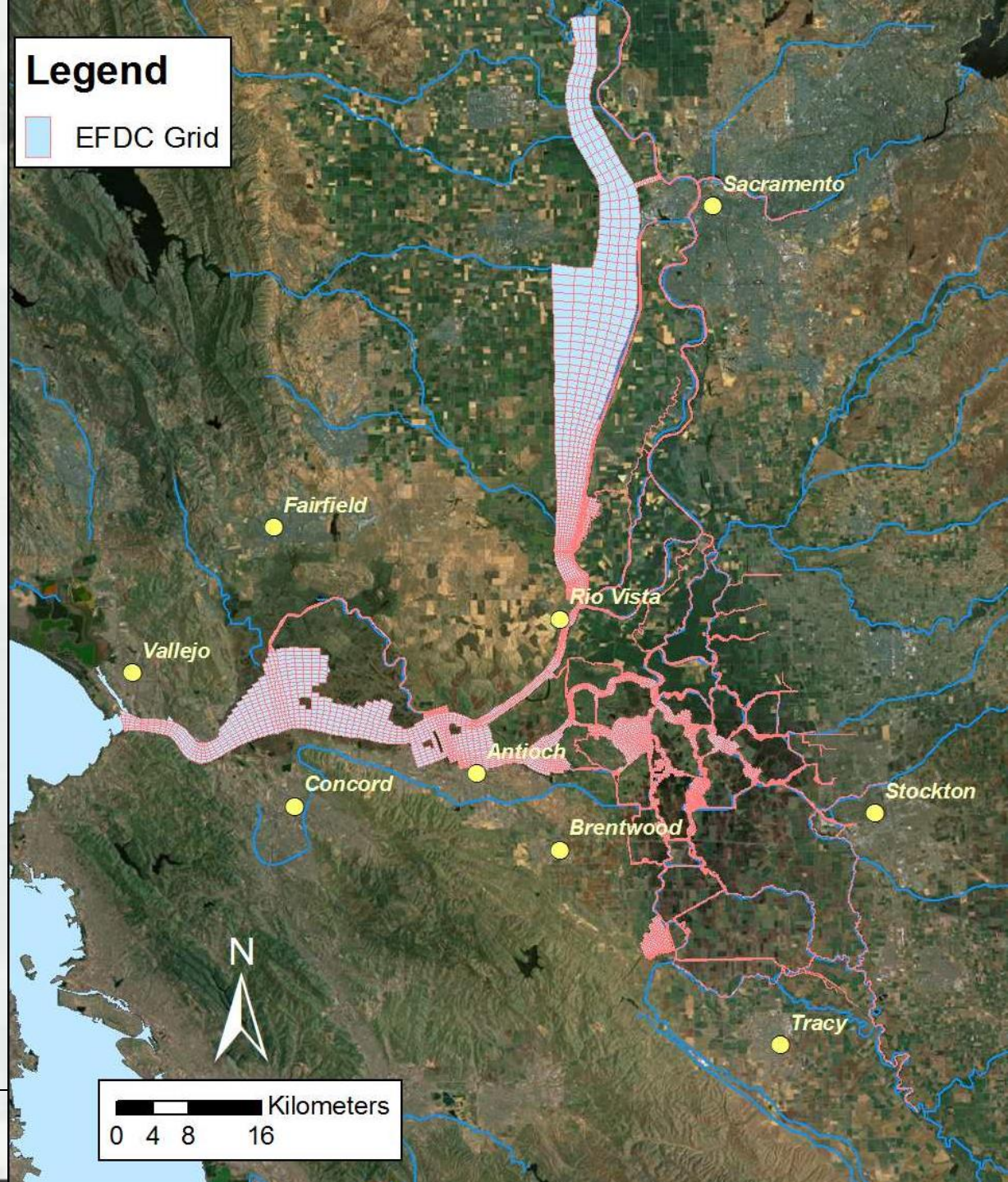
# EFDC Overview

Environmental Fluid Dynamics Code (EFDC)

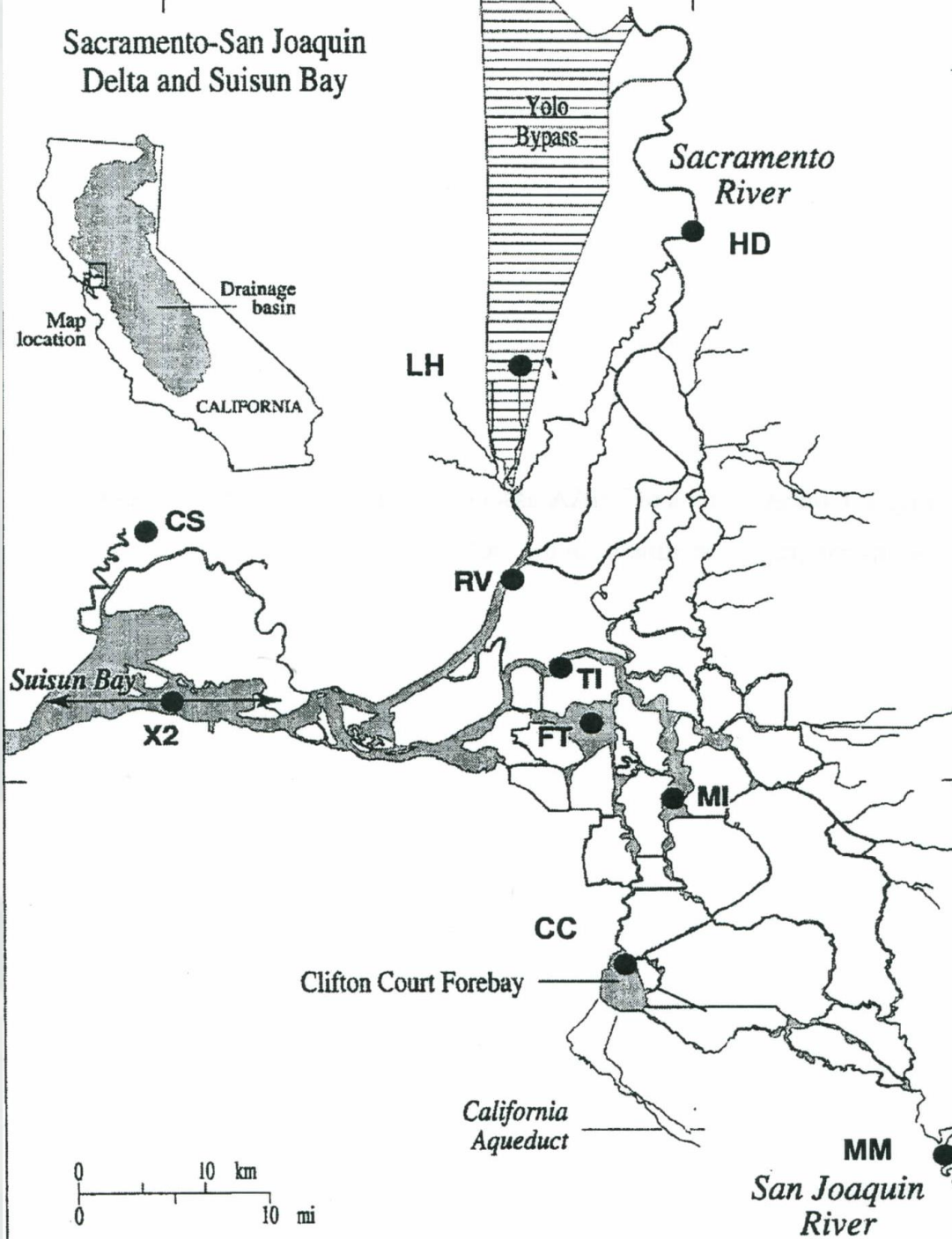


# Delta Water Quality Model

- 16,510 horizontal cells
- Four vertical layers
- 2003-2004
- Tides: Carquinez Strait
- 6 Rivers (USGS)
- 5 Pump stations
- 4 Structures
- 15 Wastewater Plants



# Sacramento-San Joaquin Delta and Suisun Bay

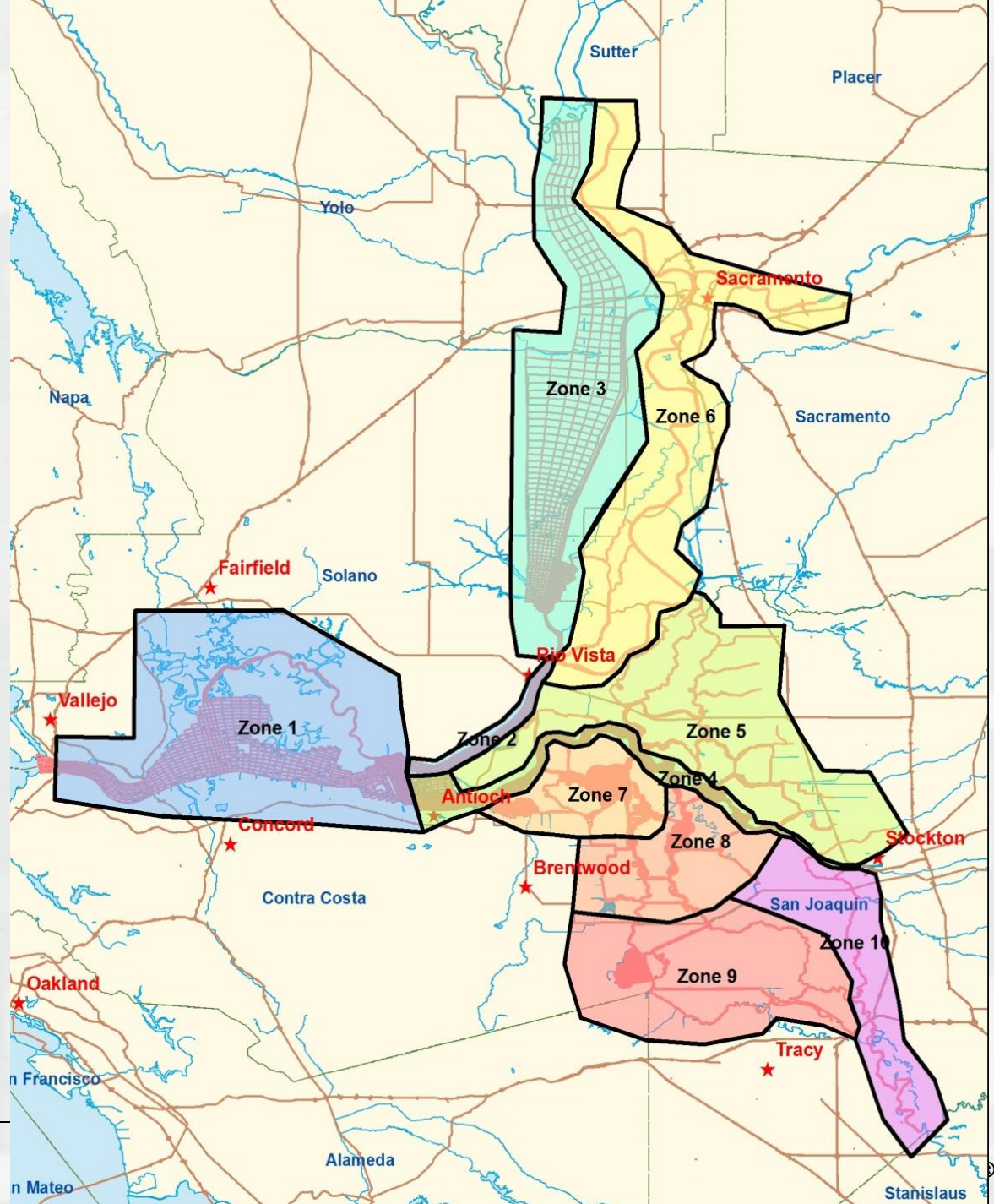


## Sediment Bed TOC & TON (Pilon, 2006)

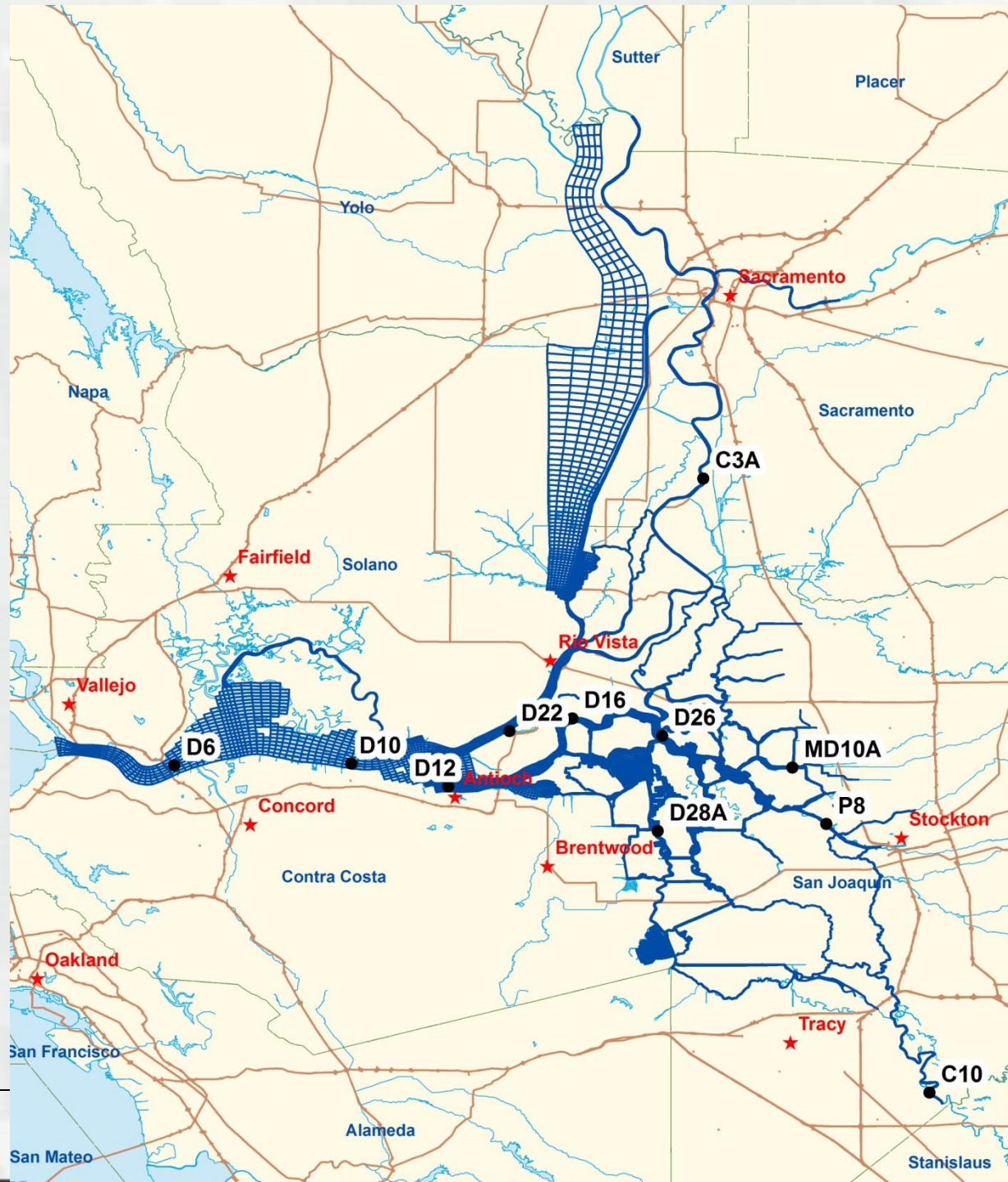


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# 10 Sediment Diagenesis Zones

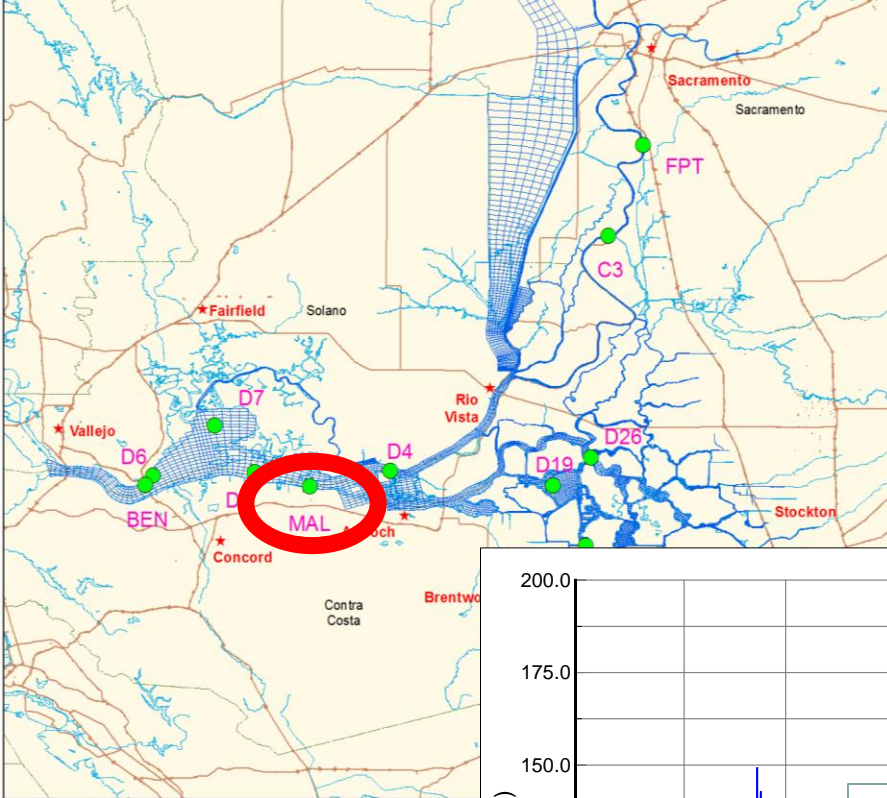


# Water Quality Calibration Validation Stations 2003-2004

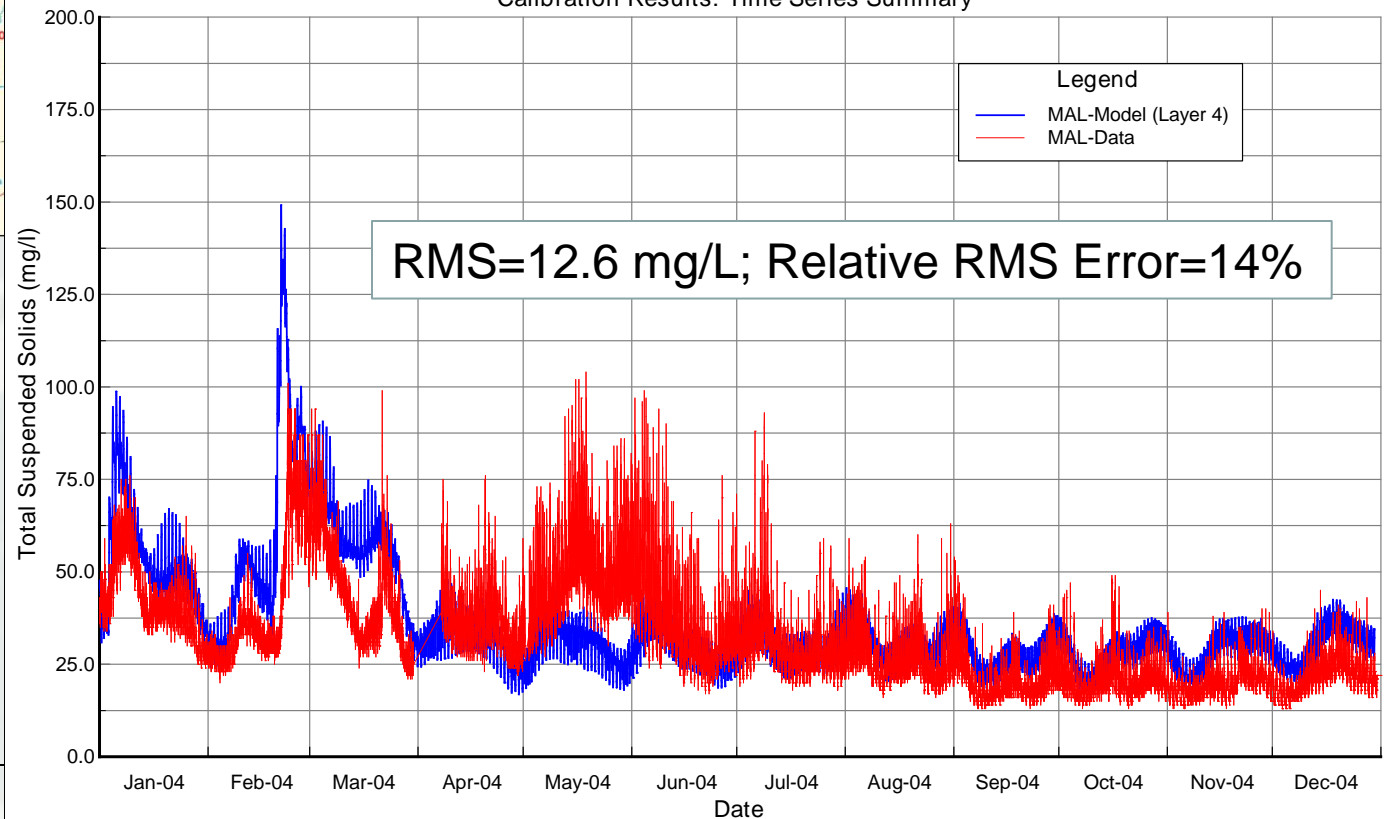




# TSS (Surface) Mallard Island 2004



Calibration Results: Time Series Summary

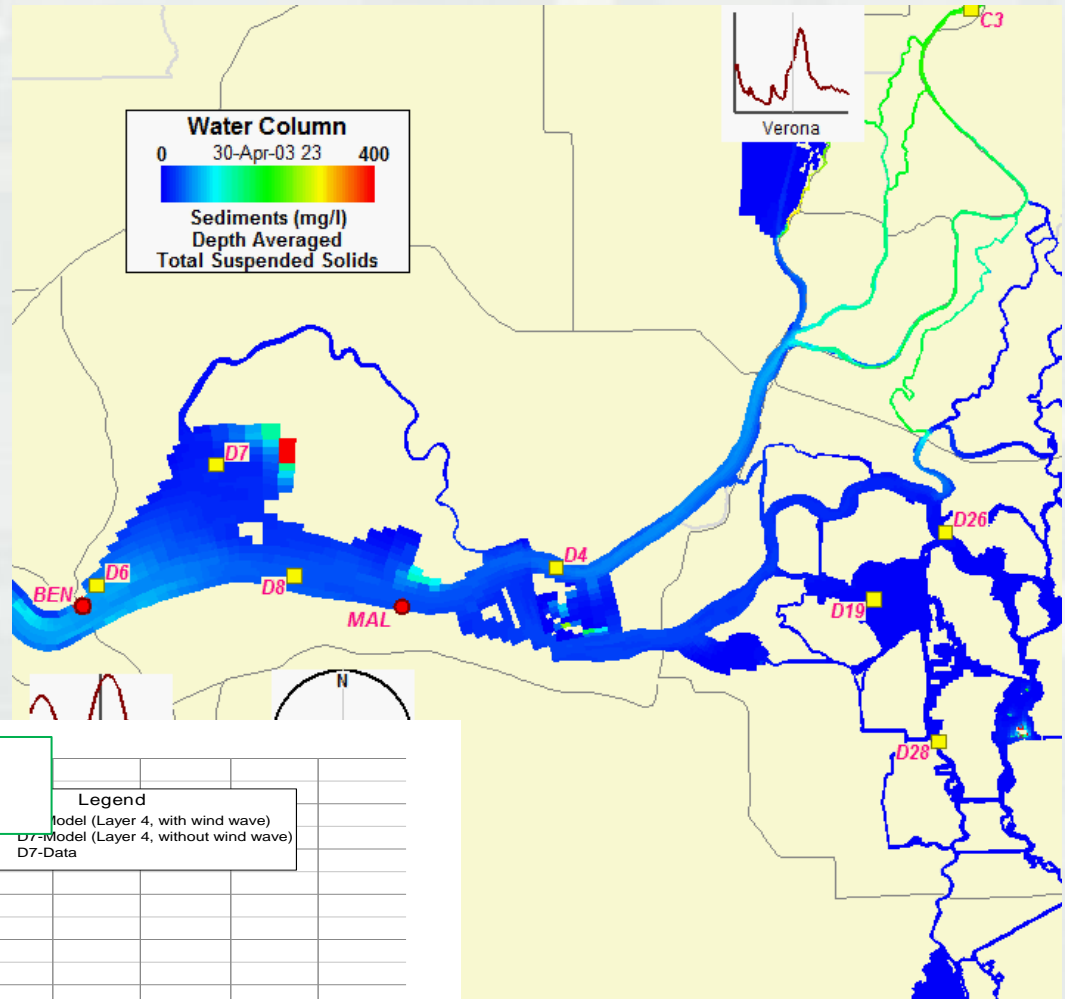
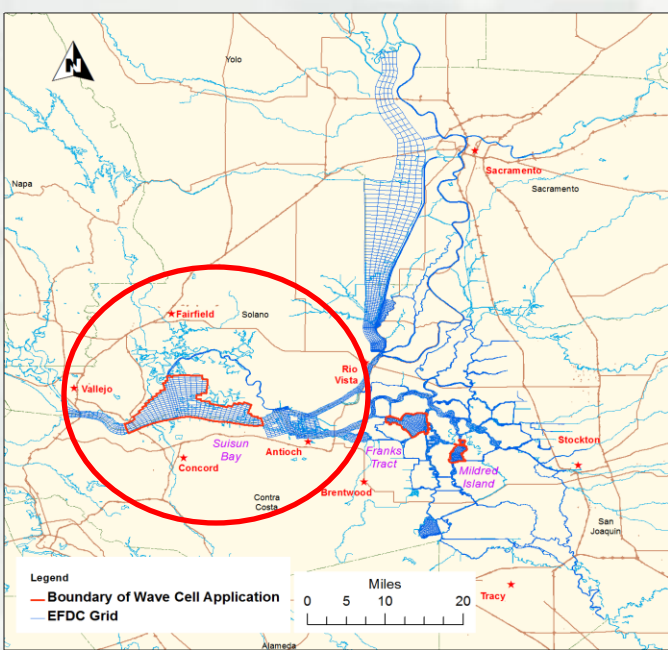


# Wind Waves & Sediment Transport

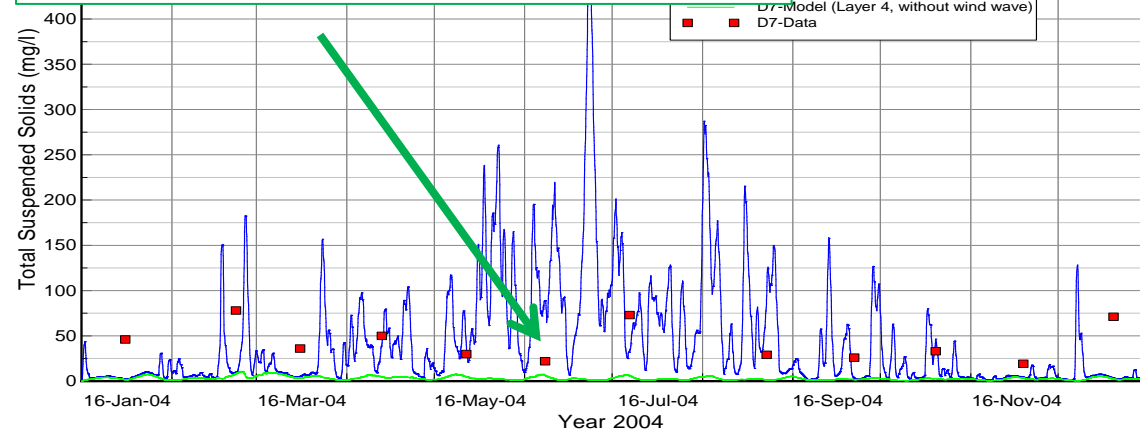
- Improved simulation of sediment transport for shallow water and wind wave mixing
- Help design structures: breakwater, storm surge barriers, manage wetlands
- Help design physical or vegetative barriers to reduce sediment suspension & wave action



# Wind Effects: Suisun Bay



## TSS without wind-waves

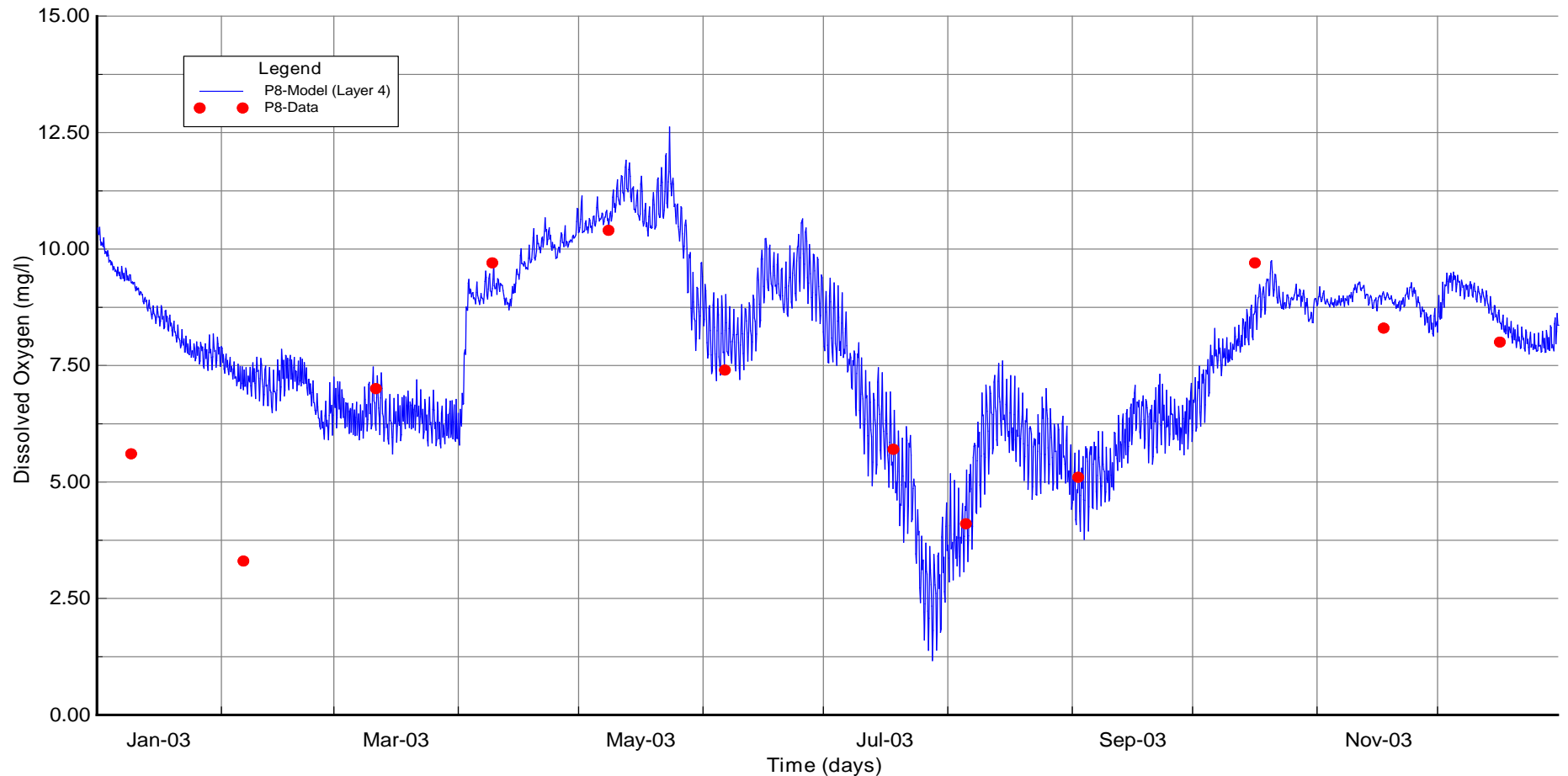


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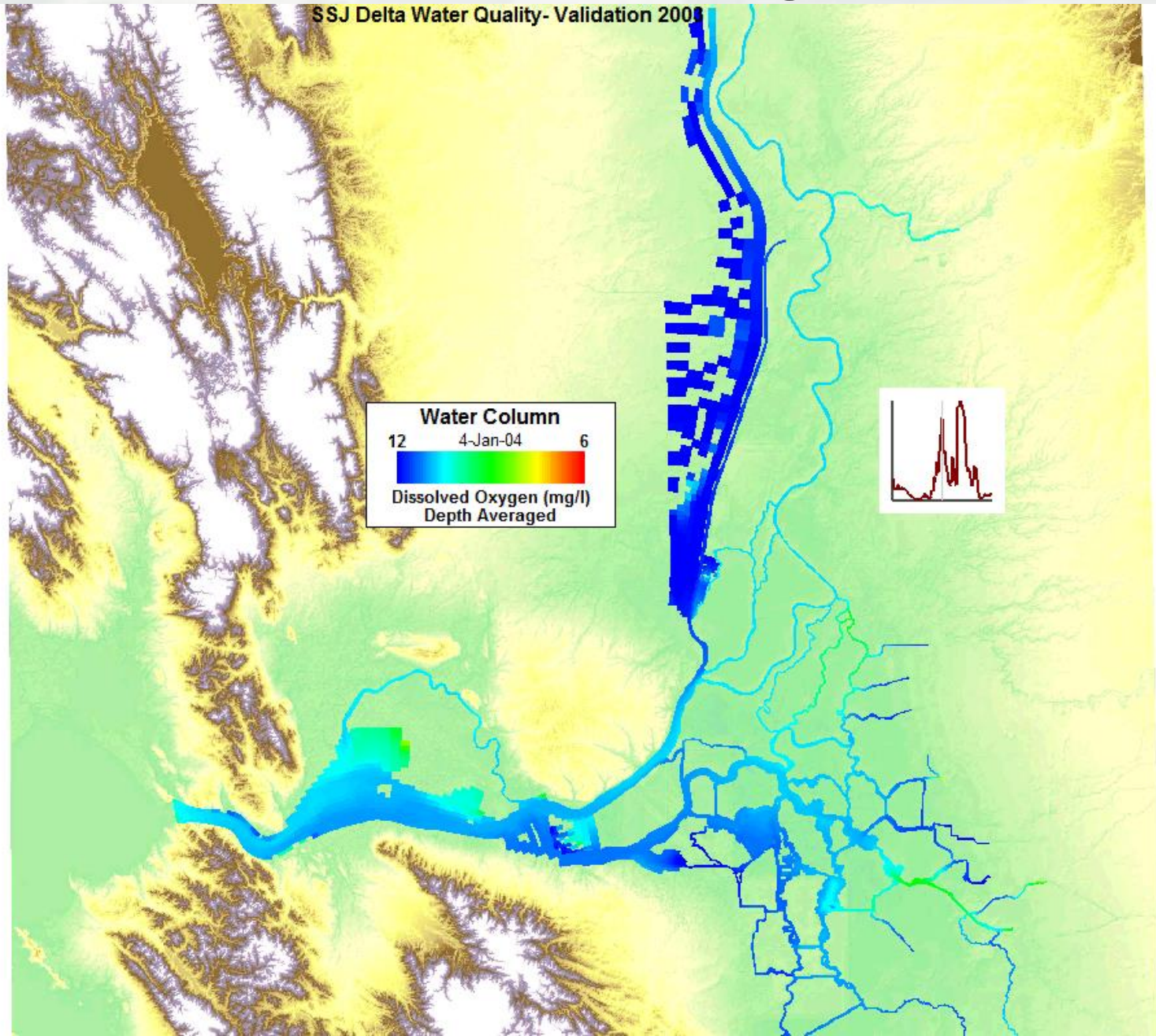
# Dissolved Oxygen (Surface) 2003 P8-Stockton Deep Channel



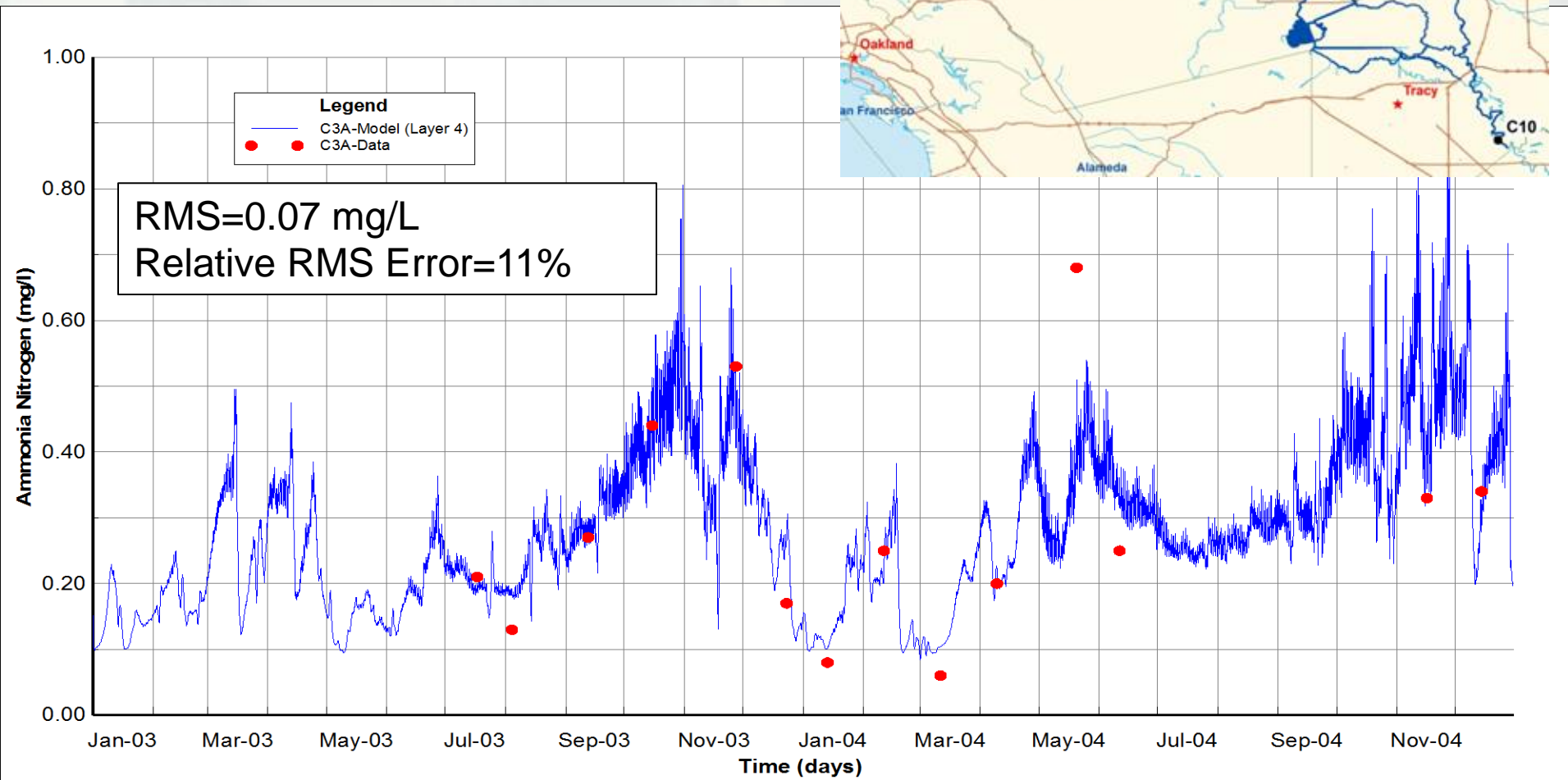
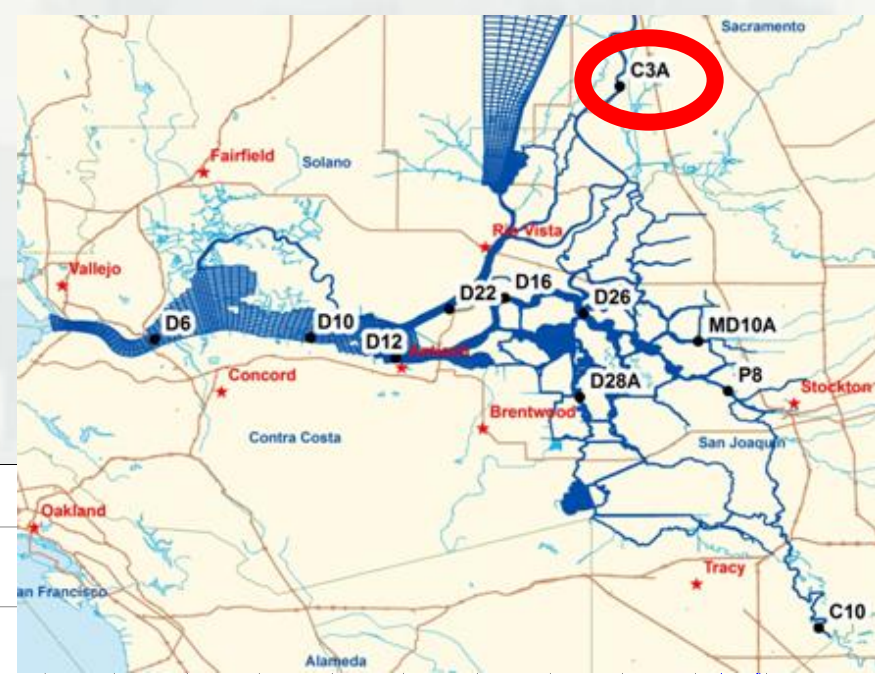
RMS = 1.6 mg/L; Relative RMS Error = 22%



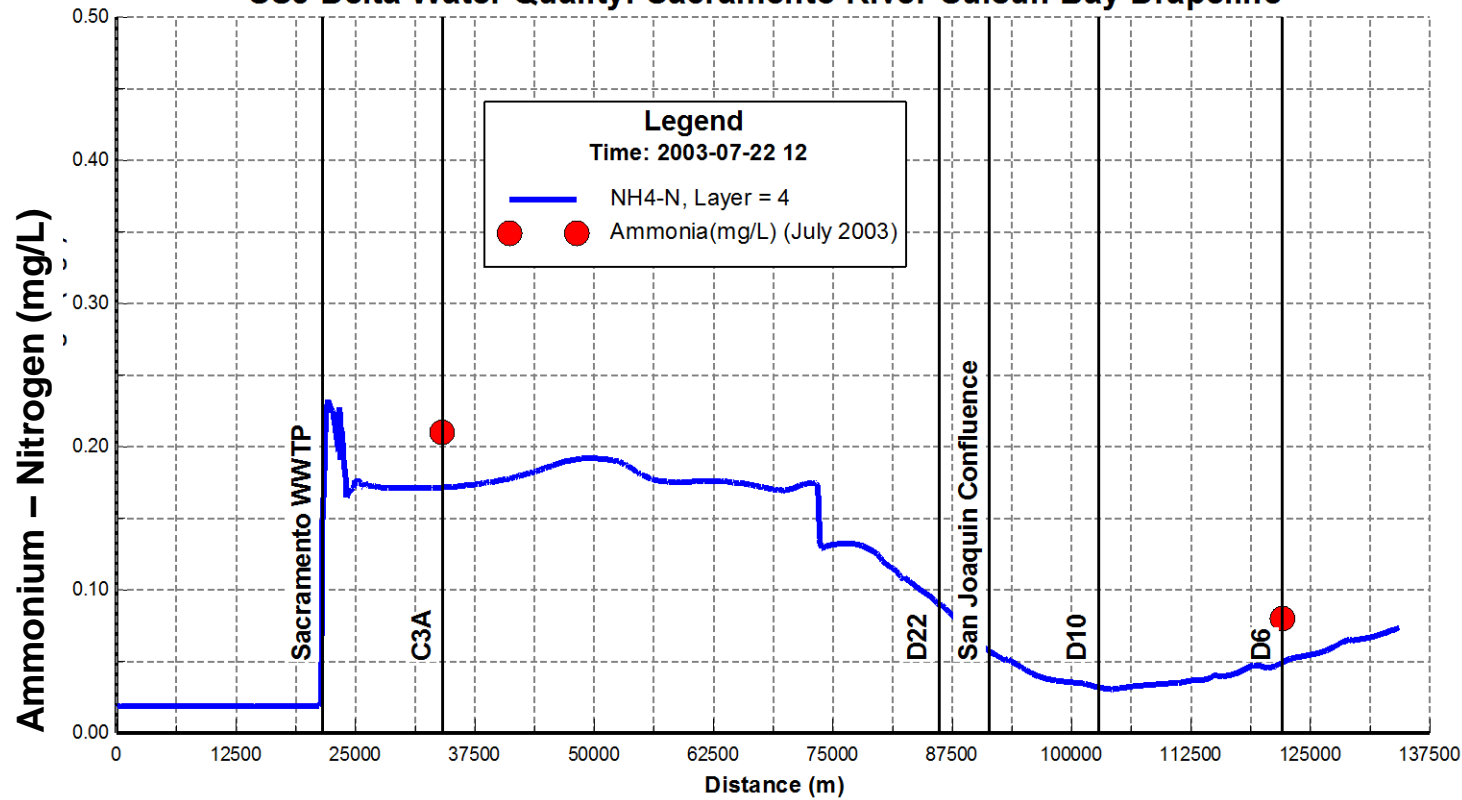
# Dissolved Oxygen



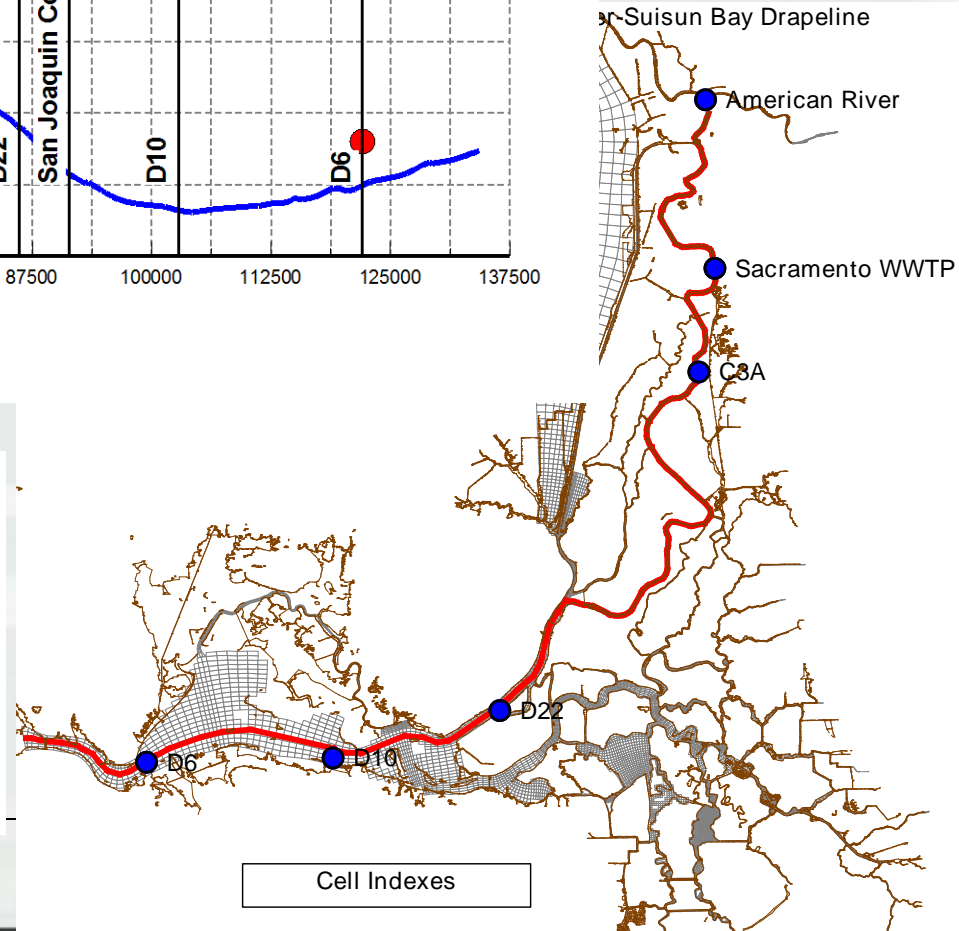
# Ammonium (Surface) C3A – Sacramento R 2003-2004



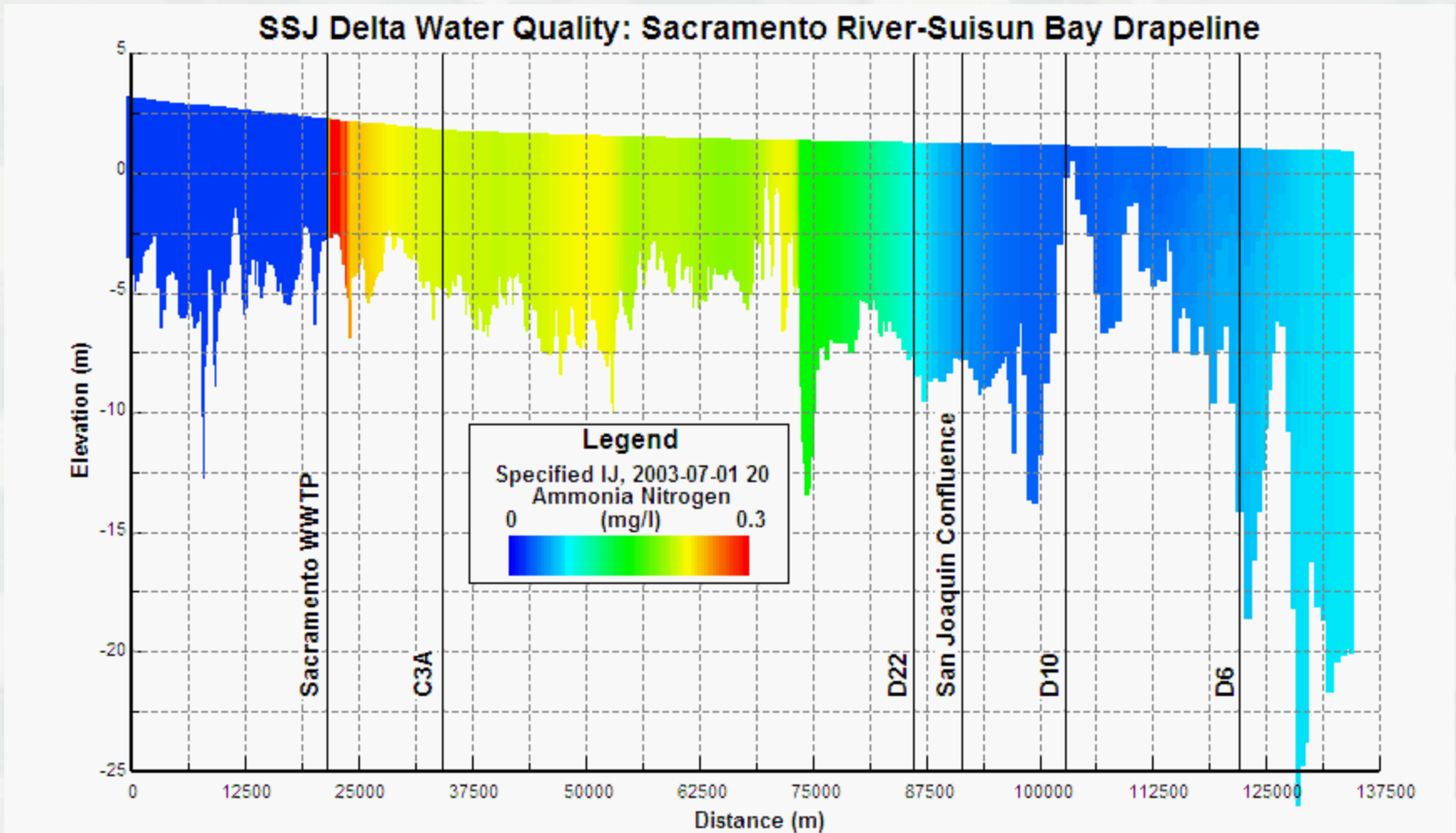
# SSJ Delta Water Quality: Sacramento River-Suisun Bay Drapeline



# Ammonium Profile: July 2003



# Ammonia Profile: Sacramento River





# Findings

- Bay-Delta hydrodynamic model- good agreement with water level, salinity & water temperature
- Delta WQ model- TSS and most WQ variables show reasonable agreement with observed data
- Delta WQ model reasonably depicts key large scale water quality transport & processes
- Delta hydrodynamic/WQ model linked to lower trophic level model (CASIM) to describe interaction of flow, transport, salinity & WQ on food web resources

# Summary

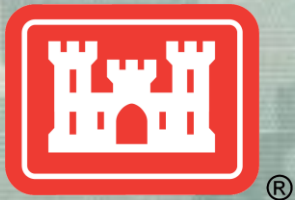
- Model framework provides US Army Corps of Engineers, other State/Federal/local agencies and Stakeholders with advanced modeling tool for resource planning & restoration evaluations
- Public investment by USACE in the Bay-Delta & Delta EFDC models can be leveraged to support State/Federal/Local regulatory, policy and ecological restoration efforts

# Discussion

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