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science for a changing world

USGS Research in the Bay-Delta

Jeff Keay, Deputy Regional Director
USGS Pacific Region

U.S. Department of Interior
U.S. Geological Survey

U.S. Geological Survey

- **We provide reliable scientific information to describe and understand the Earth**

  - $1B Congressional funding
  - 10,000 scientists, technicians, support personnel
  - 400 locations

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Pacific Region

In California
- 6 Science Centers
- 39 locations

With expertise in
- Water
- Earthquakes
- Minerals & Energy
- Coastal Marine Sciences
- Ecology
- Geography

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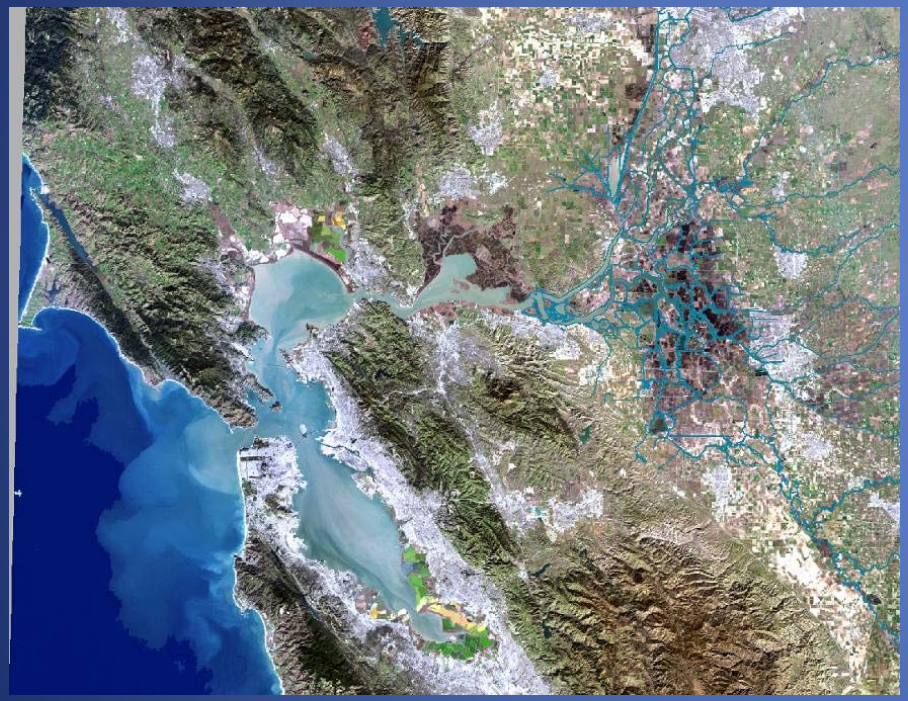
Science Leadership in the Bay-Delta



- Over 100 projects
- Totaling over $17M
  - $11M from partners
- 8 Science Centers
- Delta Executive Board

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USGS in the Bay & Delta

- Since late 1960s
  - Water quality
  - Invasive clams
  - Sediment exports
  - Delta flow network
  - River flow reversal
  - Climate change impacts
- IEP – 1985
- CALFED – Founding implementing agency
- Delta Science Program
  - Fund Lead Scientist

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Applicable Bay-Delta Science

… science that enhances understanding of natural processes and factors influencing the co-equal goals of the Delta Plan

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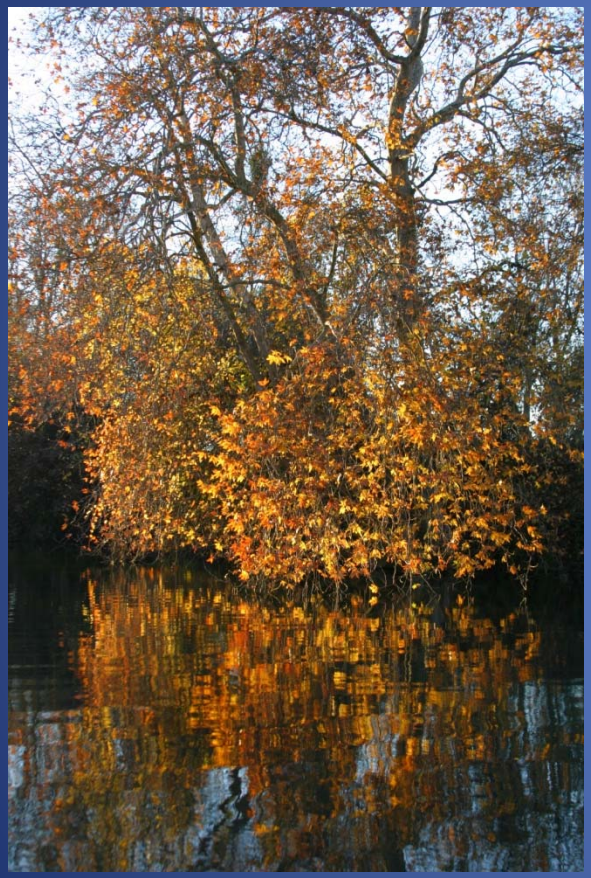
USGS Science Addresses Bay-Delta Societal Issues



- Water Quality and Availability
- Sediment Transport
- Environmental Contamination
- Animal Health and Status
- Habitat Restoration
- Natural Hazards
- Land Subsidence
- Climate Impacts

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Water Quality and Availability

- 500 stream gages state-wide
- 35+ gages track water flow through Delta
- Monitor water quality in Delta
  - Contaminants
  - Nutrients
  - Salinity
  - Suspended sediment
  - Temperature
- Inform state and federal water operations

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Sediment Transport

- Suspended sediment:
  - Cover for small or young fish
  - Nutrient rich substrate for wetlands
  - Carries contaminants
- Research to Understand
  - Source and movement of sediment in the water column
  - Changes through time
- Inform management
  - species reliant on turbid waters
  - habitat restoration

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Environmental Contamination

- Mercury, Selenium, Agricultural pesticides, Pharmaceuticals
  - How they move, transform and accumulate in the sediments and through the system
  - Impacts on species
  - Effects of agricultural practices and restoration activities on the availability of mercury

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Animal Health and Status

- Track migrating salmon and delta smelt
- Research habitat needs and threats to the giant garter snake
- Monitor the health of endangered bird species
- Assess threats to shorebirds and waterfowl
- Monitor species critical to the Bay-Delta food web

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Habitat Restoration

- Research sediment and water availability
- Examine & predict contaminants associated with restoration activities
- Assess terrestrial and aquatic species needs and considerations

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Natural Hazards

- Characterize geologic subsurface of the Delta
- Identify & understand Bay-Delta faults
- Examine the nature of Delta levees
  - Calculate seismic risk
  - Levee deformation
- Model impacts of extreme flood events for emergency preparedness

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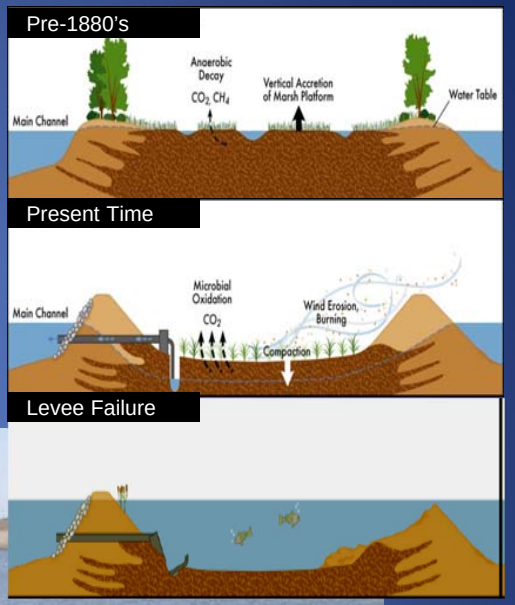
Land Subsidence

- Delta
  - Study the formation of peat soils & practices to slow or reverse subsidence
  - Carbon Farming to sequester carbon & reverse subsidence
- Central Valley
  - Study groundwater pumping impacts on water conveyance infrastructure



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Climate Impacts

- Study atmospheric rivers and nature of droughts and storms
- Develop models to examine the local effects of predicted temperature and precipitation changes
  - Water availability and quality
  - Water operations
  - Species ranges and survivability
- Examine sea level rise impacts to marshes, tidal mudflats and shallow water habitats and their species

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Setting Priorities for USGS Bay-Delta Science

- Support for Delta Science Plan
- Use of Interim Science Action Agenda
- *The State of Bay-Delta Science*
- Current priorities:
  - Challenges of habitat restoration
  - Drought
  - Natural hazards

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USGS science strives to provide essential, objective interdisciplinary collaborative science to support our partners in the Bay-Delta.
Thank You