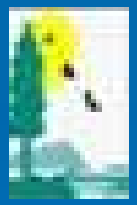
Giacomini Wetlands:

Restoring the Health of Tomales Bay

Year in Review and Looking Ahead



Year in Review

- 1. Funding Issues
  - *Loss of state bond funds in December 2008*
    - Past construction
    - Future invasives removal and monitoring
    - Problems solved or alleviated thanks to efforts of PRNSA and:
      - MCF
      - RWQCB, Coastal Conservancy
      - TBWC, EPA, SWRCB
      - PRNSA


Capitol and California

Comments (23) | Recommend (6) | Print

Bond money crunch freezes out environmental nonprofits

By Mary Lynne Vellinga
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California's ocean of red ink is threatening its


Funding crisis threatens park, levee, science projects

By Matt Weiser
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Near Placerville, long-sought park land might fall out of escrow. In the Sacramento-San Joaquin Delta, vital ecosystem research has been halted. And in West Sacramento, officials fear a delay in rebuilding levees.

Gov. Arnold Schwarzenegger, in Natomas on T highlights the need for levee repairs

Year in Review

- 2. Public Access Component
  - *Received public access funding from stimulus funds*
    - Pathways and interpretative exhibits at Dairy Mesa
    - ADA-compliant path and viewing area at White House Pool County park
    - Repair and realignment of Tomales Bay Trail
    - Viewing areas at former North Levee, Tomales Bay Trail
    - Scheduled for implementation in 2010

Year in Review

- 3. Invasives Removal
  - *Conducted additional removal of more than 29 acres of invasives and non-native plants*
    - Funded by remaining Moore (not state) funds (with lots of volunteer help!!!)
    - *Cape ivy* and *periwinkle* along Sir Francis Drake and Lagunitas
    - *Himalayan blackberry* along Lagunitas Creek
    - Non-native *thistles, radish, poison hemlock* along haul roads, ruderal areas, and in revegetation areas
    - Invasive *perennial pepperweed* in East and West Pastures

Year in Review

4. Friends of the Giacomini Wetlands

Established public education and involvement program through PRNSA

- Evening and field seminars on what's going on with restoration and other related issues such as climate change
- Volunteer opportunities to help remove weeds in revegetation and other areas
- One-time and intensive educational programs for kids
  - *Pacific Coast Learning Center*
  - *B-Wet program with local Marin schools*
- Seashore and PRNSA restoration updates on web site




Year in Review

- 5. Monitoring of New Giacomini Wetlands
  - *Continued monitoring program that will allow us to demonstrate success and value of restoration*
    - Hydrology (*Kamman Hydrology & Engineering and NPS*)
    - Water Quality (*NPS and TBWC*)
    - Birds (*Jules Evens, Maryann Flett, Seth Bidwell, Audubon Canyon Ranch*)
    - Amphibians (*USGS: Gary Fellers and Pat Kleeman*)
    - Fish (*NPS and USGS*)
    - Vegetation *(NPS)*
    - Invertebrates (*NPS with SFSU and others*)
    - Soils and Sedimentation (*NPS*)
    - Photodocumentation (*Bob Campbell, Galen Leeds*)

Year in Review

- 6. New Hope for a Species Once Thought Lost
  - *Relocation of federally endangered tidewater goby to Tomales Bay State Park to:*
    - Expand distribution within Tomales Bay watershed
    - Increase viability of Tomales Bay population in the face of a changing climate
    - Program managed by Darren Fong of Golden Gate with USGS and in cooperation with U.S. Fish and Wildlife Service

Year in Review

- 7. Project gaining national recognition

Project recently awarded Partners in Conservation Award from Department of Interior

- *"….our greatest conservation legacies often emerge when stakeholders, agencies, and citizens from a wide range of backgrounds come together to address shared challenges…."* (Ken Salazar, Secretary DOI)

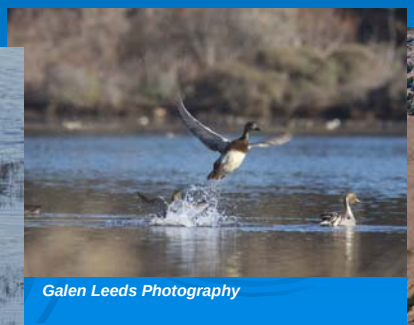
Robert Campbell Aerial Photography

Looking Ahead

- 1. Implement public access component in 2010

Galen Leeds Photography

Louis Jaffe



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Looking Ahead

- 1. Implement public access component in 2010
- 2. Continue invasives and weed removal

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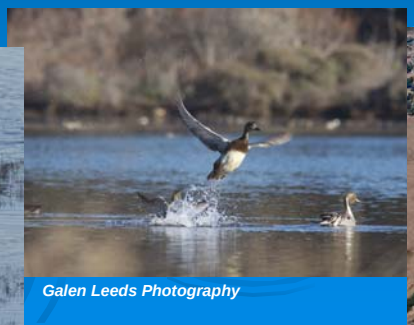

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Looking Ahead

- 1. Implement public access component in 2010
- 2. Continue invasives and weed removal
- 3. Conduct some revegetation in upland areas
  - *For example, transplants of native wildrye in weed-dominated grasslands*

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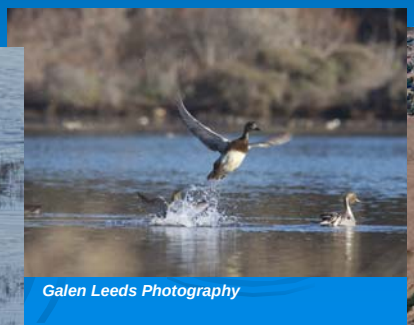

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Looking Ahead

- 1. Implement public access component in 2010
- 2. Continue invasives and weed removal
- 3. Conduct some revegetation in upland areas
- 4. Continue monitoring to demonstrate success and value of restoration efforts

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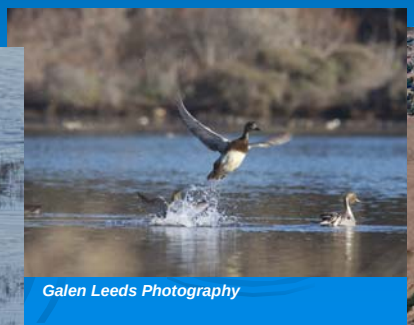

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Looking Ahead

- 1. Implement public access component in 2010
- 2. Continue invasives and weed removal
- 3. Conduct some revegetation in upland areas
- 4. Continue monitoring to demonstrate success and value of restoration efforts
- 5. Raise funds to support invasives removal and monitoring efforts

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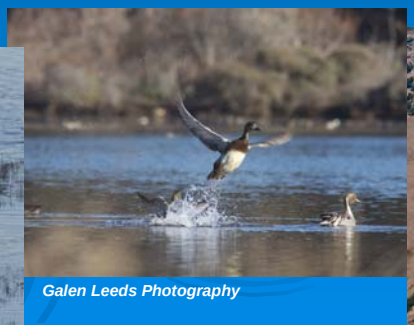

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Looking Ahead

- 1. Implement public access component in 2010
- 2. Continue invasives and weed removal
- 3. Conduct some revegetation in upland areas
- 4. Continue monitoring to demonstrate success and value of restoration efforts
- 5. Raise funds to support invasives removal and monitoring efforts
- 6. In future, continue adaptive restoration in Olema Marsh

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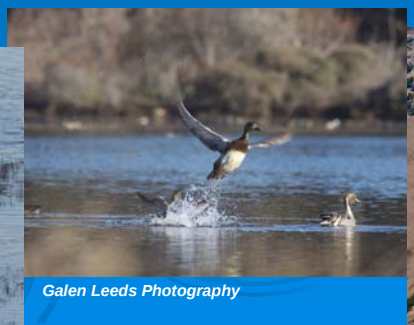

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Giacomini Wetlands

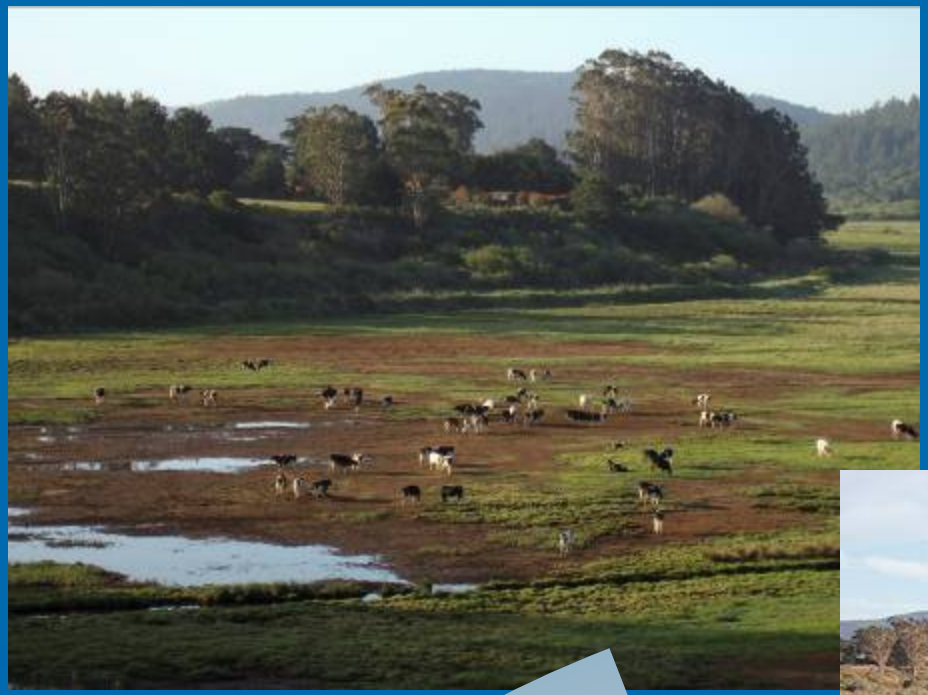
An Evolving Landscape

Giacomini Wetlands

An Evolving Landscape

Post-Restoration

Evolution of Former Dairy Pastures



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Post-Restoration

Evolution of Former Dairy Pastures

Pre and Post-Restoration

- *Changes in Hydrology*

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….. Affect Everything Else …….

Trajectories of Habitat Evolution
Giacomini Ranch – East Pasture

Gradual Continuum Model

Leveed – Muted Or Non-Tidal Pasture

Restored Marsh – Phase II – Tidal Marsh

Time from levee breach

Trajectories of Habitat Evolution

Giacomini Ranch – East Pasture

Restored Marsh – Phase I – Open Water/Marsh

Widening of created channels/inlets

Creation of new tidal channels

Dynamic or Threshold Regime

Erosion of outboard marsh "mini levees"

Restored Marsh – Phase II – Tidal Marsh

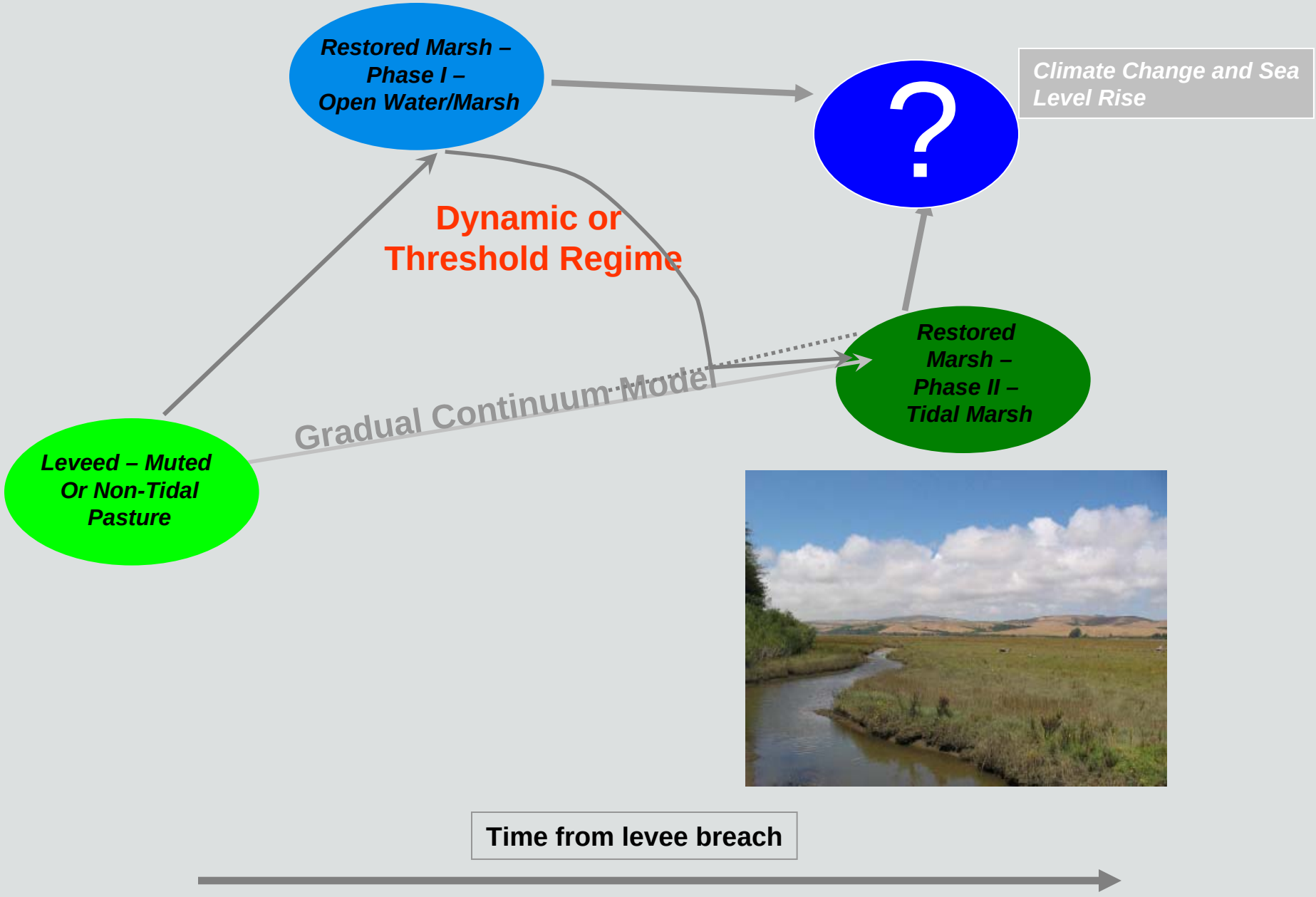
Gradual Continuum Model

Leveed – Muted Or Non-Tidal Pasture

Time from levee breach

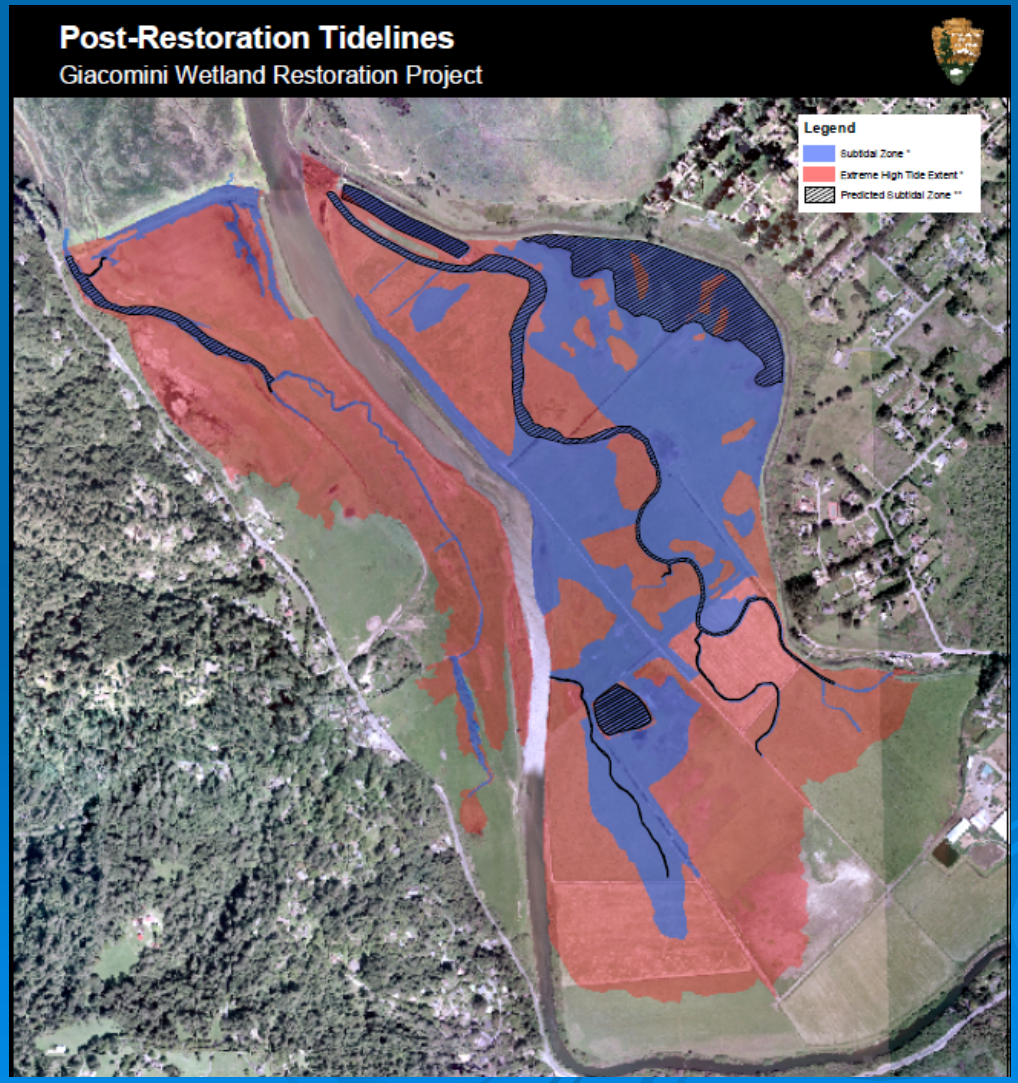
Trajectories of Habitat Evolution

Giacomini Ranch – East Pasture



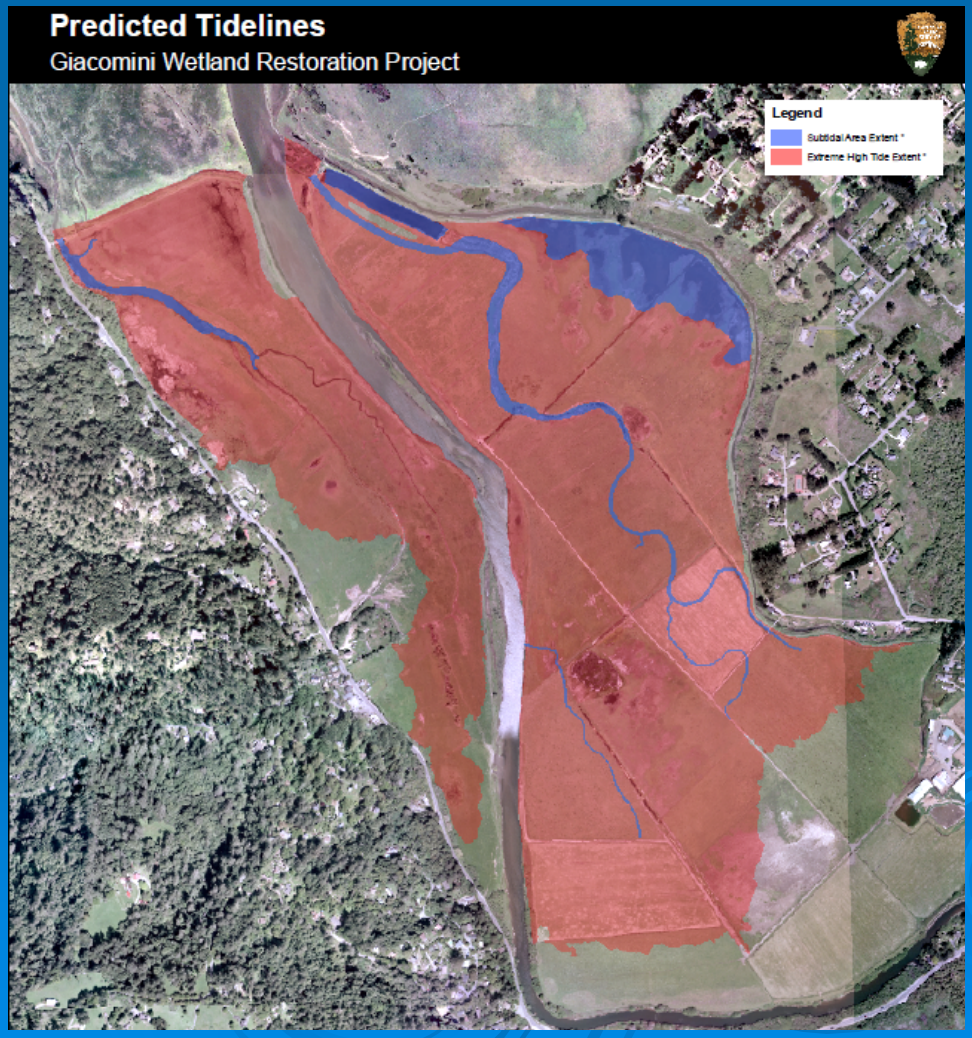
Wetland Evolution

Immediate Post-Restoration Tidal Inundation Conditions



Wetland Evolution

Predicted Future Tidal Inundation Conditions – Phase II

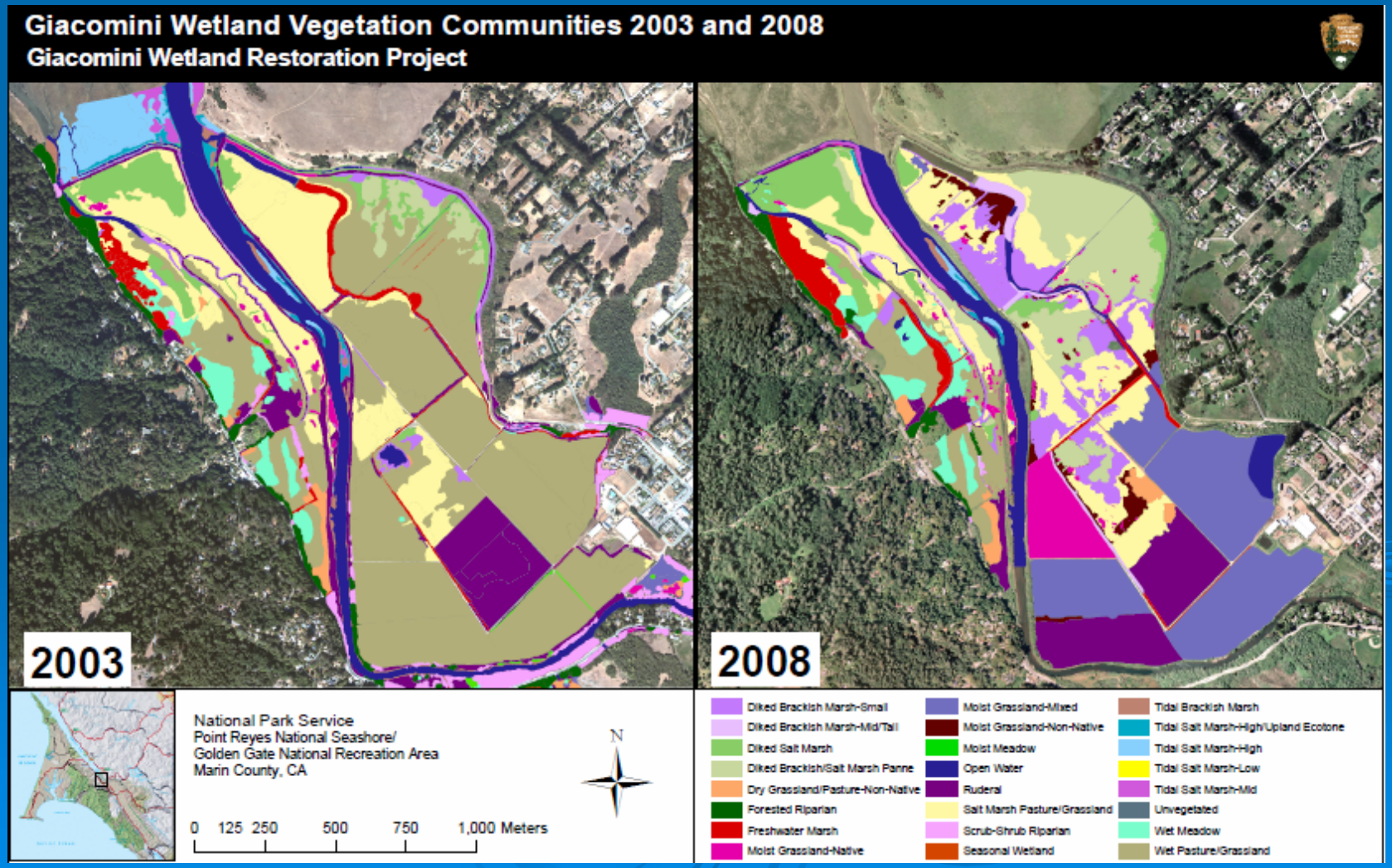


Changes in Vegetation

- Expected gradual conversion from pasture to marsh
- EIS/EIR predicted 10- 20 years

Changes in Vegetation

- However, even without full levee removal, conversion occurred



Changes in Vegetation

- Changes between 2006 and 2008 included:
  - *Development of brackish marsh/salt marsh vegetation in low elevation areas with less freshwater influence*



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  - *Rapid expansion of native pasture grasses into many of the former pastures*

Changes in Vegetation

- Changes Even More Dramatic in 2009
  - *Immediate plant die-off from inundation with saltwater*
  - *Duration and frequency of tidal flooding creates elevation-based "zones" in vegetation communities*
  - *Build-up of salts in soil and water over summer leads to second wave of pasture grass die-off and conversion of brackish plants to saline ones*

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Changes in Vegetation

Bay

Sparsely Vegetated with Salt Marsh and Brackish Marsh Species

Densely Vegetated with Brackish and Salt Marsh Species

Densely Vegetated Brackish Marsh

Densely Vegetated Brackish Marsh with Grasses

Salt Marsh Grassland

Moist and Dry Grassland

Upland

Changes in Vegetation

- Zones have shifted upwards from fall 2008 to fall 2009 with build-up of salts in soil and water

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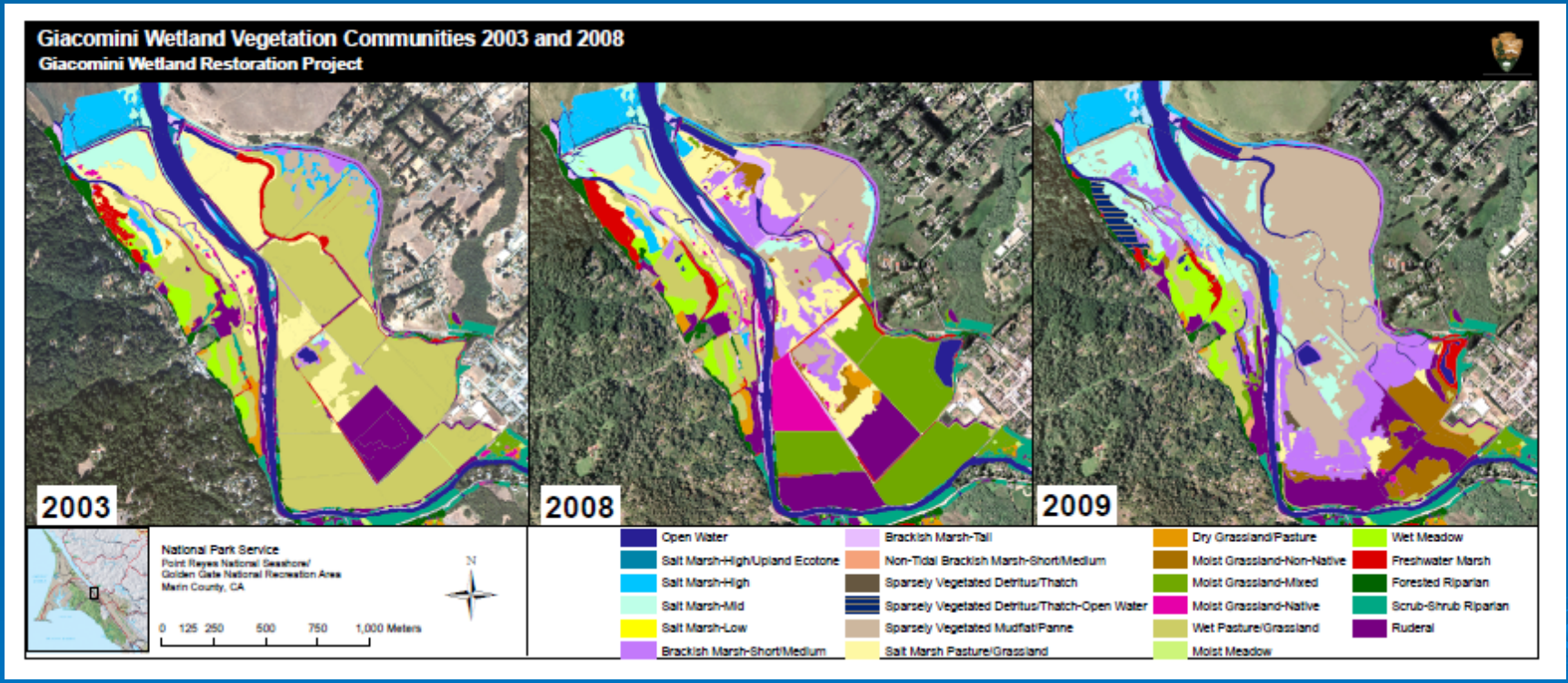
Changes in Vegetation



Changes in Vegetation

- Ecological Theory and Implications for Vegetation Diversity

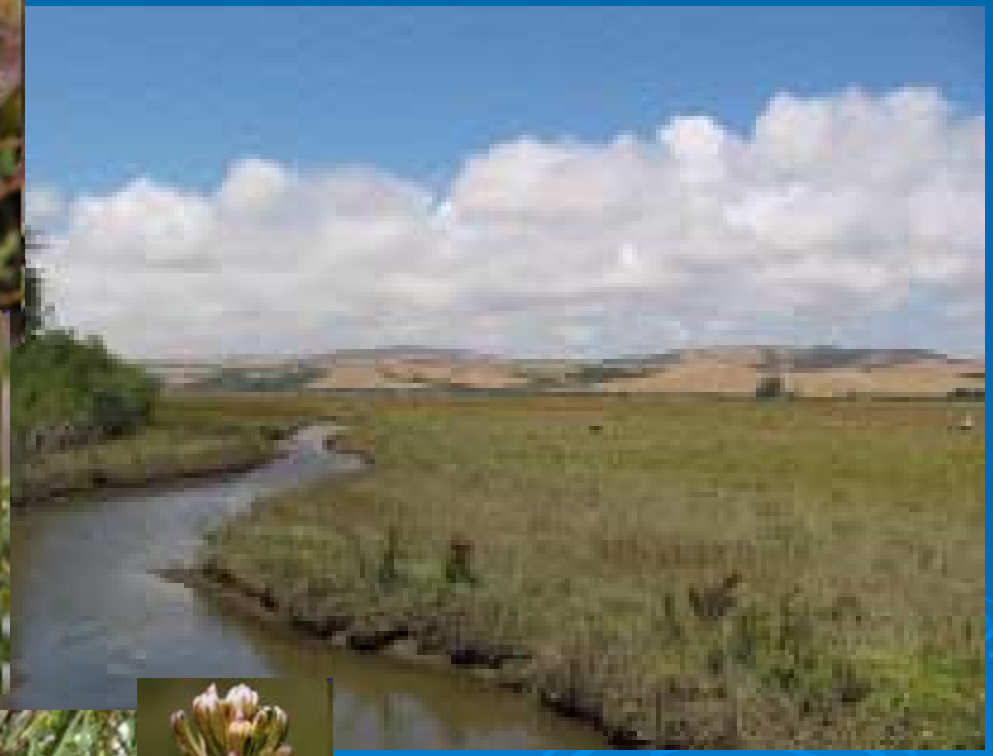
San Francisco Bay – Pickleweed marshes

Changes in Vegetation

- Target Habitat – Can We Achieve This?






Changes in Vegetation

- Early indications are – *yes*……

Changes in Water Quality

- Water Quality Improvement one of the most important wetland functions identified during planning
- Tomales Bay degraded by pollution and other impacts
- Threatens wildlife, as well as human uses such as recreation and mariculture

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Changes in Water Quality

- Hydrologically connected wetlands act as filter
  - *66% of freshwater inflow -- and potential pollutant source -- moves through Project Area*

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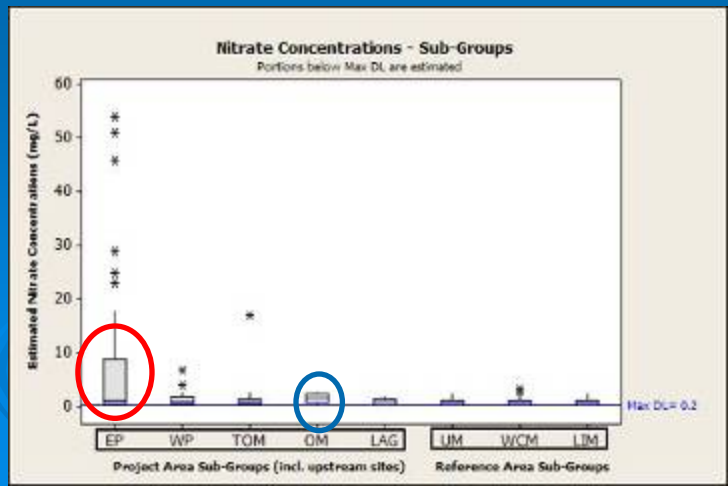
Changes in Water Quality

- Yes, it may improve on-site conditions, but can restoration improve water quality in Tomales Bay?
  - *20% decrease in floodwater volume in Lagunitas Creek*
  - *19% decrease in suspended sediment delivered to Tomales Bay*
  - *2 to 18% decrease in nutrients, contaminants, and pathogens delivered to Tomales Bay*

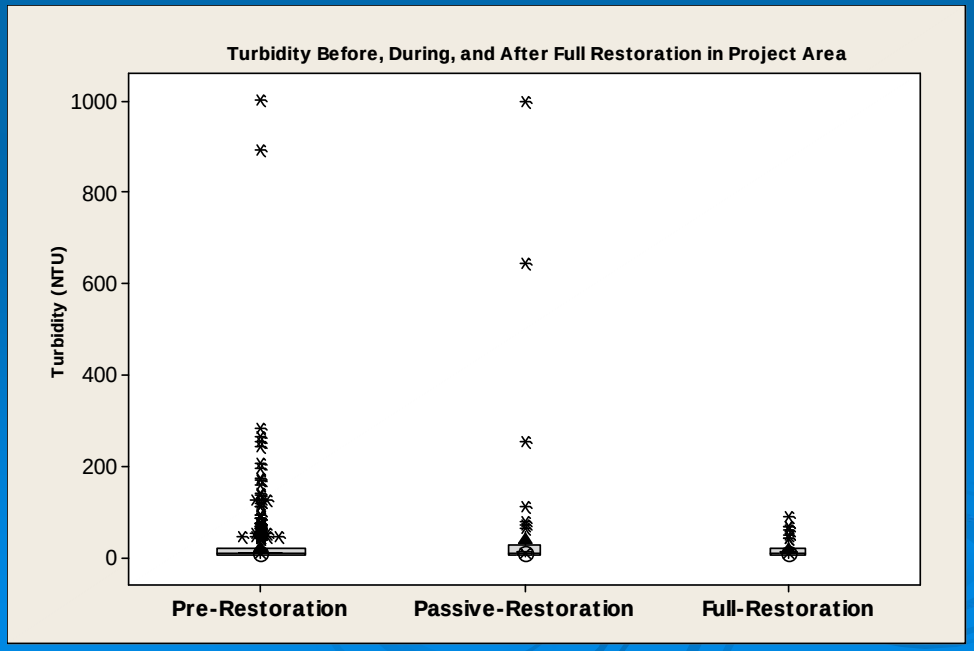
Changes in Water Quality

- Pre-Restoration Conditions
  - *Pollutant concentrations highest in Project Area*
    - Heavily managed dairy pasture (EP)
    - Bear Valley Creek
  - *Upstream areas contributed most to Tomales Bay pollutant loading*
    - Lagunitas Creek – highest
    - Only infrequent loading from heavily managed dairy pasture



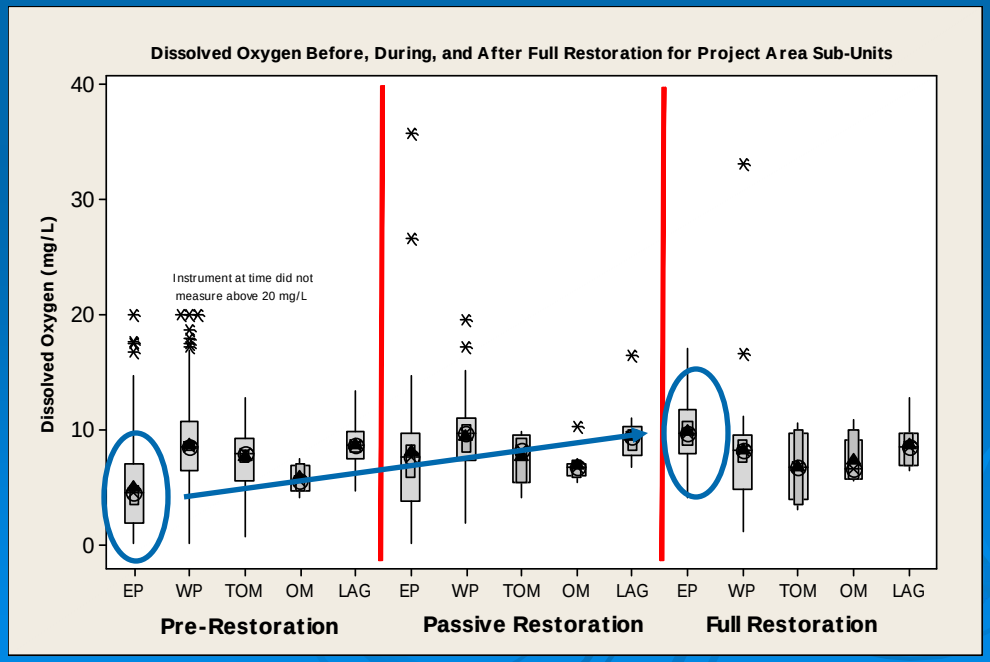
Changes in Water Quality

- *Turbidity*
  - *Expected Short-Term Increases; Long-Term Decreases*
  - *What Are We Seeing?*
    - No Change From Pre- to Full Restoration Conditions
    - Influenced by lack of large storm events?
    - Sampling included two small to moderate storm events



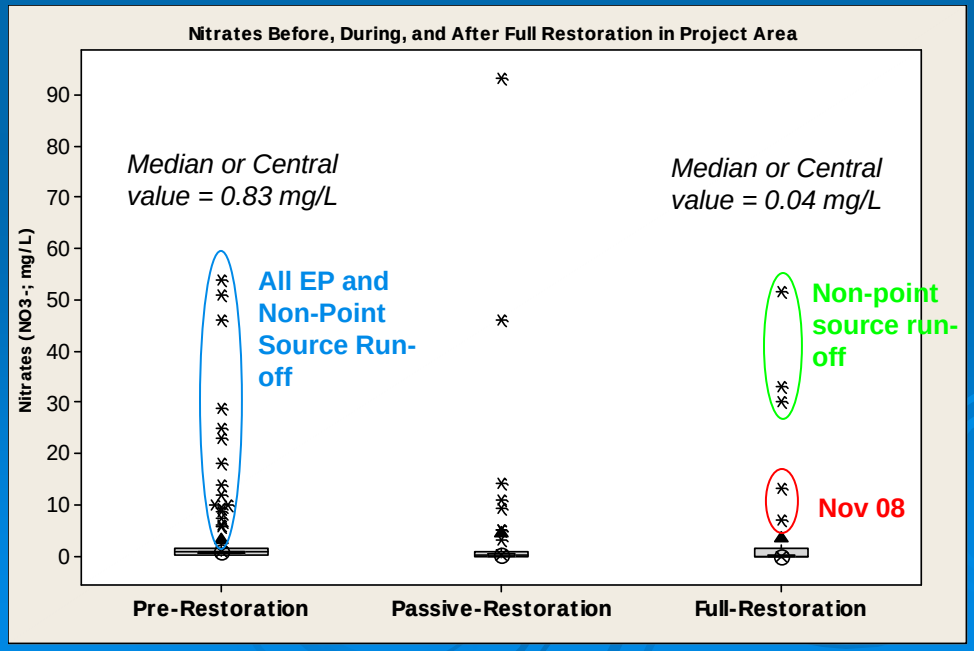
Changes in Water Quality

- *Dissolved Oxygen*
  - *Expected Short-Term Decreases; Long-Term Increases*
  - *What Are We Seeing?*
    - Heavily managed pasture usually hypoxic or even anoxic
    - Improvement even though decomposition of pasture veg could increase BOD



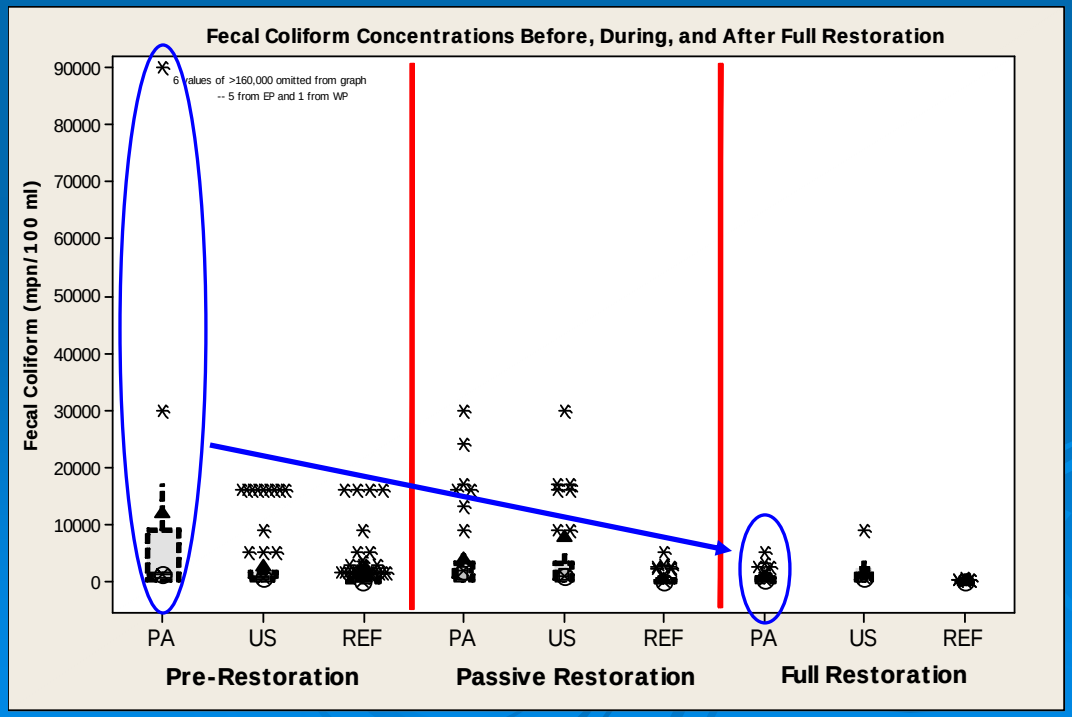
Changes in Water Quality

- *Nitrates*
  - *Expected Short-Term Increases; Long-Term Decreases*
  - *What Are We Seeing?*
    - Strong pulse right after levees breached (mean = 3.25 mg/L)
    - Steady decrease since then even after two storm events (storm mean= 1.95 mg/L; non-storm mean=0.009 mg/L)



Changes in Water Quality

- *Fecal Coliform*
  - *Expected Short-Term Increases; Long-Term Decreases*
  - *What Are We Seeing?*
    - Immediate decrease after – and perhaps even before – full restoration
    - Affected by removal of cows in 2007 ***and*** salinity increases in non-tidal areas



Conclusions

- On track for improving quality of vegetation or habitat for rare plants and wildlife
- Water quality appears to be improving and thereby also improving habitat for wildlife within Giacomini Wetlands
- "Restore it, and they will come…."
  - *Changes expected, but timeline in terms of how fast they have come greatly accelerated relative to what was expected*
- *Next Goal*: Determining how restoration is improving health and habitat quality of Tomales Bay, as well as that of former dairy ranch

Louis Jaffe