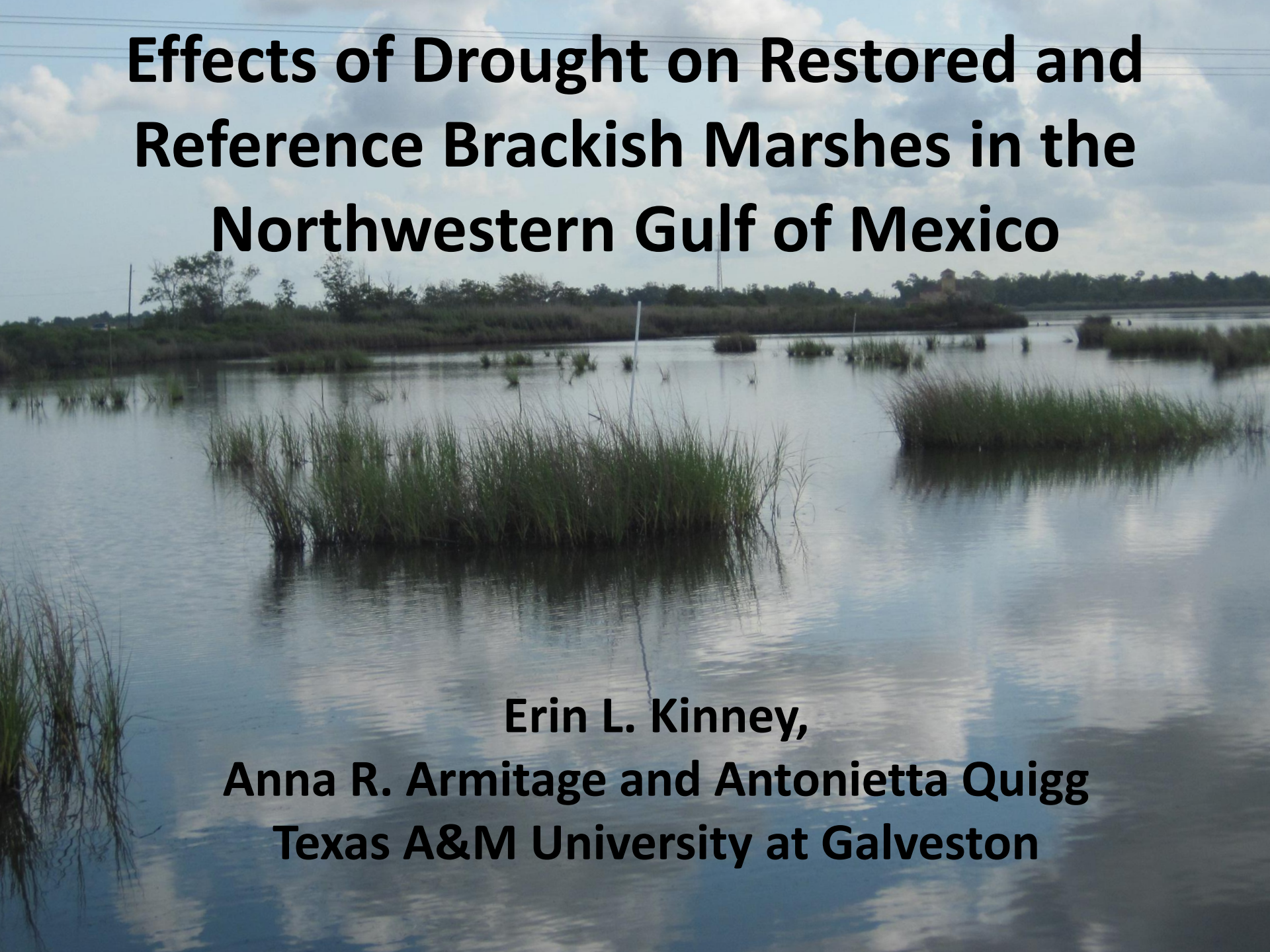
Effects of Drought on Restored and Reference Brackish Marshes in the Northwestern Gulf of Mexico



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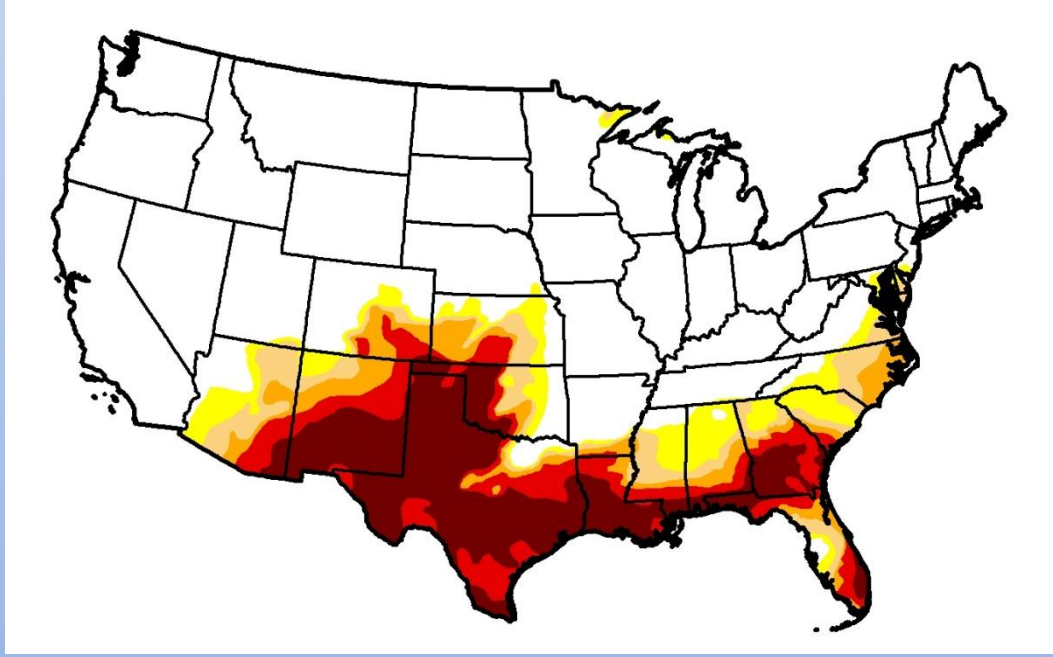
Texas “Exceptional Drought” of 2010 – 2011

- Oct 2010 – Sept 2011 = driest 12 months on record for the state of Texas
- Average of 11” (-16” from avg)

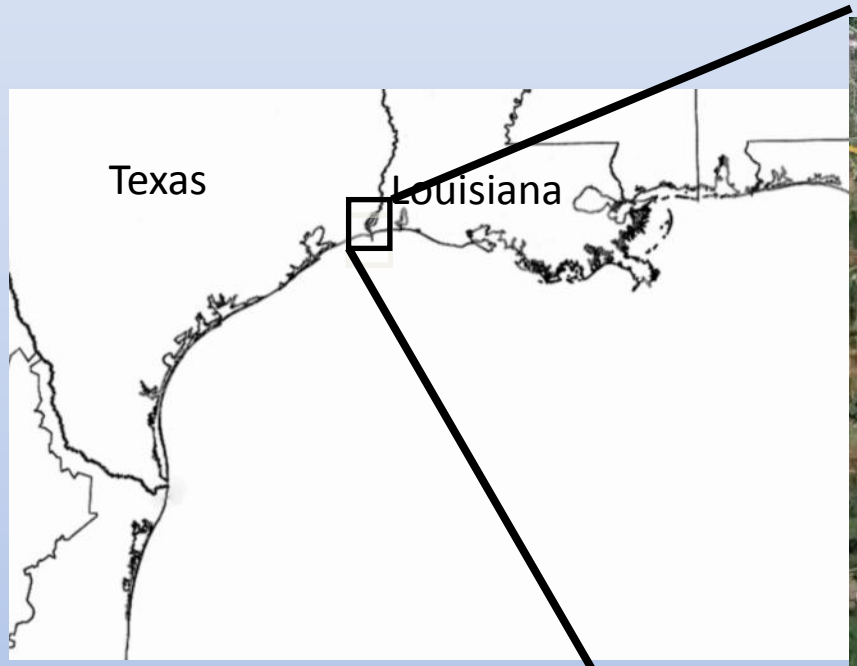


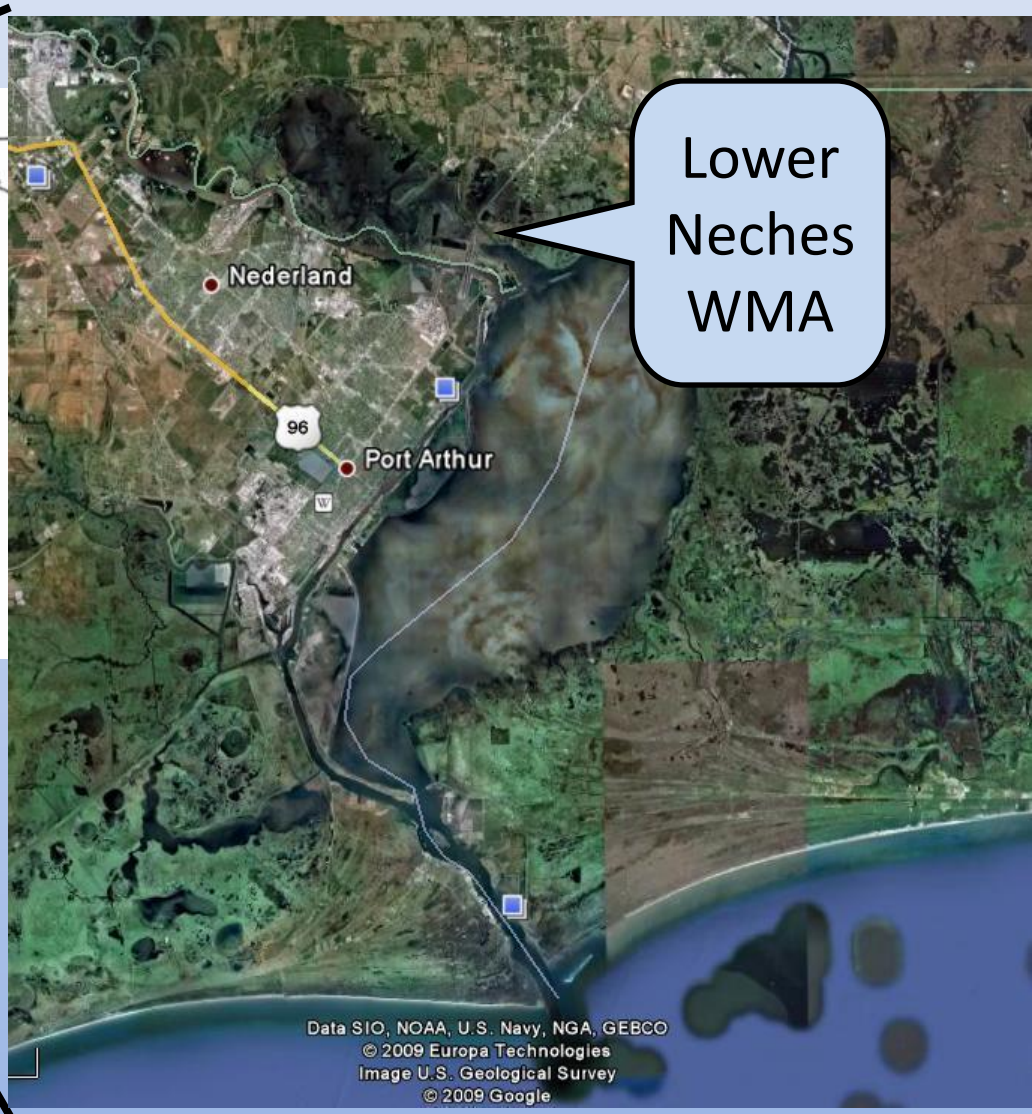
Objectives

- To evaluate effects of extreme drought in Texas coastal systems
- Took advantage of ongoing monitoring project in a brackish marsh restoration project
- Before/after impact of extreme drought on brackish system

Study site

Lower Neches Wildlife Management Area

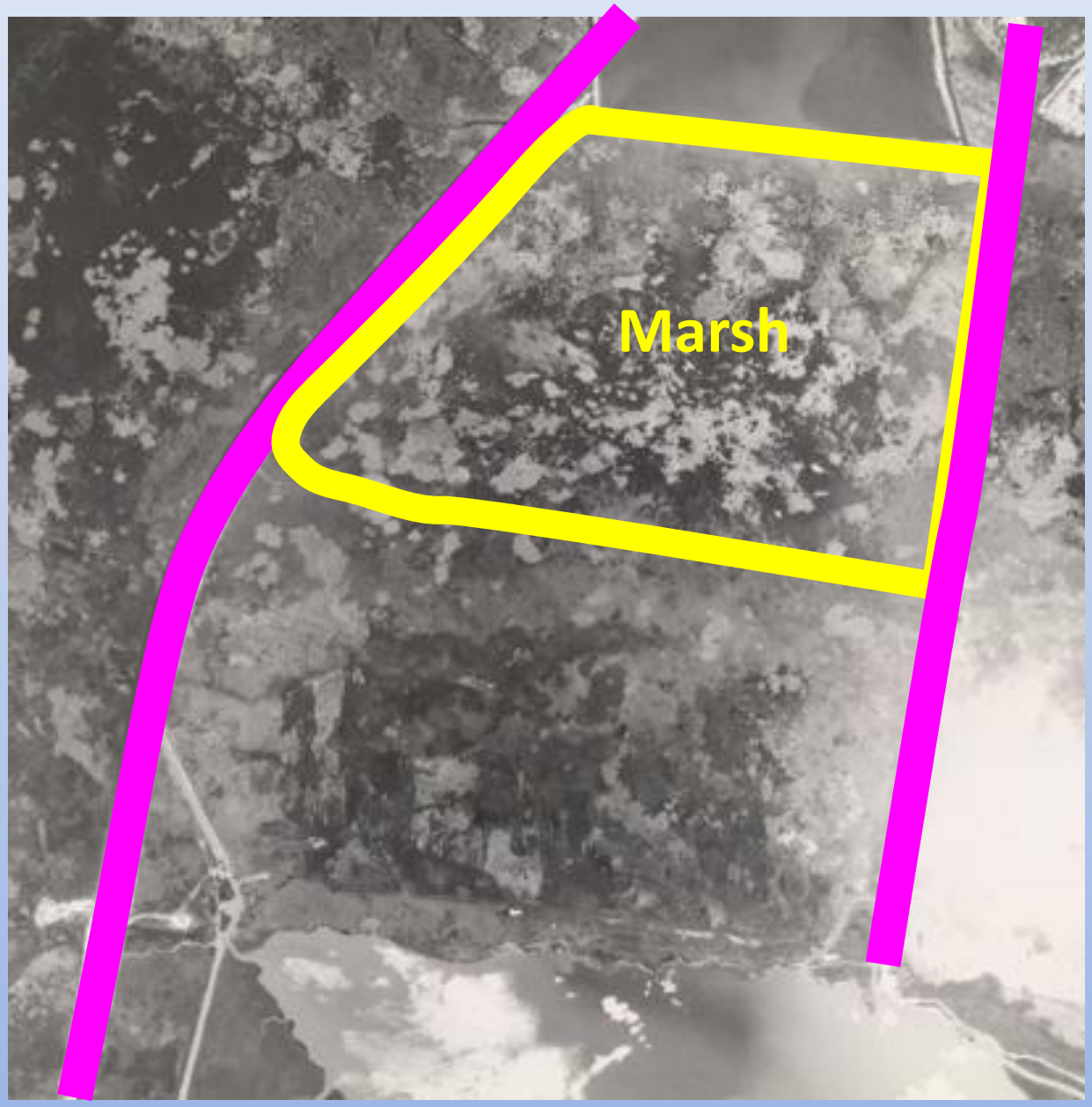




Lower Neches Restoration Location

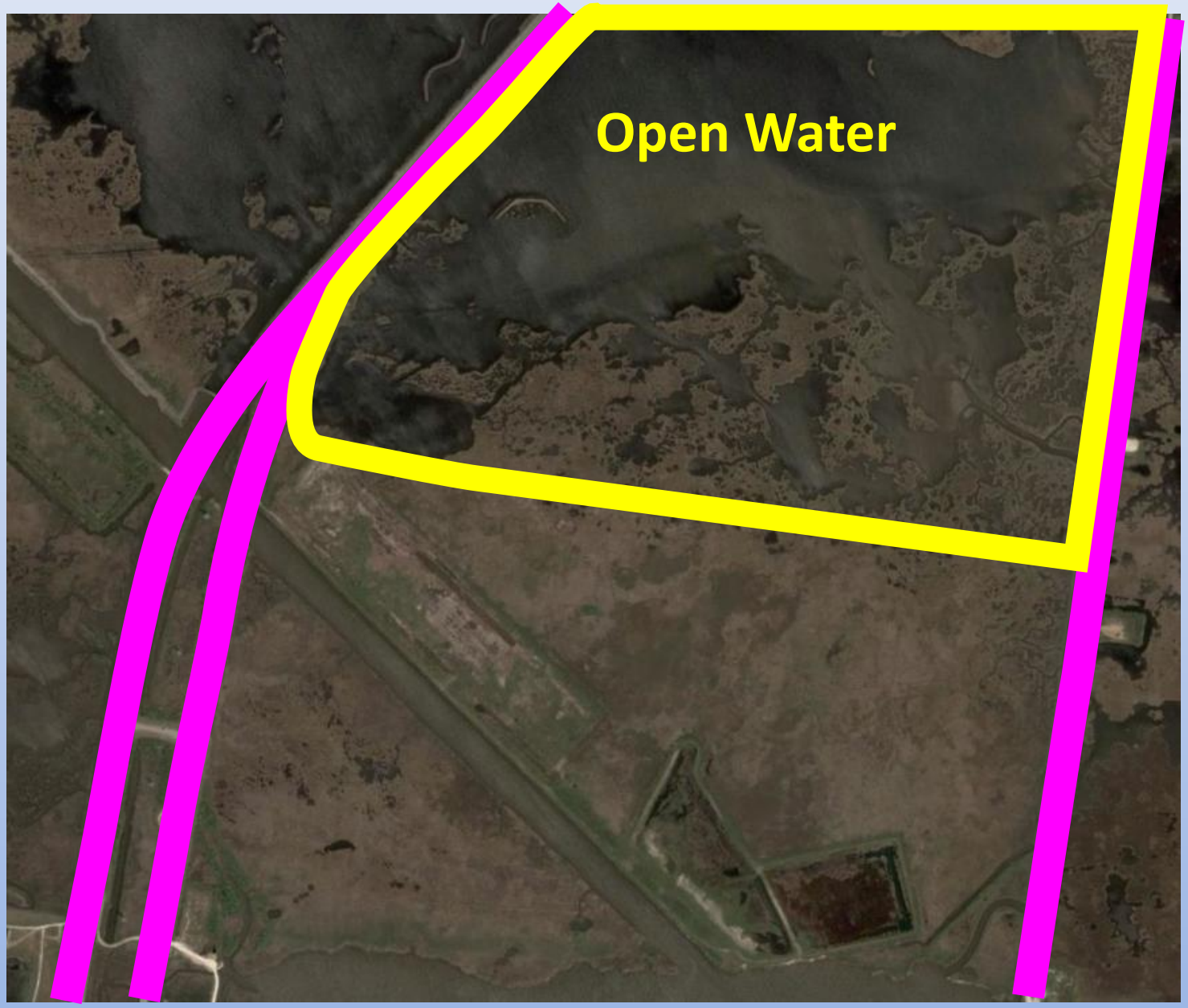
- Chenier plain used to receive water via sheet-flow, but highly disrupted
- Freshwater flow was reduced and salt water introduced through construction of canals and inter-coastal waterway
- Native vegetation largely died off, converted into open water
- Mitigation is being undertaken to bring vegetation back (2007)
- LNR site is now rain-fed with some tidal influence
- Brackish (typically 2 – 14 ppt)

Lower Neches Wildlife Management Area



c.a. 1953

Lower Neches Wildlife Management Area



c.a. 2006

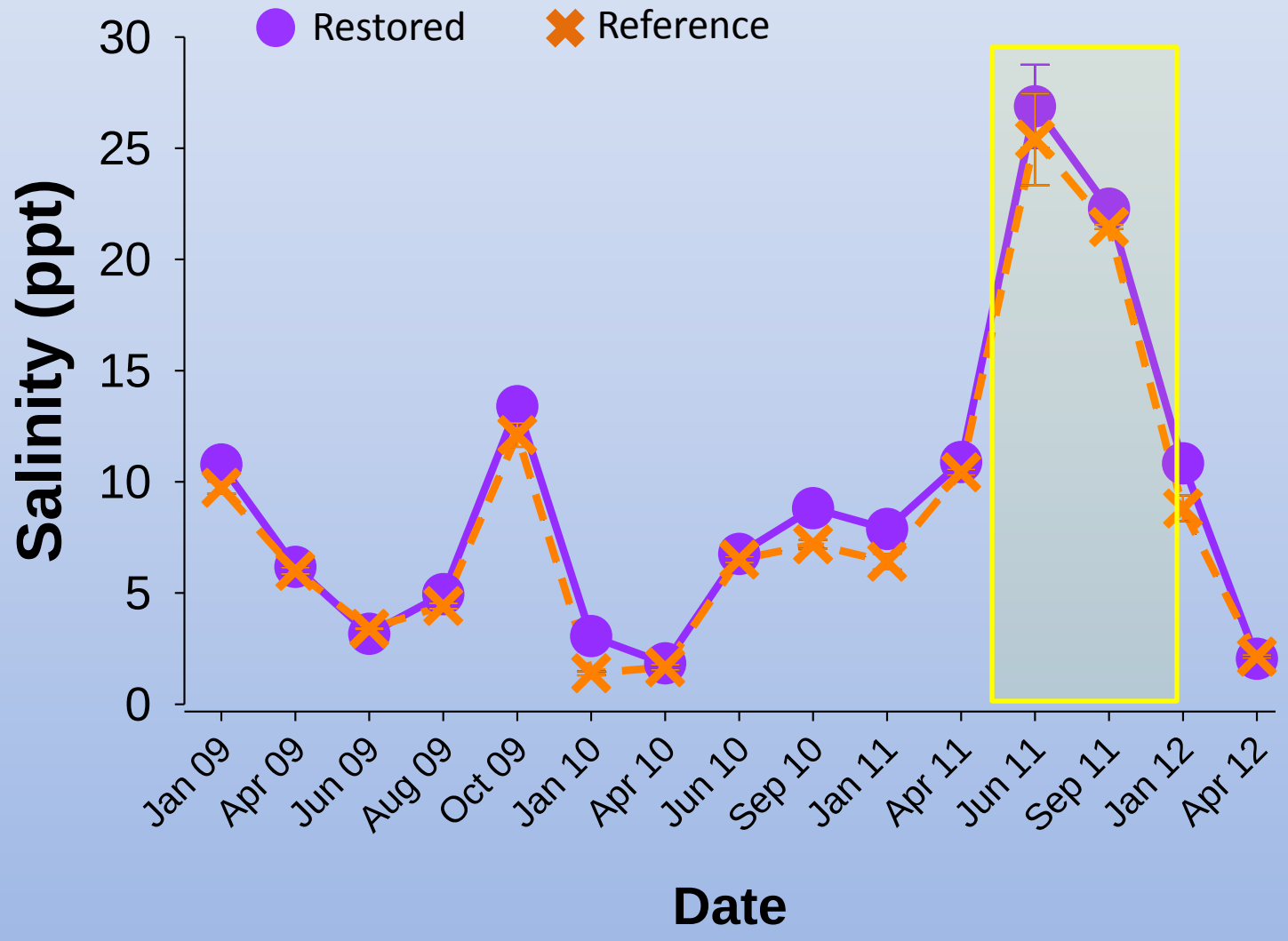
Lower Neches Wildlife Management Area

c.a. 2008

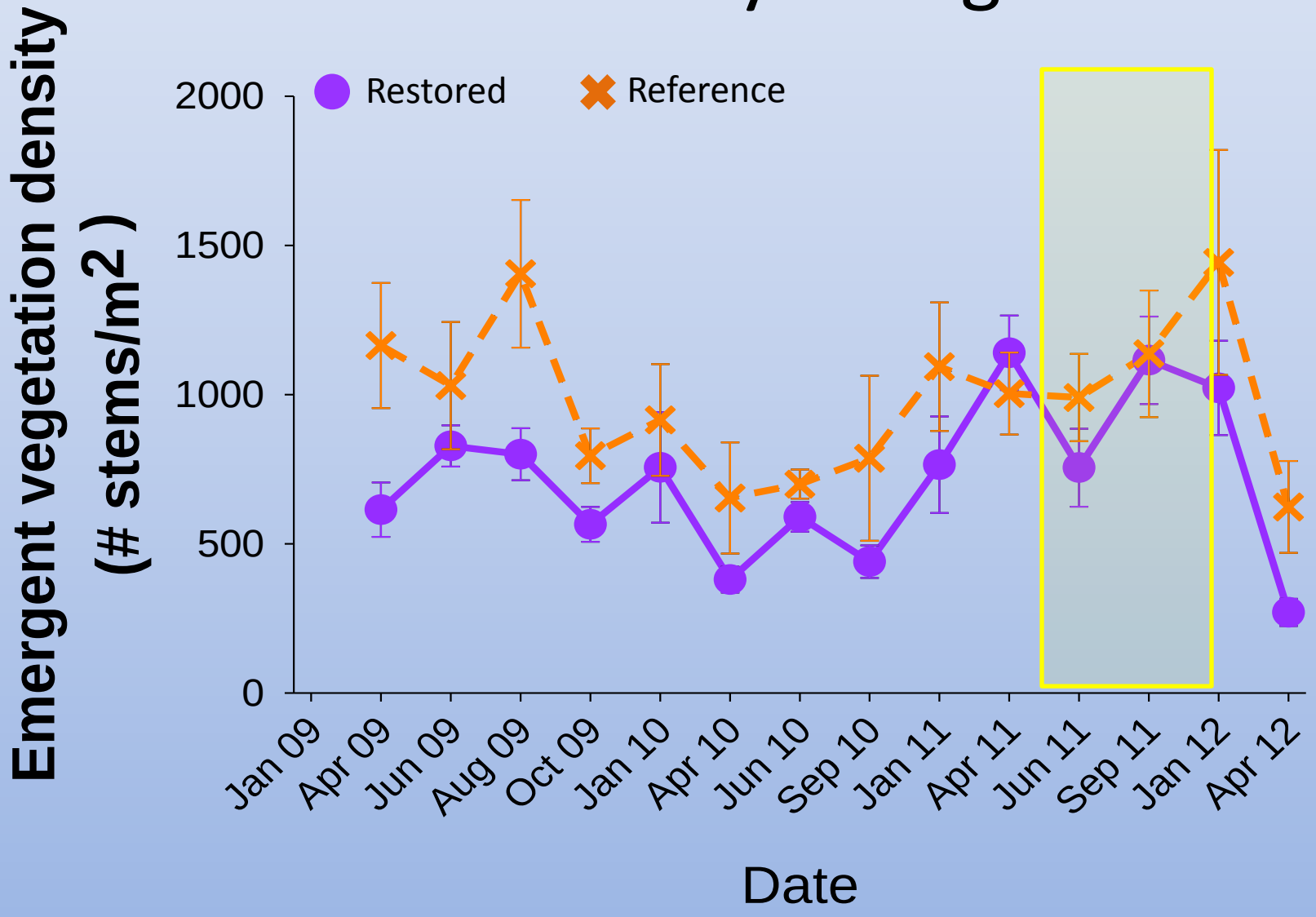
Lower Neches Restoration

- Mounds built in 2007 – 2008
- Planted with *Spartina alterniflora* Vermilion
- Quarterly sampling
  - Salinity and water quality
  - Emergent vegetation
  - Submerged aquatic vegetation
  - Fauna associated with SAV

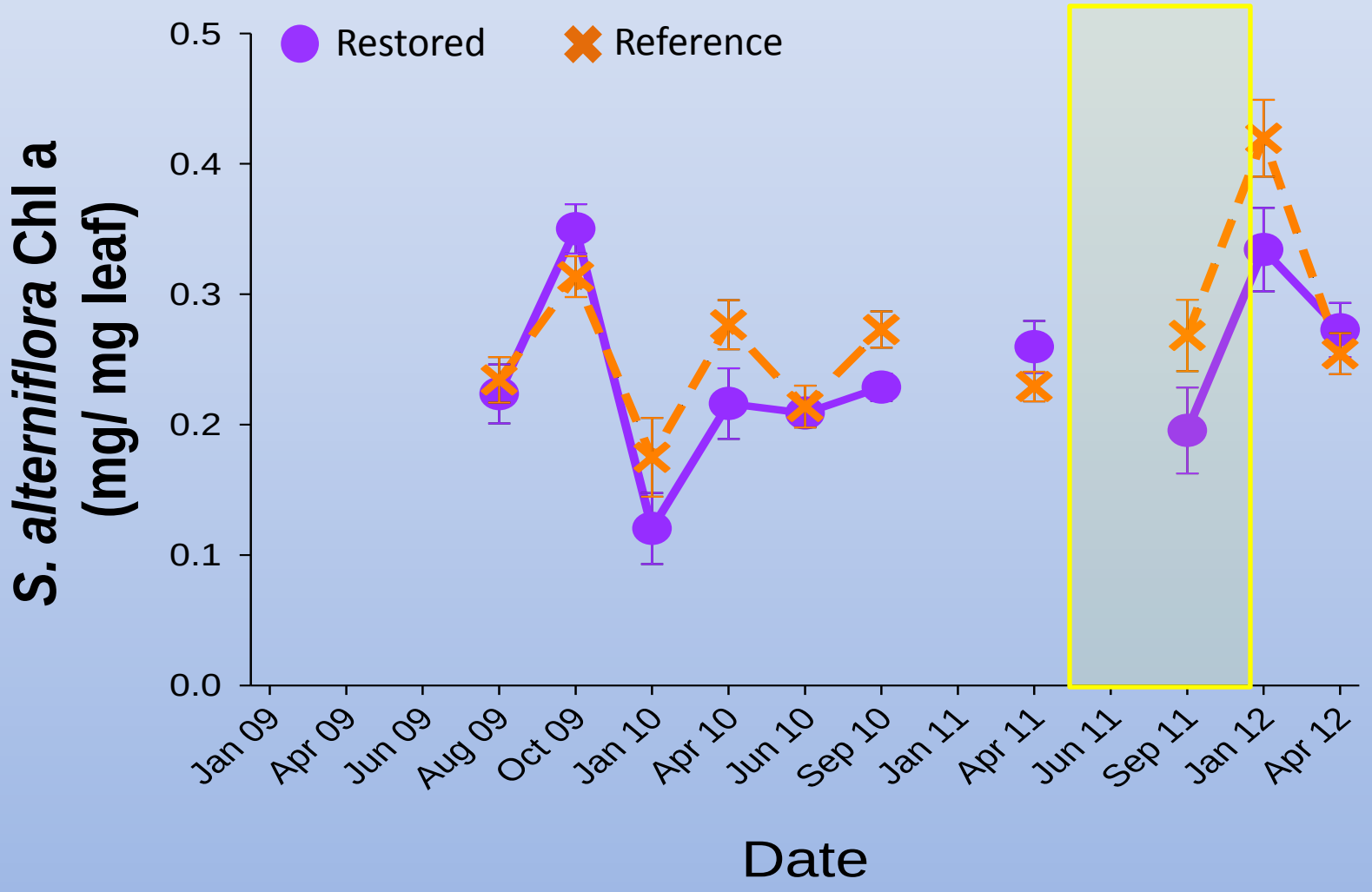
Salinity 3x higher than normal in summer 2011



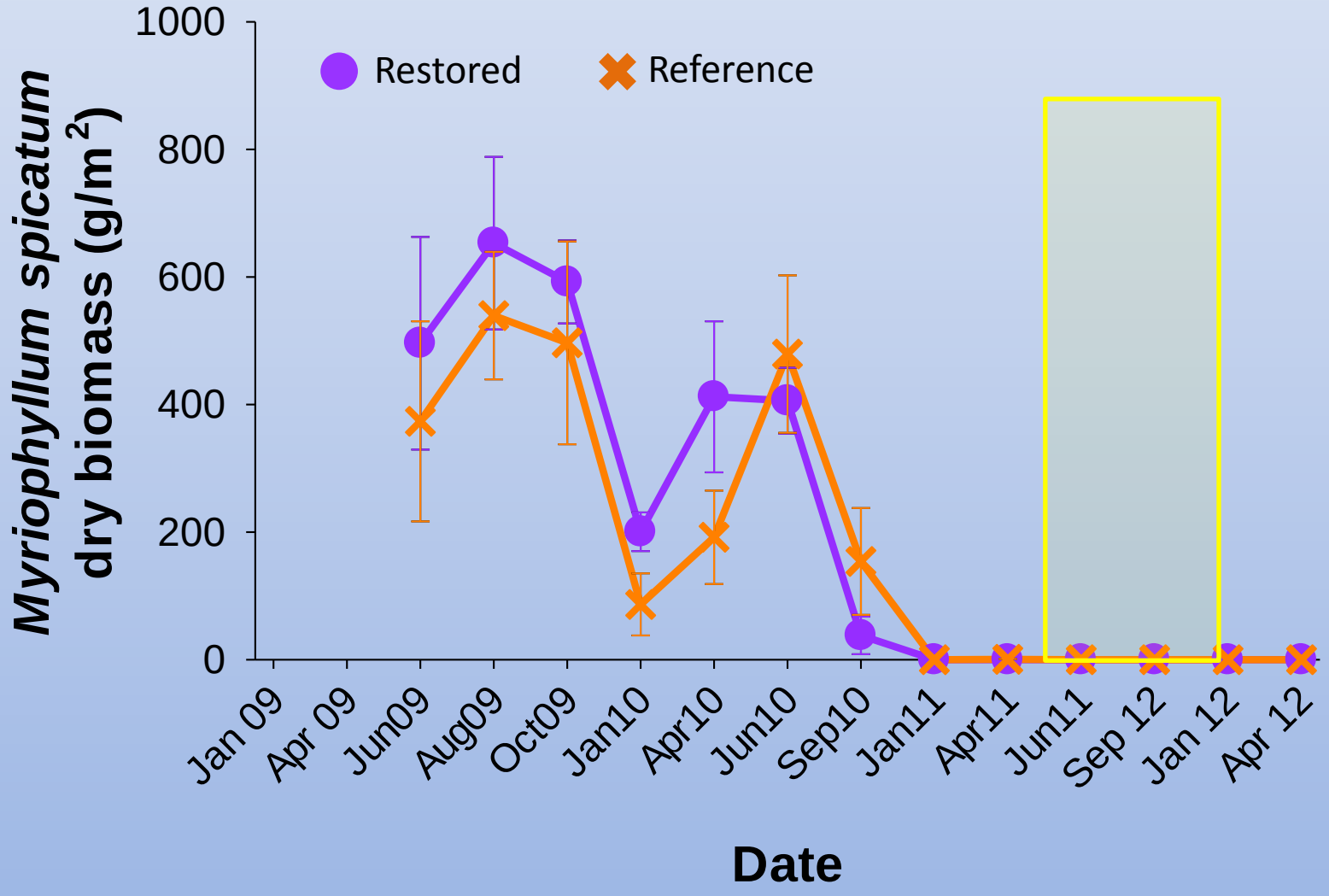
Emergent vegetation density was not affected by drought



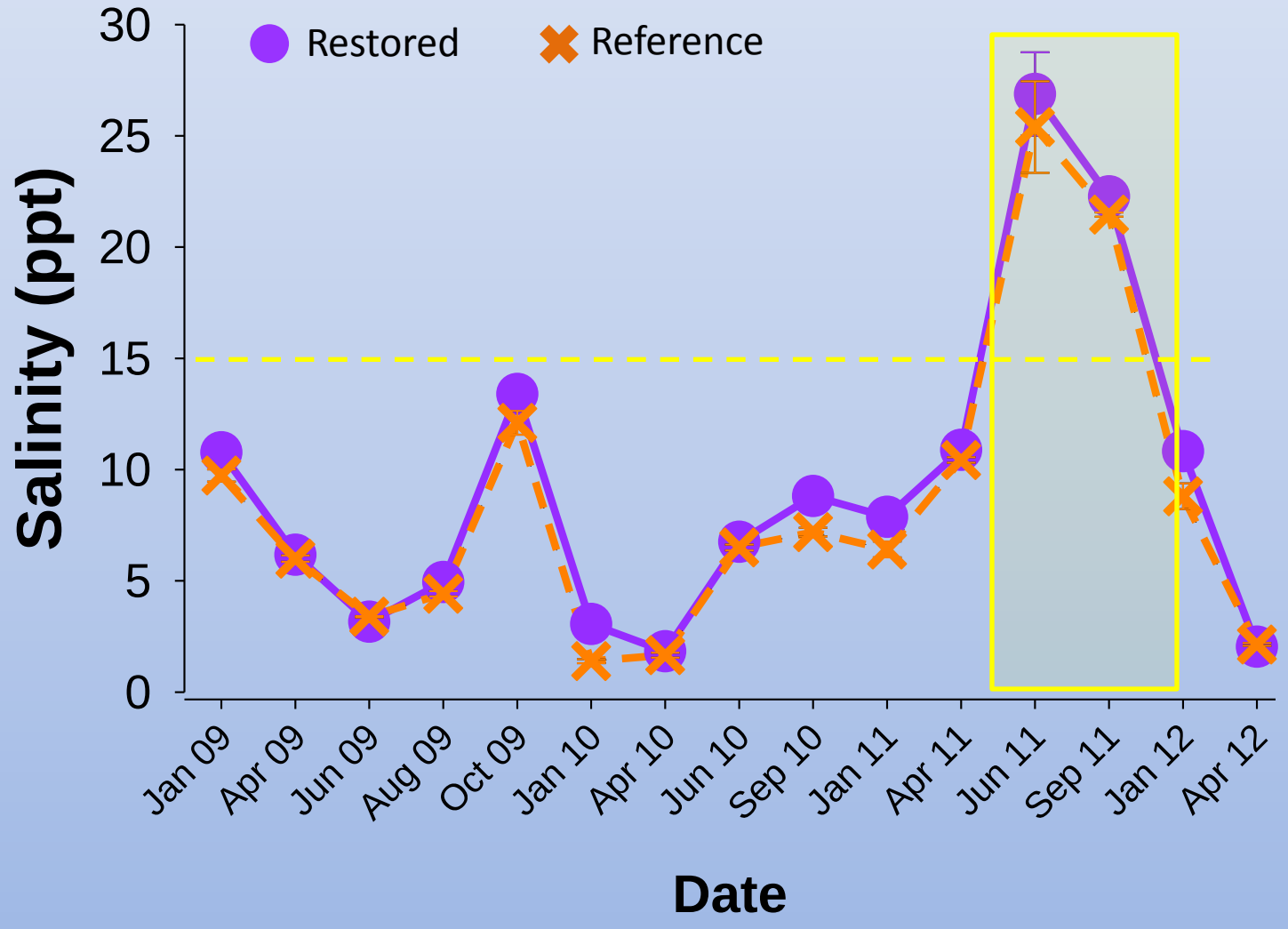
S. alterniflora fitness did not change during drought



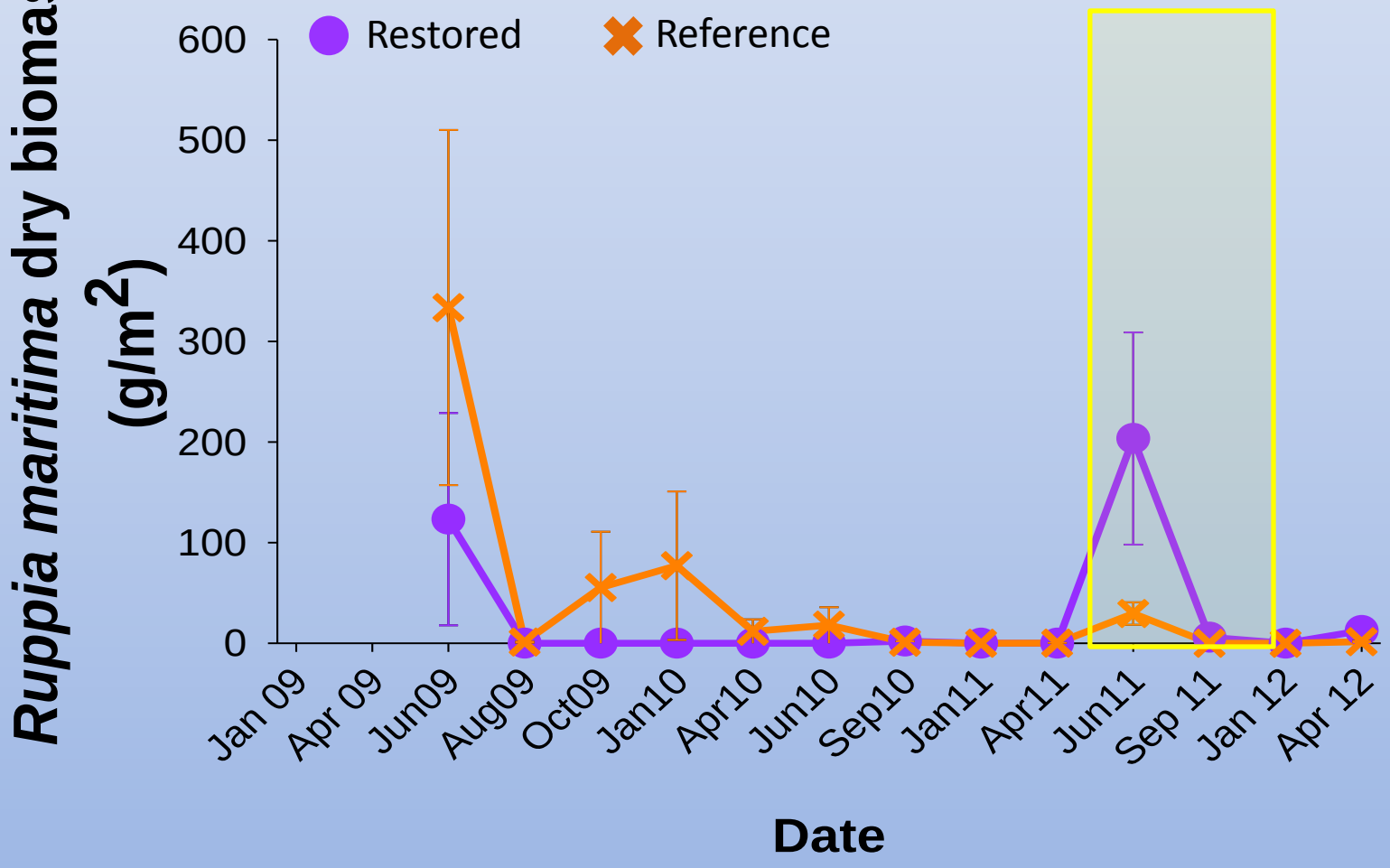
Aquatic: *Myriophyllum spicatum* absent in spring 2011



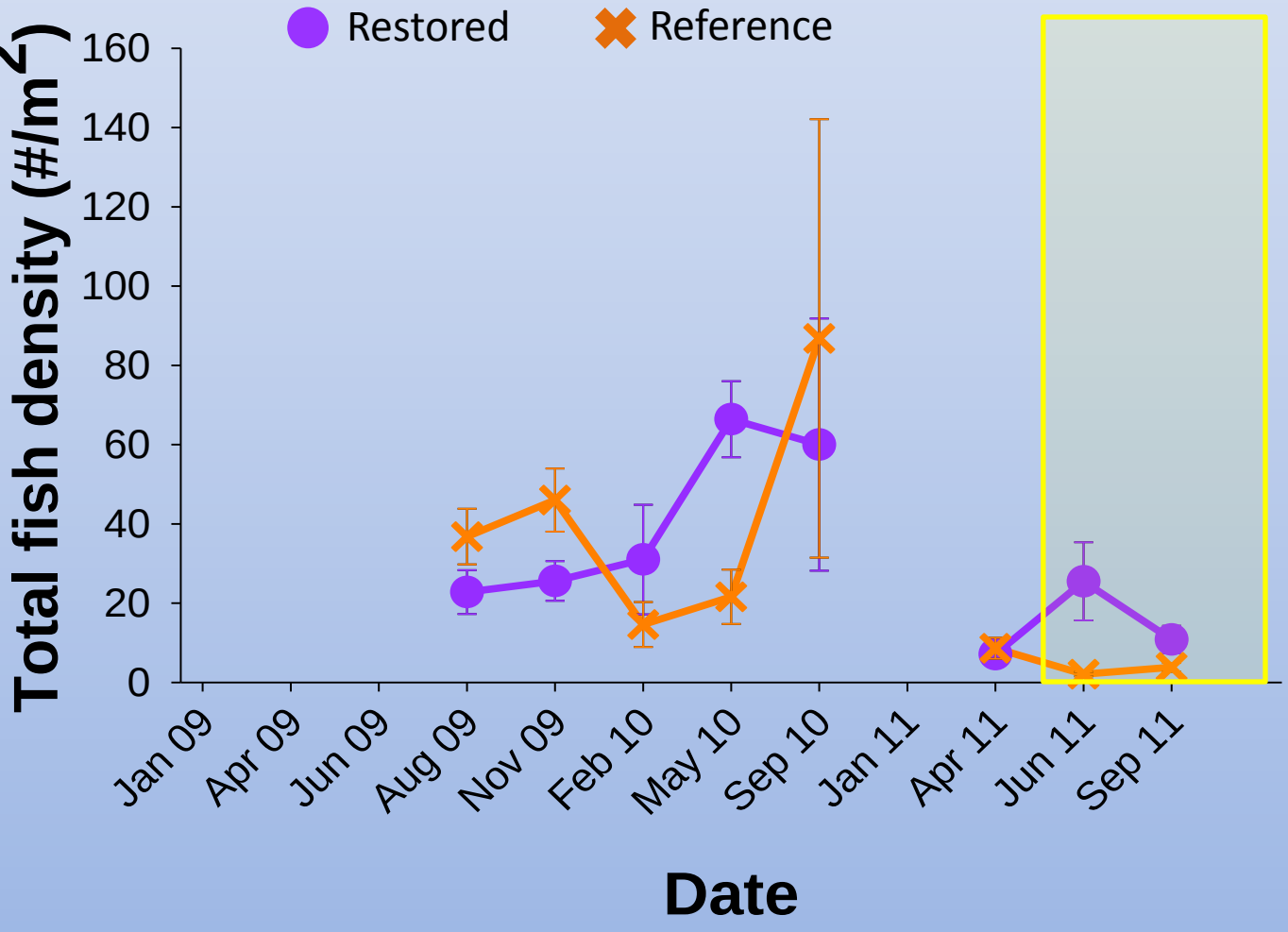
Salinity 3x higher than normal in summer 2011



Ruppia maritima biomass may have recovered slightly in response to *M. spicatum* decline



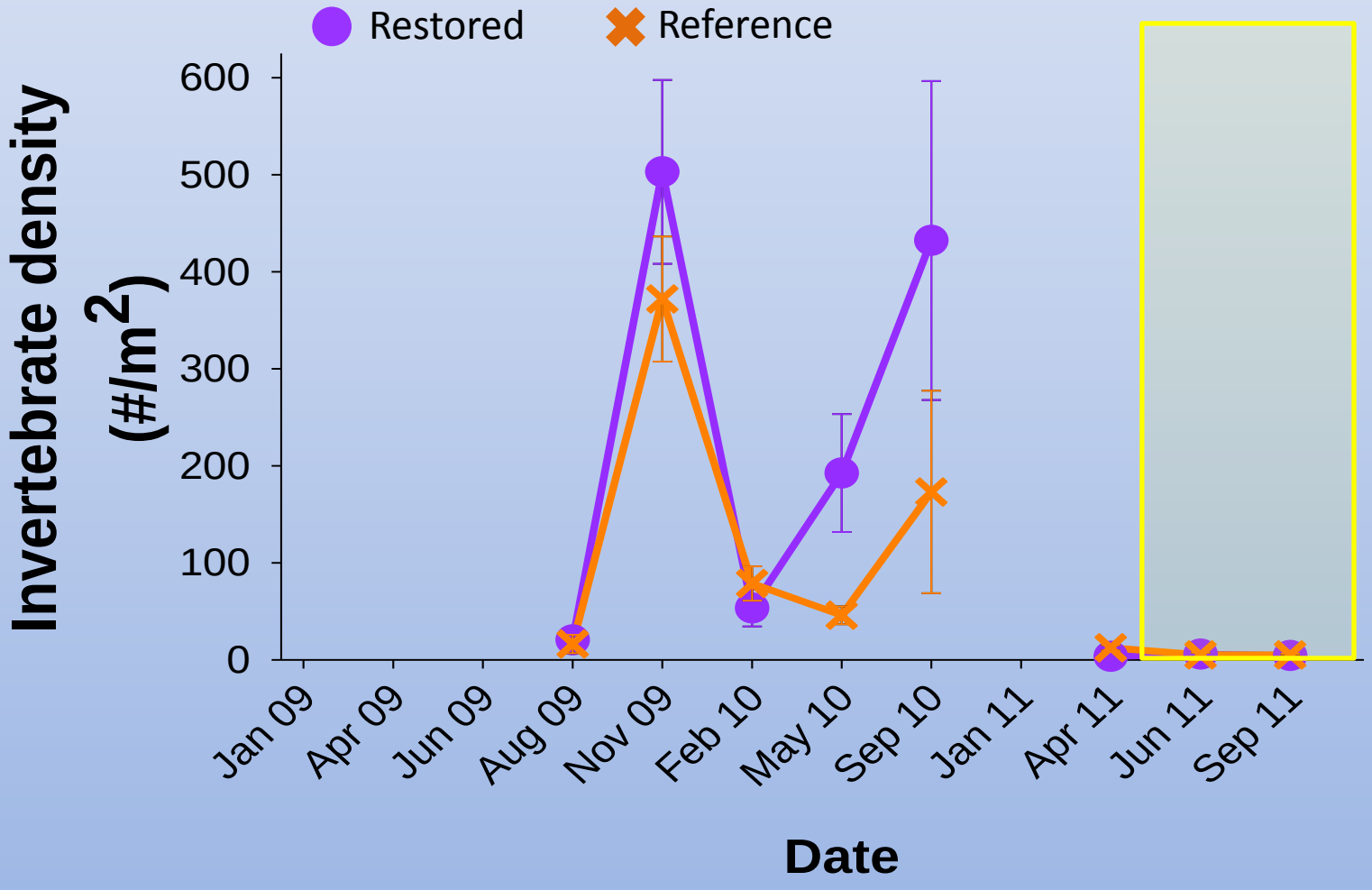
Fish density declined during drought



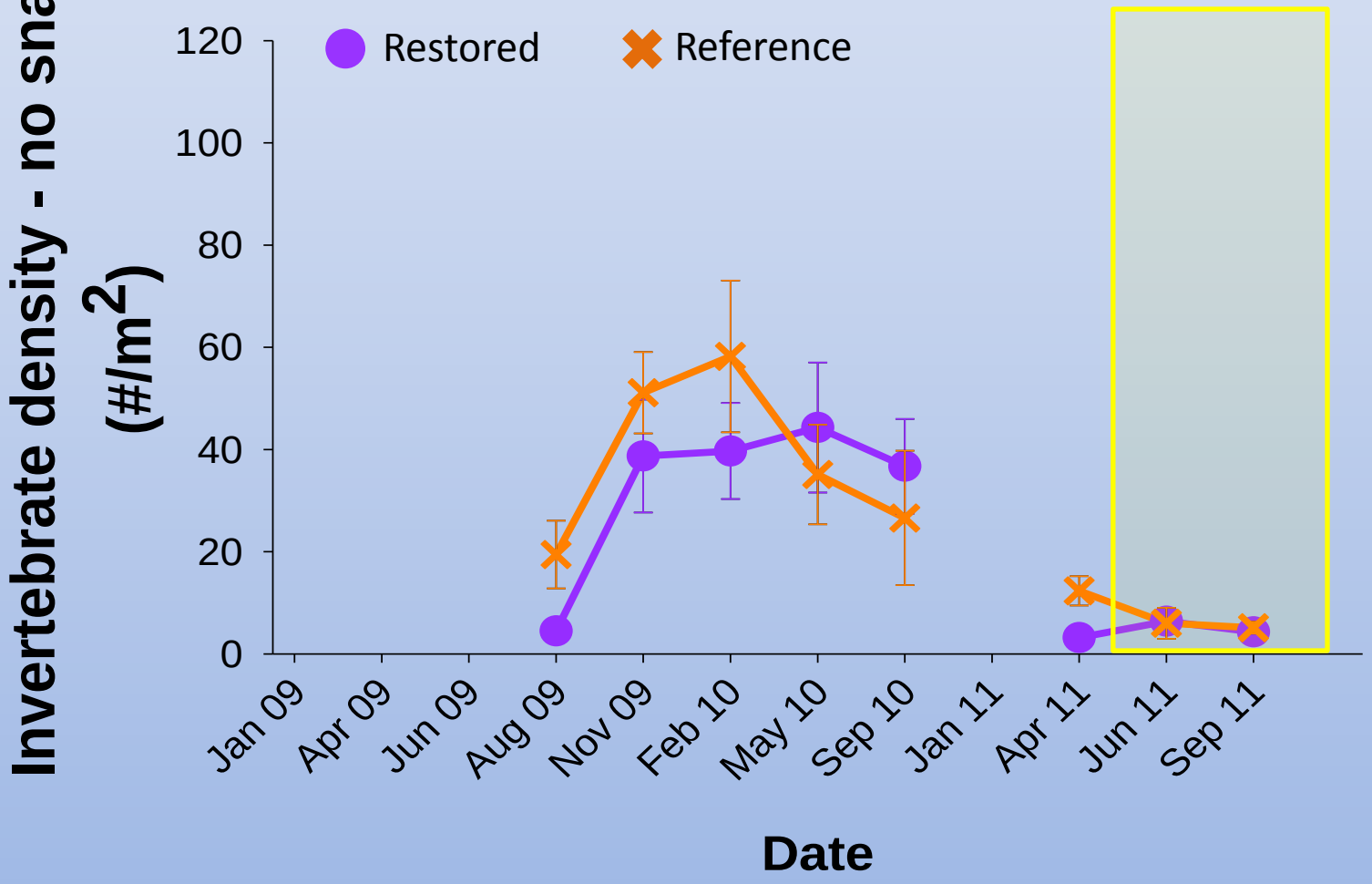
Possible shifts in fish species present?

- General reduction in fish abundance, 10-fold reduction in *Poecilia latipinna*
- Gulf menhaden *Brevoortia patronus* present April – June 2011

Invertebrate density declined dramatically – largely due to disappearance of the snail *Probythinella louisianae*



Invertebrate density, without snails, was lower during drought



Invertebrate species composition changed beginning April 2011

- *Probythinella louisianae* decreased from **500**/m^2 at restored sites in September 2010 to **0**/m^2 in September 2011
- *Penaeus aztecus* (brown shrimp) appeared in April 2011 (3-24/m^2)

Summary

- Salinity was three times higher in June 2011 than in June 2010
- Emergent vegetation was not impacted by drought
- SAV biomass was much lower in drought year
- Fish and invertebrates densities were much lower in drought year

Drought and Construction Techniques Influence Ecosystem-Level Restoration of a Brackish Marsh

Poster #345 Session 2 (Wed-Fri)

Conclusions and Implications

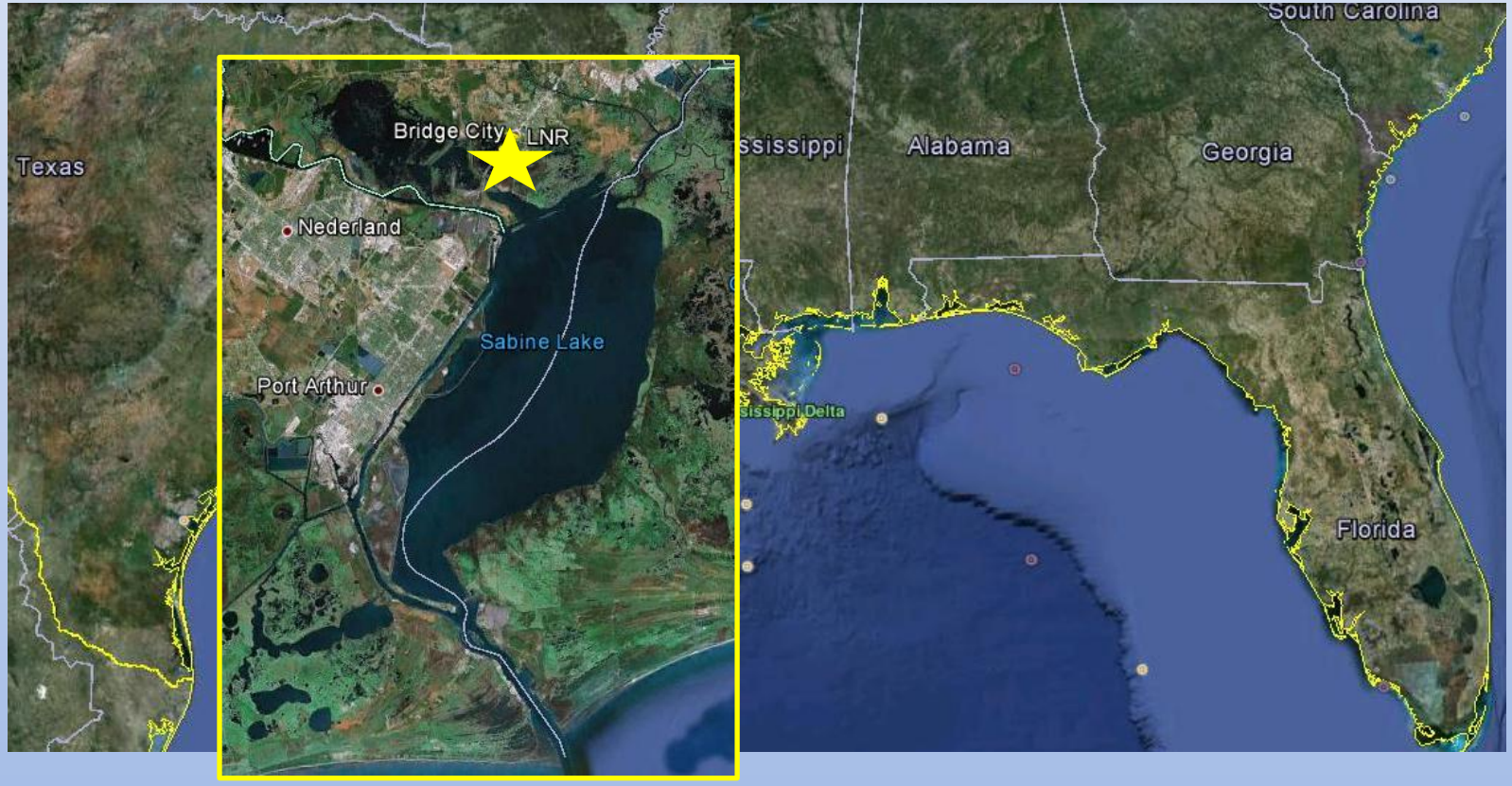
- Brackish systems are particularly susceptible to extreme drought effects because of salinity changes
- Extreme drought affected SAV much more than emergent vegetation
  - Vermilion *S. alterniflora* was resistant to drought conditions, including low rainfall and high salinity
  - SAV biomass and faunal community declined during drought, likely due to increased salinity
- Monitoring programs should include both emergent vegetation and aquatic habitats
- Ecosystem services (refuge, wave dampening, nutrient uptake by SAV) provided by aquatic habitats may be impacted by extreme drought

Thanks!

Any questions?

- The Coastal Wetlands and Phytoplankton Dynamics teams at TAMUG
- Funding: TGLO Oil Spill Prevention & Response Division, TGLO Coastal Management Program
- Texas Parks & Wildlife Department: Jim Sutherlin, Andrew Peters, and Mike Rezsutek
- Chevron: Jim Myers and Jerry Hall

Lower Neches Restoration Location



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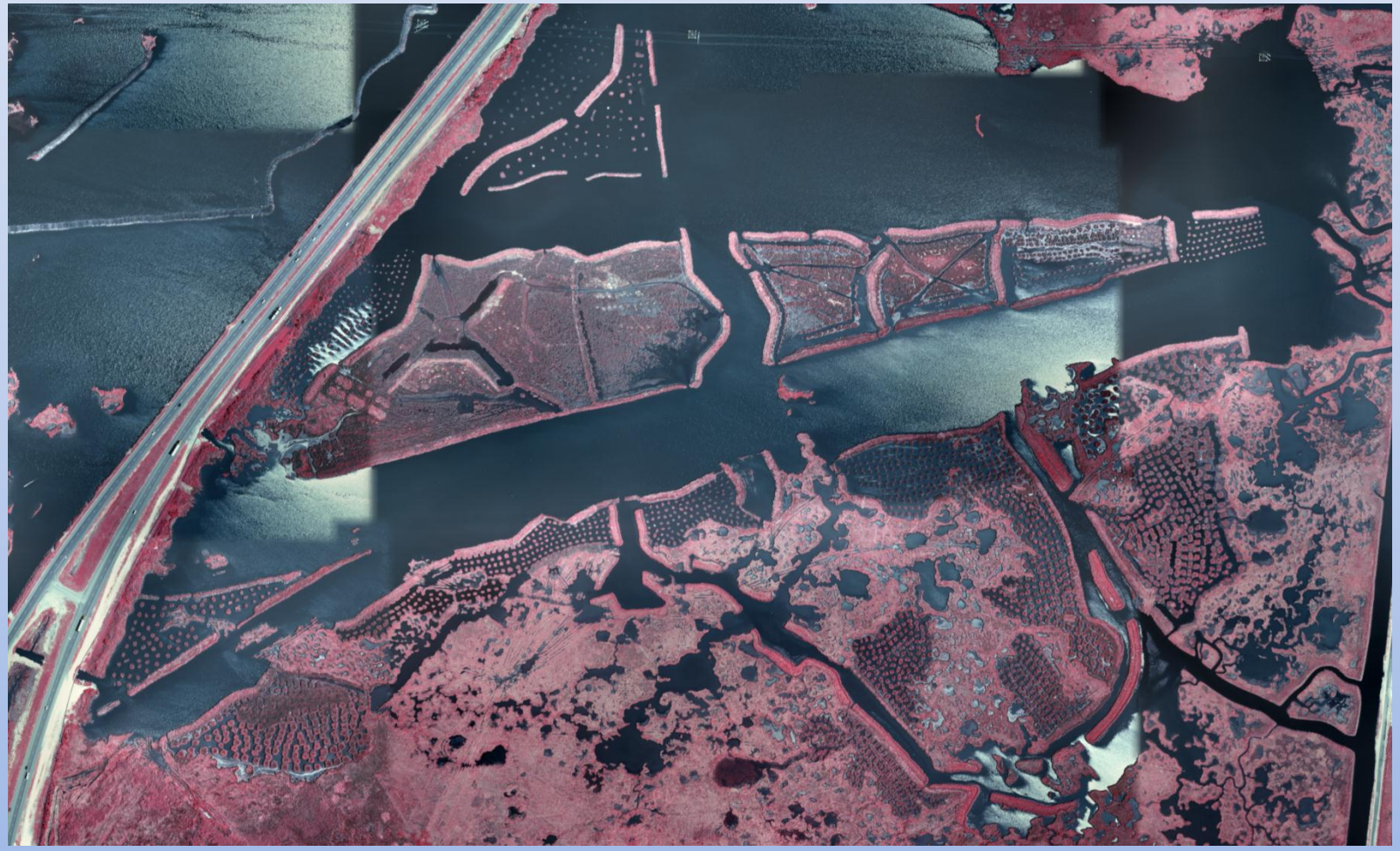

c.a. 2011