The Recent Status and Trends of Two Georgia Marsh Dieback Sites

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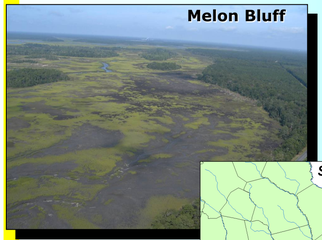
Abstract

In 2001 and 2002, Georgia experienced the largest dieback of salt marsh vegetation ever recorded, with ≥ 800 ha affected. Although the ultimate cause of the dieback was never established, the event has been linked to a severe drought. Two dieback sites located in Liberty County, GA have been monitored quarterly since 2003, one with extensive *Spartina alterniflora* dieback and a second with extensive *Juncus roemerianus* dieback. There were no consistent differences in porewater chemistry between healthy and dieback areas at either site, but there were increased densities of crab burrows in dieback as compared to healthy areas. Snail abundance was extremely low in the *Juncus* site whereas at the *Spartina* site densities were elevated in healthy areas. Both sites have exhibited signs of re-growth since March 2004. In the *Spartina* site plant density in the dieback transects increased from 0 stems/m^2 in March 2004 to 18 ± 36 stems/m^2 in June 2005. Over this same period average soil salinity decreased from 22.6 ± 5.8 to 13.3 ± 3. At the *Juncus* site, re-growth has been more substantial, with densities in dieback transects increasing from 88 ± 111 to 670 ± 611 since March 2004, but salinities were variable and did not show consistent trends.



Methods

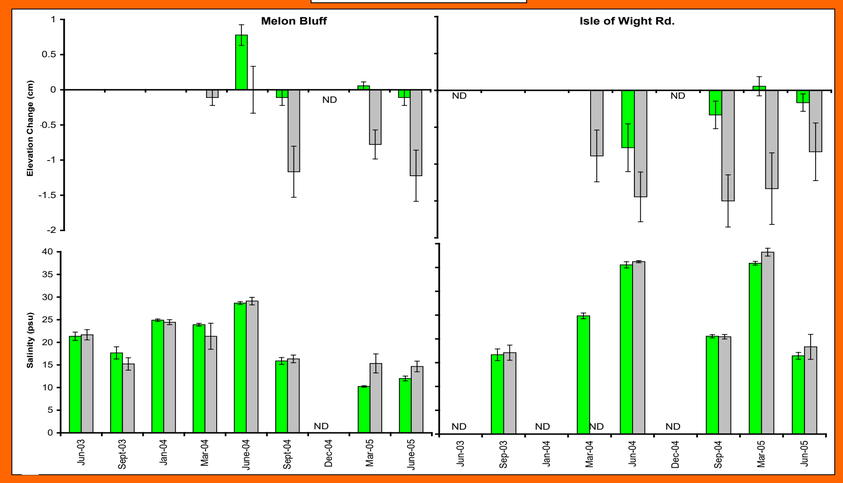
Site Setup: plots (0.5-m x 0.5-m) were spaced 10 m apart along 3 healthy and 3 dieback transects (3 plots/transect = 18 plots/site)

Plot Monitoring Protocol:

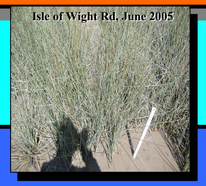
- Physical Setting
  - Surface elevation (marked PVC pipe, cm)
  - Soil temperature (°C)
  - Salinity (refractometer, psu)
  - pH (handheld probe)
- Marsh vegetation
  - Stem density (living, no./m^2)
  - Height of the 5 tallest plants (cm)
- Faunal Density
  - Snails (*Littoraria irrorata*) >10 mm (no./m^2)
  - Fiddler crabs (*Uca*) (using crab holes >5 mm as a proxy)
  - Mussels (*Geukensia demissa*) (no./m^2)
- Site and Plot Observations:
  - Distance to healthy marsh (m)
  - Soil firmness, smell
  - Vegetation color, health
  - Dead fauna
  - Other plant and animal species

Results

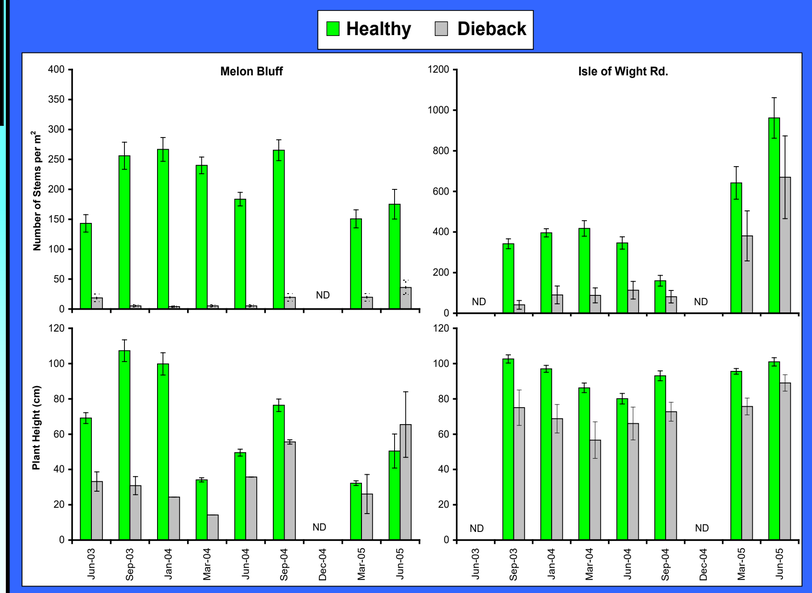
Physical Setting



- Sediment elevation showed a decrease over time at both sites, with greater losses in dieback as compared to healthy areas.
- There were no overall differences between healthy and dieback areas in salinity. However, salinity at Melon Bluff showed a decrease between June 2004 and June 2005. This trend was not as apparent at Isle of Wight, although salinities did decrease in June 2005.
- Mean soil temperature was 22.1±5.7 at Melon Bluff and 22.0±6.6 and Isle of Wight Road; pH was 6.7±0.2 and 6.2±0.4, respectively. There were no differences between healthy and dieback areas

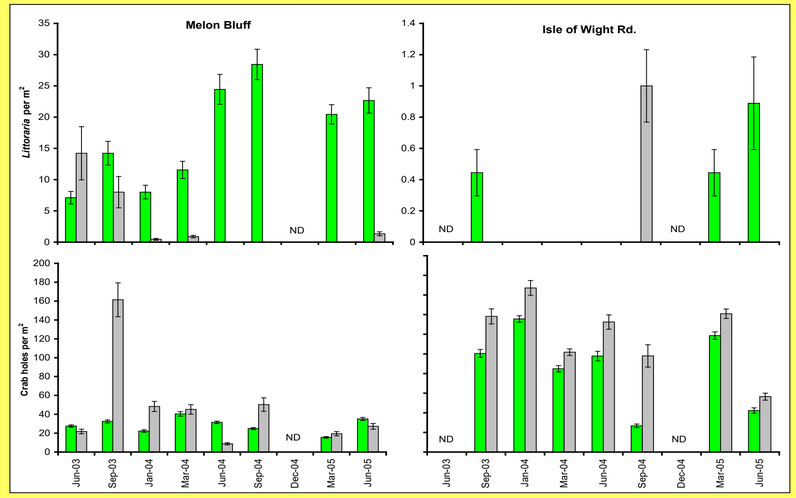


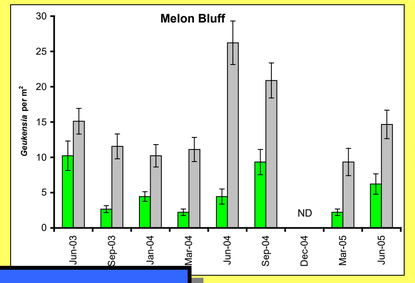
Vegetation



- Stem densities were higher in healthy versus dieback areas at both sites throughout the monitoring period. T-tests comparing values averaged across all healthy plots within a site were significantly greater than those from dieback plots: *Spartina* at Melon Bluff ($p < 0.0001$); *Juncus* at Isle of Wight ($p < 0.01$).
- The heights of the 5 tallest plants, when present, were greater in healthy versus dieback areas, with one exception (Melon Bluff, June 2005). T-tests comparing values averaged across all healthy plots within a site were significantly greater than those from dieback plots: *Spartina* at Melon Bluff ($p < 0.05$); *Juncus* at Isle of Wight ($p < 0.0001$).
- Between June 2004 and June 2005, *Juncus* density and heights at Isle of Wight showed significant increases in both healthy ($p < 0.001$, $p < 0.0001$, respectively) and dieback plots ($p < 0.05$, $p < 0.01$, respectively). No significant differences were observed for *Spartina* at Melon Bluff.

Fauna





- At Melon Bluff, there were significantly more *Littoraria* in healthy as compared to dieback areas ($p < 0.01$). At Isle of Wight (*Juncus* site) fewer snails were present (note scale change), but when observed they were associated with healthy areas.
- The number of crab holes tended to be higher in dieback as compared to healthy areas. This trend was significant at the Isle of Wight Road site ($p<0.05$).
- *Geukensia* density was higher in dieback areas at Melon Bluff as compared to healthy areas. No mussels were ever observed in the Isle of Wight (*Juncus*) site.

Conclusions

- After 2 years, both sites monitored for this project still showed significant differences between healthy and dieback areas. In comparison to healthy areas, dieback areas had lost more sediment, had lower stem density and shorter plants. In terms of fauna, dieback areas had lower snail densities, higher densities of crab holes, and more mussels (when present).
- There were no apparent differences in terms of pore water salinity, pH or temperature between healthy and dieback areas within each site.
- Long-term trends are difficult to discern, but in the *Juncus*-dominated site (Isle of Wight), plants were significantly denser and taller in June 2005 as compared to June 2004. These trends were not observed in the *Spartina*-dominated site (Melon Bluff).
- Monitoring is scheduled to continue on an annual basis (during the fall).

Acknowledgments

This study was supported by the Georgia Coastal Management Program (NOAA Award NA17OZ2331), the Georgia Coastal Ecosystems Long Term Ecological Project (NSF Award OCE 99-82133), the Georgia College Sea Grant Program (NOAA Award NA06RG0029), and the EPA (EPA Star Grant). We thank Jenny Fenton, Janice Flory, Ben Maher, Chip McFarlin, Steven O'Connell, Monica Watkins, and Susan White for help in the field and the Devendorf family for hosting us at the Melon Bluff Plantation and allowing access to field sites.