Soil Characteristics at Marsh Dieback Areas Along the Georgia Coast

Steven O’Connell, Matt Ogburn, and Meryll Alber, Department of Marine Sciences, University of Georgia

Abstract

In winter, 2002, salt marsh dieback was reported in coastal Georgia. These are areas of marsh with little or no above-ground vegetation. The cause of the dieback is unknown, but one suggestion is that it is the result of a change in soil chemistry. We were interested in determining whether dieback is associated with particular soil types. In summer 2003, soil samples were taken from 16 sites along the Georgia coast in an attempt to assess any differences in percent sand, silt, and clay composition, as well as percent organic matter. At each site, samples were taken both at dieback and nearby reference areas. Sites were also classified in terms of location (inland vs. barrier island), the presence of Juncus roemerianus within the study site, and other characteristics. Our results did not reveal any overall differences between reference and dieback sites, but we did see significant differences in % sand at 3 sites (p<0.05). We also found a greater percentage of sand in sites with Juncus roemerianus present, and at sites that are a part of barrier islands (p<0.01). These results suggest that dieback is not associated with a particular soil type. Percent organic content analysis is ongoing.

Introduction

Though a variety of hypotheses have been proposed (including pollution, fungal pathogens and salt burning), changes in soil chemistry have been identified as the most likely causes of dieback. Conclusive to this dieback, Georgia has experienced one of the worst droughts in its history. Increased evapotranspiration and decreased flushing rates may have contributed to soil desiccation and subsequent changes in soil chemistry.

This survey was conducted in order to identify patterns associated with the soil composition of salt marsh dieback areas in coastal Georgia. I was interested in determining differences in soil composition (% sand, % silt and % clay) between healthy and dieback areas. I was also interested in identifying relationships between dieback and other characteristic (such as proximity to the ocean, the presence of man-made structures, etc.).

Methods

A total of 16 sites were surveyed in this study (see map). Sites were chosen so that they were distributed throughout the coastal zone and contained both species affected. Dieback sites were classified by plant species, and included Saponaria officinalis (salt marsh), Juncus roemerianus (black needle rush), and Spartina alterniflora (salt marsh cordgrass). Percent organic content was determined using a dry combustion technique. Soil composition was determined using a disperser solution of 5% NaPO₃ and 5% NaH₂PO₄.

At each dieback site, 4 to 8 samples were collected both in the dieback area and a nearby healthy area. Samples were collected from a depth of 0 to 5 cm, placed in plastic bags and brought to the lab for analysis. Organic content was determined using a dry combustion technique. Soil composition was determined using a disperser solution of 5% NaPO₃ and 5% NaH₂PO₄.

Soil composition was highly variable. This type of patchiness has been observed elsewhere, and is typical of marsh sediments.

Results

There were no overall differences in soil composition between healthy and dieback areas.

Site Differences between Dieback and Healthy Areas

3 out of the 16 individual sites showed significant differences in soil composition between the healthy and dieback areas, but these were not consistent. Sand content was lower in the dieback areas than in the healthy area at 2 of the sites, and higher at the other site.

Conclusions

Overall, soil composition was similar between healthy and dieback areas, although differences were observed at a few sites. Other observed differences (i.e. increased % sand at sites containing M. maritimum, those on barrier islands) were consistent with published observations of marsh dieback. These results suggest that the composition of marsh soil may have had little to do with determining the location of dieback areas. Other factors such as soil organic content (studied organic), soil structure, heat stress, pathogens or other factors may have been more important in causing dieback.

Acknowledgements

Funding and logistical support was provided by the Georgia Sea Grant Program, the Coastal Resources Division of the Georgia DNR, Melon Bluff Plantation, the Georgia Coastal Research Council, and the Georgia Coastal Ecosystems LTER. For field and lab assistance we would like to thank Clark Alexander, Dan Bigelow, Jon Mackinnon, Ben Mater, Mona Shure, and Monica Watkins.