The following is a compilation of field data collected in 2011 and 2012 in Apalachicola, FL. Many coastal communities, both natural and developed, will soon be working to mitigate the effects of sea level rise, if they are not already doing so. This thesis investigates the natural patterns of the Apalachicola estuarine system through the collection and analysis of in situ water, sediment, and biomass samples. Additionally, results of the field samples are presented and recommendations for additional beneficial samples are given. The field methods and procedures developed in this study were designed to be repeated in other estuaries to build upon the work that has been conducted in Apalachicola.

Water samples were tested for total suspended solids (TSS) and compared against hydrodynamic (tidal circulation and streamflow) and meteorological (wind and precipitation) characteristics. Wind strength and direction appeared to be the dominant forcing on TSS concentration fluctuation, which was amplified by the shallow nature of the estuary. Sediment cores throughout the lower Apalachicola River revealed that coarse particles settled out in upstream areas while fine particles tended to stay in suspension until low energy areas in the lower portions of the river or marsh system were reached. Finally, biomass samples were used to validate regression models utilizing remotely sensed data to predict biomass density in marsh areas with unprecedented accuracy.

The documented patterns of this system are to be used as inputs and validation points to update an existing hydrodynamic model, and to aid in the coupling and development of sediment transport and marsh equilibrium models. The field campaign developed and implemented here provides a foundation for this novel coupled modeling effort of estuarine systems. Ultimately, these models will be used to simulate future sea level rise scenarios and will provide useful decision making tools to coastal managers.

Future work will include replicating water sampling in subsequent wet and dry seasons in Apalachicola, FL, in addition to implementing this sampling in Grand Bay, MS and Weeks Bay, AL. Additional biomass samples will be taken to validate the strong correlations found between remotely sensed data and in situ samples. In similar studies, it is recommended that water samples be taken to adequately represent influences from tidal cycles and riverine inflow. It is also recommended that an ample amount of biomass samples be taken to validate regression models.

Educational Career:
Bachelor's of Civil and Environmental Engineering, BS, 2010, University of Central Florida

Committee in Charge:
Dr. Scott C. Hagen, Chair, Civil, Environmental & Construction Engineering
Dr. Dingbao Wang, Civil, Environmental & Construction Engineering
Dr. John Weishampel, Biology

Approved for distribution by Dr. Scott C. Hagen, Committee Chair, on July 25, 2012.

The public is welcome to attend.