Final Report Summary

Application of Remote Sensing Technologies for the Delineation and Assessment of Coastal Marshes and their Constituent Species
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Coastal wetlands are a critical component of the Long Island Sound ecosystem. However, over the past century, a significant amount of these wetlands has been lost due to development, filling, and dredging, or damaged due to anthropogenic disturbance and modification. Global sea level rise is also likely to have a significant impact on the condition and health of coastal wetlands, particularly if the wetlands have no place to migrate due to dense coastal development (Donnelly and Bertness, 2001). In addition to physical loss of marshes, the species composition of marsh communities is changing. Spartina alterniflora (salt cordgrass) and Spartina patens (salt marsh hay), once the dominant species of New England salt marshes, are being replaced by monocultures of Phragmites australis (Barrett and Prisloe, 1998; Orson, 1999). During the past 30-50 years, P. australis is estimated to be spreading at a rate of 1-3 percent per year (Niering and Warren, 1980; Warren, 1994). It has been estimated that approximately 10 percent of Connecticut's tidal wetlands are dominated by P. Australis and further evidence identifies approximately50 percent of tidal and brackish wetlands in Connecticut as sites for P. Australis invasion (Niering and Warren, 1980; Roman et al, 1984; Chambers et al, 1999). P. Australis outcompetes other marsh species in areas with increased fresh water, nitrogen and sediments and is positively correlated with marsh fragmentation (e.g. Moore et al., 1999; Bertness et al., 2002). In response to the increase of P. Australis in many marshes, The Nature Conservancy, the CT DEP and other organizations have instituted efforts (commencing in the 1980s) to restore marsh health, including the control of P. Australis in some areas. The response of marshes to control activities has included both an increase of non-Phragmites marsh species and P. Australis reinvasion (Farnsworth and Meyerson, 1999). With the mounting pressures on coastal wetland areas, it is becoming increasingly important to identify and inventory the current extent and condition of coastal marshes located on the Long Island Sound estuary, identify techniques to track changes in the condition of wetlands over time, and monitor the effects of habitat restoration and management.

The goal of this project was to examine the spatial, spectral, and temporal aspects of coastal marsh vegetation characterization, and delineation along Long Island Sound using both remote sensing and in situ radiometry data. Issues addressed include determining the effectiveness of various types of remote sensing data to identify the extent of coastal wetlands, identifying dominant coastal wetland vegetation, including the invasive Phragmites Australis at select marsh locations, assessing the important potential impact of adjacent upland anthropogenic activity on coastal marsh health and sustainability, and providing recommendations for futures coastal wetland mapping efforts. Major tasks include the delineation and monitoring of coastal marshes from moderate resolution (30 m/pixels). Landsat remote sensing imagery, identification of vegetation species within five select marshes from high spatial resolution (<3 m/pixel>) QuickBird satellite imagery, ADS40, and John Deere AgriServices aircraft-based remote sensing imagery, season, development of a spectral library of dominant tidal marsh plant species throughout the growing season, determination of optimal spatial, spectral, and temporal resolutions for coastal wetland system characterization, and provide information online regarding the results of the work described here.