Seagrass Monitoring

Background

Seagrass communities are unique marine ecosystems found close to shore in intertidal and subtidal zones, usually occurring in relatively shallow water. The term seagrass is a general one used to describe underwater flowering plants. There are two species of seagrass found at Cape Cod National Seashore (CACO); eelgrass *(Zostera marina)* and widgeon grass *(Ruppia maritima)*. Seagrasses grow from the marine sediments often forming dense, expansive underwater meadows. Seagrass beds provide a variety of important functions such as the filtering of nutrients and pollutants, and the stabilization of sediments in marine systems. These communities also serve as nurseries and habitat for a variety of commercially and ecologically important species. There are several factors that lead to declines in seagrass communities. These include direct anthropogenic disturbances such as dragging and dredging, and the naturally occurring eelgrass wasting disease. The factor that usually has the greatest impact on seagrass communities is nutrient loading in coastal waters. Light, often times a limiting factor in aquatic systems, is essential for seagrass growth. When nutrient levels become high in marine systems, algal blooms are often a consequence. Algae often grow and accumulate at the surface of the water resulting in less light in the water column available for seagrass, which are rooted in the sediments. The result is a decrease in seagrass production and recruitment. The importance of seagrass beds is readily apparent however, the local, regional, and global status of seagrass is poorly understood. Long-term monitoring of seagrass beds is critical in order to understand the dynamic relationships between these systems and the natural and anthropogenic stresses placed upon them.

Figure 1. Scientists place a transect through a seagrass bed in Duck Harbor, Wellfleet.

Long-Term Monitoring

In 2001, a coordinated effort to monitor the status of seagrass beds worldwide was initiated by researchers from the University of New Hampshire. Known as SeagrassNet, this effort emphasizes standard and long-term monitoring to better ascertain the status of these coastal habitats on a global scale. CACO, in cooperation with the US Geological Survey, has adopted monitoring methods largely based on those developed by SeagrassNet (e.g. Figure 1). The monitoring program collects data on the distribution and condition of seagrass at two permanent locations within the Seashore; Duck Harbor in Wellfleet and Little Pleasant Bay in Orleans. Both of these sites are representative of typical seagrass communities found within the Seashore. At each site, monitoring is carried out along three 50m transects. The transects are placed parallel to shore at shallow, mid, and greatest depths within extensive seagrass beds. Data has been collected at these sites since 2003. This data will provide managers with high-resolution, integrative information, for example the biomass of stems and roots. Data such as this can shed light on the allocation of energy to different parts of the plant which is often reflective of physical conditions and nutrient availability.

Status and Trends

Initial data analysis has revealed a tremendous amount of variability in both systems. In 2006 at Duck Harbor, for example, all of the seagrass along the deepest transect was uprooted by strong storm waves leading to a dramatic decline in percent cover (Figure 2). By 2008 several small shoots had begun to recolonize the area. Aside from physical disturbance, water quality and clarity is usually tied to seagrass condition. The breach of a barrier beach in Chatham in 2006 resulted in the formation of a new inlet into Pleasant Bay. The influx of ocean water led to improved water clarity within the bay that has been correlated with an increase in percent cover of seagrass at the southern end of the Little Pleasant Bay in 2007-2008 (Figure 3). Access to such high-resolution information, especially when interpreted with supporting data on environmental conditions, is invaluable to managers for interpreting the causes of variability in seagrass distribution and abundance.

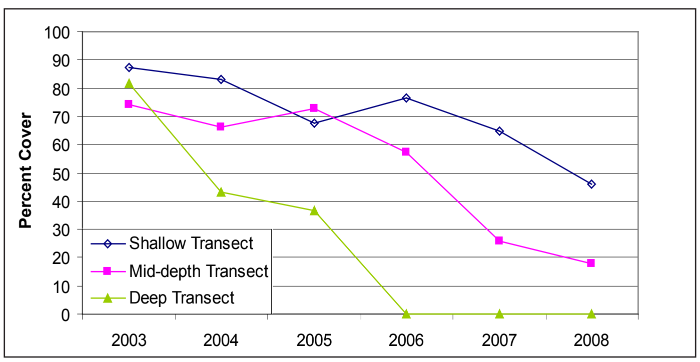

Figure 2. Percent cover of seagrass in Duck Harbor, Wellfleet, MA from July/August 2003-2008. The decline in percent cover in 2006 was largely a result of strong storm waves. In the deepest transect, all seagrass was uprooted. Data courtesy of Hillary Neckles, USGS Patuxent Wildlife Research Center, Augusta, ME.

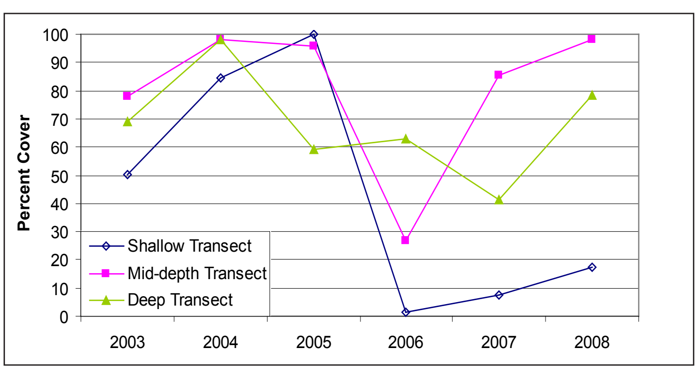

Figure 3. Percent cover of seagrass in Little Pleasant Bay, Orleans, MA from July/August 2003-2008. Note the variablility, specifically the increase in percent cover after 2006. This change in abundance followed improved water clarity in the bay due to the breach. Data courtesy of Hillary Neckles, USGS Patuxent Wildlife Research Center, Augusta, ME.

Management Applications

Seagrass communities are at risk from nutrient loading largely as a result of the subsequent light limitation associated with increased algal growth. With increasing urbanization on the Lower Cape, nutrient enrichment in coastal waters is a concern for resource managers. Long-term monitoring of seagrass beds serves as a means of tracking ecosystem response to certain impacts, such as nutrient enrichment. Physical disturbance, sea level rise and climate change may have long-term effects on seagrass as well. The current method that CACO employs to monitor seagrass provides information detailing condition and distribution at a limited spatial scale. It is important to take this limitation into account when interpreting results from data collected, especially if attempting to determine trends in population-level distribution. Seagrass monitoring at CACO should serve to augment other methods of monitoring such as aerial photography, which provides information on distribution at a much larger spatial scale. Nonetheless, the high-resolution information provided by CACO's current methods will improve our understanding of these ecosystems, acutely and over the long-term. Monitoring will help to identify what factors pose the greatest potential impacts to seagrass communities and aid in developing strategies for conservation and restoration.

More Information

Megan Tyrrell
Research and Monitoring Coordinator

ph: (508) 487-3262 x 105
email: megan_tyrrell@nps.gov

Cape Cod National Seashore
99 Marconi Site Road
Wellfleet, MA 02667

Written by Scott W. Buchanan