Gulf of Mexico Integrated Science - Tampa Bay Study
Examining the Impact of Urbanization on Seafloor Habitats

Introduction

Seafloor habitats, such as seagrass beds, provide essential habitat for fish and marine mammals. For many years, the study of seagrass vitality has been a priority for scientists and resource managers working in Tampa Bay. Seafloor habitats are extremely sensitive to changes in water quality. Like a canary in a coal mine, seagrass can serve as an ecological indicator of estuary health. Between the 1940s and the 1970s, seagrass gradually died in Tampa Bay. This loss has been attributed to a rise in urbanization and an increase in nutrient loading into the bay. Better treatment of industrial wastewater and runoff beginning in the 1980s resulted in the continuous recovery of seagrass beds. However, in the mid-1990s, the recovery began to level off in areas where good water quality was expected to support continued seagrass recovery, demonstrating that nutrient loading may be only one factor impacting seagrass health. Researchers now are trying to determine what might be affecting the recovery of seagrass in these areas. Currently, little is understood about the effects that other aspects of urbanization and natural change, such as groundwater and sediment quality, might have on seagrass vitality. This segment of the Tampa Bay integrated science study is intended to identify, quantify, and develop models that illustrate the impact that urbanization may have on seafloor habitat distribution, health, and restoration.

Seagrass, known as *Halodule wrightii*, located on a sand bar that is exposed at low tide.

Approach

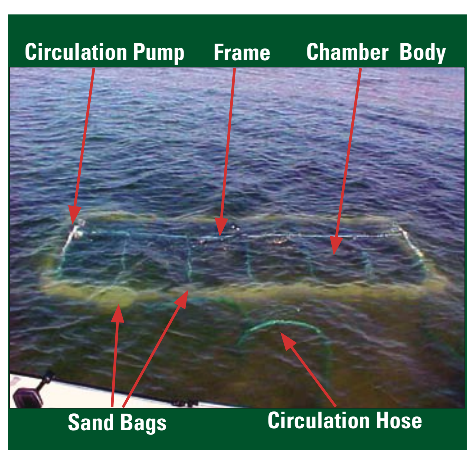
Mapping

To understand better the way seagrass beds have changed in Tampa Bay over time, USGS and Southwest Florida Water Management District (SWFWMD) scientists have partnered to develop historical maps of seagrass beds. These maps compare the locations of seagrass with increasing development in the area. Researchers are examining changes that have affected the area over the years, such as the installation of bridges, construction of industrial plants, modifications of shipping channels, and destruction wrought by hurricanes. Understanding how both natural and manmade changes in the bay have affected seagrass in the past will help scientists understand current impediments to seagrass recovery and model how future changes in the bay will affect seagrass distribution. This information will assist resource managers in assessing the health of the Tampa Bay ecosystem and in planning future seagrass restoration.

Seagrass growth

To help determine what affects seagrass growth, USGS researchers are conducting a variety of experiments. For example, incubation chamber studies are being used to measure the metabolism of seagrass communities. Large transparent chambers (called Submersible Habitats for Analyzing Reef Quality, or SHARQs) are placed over patches of seagrass, trapping bay water inside. As the seagrass grows, photosynthesis occurs, changing the oxygen levels. By measuring such changes, scientists can determine how fast and how well the seagrass is grow-

Seagrass study sites include Feather Sound, Cockroach Bay, Port Manatee, Bishop Harbor, Clambar Bay, Mariposa Key and the Terra Ceia Aquatic Preserve and Buffer.



The SHARQ, deployed on a seagrass bed.

Scientists deploying the SHARQ over seagrass beds located in shallow water in the Terra Ceia Aquatic Preserve and Buffer.

ing. Scientists then are able to compare the growth of seagrass in areas that have been strongly affected by urbanization or specific environmental disturbances with seagrass development in areas that are less urbanized. Additionally, epiphytes, which are organisms that grow on seagrass blades, can be used to help idenify whether seagrass beds are healthy or stressed. Different types of epiphytes found on seagrass can provide an indication of the water quality in a particular area. Research partners from the University of Louisiana at Lafayette are working to identify what types of epiphytes may be used as ecological indicators for seagrass health and water quality.

Sediment suspended in the water column affects how well sunlight can penetrate the water and reach the seagrass. Scientists are developing a model that can be used to predict how suspended sediments in Tampa Bay may affect seagrass health. Predictive models can be used as tools to help plan and understand the consequences of changes in the bay to natural habitats.

Seagrass restoration

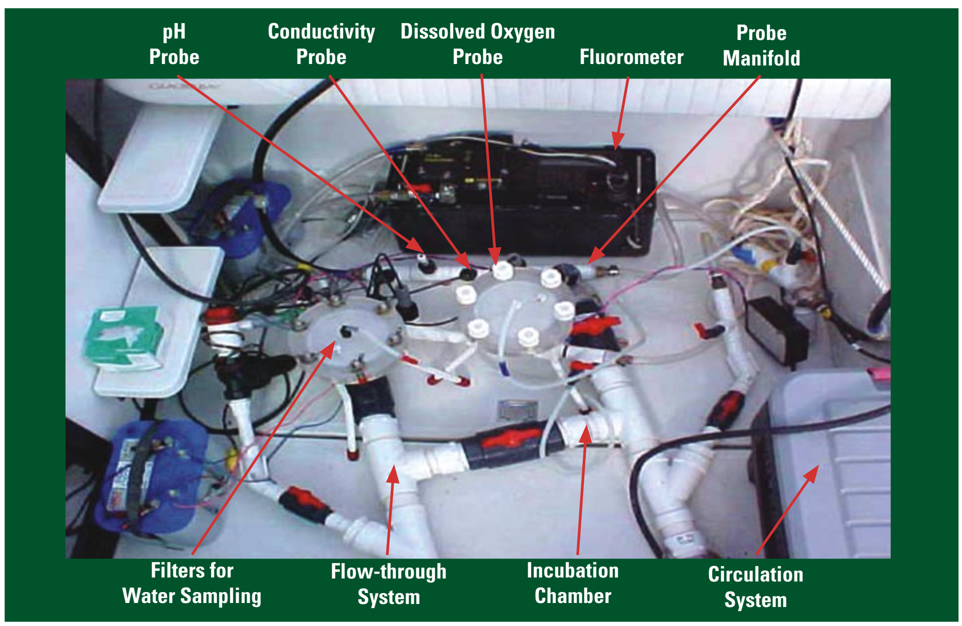
Experiments are also being conducted to determine the best techniques for restoring seagrass by transplantation. This approach involves testing various types of sediments and biodegradable pots in which to replant seagrass. Field studies by research partners from the University of South Florida have shown that coarser sediments, such as crushed oyster shell, and peat pots improve the chances that new seagrass will survive. Scientists also are working to determine whether sediment type and quality in the bay impacts seagrass.

Other bay bottom habitats

Scientists also are examining other seafloor communities, such as hardbottom areas containing sponges and corals, to determine where different seafloor habitats are located, how well their organisms are growing, and how urbanization may impact these habitats.

Links to other project research

Studying seagrass helps scientists understand the impact of water and sediment quality on important seafloor habitats in Tampa Bay. Combining results from investigations on surface water, groundwater, and sediment quality with information on seagrass distribution and vitality assists researchers in identifying potential impediments to seagrass restoration and recovery. USGS seagrass research activities are a small component of a very long history of work conducted by numerous other federal, state, and local agencies in the Tampa Bay area. The work by the USGS is coordinated with these other organizations through the Tampa Bay Estuary Program.



Flow through analytical system for the SHARQ. The instruments in this picture are used to measure water chemistry changes inside the incubation chamber.

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