NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

New York City CSO-PlaNYC Green Infrastructure Initiatives–Ecological Pilot Projects

New York City, New York

Innovative ecosystem pilot projects are being implemented across Jamaica Bay to successfully improve water quality and reintroduce ecosystems no longer found within the Bay, including eelgrass beds and oyster reefs.

Biohabitats is leading the implementation of a range of ecosystem restoration pilot projects within the Jamaica Bay watershed in New York City. The pilot projects were identified as part of the Jamaica Bay Watershed Protection Plan, which is focused on cleaning the water of the Bay and reestablishing previously lost ecosystems.

Working with joint venture partners Hydroqual and Hazen & Sawyer, Biohabitats is helping New York City pursue a range of innovative pilot projects. They include harvesting macroalgae from the Bay interior to convert to biofuel, introducing algal turf scrubber technology at a wastewater treatment plant (WWTP), planting eelgrass, and installing an oyster bed and oyster reef balls.

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OYSTER REEF RESTORATION PILOT PROJECT

Oysters, which serve as natural water filters, once thrived in Jamaica Bay. Due to overharvesting and other human disturbances, oyster reefs are no longer found in the Bay. To research the potential for restoring oyster habitat, NYCDEP installed an oyster bed off of Dubos Point in Queens and 12 oyster reef balls in Gerritsen Creek in Brooklyn.

The clam shells and reef balls were set with oyster spat and placed in Jamaica Bay in 2010. Monitoring, to determine whether oysters can survive, reproduce, and provide water quality and ecological benefits to the bay, is ongoing.

Data collected throughout the monitoring process will be used to inform future attempts to restore this significant habitat type to Jamaica Bay. The team is also coordinating with other organizations and researchers undertaking similar efforts in the New York/ New Jersey Harbor Estuary.

RIBBED MUSSEL PILOT PROJECT

Discharge from combined sewer overflows (CSOs) and water pollution control plants (WPCP) contains organic particulates and nutrients, and undesirable chemical contaminants. Through filtration, mussels could potentially remove substantial quantities of these constituents that accumulate in the waterbody and degrade water quality.

In 2011, several artificial substrates for the growth of ribbed mussels were constructed within Fresh Creek in Brooklyn. The sites are currently being monitored for mussel growth, substrate condition, and water quality.

The primary goals are to test the effectiveness of ribbed mussels in removing nutrient and particulate organic matter from a CSO discharge and provide baseline information for further development of mussel filtration as a means of improving water quality in Jamaica Bay. If ribbed mussel populations increase to significant densities, correlations between mussel growth and changes to the baseline water quality data will be analyzed. Monthly routine monitoring is currently ongoing.

EELGRASS PILOT PROJECT

To better understand how to restore eelgrass within Jamaica Bay, NYCDEP together with the Joint Venture team and Cornell Cooperative Extension conducted a series of test plantings of eelgrass within Jamaica Bay from the spring of 2009 through the fall of 2011. These plantings were conducted to better refine site selection parameters, planting methodology, and timing of planting within the region since historically there has never been an attempt to restore eelgrass in Jamaica Bay.

Each site was monitored on a weekly basis, with a focus on eelgrass health, ambient water conditions, and potential disturbances from predators to inform future restoration efforts. Although the plantings did not result in a sustainable establishment of eelgrass in Jamaica Bay, the project provided new insight into issues affecting eelgrass planting in the area.

MACRO-ALGAE HARVESTING PILOT PROJECT

Sea lettuce can be beneficial in providing habitat for juvenile crabs and fish in some systems, but in eutrophic systems such as Jamaica Bay, these buildups can begin to accumulate along shorelines and in near-shore areas, becoming an environmental concern. As these mats decompose, nutrients are released and the resultant depletion of oxygen in the water causes stress to many aquatic organisms, such as fish and crabs. This project is an important first step towards restoring unvegetated subtidal habitat in Jamaica Bay, which is currently subjected to smothering by dense mats of detached sea lettuce.

In 2010, NYCDEP trash skimmer boats were used to harvest sea lettuce where it amasses in Jamaica Bay in order to determine if this is a feasible management approach. Such harvesting can alleviate stress to benthic invertebrate and finfish populations, especially during mid-summer when occurrences of periodic anoxia or hypoxia are most likely, while also removing a substantial quantity of nitrogen and phosphorous from the Bay.

A chemical analysis of the macroalgae was undertaken to assess its viability as a source of biofuel. In 2010, the team worked with the University of Arkansas to create biobutanol, a biofuel, from the Ulva harvested in Jamaica Bay. A cost-benefit analysis of implementing a full-scale macroalgae harvest program is ongoing.

ALGAL TURF SCRUBBER® PILOT PROJECT

In September 2010, New York City completed construction of an Algal Turf Scrubber® adjacent to the Rockaway Wastewater Treatment Plant as a pilot project to improve water quality in Jamaica Bay.

The Algal Turf Scrubbers (ATS™), a patented technology developed by HydroMentia, Inc., is a unique wastewater treatment device that harnesses the natural abilities of algae, bacteria, and phytoplankton to remove pollutants from water. The ATS™ is designed to promote the growth of beneficial algae, which filter nutrients from wastewater effluent that is pumped into the floway.

For the 2.5-year duration of the pilot project, Biohabitats was responsible for regularly harvesting the algae and maintaining the system. The harvested algae is a viable source of biofuel and can be reused as fertilizer. Efforts are underway to more effectively utilize algae oils for biodiesel production from a scaled-up ATS™; if proven feasible, the system could potentially fuel city vehicles, like garbage trucks, in the future.

FLOATING ISLAND WAVE ATTENUATOR PILOT PROJECT

The proposed floating island wave attenuator pilot project uses an innovative ecological technology to slow erosion and promote the accretion of sediments along shorelines, thus helping to prevent the loss of salt marshes in Jamaica Bay and protect existing natural shorelines.

Brant Point was chosen as the location for the wave attenuator project, as its shorelines and marshes are actively eroding due to wave energies. NYCDEP, working with the Joint Venture team, developed a wave attenuator design that would use a series of buoyant mats planted with Spartina alterniflora, whose roots would grow from the surface to the subaquatic environment making them available to the subaqueous community for habitat purposes. The introduction of an active biological system to the wave attenuator adds many ecological benefits including the ability of the system to assist in the removal of pollutants from Jamaica Bay via the root structures and also from the porous nature of the submerged matrix of the floating island.

The team is using remote acoustic monitoring devices to measure how the attenuators perform. If the attenuators succeed in diminishing the strength of the waves and slowing the rate of erosion, that information will be used to determine whether breakwater offshore structures could be planted in similar areas to protect other critical wetland and shoreline areas.