



East Harbor Vegetation Restoration

Background

The 720-acre East Harbor has been artificially isolated from the Cape Cod Bay marine environment since the 1868 filling of the original 1000-ft wide inlet at the northwest end of the system. A drainage system was installed at the south end of the embayment in 1894 to allow freshwater to escape. The exclusion of tides caused salinity to decline from 25-30 parts per thousand (ppt) to nearly freshwater conditions. Native flora of the peripheral marshes were largely extirpated and algae blooms, nuisance chironomid midge hatches and chronic summertime dissolved oxygen stress occurred frequently.

In September 2001, the town of Truro and Cape Cod National Seashore officials opened the clapper valves in the 4-ft diameter drainage pipe connecting the southeast end of the system with Cape Cod Bay in hopes of restoring some tidal exchange and increasing aeration. These valves have been cabled open almost continuously from November 2002 to the present. Despite limits on tidal exchange imposed by the pipe's small diameter, and the distance that it travels under ground, there has been an impressive response in the recovery of estuarine vegetation.

Restoration challenges

While a substantial amount of freshwater, non-native vegetation has been salt-killed, there were not remnant salt marsh species left in the system to replace them. In addition, a number of relic earthen berms in the marshes prevented seawater from penetrating many interior marsh areas. Finally, while lagoon water salinities have risen dramatically the volume of water exchanged through the pipe is insufficient to create water level fluctuations (i.e. tides) more than a few centimeters over such a broad area. In other words, lagoon water has not been able to rise above the elevation of the peripheral marsh and salinities just meters away from the lagoon's edge have remained close to freshwater. Accordingly, three adaptive management projects were undertaken in an effort to accelerate the process of vegetation restoration. These included seeding, berm perforation, and water level manipulations using a reverse tide gate.

Adaptive management techniques

Seeding

In 2004, seeds of native salt marsh plant taxa were collected from a nearby pristine marsh, bagged and transported to East Harbor where they were scattered into areas of salt-killed vegetation. The seeds germinated and produced numerous stands of salt marsh vegetation, which are now a source of seed inputs themselves. Subsequent expansion through clonal growth has resulted in rapid expansion of salt marsh vegetation throughout the system.



AmeriCorps member hand-seeding a salt-killed cattail area with seeds of native salt marsh species (left) and an example of the results (right) – a vigorous stand of cordgrass (*Spartina alterniflora*) in 2005. This species dominates pristine marshes elsewhere in the Seashore.

Berm perforation

In 2008, seven openings were created in old earthen berms in the southeastern marsh area of East Harbor (known as Moon Pond). With the help of Cape Cod Mosquito Control and their heavy machinery, channels were dug through the berms to allow for the free flow of water into marsh areas behind them.



Cape Cod Mosquito Control constructing channels through a berm.

Water level manipulations

In 2001, a reverse tide-gate was constructed and installed where seawater enters the system through the old drainage pipe. The gate was designed to let high tides into the system but prevent their escape – thereby trapping high salinity water and increasing water levels throughout the basin.

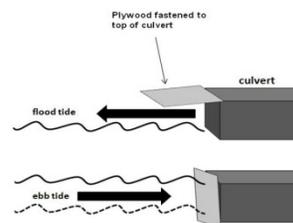


Diagram of reverse tide-gate (left) and its consequences (salt-killed area of cattail) (right).

Conclusions

These adaptive management projects have produced favorable results with respect to vegetation restoration with no observable adverse impacts on other biota. In general, seeding, berm perforation, and water level manipulations have resulted in a decrease in unwanted plant species with concurrent increases in native, salt marsh species.

Continued management of this nature will be undertaken in the future and holds promise for accelerating the continuing restoration of this important ecosystem at Cape Cod National Seashore

More information

Stephen Smith
Plant Ecologist

ph: (508) 487-3262
email: Stephen_M_Smith@nps.gov

Cape Cod National Seashore
99 Marconi Site Rd
Wellfleet MA 02667