Coastal Habitat Restoration Approaches

Degradation and Restoration

The historic causes and extent of habitat loss and degradation in Connecticut vary, depending on the habitat. Restoration strategies for coastal habitats also vary, according to the habitat type. The following information is provided to convey contextual knowledge on the science of habitat restoration. More complete information is available in the Long Island Sound Habitat Restoration Manual.

Coastal and Island Forests

Degradation

The primary causes of degradation of coastal islands and forests are development and fragmentation resulting from development. Coastal forests were historically cleared for agricultural land, building materials, and fuel, and were later converted for urban development. Island forests were mainly cleared for development of private coastal residences prior to the passage of Connecticut's Coastal Management Act (CCMA) in 1980. Invasive pests and diseases and severe storm events have also impacted these forests. For coastal and island forests directly along or within Long Island Sound waters or adjacent to salt marshes, sea level rise impacts are already occurring in some understories with colonization by salt marsh grasses and death of trees due to salt water.

Restoration

Restoration of coastal and island forests typically occurs in part with conservation or preservation of existing stands. Restorative actions may include removal and management of invasive species and/or employing silvaculture techniques with consideration to the development of different canopy layers in regards to the types of trees, shrubs, and herbaceous perennials suitable for re-establishing desired wildlife and resources. This restoration approach is also useful for reconnecting fragmented forest stands through land acquisition. Planning for resilience to sea level rise involves consideration of sea level rise scenarios, land elevation, and possible incorporation of sturdy, slightly salt tolerant trees and shrubs at the waterward edges of the forest canopy to buffer the forest area inland and inhibit erosion and salinization of forest soils.

Coastal Grasslands

Degradation

The primary causes of degradation in grassland communities are development and fragmentation resulting from development. Coastal grasslands were historically transformed to agricultural land and later converted for urban development, airfields, and golf courses. After the initial physical disturbance to convert grasslands, the original grassland soils became extremely erodible by wind and water. As these areas were developed, suppression of natural fire events also contributed to grassland community degradation. In Connecticut, sand plain grassland communities are now nearly nonexistent.

Restoration

Restoration of coastal grasslands encompasses the same methods that are used for restoring Midwestern tall grass prairies, which includes persistent mowing and sometimes controlled burning of undesirable species in less developed areas, followed by planting of native grassland species to accompany natural revegetation. Presently, Connecticut's upland grassland communities are mostly limited to those that have been artificially created. Converting cleared land back to coastal grasslands improves carbon sequestration and helps to reconnect important habitat areas.

Cliffs and Bluffs

Degradation

Cliffs and bluffs are degraded by progressive erosion caused by severe wind, wave, and human-induced actions, often which happen in concert. Urban development along bluffs and escarpments has removed much of the root structure and compacted soils that worked to naturally slow stormwater runoff and erosion processes. Bulkheads and other shoreline flood and erosion control structures limit natural erosion processes and consequently affect the sediment supply available for littoral transport, resulting in associated changes in beach and sand flat habitat stability.

Shore-parallel structures placed along coastal bluffs impound potential beach sediment and fundamentally change the beach and backshore. The amount of drift sediment available for maintenance of downdrift beaches becomes reduced, and upper beach spawning habitat becomes buried and lost. Sea level rise and the impacts of climate change also increase erosion rates of cliffs and bluffs, as coastal storms become more frequent and brutal.

Restoration

Restoration of coastal bluffs and escarpments involves structure removal, repairing changes in estuarine function, and beach enhancement. Sustainable restoration by removing bulkheads placed along cliffs and bluffs restores natural sediment input to the nearshore. Revegetation of bluffs helps to consolidate bluff soils, slowing the rate of runoff and progressive erosion. These restoration measures also make bluffs and escarpments more resilient to the effects of climate change and sea level rise.

Coastal Barriers, Beaches & Dunes

Degradation

A high percentage of coastal barrier beaches have been destroyed by shoreline development and erosion control structures that impede beach re-nourishment and the formation of new beaches. Dunes have been cut down simply to improve the view for the buildings located behind them. Many remaining beach and dune complexes are degraded by trampling and over-use. In these areas, invasive species can infiltrate dunes, further impacting the habitat.

Restoration

From Structural Alteration

Restoring areas where beaches or dunes have been replaced or altered by structures is best achieved when those structures can be relocated or removed, so that beach areas can be replenished with sand and beach and dune habitats can be rebuilt. Rebuilding dunes involves adding comparable sand to create sufficient height and breadth and planting stabilizing native vegetation to trap windborne sand. This is generally followed by placement of dune fencing or logs along the perimeter for additional protection.

From Trampling

Keeping existing dunes undisturbed by placement of dune fencing and signage often allows for natural recovery of the dune habitat if the damage is minimal. Creating denser vegetation with augmented planting of inhospitable shrubs (like poison ivy, for example) also deters disturbance. Clearly marked alternate or permanent pathways also help to direct traffic away from dune habitats. Seasonal restrictions and regulation of vehicle and pet access along beaches is also important to protect breeding species.

From Invasive Species

Removing non-native, invasive plants requires cutting, pulling, and sometimes specialized herbicide application. Replanting of native species may be necessary where removal of the invasives can destabilize the dune structure. Wire mesh fencing around nesting sites may also be needed to deter predators and other invaders.

Freshwater Wetlands

Degradation

Freshwater wetland degradation occurs when its hydrology is altered. This alteration results from a number of activities such as draining, filling, and impounding. Other degradation may be caused by pollutants or invasion of exotic species.

In the past, large tracts of Connecticut's wetlands were drained for agriculture, or altered to create cranberry and blueberry bogs. Until inland wetlands became protected in Connecticut in 1972, many were also filled for development, especially during the post-World War II housing boom. It is estimated that the state's freshwater wetlands have been reduced by 40 to 50 percent from such activities.

Restoration

Restoration of freshwater marshes is generally accomplished by reversing the type of degradation that occurred. When drainage ditches are filled or plugged and stream diversions corrected, drained wetland areas are naturally refilled with freshwater and can recolonize. When fill material is excavated from filled wetlands, the wetland hydrology eventually reaches equilibrium and becomes naturally revegetated. Restoration of impounded wetlands requires removal or lowing of the impoundment structure; replanting is seldom necessary. Wetlands degraded by invasive species require either mechanical removal by continual mowing or precise herbicide application that targets only the invasive vegetation.

Contaminated wetlands are typically more difficult to restore and require more specialized restoration management. Either the contaminated area must be excavated to remove the contaminants or capped with clean material to encase the contaminants. Sometimes bioremediation of heavily contaminated wetlands is possible using vegetation that is both tolerant of the contaminants and also extracts and sequesters them. The foliage must then be harvested and properly disposed.

Tidal Wetlands

Degradation

Approximately 30% percent of the state's tidal wetlands have been permanently lost to filling and dredging since colonial times. A significant percentage of the remaining wetlands have been degraded by tidal flow restrictions through draining, placement of tide gates or undersized culverts, and ditching, before modern-day understanding of the importance of tidal wetlands discontinued such means of degradation.

Degradation of brackish and tidal fresh marshes of the lower Connecticut River is being caused by the rapid displacement of native vegetation by the highly invasive common reed, *Phragmites australis*. This invasive type of common reed resultantly forms a monoculture, which reduces marsh value and functionality.

Restoration

More information about tidal wetlands and their restoration can be found on the Tidal Wetlands page.

Migratory Riverine Corridors

Degradation

Riverine corridors in Connecticut supported significant anadromous fish runs well into the mid-to-late 1700's. During the Industrial Revolution and even before, however, construction of dams on small streams and large rivers severely impacted Atlantic salmon, American shad, river herring, shortnose sturgeon, and other anadromous fish. The dams prevented these species from reaching their freshwater spawning sites and caused the degradation of downstream habitats by reducing water flow and increasing water temperature.

Restoration

The best method for restoring migratory corridors involves removing impediments to river flow. However, removing dams, dikes, or other structures may not be feasible due to current land uses. Installation of fish ladders may be necessary to enable migratory species to bypass these impediments. In these cases, river bank and streambed restoration can still be implemented to improve habitat, inhibit erosion, and prevent runoff into the waterway.

Estuarine Embayments

Degradation

Actions affecting coastal water quality result in the degradation of estuarine embayments. These can be through direct and indirect activities, which pollute coastal waters or which degrade other types of coastal habitats that naturally work to improve water quality. Climatic extremes resulting from imbalances between precipitation, temperature, and evaporation can alter the hydrology and salinity of embayments, disturbing their estuarine ecosystems.

Restoration

Improving water quality by removing sources of pollution or reestablishing the natural functions of other habitats naturally restores the functions of estuarine embayments. Adopting resilience measures that work to protect coastal, riverine, and forest habitats in response to climate change can also help deter extreme changes in hydrology and salinity of estuarine embayments.

Rocky Intertidal Zone

Degradation

An imbalance of species colonization along a rocky shorefront can degrade the overall health of the habitat. The availability of space, marine characteristics, and level of predation are factors that influence the diversity of a rocky intertidal community. Human disturbances such as pollution and eutrophication and the effects of climate change can also affect species abundance and diversity.

Restoration

Improving water quality and adopting resilience measures that help to deter extreme changes in the marine environment can restore the balance of the rocky intertidal community by creating a more hospitable environment for a variety of species. These improvements also increase the presence of different terrestrial and marine predators that help to balance species colonization along the rocky shorefront.

Intertidal Flats

Degradation

Intertidal flats are dynamic and naturally change in response to fluctuations in littoral transport and coastal storms, but they can stabilize when there is no net change in their sediment volume. Structures that impound eroded sediment on the upland or that impede the transport of sediment within the subtidal zone can cause the sediment volume of a down drift tidal flat to recede, potentially resulting in loss of the habitat within a particular area.

Restoration

Restoration of intertidal flats involves reestablishing the sediment supply, allowing the flats to re-accumulate. Tidal flats can become naturally restored through the removal of bulkheads placed along cliffs and bluffs and the removal of groins, jetties, and breakwaters that disrupt sediment transport. Tidal flats can also be created by using these same perpendicular shoreline structures to enhance the accumulation of sediment within the intertidal zone on the updrift side; however, this can be self-defeating if such structure placement results in downdrift beach and sand flat loss.

Submerged Aquatic Vegetation

Degradation

There are a combination of stresses that contribute to SAV degradation. Impaired water quality coupled with localized physical disturbances significantly impacts the health and density of SAV beds. A massive decline of eelgrass occurring from the mid to late 20th century in Long Island Sound is attributed to various sources, including commercial fishing and pollution from sewage overflows. Poor water quality can also inhibit the natural recovery of an SAV bed that has been stressed by trawling or net dragging. Shading from fixed and floating structures and moored boats placed directly over SAV beds and hardened shoreline structures that affect wave energy can stress SAV beds, degrading them over time. Dredging or fill activities may remove or bury existing SAV beds, and depth changes affecting optimal light penetration can inhibit their regrowth. Overgrazing from waterfowl can also degrade the ability of SAV beds to naturally regenerate.

Restoration

Historical literature suggests that eelgrass was once prolific along Connecticut's coast. The great decline prompted regular eelgrass surveys between the mid-1980s and early 21st century. These surveys showed eelgrass returning in areas of Long Island Sound where water quality has improved. Continued measures to improve water quality, including preventing combined sewage overflows and eliminating sources of nitrate and phosphorus pollution, will further natural regeneration of SAV beds.

CCMA includes a legislative policy to protect, enhance, and allow natural restoration of eelgrass flats except in special limited cases. Thus, shading and other causes of SAV degradation are a consideration in determining the adverse impacts to coastal resources that proposed activities potentially have. Sometimes transplantation or seeding of eelgrass beds are included as measures to mitigate for potential impacts to existing beds when shading or other activities affecting the beds may be unavoidable. Discouraging migratory and invasive waterfowl from lingering in a particular area helps to deter instances of overgrazing.

Shellfish Reefs

Degradation

Overharvesting, impaired water quality from point and nonpoint source pollution, industrialization, dredging and fill activities, shoreline development, and predation have historically degraded shellfish reefs within Connecticut's coastal waters. More recently, severe storms, warming temperatures, eutrophication, disease, and increased carbon inputs continue to contribute to shellfish reef degradation. In 1997, parasitic diseases destroyed 90% of the oyster population in Long Island Sound.

Restoration

A status review conducted in 2005 of the eastern oyster in Long Island Sound concluded restoration is important to maintain the oyster fishery and to conserve the ecosystem services that oyster reefs provide. Restoration activities involving bed seeding, which entails dumping hundreds of bushels of shells in an area to create a substrate for a new reef to establish, has helped to replenish oyster reefs in Connecticut. Given their ecological, economic, and cultural importance, restoration of oyster beds remains a priority in Long Island Sound. Recently, interest has arisen in reestablishing and creating shellfish beds for the purpose of restoring ecosystem function. Establishing mussel species with a lack of commercial or recreational harvest and a wide environmental tolerance within the eutrophic waters of western Long Island Sound could enhance nutrient removal, improving water quality and creating a more hospitable habitat for other marine life.

Restoration Benefits

Over the long term, coastal habitat restoration ensures the balance of nature and protects our quality of life by reestablishing characteristic functions, which directly and indirectly benefit the coastal environment and human uses. Specific benefits of coastal habitat restoration include:

- Enhancement of the diversity of plants and animals in the Long Island Sound ecosystem;
- Protection of wildlife including shorebirds, waterfowl, and certain endangered species;
- Restoration and protection of diadromous and freshwater fish species;
- Nursery for economically valuable finfish and shellfish harvests;
- Improvement of water quality in the Sound;
- Flood and erosion control;
- Groundwater recharge; and,
- Sediment stabilization.

See the Restoration Primer and Efforts pages to learn more about DEEP's Coastal Habitat Restoration program. For more information about coastal resources and coastal habitat restoration, see the Connecticut Coastal Management Manual and the Long Island Sound Study Thriving Habitats and Abundant Wildlife page.

Ed Bills Pond Dam Removal - East Branch Eight Mile River Restoration, Lyme