LONG ISLAND SOUND STUDY HABITAT RESTORATION INITIATIVE

ANNUAL SUMMARY FOR THE YEAR 2002

Technical Support for Coastal Habitat Restoration

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BACKGROUND

This report summarizes the accomplishments of the Long Island Sound Study's (LISS) Habitat Restoration Initiative (HRI) for year 2002, the fifth year of implementation. The HRI is a bi-state, multi-organizational effort to restore estuarine coastal habitats in Connecticut and New York. The HRI members meet several times a year to discuss progress, share new technologies, and identify emerging issues. In 1997, the LISS HRI established the following goals:

- Restore the ecological functions of degraded and lost habitats;
- Restore at least 2000 acres of coastal habitats and 100 miles of riverine migratory corridor habitat over the next 10 years; and
- Use partnerships to accomplish the restoration objectives and to leverage limited state, local, and federal funds.

Potential restoration sites were identified through interviews with individuals knowledgeable with the states' ecosystems, and the public was provided an opportunity to nominate sites as well. These data were compiled into a Habitat Restoration Geographic Information System and an Access database and published in a brochure called "Restoring Long Island Sound's Habitats." Implementation of restoration projects began in 1998. Twelve priority coastal habitat types have been identified by the HRI members as particularly important to sustaining the living resources of the LIS ecosystem. These habitat types are Tidal Wetlands, Freshwater (non-tidal) Wetlands, Riverine Migratory Corridors, Submerged Aquatic Vegetation, Coastal Grasslands, Intertidal Flats, Estuarine Embayments, Coastal and Island Forests, Shellfish Reefs, Cliffs and Bluffs, Rocky Intertidal Zones, and Coastal Barriers, Beaches, and Dunes.

In 2000, eleven state, federal, municipal and non-governmental organizations signed a Memorandum of Understanding (MOU) that codified their commitment to work cooperatively on the LISS HRI goals. To view the MOU, please visit the LISS website: http://www.longislandsoundstudy.net/archive/misc/mou.pdf. For more information on the habitat restoration initiative go to: http://www.longislandsoundstudy.net/habitatteam.htm.

The Long Island Sound Study plays a major role in habitat restoration by providing annual funding to the New York Department of Environmental Conservation's Bureau of Marine Resources and to the Connecticut Department of Environmental Protection's Office of Long Island Sound Programs (OLISP).

In New York, due to limited in-house capacity for construction projects, most restoration projects are being carried out by local governments who have received funding under the 1996 New York State Clean Air / Clean Water Bond Act, Environmental Protection Fund and other state, federal, and private grants. Projects receive technical and planning assistance from state staff, and other members of the Habitat Restoration Workgroup.

The OLISP provides a coordination function for habitat restoration efforts in Connecticut. To that end, four habitat teams have been formed which meet several times a year. These are Tidal Wetlands, Riverine Migratory Corridors, Coastal Barriers/Beaches/Dunes, and Eelgrass (Submerged Aquatic Vegetation). The teams, composed of representatives from federal and state agencies, scientists, and non-governmental organizations, establish annual work plans. The lead agency or organization varies from project to project.

2002 PROGRESS REPORT

Although the ultimate goal of habitat restoration is the implementation of projects, it can take several years of planning, design, obtaining permits and applying for grant funds before a project is ready for construction. For this reason, restoration acreages can vary considerably from year to year, and acreage alone is not a true measure of progress in the field of habitat restoration. Progress is reported by major habitat types with emphasis placed on completed projects. An introduction to each section is provided to summarize the overall work effort.

In calendar year 2002, significant progress was made toward the restoration goals. Five tidal wetland projects were completed, resulting in 118.69 acres restored. Three riverine migratory corridor projects were completed, which now provide access to an additional 8.75 miles of migratory passageways for fish. Progress on other habitat types includes restoration of 11.78 acres of freshwater wetland, 2 acres of coastal forest, and 5 acres of coastal grassland. Additional progress on more than 50 other on-going projects was made in such areas as securing funding, initiating engineering design, and conducting preliminary tidal studies.

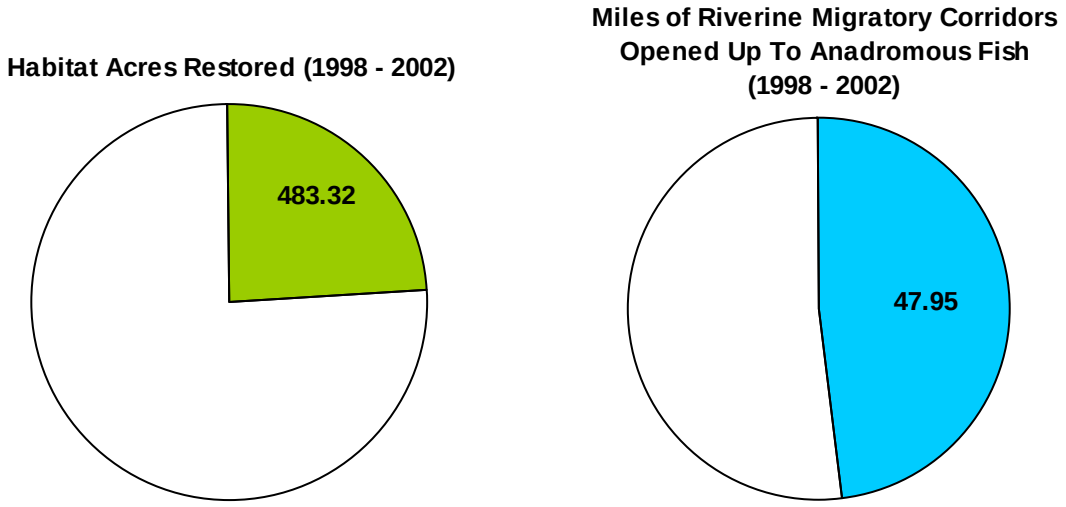


FIGURE 1. Acres and miles restored relative to our HRI goals – we are currently at 24.2% and 47.95% of the goals of 2000 acres of coastal habitats and 100 river miles, respectively.

Other miscellaneous highlights include:

- The U.S. Fish and Wildlife Service conducted an aerial survey for eelgrass in eastern Long Island Sound, using the aerial photography standards set by NOAA's Coastal Change Analysis Program.
- Originally printed in 1998, the LISS Habitat Restoration Team's poster entitled "Restoring Long Island Sound's Habitats" was updated by the Connecticut Department of Environmental Protection (CTDEP) and the New York State Department of Environmental Conservation (NYSDEC) and reprinted. An electronic version is available at: http://www.longislandsoundstudy.net/pubs/reports/LISSHabMap02.pdf.
- CTDEP and NYSDEC authored five chapters for the LISS Habitat Restoration Initiative's manual – *Technical Support for Coastal Habitat Restoration:* Tidal Wetlands, Freshwater Wetlands, Submerged Aquatic Vegetation, Coastal Grasslands, and Coastal Barriers, Beaches, and Dunes. These documents contain background information and guidance for the restoration of the corresponding habitats.

The following sections summarize restoration projects completed in 2002 by the states of Connecticut and New York. The habitat types included are tidal wetlands, riverine migratory corridors, freshwater wetlands, coastal forest, coastal grasslands, and submerged aquatic vegetation.

TIDAL WETLAND RESTORATION

Five tidal wetland restoration projects were completed in 2002, for a total of 118.69 acres restored:

- Bronx Cement Plant tidal wetland restoration - Bronx, NY 0.34 acres
- Lower Connecticut River marshes - Great & Upper Islands, Old Lyme, CT 96.5 acres
- Milton Harbor salt marsh restoration - Rye, NY 2.0 acres
- Pryer Manor marsh - Mamaroneck and New Rochelle, NY 5.25 acres
- Quinnipiac River marsh - North Haven, CT 14.6 acres

118.69 acres of tidal marsh

Descriptions of these projects appear below. In addition, a 24.9-acre parcel was treated with tidal marsh enhancements:

- Great Meadows marsh complex - Stratford, CT

The tidal marsh enhancements at Great Meadows do not count toward the Long Island Sound Study goal of 2000 acres of restored coastal habitat.

Completed tidal wetland project acreage for 1998-2002 are presented in **Figure 2**.

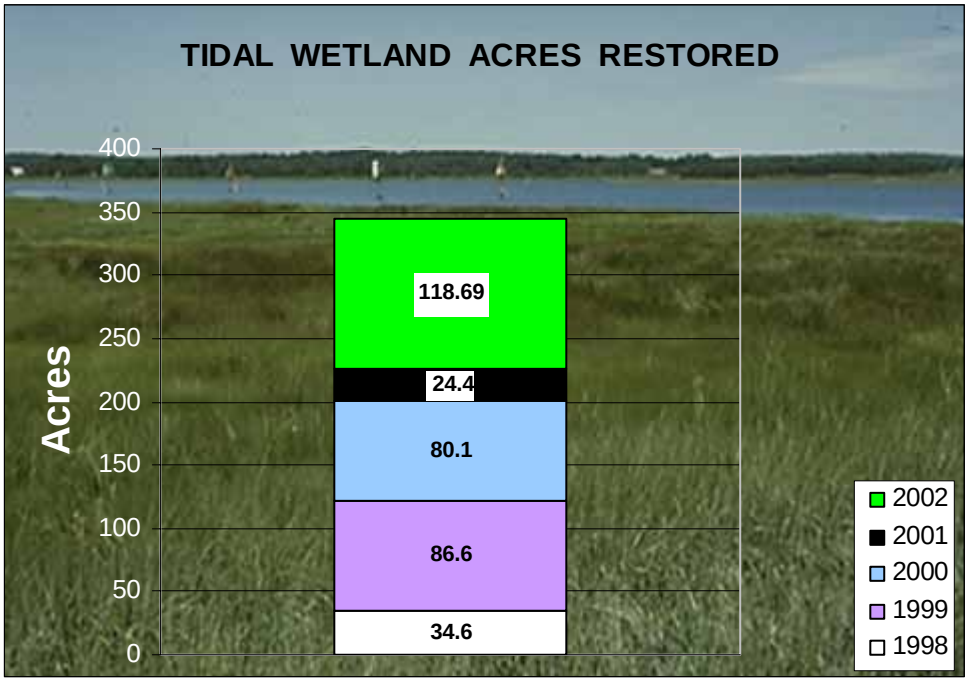


FIGURE 2. Acres of tidal wetlands restored (344.39 acres) between 1998–2002.

Many other projects were in various stages of development. Connecticut's 2002 habitat restoration workplan contained 28 tidal wetland projects, including *Phragmites australis* control efforts (see discussion on following page). Some of the highlights include:

- Great Island/Upper Island: The Connecticut Department of Environmental Protection (CTDEP) completed a 220-acre Phragmites control project in the tidal marshes of the lower Connecticut River, specifically on Great Island and Upper Island in Old Lyme.
- Lieutenant River: CTDEP completed a 115-acre Phragmites control project in the tidal marshes of the Lieutenant River in Old Lyme.

- Lower Connecticut River: The first year of post-construction monitoring at the Lower Connecticut River marshes (Great Island, Upper Island, and Lieutenant River near the confluence with Connecticut River) was completed by researchers from Connecticut College.
- Great Meadows Marsh: A series of ponds and meandering creeks was constructed on a 24.9-acre tidal wetland parcel in Great Meadows Marsh, Stratford, CT. Restoration of this parcel actually began around 1987, when an abandoned tidegate was destroyed by a storm. Gradually, the Phragmites became stunted and sparse as the typical marsh vegetation recolonized the site, and the marsh surface subsided naturally.

Phragmites australis *Control*

In marshes that are diked and drained, the non-native genetic strain (haplotype) of common reed (*Phragmites australis*) can become the dominant plant, in large part due to the reduced concentrations of salt and sulfides that are otherwise toxic for this grass. Phragmites invades these otherwise healthy, natural tidal marshes where the salinity is less than 18 parts per thousand (this includes brackish and tidal fresh marshes). The Connecticut Department of Environmental Protection (CTDEP) is conducting a series of experiments to control Phragmites, including manipulation of the hydromodifications caused by mosquito ditches.

One Phragmites control technique is application of the same herbicide that is used in an over-the-counter, backyard weed herbicide. To date, CTDEP has found that single treatments of glyphosate only are effective for a period of 5 years or so, after which additional treatment is required. Many of the wetlands in the Connecticut River that are being invaded are designated as Wetlands of International Importance. Given the wetlands' ecological significance, CTDEP is making a long-term commitment to Phragmites control there. Because these treatments are not long lasting, the restoration effort is reported here, but the acreage of wetland treated with herbicide is not included in the cumulative wetland restoration statistics.

Evaluation of Restoration Techniques

In contrast to strictly spraying and mowing operations, projects that include significant modifications to marsh hydrology that result in long-term improvements in fish and wildlife habitat and Phragmites reduction are classified as restoration projects. For instance, the large-scale, marsh restoration project on a 96.5-acre section of Great Island and Upper Island (part of the Lower Connecticut River tidal marsh complex), first described in the 2001 *Annual Summary,* was completed in June. Different combinations of treatments (creating ponds, plugging ditches, filling ditches, and herbiciding and mulching) were tested to determine the most effective method(s) for reducing the amount of Phragmites and enhancing fish and wildlife habitat.

The ultimate goal of this project is to restore and enhance nearly 300 acres of degraded marsh habitat to a mixture of brackish meadows interspersed with shallow, open water areas–a condition that approximates the pre-ditched marsh environment. Some of the individual objectives of this work are to:

- stop the spread and significantly reduce the aerial extent of Phragmites;
- restore the vegetation mosaic that characterized these brackish tidelands prior to their invasion by Phragmites; and
- enhance the habitat value of the marsh system for birds, fish, and other wildlife.

For additional information about this project, please read the Lower Connecticut River Marshes restoration summary on pp. 6–9.

Staff from CTDEP's Wetlands Restoration Unit began monitoring the treatment and control sites on Great and Upper Islands immediately after the construction phase was completed. CTDEP and its restoration partners also plan to continue monitoring for several years into the future. Researchers from Connecticut College applied for and were awarded funding in the amount of $21,106 (plus $21,944 in match) through the Long Island Sound License Plate program to continue the post-restoration monitoring into 2003 and 2004. Other future funding sources include the Long Island Sound Study and The Nature Conservancy.

BRONX CEMENT PLANT TIDAL WETLAND RESTORATION

State: New York
Town: Bronx
Habitat Type: Tidal Wetlands
Acres Restored: 0.34

Cause of Degradation: Industrial development of the site previously had left the site filled with debris and large riprap. The urban fill was occupied by mugwort, vines, and *Phragmites australis* (common reed).

Project Description: The debris from the site was cleared and invasives were removed. Clean sandy fill was used to regrade the restoration site and a cellular confinement system was used to aid shore stabilization. *Spartina alterniflora* was planted in the low marsh.

Implementation Partners: New York City Department of Parks and Recreation; Bronx River Alliance; Sustainable South Bronx; Hunts Point Community Development Corporation; Youth Ministries for Peace and Justice.

Funding Provided By: NOAA Restoration Center; New York City Department of Parks and Recreation.

Before (top) and after (bottom) restoration photos of the Bronx Cement Plant tidal wetland restoration site. Photos provided by New York City Department of Parks and Recreation.

LOWER CONNECTICUT RIVER TIDAL WETLAND RESTORATION – GREAT ISLAND and UPPER ISLAND

State: Connecticut
Town: Old Lyme
Habitat Type: Tidal Wetland – brackish marsh
Acres Restored: 96.5

Cause of Degradation: The primary cause of habitat degradation has been the gradual but progressive invasion by the non-native haplotype of common reed (*Phragmites australis*) into these brackish marshes since the 1950's. These marshes were ditched for mosquito control purposes in 1929 and 1930. Ditching caused the loss of surface pools and ponds that are vital to wildlife such as waterfowl, wading birds and shorebirds. Ditching can also lead to reduced soil salinities, which can promote colonization by Phragmites.

The extent of *Phragmites* is displayed in the figure above for 1968 (green) and 1994 (pink).

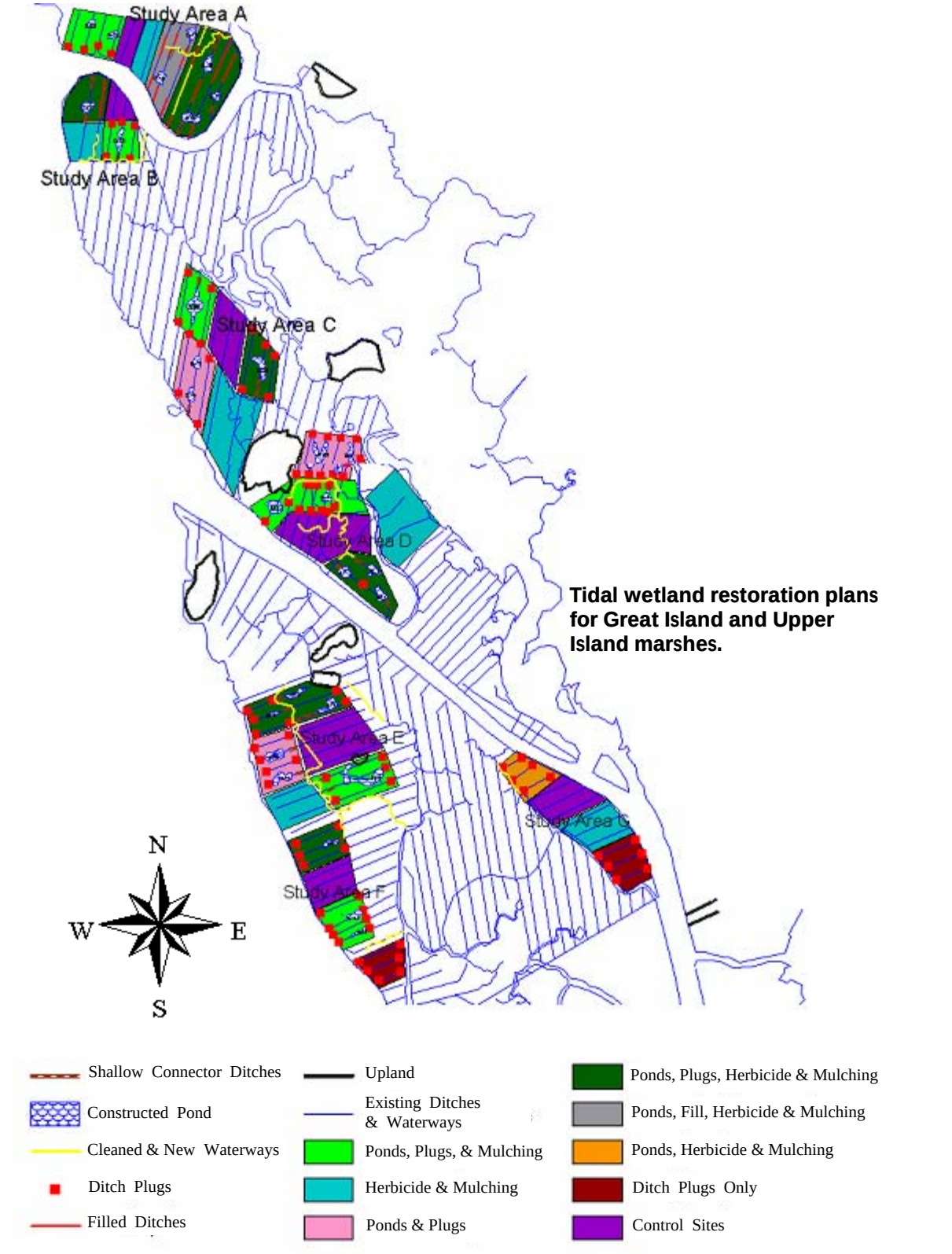
Project Description: Approximately 220 acres were treated with the herbicide glyphosate in late summer. Following a root kill, the dead standing stalks of Phragmites were cut with a mulching mower that greatly reduced the 'bulk' of material and accelerated decomposition. Removal of the above ground biomass reduced shading effects, promoting rapid recolonization by the native vegetation. Vegetation recovery is quickest in the youngest colonies of Phragmites where there is still native 'understory' vegetation. The total project area (Great Island and Upper Island) covers over 575 acres, 220 of which were limited to treatment with herbiciding and mulching dense stands of monoculture Phragmites only (rehabilitation).

Approximately 96.5 additional acres of ditched tidal wetland were treated with a wider array of tidal wetland restoration and enhancement activities (see p. 9). A portion of this site is being restored through a plan to selectively plug strategic ditch segments to restore the hydrology of the marsh–including the restoration of shallow pool/panne habitat. A number of ponds were 'restored' through excavation; the excavated soil in turn, was used to plug ditches. In several locations, an experimental design was used to direct the ebb and flood of flows into the remnants of original meandering creeks. Ditch plugging is being tested along a salinity gradient to determine where it may be possible to check or reverse the spread of Phragmites by increasing soil salinities through evapo-transpiration.

Implementation Partners: Connecticut Department of Environmental Protection - Wildlife Division (lead and construction); Connecticut Audubon Society; Connecticut Waterfowl Association; Connecticut Duck Stamp Program; Ducks Unlimited; Northeast Utilities; U.S. Fish and Wildlife Service - Stewart B. McKinney National Wildlife Refuge; National Oceanic and Atmospheric Administration (NOAA) - Restoration Center; and North American Waterfowl Management Program.

Funding Provided By: Connecticut Audubon Society; The Nature Conservancy; Connecticut Department of Environmental Protection - Long Island Sound Clean-up Account; Connecticut Waterfowl Association; Connecticut Duck Stamp Program; Ducks Unlimited; Northeast Utilities via Ducks Unlimited; NOAA – Direct Solicitation Funds; U.S. Fish and Wildlife Service - North American Wetlands Conservation Act Grant, and Stewart B. McKinney National Wildlife Refuge. Post-construction funds to evaluate restoration techniques were provided by the Long Island Sound License Plate Fund as administered by the CTDEP; by the U.S. Environmental Protection Agency's Long Island Sound Study; and by The Nature Conservancy (Lieutenant River marshes only).

This aerial photo taken in Sept 2002 shows the contrast between ditched and unditched wetlands. Note the abundance of small ponds and meandering creeks on the marsh islands to the east and southeast of Great Island, which is heavily grid-ditched. The narrow strip of marsh on the southeast side of Great Island that contains numerous ponds and creeks is also unditched.



Tidal wetland restoration plans for Great Island and Upper Island marshes.

LEFT: Construction begins for one of the new ponds created in the Lower Connecticut River tidal marsh complex.

ABOVE: View of a created pond just a few seasons after the construction phase has ended.

MILTON HARBOR SALT MARSH RESTORATION and INVASIVE SPECIES CONTROL

State: New York
Town: Rye
Habitat Type: Tidal Wetland
Acres Restored: 2

Cause of Degradation: Invasive species (*Phragmites australis* – common reed) infestation.

Project Description: Restoration of portions of the low marsh of a tidal wetland and installation of a channel to prevent the spread of common reed into largest *Spartina* tidal marsh in Westchester County.

Implementation Partners: Westchester County Department of Planning; Westchester County Soil and Water Conservation District; U.S. Environmental Protection Agency, Region 2; and City of Rye.

Funding Provided By: U.S. Environmental Protection Agency; County of Westchester.

Photos courtesy of Westchester County Department of Planning.

QUINNIPIAC RIVER MARSH RESTORATION

State: Connecticut
Town: North Haven
Habitat Type: Tidal Wetland
Acres Restored: 14.6 acres

Cause of Degradation: The marsh in question is a small remnant of marsh that fortunately was not filled for railroad operations. Mosquito ditches constructed in the early 1900s, however, drain this marsh and cause loss of several critical wetland functions. Ditching drains surface water from the marsh thus eliminating surface pools and ponds (see photographs below) that are vital to wildlife such as waterfowl, shorebirds and wading birds. It also eliminates the pannes of stunted saltmarsh cordgrass (*Spartina alterniflora*) that are critical habitat for the Seaside Sparrow. Although maintenance of mosquito ditches was discontinued in 1984 in Connecticut and ditches gradually are reverting to marsh habitat, these ditches nonetheless continue to drain the marsh. The non-native haplotype of common reed (*Phragmites australis*) has invaded this marsh yet largely is restricted to the upper border, where the soil salinities tend to be less than 18 ppt.

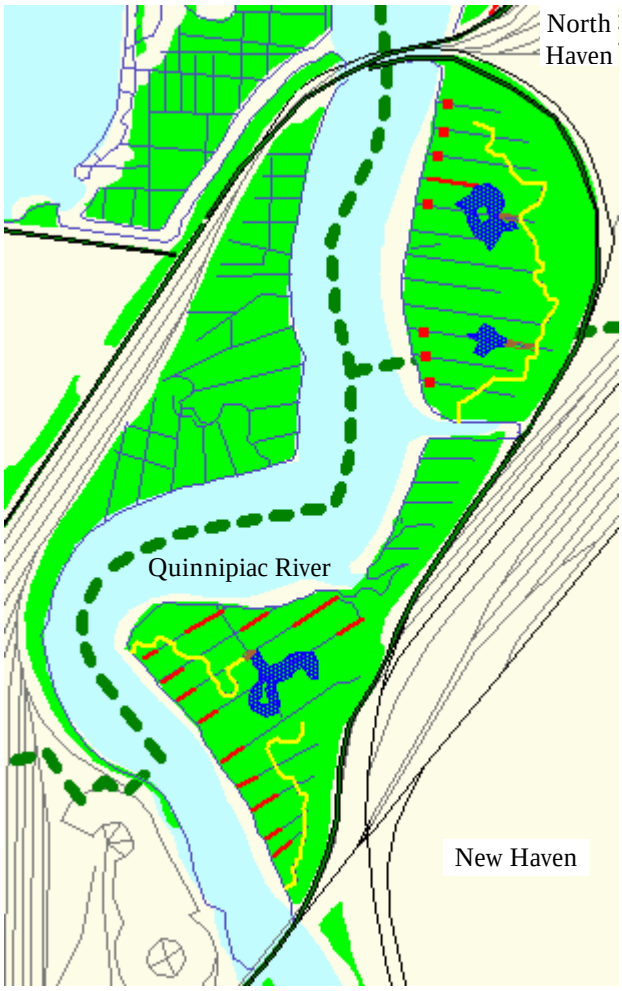
Photographs of a portion of the Quinnipiac River marshes in 1917. The left photo shows the natural marsh with an abundance of shallow pools. The right photo shows the loss of pool habitat following the construction of mosquito ditches.

Project Description: The purpose of this project is to evaluate and reverse the damage to the marsh resulting from ditching by plugging strategic ditches to restore the watertable position. The project is designed to test this procedure by plugging three to four adjacent ditches and leaving ditched areas as a scientific control to evaluate marsh response. To restore pond habitat, small areas of marsh are excavated and the pond soil is then used to create the ditch plugs. Monitoring will be used to gage the success of these experimental techniques as compared to the control areas. A component of the monitoring is to determine if the creation of shallow pools and the subsequent evaporation of freshwater will create elevated soil salinities that may check or reverse the spread of the border colonies of Phragmites. The first 14.6 acres, all of which are located south of the railroad bridge, were completed in 2002.

Implementation Partners: Connecticut Department of Environmental Protection - Wildlife Division.

Funding Provided By: American Environmental Technologies; Connecticut Waterfowl Association; O.F. Mossberg & Sons, Inc.; Marlin Firearms; Campfire Fund; U.S. Fish and Wildlife Service; Connecticut Department of Environmental Protection Supplemental Environmental Project (SEP) funds from oil spill fines.

Above: aerial view of tidal wetlands in the Quinnipiac River.



Left: Tidal wetland restoration plans for a portion of the Quinnipiac River marshes in New Haven, Hamden, and North Haven, Connecticut. Only the lower section was completed in calendar year 2002.

Shallow Connector Ditches
Cleaned & New Waterways
Filled Ditches
Ditch Plugs
Constructed Pond
Railroad/Upland Edge
Existing Ditches & Waterways

STRATFORD GREAT MEADOWS MARSH RESTORATION

State: Connecticut
Town: Stratford
Habitat Type: Tidal Wetland
Acres Restored: 0 acres restored; a 24.9 acre parcel was treated with tidal marsh enhancements

Tidal wetlands at Great Meadows, Stratford, CT.

Cause of Degradation: The southern most (NW to SE trending) dike segment to this marsh is part of the original Great Dike that was constructed in the early 1930s from the blocks of peat excavated from Great Meadows when it was first ditched in 1932. Where the dike crossed major tidal creeks, a frame with wooden tide gates was installed. This sod dike was repeatedly repaired in the 1930s and then the hurricane of 1938 destroyed all of the tide gates. Additional diking (including construction of the eastern segment of dike at the restoration site) was done in association with Bridgeport Harbor dredging beginning in 1948 and then continued in 1952 and 1953. Sediment dredged from the harbor was hydraulically pumped onto the Great Meadows after a perimeter containment dike was constructed including the easternmost dike to the featured restoration marsh.

Beginning in the early 1980s (and completed in 1987), the Corps of Engineers required the dike at this marsh to breach in three locations to restore tidal flow. At first, tidal flow restoration did little to reduce the height or density of the common reed (*Phragmites australis*) in this marsh. Elevation data for this filled marsh was greater than 6.5 feet NGVD, too high to be flooded by even the spring tides. However, by the late 1990s, the reed became stunted and diffuse and high marsh vegetation began to expand. By 2000 surface elevations were less than 6.0 feet NGVD, suggesting the marsh subsided and became subject to tidal inundation.

Project Description: Because of historic filling activities, the marsh lacked tidal creeks and the natural ponds that are characteristic of the nearby unditched portions of Great Meadows. Nine small tidal ponds were restored through excavation and a 4-foot wide tidal creek was constructed to enhance the ebb and flow of the tides. Excavated sediments were disposed on the adjacent uplands. These enhancement activities are classified as adaptive management and represent modifications to the original–yet very basic–plan to restore tidal flow. The 24.9-acre parcel that was modified, as indicated by the asterisk (*) in the image above, does not count toward the Long Island Sound Study's goal of 2000 restored acres of coastal habitats. (See also aerial photographs on pp. 16 and 17.)

Implementation Partners: U.S. Fish and Wildlife Service; Connecticut Department of Environmental Protection - Wildlife Division (construction).

Funding Provided By: U.S. Fish and Wildlife Service Challenge Grant; Connecticut Duck Stamp Program.

Vertical aerial photo of Great Meadows marsh. The restoration site is highlighted in green.

Aerial view of the restoration site looking southwest toward Long Beach, Pleasure Beach and Long Island Sound.

PRYER MANOR MARSH RESTORATION - PHASE I

State: New York
Town: Mamaroneck and New Rochelle
Habitat Type: Tidal Wetland
Acres Restored: 5.25

Cause of Degradation: Historic loss of tidal flooding due to road construction.

Project Description: This project entails the reconnection of Pryer Manor Marsh, a formerly connected tidal wetland, by underground culvert to the Premium River, thereby reintroducing salt water and tides to the 5.25-acre marsh. The project provides for excavation of a tidal creek, contouring of the tide creek sides, regrading of marsh surface, removal of *Phragmites australis* (common reed), and planting of native salt marsh vegetation. During 2002, progress was made on installation of pipe outlets and excavation of the tide creek, and regrading.

Implementation Partners: New York State Department of Environmental Conservation; Town of Mamaroneck; City of New Rochelle.

Funding Provided By: New York State Department of Environmental Conservation; Town of Mamaroneck.

Photo by Sandra Marrafino, National Audubon Society.

RIVERINE MIGRATORY CORRIDOR RESTORATION

The Connecticut Riverine Migratory Corridor (RMC) team, led by the Department of Environmental Protection (CTDEP) Inland Fisheries Division, completed three migratory fish passage projects, resulting in the restoration of access to an additional 8.75 river miles for anadromous species of fish. Fishways were built at Bunnells Pond, Beaver Swamp Brook, and Upper Millpond Dams (project summary pages follow).

New York completed a number of riparian buffer restoration projects, which involved plantings for bank stabilization. New York's portion of the Long Island Sound shoreline presents significantly fewer opportunities for riverine migratory corridor restoration. However, those opportunities that do arise are very important to the overall health of migratory and riverine species, and in the reduction of sediment and nutrients reaching Long Island Sound. Because the projects described are riparian or streambank enhancements, and not specifically geared toward the restoration of historic migratory fish runs, the miles for New York's projects are not included in the totals for riverine migratory corridors. Many of these projects, however, are described in the next section, which focuses on the restoration of Freshwater (non-tidal) Wetlands.

The 10-year goal (1998–2007) for this habitat type is to open up 100 currently inaccessible river miles to diadromous fish. To date, 47.95 river miles have been restored through fish passage projects, such dam modifications or dam removal. River mileage for projects completed in 1998–2002 is presented in **Figure 3**.

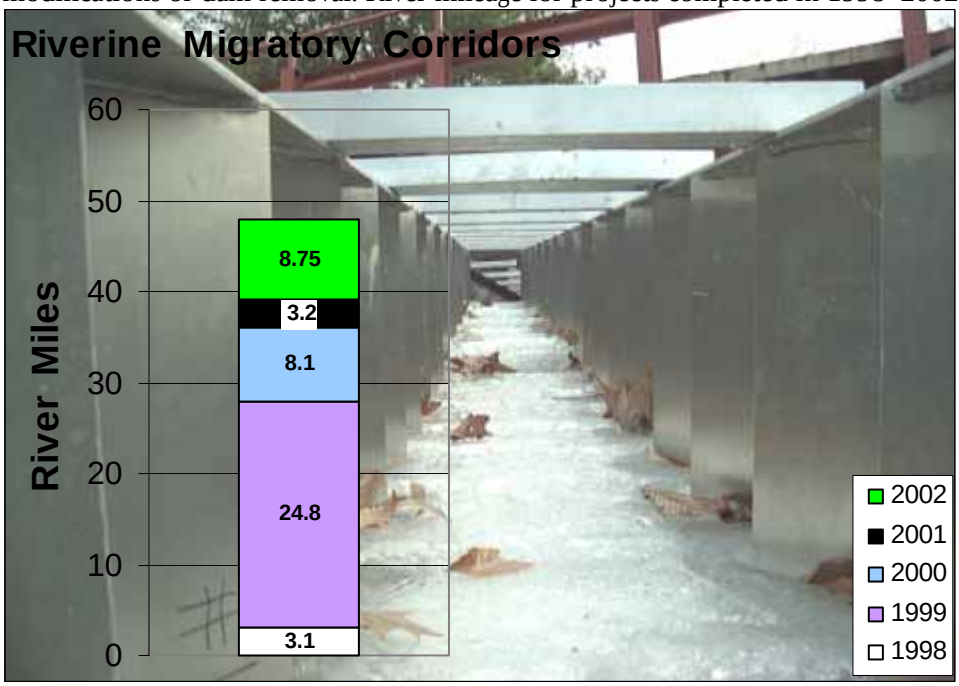


FIGURE 3. Cumulative river mileage (47.95 miles) for RMC projects completed between 1998–2002.

The RMC team also worked on 28 other projects that were in various stages of development. Highlights of progress include:

- Jordan Millpond Dam: A Certificate of Permission was obtained from the CTDEP's Office of Long Island Sound Programs, approving the construction of a steeppass fishway on Jordan Brook, Waterford, CT.
- Hanover Pond Dam: Final design was completed and approved on a Denil Fishway to be built as part of the complete reconstruction of the dam on the Quinnipiac River in Meriden, CT.
- Vinton's Millpond Dam: The fishway proposed for this dam on Podunk River, South Windsor, CT, had to be cancelled because of the large number of beaver dams causing obstruction to migratory fish downstream of the restoration site.

BUNNELLS POND DAM FISHWAY

State: Connecticut
Town: Bridgeport
Habitat Type: Riverine Migratory Corridor
Stream Name: Pequonnock River
Miles Restored: 7.4

Cause of Degradation: Construction of a dam that impedes fish passage on the Pequonnock River, Bridgeport, CT.

Project Description: An eleven-unit steeppass fishway was constructed along the east bank spillway abutment, extending from a notch in the spillway down to a pool below with a grouted rip-rap apron at the base of steeppass. The slope is 1 on 5 and the entire fishway is covered with grating that doubles as a walkway for authorized workers. The steeppass has a concrete entrance pool and four resting pools. There also is a Delaware-style eelpass adjacent to the steeppass.

Targeted Fish Species: Alewife, blueback herring, sea-run brown trout, American eel.

Implementation Partners: Connecticut Department of Environmental Protection - Inland Water Resources Division (lead); CTDEP - Inland Fisheries Division.

Funding Provided By: Connecticut Department of Environmental Protection – Inland Water Resources Division.

Bunnell's Pond Dam and newly installed fishway.

BEAVER SWAMP BROOK DAM FISHWAY

State: Connecticut
Town: East Lyme
Habitat Type: Riverine Migratory Corridor
Stream Name: Beaver Swamp Brook
Miles Restored: 0.6

Cause of Degradation: A 4-foot tall dam in Beaver Swamp Brook is a barrier to fish passage.

Project Description: Construct a two-unit steeppass fishway to restore fish passage, especially for alewife. Beaver Swamp is a tributary of Brides Brook and Brides Lake, to which alewives already have access. The dam and fishway are located within the premises of the Janet York Correctional Institution in East Lyme and about 4 miles from Long Island Sound. The pond created by this dam is shallow, eutrophic and excellent spawning habitat.

The two units of steeppass fishways are bolted to a pre-cast concrete entrance pool and the downstream face of a new concrete spillway. There are no resting pools. This fishway was a condition of an emergency permit issued by the DEP for the Dept. of Corrections to repair a failing dam on the grounds of the prison.

Targeted Fish Species: Alewife

Implementation Partners: Connecticut Department of Corrections (lead); Connecticut Department of Environmental Protection – Inland Fisheries Division.

Funding Provided By: Connecticut Department of Corrections (dam owner).

Beaver Swamp Brook Dam and newly installed fishway.

UPPER MILLPOND DAM FISHWAY

State: Connecticut
Town: Old Lyme
Habitat Type: Riverine Migratory Corridor
Stream Name: Mill Brook
Miles Restored: 0.75

Cause of Degradation: Construction of a barrier dam in the brook is an impediment to fish passage.

Project Description: A straight, four-unit steeppass fishway was installed on the north bank of Mill Brook, downstream of the dam. A concrete exit pool was installed across the earthen dam. A concrete entrance pool downstream of a rock berm that guides fish to the entrance is at the bottom. This fishway is on private land and not open to the public.

Construction of the fishway on Upper Millpond Dam.

Targeted Fish Species: Alewife, sea-run brown trout.

Implementation Partners: Connecticut River Watershed Council (lead); Old Lyme Conservation Trust; Connecticut Department of Environmental Protection - Inland Fisheries Division.

Funding Provided By: Natural Resources Conservation Service - Wildlife Habitat Incentives Program (WHIP); Pfizer Corp.; Old Lyme Conservation Trust; Connecticut Department of Environmental Protection – Connecticut River Supplemental Environmental Project (SEP) funds.

FRESHWATER WETLAND RESTORATION (NON-TIDAL)

The term 'freshwater wetlands' is used collectively to describe the diverse range of non-saline (and non-tidally influenced) ponds, bogs, fens, swamps, and marshes found in the world. The U.S. Fish and Wildlife Service wetland classification system created by Cowardin et al. (1979)[1] categorizes freshwater wetlands in the United States as palustrine, lacustrine, or riverine systems. The classification system also addresses deep-water habitats where the substrate is predominantly non-soil and flooding is permanent, but those types of wetlands generally are not included in the Long Island Sound Study Habitat Restoration Initiative.

Palustrine Systems

Palustrine wetland systems are defined by Cowardin et al. (1979) as non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens; or they may be non-vegetated, shallow water areas (less than six feet deep) with no wave formed or exposed bedrock shoreline features. To be considered palustrine, these non-vegetated areas must be less than 20 acres in size.

Lacustrine Systems

Lacustrine wetlands are wetlands and deep water habitats situated in a topographical depression or dammed river channel; lacking trees, shrubs, persistent emergent vegetation[2], emergent mosses or lichens with greater than thirty percent areal coverage; and with a total area larger than 20 acres. Certain wetlands smaller than 20 acres may be classified as lacustrine if there are active wave-formed or bedrock shoreline features making up all or part of the boundary, or if the deepest part of the basin exceeds 6.6 feet at low water (Cowardin *et al.*, 1979). Although lacustrine wetlands do occur within the project boundary in Westchester County, NY, and in Connecticut, for the purposes of this initiative, restoration will focus on the shorelines of these bodies of water where the classification shifts to palustrine.

Riverine Systems

Riverine communities are defined by Cowardin et al. (1979) as "all wetlands and deep-water habitats contained within a channel" except those that are dominated by persistent emergent vegetation, trees or shrubs (palustrine), or have more than 0.5 ppt ocean-derived salinity (estuarine, marine). Community types are classified by the rate of water flow, which, in turn, dictates the substrate composition and faunal and vegetation types present. Although the Cowardin et al. system also includes tidally influenced, freshwater, non-persistent emergent riverbank vegetation, such as wild rice, all tidally influenced wetland restoration sites were included in the Tidal Wetlands Restoration chapter of this report

Restoration Objectives

The major cause of wetland degradation is hydrological alteration, which may be caused by a number of activities, such as draining, filling, and impounding. In the past, surface water supplies to wetlands have been diverted for drinking water reservoirs, flood control projects, cooling of industrial plants, and irrigation of crops. Other degradation may be caused by chemical inputs to wetlands, or invasion by exotic species. Although degradation is caused by unique combinations of circumstances in each affected wetland, some general causes and restoration methods can be outlined. These methods include fill removal, invasive species control, relocation of excessive runoff, and other hydrological modifications.

[1] Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* U.S. Fish and Wildlife Service, FWS/OBJ.79/31. Washington, DC 103 pp.

[2] Persistent emergent plants are those that leave all or a visible portion of their foliage above the saturation zone or water surface during the dormant season. Conversely, non-persistent emergents are those plants that leave no portion of their foliage visible during the dormant season.

In New York, four freshwater wetland restoration projects were completed during 2002, for a total of 11.78 acres restored:

- Baxter Estates, North Hempstead, NY 4.28 acres
- Beaver Swamp Brook, Harrison, NY 2.0 acres
- Seton Falls, Bronx, NY 1.5 acres
- Twin Ballfields - Forest Park, Queens, NY 4.0 acres

11.78 acres of freshwater wetland restored

Several other projects were in various stages of development.

No freshwater wetland restoration projects were completed in Connecticut. The State of Connecticut currently has no program dedicated specifically to the restoration of freshwater (non-tidal) wetlands.

BAXTER ESTATES POND FRESHWATER WETLAND RESTORATION

State: New York
Town: Baxter Estates
Habitat Type: Freshwater Wetland
Acres Restored: 4.28 acres

Cause of Degradation: Erosion, stormwater/enhancement project

Project Description: Installation of a vegetated aquatic bench and shoreline filter strip, and limited excavation of sediment following construction of a permanent sedimentation basin to prevent further siltation of the pond.

Implementation Partners: Nassau County Department of Public Works; New York State Department of Environmental Conservation.

Funding Provided By: Federal, New York State, and Nassau County governments.

BEAVER SWAMP BROOK FRESHWATER WETLAND RESTORATION

State: New York
Town: Harrison
Habitat Type: Freshwater Wetland
Acres Restored: 2 acres

Cause of Degradation: Stormwater runoff, invasive species, area used as junkyard.

Project Description: First, a dense stand of common reed (*Phragmites australis*) and junk that included car parts and steel drums were removed. Then Westchester County transplanted thousands of native plants of more than two-dozen species that included sedges, rushes, and wildflowers, as well as *Viburnum* spp., ash, and sycamore trees. Heron roosts and swales for breeding turtles were also installed, along with a subsurface structure in the stream channel to reduce bank erosion. The plants provide habitat for fish and wildlife, and help filter out pollutants and excess nutrients before they enter Long Island Sound.

Implementation Partners: New York State Department of Environmental Conservation; Westchester County Department of Planning; Town of Harrison; City of Rye.

Funding Provided By: Federal, NY State, and Westchester County governments.

Photo courtesy of Westchester County Planning Department.

SETON FALLS PARK

State: New York
Town: Bronx
Habitat Type: Freshwater Wetland
Acres Restored: 1.5 acres

Cause of Degradation: Sedimentation of the pond *Phragmites australis* (common reed) domination.

Project Description: Phragmites and over 3,000 cubic yards of fill were removed from the site. The site then was regraded. A small weir was installed to control water levels for successful plantings. Various native wetland plants were planted at the site by staff and volunteers, including three-square rush (*Scirpus americanus*), pickerelweed (*Pontedaria cordata*), and crinkled sedge (*Carex critina*).

Implementation Partners: New York City Department of Parks and Recreation - Natural Resources Group; Seton Falls Park Preservation Coalition; Wave Hill Forest Project.

Funding Provided By: New York State Department of Environmental Conservation and City of New York.

The top photo shows the pre-restoration landscape dominated by Phragmites. The bottom photo shows the site after regrading and planting with native species. Photos Provided by New York City Department of Parks and Recreation.

TWIN BALLFIELDS, FOREST PARK

State: New York
Town: Queens
Habitat Type: Freshwater Wetland
Acres Restored: 4 acres

Cause of Degradation: The kettle pond was filled in 1966 to build two ballfields, but the natural hydrology of the land caused the fields to be unusable.

Project Description: The fill was removed from the site, and the area was re-contoured to rebuild the kettle pond. The shoreline of the pond was stabilized, and shallow and emergent plantings were done at the restoration site.

Implementation Partners: New York City Department of Parks and Recreation, New York State Department of State Division of Coastal Resources, and New York State Department of Environmental Conservation.

Funding Provided By: New York State Department of Environmental Conservation and City of New York.

Unfortunately, photographs of this site and details regarding the specific causes of degradation were unavailable at the time of publication.

COASTAL FOREST RESTORATION

At this time, the Habitat Restoration Manual does not include a finalized chapter to summarize the key elements of coastal forest restoration. A draft chapter currently is in the early stages of development, however.

In New York, one coastal forest restoration project was completed during 2002, for a total of 2 acres restored. Several other projects were in various stages of development.

- Twin Ballfields - Forest Park, Queens, NY 2.0 acres of coastal forest

No coastal forest restoration projects were completed in Connecticut. The State of Connecticut currently has no program dedicated specifically to the restoration of coastal forest habitat.

The State of New York also purchased 3.1 acres of forested coastal upland adjacent to Glenville Lake in New Rochelle and 21.7 acres of forested coastal upland abutting Sunken Meadow State Park in Smithtown, thereby protecting 24.8 acres of habitat from future degradation or development. Since habitat at these sites was protected yet not restored, the acreage from the Glenville Lake and Sunken Meadow State Park (formerly the "Gouldstone Property") acquisitions cannot be contributed toward the Long Island Sound Study goal of 2000 acres. Funding for the acquisition of the Gouldstone Property was provided by New York State; funding for the acquisition of the Glenville Lake property was provided by a combination of federal, State, and Westchester County governments.

TWIN BALLFIELDS, FOREST PARK

State: New York
Town: Queens
Habitat Type: Coastal Forest
Acres Restored: 2 acres

Unfortunately, photographs of the upland portion of this site and details regarding the specific causes of degradation were not available at the time of publication.

Cause of Degradation:

Project Description: Re-forestation of two acres of coastal forest in the surrounding watershed.

Implementation Partners: New York City Department of Parks and Recreation, New York State Department of State Division of Coastal Resources, and New York State Department of Environmental Conservation.

Funding Provided By: New York State Department of Environmental Conservation and City of New York.

COASTAL GRASSLAND RESTORATION

Coastal grasslands are an exceedingly rare habitat type in the Long Island Sound watershed. Few opportunities exist to restore these habitats, which support a number of rare and endangered plant and animal species. The grassland community types that are the focus of the Long Island Sound Study Habitat Restoration Initiative are those that occur on the rolling glacial outwash plains of Connecticut and Long Island. These areas are characterized by extremely well drained, nutrient-poor, sandy soils. Four grassland community types occur in the vicinity of Long Island Sound and are described below.

Maritime Grasslands

Maritime grasslands are found within the coastal zone and are influenced directly by spray from the ocean and strong onshore winds. This community differs from the dune grass communities in that the landscape is more gently rolling and the substrate is more stable. Nonetheless, the soils are characteristically sandy or gravelly and very well drained. The vegetation of the maritime grassland community is dominated by grasses, such as little bluestem (*Schizachyrium scoparius*), common hairgrass (*Deschampsia flexuosa*), and poverty grass (*Danthonia spicata*).

Sand Plain Grasslands

Sand plain grassland communities are found on outwash plain soils, ranging from medium-grained sand to coarse gravel. The characteristic plant species display xerophytic tendencies due to the extremely rapid drainage characteristics of the soil. Like the maritime grasslands, the dominant grass species on sand plains is little bluestem, but this community is characterized by higher elevations and little to no salt spray influence.

Hempstead Plains

The Hempstead Plains has been described as the only true prairie east of the Allegheny Mountains. It is dominated by grasses such as little bluestem and switchgrass (*Panicum virgatum*). The plant diversity of the Hempstead Plains is well documented. Seasonal dominants include many wildflowers. In 1968, a survey of the vegetation in a preserved plot at Mitchell Field Park identified 147 species of wildflowers, 27 species of shrubs and vines, and 13 species of grasses (Neidich, Carol. 1984. The Hempstead Plains and the birdfoot violet. Long Island Forum. Vol. 43, No. 6:108-115).

Old Field Grasslands

Old field successional grasslands, otherwise referred to as post-agricultural or ruderal grasslands, are found on abandoned farm and pasture lands. Frequently these lands were converted from forest cover to cropland or grazing area. Once active agriculture or grazing ceases on a plot, nearby grasses and forbs quickly colonize it. Bluegrasses (*Poa sp.*), goldenrods (*Solidago sp.*), New England aster (*Aster novae-angliae*), and quackgrass (*Agropyron repens*) are some characteristic herbs. Shrubs and trees such as the silky dogwood (*Cornus amomum*) and eastern red cedar (*Juniperus virginiana*) also may be present in small patches.

Restoration Objectives

Coastal grasslands are the most rare of the 12 habitat types chosen as priorities by the Habitat Restoration Workgroup. Any and all opportunities to restore areas of grassland should be taken. It is useful to remember that some of the important functions of grasslands as habitat for birds and other animal species require a minimum parcel size of as much as 50 acres. It may be necessary to acquire additional land to be able to restore large tracts of grasslands or to use managed areas such as airports and industrial parks to act as surrogates for open grassland areas. There are other areas of public land where large lawn areas can be managed for warm season grasses. Fields at several New York City parks in Queens and the Bronx are being restored and managed for warm season grasses in the midst of a densely populated urban area. Any parkland with unused or passive fields can be adapted to grassland management.

In New York, one coastal grassland restoration project was completed during 2002, resulting in the restoration of 5 acres:

- Edith G. Read Natural Park, Rye, NY 5.0 acres of coastal grassland restoration

Several other projects were in various stages of development

No coastal grassland restoration projects were completed in Connecticut. The State of Connecticut currently has no program dedicated specifically to the restoration of coastal grassland habitats.

EDITH G. READ NATURAL PARK & WILDLIFE SANCTUARY UPLAND MEADOW RESTORATION

State: New York
Town: Rye
Habitat Type: Coastal Upland Meadow
Acres Restored: 5

Cause of Degradation: An abandoned plant nursery for nearby Playland Park had evolved into an upland meadow. Eventually, the non-native and invasive porcelain berry vine (*Ampelopsis brevipedunculata*) overtook the meadow. Other exotic and invasive plants also became established, including Japanese knotweed (*Polygonum cuspidatum*), mutiflora rose (*Rosa multiflora*) and common reed (*Phragmites australis*). Before long, the porcelain berry had smothered just about every other plant in the meadow, including several nearby trees.

Project Description: The goal of the restoration was to provide habitat for wildlife, including butterflies, and to filter out pollutants from stormwater runoff. The invasive weeds were first cut and removed by machine, then sprayed with a systemic herbicide when they re-emerged. The restored meadow was replanted with native grasses and wildflowers.

Implementation Partners: New York State Department of Environmental Conservation; Westchester County Departments of Planning.

Funding Provided By: Federal, NY State, and Westchester County governments.

Photo courtesy of Westchester County Planning Department.

SUBMERGED AQUATIC VEGETATION (SAV)

Eelgrass

In 2001, Connecticut Department of Environmental Protection (CTDEP) was awarded a grant by the Long Island Sound Study to re-map eelgrass *(Zostera marina)* in eastern Long Island and Fishers Island Sounds in New York and Connecticut. The CTDEP used those funds to contract with the National Wetlands Inventory Program of the U.S. Fish and Wildlife Service to (a) acquire low-altitude aerial photography, (b) perform photointerpretation of eelgrass beds, and (c) ground-truth those areas interpreted as possible eelgrass beds. Aerial photography was conducted in mid-June, 2002. The results of this survey were compared with mapping of eelgrass that was done during 1993 and 1994 to identify trends (gains/losses) in Long Island Sound eelgrass beds, and potentially identify future restoration opportunities. A Geographical Information Systems (GIS) project with a final summary report for this survey will be created and made available next year.

The SAV restoration team has not yet begun implementing restoration projects. The current data are insufficient to show that water quality is adequate to sustain new eelgrass beds. There are too many examples of failed projects from other states where planting was done without an adequate understanding of eelgrass' water quality requirements.

Water Chestnut Removal

Restoration of the Hockanum, Connecticut, and Podunk Rivers

CTDEP completed a fourth year of control efforts for the highly invasive aquatic plant, water chestnut (*Trapa natans*). Water chestnut was first documented in Connecticut in 1999 when it was discovered in Keeney Cove, a freshwater tidal cove of the Connecticut River in Glastonbury. Infestations in the Hockanum River and Podunk River were first treated in 2000. Although these infested sites are well outside the LISS Project area, there is a real possibility that the weed could spread to the tidal coves of the lower Connecticut River.

The trend of diminishing populations of water chestnut continued through the 2002 growing season. Numbers were down, once again, in the Hockanum River and Keeney Cove sites, and no plants were reported in Vinton's Millpond. Removal of the water chestnut plants before their seeds mature and drop is proving to be a very effective means of controlling this non-native invasive aquatic weed. Water chestnut is an annual that spreads only by seed dispersal, it is possible, however, for a floating rosette to break free of its stem, continue to grow and develop seeds that will drop off wherever the currents happen to carry it.

The use of a mechanical harvester was needed to help remove the bulk of the water chestnut infestation from the Hockanum River in 2000 and 2001. Aggressive removal efforts during these first two years of harvesting reduced the infestation to one that was manageable using only hand-harvesting after only two years.

Efforts in 2000 yielded an estimated 50 tons (wet weight) of plant material removed mostly from the Hockanum River in East Hartford (above). Last year the total harvest amounted to only 4.25 tons (a 91% decrease in the biomass of plants), with a slight decrease harvested again this year. Below, the same stretch of the Hockanum River after the removal of water chestnut.

Water Chestnut Expansion

Two new infestations of water chestnut were noted this year. Approximately 2000 lbs of the aquatic weed were removed from a short stretch of the Trout Brook in West Hartford, between the Boulevard and Farmington Avenue. The other infestation is toward the northern end of Bantam Lake in the Morris / Litchfield area of CT. Details about the extent of the infestation and biomass of water chestnut removed are unknown. Control efforts are being coordinated by the Bantam Lake Protective Association.