LONG ISLAND SOUND HABITAT RESTORATION INITIATIVE

SECTION 4: COASTAL GRASSLANDS

Technical Support for Coastal Habitat Restoration

NOVEMBER 2003

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DESCRIPTION

The grassland communities described in this chapter occur on the rolling glacial outwash plains of Connecticut and Long Island. These areas are extremely well drained, nutrient-poor, sandy soils. Three 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. However, the soils are still characteristically sandy or gravelly and very well drained. The vegetation of the maritime grassland community is dominated by grasses like little bluestem (*Schizachyrium scoparius*) (**Figure 4-1**), common hairgrass (*Deschampsia flexuosa*), and poverty grass (*Danthonia spicata*). Other characteristic species include Atlantic golden aster (*Pityopsis falcata*), the New York State threatened bushy rockrose (*Helianthemum dumosum*), Pennsylvania sedge (*Carex pensylvanica*), and Indian grass (*Sorghastrum nutans*).

Figure 4.1. *Newly Seeded Little Bluestem*

Newly seeded little bluestem,* Schizachyrium scoparius*, after three months' growth at Orient Point County Park, NY

Maritime grasslands often occur in a mosaic-like distribution interspersed with maritime heath lands. These heath areas will have populations of dwarf shrubs like bearberry (*Arctostaphylos uva-ursi*), beach plum (*Prunus maritima*), beach heather (*Hudsonia tomentosa*), bayberry (*Myrica pensylvanica*), and black huckleberry (*Gaylussacia baccata*). Although there are grasses and forbs present in the heath land patches, they compose less than 50 percent of the ground cover and do not form a turf (Reschke, 1990).

The most extensive maritime grasslands and heathlands in New York currently occur outside of the project area in the Montauk Downs and Shinnecock Hills areas of the south fork of Long Island. Taylor (1923) describes the dominant vegetation species at the Montauk Downs as being little bluestem, Greens' rush (*Juncus greenei*), common hairgrass, Indian grass, toothed white-topped aster (*Aster paternus* [*Sericocarpus asteroides*]), plantain-pussytoes (*Antennaira plantaginifolia*), and sand-plain agalinis or sandplain gerardia (*Agalinis acuta*). Additional small patches of maritime grassland can be found along the Connecticut coast such as the restoration project completed by the Connecticut Department of Environmental Protection at Nott Island.

SAND PLAINS

Sand plain grassland communities are found on outwash plain soils ranging from medium-grained sand to coarse gravel. There are reports of the water table being just a few inches below the soil surface in some places in the New Haven area sand plains (Britton, 1903). 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. There is often a habitat mosaic found in the sand plain areas of Connecticut with bare ground, lichens (*Cladonia spp.*), and grass cover interspersed with black oaks (*Quercus velutina*) and pitch pines (*Pinus rigida*).

Olmstead (1937) described three distinct zones of vegetational dominance in the Quinnipiac sand plains. There are areas of "savanna" where the soil is almost completely covered by little bluestem grass, lichens, and other non-woody vegetation. There may be scattered trees and shrubs present in the midst of these grassy stretches. Other areas are dominated by woody scrub vegetation or forest. Dominant trees include pitch pine, black oak, grey birch (*Betula populifolia*), and eastern red cedar (*Juniperus virginiana).* Areas dominated by forest cover are often devoid of ground cover vegetation, resulting in bare soil between the tree trunks. A third zone is characterized by the lack of plant cover altogether and are designated as barrens. Olmstead (*op. cit.*) speculated that the barren areas may represent localized disturbance due to human farming activities like plowing and animal grazing. The pre-disturbance climax community was most likely a tall grass savannah with scattered oaks.

In addition to floristic attributes, Olmstead (*op. cit.*) described three distinct soil "habitats" based on observations of disturbed soil profiles in areas that had been farmed in the past and were then abandoned. Type 1 is characterized by relatively undisturbed soil profiles. Type 2 consists of areas where the "A" horizon of the soil is entirely removed and at least some of the "B" horizon is likewise eroded. Type 3 is characterized by intact "A" and "B" horizons and additional sand deposition at the surface in ridges and hummocks of varying depth.

Further, Olmstead (*op. cit.*) described distinct species communities occurring in specific zones of the soil habitats. In Type 3 habitats, orange grass (*Hypericum gentianoides)* is found chiefly on the windward slope of wind formed ridges and hummocks of the "A" horizon. It grows interspersed with sand rush, (*Bulbostylis* [*Stenophyllus*] *capillaris*). These species are then invaded by little bluestem and lichens.

In Type 2 habitats, blue curls (*Trichostema dichotomum*), an annual weedy species, and little bluestem are prevalent. These are important pioneering species, since all the humus in these sand plains is contained in the "A" horizon. The "B" horizon is largely devoid of nutrients to sustain plant growth.

A similar type of sand plain habitat occurred on an estate encompassing High Hill in Huntington, N.Y. The description of the site (Blizzard, 1931) is similar to the descriptions of the Connecticut sand plains. The dominant grass was little bluestem occurring in clumps separated by exposed patches of sand and gravel. The spaces between clumps of little bluestem contained lichens (*Cladonia* spp.) and mosses. Blizzard particularly noted the lack of diversity in this grassland as compared with the nearby Hempstead Plains, especially the absence of false indigo (*Baptisia tinctoria*) and wildflowers.

Conard (1923) noted a similar successional assemblage of plants on the disturbed right-of way along the Cold Spring Harbor line of the Long Island Rail Road. The disturbed areas displayed more invasion by non-native plants than seen in the Connecticut or High Hill communities, mainly along the border of developed and cultivated neighboring properties. A dominance of little bluestem was noted in flat areas and those areas with gravel soils.

HEMPSTEAD PLAINS

The Hempstead Plains have been described as the only true prairies east of the Allegheny Mountains. They are dominated by grasses like little bluestem and switchgrass (*Panicum virgatum*). Seasonal dominants include many wildflowers. May blossoms are dominated by several species of violets (*Viola lineariloba, V. pedata*, *V. fimbriatula*). Summer flowers included false indigo and unicorn root (*Aletris farinosa*) in June; yellow-fringed

orchis (*Habenaria ciliaris*) in July; and various asters (*Aster linariifolius, A. ericoides, A. multiflorus*) and goldenrod (*Solidago tenuifolia*) in August (Conard, 1935).

The plant diversity of the Hempstead Plains is well documented. As late as 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, 1984). The Hempstead Plains community is a mature and stable community rather than an intermediate stage between bare ground and forest cover. It is theorized that the thick turf formed by the dense root system of *Andropogon* species of grasses, in combination with fires, have prevented succession to a forest cover on these plains. Olmstead (1937) drew similar conclusions about the sandplain communities of Connecticut.

OLD FIELD GRASSLANDS

Old field successional grasslands, otherwise referred to as post-agricultural or ruderal grasslands, are found on abandoned farm and pasture lands (**Figure 4-2**). 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 like the silky dogwood (*Cornus amomum*) and eastern red cedar (*Juniperus virginiana*) may also be present in small patches (Reschke, 1990). In contrast to the Hempstead Plains community, these grasslands will succeed to forest and shrub cover relatively quickly if not managed. As with many disturbed habitats they are also quite susceptible to invasion by non-native species. While old field habitats are not, strictly speaking, native habitats, they represent an excellent opportunity for grassland management and may be used as surrogate habitat by grassland dependent species.

Figure 4-2. Farm Field with Common Reed, Shrubs, and Invasive Vines

An abandoned farm field has become overgrown with common reed (*Phragmites australis*), shrubs, and invasive vines.

VALUES AND FUNCTIONS

Grassland habitat is the home of many bird species like the grasshopper sparrow (*Ammodramus savannarum*)▪◆, Eastern meadowlark (*Sternella magna*), Northern harrier (*Circus cyaneus*)●▪◆, upland sandpiper (*Bartramia longicauda*)◆, and savannah sparrow (*Passerculus gramineus*)◆, which nest, breed, and forage there. Raptor species like the American kestrel (**Figure 4-3**) (*Falco sparverius*), rough-legged hawk (*Buteo logopus*), red-tailed hawk (*Buteo jamaicensis*), common barn owl (*Tyto alba*)◆, and the bobolink (*Dolichonyx oryzivorus*) depend on grasslands for feeding.

Figure 4-3. Juvenile American Kestrels in Nest Box

Photo by Bob Parris, USFWS

● Denotes federally protected species including federally endangered or threatened.
▪ Denotes state protected species including endangered, threatened, or of special concern in New York.
◆ Denotes state protected species including endangered, threatened, or of special concern in Connecticut.

Raptors use their keen eyesight and hearing to locate prey found in grasslands. Rodents like the meadow vole (*Mictrotus pennsylvanicus*), deer mouse (*Peromyscus maniculatus*), white-footed mouse (*P. leucopus*), and the nocturnal meadow jumping mouse (*Zapus hudsonius*) are principal components of the raptors' diets and are abundant in the open grassland areas. The raptors also feed on the Eastern cottontail rabbit (*Sylvilagus floridanus*), which once browsed in the little bluestem-dominated areas of the Hempstead plains. Due to their heavy dependance on visual cues in hunting, the American kestrel and Northern harrier must hunt in areas mostly free of dense woody vegetation. Other raptors like the short-eared owl (*Asio flammeus*)◆ and hawks use open coastal grasslands as overwintering habitat.

Natural Heritage Program priority vertebrate species associated with northeastern United States grasslands include the big brown bat (*Eptesicus fuscus*), spadefoot toad (*Scaphiopus holbrooki*) ■◆, and eastern hognose snake (*Heterodon platyrhinos*) ■◆. Federally-endangered invertebrate species dependant on grasslands as their primary habitat include butterflies like the regal fritillary (*Speyeria idalia*)●◆ and the American burying beetle (*Nicrophorus americanus*)●◆.

One important feature of the grasslands described above is that they are able to withstand periods of drought that severely stress other plant communities. The vegetation found in Hempstead Plains and Sand Plain grasslands grow extensive root systems that comprise up to two-thirds of their biomass. The massive root system is extremely efficient in absorption and utilization of water. This ensures that even during the driest summers or periods of fire, the deep and wide reaching root system of the grasslands is able to survive until the following growing season. This fact plays an important role in soil conservation. Olmstead (1937) discusses the effect of plowing some areas of the Quinnipiac sand plains:

> "An effect much more harmful to reestablishment of the natural vegetation than soil depletion was the actual soil destruction, which occurred on many of the areas soon after plowing. The loose sand...must have been subject to wind erosion almost as soon as the original vegetation was destroyed."

He goes on to describe historical accounts of vast depressions created by wind scour over denuded areas of the sand plains.

Several state- and federally-endangered plant species are found only in grasslands. One of these is sand-plain agalinis. In New York this flowering annual is only known to exist in two sites in Suffolk County. A 1950 edition of Gray's Manual of Botany describes sand-plain agalinis as only occurring at Cape Cod, Massachusetts, western Long Island, Providence County, Rhode Island, and Hartford County, Connecticut. This is truly a plant of specialized habitat that is unlikely to reestablish in any great quantity without human intervention. Sand-plain agalinis and the previously mentioned bushy rockrose are two of 14 plant species listed as rare by the New York Natural Heritage Program supported by Hempstead Plains grassland communities. The U.S. Fish and Wildlife Service is currently managing remnant populations of sand-plain agalinis on Long Island. It is hoped that the plant may be reintroduced to additional sites in the future.

STATUS AND TRENDS

Hicks (1892) quotes accounts from the diaries of colonial settlers of the Native American tribes using grasslands as hunting grounds and maintaining them by deliberately setting fires to remove woody vegetation. The colonists later maintained the grasslands as common pasturage for livestock. During the late 19th century the Long Island Rail Road continued to burn the remaining Hempstead Plains to maintain the fields' value for livestock and farming while maintaining rail line rights-of-way (Hicks, 1892).

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◆ Denotes state protected species including endangered, threatened, or of special concern in Connecticut.

Maritime grasslands are not found within the boundaries of this project on Long Island, Bronx, Queens, or Westchester Counties. The North Fork area of Long Island is the most likely area for them to have occurred, but farming has remained the predominant land use in that area since the late 17th century, and such activities would have destroyed the natural plant community and soil profile. Suitable soil and atmospheric conditions exist along the flatter areas near Southold to have supported maritime grasslands and likely could do so again. The North Fork area is in a continuous line of Wisconsin glacial moraine deposits which include Nantucket, Block Island, Martha's Vineyard, and the Elizabeth Islands. These areas along with Cape Cod, southern Rhode Island and southeastern Connecticut are part of the same biogeographic region which support similar characteristic grassland communities. The islands of Nantucket and Martha's Vineyard, and Block Island are still known to support maritime grassland communities.

In Connecticut, sand plain communities are nearly extirpated. In his description of the North Haven sand plains, Britton (1903) writes that "A large portion of this land has been improved..." but no estimate of the original extent of these sand plains is made other than the two small specific plots he studied. Those two plots encompassed roughly 120 acres according to Britton's estimates. Olmstead (1937) investigated the same areas cited by Britton, as well as additional areas nearby. His description of the entire sand plain area reads, "One of the most noteworthy of these terraces extends along the east side of the Quinnipiac River in the towns of North Haven and Wallingford, for a distance of 15 to 16 miles, between New Haven and Meriden, Connecticut, with and average width of 1 to 1½ miles." Using this description of the then current extent of the Quinnipiac sand plains, the area of sand plain habitat can be crudely calculated at 15,360 acres. The description of these plains in Olmstead, Britton, and Nichols (1914) all describe a tract to the east of the Quinnipiac between New Haven and Meriden. The historical acreage can be inferred if not quantified by the statements in the previously cited papers. For example, Olmsted (1937) says "When not used for urban or industrial purposes, they are covered with various xerophytic types of natural or semi-natural plant communities..." This would seem to indicate some level of loss or degradation of this habitat that was at one time "a conspicuous feature of the central lowland of Connecticut." (Nichols, 1914).

On Long Island, the Hempstead Plains once covered more than 60,000 acres. The Hempstead Plains grasslands were first purchased by the Dutch from Native Americans in 1640 as part of the county of Queens. English settlers from New Haven purchased the "Great Plains" in 1643 and settlement began the following year. The settlers thought the plains were unsuitable for tillage and retained approximately 17,000 acres as common pasturage (Neidich, 1984).

More intensive development on the plains began in 1869 with Alexander T. Stewart's purchase of 7500 acres, which was to become Garden City, Long Island. After the Wright brothers historic flight at Kitty Hawk, N.C. in 1903, small airfields began to spring up all over the plains for both military and civilian use. Large portions of the Hempstead plains were converted to agriculture as the urban centers of Queens expanded.

Following World War II, the neighborhood called Levittown heralded the birth of suburbia with the construction of 17,000 cheap, mass-produced homes for returning soldiers. This was the largest single development effort on the plains. As of 1984, only 44 acres of the original 60,000 was preserved. This represents less than one tenth of one percent of the original known coverage of this habitat (Neidich, 1984).

Due to the glacial action that formed these grasslands, no new "natural" grasslands are expected to form in Connecticut or New York. Today, the existing upland grassland communities are mostly limited to those created through anthropogenic activities. Golf courses, airports, corporate parks, utility rights-of way, and abandoned agricultural lands have filled an ecological niche. The lack of regulatory protection of grasslands leaves them particularly vulnerable to development. Management of grasslands on areas already developed has been successfully achieved at Brainard Field Airport in Connecticut and Floyd Bennett Field in Brooklyn as well as other sites across New England. The New York Natural Heritage Program is currently managing a 19-acre open area at Nassau Community College on Long Island. This remnant tract of the Hempstead

Plains is surrounded by dense development, nonetheless it appears to be the best representative acreage of the undisturbed community.

DEGRADED GRASSLANDS AND RESTORATION METHODS

The most prevalent cause of degradation in grassland communities is development. Placement of structures in grassland areas reduces the overall area of grassland cover. An additional indirect effect of the development is fragmentation of the remaining undisturbed grassland tracts. Studies on grassland bird population dynamics indicate that species like the Bobolink, savannah sparrow, grasshopper sparrow, and Henslow's sparrow only nest in grasslands greater than 25 acres in size. Upland sandpipers and Northern harriers prefer ranges 74 acres or larger (Askins, pers. comm.).

Fire suppression policies in the remaining grassland areas is an equally important factor in their degradation. Low diversity shrub cover steadily invades making the area unsuitable for grassland specialized species. Fire suppression increases with development of an area. Suppression of natural fire events has been recognized as contributing to community degradation of many forest types as well as the detrimental effects on grasslands (Clapham, 1983).

A historic cause of degradation to the sand plains in Connecticut, and possibly the North Fork of Long Island, was plowing of the grasslands for agriculture. The action of farming the soils caused the destruction of the upper layer of the soil profile. After the initial physical disturbance by plows, the soils became extremely erodible by wind and water. Colonists also planted trees along the fence rows separating the agricultural plots in the New Haven sand-plain region, facilitating the spread of woody vegetation into the grassy areas.

There are several restoration techniques described in the literature for grassland communities. The most extensive body of research has been done on the tallgrass prairies of the Midwestern United States. Due to the close ecological similarity of the Hempstead Plains, sand plain communities, and these prairies, the techniques developed in the Midwest are appropriate to use on the East Coast. Generically, these techniques could be used on almost any grassland restoration site, and the most important component of these restoration techniques is long-term maintenance.

Restoration Methods:

① Prairie preserve restorations in Illinois have been successful using combinations of plowing, disking, and planting along with natural revegetation from the existing seed bank (**Figure 4-4**). An example of this technique can be found at the Fermi National Laboratory on the land inside the accelerator ring. This technique combined with a seed drill designed for use with warm season grass seeds has been successfully employed at Orient County Park in Orient, New York. The site must first be cleared of any woody vegetation, and will still require follow up mowing or burning to maintain the grasses.

Figure 4-4. Preparation of a Grassland Restoration Site

Standard farm tractors can be used to prepare grassland restoration sites for replanting.

② A grassland management and restoration technique utilized by the Natural Heritage Program is controlled burning (**Figure 4-5**). Also called prescribed burning, this technique has been shown to favor native grass species like little bluestem while stunting or eliminating woody vegetation and non-native forbs. This technique has been utilized on all of the grassland types discussed in this chapter with much success (The Nature Conservancy, 1994). The major advantage to using this technique is that it takes advantage of the natural fire adaptations of the grassland plant communities. The disadvantages include the long time period for vegetation to reestablish itself, and the need for maintenance of the site for long periods of time, possibly in perpetuity. The natural grass community may take years to fully develop, while requiring biennial or annual burning to reduce invasive species competition.

Figure 4-5. Controlled Burning

A U.S. Fish and Wildlife Service staff member uses a drip torch to burn a managed grassland in New York.

③ Mowing or cutting the grass at regular intervals will also help to discourage invasion of woody growth in grassland areas. Mowing will cut the leafy parts off of newly sprouted seedlings. Once the food stored within the seed itself is expended, the seedling becomes completely dependant on photosynthesis to survive. If the upper leafy portion of the tree or shrub is removed, the young plant will die. The mowing must also be timed to prevent disturbance to nesting birds. Grass cuttings should also be removed following mowing to reduce the leaf litter. Some studies suggest that buildup of leaf litter may enable invasion by non-native and woody species.

This method of grassland restoration and management is often used in developed areas where burning is unsafe. For example, corporate parks and airports are often attractive to grassland birds due to the maintenance of level, grassy areas that are less prone to pedestrian disturbance. While the plant community of a managed grassland may not be as diverse as the natural community, many of the same habitat features may exist on the managed grassland to attract birds to colonize it. The lawn areas of large corporate office parks and airports are less intensively landscaped, and may have a variety of grasses and wildflowers. Because the grassy areas at an airport must be regularly mowed to control possible navigation hazards, this provides an excellent partnership opportunity. Once a management plan is implemented in cooperation with appropriate state and federal agencies, the work schedule of the maintenance crew can be adjusted easily to accommodate the birds' nesting season.

SPECIFIC 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 like 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.

Due to the lack of legislative protection of grasslands, the best restoration strategy for these communities, other than outright acquisition, is to cooperatively manage them with the private owners. In the case of airports the maintenance of an *Andropogon spp.* dominated meadow not only attracts grassland breeding birds, but discourages use of the area by nuisance bird species like gulls (Robert Askins, pers. comm.). These larger birds can potentially cause severe jet engine damage in the case of a bird to plane collision.

An additional set of goals would include restoration of endangered, threatened, and special concern species. Plant species can be propagated from seeds, while invertebrates could be captive bred and released into the restored area once the plant community becomes established. Vertebrate species could be expected to colonize from nearby sites or could be trapped and released onto the restored site. The U.S. Fish and Wildlife Service is working to expand the population of sand-plain agalinis on Long Island. Additional sites to establish populations would help maintain the fragile status of this endangered plant.

Overall increase of grassland dependant and associated species should be a generic goal and measured as part of site monitoring. Setting specific goals for individual species will be in part determined by the size of the grassland site. Extensive literature exists regarding the minimum acreage requirements of grassland breeding birds, raptors, and other vertebrates. Goal setting will also be influenced by the available management techniques for the site. A site managed through controlled burning may have different restoration targets than a site managed by mowing. A restoration project manager must research the different needs of plants and animals which may utilized the restored site and plan accordingly.

RESTORATION SUCCESS AND MONITORING

A standard measure of restoration success in grassland restorations is to examine the species diversity and wildlife usage of the area. In areas like the Hempstead Plains, accurate records of the species occurring there prior to significant disturbance make an excellent benchmark for restoration efforts. The same is true in the sand plain communities of Connecticut's central lowlands. Using these records and the attributes of remaining grassland areas such as Montauk Downs in New York, and the grasslands on Nantucket and Martha's Vineyard islands in Massachussets, a target profile of a restored grassland can be built. It may take several growing seasons to achieve full species diversity in the plant community. Intensive management may be required in the first several growing seasons following restoration to suppress unwanted vegetation.

Measurement techniques for this habitat include vegetation transects and quadrat surveys to determine species abundance, diversity, and richness. Also important in determining the success of a grassland restoration is bird, mammal, and insect censussing, again making the same abundance, diversity, and species richness determinations. Seasonal and diurnal patterns of use should be considered when planning sampling. For example, nesting species may not be found at times of the year other than breeding season, and nocturnal species like owls may not be seen if all surveys are done in daylight.

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