



Audubon CONNECTICUT



IMPORTANT BIRD AREA CONSERVATION PLAN

*Salt Meadow Unit of the Stewart B. McKinney National
Wildlife Refuge and Adjacent Areas in Westbrook CT*

December 2009



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Acknowledgements

This plan was written by staff members of the Maguire Group, Inc. Planning and Environmental Compliance Unit. Anthony J. Zemba, Senior Ecologist was primary author. Daniel Hageman and Kathleen Hall were contributing authors. Geographic information system graphics and mapping were composed by Gregg Rotundo and Kathleen Hall of Maguire Group using base mapping referenced herein. Other information sources used to compose this IBA Conservation Plan are provided as parenthetical citations. Patrick Comins of **Audubon** CONNECTICUT, and personnel at the Stewart B. McKinney NWR provided the main information available for seasonal avifaunal usage of the site.

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Salt Meadow Unit of the Stewart B. McKinney
National Wildlife Refuge and Adjacent Lands □
Westbrook, CT
December 2009*

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Taxonomy and Nomenclature

For each specific section within this report, the English name of species is given first, followed by the scientific name during the first usage. Repeated references to the same species thereafter are given in English only. Exceptions occur when English names are not available for a given species. In cases where English names are not available, only the scientific names are provided. This frequently occurs in the case of herbaceous vegetation or invertebrates. When an English name is available for a given species, but it is not yet officially recognized by the species taxonomic authority, the English name is provided in quotations.

When referring to English names of birds, the convention is to capitalize their names to avoid confusion with other modifiers (adjectives) that may be used in the same sentence as their name. References to unspecified birds (e.g., salt marsh sparrows, warblers, vireos, woodpeckers, etc.) are provided in lower case letters. For species that have a three-word unhyphenated English name, all three words are capitalized (e.g., "the American Black Duck"). Many birds have compound or hyphenated names. In these cases, the convention is to capitalize only the first letter of the compound name as in "Saltmarsh Sharp-tailed Sparrow", or "Black-throated Green Warbler", unless the bird has a compound "last name" as in "Eastern Screech-Owl". English names of American birds are established by the American Ornithologists' Union (AOU). English names of birds provided herein were obtained from the AOU's Checklist of North American Birds (1998) and subsequent supplements.

Scientific names were obtained from various sources depending upon the specific taxon discussed. Generally, the scientific names used are those used by various government agencies that are partners in the Integrated Taxonomic Information System (ITIS). The ITIS is an inter-governmental agency partnership formed to provide and maintain a database with credible taxonomic information. ITIS partners include Department of Commerce (National Oceanic and Atmospheric Administration), Department of Interior (United States Geological Survey) Environmental Protection Agency, Department of Agriculture (Both the Agriculture Research Service and Natural Resources Conservation Service) and the Smithsonian Institution (National Museum of Natural History).

The goal of the ITIS partnership is to create an easily accessible database with reliable information on species names and their hierarchical classification. Through periodic revisions, the database is updated to provide valid classifications and revisions for existing species and additions for newly described species. The ITIS includes documented and referenced taxonomic information of both aquatic and terrestrial flora and fauna species.

Executive Summary

Maguire Group Inc. (Maguire) was retained by Audubon Connecticut to prepare an Important Bird Area (IBA) conservation plan for the Salt Meadow Unit Important Bird Area (IBA) which includes the Salt Meadow Unit of the Stewart B. McKinney National Wildlife Refuge and adjacent lands. The conservation plan supports the recent designation of this refuge unit as an IBA under BirdLife International's IBA program. The SMU of the SBM NWR, the Menunketesuck River, adjacent marshes and coastal forests provides high salt marsh, shrubland, and coastal forest habitats within a rapidly developing rural/suburban landscape. It is also a known breeding locality for a number of avifaunal species of conservation concern including state listed (special concern) species. Connecticut threatened and endangered species also use the site extensively during the breeding season (for foraging), during migration, post-breeding dispersal, winter or a combination thereof.

Adjacent parcels are owned by private land owners, the State of Connecticut, and the Westbrook Land Conservation Trust. Supporting landscape features to the IBA include the upper reaches of Menunketesuck River and Chapman Pond, the wetlands and headwater streams of Gatchen Brook, and contiguous forest blocks to the north; additional salt marsh associated with the Patchogue River to the east; and the Menunketesuck Island/Duck Island IBA and adjacent tidal flats associated with the shoreline to the south. Stakeholders identified as having an interest in conservation planning within the IBA include federal and state agency personnel, non-governmental organizations, and private entities.

The SMU IBA lies along the Atlantic migration corridor. The mosaic of habitat types within the IBA provides valuable breeding migratory stopover habitat for a variety of bird species. Over 300 species of birds are regularly recorded in and around southern and coastal Connecticut. Many of these species have been reported to occur within the IBA. Most of these species, especially waterfowl and coastal birds, can be observed from within or proximal to the refuge lands. During spring and fall migration the IBA supports numerous species of water birds, marsh birds, shore birds, and land birds.

The site was nominated as an IBA by staff of Audubon Connecticut, USFWS, and the Connecticut Audubon Society. It meets many state and national IBA Criteria. The site meets the following State IBA criteria: It is important to State listed endangered, threatened, and special concern species and species of high conservation priority in Connecticut. The site contains an exceptional representative natural habitat that holds important species or species assemblages largely restricted to a distinctive habitat type. Significant numbers of birds concentrate for breeding, during migration, or in winter, especially wading birds, waterfowl, and neotropical migrant passerines. The site is important for long-term research and/or monitoring projects that contribute substantially to ornithology, bird conservation, and/or education.

The IBA has also met the following IBA national IBA criteria: it is a locality that contains rare, unique, or representative habitat; it provides habitat to high conservation priority species of birds; it is known for exceptional concentrations of migratory land birds, and the IBA has served as a long-term research and/or monitoring site for avian study. In addition to these IBA criteria, the riverine features within the IBA support estuarine finfish and shellfish

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resources which provide food for federally managed finfish species that occur in adjacent coastal and estuarine waters.

The primary use of the IBA is for fish and wildlife habitat. Passive recreational activities for which the IBA is important include nature and wildlife conservation, and fishing. The IBA offers a diversity of habitats within a shoreline region experiencing increasing development pressure. Among these habitats are salt marsh, intertidal flats, estuary, coastal forest, lawn, freshwater wetlands, coastal shrubland edge. The predominant land use outside of and adjacent to the IBA is low-density residential to the north, east, and west; and commercial to the south.

Forested areas consist of Murdock Hill, a drumloidal landscape feature at the eastern side of the IBA, forested islands within the salt marshes fringing the Menunketesuck River and Gatchen Brook, a forested peninsula between these two water features and forest areas along the western shore of the IBA. Discrete forested blocks of the Cockaponsett State Forest lie to the north of the IBA across I-95. The forests, shrub lands, and salt marsh provide cover, concealment, and foraging habitat for a variety of migrant and resident birds. Intertidal flats along the watercourses within the IBA provide foraging habitat for long-legged waders in the nesting, post nesting (dispersal), and migration seasons. Salt marsh areas within the IBA are important habitat for wading birds in the nesting, and post nesting seasons and also provide feeding habitat for waterfowl and gulls in the winter and migration seasons. Salt pannes along the eastern side of the IBA and a mud flat at the southern limit are particularly important habitat features for foraging waders and shore birds.

The IBA offers two habitats that are rare in Connecticut: salt marsh and coastal forest. Coastal forests along the Connecticut Shore of LIS are critical migratory stopover habitats for many birds. Many species return year after year during the spring and fall migrations since the IBA is situated on coastal migration paths. Bird species richness, abundance, and composition changes with the seasons at the IBA. A wide variety of migratory birds exploit the food resources within the IBA. Birding activity begins to increase concurrently with the increase in fall migration.

The IBA supports some species included on the CTDEP list of “Connecticut’s Endangered, Threatened and Special Concern Species” (‘listed species’). Some occur regularly within the IBA while others rarely occur, or could potentially occur but have not yet been reported within the IBA. Regularly Occurring Special Concern Species include the Common Tern, Yellow-crowned Night-Heron, Little Blue Heron, Saltmarsh Sharp-tailed Sparrow, and Brown Thrasher.

Regularly occurring threatened or endangered species include the Great Egret, Least Tern, Snowy Egret, and Purple Martin. Desired additional species identified by the National Audubon Society, United States Fish and Wildlife and others as species of conservation concern for which Connecticut has a regional responsibility also occur within the IBA and adjacent inter-dependent areas.

Other non-avian taxa benefit from the natural areas within the IBA as well. The IBA provides habitat for prey of managed fish species and piscivorous birds. The IBA’s coastal location

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and abundance of forest cover make it an ideal migratory stopover habitat for bats as well, likely including some species listed as state special concern.

Conservation concerns, and threats, identified in the IBA include development of adjacent lands, disturbance to birds or their habitat, presence of invasive or non-native plants/animals potential pollution, unregulated recreation, and sea level rise. Opportunities to manage the IBA in such a way as to improve the overall avian habitat quality center largely on conservation, invasive species control, and enhancement of existing habitat attributes, as well as implementing measures to improve the overall habitat “matrix” of the IBA.

Current conservation activities include long term planning for additional land acquisition, and the management of estuarine and terrestrial habitats. The IBA is an ideal site for monitoring avifauna usage across a seasonal gradient. It is a destination for local birders during the annual Old Lyme/Old Saybrook CT Christmas Bird Count. The IBA is also used for research on the breeding ecology of the Saltmarsh Sharp-tailed Sparrow (Elphick et al., 2005) and has been used as a study site used to develop a hydrodynamic model for coastal riverine systems (Line, et al. 2003) and for studies of foraminiferal distributions in salt marshes in New England (Gehrels and van de Plassche 1999).

Current public outreach and education measures that occur at the IBA consist of Bird/nature walks led by local Audubon society members. Additional signage could provide information regarding the natural communities of the refuge and the habitat management techniques conducted at the refuge to date. Opportunities for conservation planning within the IBA include enhancing the IBA’s natural habitat for resident and migratory birds and other wildlife, stabilizing and increasing populations of priority bird species that make this area an IBA; engaging people as stewards to ensure long-term protection and management of the IBAs sensitive bird habitats, and educating the public about the importance of this area for birds, and encouraging individual action aimed at attracting beneficial birds and wildlife.

The site should also be considered for inclusion on the Connecticut Coastal Birding Trail, a project currently being developed by the CTDEP Wildlife Division. Development and implementation of outreach projects through stewardship adoption groups is encouraged in order to enact effective conservation planning, coordinate habitat management/restoration, and monitor natural resources at the site. Stewardship groups could use the refuge facilities to host a lecture series that addresses topics pertinent to avifauna conservation and wildlife habitat improvement.

Several habitat improvement projects have occurred in the refuge in the last few years. Since the primary functions of the refuge are twofold (i.e., as important breeding or foraging habitat for coastal birds, and as migratory stopover habitat along a coastal flyway), the existing acreage of the IBA should be optimized to enhance or conserve the special habitat attributes for resident and migratory bird species, especially species of conservation concern.

Monitoring needs include a program that would track the key species that resulted in the IBA designation. Currently, no long-term organized monitoring occurs within the marsh. Little is known about many of the listed bird species (i.e., other than Saltmarsh Sharp-tailed Sparrows) using the refuge. A clear priority is to create a monitoring scheme to gauge population trends of salt marsh sparrows and other marsh birds. Simultaneously, tracking

vegetation change in the marsh would provide useful information that could help to explain any changes in marsh bird populations. The refuge within the IBA is an ideal location for establishment of an avian monitoring program for spring and fall migrant shore birds, waterfowl, and waders in the salt marsh habitat, and neotropical migrant passerines in the upland habitat.

Potential research needs fall into two areas: studies that directly examine the birds that use the marsh and examine the likely future quality of the habitat, and studies that determine the importance of upland habitat for migratory and breeding birds of conservation concern. Outside of the avian conservation realm, the IBA could serve as a suitable research site to address research needs in the conservation biology of other resident taxa, particularly species of conservation concern.

An integrated management plan should be prepared for the IBA. This management plan would essentially meld management planning measures identified by refuge personnel as conservation and management goals appropriate to the Service's mission with those measures chosen to serve the greater IBA. The integrated management plan should be detailed as needed for proper management of the IBA. Specific management objectives should be identified after completion of a comprehensive inventory of plants, plant communities, and wildlife. Fundamental management objectives should be consistent with USFWS goals and objectives and could include the following:

- ◆ Conservation of existing forested areas of the IBA.
- ◆ Management of forested areas to benefit transitory migrants and breeding residents.
- ◆ Elimination or control of non-native invasive plant species.
- ◆ Inventory and delineation of existing invasive plant species infestations.
- ◆ Increase habitat value by establishing, conserving, or enhancing existing habitat attributes that benefit wildlife.
- ◆ Management of existing shrubland within the IBA as an important habitat for native avifauna.
- ◆ Conservation of intertidal flats for migratory shore birds and resident coastal birds and as habitat for their invertebrate prey.
- ◆ Land management to protect the water and sediment quality of the system.
- ◆ Continued monitoring of marsh accretion rates and sea level changes.
- ◆ Proper grounds keeping to prevent the spread of invasive species, and to discourage attracting predators.

Floral and faunal inventories would provide data that would enhance knowledge about the system and allow for management decisions that would have a multi-taxa benefit. However, the approach to habitat management within the IBA should be adaptive and organized in such a way as to supplement the goals and objectives of the skilled professional personnel of the USFWS and CTDEP who are already partnering to lead conservation efforts within the IBA by managing habitat on the SMU core refuge lands and adjacent parcels.

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Westbrook, CT*

1.0 Introduction

Maguire Group Inc. (Maguire) was retained by **Audubon** CONNECTICUT to prepare an Important Bird Area (IBA) conservation plan for the Salt Meadow Unit (SMU) Important Bird Area (IBA). Salt Meadow Unit is a 316+ acre holding of the larger acre Stewart B. McKinney National Wildlife Refuge (SBM NWR) complex which now protects over 1,000 acres in Coastal CT. This refuge unit is owned and managed by the United States Fish and Wildlife Service (USFWS) and is located in Westbrook, CT. The IBA includes this unit and additional adjacent parcels owned by the Town of Westbrook, The Westbrook Land Conservation Trust, Trust for Public Land, Connecticut Department of Environmental Protection (CTDEP) and various other private parties. The conservation plan would support the recent designation of this site as an IBA under BirdLife International's IBA program. The refuge, the Menunketesuck River, adjacent marshes and coastal forests provide the following habitats within a rapidly developing rural/suburban landscape (Rosgen and Billings, 1996):

- Tidal creek/estuary
- Intertidal mud flat
- High *Spartina patens* dominated salt marsh
- Wooded edges
- Coastal forest, including wetland and upland components, (predominantly mature hardwoods)
- Old field/shrubland,
- Palustrine forested wetland

Due to its location in the landscape relative to other natural habitats, the SMU is recognized for being one of the most important stopover areas for Neotropical migrant land birds in Connecticut. It is also a known breeding locality for a number of avifaunal species of conservation concern including state listed (special concern) species. Connecticut threatened and endangered species also use the site during migration, post-breeding dispersal, winter or a combination thereof.

Chris Elphick provided extensive peer review and contributed much information on the ecology of the Saltmarsh Sparrow and avian ecology in general. Patrick Comins of **Audubon** CONNECTICUT, and various SMU staff members provided site specific information regarding seasonal avifaunal usage at the site. All other information sources are referenced herein.

2.0 The Important Bird Area Program

Audubon's Important Bird Areas (IBA) Program was started in 1995. The goals of the IBA program are to identify a network of sites throughout the state that are essential for sustaining wild bird populations, and to protect or manage these sites for the long-term conservation of birds, other wildlife, and their habitats.

Started in Europe in the late 1980s by BirdLife International, the Important Bird Areas program has been a powerful conservation tool, protecting millions of acres of habitat. The program is part of a global effort linking sites that are important for birds. In the U.S., the National Audubon Society pioneered the first statewide IBA project in Pennsylvania in 1995. The IBA program is currently underway in 30 states, including Connecticut, and more than 500 IBAs have been identified in the United States alone.

Audubon chapters, bird clubs, and other conservation groups can play a vital role in furthering the goals of the IBA program. By adopting one or more IBAs, local community groups can provide much-needed stewardship of the site, recruit volunteer *Citizen Scientists* for monitoring bird populations, and offer educational opportunities that will help conserve the site.

For an IBA to be identified it must meet certain scientific criteria. IBAs provide essential habitat for one or more avian (bird) species. IBAs include sites important to breeding, wintering, and/or migrating birds. IBAs range in size from a few acres to thousands of acres, but typically are discrete sites that stand out from the surrounding landscape. IBAs may include public or private lands, or both, and they may be protected or unprotected from development or other activities that may impact the attributes that make them so valuable to bird life. To qualify as an IBA, sites must have satisfied at least one of the following criteria:

- ◆ The site is important to endangered or threatened species in Connecticut;
- ◆ The site is important to species of high conservation priority in Connecticut;
- ◆ The site contains rare or unique habitat within the state/region or an exceptional representative of a natural habitat, and that hold important species or species assemblages largely restricted to a distinctive habitat type;
- ◆ Significant numbers of birds concentrate for breeding, during migration, or in winter at the site; or
- ◆ The site is important for long-term research and/or monitoring projects that contribute substantially to ornithology, bird conservation, and/or education.

Further details on these criteria, site selection and the nomination process can be found here <http://www.audubon.org/bird/iba/criteria.html>.

The SMU IBA meets many of these relevant criteria. (These criteria are discussed further in Section 4.2.) Identification of a site as an IBA indicates its unique importance for birds and helps to establish priorities for conservation efforts (www.audubon.org).

3.0 Site Background

3.1 Description of the Project Area

The SMU IBA area (referred to herein as the IBA) encompasses an approximate total of 670 acres. It includes the limits of SMU, portions of the Menunketesuck River, Gatchen Creek and associated wetlands, Murdock Hill, and adjacent privately owned parcels roughly bounded by Old Clinton Road to the east and north, Grove Beach Road to the west, and State Route 1 to the south (Refer to Figure 1). The 316-acre SMU is owned by the USFWS. Adjacent parcels are owned by private land owners, the State of Connecticut, the Trust for Public Land, and the Westbrook Land Conservation Trust.

Supporting landscape features to the IBA include the upper reaches of Menunketesuck River and Chapman Pond, the wetlands and headwater streams of Gatchen Creek, and large (i.e., >250 acres) contiguous forest blocks to the north; additional salt marsh associated with the Patchogue River to the east; and the Menunketesuck Island/Duck Island IBA and adjacent tidal flats associated with Hawk's Nest and West Beach to the south. The SMU IBA lies along the Atlantic migration corridor (Bellrose, 1976). Over 300 species of birds are regularly recorded in and around southern and coastal Connecticut, of these, an estimated 150-180 species have been or are expected to occur within the IBA. Many of these species, especially waterfowl and coastal birds, can be observed within or proximal to the IBA and adjacent lands.

The river and fringing salt marshes are bisected by a railroad causeway (Figure 3-1). The Menunketesuck River's lower reach within the IBA (i.e., south of the railroad trestle) in the vicinity of State Route 1 contains three marinas. Private residences along the upper reaches of the River (i.e., above the confluence with Gatchen Creek) have private docks on the river. Therefore, the river supports some recreational activity in boating, kayaking, birding, photography, and fishing. The grounds of the refuge on Murdock Hill include walking trails, a viewing platform overlooking the marsh, an information kiosk, and the headquarter offices of the SBM NWR complex. As a wildlife refuge, recreational opportunity is not (and should not be) the primary focus for management, other than passive recreational activity such as birding, photography, and nature study. The refuge includes coastal woodlands, lawn areas, freshwater wetlands, old field, and shrubland. This mosaic of habitat types provides valuable migratory stopover habitat for a variety of bird species.

3.2 Historical Use

Prior to European settlement, Native Americans likely hunted and fished from shore and harvested shellfish from the Menunketesuck River and other drainages and embayments in the area. An abundance of game, fish, shellfish and other natural resources in and around the IBA likely supported seasonal settlements and may have sustained permanent

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settlements. Later, during colonial times, farmers hayed large portions of the salt marsh for *S. patens*, *Juncus gerardii* and *Distichlis spicata* to use for livestock fodder, bedding, and mulch. Before the invention of the mowing machine, farmers cut the hay by hand using scythes.

Use of the marshes for salt hay likely continued through the 1700's and 1800's. By the end of the 1800's significant changes had already occurred within the IBA such as the construction of the railroad (built in the mid 1800s) which bisects the IBA in an east-west orientation, and the construction of State Route 1 which forms the southern boundary of the IBA. However, at this time, the salt marsh habitat was still contiguous with the marshes along the Patchogue River to the east, as they had not yet been bisected by Hammock Road. To the south, across State Route 1, extensive contiguous marshland existed between the Menunketesuck River to the west and the Patchogue River to the east and beyond (Refer to Figure 3-1).

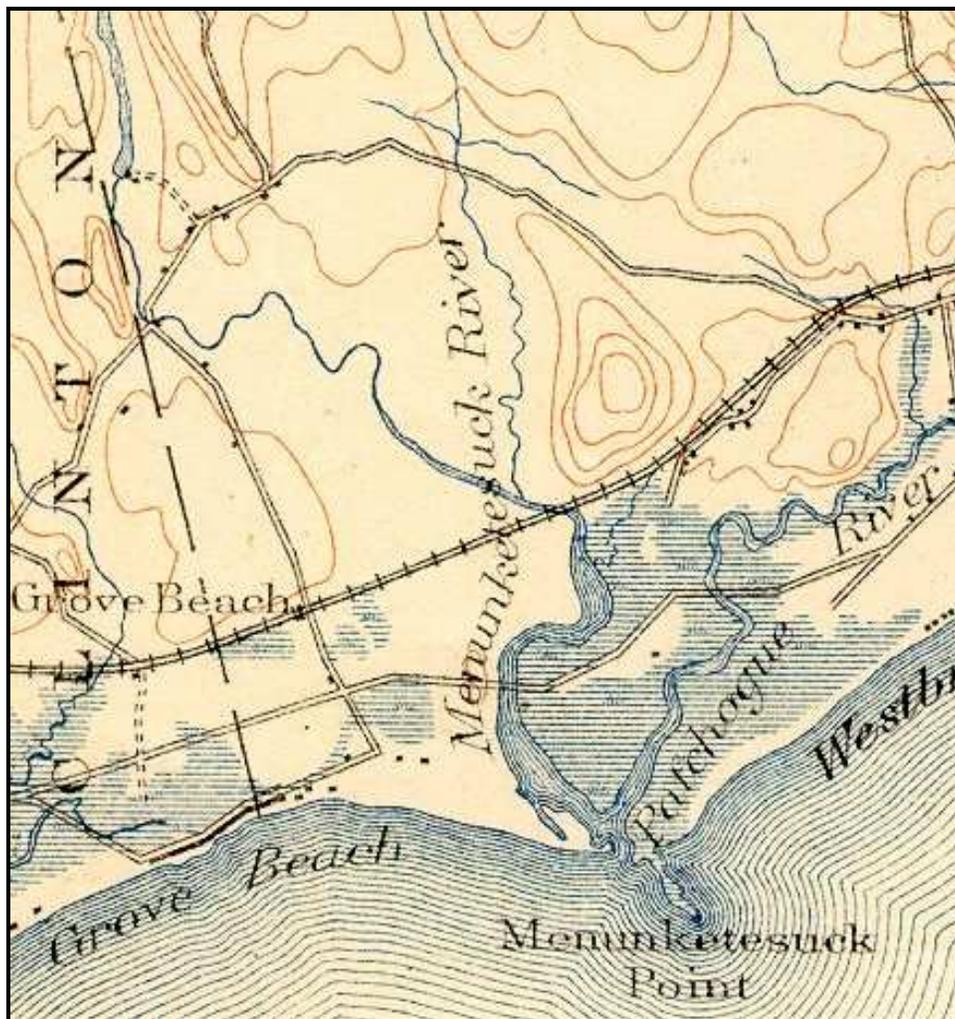


Figure 3-1. 1893 USGS Topographic Map depicting IBA and vicinity. Note the old alignment of State Route 1 between the Menunketesuck and Patchogue Rivers. Hammock Road does not connect to Route 1.

(Source: <http://docs.unh.edu/CT/sayb93sw.jpg>)

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During the 1920s, Connecticut's marshes were ditched for mosquito control to eliminate standing bodies of water within the marsh where mosquitoes bred. This resulted in the loss or reduction of pools and pannes often vegetated with the stunted form of *S. alterniflora*. Hammock Road, which forms the eastern boundary of the IBA, was formed by filling a corridor through the marsh as well. These anthropogenic changes to the system are depicted in the 1944 USGS Topographic Map of the area (Figure 3-2). Linear water features identify the extent of the mosquito ditching on the map. These ditches extend westward and northwest upstream along the Menunketesuck River between the channel and the ten foot contour elevation; northward along Gatchen Creek and eastward to Hammock Road, which by then had connected to Route 1 (Boston Post Road).

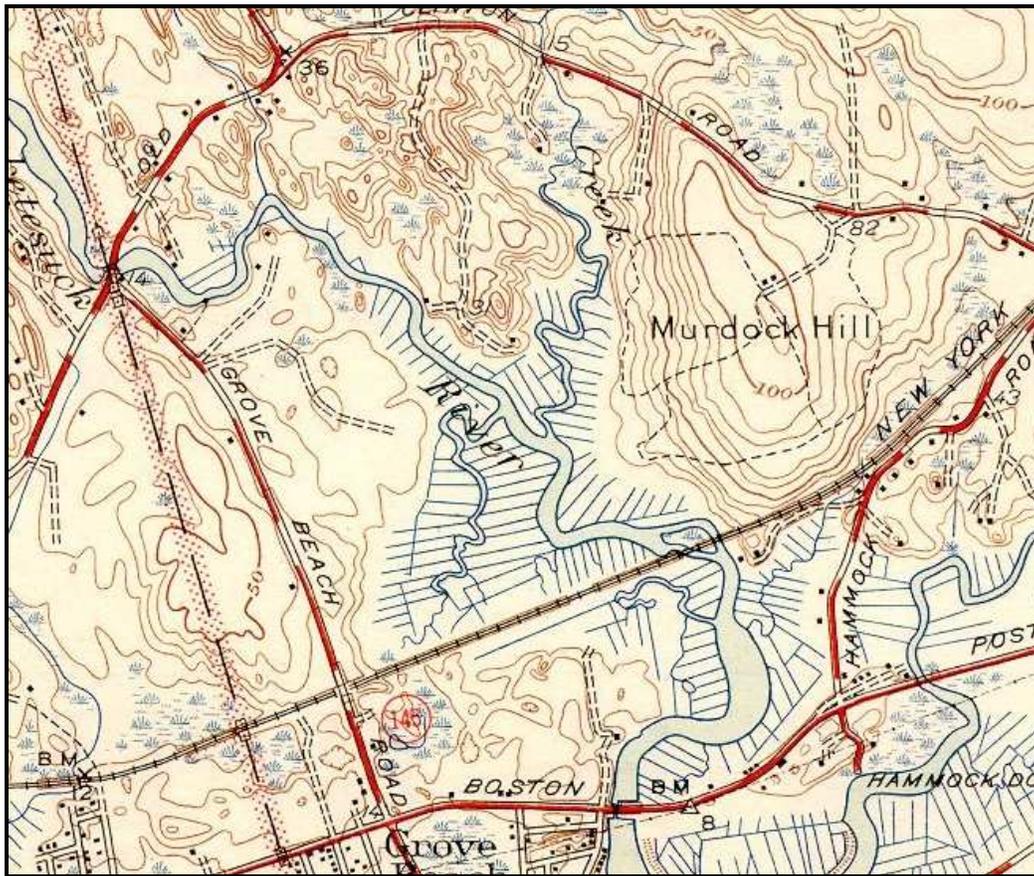


Figure 3-2. 1944 Topographic Map of the Essex Quadrangle depicting IBA and adjacent areas.

Two residential structures depicted near the summit of Murdock Hill (that now house the refuge headquarters) were originally the country home of Esther Lape (1881-1981) and her life partner Elizabeth Fisher Read (1872-1943). Both women were personal friends of Eleanor Roosevelt. Ms. Lape was a well known journalist, researcher, and publicist. She taught English at Swarthmore College in Pennsylvania, the University of Arizona, and Barnard College in New York City. She was also associated with the Women's Trade

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Union League and one of the founders of the League of Women Voters. Ms. Read, a scholar and one of Eleanor Roosevelt's earliest female political and feminist mentors, was Ms. Roosevelt's personal attorney and financial advisor (www.nps.gov/archive/elro).

Both Ms. Lape and Ms. Read have been described as “independent, financially self-supporting, politically active, and socially emancipated”, characteristics that inspired Eleanor Roosevelt, and as a result, the three women became close confidants and friends. They spent time together reading poetry and discussing political issues. As first lady, Eleanor Roosevelt rented a floor in Read and Lape's building in Greenwich Village, New York which she would use as a retreat to escape the public eye and the pressures inherent in her public position. The three women also spent time together at Salt Meadow in Westbrook.

Ms. Read died in New York on December 13, 1943. Ester Lape donated the Westbrook estate with over 150 acres of land to the USFWS in 1972. This donation became Salt Meadow National Wildlife Refuge, Connecticut's first National Wildlife Refuge. Ms. Lape's house at Salt Meadow is now the refuge headquarters (Figure 3-3).



Figure 3-3. The USFWS headquarters at SBM NWR.

Marinas were built on the Menunketesuck River sometime prior to 1972. Much of the fill from dredging berths and boat basins associated with construction of the Marina was dumped on the wetlands, further degrading the marsh. Other changes that occurred

included the construction of residential subdivisions along Grove Beach Road to the west and along Old Clinton Road to the north of the IBA, the realignment of the intersection of Route 1 with Hammock Road, and the excavation of a boat basin from the marsh at the southeastern limits of the IBA proximal to this intersection.

Throughout the years, Salt Meadow grew to become a 316+ acre refuge as neighbors donated or sold adjacent property to the US Fish and Wildlife Service. Conservation-minded people worked to increase the area of protected land associated with the refuge and with the help of non-profit organizations like National Audubon Society, Saugatuck Audubon Society, The Nature Conservancy, Trust for Public Lands, Westbrook Land Trust, and others, additional parcels were acquired by US Fish and Wildlife Service and added to the “Salt Meadow National Wildlife Refuge”. With the addition of Sheffield, Chimon, and Goose Islands near Norwalk, CT and Milford Point in Milford, CT in 1984, the name was changed to Connecticut's Coastal National Wildlife Refuge.

In 1987, the name of the refuge was again changed to honor US Congressman Stewart B. McKinney, who had an integral role in the refuge's formation. Additional units were added in 2003 (Calf Island) and 2005 (Peach Island). Through charitable donations and the generous help of many partners, the Stewart B. McKinney NWR currently consists of ten distinct refuge units spread over 70 miles of Connecticut's coastline, from the Salt Meadow Unit in Westbrook to Calf Island in Greenwich (www.fws.gov/refuges/profiles).

3.3 Environmental Setting

The IBA is found on the USGS Essex, Connecticut 7.5 minute topographic series Quadrangle Maps, a portion of which is depicted in Figure 1. Elevations on the Site range from a topographic high of approximate elevation of 110 feet (ft) North American Vertical Datum of 1988 (NAVD 88) atop Murdock Hill, down to approximate elevation 0 ft (NAVD 88) along the tidally-influenced Menunketesuck River.

The IBA lies within the Eastern Coastal Ecoregion of the Coastal Hardwoods Zone (Dowhan and Craig, 1976). Table 3-1 summarizes the physiographic features of this ecoregion. The major native forest vegetation is the coastal hardwood association which typically includes an assemblage of one or more of the following tree species: black oak (*Quercus velutina*), white oak (*Q. alba*), red oak (*Q. rubra*), several hickories (*Carya* spp.), especially mockernut (*C. tomentosa*), black cherry (*Prunus serotina*), and sassafras (*Sassafras albidum*). The region's woodlands are notable for a dense shrub and entangled vine vegetation strata typically dominated by briers (*Smilax* spp.). Poison ivy (*Toxicodendron radicans*), Japanese honeysuckle (*Lonicera japonica*) and Asiatic bittersweet (*Celastrus orbiculatus*) are also common.

The IBA includes large blocks of deciduous forests and tidal marshland within close proximity to a highly developed shoreline. The IBA is bounded by roadways at each of the four cardinal directions. To the north of the IBA lies the I-95 corridor, a significant barrier to wildlife movement to and from the IBA. Further north lies first, an industrial

Table 3-1. Physiographic features of the Eastern Coastal Ecoregion	
Mean annual temperature	51 ° F
Average winter temperature	32.5 ° F
Coldest month monthly mean minimum	23 ° F
Mean annual minimum temperature	5 ° F
Average seasonal snowfall accumulation	35 in.
Frost free season	195 days
Average summer temperature	70 ° F
Warmest month monthly mean max. temp.	81 ° F
Annual precipitation	46 in.

(Dowhan and Craig, 1976).

park and then, rural forested land some of which is conserved as blocks of the Cockaponsett State Forest. To the east of the IBA, beyond Hammock Road, lies additional tidal marsh associated with the Pachogue River which lies parallel to State Route 1. To the south of the IBA lies commercial development within the marina district of Westbrook. Residential development and a Golf course lie to the west of the IBA. Land usage in the local environmental setting is depicted in Figure 3-4.

Based upon the most current ecoregion classification system for Connecticut, developed by Metzler and Barret (2006), the IBA lies within the Southern New England Coastal Lowland Subsection of the larger Eastern Broadleaf Forest Province.

The majority of the IBA consists of two major vegetative communities using the Metzler and Barrett (2006) classification:

- ◆ Northern red oak – black oak – chestnut oak (*Quercus rubra* – *Q. velutina* – *Q. prinus*) forests in drier upland areas
- ◆ Red maple / highbush blueberry forests with the red maple / common winterberry – highbush blueberry community predominating which form along hillside seeps
- ◆ Satmeadow cordgrass (*Spartina patens*) tidally flooded grasslands are the predominant vegetation type in the salt marsh

Other smaller associations or communities occur within the IBA as well, notably

- ◆ Narrowleaf cattail stands along landward borders of the tidal marshes (especially at upstream reaches where salinity decreases),
- ◆ Common reed (*Phragmites australis*) temporarily flooded grasslands which also occur along the landward edge of the salt marsh in areas where nutrient rich stormwater or groundwater discharges
- ◆ Widgeongrass (*Ruppia maritima*) permanently flooded vegetation in tidal creeks.

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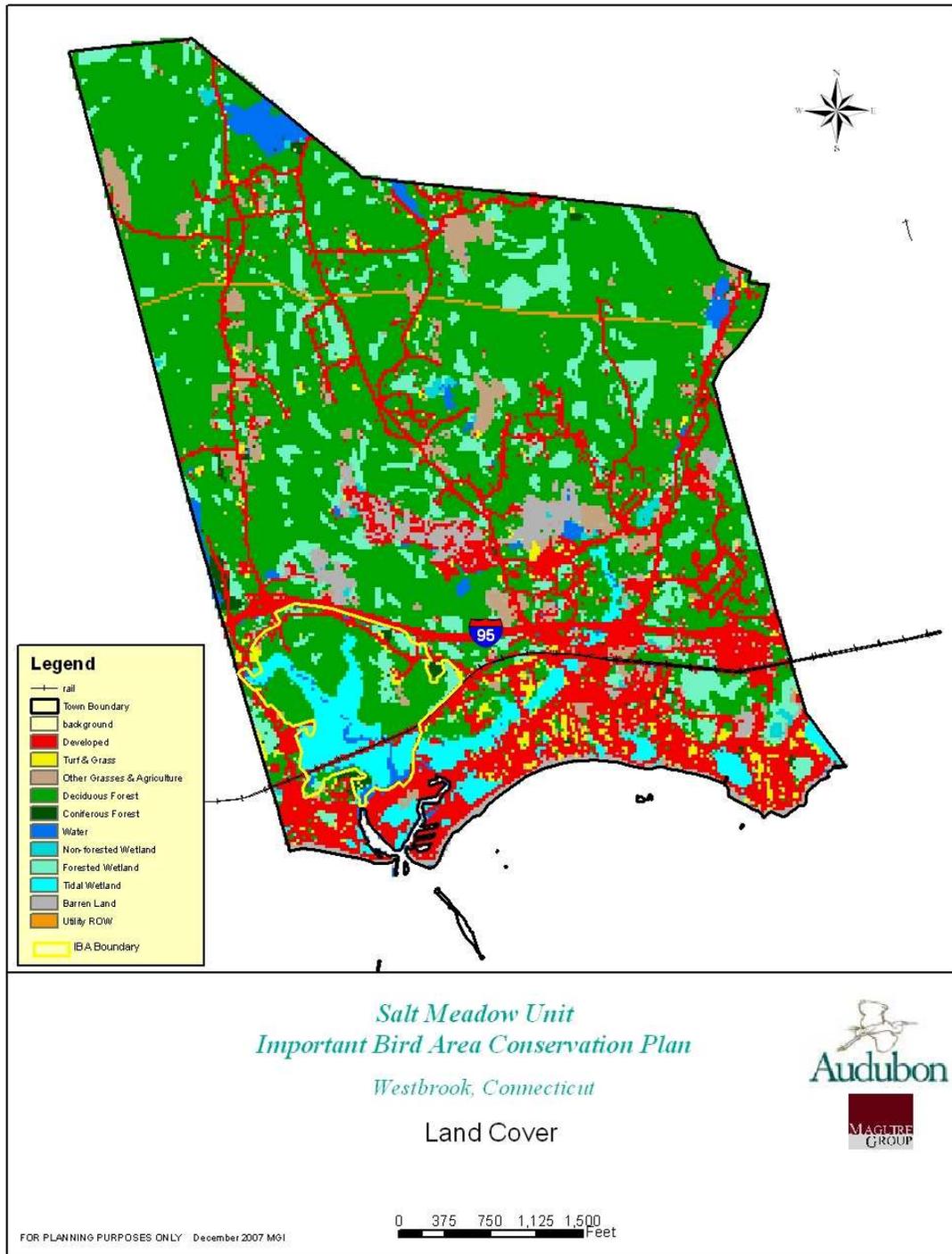


Figure 3-4 Land Cover within the IBA and Westbrook Connecticut

Important Bird Area Conservation Plan: Salt Meadow Unit of the Stewart B. McKinney National Wildlife Refuge and Adjacent Areas in Westbrook CT

The habitats and subhabitats/vegetative communities of conservation priority identified in Connecticut’s Comprehensive Wildlife Conservation Strategy (CCWCS) Plan (CTDEP 2005) that can be found within the IBA are provided in Table 3-2.

TABLE 3-2. THE HABITATS AND SUBHABITATS/VEGETATIVE COMMUNITIES OF CONSERVATION PRIORITY* THAT CAN BE FOUND WITHIN THE IBA	
Habitat	Subhabitat
Tidal Wetland	Tidal Wetland
Freshwater Aquatic	Head of tide
Estuarine Aquatic	Coastal Rivers, Coves, Embayments
	Vegetation Beds
	Sedimentary Bottoms
Open Water	
Intensively Managed Habitats	Early Successional Shrublands and Forests

* Identified in Connecticut’s Comprehensive Wildlife Conservation Strategy (CCWCS) Plan (CTDEP 2005)

3.4 Stakeholder Identification

3.4.1 Landownership

The IBA boundary encompasses the whole of the 316+ acre SMU of the SBM NWR, which has been owned by the USFWS since 1972. Other land owners within the IBA include the Trust for Public Land, CTDEP, Westbrook Land Conservation Trust, The Town of Westbrook, and a number of private land owners. These lands together encompass approximately 670 acres. The land abutting the IBA is sparsely developed with residential properties adjacent to the western, northern, and eastern boundaries. Commercial and residential properties lie adjacent to the IBA’s southern boundary along State Route 1.

3.4.2 Organizations and Individuals

The following organizations and individuals were identified as potential stakeholders having an interest in conservation planning for the IBA. These organizations were contacted via survey to solicit input during the conservation planning process. Stakeholders marked with an asterisk* have indicated a willingness to participate in an IBA stewardship group, provided stakeholder comments during the preparation of this conservation plan or both. Further details and contact information regarding these stakeholders are provided in Appendix A.

Government Organizations

*Connecticut Department of Environmental Protection:

- ◆ Wildlife Division,
- ◆ OLISP WHAMM Program

*United States Fish and Wildlife Service

Town of Westbrook

Non-government Organizations

Trust for Public Lands
*Audubon Connecticut
Westbrook Land and Conservation Trust
Potopaug Audubon Society
Connecticut Ornithological Association
Connecticut Butterfly Association
Connecticut Waterfowl Association
Ducks Unlimited
Trout Unlimited
Menunketuck Audubon Society
Mattabeseck Audubon Society
New Haven Bird Club
Nature Conservancy

Individuals

*Dr. Robert Askins – Professor, Department of Biology Connecticut College
*Milan Bull – Connecticut Audubon Society
*Dr. Lawrence Gall – Yale University
*Dr. David Wagner – Center for Conservation and Biodiversity University of Connecticut
Dept. of Ecology and Evolutionary Biology
*Michael Thomas – Connecticut Agricultural Experiment Station

3.4.3 Stakeholder Comments and Recommendations

Given the level of interest in the IBA Conservation Planning process, it is clear that this IBA will benefit from having the core area protected and managed by the professional staff of the USFWS, supplemented by enthusiastic, informed, and involved stakeholders. This pool of human resources will provide a strong base of stewardship so important to the future conservation of this valuable resource area.

Stakeholders were encouraged to provide input into the development of the Conservation Plan through interviews and surveys. Stakeholders will also be provided an opportunity to review and comment on a draft of the Conservation Plan. Stakeholders provided comments on important habitat features, key issues and potential threats, and provided recommendations on physical, educational, organizational, and general improvements to the IBA that could benefit avifauna. The information they provided was used to describe existing conditions in this plan, and their opinions and suggestions were used to develop the recommendations for management also provided herein.

4.0 Natural Resources

4.1 Designation as an IBA

The refuge and adjacent undeveloped lands are an important migratory stopover for birds migrating along the Atlantic flyway. This parcel is a large undeveloped block of habitats within an increasingly developed coastline. During spring and fall migration the IBA supports numerous species of water birds, marsh birds, shore birds, and land birds. Some marsh birds and shore birds are also summer residents and are potential nesters. Winter residents consist of both water birds (such as herons, cormorants, ducks, and geese), which use the waterways within the IBA and land birds (woodpeckers, chickadees, titmice, sparrows, finches, kinglets, jays, crows, etc.). The varied habitats within the refuge provide suitable nesting sites for marsh birds, shore birds, and land birds.

“The site is known for exceptional concentrations of migratory land birds during spring and fall migrations, is one of the most productive sites in southern coastal CT for observing migratory and resident marsh birds, marsh nesting shore birds, and Osprey. Specialty marsh residents such as Saltmarsh Sharp-tailed Sparrow also find suitable nesting habitat within the IBA.”

The site was nominated as an IBA jointly by staff of Audubon Connecticut, USFWS, and the Connecticut Audubon Society.

4.2 Relevant IBA Criteria

There are global, continental and national IBA criteria that the National Audubon Society uses to prioritize sites and there are also criteria dictated by state chapters. These IBA criteria are summarized here:

Global Criteria

[A1](#) - Species of global conservation concern

[A2](#) - Assemblage of restricted-range species

[A3](#) - Assemblage of biome-restricted species

[A4i](#) - $\geq 1\%$ of the biogeographic (Northern American) population of a waterbird simultaneously; $\geq 5\%$ over a season

[A4ii](#) - $\geq 1\%$ of the global population of a seabird or terrestrial species simultaneously; $\geq 5\%$ over a season

[A4iii](#) - $\geq 20,000$ water birds/ $\geq 10,000$ seabirds [*not currently applied in the U.S.*]

[A4iv](#) - aerial bottleneck where $\geq 5\%$ of the North American population of a migratory water bird, or $\geq 5\%$ of the global population of a migratory seabird or terrestrial species passes during a season

Continental Criteria

[B1](#) - Species of continental conservation concern

B2- [Not applicable at regional level]

B3- Assemblage of individuals/species concentrated in a Bird Conservation Region

B4i- $\geq 1\%$ of the flyway/subspecies population of a water bird simultaneously; $\geq 5\%$ over a season

B4ii- $\geq 1\%$ of the biogeographic (North American) population of a seabird or terrestrial species simultaneously; $\geq 5\%$ over a season

B4iv- aerial bottleneck where $\geq 5\%$ flyway/subspecies population of a migratory water bird, or $\geq 5\%$ of the North American population of a seabird or terrestrial species passes during a season

Connecticut Criteria

1. Sites important to endangered or threatened species in Connecticut.
2. Sites important to species of high conservation priority in Connecticut. (Including WatchList species, species considered of high priority for our region by Partners in Flight, State Special Concern Species and species for which Connecticut supports a significant percentage of the global or continental population.)
3. Sites that contain rare or unique habitats within the state/region or an exceptional representative of a natural habitat and that hold important species or species assemblages largely restricted to a distinctive habitat type.
4. Sites where significant numbers of birds concentrate for breeding, during migration, or in winter, including:
 - (4a) Waterfowl: The site regularly supports 500 or more waterfowl in winter and/or 1,000 or more waterfowl in migration (staging).
 - (4b) Gulls and terns: The site regularly supports 100 or more terns or 500 or more gulls in a season.
 - (4c) Shore birds: The site regularly supports 500 or more shore birds (over a short period) at any time of the year.
 - (4d) Wading birds: The site regularly supports 25 or more breeding pairs of wading birds or 100 or more individuals feeding or in migration.
 - (4e) Raptors: The site is a “bottleneck” or migration corridor for $>5,000$ migratory raptors (seasonal total).
 - (4f) Land birds: The site is an important migratory stopover or seasonal concentration site for migratory land birds.
 - (4g) Single-species concentrations: The site regularly supports significant concentrations of a congregating species but may not meet the thresholds above. Such sites should support a higher proportion of a species statewide population ($>1\%$, if known) than other similar areas.
5. The site is important for long-term research and/or monitoring projects that contribute substantially to ornithology, bird conservation, and/or education.

The Salt Meadow Unit IBA meets several of the criteria listed above including:

Global Criterion A1: The Saltmarsh Sharp-tailed Sparrow (*Ammodramus caudacutus*) is a species of global conservation concern due to its rank of Vulnerable to extinction on the IUCN list. There must be either 10 pairs or 30 individuals during the breeding season to be considered a site of global importance. In this case, since Saltmarsh Sharp-tailed

Sparrows are polygamous with no pair bonds, the number of individuals should be used as the criterion instead of the number of pairs. Current population during the breeding season at SMU is estimated to be approximately 85-90 individuals with a mean of 3.4 nests per hectare (Elphick et al. 2005). Based on these estimates, this criterion is easily met. Therefore, the IBA supports a significant population of Saltmarsh Sharp-tailed Sparrows and may be considered to be among the top twelve sites in Connecticut for this species (C. Elphick, personal communication).

Continental Criterion B1: Both the Saltmarsh Sharp-tailed Sparrow and Seaside Sparrows are species of continental concern. As stated above, Saltmarsh Sharp-tailed Sparrow numbers are much higher than the threshold of 30 individuals. Seaside Sparrows were not detected at SMU, as a breeding resident. However the site may provide a stepping stone habitat for late summer birds dispersing from nearby breeding areas.

Connecticut Criterion 2: A number of species that are of conservation concern in Connecticut are obligate marsh species and need this habitat to successfully breed. Both the Saltmarsh Sharp-tailed Sparrow and Seaside Sparrow (*Ammodramus maritimus*) are listed as species of special concern in the state, are high conservation priorities according to Partners in Flight, and are Audubon WatchList species (red and yellow, respectively). The Willet (*Catoptrophorus semipalmatus*) and Clapper Rail (*Rallus longirostris*) also both Audubon WatchList species, are additional obligate marsh breeders and could potentially have a relatively high number of nests within the site, although exact numbers are not known. The site also provides staging and wintering habitat for American Black Ducks, which also nest in the marsh, although, again, breeding numbers are not known.

Connecticut Criterion 3: Large salt marshes are rare in Connecticut and this site is one of the largest examples of this habitat type in the state. Several species, as stated above, are restricted to this type of habitat and depend on its existence for survival.

The IBA has also met the following IBA criteria: it is a locality that contains rare, unique, or representative habitat (e.g., coastal forest, shrubland, and salt marsh); it provides habitat to high conservation priority species of birds (including state-listed endangered, threatened, and special concern species), it is known for exceptional concentrations of migratory land birds (e.g., warblers and other Neotropical migrant passerines), and the refuge has served as a long-term research and/or monitoring site for avian study. Its importance to rare avifauna is evident during the breeding season when the state threatened Great Egret (*Ardea alba*), Snowy Egret (*Egretta thula*), Least Tern (*Sterna antillarum*) and Purple Martin (*Progne subis*); and the state special concern Glossy Ibis (*Plegadis falcinellus*), Yellow-crowned Night Heron (*Nyctanassa violacea*), Little Blue Heron (*Egretta caerulea*) and Saltmarsh Sharp-tailed Sparrow frequent the marsh and adjacent waters for foraging, nesting, or both.

Other Connecticut-listed species known to use the refuge and adjacent lands outside the breeding season include the state endangered Northern Harrier (*Circus cyaneus*) and Sharp-shinned Hawk (*Accipiter striatus*) during fall, winter, and spring seasons. State special concern Brown Thrasher (*Toxostoma rufum*) and state endangered Yellow-

breasted Chat (*Icteria virens*) arrive during migration and in winter. Additionally, fall migration is known to bring the state special concern Saw-whet Owl (*Aegolius acadicus*) state endangered Red-headed Woodpecker (*Melanerpes erythrocephalus*) and Peregrine Falcon (*Falco peregrinus*) to coastal locations such as the SMU IBA.

Over 200 bird species are expected to occur within the IBA. Neotropical migrant passerines abound, as illustrated by the 29 species of warblers recorded at SBM NWR during fall migration. A comprehensive list of bird species observed or expected to occur within the IBA is provided in Appendix B.

4.3 Abiotic Features

4.3.1 Water features

The entire IBA is contained within the major watershed of the South Central Coast Major Basin. Within this major watershed basin the IBA lies within the South Central Eastern Complex regional watersheds. Of the total 116,954 acres of land contained in the South Central Eastern Watershed, 17.4% is developed, 57.1% is deciduous forest and 1.6% is tidal wetland (<http://clear.uconn.edu/projects/landscape/local/rbasin>).

Within this regional watershed, there are several subregional basins. The IBA lies within the Menunketesuck River subregional basin. Most of the undeveloped land within the watershed is privately owned, however large parcels are owned by the State of Connecticut Department of Environmental Protection Bureau of Natural Resources Forestry Division (Cockaponset Forest Blocks) and the Connecticut Water Company Guilford-Cheshire Division. Smaller undeveloped parcels are owned by the Westbrook Land and Conservation Trust, and the Nature Conservancy.

Riverine

Riverine systems associated with the IBA include both named and unnamed systems. Unnamed systems include various small intermittent streams that drain the uplands within or surrounding the IBA. Many of these intermittent streams flow during a very limited time during the spring season, as they drain very small catchments within the watershed and discharge very low volumes compared to other drainages in the area. These unnamed streams are classified as Riverine Intermittent Streambed (R4SB) systems and have either cobble, gravel, organic (e.g., root mass, muck), or vegetated channels.

Named systems include limited reaches of the Menunketesuck River and Gatchen Creek at the northern limit of the IBA where the systems are still tidally influenced but where freshwater vegetation predominates. These are described below.

Menunketesuck River

The Menunketesuck River (Figure 4-1) originates in Killingworth near the town's northern border with Haddam. The River flows for a length of approximately 2.1 miles through the IBA. The reach of the River from I-95 south to the mouth at Long Island

Sound is tidally influenced. Using the Cowardin et al. (1979) classification system, the Menunketesuck River is classified as a Riverine Tidal (R1) watercourse. The various classes and subclasses associated with this system within the IBA are provided in Table 4-1.

Class	Subclass	Denotation	Locations found in IBA
Streambed	Cobble-Gravel	R1SB3	At upper reaches of Menunketesuck River and Gatchen Creek
Unconsolidated Bottom	Mud	R1UB3	Various segments of the Menunketesuck River and Gatchen Creek
Aquatic Bed	Rooted vascular	R1AB3	Middle reach of Gatchen Creek
Rocky shore	Bedrock	R1RS1	At limited areas of outcrops along upper reach of Menunketesuck River
Unconsolidated shore	Cobble-Gravel	RIUS1	At areas along river where the forested uplands meet the channel edge
	Mud	R1US3	Along interface between salt marsh and tidal creeks
Open Water	Unknown bottom	R1OW	Deeper channel portions of Menunketesuck River and Gatchen Creek

The river is important to a variety of fisheries in the state, including the catadromous American eel (*Anguilla rostrata*). Fringing salt marshes, tidal creeks, and the lower reaches of the Menunketesuck River and Gatchen Creek within the IBA support estuarine finfish and shellfish resources as well. Lower reaches support amphidromous species such as hog choker (*Trinectes maculatus*). Predatory fish such as juvenile bluefish (*Pomatomus saltatrix*) likely enter the lower reaches of the River to feed on smaller baitfish. The majority of the reach of the Menunketesuck River that flows through the IBA is characterized by a silt substrate. Silt and organic muck banks vegetated with salt marsh gramminoids extend landward from the river. In a few isolated locations, the river edge meets a steep wooded bank of the coastal forest growing on glacial till uplands. Numerous tidal creeks and mosquito ditches form tributaries to the river within the IBA, the largest being Gatchen Creek.

Of the 13 functions and values known to potentially occur in wetlands and watercourses (ACOE-NED, no date), the riverine systems provide the following within the reach that bisects the IBA:

- ◆ Groundwater Discharge
- ◆ Production Export
- ◆ Wildlife Habitat
- ◆ Fish and Shellfish Habitat
- ◆ Educational/Scientific Value

◆ Visual Quality/Aesthetics



Figure 4-1 The Menunketesuck River viewed looking west from the base of Murdock Hill

Gatchen Creek

Gatchen Creek, a tributary to the Menunketesuck River, originates within Westbrook and extends approximately 0.75 miles downstream to its confluence with the Menunketesuck River. Most of the Creek is highly influenced by the tides. It likely supports a similar finfish community as the Menunketesuck River. The tidal flats exposed along the river during low tide are important feeding areas for Willets and basking areas for Diamond-backed Terrapins (*Malaclemys terrapin*). Reaches of the creek support stands of Wigeon Grass (*Ruppia maritima*), a species of submerged aquatic vegetation that is a valuable food source for aquatic waterfowl and shore birds. This plant is an especially important component in the diet of the American Black Duck (*Anas rubripes*), American Wigeon (*Anas americana*), Redhead (*Aythya americana*), Canada Goose (*Branta canadensis*) and other waterfowl. It is also consumed by dowitchers, *Calidris* sandpipers, and American Coot (*Fulica americana*). Martin et al. (1951) lists 33 species of birds that are known to include Wigeon Grass as an “appreciable extent” of their diets.

Gatchen Creek and its associated wetlands provide the same functions and values known to potentially occur in wetlands and watercourses as those described for the Menunketesuck River. The fringing wetlands along these drainages provide additional functions and values, identified below.

Tidal Wetlands

As described in section 4.3.3, there are poorly drained soils on the site, represented by the Westbrook and Scarboro series. The Westbrook series forms extensive expanses within the salt marsh while the Scarboro series is limited to a few isolated inclusions. Being very poorly drained soils, areas containing these soil units meet the state definition of a wetland. Further, since they are subjected to tidal inundation, they meet the Connecticut classification of tidal wetlands.

Using the Cowardin, *et al.* (1979) classification system, the tidal wetlands within the IBA are considered estuarine wetlands. Two subsystems, subtidal, and intertidal, of the Estuarine system are represented. Within these subsystems are various classes and subclasses based upon the characteristics of the benthic habitat. Those represented within the IBA are listed within Table 4-2.

Table 4-2. Various Wetland Classes and Subclasses Represented by the Tidal Wetlands within the IBA			
Class	Subclass	Denotation	Locations found in IBA
Subtidal System			
Rock Bottom	Rubble	E1RB1	At RR crossing
Unconsolidated Bottom	Mud	E1UB3	Tidal creeks
	Organic	E1UB4	Salt pannes and portions of tidal creeks
Open Water	Unknown bottom	E1OW	Areas along the southern end of the IBA
Intertidal System			
Streambed	Mud	E2SB4	Tidal creeks
Unconsolidated shore	Mud	E2US3	Along interface between salt marsh and tidal creeks
	Organic	E2US4	Unvegetated areas of salt marsh, salt pannes
Emergent	Emergent Irregularly Flooded and Ditched	E2EMPd	Salt marsh
	Emergent Irregularly Flooded, Mesohaline and Ditched	E2EMP5d	Brackish marsh

Portions of the salt marsh wetland system have to some extent, been impaired by past filling and development within the watershed. Invasive vegetation such as common reed has colonized and proliferated around these fill areas, reducing the species diversity and structural diversity of the emergent community. Common reed and other invasive species removal/control offers opportunity for habitat restoration. Areas formerly filled within the IBA include the southeast corner in relation to a residence built off of Hammock Road, along the Amtrak railroad line, and along the southern boundary of the

IBA in association with commercial properties and marinas along the north side of Route 1.

The major functions and values provided by the tidal wetland systems on-site consist of the following:

- ◆ Sediment/Toxicant/Pathogen Retention
- ◆ Nutrient Removal/Retention/Transformation
- ◆ Production Export
- ◆ Sediment/Shoreline Stabilization
- ◆ Wildlife Habitat
- ◆ Fish and Shellfish Habitat
- ◆ Educational/Scientific Value
- ◆ Visual Quality/Aesthetics

Inland Wetlands

Inland wetland areas also exist as groundwater discharge seeps at the toe of the slope associated with Murdock Hill. These wetlands exist predominantly as palustrine forested broad-leaved deciduous forest (PFO1) wetlands using the Cowardin system. These wetlands provide habitat for American Woodcock (*Scolopax minor*) Carolina Wren (*Thryothorus ludovicianus*), Veery (*Catharus fuscescens*), Northern Cardinal (*Cardinalis cardinalis*), Black-capped Chickadees (*Poecile atricapillus*), and a multitude of migrant passerines that prefer wetter habitats (e.g., Canada Warbler [*Wilsonia canadensis*], Louisiana and Northern Waterthrushes [*Seiurus motacilla* and *S. noveboracensis*], Swamp Sparrows [*Melospiza georgiana*], etc.).

Of the 13 functions and values known to potentially occur in wetlands and watercourses (ACOE-NED, no date), the freshwater inland wetlands within the IBA provide the following:

- ◆ Groundwater Discharge
- ◆ Production Export
- ◆ Wildlife Habitat
- ◆ Educational/Scientific Value

Gatchen Creek originates from a palustrine scrub-shrub/forested wetland at its source outside of the IBA. Here it provides habitat for Golden-crowned Kinglet (*Regulus satrapa*) in winter; warblers (e.g., Common Yellowthroats [*Geothlypis trichas*] and Yellow Warblers [*Dendroica petechia*] in the breeding season), Cedar Waxwings (*Bombycilla cedrorum*), Song Sparrows (*Melospiza melodia*), Common Grackles (*Quiscalus quiscula*), etc. Within the IBA, upper to middle reaches of Gatchen Creek are vegetated with Common Reed while middle to lower reaches are vegetated with either salt marsh vegetation or oak-hickory forest where creek meanders touch the steep hillside of the Murdock Hill drumlin.

Flood Zones

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map

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(FIRM) dated June 16, 1992 for the Town of Westbrook Connecticut shows that various flood zones occur on Site, and include areas designated as Zone A2, Zone A6, Zone A7, Zone B, and Zone C. Areas designated as an “X” delineate areas inundated by the 100 year flood where the base flood elevation has been determined and flood hazard factors have been determined. Areas designated as Zone B are areas between limits of the 100-year flood and 500 year flood; or certain areas subject to 100 year flooding with average depths less than one foot or where contributing drainage area is less than one square mile; or areas protected by levees from the base flood. Areas designated as Zone C are considered areas of minimal flooding (FEMA, 1992). The location of the respective flood zones in relation to the Site are depicted in Figures 4-2 and 4-5.

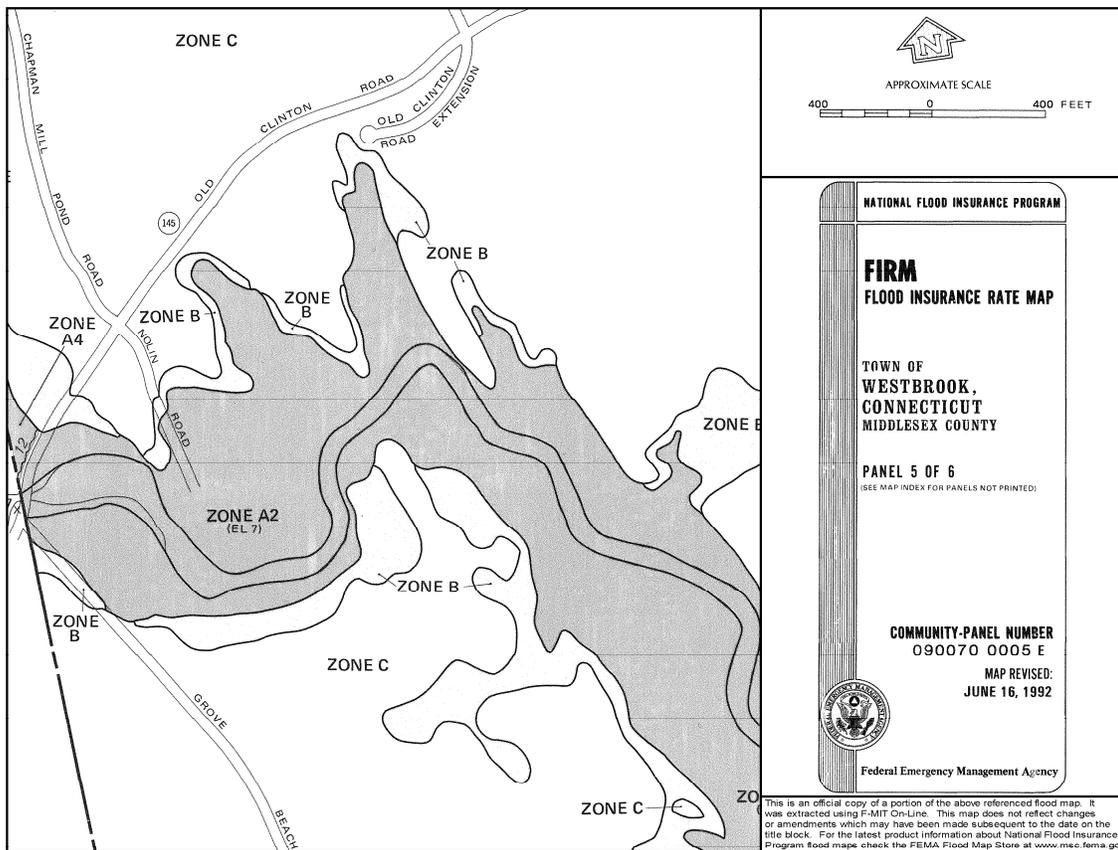


Figure 4-2. Flood Zones along the Upper Reach of the Menunketesuck River within the SMU IBA

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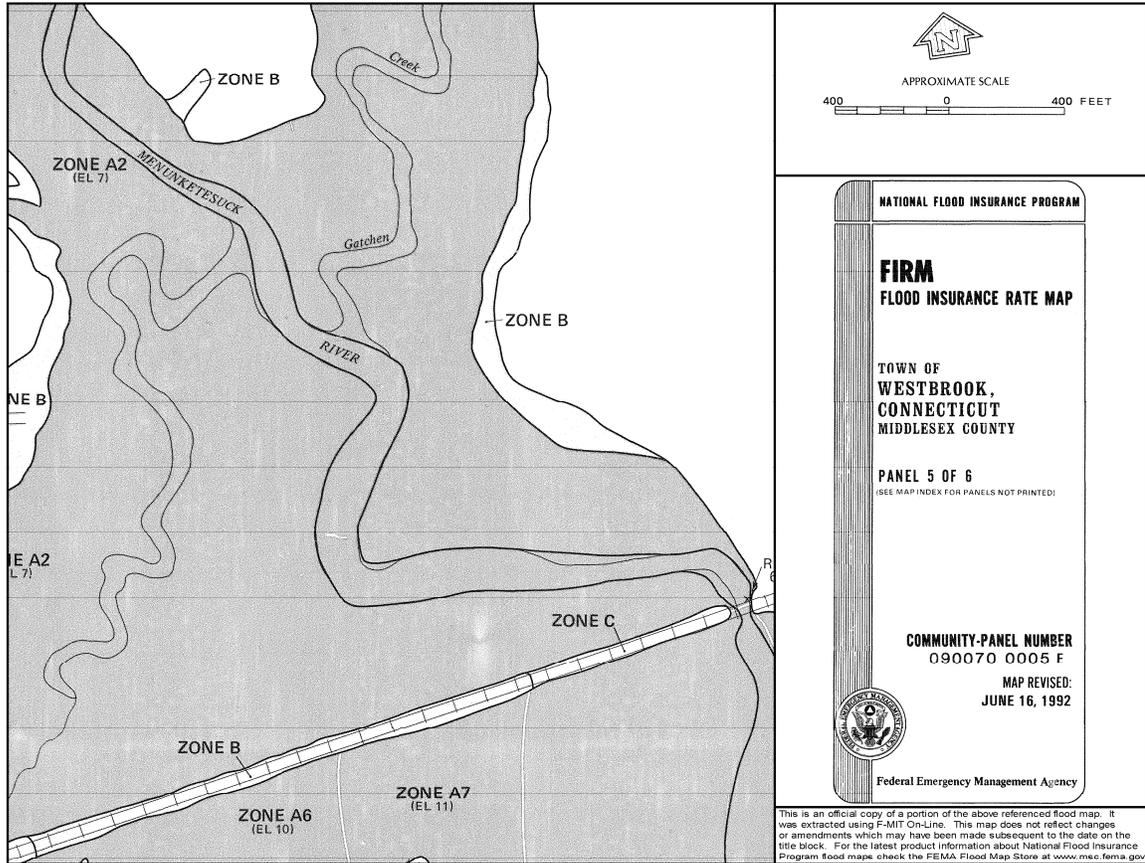


Figure 4-3. Flood Classification Zones along the Middle Reach of the Menunketesuck River within the SMU IBA

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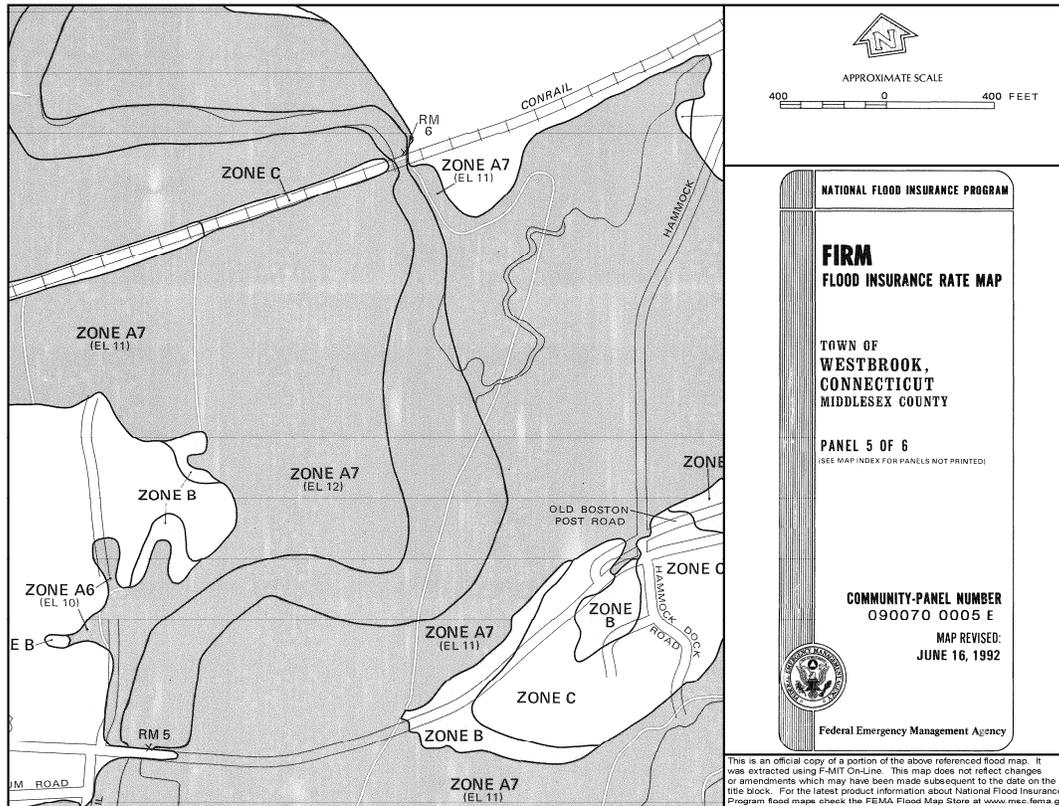


Figure 4-4. Flood Classification Zones along Lower Reach of the Menunketesuck River within the SMU IBA

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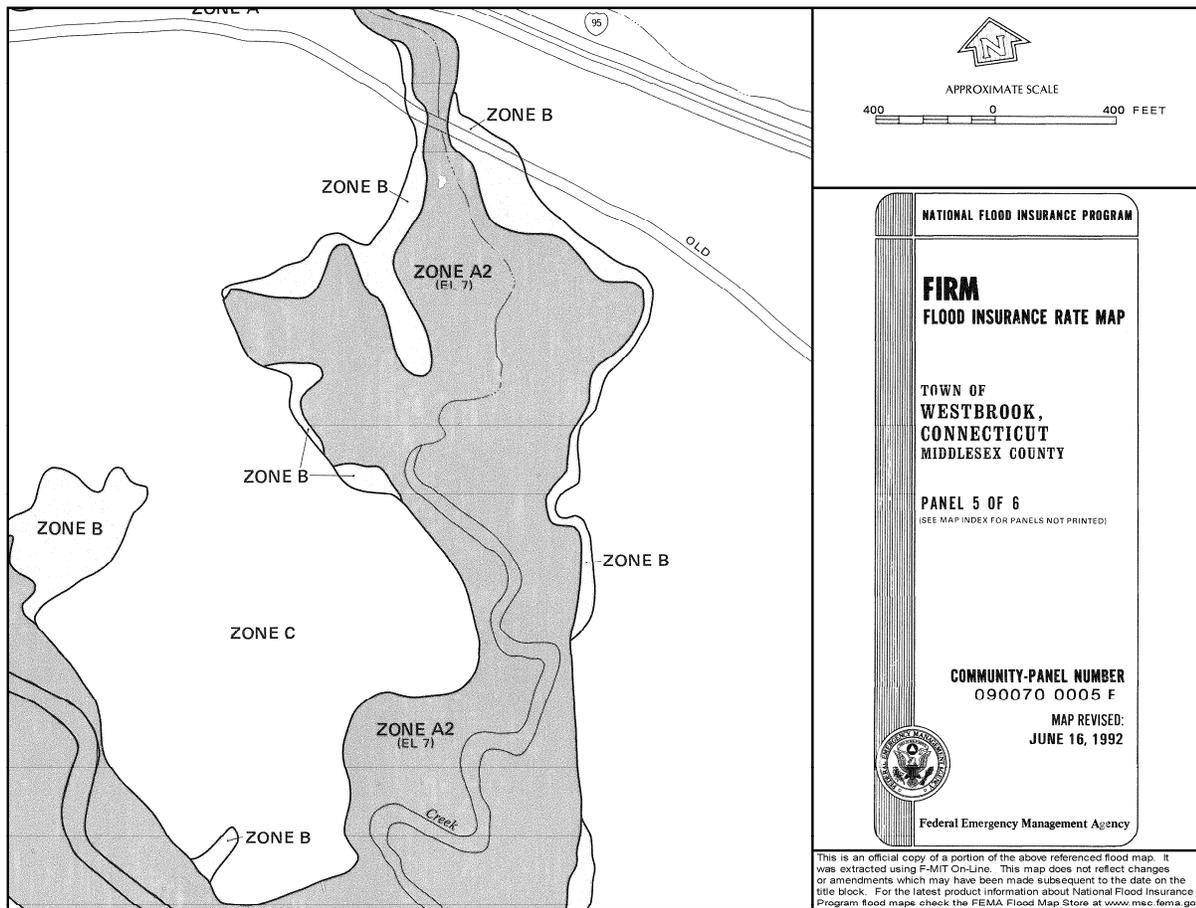


Figure 4-5. Flood Classification Zones along Gatchen Creek within the SMU IBA

4.3.2 Water Quality

Groundwater

Groundwater beneath the majority of the IBA is classified as GA (CTDEP, 2006). Waters with the GA designation are within the area of existing private water supply wells or an area with the potential to provide water to public or private water supply wells. Groundwater within areas with a GA designation is presumed by the CTDEP to be suitable for drinking or other domestic uses without treatment.

According to the Groundwater Availability in Connecticut map (Meade, 1978), the IBA has two distinct water-bearing units. The majority of the IBA including Murdock Hill and adjacent areas is mapped as till and stratified drift which is composed of mixtures of gravel, sand, silt, and clay. This mapped unit is inferred to be capable of yielding small to moderate amounts of water (1 – 100 gallons per minute).

Areas along either side of the Menunketesuck River are designated as having coarse-grained stratified drift (composed predominantly of sand, or sand and gravel) overlying fine-grained stratified drift (composed predominantly of very fine sand, silt, and clay). This unit is inferred to be capable of yielding moderate to large amounts of water (50 – 500 gallons per minute).

Surface Water

The Menunketesuck River is classified as SB/SA by the CTDEP (2005). Surface water with this designation has been impacted due to a combination of both historical and current point and non-point sources of pollution. As a result, certain water quality criteria for one or more designated uses assigned to Class SA waters are not currently met.

The water quality goal is achievement of Class SA criteria and attainment of Class SA designated uses. Class SA designated uses are for “habitat for marine fish, other aquatic life and wildlife; commercial shellfish harvesting; recreation; industrial water supply; and navigation” (CTDEP, 2002). Surface water quality classification areas are depicted in Figure 4-6.

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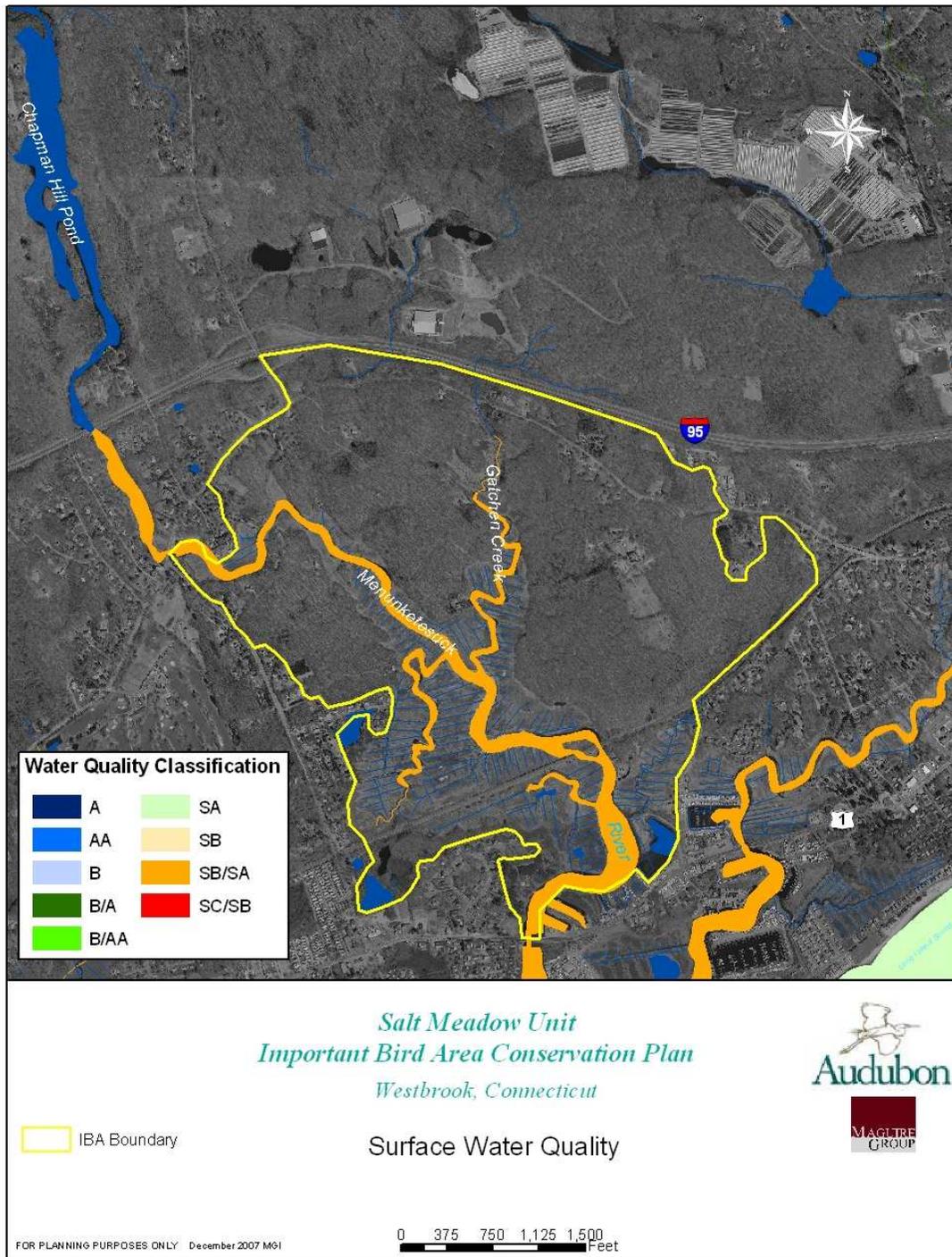


Figure 4-6. CTDEP Surface Water Quality Classifications within and Proximal to the IBA

4.3.3 Soils

The following distinct soil units (series or associations) are mapped by the Natural Resource Conservation Service (NRCS) (1981) for the Site and adjoining areas:

- Charlton-Hollis
- Canton and Charlton
- Paxton and Montauk
- Woodbridge
- Hinkley
- Merrimac
- Westbrook
- Scarboro

The area within the IBA contains both non-hydric (upland) and wetland (hydric) soils. Areas with hydric soils within 18 inches of the ground surface may meet the state, federal, or both definitions of a wetland, and therefore fall under the appropriate jurisdiction of authorities regulating activity within a wetland. Hydric soils in Connecticut are defined as those soils that are “poorly drained” and “very poorly drained”. “Very poorly drained” soils are defined as having a water table which remains at or above the surface most of the time. These soils occupy level or depressed areas. The soils are usually gray throughout with possibly some brown mottling in the substratum. Surface soils are generally thick and very dark gray or black with partly decomposed organic material. Most areas meeting the drainage class of very poorly drained consist of the Westbrook soil series. This soil series is comprised of mucky peat.

The major soils series found within the IBA and their characteristics (e.g., texture, permeability, lithologic origin, etc.) are presented in Table 4-3. The extent of these soil units on site, based upon existing mapping, is depicted in Figure 4-7.

An analysis of chronological aerial photographs of the site depict that extensive areas at the southern end of the original salt marsh system associated with the Menunketesuck River drainage have been filled over time. Soils within filled areas are identified as “Aquents”. They occur mostly along the southern portion of the marsh along State Route 1.

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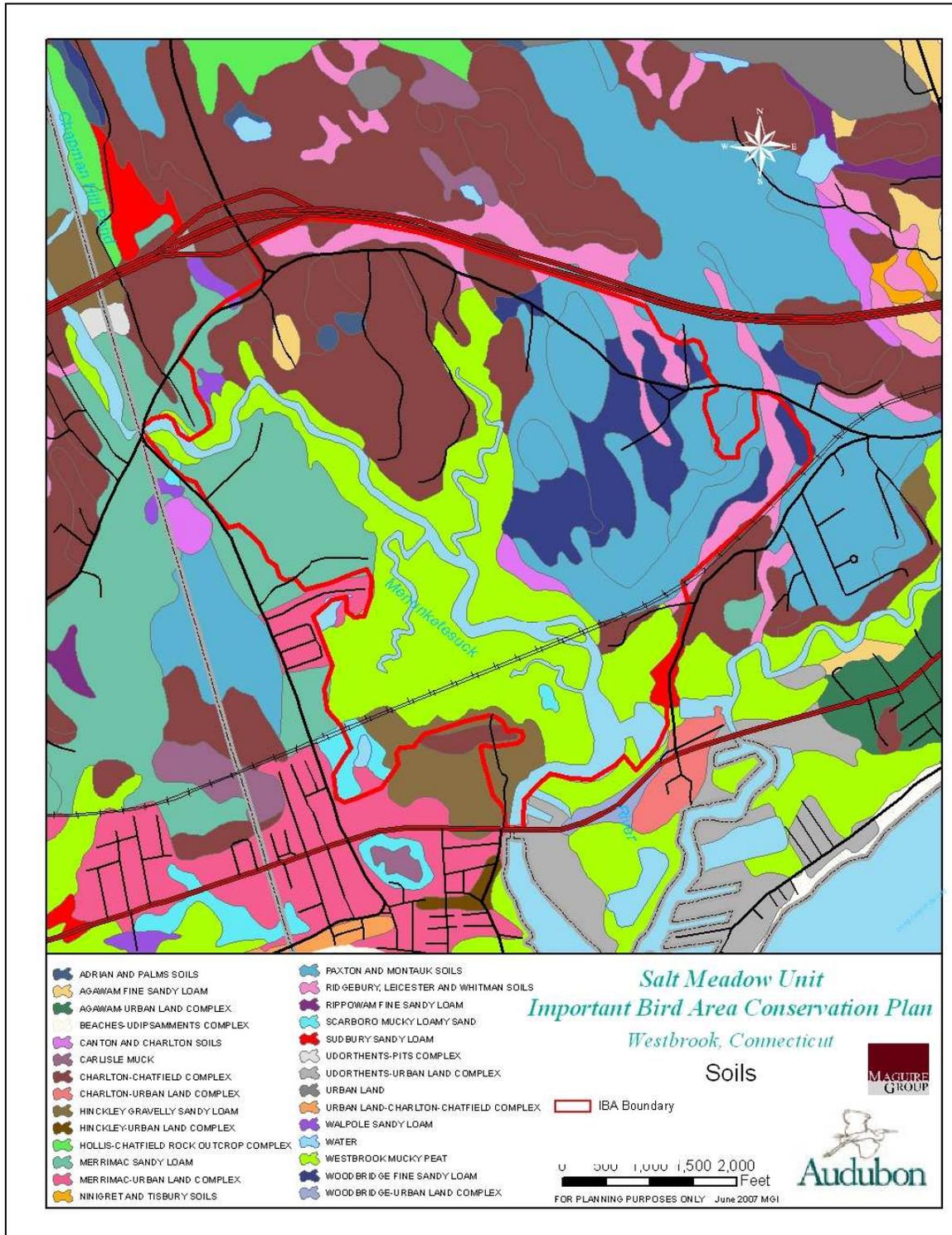


Figure 4-7 Soil Units within and adjacent to the IBA

4.3.4 Bedrock Geology

Bedrock outcrops occur on site in the vicinity of the west bank of the Menunketesuck River within the IBA. These areas add to the habitat diversity of the IBA. Bedrock underlying the Site is composed predominantly of Brimfield Schist, defined by Rodgers (1985) as gray, rusty-weathering, medium to coarse grained inter-layered schist and Gneiss. Schist is defined as “light to silvery dark, coarse to very coarse-grained strongly to very strongly layered metamorphic rock whose layering is typically defined by parallel alignment of micas. Primarily composed of mica, quartz and feldspars; occasionally spotted with conspicuous garnets”. Gneiss is defined as light and dark, medium- to coarse-grained metamorphic rock characterized by compositional banding of light and dark minerals, typically composed of quartz, feldspar, and various amounts of dark minerals...” (Rodgers, 1985).

Table 4-3A. Major Soil Types Occurring within the SMU IBA

Characteristic	Hinkley	Merrimac	Charlton-Hollis / Hollis-Charlton Complexes
Drainage Class	Excessively drained.	somewhat excessively drained	Somewhat excessively drained
Depth of Deposit	Variable	very deep	Charlton 20-36"; Hollis 12-30"
Formed in	Water-sorted sand and gravel	water sorted gravelly and sandy material	Charlton in glacial till; Hollis in thin mantle of glacial till
Lithology	Derived principally from granite, gneiss, and schist.	derived mainly from granitic, gneissic and some schistose rocks	Derived principally from gneiss and schist.
Toposequence Position	Nearly level to very steep soils	On glacial outwash plains, valley trains, and associated kames, eskers, stream terraces and water-deposited parts of moraines	Charlton on hills and ridges; Hollis on hilltops, ridgetops and side slopes
Slope Ranges	generally 0 to 8 percent on tops of the terraces, outwash plains and deltas	0 to 35 percent	3 to 15 %
Saturated hydraulic conductivity	high or very high.	high or very high	
Rock Fragments	less than 15	mainly granite or gneiss, but up to 25 percent are flat, fine-grained slate, shale, or phyllite fragments	
Acidity	extremely acid to moderately acid	strongly acid	Very strongly acid to medium acid

Source: Soil Survey Staff NRCS, USDA <http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi>

Reynolds (1979)

Table 4-3B. Major Soil Types Occurring within the SMU IBA (Continued)

Characteristic	Paxton	Agawam	Woodbridge	Sudbury
Drainage Class	Well drained	Well-drained	Moderately well-drained	Moderately well to Somewhat poorly-drained
Depth of Deposit	Solum thickness ranges from 20 to 40 inches	Solum thickness ranges from 15 to 35 inches.	Solum thickness ranges from 18 to 40 inches	Thickness of the solum and depth to stratified sand and gravel ranges from 18-36 in.
Formed in	Subglacial till	Sandy, water deposited materials.	Subglacial till	glacial outwash
Lithology	Derived from schist, gneiss, and granite	Derived principally from schist, granite, gneiss, and phyllite	Derived from schist, gneiss, and granite	Rock fragments mainly granite or gneiss with less than 25 % dark, fine-grained shale, slate, or phyllite
Toposequence Position	Atop till plains, hills, and drumlins	Outwash plains and high stream terraces	Atop till plains, hills, and drumlins	nearly level to strongly sloping soils in slight depressions and on terraces and foot slopes in areas of glacial outwash
Slope Ranges	0 to 45 %	0 to 15 %	0 to 25 %	0 to 15 %
Saturated hydraulic conductivity	Moderately high; or high in the surface layer and subsoil	High in the upper solum and high or very high in the lower solum and substratum	Ranges from moderately low or Moderately high in the surface layer and subsoil	High in the upper solum and high or very high in the lower solum and substratum
Rock Fragments	5-35% by volume (sub-rounded gravel)	0 - 10 % by volume in the surface, 0 - 30 % in the B and C horizons (above 40 in) and 0 - 60 % below.	5-35% by volume (sub-rounded gravel)	Ranges from 0 to 30 % by volume in individual horizons of the solum
Acidity	Very strongly acid to moderately acid	Ranges from very strongly acid to slightly acid, unless limed.	Very strongly acid to moderately acid	Ranges from extremely acid to slightly acid in the solum, unless limed, and from very strongly acid to slightly acid in the substratum

Source: Soil Survey Staff NRCS, USDA <http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi>

Reynolds (1979)

Table 4-3C. Major Soil Types Occurring within the SMU IBA (Continued)

Characteristic	Walpole	Adrian	Westbrook	Scarboro
Drainage Class	Poorly drained (water table at or near the surface much of the year)	Very Poorly Drained	Very Poorly Drained	Very poorly drained
Depth of Deposit	Thickness of the solum and depth to sand or loamy sand substratum layers range from 18 to 28 inches	Typically an organic layer to 24 in. thick; mineral material generally from 34 to 60 inches	Organic layer to 32 inches; mineral layer to 99 inches or more.	Organic layer to 12 in.; mineral layer to 60 in. or more.
Formed in	Sandy glaciofluvial and stratified drift materials	organic material over sandy deposits on outwash plains, lake plains, lake terraces, flood plains, moraines, and till plains	Organic deposits over loamy mineral materials	Sandy glaciofluvial deposits
Lithology	Derived mainly from crystalline rocks	Organic deposits from herbs; Sand or sand & gravel derived from gneiss, schist, granite, sandstone, conglomerate	Mineral materials derived principally from gneiss and schist	Mineral materials derived principally from gneiss and schist
Toposequence Position	Nearly level and gently sloping soils in shallow drainageways and low-lying areas on terraces and plains	Nearly level	Nearly level	Low depression on outwash plains and terraces
Slope Ranges	0-8 %	0-1 %	< 1%	0 to 3 %
Saturated hydraulic conductivity	Moderately rapid in the surface layer and subsoil, and rapid or very rapid in the substratum	Permeability is moderately slow to moderately rapid in the organic material and rapid in the sandy material	Mod. high – very high in the organic layers and low - high in the underlying mineral sediments	High or very high
Rock Fragments	Range from 0-25 % by volume in the solum; from 0-50 % in individual layers of the substratum	0 to 60 %	None; likely to contain shell fragments	Up to 10 % rock fragments
Acidity	Ranges from very strongly acid to neutral throughout	Organic subhorizons: strongly acid to neutral; Mineral horizon: slightly acid to mod. alkaline.	Strongly acid to neutral; extremely acid when dried	Strongly acid to medium acid

Source: Soil Survey Staff NRCS, USDA <http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi>

Reynolds (1979)

4.4 Land Use

The IBA is bordered to the south by the Marina District of Westbrook, areas containing dense commercial development along State Route 1 in Westbrook, and residential areas to the west along Grove Beach Road. Residential development at other areas surrounding the IBA is relatively low-density. A land use cover map (Figure 3-4 presented previously in Section 3.3) depicts the dominant land uses in the vicinity of the IBA.

The primary use of the IBA is for fish and wildlife habitat. Access to the Menunketesuck River is not provided via the wildlife refuge, but public water access areas lie at the upper reaches of Menunketesuck River and Gatchen Brook within the IBA. Marinas are also located at the southwestern limit of the IBA adjacent to State Route 1 and provide boat ramp access to the river.

Other IBA amenities include the following, provided within the SMU refuge:

- Walking trails
- Log-cabin pavilion used as an environmental education center
- Observation platform with telescope for viewing wildlife out in the salt marsh
- Parking lot facility

The IBA is a destination for birders traveling along the coast, and is a recommended destination in local bird finding guides (Rosgen and Billings, 1996). Passive recreational activities in which the IBA is important include nature and wildlife observation/photography, and fishing. The facility on Murdock Hill within the SMU serves as the headquarters for USFWS SBM NWR personnel.

The fish within the Menunketesuck River support both recreational and commercial fisheries and, therefore, are an important economic resource. Fish spawned in the salt marshes of Connecticut are important forage base for economically important finfish in Long Island Sound such as weakfish (*Cynoscion regalis*), bluefish, winter flounder (*Pseudopleuronectes americanus*), summer flounder (*Paralichthys dentatus*), striped bass (*Morone saxatilis*), cunner (*Tautoglabrus adspersus*), tautog (*Tautoga onitis*), and scup (*Stenotomus crysops*).

4.5 Habitats/Natural Communities

The IBA offers a diversity of habitats within a shoreline region experiencing increasing development pressure. Among these habitats are: salt marsh, intertidal flats, estuary, pond (Chapman Pond), coastal forest, lawn, freshwater wetlands, meadow, coastal shrubland edge. The proportion of major habitat categories that occur within the IBA are estimated as follows: 53% deciduous forest, 1% shrub, <1% inland wetland, 30 % salt marsh and associated tidally influenced brackish water riverine estuary. The remaining consists of residential and commercial (marina) development. Details about the habitats and natural communities found within these cover types are provided below. The distribution of

habitats and natural communities in the IBA are depicted in Figure 4-8. A discussion of the importance of these habitats to avifauna is provided in this section. The special habitat attributes listed by DeGraaf and Yamasaki (2001) that are important to New England avifauna and other wildlife and which were noted to occur on-site are presented in Appendix C.

4.5.1 Forest

Forested areas consist of Murdock Hill, a drumloidal landscape feature at the eastern side of the IBA (Figure 4-9), forested islands within the salt marshes fringing the Menunketesuck River and Gatchen Creek, a forested peninsula between these two water features, and forest areas along the western shore of the IBA. Discrete forested blocks of the Cockaponsett State Forest lie to the north of the IBA across I-95.

The forests provide cover and foraging habitat for a variety of migrant and resident birds. Accipiters cruise along the river and creek corridor at the forest edge. Woodpeckers, vireos, corvids, chickadees, nuthatches, creepers, kinglets, wrens, thrushes, warblers, tanagers, sparrows, cardinals, orioles, and finches can typically be found within the wooded areas as well. Resident passerines typically occur as mated pairs, while migrant and winter resident passerines typically occupy this habitat in mixed species flocks of adults and juveniles.

4.5.2 Shrubland

Shrubland areas predominate at the center of Murdock Hill extending from the refuge headquarters, downslope to the south. These shrubland areas are composed of a mix of non-native shrubs such as multiflora rose (*Rosa multiflora*) and honeysuckle (*Lonicera* sp.) and some native shrub species (e.g., highbush blueberry [*Vaccinium corymbosum*], silky dogwood [*Cornus amomum*], etc.).

Shrublands within the IBA are important cover habitat for Wild Turkey (*Meleagris gallopavo*) and American Woodcock. Well-developed stands of both native and non-native shrubs provide cover and foraging habitat for both resident and migrant flycatchers (e.g., Willow, Alder, and Yellow-bellied Flycatchers [*Empidonax trailii*, *E. alnorum*, *E. flaviventris*]), wrens, mimic thrushes (including the state listed special concern Brown Thrasher – *Toxostoma rufum*), warblers (Common Yellowthroat, Chestnut-sided [*Dendroica pensylvanica*], Blue-winged [*Vermivora pinus*], and Yellow Warblers); sparrows such as White-throated Sparrow (*Zonotrichia albicollis*), Song Sparrow, Field Sparrow (*Spizella pusilla*), and Dark-eyed Junco (*Junco hyemalis*); Northern Cardinal, American Goldfinch (*Carduelis tristis*), and House Finch (*Carpodacus mexicanus*). Nest boxes placed within the shrubland area of Murdock Hill host nesting Eastern Bluebirds (*Sialia sialis*) and Tree Swallows (*Tachycineta bicolor*).

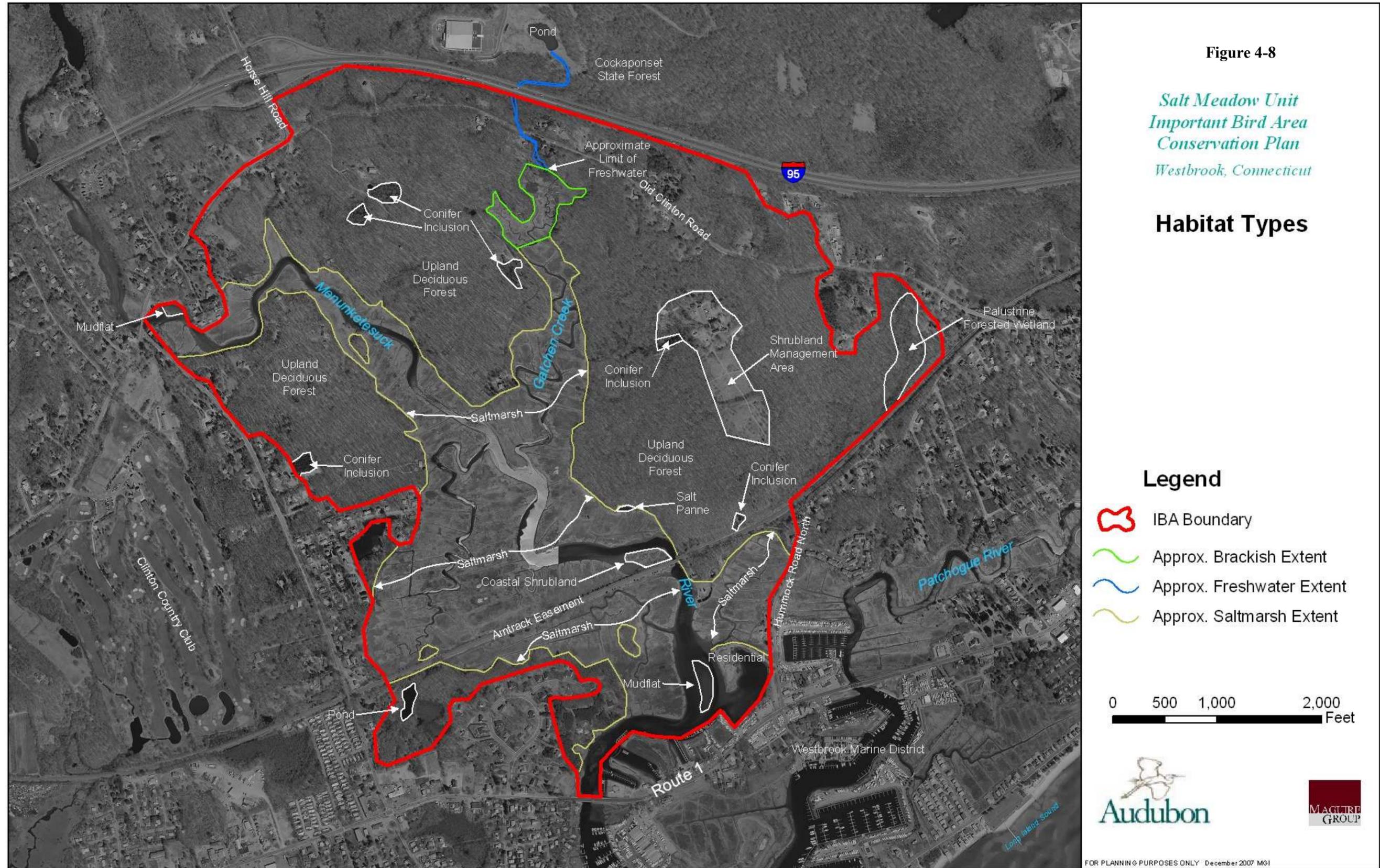




Figure 4-9. Coastal Forest

4.5.3 Intertidal Flats

Much of the Menunketesuck River and Gatchen Creek channels are devoid of aquatic vegetation beds due to high turbidity. The high turbidity of the system is caused by erosion in the watershed, sediment input from area roadways, and net import of organic detritus produced within the system by the decay of highly productive salt marsh vegetation.

The benthic invertebrate community composition in the marine waters of Connecticut varies with hydrodynamic conditions and substrate types. The substrate of the Menunketesuck River and Gatchen Creek is composed primarily of silt, and therefore is most likely colonized by species of invertebrate taxa that favor fine textured sediments. Species of benthic invertebrate taxa expected to be numerically abundant within the finer textured sediments of the project area include the Amphipods *Gammarus mucronatus*, *G. palustris*, *Ampelisca* spp., *Corophium* sp. and *Microduetopus anomalus*; the isopod *Cyathura polita*, and the following polychaetes: *Scoloplos fragilis*, *Scolecopelides viridis*, *Streblospio benedicti*, *Polydora ligni*, *Eteone longa*, and *Nereis succinea*, or analogous species that inhabit southern New England estuaries in fine textured sediment.

Intertidal flats along the watercourses within the IBA provide foraging habitat for long-legged waders in the nesting, post-nesting (dispersal), and migration seasons. These intertidal flats provide some of the most important foraging habitat for both resident and migrant waders (herons and egrets) and shore birds (plovers, sandpipers and their allies) on the Connecticut shore of Long Island Sound. Waterfowl, gulls, terns, and cormorants also use these intertidal flats throughout the year.

4.5.4 Grassy Lawn Areas

Grassy lawn areas are found within the IBA associated with residential developments and a limited area of the refuge headquarters (Figure 4-10). These areas are used as foraging habitat for, thrushes and mimic thrushes (e.g., robins, bluebirds, and Northern Mockingbird (*Mimus polyglottus*), icterids (Common Grackles, and Red-winged Blackbirds [*Agelaius phoeniceus*]), Chipping Sparrow (*Spizella passerina*), White-throated Sparrow, and Dark-eyed Junco during nesting, migration, or winter seasons. Crows and Mourning Doves (*Zenaida macroura*) frequently forage in grassy lawn areas as well.

Other lawn areas occur within the IBA associated with residential properties. Grassy areas maintained as lawns within the IBA are likely to remain as such. They offer no habitat potential to grassland specialists anyways due to their small size and their proximity to and frequency of human disturbance.

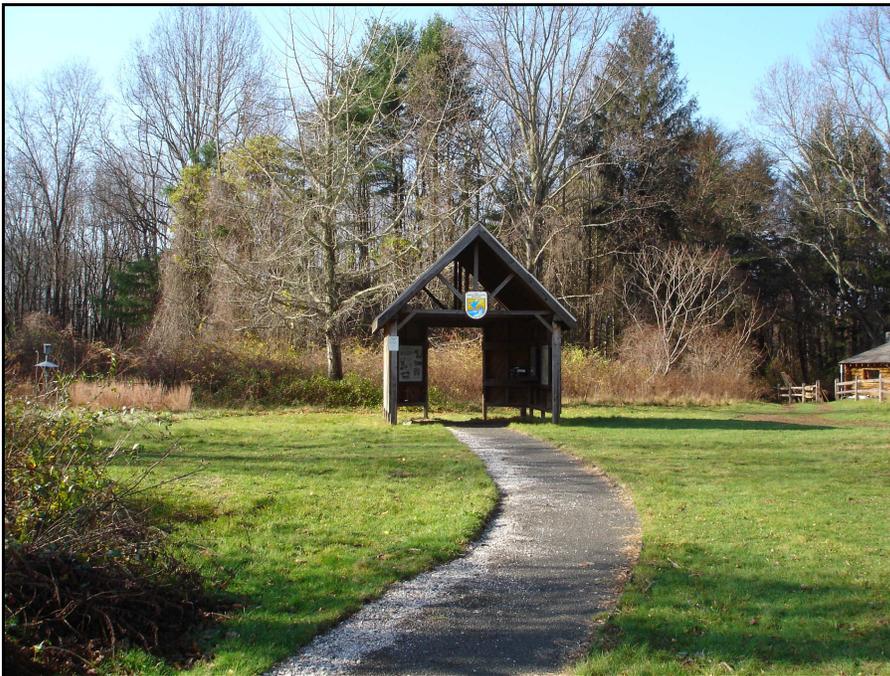


Figure 4-10. Lawn Area at the Stewart B. McKinney NWR Headquarters

4.5.5 Tidal Wetlands (Salt Marsh)

Tidally influenced salt marsh areas (Figure 4-11) within the IBA are extensive. Tidal wetlands were identified by Metzler and Wagner (1998) as one of the 13 most imperiled

ecosystems in Connecticut. They are also one of 12 key habitats of greatest conservation need identified in Connecticut's Comprehensive Wildlife Conservation Strategy (CCWCS) (CTDEP, 2005). They are an important habitat for the IBA's avifauna. Various mollusks found within the salt marshes of the IBA provide food for fish and wildlife. The most commonly encountered mollusks within the marsh are likely to be snails such as the mud snail (*Nassarius obsoletus*), the rough periwinkle (*Littorina saxatilis*), and the salt marsh snail (*Melampus bidentatus*). The ribbed mussel (*Modiolus demissus*) is likely the dominant bivalve within the salt marsh. Crustaceans, including decapod (crabs and shrimp), amphipod (sand fleas), and isopod (sowbug) crustaceans are other important food sources to fish and wildlife that are typically found in the salt marsh of the system. Notable species include the blue crab (*Callinectes sapidus*); and the fiddler crabs *Uca pugnax* and *Uca minax*. Abundant shrimp found in Connecticut tidal marshes tend to be the prawns *Palaemonetes vulgaris* and *Palaemonetes pugio*. Less conspicuous are the amphipods (typically three common species in Connecticut marshes) and the terrestrial or semi-terrestrial isopods. All mollusks and crustaceans are important food sources for fish and wildlife and therefore are important components of the marsh system. They typically fill ecological roles of both primary consumers and detritivores and therefore play an extremely important role in linking the energy flow of the system from the highly productive salt marsh flora to higher trophic levels.



Figure 4-11. Salt Marsh Habitat within the IBA

The salt marsh found within the IBA provides foraging habitat for wading birds (Snowy and Great Egrets, Little Blue Heron, Yellow-crowned Night-Heron, Glossy Ibis) in the nesting, and post nesting seasons, and also provides feeding habitat for waterfowl and gulls in the winter and migration seasons. Willets are common throughout the breeding season. Salt pannes (Figure 4-12) along the eastern side of the IBA provide foraging

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habitat for Willets (*Catoptrophorus semipalmatus*), Short-billed Dowitchers (*Limnodromus griseus*), Greater and Lesser Yellowlegs (*Tringa melanoleuca* and *T. flavipes*), Least Sandpipers (*Calidris minutilla*). Other species noted visiting the pannes from time to time include Semipalmated Sandpipers (*Calidris pusilla*), Semiplamted Plovers (*Charadrius semipalmatus*), Spotted Sandpipers (*Actitis macularia*), Killdeer (*Charadrius vociferous*), and Black-bellied Plovers (*Pluvialis squatarola*).

The invertebrates of Connecticut tidal marshes are important food sources for coastal birds (primarily gulls, terns, and cormorants), water birds (grebes, loons, ducks), marsh birds (rails), shore birds (plovers and sandpipers), and various passerines (e.g., swallows, sparrows, blackbirds). Saltmarsh Sharp-tailed Sparrows occupy the high marsh areas dominated by salt meadow cordgrass, spike grass, and black grass (Gjerdrum et al., 2008). During migration or post breeding dispersal, Seaside Sparrows may potentially occur in low marsh areas dominated by salt marsh cordgrass (Figure 4-13).



Figure 4-12. Salt Panne within the Salt Marsh Habitat of the IBA



Figure 4-13. Salt Marsh Cordgrass (*Spartina alterniflora*) - dominated Zones along a Ditched Tributary within the Salt Marsh Habitat of the IBA

4.6 Avian Species Information

The IBA offers two habitats that are rare in Connecticut: salt marsh and coastal forest. Similar habitat occurs nearby but is typically much less extensive and fragmented or does not occur adjacent to each other as one large protected unit. Similar marsh and upland coastal forest associations occur at nearby Hammock River in Clinton (approximately 3 miles to the southwest) and Hammonasset Beach State Park in Madison (approximately 4 miles to the southwest).

Coastal forests along the Connecticut shoreline of Long Island Sound are critical migratory stopover habitats for many birds. Songbirds especially use these forests as critical foraging areas where they obtain much needed energy reserves after or before crossing LIS. Many species return year after year during the spring and fall migrations since the IBA is situated on coastal migration paths. To date, 29 warbler species and a multitude of rarities and other species of management concern have been recorded from the IBA. Species considered rare or of management concern include those species designated as special concern, threatened, or endangered by the CTDEP, globally threatened species as designated by the IUCN, PIF high priority species, Audubon

WatchList species, and USFWS continental, national, and regional concern species.

4.6.1 Avian Community Overview

Numerous bird species use the marsh during the summer for breeding and foraging. In the summer, Osprey (*Pandion haliaetus*) nest on platforms in the marsh. They feed on the plentiful fish in the Menunketesuck River during this time and during migration. Common and Least Terns also take advantage of these food sources and spend hours snatching small fish out of the water. Red-winged Blackbirds, Marsh Wrens (*Cistothorus palustris*), Willets, Saltmarsh Sharp-tailed Sparrows, and Clapper Rails all nest in the marsh and can be heard commonly during the breeding season. Long-legged waders such as Great Egrets, Snowy Egrets, Little Blue Heron, and Glossy Ibis feed daily in the pools and creeks during the breeding season. Aerial insectivores such as Tree Swallows and Barn Swallows (*Hirundo rustica*) are numerous over the marsh while Northern Rough-winged Swallows (*Stelgidopteryx ruficollis*) and Chimney Swifts (*Chaetura pelagica*) can be seen occasionally. Northern Harriers search the marsh for small mammals and birds during the non-breeding season, and Red-tailed Hawks (*Buteo jamaicensis*) occur year-round in the surrounding area.

During migration, shore birds and raptors that are absent during other times of the year can be found in the marshes while passerines that breed at more northern latitudes pass through the forested areas. Shore birds commonly seen feeding in pools, ditches and creeks during migration include Semipalmated Plovers both Greater and Lesser Yellowlegs, Short-billed Dowitchers, Least Sandpipers; Semipalmated Sandpipers. American Kestrels (*Falco sparverius*), Cooper's Hawks (*Accipiter cooperii*) and Sharp-shinned Hawks also often stop-over to feed while traveling through.

4.6.2 Seasonal Changes to the Avian Communities

Bird species richness, abundance, and composition changes with the seasons at the IBA. January is typically among the coldest months of the year in Connecticut. In contrast to many of Connecticut's inland waters, which are frozen over or beginning to freeze over in January, the tidal action and brackish water of the Menunketesuck River combines to keep this body of water open later and longer as winter progresses. Late migrants such as waterfowl take advantage of the open water to prolong their journey south. Wintering land birds, such as White-throated Sparrows, American Tree Sparrows (*Spizella arborea*), Dark-eyed Juncos and others are settled in for the winter.

By late February, a majority of the marsh and associated tributaries become mostly frozen over. Opportunistic wintering birds, such as gulls, concentrate in the remaining open water area of the river. Most waterfowl move to the open water of Long Island Sound. During the winter, Red-breasted Mergansers (*Mergus serrator*), American Black Ducks, Buffleheads (*Bucephala albeola*) and Mallards (*Anas platyrhynchos*) feed on aquatic vegetation, fish and invertebrates. Short-eared Owls (*Asio flammeus*) scan the marsh ground seeking out rodents that scurry and hide among the marsh grass. Occasionally flocks of American Pipits (*Anthus rubescens*), Snow Buntings

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(*Plectrophenax nivalis*), or Horned Larks (*Eremophila alpestris*) can be found feeding on seeds in the high marsh.

During the month of March, winter grades to spring. Frozen water opens up, hardy water birds such as Bufflehead and other waterfowl, which spend the winter only as far south as necessary to find open water, are gradually moving back north. The first migrant land birds, such as American Woodcock and even Tree Swallows and Eastern Phoebes (*Sayornis phoebe*) begin to arrive by late in the month.

Spring migration is well underway by April; the numbers of waterfowl and gulls decrease while long-legged waders, such as Great Egret and Snowy Egrets, return and gradually build in number. Numbers of migrant sparrows swell, increasing the chances for sightings of uncommon visitors such as White-crowned Sparrow (*Zonotrichia leucophrys*), Fox Sparrow (*Passerella iliaca*), and Vesper Sparrow (*Pooecetes gramineus*). By late in the month, large numbers of Yellow-rumped and Palm Warblers (*Dendroica coronata* and *D. palmarum*) and the first representatives of later migrants such as Black-and-white Warblers (*Mniotilta varia*), Blue-gray Gnatcatcher and Louisiana Waterthrushes visit the IBA as a rest stop on the east coast flyway.

“In May, spring migration reaches its apex as warblers, vireos, and other Neotropical migrants pass through the area. The Salt Meadow Unit IBA offers a welcomed respite to these migrants after a potentially arduous flight across LIS or through the metropolitan areas of New York and southwestern Connecticut. In that respect, the Salt Meadow Unit IBA offers a critical ‘refueling’ station to these migrants”.

In May, spring migration reaches its apex as warblers, vireos, and other Neotropical migrants pass through the IBA. The IBA offers a welcomed respite to these migrants after a potentially arduous flight across LIS or through the metropolitan areas of New York and southwestern Connecticut. In that respect, the refuge offers a critical “refueling” station. These migrants may spend time at the refuge actively feeding and at times may be quite visible while preoccupied with feeding, thus attracting a multitude of birders.

By mid-June, the waves of migrants begin to ebb. However, late migrants such as Blackpoll and Mourning Warblers, and some flycatchers are still moving northward and may still be encountered in the IBA. Local nesters such as American Robin (*Turdus migratorius*), Gray Catbird (*Dumetella carolinensis*), and Northern Cardinal are feeding their first broods at this time. The Menunketesuck River Marshes are frequented by long-legged waders, and terns which use the area for feeding but nest colonially on offshore islands elsewhere outside the IBA. Great and Snowy Egrets commute between the IBA and their nesting colonies at Duck Island and perhaps as far away as the Thimble Islands in Branford (a distance of 14 or more miles, each way), to bring back food for their demanding and rapidly growing chicks. Common Terns may fly similar distances to and from colonies at Falkner Island (approximately 10 miles southwest) but more likely, the marshes of the IBA are used by Common Terns that nest at Menunketesuck Island near the mouth of the river.

By July, increasing numbers of egrets and water birds appear at the IBA, as young begin to disperse from breeding colonies in search of food for themselves. This number is also supplemented by the parents who can spend more time hunting, no longer needing to fly back and forth from the colony several times a day. The first southbound migrants, mainly shore birds, use the habitats of the IBA to forage, attempting to fuel up for their arduous journeys to their wintering grounds, having spent only a few weeks on their breeding grounds to the north.

In August, avian diversity is increasing nearly every day, as a wide variety of migratory birds exploit the food resources within the IBA. Shorebird abundance increases dramatically and transient flocks can be found on the fringing intertidal flats of the river or within high marsh salt pannes within the IBA. These flocks include birds hatched just a few weeks ago and are finding their way south without the help of their parents. Terns and egrets also begin to stage for their journey southward.

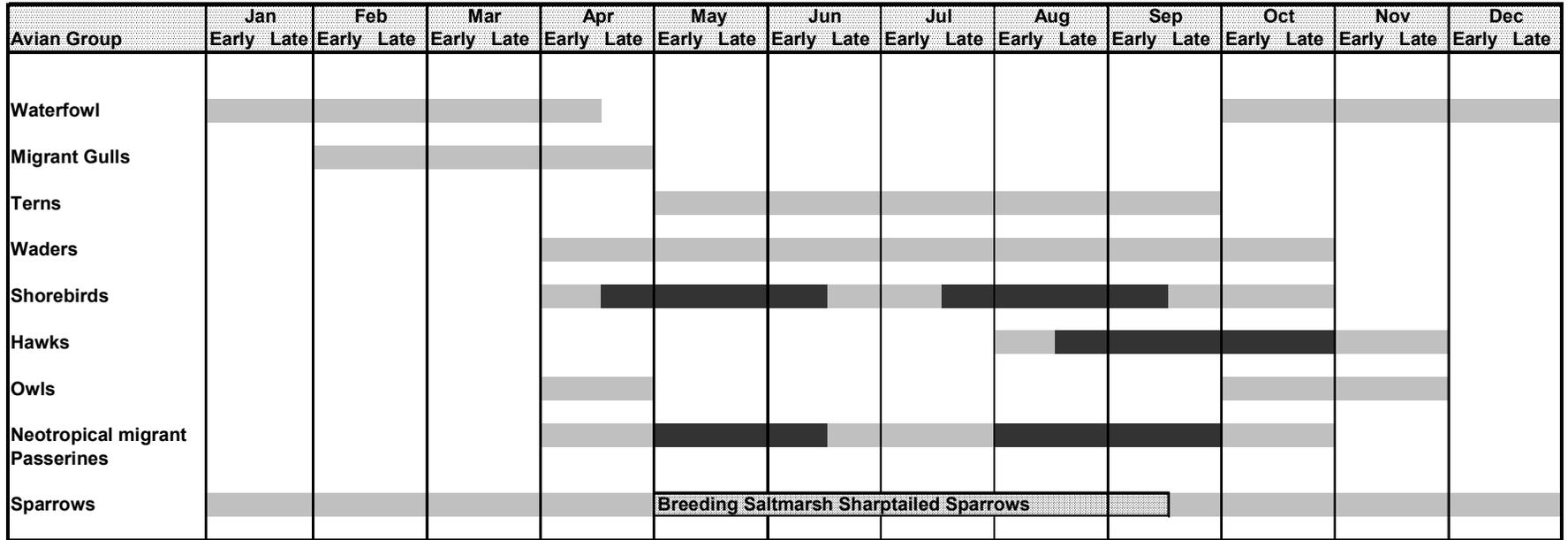
As September progresses, increasing numbers of songbirds and raptors follow each cold front. Birding activity begins to increase concurrently with the increase in fall migration. Each clear night with northerly winds brings more migrants, predominantly songbirds. These tiny travelers, such as warblers and thrushes, fly at night, taking advantage of any tail wind they can find. Hop-scotching from place to place until they reach the coast, some birds continue down the coast in small legs, while other tiny travelers embark on a long and perilous journey, beginning from Connecticut and other southern New England states. Some species, such as the Blackpoll Warbler (*Dendroica striata*) which weigh less than a half of an ounce, are thought to fly directly from Connecticut and southern New England to South America in one long, arduous journey over the open water of the Atlantic Ocean.

By October, late migrants continue to move through the IBA especially hawks, woodpeckers, and northern passerines. Large flocks of sparrows begin to arrive either as migrants passing through or as winter residents. In November, as the days get shorter and autumn fades to winter, many of the winter residents will have arrived at the IBA. Late October and early November is a good time to see concentrations of waterfowl within the IBA. Many remain long into winter as long as the waters remain ice free. In November one often gets a preview of what sort of winter this will be for birds. Large numbers of finches sometimes invade our area during the winter. Some winters are notable for the irruption of Snowy Owls (*Bubo scandiaca*).

December is Christmas Bird Count (CBC) month. The CBC was started in 1900 as an alternative to traditional Christmas bird hunts. Thousands of people across North America brave the December winds to count birds and with hopes of finding a rarity. The IBA lies within the Old Lyme-Saybrook Christmas Bird Count area.

The seasonal occurrence of various groups of birds is depicted in Figure 4-14.

Figure 4-14. Seasonal Occurrence of Major Avian Groups at Coastal Connecticut Sites



 Typical Seasonal Occurrence
 Peak Abundance

4.6.3 State and Federal Listed Avian Species

The IBA supports some species included on the CTDEP list of “Connecticut’s Endangered, Threatened and Special Concern Species” (CTDEP, 2004). Which are defined by Public Act 89-224 as follows:

- " 'Endangered Species' (E) means any native species documented by biological research and inventory to be in danger of extirpation throughout all or a significant portion of its range within the state and to have no more than five occurrences in the state, and any species determined to be an 'endangered species' pursuant to the federal Endangered Species Act”.
- " 'Threatened Species' (T) means any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within the state and to have no more than nine occurrences in the state, and any species determined to be a "threatened species" pursuant to the federal Endangered Species Act, except for such species determined by the Commissioner to be endangered in accordance with Section 4 of the Act”.
- " 'Species of Special Concern' (SC) means any native plant species or any native nonharvested wildlife species documented by scientific research and inventory to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population or has been extirpated from the state”.

Some species with one of the above designations regularly occur within the IBA (Table 4-3) while others rarely occur, or could potentially occur but may have not yet been reported within the IBA (Table 4-4).

Regularly Occurring Special Concern Species

- ◆ Little Blue Heron
- ◆ Yellow-crowned Night-heron
- ◆ Glossy Ibis
- ◆ Common Tern
- ◆ Brown Thrasher
- ◆ Saltmarsh Sharp-tailed Sparrow

Little Blue Heron

Little Blue Herons are found in a wide variety of shallow waters and wetlands, including fresh and saltwater. The species is more abundant in the southeastern United States, and is also found in the Bahamas, Cuba, and most of the coast of Mexico south into South

America. This species reaches the northern limits of its range distribution in Southern New England. This heron nests in small numbers among the Great Egrets, Snowy Egrets, and Glossy Ibis on Duck and Cockenoe Islands. In 2004, only one pair bred at Cockenoe and 4 pairs at Duck. They are seen frequently in low numbers foraging in the marsh during the summer. Most recent calculations by Bancroft et al. (1990) estimate that Little Blue Herons travel a daily average of 10.2 km from their breeding colonies to foraging sites (Rodgers & Smith 1995). Little Blue Herons are opportunistic, feeding on a variety of small fish, amphibians, and invertebrates, mainly crustaceans. This species has declined 54% in its North American range since 1967¹. It has been suggested that the continued population decline throughout this range (except in Texas) is due to a failure to protect foraging sites (Rodgers & Smith 1995). Quality foraging sites are imperative to the long-term success of these herons. They forage for fish, crustaceans, and frogs in shallow water in saline, brackish, and freshwater habitats, areas that are very vulnerable to declines in water quality.

¹ <http://stateofthebirds.audubon.org/cbid/profile.php?id=19>

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TABLE 4-4 CTDEP-LISTED AVIFAUNA THAT REGULARLY OCCUR WITHIN OR ADJACENT TO THE IBA				
Common Name (Scientific name)	Habitat¹	CT Status²	Federal Status³	Dates Expected within IBA⁴
Sharp-shinned Hawk <i>Accipiter striatus</i>	Woodland edges and paths, brushy fields and meadows, and other small openings in vegetation provide suitable hunting during migration	E	Not listed	Spring and fall migration. Sometimes a winter resident
Great Egret <i>Ardea alba</i>	Streams, ponds, lakes, rice fields, freshwater and saltwater marshes, mud flats	T	Not listed	Coastal migrant and summer visitor from Apr to early Nov; accidental in winter
Northern Harrier <i>Circus cyaneus</i>	Open areas provide foraging habitat during migration	E	Not listed	Migrant, winter resident
Snowy Egret <i>Egretta thula</i>	Lives around fresh, brackish, and salt water, sometimes dry agricultural fields in association with cattle	T	Not listed	Coastal migrant and summer visitor from mid-Apr to early Nov; sometimes lingers along coast into December
Little Blue Heron <i>Egretta caerulea</i>	Prefers freshwater marshes, ponds, lakes and marshy borders of streams; also frequents salt or brackish water marshes	SC	Not listed	Uncommon coastal visitor from May to mid-Sep; sometimes fairly common in late summer when post-breeding dispersals (esp. juveniles) enter the state
Yellow-crowned Night-Heron <i>Nyctanassa violacea</i>	Lush riverine swamps and marshes	SC	Not listed	Rare to uncommon coastal migrant and summer visitor from mid-Apr to early Oct
Peregrine Falcon <i>Falco peregrinus</i>	Habitat includes oceans and bays wherever there is an abundance of birds such as gulls, waterfowl, large nesting colonies of coastal birds, seabirds, songbirds, and rock doves	E	De-listed	Coastal migrants appear from late Mar – early May, and Sep – early Oct. Winter residents appear sporadically throughout winter; also summer dispersals, and unmated individuals appear on occasion
Least Tern <i>Sterna antillarum</i>	Flat, open, sandy, coastal beaches and associated bays, estuaries, and ocean	T	CT regional and east coast populations not listed; Endangered in 17 other states (Mississippi River Valley, Midwestern, western and California populations)	Uncommon coastal migrant and summer visitor from May to Sep

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TABLE 4-4 CTDEP-LISTED AVIFAUNA THAT REGULARLY OCCUR WITHIN OR ADJACENT TO THE IBA				
Common Name (Scientific name)	Habitat¹	CT Status²	Federal Status³	Dates Expected within IBA⁴
Common Tern <i>Sterna hirundo</i>	Nests in colonies near extremity of some beach sandpits, isolated island of sand and oyster shells, dredge spoil bank, or ledges.	SC	Not listed	Uncommon to fairly common summer visitor for feeding within the lower reach of the Menunketesuck River. Fairly common coastal migrant from late Apr to late May and from late Aug to Oct, casual Nov and Dec
Purple Martin <i>Progne subis</i>	Open areas adjacent to water provides potential suitable breeding sites with installation of proper nest boxes	T	Not listed	Migrant; potential breeder
Brown Thrasher <i>Toxostoma rufum</i>	Thickets and dense woodland borders provide migration foraging habitat and cover as well as potential breeding habitat	SC	Not listed	Migrant; potential breeder within the IBA
Savannah Sparrow <i>Passerculus sandwichensis</i>	Open grassy areas; field margins provide migration foraging habitat and cover	SC	Not listed	Migrant
Saltmarsh Sharp-tailed Sparrow <i>Ammodramus caudacutus</i>	High marsh zones dominated by Salt Meadow Cordgrass, Spike Grass, and Black Grass	SC	Not listed	Documented breeding species within the IBA

¹ Terres (1980)

³ USFWS (no date)

⁵ Breeding populations only

T= Threatened

² CTDEP (2004)

⁴ Zeranski and Baptist (1990)

E= Endangered

SC = Special Concern

TABLE 4-5. OTHER CTDEP-LISTED SPECIES THAT RARELY OR POTENTIALLY COULD OCCUR WITHIN THE IBA.

Species	CT Designation	Local Status	Role of IBA Habitats
Pied-billed Grebe <i>Podilymbus podiceps</i>	E	Occasional winter resident/visitor	Open water areas underlain by submerged aquatic vegetation provide potential winter foraging habitat
Blue-winged Teal <i>Anas discors</i>	T (Nesting populations only)	Spring and fall migrant	Shallow areas of estuarine marshes provide migratory stopover habitat
Short-eared Owl <i>Asio flammeus</i>	T (Wintering populations)	Winter visitor	Dunes and salt marsh areas provide migration and winter foraging habitat and cover
Common Barn Owl <i>Tyto alba</i>	E	Potential breeder; Not reported from IBA	Offers potential breeding habitat with proper nest box installation
Northern Saw-whet Owl <i>Aegolius acadicus</i>	SC	Late fall and winter visitor to area; Not reported from IBA	Dense thickets provide migration and winter foraging habitat and cover
Long-eared Owl <i>Asio otus</i>	E	Very rare winter visitor	Tall dense conifers provide potential winter roost sites
Yellow-breasted Chat <i>Icteria virens</i>	E	Migrant	Thickets within wet areas provide potential migration foraging habitat and cover
Seaside Sparrow <i>Ammodramus savannarum</i>	SC	Migrant	Found in low marsh zones during migration
Eastern Meadowlark <i>Sturnella magna</i>	SC	Migrant	Open grassy areas of salt marsh provide potential migration foraging habitat

Yellow-crowned Night-Heron

This special concern species is an uncommon and local migratory breeder in Connecticut (Clark, 1994). The first confirmed nest for this species in Connecticut was reported from South Norwalk in 1953 (Zeranski and Baptist, 1990), with subsequent nests confirmed for Norwalk Islands, Darien, and Milford (Clark, 1994). Rare in winter, migrants generally begin to appear in mid-March, with breeding occurring from May to June. These birds generally remain in the state until mid-October, after which they become rare, and then are generally gone by the end of December (Hanisek, 2005). Since crabs, particularly fiddler crabs, are a major component of their diet (Terres, 1980), the Menunketesuck River and adjacent tidal creeks within the IBA are important foraging areas for this species.

Glossy Ibis

Glossy Ibis nest at Tuxis and Duck Islands, and in 2004 these sites had 9 and 6 breeding pairs, respectively. They use the salt marsh habitat within the IBA for foraging during the breeding season and likely during migration, feeding on invertebrates such as aquatic beetles, water boatmen, dragonfly larvae, fly larvae, crickets, caddisflies, worms,

mollusks, and clams. Coastal marshes ditched to control breeding mosquitoes on Long Island, New York, and in Rowley, Massachusetts (Clarke et al. 1984) have been shown to have fewer foraging Glossy Ibis than un-ditched marshes (Davis & Kricher 2000).

Common Tern

Common Terns nest on small rocky islets within LIS (USFWS, 1991) such as Falkner Island, CT and Great Gull Island, NY (Peterson, 1988). They frequently feed in shallow subtidal waters adjacent or proximal to the various offshore breeding islands. These terns are not known to breed within the IBA, but are commonly observed in and around the lower reaches of the Menunketesuck River and associated coves during the breeding season, as post-breeding summer dispersals, and during migration.

Brown Thrasher

The Brown Thrasher commonly inhabits brushy fields, hedgerows, powerline rights-of-ways, and other comparable pasture or old-field habitats. It requires low, dense, woody vegetation for nesting and cover (DeGraaf and Yamasaki, 2001), defending a territory of approximately 0.6 hectare (1.6 acre). It arrives in New England in late April (Terres, 1980), and is apparently a declining breeding resident in Connecticut. Nesting and egg dates are reported from May 9 to June 21 (DeGraaf and Yamasaki, 2001) after which both sexes incubate eggs for 12 to 14 days. Young fledge after 9-13 days old (Terres, 1980). Brown Thrashers occur in shrublands of the more drier parts of the refuge (along railroad easement and areas underlain by well-drained soils) and adjacent areas.

Saltmarsh Sharp-tailed Sparrow

This is one of the very few bird species that breeds exclusively in salt marshes. Its breeding range extends from the coastal marshes of Maine to North Carolina, with birds wintering from New York (rare) to Florida. The total acreage of the narrow band of suitable breeding habitat is less than the total area of Connecticut. This limited range and specialized habitat make the Saltmarsh Sharp-tailed Sparrow a species of global conservation concern. Threats to this species include habitat loss and degradation, pollution, and rising sea level. In southern New England, this species usually nests in salt marshes with native vegetation (Benoit & Askins 1999, Shriver 2002), specifically in the high marsh where *Spartina patens* dominates and *Juncus gerardii* is most abundant (Elphick et al. 2005, Gjerdrum et al. 2005) and where thatch has accumulated providing nest concealment (Gjerdrum et al. 2008). Saltmarsh Sharp-tailed Sparrows have a breeding system that lacks pair bonds, and in which both males and females may have multiple mates. Birds are not territorial and only the females incubate and feed the young. In Connecticut, most nest failure is caused by flooding and occurs during high spring tides. If timed correctly, the female lays her eggs right after the high spring tides so that the chicks are able to fledge before the next occurrence of especially high tides. If not, the first brood is typically lost. A second attempt at nesting – if begun immediately after losing the first brood – may succeed, since nest building, egg laying, incubation and fledging takes about one lunar cycle which is just enough time for the young to escape the next high spring tide.

In addition to being listed by the CTDEP as a species of special concern, the Saltmarsh

Sharp-tailed Sparrow has an IUCN ranking of Vulnerable to extinction (Birdlife International 2004) due to its limited habitat range and very particular breeding requirements.

Regularly Occurring Threatened or Endangered Species

- ◆ American Bittern
- ◆ Least Tern
- ◆ Snowy Egret
- ◆ Great Egret
- ◆ Northern Harrier
- ◆ Short-eared Owl
- ◆ Purple Martin

American Bittern

American Bitterns are migratory and occur in Connecticut mainly during the nonbreeding season, although there is one confirmed Connecticut breeding location². They are generally found in fresh and salt water wetlands that contain tall, emergent vegetation, and hunt stealthily for a variety of prey including insects, amphibians, crayfish, snakes, fish and sometimes voles. Information on this species is limited due to its secretive nature, but it is believed that the species' decline throughout its range is due to the degradation of wetlands (Gibbs et al. 1992).

Least Tern

Least Terns nest at coastal sandy beach sites in Connecticut. They establish colonies on beaches near shoal areas – a habitat that tends to be dynamic and sometimes ephemeral. These birds can be found searching for prey within the LIS waters from May to September (Sibley, 1994). They do not breed within the IBA but have historically nested at coastal sandy beach sites proximal to the SMU IBA. They may be observed in and around the lower reaches of Menunketesuck River during the breeding season, as post-breeding summer dispersals, and during migration.

Snowy Egret

Snowy Egrets breed on Duck Island, Charles Island, Cockenoe Island and Tuxis Island off the coast of Madison. In 2004, these islands supported 14, 70, 29, and 15 breeding pairs, respectively. Snowy Egrets forage in the Menunketesuck River marshes during the breeding season, usually in the salt marsh pools and channels. Their main food sources include aquatic and terrestrial insects, shrimp, crayfish, and fiddler crabs.

Great Egret

The closest breeding colony to this site lies just south of Westbrook at Duck Island, where 5 pairs bred in 2004. Other nearby colonies include Charles Island off the coast of Milford and Cockenoe Island off the coast of Westport. In 2004, Charles Island

² www.dep.state.ct.us/factshts

supported 28 breeding pairs while Cocksfoot had 49 pairs. Great Egrets frequent the marsh during the breeding season to forage among the ponds and channels in search of fish, crayfish, and aquatic insects. When breeding, colonial water birds travel long distances from nesting colonies to find suitable food with the maximum distance recorded for a Great Egret being 40 km (25 mi) in the Everglades (McCrimmon et al. 2001). Consequently, the protection of sites that provide adequate food sources is important for successful breeding and species conservation.

Northern Harrier

Northern Harriers are most often seen in the region in the fall during migration. No nesting activity has been confirmed at the Salt Meadow Unit. Harriers forage in marshes and open meadows where they prey upon small mammals, such as mice and small birds. The decline of Northern Harriers in Connecticut has been attributed to the loss and degradation of wetlands along with the past use of DDT³

Short-eared Owl

The Short-eared Owl does not breed in the state, however, it does winter here. This owl can be spotted in salt marshes during the winter and fall searching for voles, shrews, mice, and small birds. Winter and fall numbers have dropped in the region over the last 20 years. Total number and frequency of usage within the IBA may be difficult to determine due to the constraint imposed by lines of sight restrictions at various vantage points.

Purple Martin

This species is uncommon to locally common breeder with scattered colonies in Southern New England. It inhabits open habitats near water including fields, parks, suburban yards, farmlands, meadows, coastal and freshwater marsh edges, and open shores of lakes and ponds, but requires large, multi-roomed nest boxes for breeding (DeGraaf and Yamasaki, 2001). A Neotropical migrant, this species typically arrives in Connecticut during the last few days of April and in early May. Where suitable habitat occurs, and appropriate nest boxes are provided, the martin nests from late May to mid-June (Hanisek, 2005). Purple Martins are a communal nester and colonies as large as 200 pairs have been reported.

The Purple Martin is listed as Threatened by the CTDEP (2004). The IBA provides suitable habitat for this species (open habitat near water) and the IBA's location along the coastal flyway of this migratory species should allow for high probability of successful colonization of suitable multi-compartmental nest boxes in the IBA. Currently there are four such nest boxes within the IBA, but none appear to be occupied by Purple Martins. It is unknown why these boxes do not support productive colonies. It could be that they are not properly maintained or it may be that House Sparrows or European Starlings (which are non-migratory) occupy the nest cavities prior to the spring return of the martins.

³ <http://dep.state.ct.us/burnatr/wildlife/factshts/harrier.htm>.

Other Listed Species

Outside of the breeding season, other avian species listed by the CTDEP as threatened, or endangered may regularly or infrequently appear in the IBA during migration, as winter residents or visitors, or as post-breeding dispersals. These species are listed in Table 4-4 and 4-5.

4.6.4 Other Key Current Species

Other key current species addressed by this conservation plan includes those not already discussed above, that are identified by the World Conservation Union (IUCN), Partners in Flight (PIF), the USFWS, Audubon WatchList and other recognized conservation organizations.

The World Conservation Union

The Union for Conservation of Nature and Natural Resources (IUCN) – known since 1990 as The World Conservation Union – is a unique union of some 140 countries include 77 States, 114 government agencies, and 800-plus non-governmental organizations. More than 10,000 internationally-recognized scientists and experts representing more than 180 countries around the world volunteer their services to one of six IUCN global commissions. For more than 50 years, a staff of approximately 1000 members in offices around the world have worked to “generate environmental conventions, global standards, scientific knowledge and innovative leadership”. IUCN’s “green web” has worked to manage and restore ecosystems and protect threatened species. The Mission of the IUCN is “*to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.*”⁴ Globally Threatened Species included on the IUCN List (Top Priority) whose range includes southern Connecticut are addressed in Table 4-6.

Partners in Flight

Partners in Flight (PIF) is a cooperative partnership among federal, state, and local government agencies, philanthropic foundations, professional organizations, conservation groups, industry, the academic community and private individuals whose focus is to improve monitoring, research, management and education programs involving birds and their habitats. Through their Species Assessment Process, PIF has objectively evaluated the conservation status of each bird species in North America, and has identified areas where conservation efforts for those species would be most effective.

The IBA lies within the PIF Conservation Region No. 30 – the Northeast and Mid-Atlantic Coast which is addressed by their Physiographic Area No. 9 Conservation Plan. Species identified by PIF as the highest priorities for southern New England and Connecticut (weighing continental concern and "area importance") and WatchList Species with reasonable "area importance" are addressed in Table 4-7.

⁴ www.iucn.org/about/index.htm#do

The area inclusive of the IBA is also addressed in the USFWS Region 5 Avian Conservation Summary for Connecticut. Desired additional species identified by the USFWS, National Audubon Society, and others as species of conservation concern for which Connecticut has a regional responsibility are listed in Tables 4-8 through 4-11. There are a number of marsh-nesting species that may or may not use this marsh. Little is known about their occurrence due to the elusive and very secretive nature of the species. It would be highly desirable if species such as the Black Rail (*Laterallus jamaicensis*), King Rail (*Rallus elegans*), and more Purple Martins could be attracted to the area through management activities.

TABLE 4-6 GLOBALLY THREATENED SPECIES (IUCN LIST – TOP PRIORITY) FOR WHICH THE IBA OFFERS SUITABLE HABITAT		
Species	Status	Role of SMU IBA
Saltmarsh Sharp-tailed Sparrow	Vulnerable	Breeding site
Cerulean Warbler	Vulnerable	Potential migration stopover
Red-headed Woodpecker	Near Threatened (Small CT population)	Potential migration stopover
Buff-breasted Sandpiper	Near Threatened (Migration only, small CT Population)	Potential migration stopover
Black Rail	Near Threatened (Small CT population, if not extirpated)	Potential migration stopover
Olive-sided Flycatcher	Near Threatened (Migration only or accidental breeder in CT)	Potential migration stopover
Bicknell’s Thrush	Vulnerable (Migration only)	Potential migration stopover

TABLE 4-7 PARTNERS IN FLIGHT (PIF) HIGHEST PRIORITIES FOR SOUTHERN NEW ENGLAND AND CONNECTICUT ¹ AND WATCHLIST SPECIES² FOR WHICH THE IBA OFFERS SUITABLE HABITAT		
Species	Status	Role of SMU IBA
Saltmarsh Sharp-tailed Sparrow	Breeder	Breeding habitat
Seaside Sparrow*	Rare to uncommon coastal migrant	Potential migration stopover, potential summer dispersal habitat
Blue-winged Warbler*	Regular migrant, Presumed Breeder	Early successional management area of Refuge offers suitable habitat (food, cover) for migration
Wood Thrush*	Regular migrant, Presumed Breeder	Migration stopover habitat (food and cover); suitable breeding habitat
Worm-eating Warbler*	Uncommon migrant	Migration stopover habitat (food and cover); suitable breeding habitat
Prairie Warbler*	Uncommon migrant	Migration stopover habitat (food and cover); potential breeding habitat within early successional management area
Baltimore Oriole	Migrant and nester	IBA Provides breeding and migration stopover habitat (food and cover)
Black-billed Cuckoo	Rare migrant	Migration stopover habitat (food and cover)

TABLE 4-7 PARTNERS IN FLIGHT (PIF) HIGHEST PRIORITIES FOR SOUTHERN NEW ENGLAND AND CONNECTICUT ¹ AND WATCHLIST SPECIES² FOR WHICH THE IBA OFFERS SUITABLE HABITAT		
Species	Status	Role of SMU IBA
Scarlet Tanager	Regular migrant, Presumed Breeder	Migration stopover habitat (food and cover)
Louisiana Waterthrush	Rare migrant	Migration stopover habitat (food and cover)
American Woodcock*	Migrant; presumed breeder	Migration stopover habitat (food and cover); suitable breeding habitat
Bicknell's Thrush* (Migration only)	Potential migrant	Migration stopover habitat (food and cover)
Canada Warbler*	Uncommon migrant	Migration stopover habitat (food and cover)
Chestnut-sided Warbler	Uncommon migrant	Migration stopover habitat (food and cover)
Black-throated Blue Warbler	Uncommon migrant	Migration stopover habitat (food and cover)
Blackburnian Warbler	Uncommon migrant	Migration stopover habitat (food and cover)

¹ Weighs continental concern and "area importance"

² With reasonable "area importance" (WatchList Species marked with "*")

TABLE 4-8 ADDITIONAL WATCHLIST SPECIES FOR WHICH CONNECTICUT HAS A REASONABLE RESPONSIBILITY AND FOR WHICH THE IBA OFFERS SUITABLE HABITAT		
Species	Status	Role of SMU IBA
American Black Duck	Migrant and Winter visitor	Migratory stopover site; winter resident; potential breeding site
Whimbrel	Migrant only	Migratory stopover site
Short-billed Dowitcher	Migrant only	Migratory stopover site
Willow Flycatcher	Migrant; presumed breeder	Migratory stopover site
Bay-breasted Warbler	Migrant only	Migratory stopover site
Rusty Blackbird	Migrant only	Migratory stopover site; potential winter habitat

TABLE 4-9 USFWS BIRDS OF CONSERVATION CONCERN (NATIONAL AND CONTINENTAL CONCERN *ALSO A WATCHLIST SPECIES) FOR WHICH THE IBA OFFERS SUITABLE HABITAT		
Species	Status	Role of SMU IBA
Little Blue Heron	Summer visitor	Important foraging site for CT breeding birds
Northern Harrier	Small breeding population in CT, but significant numbers of migrants	Migratory stopover and winter residency site
Peregrine Falcon	Small breeding	Migratory stopover site

TABLE 4-9 USFWS BIRDS OF CONSERVATION CONCERN (NATIONAL AND CONTINENTAL CONCERN *ALSO A WATCHLIST SPECIES) FOR WHICH THE IBA OFFERS SUITABLE HABITAT		
Species	Status	Role of SMU IBA
	population in CT, but significant numbers of migrants	
Black Rail*	Very rare; breeding status unknown in CT	Potential migration stopover site
American Golden-Plover *	Migrant only	Migratory stopover site;
Solitary Sandpiper	Migrant only	Migration stopover site
Whimbrel *	Migrant only	Migratory stopover site
Hudsonian Godwit *	(Rare) Migrant only	Potential migratory stopover site (rare coastal migrant)
Marbled Godwit *	(Rare) Migrant only	Potential migratory stopover site (rare coastal migrant)
Stilt Sandpiper	Migrant only	Potential migratory stopover site (rare coastal migrant)
Buff-breasted Sandpiper*	Migrant only	Potential migratory stopover site (rare coastal migrant)
Short-billed Dowitcher*	Migrant only	Migratory stopover site
Wilson's Phalarope*	Migrant only	Potential migratory stopover site (rare coastal migrant)
Common Tern		See Table 4-3
Least Tern		See Table 4-3
Black-billed Cuckoo	Uncommon migrant	Migration stopover habitat (food and cover)
Short-eared Owl *	Migrant and winter visitor only	Migration stopover habitat
Whip-poor-will	Very rare migrant; local breeder	Potential migration stopover; potential breeding site?
Red-headed Woodpecker *	Small Population in CT	Potential migration stopover
Olive-sided Flycatcher *	Small breeding population in CT, but significant numbers of migrants	Limited migration stopover habitat
Bicknell's Thrush* (Migration only)	Potential migrant	Migration stopover habitat (food and cover)
Wood Thrush *	Regular migrant, Presumed Breeder	Breeding and migration stopover habitat (food and cover)
Golden-winged Warbler*	Potential migrant	Potential migration stopover (not known to occur in IBA)
Cape May Warbler	Migrant only	Migration stopover habitat (food and cover)
Cerulean Warbler *	Rare migrant	Potential migration stopover
Prairie Warbler *	Uncommon migrant	Migration stopover habitat (food and cover)
Worm-eating Warbler *	Uncommon migrant	Migration stopover habitat (food and cover)

TABLE 4-9 USFWS BIRDS OF CONSERVATION CONCERN (NATIONAL AND CONTINENTAL CONCERN *ALSO A WATCHLIST SPECIES) FOR WHICH THE IBA OFFERS SUITABLE HABITAT		
Species	Status	Role of SMU IBA
Prothonotary Warbler *	Very rare migrant	Migration stopover habitat (food and cover)
Kentucky Warbler *	Rare migrant	Migration stopover habitat (food and cover)
Canada Warbler *	Uncommon migrant	Migration stopover habitat (food and cover)
Grasshopper Sparrow	Very rare migrant on coast	Potential migration stopover habitat (not known to occur in IBA)
Saltmarsh Sharp-tailed Sparrow *		See Table 4-3
Nelson's Sharp-tailed Sparrow *	Migrant only	Migration habitat
Seaside Sparrow *	Uncommon migrant	Potential migration stopover
Dickcissel *	Migrant only	Potential fall migration stopover

TABLE 4-10 USFWS BIRDS OF CONSERVATION CONCERN REGIONAL CONCERN IN NORTHEAST 1		
Species	Status	Role of SMU IBA
Marsh Wren	Uncommon fall migrant; potential breeder	Migratory stopover
Blue-winged Warbler	Regular migrant, breeder	Early successional management area offers suitable habitat (food, cover) for migration
Chestnut-sided Warbler	Uncommon migrant	Provides food and cover within migration stopover habitat and potential breeding habitat
Cape May Warbler	Migration only	Migration stopover habitat (food and cover)
Bay-breasted Warbler	Migration only	Migratory stopover site (food and cover)
Blackpoll Warbler	Migration only	Migratory stopover site (food and cover)
Baltimore Oriole	Migrant and breeding resident	Provides food and cover within migration stopover habitat and potential breeding habitat

¹ Considered Priorities for Northeast US and Connecticut

TABLE 4-11 ADDITIONAL SPECIES THAT MAY BE OF CONCERN IN CONNECTICUT (LOWER CONCERN)		
Species	Conservation Status	Role of SMU IBA
Clapper Rail	American Bird Conservancy (ABC) high conservation priority	Breeding site
Chimney Swift	PIF regional priority	Foraging area (salt marsh)
Hairy Woodpecker	PIF regional priority	Breeding and Migratory Stopover habitat
Eastern Wood-Pewee	PIF regional priority	Breeding and Migratory Stopover habitat
Acadian Flycatcher	Range restricted	Migration Stopover; potential breeder
Least Flycatcher	PIF regional priority	Migration Stopover; potential breeder
Great Crested Flycatcher	PIF regional priority	Breeding and Migratory Stopover habitat
Eastern Kingbird	PIF regional priority	Migration Stopover; potential breeding habitat
Veery	PIF regional priority	Breeding and Migratory Stopover habitat
Gray Catbird	PIF regional priority	Breeding habitat; migration stopover site; post breeding summer dispersal site
Pine Warbler	Restricted range	Migration Stopover; potential breeding habitat in area conifer inclusions

TABLE 4-11 ADDITIONAL SPECIES THAT MAY BE OF CONCERN IN CONNECTICUT (LOWER CONCERN)		
Species	Conservation Status	Role of SMU IBA
Black-and-white Warbler	PIF regional priority	Breeding and Migratory Stopover habitat
Ovenbird	PIF regional priority	Breeding and Migratory Stopover habitat
Scarlet Tanager	PIF regional priority	Breeding and Migratory Stopover habitat
Eastern Towhee	PIF regional priority	Breeding and Migratory Stopover habitat
Field Sparrow	PIF regional priority	Breeding and Migratory Stopover habitat
Swamp Sparrow	USFWS regional priority	Breeding and Migratory Stopover habitat
Orchard Oriole	Regional responsibility	Breeding and Migratory Stopover habitat
Purple Finch	Regional responsibility	Migration stopover

TABLE 4-12 OTHER SPECIES OF CONSERVATION PRIORITY IN CONNECTICUT AS IDENTIFIED BY THE CT DEP COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY (NOT ALREADY IDENTIFIED IN THE ABOVE CATEGORIES):		
Species	Connecticut Status	Role of SMU IBA
Very Important		
Blue-headed Vireo	Uncommon migrant; local breeder	Migratory Habitat
Golden-crowned Kinglet	Fairly common –common migrant; Rare breeder	Wintering Habitat
Greater Scaup	Common migrant; rare summer resident	Potential Migratory Stopover Site?
Green Heron	Fairly common breeding resident and migrant	Breeding and Migratory Stopover Habitat
Hermit Thrush	Uncommon migrant and breeder	Potential Migration Stopover
Hooded Merganser	Uncommon to fairly common migrant; uncommon breeding resident	Migration Stopover
Indigo Bunting	Uncommon to fairly common migrant fairly common breeding resident	Breeding and Migratory Stopover Habitat
Rose-breasted Grosbeak	Uncommon to fairly common migrant; Fairly common breeding resident	Migration Stopover; potential breeding habitat
Ruffed Grouse	Uncommon permanent resident	Potential Breeding Habitat
Yellow-billed Cuckoo	Uncommon migrant and breeding resident	Breeding habitat; migration stopover site
Important		
American Redstart	Common migrant and breeding	Breeding Habitat, Migration

TABLE 4-12 OTHER SPECIES OF CONSERVATION PRIORITY IN CONNECTICUT AS IDENTIFIED BY THE CT DEP COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY (NOT ALREADY IDENTIFIED IN THE ABOVE CATEGORIES):

Species	Connecticut Status	Role of SMU IBA
	resident	Stopover
Bank Swallow	Uncommon to fairly common migrant and breeding resident	Migratory Stopover habitat
Barred Owl	Fairly common permanent resident	Breeding Habitat
Belted Kingfisher	Uncommon (winter) to fairly common permanent resident	Wintering and Migratory Stopover habitat
Black-crowned Night-Heron	Uncommon (winter) to fairly common permanent resident	Foraging Habitat
Black-throated Green Warbler	Fairly common migrant and breeding resident	Breeding and Migratory Stopover habitat
Blue-gray Gnatcatcher	Fairly common migrant and breeding resident	Breeding and Migratory Stopover habitat
Broad-winged Hawk	Uncommon to Abundant (mid-Sep) migrant; Uncommon breeding resident	Breeding and Migratory Stopover habitat
Brown Creeper	Uncommon migrant; Uncommon breeding and winter resident	Migration stopover
Cooper's Hawk	Fairly common migrant and winter resident; Uncommon breeding and summer resident	Breeding, Wintering, and Migratory Stopover Habitat
Dark-eyed Junco	Abundant migrant and winter resident; Rare breeding and summer resident	Wintering and Migratory Stopover habitat
Eastern Screech-Owl	Fairly common permanent resident	Breeding, Wintering, and Migratory Stopover Habitat
Hooded Warbler	Uncommon breeding resident; rare spring and autumn migrant	Breeding and Migratory Stopover habitat
Lesser Scaup	Uncommon to fairly common winter resident, spring and autumn migrant	Wintering and Migratory Stopover habitat
Magnolia Warbler	Uncommon to fairly common spring and autumn migrant; uncommon breeding resident	Migratory Stopover habitat
Northern Flicker	Fairly common breeding and summer resident; Uncommon winter resident	Breeding, Wintering, and Migratory Stopover Habitat
Northern Goshawk	Uncommon breeding resident and migrant; fairly common but irruptive winter resident	Breeding?, Wintering, and Migratory Stopover Habitat
Northern Rough-winged Swallow	Fairly common breeding and summer resident; Uncommon to fairly common migrant	Migratory Stopover habitat
Osprey	Uncommon migrant; Uncommon to fairly common breeding resident	Breeding and Migratory Stopover habitat

TABLE 4-12 OTHER SPECIES OF CONSERVATION PRIORITY IN CONNECTICUT AS IDENTIFIED BY THE CT DEP COMPREHENSIVE WILDLIFE CONSERVATION STRATEGY (NOT ALREADY IDENTIFIED IN THE ABOVE CATEGORIES):

Species	Connecticut Status	Role of SMU IBA
Pileated Woodpecker	Uncommon permanent resident	Breeding and Wintering Habitat
Red-breasted Nuthatch	Rare breeding resident; Uncommon irruptive autumn migrant; common but irruptive winter resident	Breeding, Wintering, and Migratory Stopover Habitat
Red-shouldered Hawk	Uncommon permanent resident; Fairly common autumn migrant	Breeding, Wintering, and Migratory Stopover Habitat
Rough-legged Hawk	Uncommon to fairly common but irruptive winter resident	Wintering Habitat
Ruby-throated Hummingbird	Fairly common breeding and summer resident; and spring migrant; fairly common to common autumn migrant	Breeding and Migratory Stopover habitat
Snowy Owl	Rare winter visitor	Wintering and Migratory Stopover habitat
Spotted Sandpiper	Fairly common breeding and summer resident	Migratory Stopover habitat
Swainson's Thrush	Uncommon migrant (May and Sep)	Migratory Stopover habitat
Warbling Vireo	Fairly common breeding and summer resident; rare migrant	Breeding and Migratory Stopover habitat
White-eyed Vireo	Uncommon breeding and summer resident; rare migrant	Breeding and Migratory Stopover habitat
Willet	Uncommon breeding resident; Fairly common summer resident	Breeding and Migratory Stopover habitat

4.6.5 Desired Additional Species

Barn Owl

A cavity-nesting raptorial species known to use nest boxes for breeding, the Barn Owl is a rare to uncommon breeder in Southern New England, where it reaches the northeastern limit of its range in the United States. Northern birds are known to be migratory, individuals in New England included. However, some individuals are known to overwinter during mild winters. It inhabits semi-open, low-elevation habitats such as agricultural areas, pastures, salt marshes, grasslands, wet meadows, and deserts. Nests are typically placed within man-made structures, such as old barns, silos, church steeples, or abandoned buildings within these habitats. It is also known to use natural nest sites such as hollow trees, holes or crevices in banks or cliffs, in abandoned mammal burrows on the ground. Barn Owls are also known to use nest boxes (DeGraaf and Yamasaki, 2001). Where rodents are in abundant supply, and where appropriate nest boxes are provided, Barn Owls may nest beginning in early March. In Connecticut, nesting lasts until the end of July (Hanisek, 2005).

The Barn Owl is listed as an endangered species in CT (CTDEP, 2004). The marsh within the IBA provides suitable habitat for this species (open habitat near water) and the IBA's location along the coastal flyway allows for a probability of successful colonization should a suitable nest box be provided. However, the status of the state endangered least shrew population should be definitively determined prior to the introduction of the Barn Owl to the IBA since shrews are included in the Barn Owl diet (Terres, 1980).

Other “rarities”

Other “rarities” have been encountered within the IBA as well. They include vagrant or accidental species with otherwise extralimital range distributions. These species may not necessarily be of management concern, but none-the-less are often sought by local birders and therefore may be considered by many to be “desirable” species for the IBA from an ecotourism perspective. These species, especially, bring tourists to the area as birders from other regions come to the IBA just to see them when they are reported on hotlines and computer list serves. These species include birds whose range distributions typically occur outside of Connecticut and may be quite common in other regions of the country.

Many of these sightings have been made by local birders who have shared these sightings with other members of the local birding clubs, and refuge personnel. Some examples of rare birds with more southerly range distribution that have been seen on more than one occasion at Connecticut coastal locations during migration or other movement periods include:

- ◆ Brown Pelican (*Pelicanus occidentalis*)
- ◆ Mississippi Kite (*Sterna sandvicensis*)
- ◆ Gull-billed Tern (*Sterna nilotica*)
- ◆ Chuck-will's Widow (*Caprimulgus carolinensis*)
- ◆ Ash-throated Flycatcher (*Myiarchus cinerascens*)
- ◆ Gray Kingbird (*Tyrannus dominicensis*)
- ◆ Prothonotary Warbler (*Protonotaria citrea*) – could appear during spring migration in wet areas of the southeast corner of the IBA or upper reaches of Gatchen Creek
- ◆ Yellow-throated Warbler (*Dendroica dominica*) – may appear during spring migration
- ◆ Blue Grosbeak (*Guiraca caerulea*)
- ◆ Summer Tanager (*Piranga rubra*)
- ◆ Clay-colored Sparrow (*Spizella pallida*)
- ◆ Dickcissel (*Spiza americana*) – has appeared annually along the coast during fall migration (but is mainly a fly-over). It sometimes is found in fall or early winter in shrubby areas and fields
- ◆ Painted Bunting (*Passerina ciris*)

Some examples of birds with more northerly range distributions that have been seen on more than one occasion at Connecticut coastal locations during migration or other

movement periods include:

- ◆ Rough-legged Hawk (*Buteo lagopus*) – a nearly annual winter visitor (with fair numbers in some years) typically found hunting rodents in open country or perched atop tall trees or poles.
- ◆ Snowy Owl (*Bubo scandiacus*)
- ◆ Boreal Owl (*Aegolius funereus*)
- ◆ Evening Grosbeak (*Coccothraustes vespertinus*)
- ◆ Red Crossbill (*Loxia curvirostra*) – sporadic irruptions at coastal locations
- ◆ White-winged Crossbill (*Loxia leucoptera*) – sporadic irruptions at coastal locations
- ◆ Common and Hoary Redpolls (*Carduelis flammea* and *C. hornemanni*)
- ◆ Pine Siskin (*Carduelis pinus*)
- ◆ Snow Bunting
- ◆ Lapland Longspur (*Calcarius lapponicus*)

Some examples of birds with more western range distribution that have been seen on more than one occasion at Connecticut coastal locations during migration or other movement periods include:

- ◆ American White Pelican (*Pelecanus erythrorhynchos*)
- ◆ Western Kingbird (*Tyrannus verticalis*)
- ◆ Lark Sparrow (*Chondestes grammacus*)
- ◆ Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)

Uncommon European vagrants periodically appear in coastal areas as well. Typically they are highly migratory species such as shore birds and waterfowl that have wandered off their normal migratory routes. Some examples of species from this category that periodically appear along the New England coast include the following:

- ◆ Northern Lapwing (*Vanellus vanellus*)
- ◆ Ruff (*Philomachus pugnax*)
- ◆ Curlew Sandpiper (*Calidris ferruginea*)
- ◆ Eurasian Wigeon (*Anas penelope*)
- ◆ Tufted Duck (*Aythya fuligula*)

4.7 Non-avian Species Information

The Menunketesuck River system, either directly or via a production export function to coastal marine waters, has been designated as “essential fish habitat” for one or more life stages of at least 12 federally managed fish species. The abundant finfish and shellfish fisheries resources within the system and adjacent off-shore waters sustain not only piscivorous and molluscivorous birds including Osprey, various long-legged waders, mergansers, bay ducks, sea ducks, kingfishers, but also wildlife such as otters, weasels, terrapins, etc. An abundance of insects provide food for amphibians, reptiles, and shrews as well as migrant and resident birds. Thus, the productivity and energy flow of the system is an important attribute to the IBA and one which is an important part of the LIS ecosystem.

4.7.1 State and Federal Endangered, Threatened, or Special Concern Flora or Fauna

Consultation with the CTDEP Bureau of Natural Resources Wildlife Division revealed that historic records of the Least Shrew (*Cryptotis parva*) are known from the area of Westbrook that includes the IBA. No extant populations of other federal or state listed non-avian fauna or flora were reported to occur within the IBA (Refer to Appendix D). Information regarding federal or state endangered, threatened, or special concern avian species is provided in Section 4.6.3.

4.7.2 Federally Managed Fish Species

The IBA lies within one of the 10-minute x 10-minute grid areas designated as Essential Fish Habitat (EFH) by the New England Fisheries Management Council (NEFMC) in marine waters. A description of this EFH quadrant applicable to the IBA is provided in Table 4-12.

TABLE 4-12. SUMMARY OF ESSENTIAL FISH HABITAT (EFH) DESIGNATION FOR AREA INCLUSIVE OF THE IBA				
Boundary	North	East	South	West
Coordinate	41° 20.0' N	72° 20.0' W	41° 10.0' N	72° 30.0' W
<p>Square Description (i.e. habitat, landmarks, coastline markers): The waters within the square within the Connecticut River estuary affecting the following: the Connecticut River, Westbrook and Old Saybrook, CT., the Patchogue and Menunketesuck Rivers, western Great I., Ferry Pt., Cornfield Pt., North Cove, Saybrook Pt., Lynde Neck and Guardhouse Pt., Chapman Pt., Old Kelsey Pt., Duck I., the Duck Island Roads and Menunketesuck I. Also affected are: Westbrook Harbor, eastern Six Mile Reef, and Long Sand Shoal, Hen and Chickens, Crane Reef, Half Tide Rock, and Cornfield Pt. Shoal. Finally, there is a dumping ground towards the southeast corner, south of the Connecticut River. These waters also affect the following features: South Cove, Fenwick, CT., Lynde Pt., Knollwood, CT., Plum Bank Beach, Ragged Rock, Calves I., Back River, southwest Lieutenant River, Saybrook Shoal Channel, Saybrook Shoal, Gibraltar Rock, Dickerson Pier, Sodom Rocks, Shifting Shoal, Griswold Piers, Oyster River, Back River (different from above in list), Indian Town, CT., Chapman Neck, CT., Cold Spring Brook, Saltworks Bay, Money Pt., and Long Rock.</p>				

This 10-minute x 10-minute grid area, is designated as Essential Fish Habitat (EFH) for 12 fisheries resources by the New England Fisheries Management Council (NEFMC) in marine waters. The designated species, their applicable life stages, and importance to birds and the marine food web are outlined in Table 4-13 below:

TABLE 4-13. SPECIES FOR WHICH ESSENTIAL FISH HABITAT (EFH) HAS BEEN DESIGNATED WITHIN THE AREA INCLUSIVE OF THE SMU IBA					
Species	Eggs	Larvae	Juveniles	Adults	Importance to Birds and the Marine Food Web

TABLE 4-13. SPECIES FOR WHICH ESSENTIAL FISH HABITAT (EFH) HAS BEEN DESIGNATED WITHIN THE AREA INCLUSIVE OF THE SMU IBA					
Species	Eggs	Larvae	Juveniles	Adults	Importance to Birds and the Marine Food Web
Atlantic Salmon (<i>Salmo salar</i>)			X	X	Food for Osprey
Pollock (<i>Pollachius virens</i>)			X	X	Food for Double-crested Cormorant, Gannet
Red Hake (<i>Urophycis chuss</i>)	X	X	X	X	Food for skates, hakes, and bluefish (See below)
Windowpane (<i>Scophthalmus aquosus</i>)	X	X	X	X	Food for cormorants, Common Loon and Osprey
Atlantic Sea Herring (<i>Clupea harengus</i>)			X	X	Food for Gannet, Double-crested and Great Cormorant, Common Loon
Bluefish (<i>Pomatomus saltatrix</i>)			X	X	Food for Osprey; terns are attracted to schools of feeding bluefish where they glean injured bait fish and scraps
King Mackerel (<i>Scomberomorus cavalla</i>)	X	X	X	X	Food for sharks
Spanish Mackerel (<i>Scomberomorus maculatus</i>)	X	X	X	X	Food for sharks
Cobia (<i>Rachycentron canadum</i>)	X	X	X	X	Food for sharks
Little Skate (<i>Leucoraja erinacea</i>)			X	X	Prey to bluefish and summer flounder and other spp. of bony fishes
Winter Skate (<i>Leucoraja ocellata</i>)			X	X	Eaten by sharks and other skates
Sand Tiger Shark (<i>Carcharias taurus</i>)		X			A voracious predator of bony fish species; may forage cooperatively and therefore attract local seabirds, which may glean scraps from feeding sharks

Source: www.nero.noaa.gov/hcd/STATES4/conn_li_ny/41107220.html

The EFH designations in Table 4-13 above, provide data to characterize the federally-managed fisheries resources within the IBA. However, it should be noted that the

number, species richness, and community composition of the finfish and shellfish resources in any given area could vary considerably from year to year. In addition to state or federally managed species, the NEFMC management area inclusive of the IBA also supports important recreational fisheries and provides habitat for prey of managed fish species and piscivorous birds.

4.7.3 Other Fisheries Resources

The upper reaches of the Menunketesuck River support populations of Blacknose Dace (*Rhinichthys atratulus*), Brown Trout (*Salmo trutta*), Largemouth Bass (*Micropterus salmoides*), White Sucker (*Catostomus commersoni*), American Eel (*Anguilla rostrata*), and Brook Trout (*Salvelinus fontinalis*) (Hagstrom et al., 1991). The presence of American Eel (a catadromous species) and possibly Brown Trout (some populations of which are anadromous) identifies the Menunketesuck River as a watercourse that supports a diadromous fishery.

The lower reaches of the river and Gatchen Creek also sustain an estuarine fish community as well. The salt marshes associated with rivers such as these typically support a variety of fish species both within the small creeks and ditches and in the river channels that flow through the IBA. Creeks and ditches typically contain Atlantic Silversides (*Menidia menidia*), Common Mummichogs (*Fundulus heteroclitus*) and Striped Killifish (*Fundulus majalis*). During periods of flooding, these species of fish swim from the ditches and creeks onto the marsh where they consume mosquito larvae, other invertebrates, and detritus. In turn, they are preyed upon by Winter Flounder (*Pseudopleuronectes americanus*) and Striped Bass (*Morone saxatilis*) (King 2006) and other voracious piscivorous fish spp.

4.7.4 Mammals

The combination of salt marsh, upland forest habitat and old field habitat adds to the species richness of the IBA. Many species typical of the Salt Meadow Unit are not unique to salt marshes, but are generalists, commonly found in suburban areas as well. They include White-tailed Deer (*Odocoileus virginianus*), Eastern Coyote (*Canis latrans*), Red Fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), Virginia Opossum (*Didelphis virginianus*), and Striped Skunk (*Mephitis mephitis*). These species likely utilize both the upland and salt marsh habitats on site.

Eastern Grey Squirrels (*Sciurus virginianus*), Eastern chipmunk (*Tamias striatus*), and Eastern Cottontail (*Sylvilagus floridanus*) were observed on the refuge grounds. Additional small mammals likely to occur within one or more of the on-site habitats include White-footed Mouse (*Peromyscus leucopus*), Meadow Vole (*Microtus pennsylvanicus*), Eastern Mole (*Scalopus aquaticus*) and Short-tailed Shrew (*Blarina brevicauda*). These small mammals are an important prey base to larger mammals that may occur at the site from time to time such as Mink (*Neovison vison*), American River Otter (*Lontra canadensis*), Red Fox, Fisher (*Martes pennanti*), Short-tailed and Long-tailed Weasel (*Mustela erminea* and *M. frenata*).

The CTDEP Bureau of Natural Resources Division of Wildlife Natural Diversity Data Base reports historic records of the state endangered Least Shrew from the area of

Westbrook inclusive of the IBA⁵. Recent sampling efforts conducted in the area have not been able to confirm extant populations. However, due to the cryptic nature of this species, continued sampling efforts are always warranted.

The IBA's coastal location and abundance of forest cover make it an ideal migratory stopover habitat for bats (Order: CHIROPTERA). Connecticut's bat species are all insectivores, which means they must either hibernate or migrate to survive Connecticut's winters. Some do both by migrating to established hibernacula. Typical migratory bat species that could be expected to occur within the IBA from time to time include the Little-brown Bat (*Myotis lucifugus*), Silver-haired Bat (*Lasionycteris noctivagans*) - a state special concern species, Red Bat (*Lasiurus borealis*) - state special concern, and Hoary Bat (*Lasiurus cinereus*) - state special concern.

4.7.5 Herpetofauna

The most noticeable reptile of the salt marsh is the Diamondback Terrapin (*Malaclemys terrapin*). Almost driven to extinction by market hunting in the early 1900s, this species has been slowly recovering since hunting pressures have subsided. This is the only saltwater species of turtle that regularly occurs in Connecticut and they are most abundant west of the Connecticut River. Terrapins are frequently observed sunning themselves along the exposed mud banks of Gatchen Creek during low tides. Other reptile species that may be encountered in the salt marsh include Snapping Turtle (*Chelydra serpentina*) and the Northern Water Snake (*Nerodia sipedon*). Few amphibians are found in the salt marsh due to the high salinity of the water and the physiological challenge of maintaining a proper osmotic balance. Especially since these organisms respire via gills first (during a larval stage) and then skin later (adult stage) during their development. As a result, frogs and salamanders are usually restricted to fresh water, and expire within a few hours if placed in salt water (Schmidt-Nielsen, 1983). Upland areas are likely to support American Toad (*Bufo americanus*), Red-backed Salamander (*Plethodon cinereus*) and Common Garter Snake (*Thamnophis sirtalis*) while palustrine forested and scrub/shrub wetlands likely support Green Frog, Pickerel Frog, and possibly Eastern Ribbon Snake (*Thamnophis sauritus*).

4.7.6 Invertebrates

The salt marshes provide important habitat for gastropod and bivalve mollusks such as the Mud Snail (*Nassarius obsoletus*), Salt Marsh Snail (*Melampus bidentatus*), Ribbed Mussel (*Geukensia demissus*). Even Eastern Oyster (*Crassostrea virginiana*) can be found in the lower reach of the Menunketesuck River. Oyster spat was noted on dock structures within the small cove at the southeast corner of the IBA. Other important food sources to fish and wildlife are amphipod (sand fleas), isopod (sowbug), and decapod (crabs and shrimp) crustaceans found within the tidal creeks.

Two of the most visible invertebrates in the salt marsh are fiddler crabs and ribbed mussels. Ribbed Mussels partially bury themselves in the mud where they cling to cordgrass rhizomes and other firm objects. In large numbers they stabilize the sediments and help prevent erosion. Ribbed Mussels feed by filtering out phytoplankton, bacteria

⁵ Via correspondence with CTDEP Bureau of Natural Resources Division of Wildlife 15 August 2007.

and detritus from the water. They also provide cordgrass with nutrients through their excretion (Warren and Fell, 1995).

There are two species of fiddler crabs in Connecticut marshes – the Marsh Fiddler Crab (*Uca pugnax*) and Red-jointed Fiddler Crab (*Uca minax*). Burrows dug by fiddler crabs allow oxygen and nutrients to reach cordgrass roots more easily. As burrows collapse and get re-dug the upper layer of sediment gets tilled. Both fiddler crab and Ribbed Mussel numbers are positively correlated with the productivity of cordgrass (Warren & Fell 1995).

Other invertebrate species found in the low marsh include the Common Clamworm (*Nereis succinea*), the Rough Periwinkle (*Littorina saxatilis*) and the Mud Snail (*Ilyanassa obsoleta*). High marsh invertebrates include the Saltmarsh Snail (*Melampus bidentatus*), the Saltmarsh Isopod (*Philoscia vittata*), and the Saltmarsh Amphipods *Orchestia grillus* and *O. uhleri*. All are deposit feeders that eat partly decomposed marsh grasses, algae, and other material.

The marsh is also home to many species of insects, which provide food for fish, birds, herpetofauna, and rodents. Common insects found in the marsh include meadow grasshoppers, ground crickets, planthoppers, leafhoppers, aphids, beetles and saltmarsh mosquitoes. Praying Mantis (*Mantis religiosa*) can also be found stalking prey, especially late in the summer (King, 2006). Dragonfly species commonly found in the marsh include the Seaside Dragonlet (*Erythodiplax berenice*), Common Green Darner (*Anax junius*), Comet Darner (*Anax longipes*) and meadowhawks (*Sympetrum* spp.). Many dragonflies also engage in coastal migrations, and flights containing large numbers of certain dragonfly species can often be seen moving through coastal locations when weather conditions are right. The ideal weather conditions for these movements occur when northwest winds prevail associated with frontal high pressure systems. These flights often sustain the flights of small falcons such as the American Kestrel (*Falco sparverius*) and other migrating insectivores that readily prey on dragonflies such as kingbirds, phoebes, and other flycatchers (Riepe, 1993).

The IBA likely hosts throngs of migrating butterflies as well. Species such as the Monarch (*Danaus plexippus*), Question Mark (*Polygonia interrogationis*), Painted Lady (*Vanessa cardui*), and Red Admiral (*Vanessa atalanta*) are notable migratory species that are expected to move through the IBA in considerable numbers in most years.

Collectively, these organisms fill ecological roles of primary consumers, detritivores, and other lower trophic level consumers and therefore play an extremely important role in linking the energy flow of the system from the highly productive salt marsh flora to higher trophic levels.

4.8 SMU as an Important Bird Area

The diversity and productivity of habitat types within the IBA, the IBA's location along a major flyway and the fact that it remains predominantly a natural area in a rapidly developing landscape sets the stage for importance to avian ecology. However, the importance of the IBA and surrounding lands to avian ecology is magnified by the following:

- ◆ The area provides an abundance of food and water for birds of all major feeding guilds (e.g., herbivores, granivores, piscivores, insectivores, molluscivores, frugivores, nectarivores, carnivores, etc.) throughout all or much of the year;
- ◆ The vegetated areas provide requisite cover for migrant and seasonal resident birds; and
- ◆ The area provides specific habitat attributes to respective bird species or other taxa in a region where these attributes are depauperate (e.g., extensive intertidal salt marsh for waders, shore birds, rails, and Saltmarsh Sharp-tailed Sparrows; coastal forest/woodland for neotropical migrant passerines, etc.).

5.0 Conservation Concerns, Threats, Opportunities

5.1 Conservation Concerns and Threats

Because of the inter-related complexities within and among ecosystems, impact to one ecosystem component may affect other components of the system as well. This may result in both short term and long term effects that may have either positive or negative impacts to the sustainability of ecosystem components. Whether or not disturbance will impact the ecosystem negatively typically depends on the source and on the temporal scale on which it is measured. Both biotic disturbances (e.g., disease) and abiotic disturbances (e.g., fires or storms) are natural factors of many ecosystems and may be an integral ingredient in long-term population management. Often, disturbances occur as episodic events, altering a habitat in such a way as to create new habitat for other species. Usually, on a greater temporal scale, the overall health of the ecosystem is maintained and recovery occurs. Physical alteration of the environment by man tends to have lasting impacts to the ecosystem. Examples of these disturbances include: pollution, introduction of exotic species, and the disruption of natural species life histories through habitat fragmentation; elimination of breeding, feeding, roosting, or migratory stopover sites, etc.

Anticipated or likely negative impacts to the major biological components of the IBA's ecosystems include the loss of habitat due to development, fragmentation of existing large forested blocks, the introduction of non-native plant and animal species, and introduction of sediment and toxicants to the aquatic and estuarine resources.

As would be expected, species which require specific types of habitat or occupy narrow niches (specialists) are more susceptible to environmental disturbance than those which are more adaptable to changes in their environment (generalists). Examples of both groups were noted among the avifauna of the IBA. Avifauna specialists noted within the IBA generally included wetland dependent species, forest interior specialists, and top carnivores.

5.1.1 Development of adjacent lands

Much of the land surrounding the IBA is heavily developed with suburban residential use. Commercial land usage lies along Route 1. Route 1 bisects the Menunketesuck River and the municipalities of Clinton and Westbrook. It forms the southern boundary of the IBA. Further development of lands adjacent to the IBA may negatively impact the value of the IBA by removing habitat features within the landscape that add to the total land area and hence the overall importance of the IBA.

Concentrated residential development at the project site has the potential to degrade water quality of the Menunketesuck River and thereby diminish the quality of associated marshes, with subsequent effects on diadromous fish runs, migratory waterfowl concentration areas, and other aquatic species that use the river and marshes for parts of their life cycle. It has also been shown that development along salt marsh margins can contribute to the input of nitrogen into the marsh leading to a landward spread of tall *S. alterniflora* and a seaward spread of Common Reed (Bertness et al. 2002). In combination, these changes would be expected to reduce the area of *S. patens* and *J. gerardii*, which is where Saltmarsh Sharp-tailed Sparrows typically nest. Such

development also would increase sediment loads into the marsh and increase runoff containing fertilizers, pesticides, etc. Finally, additional development would limit the scope for the landward migration of the marsh if relative sea level rise continues at or above the current rate (King, 2006).

Existing undeveloped land remaining within the IBA consists largely of forested parcels bordering the salt marshes fringing the Menunketesuck River and Gatchen Creek and outside of the SMU. Parcels to the north of the IBA are of particular conservation concern because together with the individual blocks of the Cockaponsett State Forest, they form a forested migratory corridor that extends north bisecting the State of Connecticut through the Cockaponsett and Meshomasic State Forests and forests of the Bolton Range. The forested areas between IBA and the corridor described above is bisected by I-95 and is further encroached upon by the industrial park along Pequot Park Road where development for commercial business further degrades the contiguous forest. Additional land clearing is currently occurring at the terminus of this road and additional parcels are for sale.



Figure 5.1. Commercial Parcel for sale along Pequot Park Road to the North of the IBA.

5.1.2 Disturbance to / loss of birds and their habitat

The CTDEP NDDDB reports three species of rare avifauna and historic records of one mammal species from the area of Westbrook that includes the IBA. Site observations from Audubon personnel, Dr. Chris Elphick⁶ and his staff, refuge personnel, local birders, and others (including the authors of this conservation plan) have resulted in the recordation of 10 species of rare avifauna known to occur within the IBA during the

⁶ Assistant Professor, Department of Ecology and Evolutionary Biology University of Connecticut, Storrs Campus

breeding season. Detailed inventories or surveys for other plant and animal taxa could yield other listed flora or fauna species, especially within the brackish water areas of the marsh. Further investigation regarding the potential presence or absence of listed species may be warranted prior to any habitat conversion, management, development or disturbance, if the proposed action is funded with state or federal money, wholly or in part. Should it be determined that federally protected species may be impacted by a proposed action within the IBA, preparation of a Biological Assessment or further consultation with the USFWS under Section 7 of the Endangered Species Act may be required.

A water quality issue associated with the conservation and management of Menunketesuck River is the potential need for maintenance dredging of navigational channels within the lower reaches of the river to remove accumulated sediment introduced from runoff from State Route 1. The need for periodic maintenance dredging is typical for operation of marinas and the navigable channels and berths that provide boat access.

Authorization for dredging and dredged material disposal is required by the Army Corps of Engineers (ACOE) and CTDEP under Section 10 of the Rivers and Harbors Act of 1899 and Sections 404 and 401 of the Clean Water Act. Evaluations of sediment quality and measures to prevent sedimentation may be required during and after dredging to ensure that state Surface Water Quality Standards are maintained.

To accurately assess impacts to marine resources (e.g., finfish, shellfish, benthic invertebrate species, etc.) the temperature, salinity, depth, and substrate of the marine environment within the areal extent of any proposed dredging project, as well as within influence of the project limits (e.g., down current, or adjacent, etc.), may need to be considered. Any proposed dredging project could result in impact to benthic biota, which are the prey organisms of many bird species and managed finfish species that frequent the area. Potential impacts generated by any proposed dredging include localized impairment to water quality, disruption of benthic habitat, and direct effects to marine organisms. Indirect effects to marine organisms in the area may occur due to the alterations of energy flow, habitat structure, and biotic interaction. Certain fisheries resources are particularly sensitive to dredging and turbidity-induced impacts due to their demersal egg and larval stages, or due to their migration, feeding, or hibernation habits.

The fisheries resources that occur within the area that are particularly susceptible to dredging and turbidity-induced impacts include windowpane, anadromous fish, and shellfish resources. Windowpane are demersal and therefore, are susceptible to impact from dredging operations by the re-settlement of sediment from the water column. Windowpane spawning begins in spring and extends into summer within the LIS, with some researchers reporting a split spawning season with peaks in spring and autumn (Chang et al, 1999). Anadromous fish runs to and from LIS occur from April to the end of June. This overlaps with peak shellfish spawning which occurs approximately from the beginning of June to late September. Any proposed dredging should be limited during these sensitive time periods.

The magnitude of Total Suspended Solids (TSS) released or generated during dredging operations can be minimized using best management practices such as the deployment of

appropriate dredging equipment and techniques. Chemical analysis of the sediment will likely need to be conducted to determine the suitability of the material for open ocean disposal, upland disposal, reuse, recycling, or treatment.

Proposals for large scale dredging operations should adequately assess the impact to the ecological attributes of the Menunketesuck River. The scale of the anticipated impact is assessed in relation to the purpose and need of the proposed dredging.

Clearing of Natural or Semi-natural Areas

The existing woodlands, salt marshes, shrubland and other natural or semi-natural habitats within the IBA should be protected from further size reductions, fragmentation, and clearing. The remaining natural areas on site represent some of the IBA's most valuable habitat. For instance, the forest blocks to the north of the IBA link the IBA to a major landscape level forest corridor that extends northeastward to the Connecticut River, where it links to the Bolton Range, a similar corridor that continues northeastward across the Connecticut-Massachusetts border where it links to yet another similar greenway associated with the Quabbin Reservoir watershed and further points north. This landscape feature provides a major migratory corridor for Neotropical migrant forest birds in the state. The coastal forests of the SMU IBA serve as a gateway to birds entering and leaving this migratory corridor during seasonal movements.

Despite reports of a resurgence of temperate forests on abandoned agricultural or silvicultural land in the northeast (Franklin, 1988), large contiguous tracts of forests in Connecticut may actually be decreasing. Forest blocks greater than 100 hectares (247 acres) in Connecticut continue to become scarce. In their 1996 annual report the Connecticut Council of Environmental Quality (CEQ) recognized the downward trend in privately owned forest blocks of greater than 10 hectares (25 acres) in the state. The CEQ reported that more acreage of forest lands lay in the hands of private land owners, than in state forests. Since the average age of these land owners was over sixty years old, they predicted that the number of forest blocks in the near future would be expected to decline sharply, as heirs to these private land holdings would most likely subdivide them for sale to developers. Therefore, this downward trend in the number of privately owned forest blocks is expected to continue in the near future.

Generally, an area of 40.5 hectares (100 acres) or greater is considered an important habitat for forest interior species (Askins, personal communication). According to Wilcove (1988), certain widely distributed Neotropical migrants such as the Hooded Warbler (*Wilsonia citrina*) and the Yellow-throated Vireo (*Vireo flavifrons*) tend to be absent from small (i.e., <20 ha [<50 ac]) forest blocks. Moreover, the surrounding landscape may have an impact on the suitability of the small forest fragments (Wilcove 1988; Askins 1995). Forest fragments that are surrounded by intensely agricultural areas or dense urban areas may have less value to the reproductive success of Neotropical migrants than forested fragments surrounded by other land uses (e.g., rural residential, wetlands, montane, or an interspersed of all land types). This is due largely to the fact that many of the Neotropical migrant forest interior bird species are sensitive to nest predation which occurs more heavily along edge habitat than within deeper forest interiors. Nest predators such as Blue Jay (*Cyanositta cristata*), American Crow (*Corvus branchyrhynchos*), Common Grackle (*Quiscalus quiscula*), Eastern Chipmunk, Long-tailed Weasel and Raccoon, as well as brood parasites such as Brown-headed Cowbird

(*Molothrus ater*), occur in higher densities around forest edges (Wilcove 1988). Wilcove et. al. (1986) provides evidence that nest predation and brood parasitism may extend into the habitat block for as far as 300 to 600 m (985 ft to 1,970 ft).

The construction of I-95 to the north of the IBA through the area’s forested landscape has likely constrained the effective dispersal of some animal taxa between the IBA and the forest blocks to the north of I-95. Subsequent residential and commercial development within these forest blocks add further constraints. As the areal extent of forest cover decreases the forested block begins to become less suitable for forest interior species.

The effect of forest fragmentation is one factor that has contributed to the nationwide decline of Neotropical migrants on their breeding grounds at home in the United States (Askins, 1995) and on wintering grounds abroad (Wilcove, 1990). There are a number of species, considered forest interior species that are also Neotropical migrants, which likely breed within and adjacent to the IBA. Neotropical migrants that prefer large tracts of unfragmented woodland for breeding are identified in Table 5-1. Often these species have specific habitat requirements within these large forest blocks. Some of these forest interior specialists, such as the Worm-eating Warbler (*Helmitheros vermivorus*) and Hooded Warbler are characteristic species of more southern woodlands and reach the northern limits of their range in the vicinity of Connecticut and bordering southern New England states. Studies in mid-Atlantic states have shown that these two species have disappeared from historic breeding areas fragmented or reduced by increased urbanization (Wilcove 1988; Askins 1995).

Three significant forest blocks lie between the IBA and the existing protected forested blocks of the Cockaponsett Forest migratory corridor to the north of the IBA. The first forest block (Forest Block No. 1) north of the IBA is approximately 330 acres (136 ha) and is located to the north of the Pequot Park Road business park which borders the forest block to the south. It is bordered to the east by residential and agricultural lands off of Brainard Road, to the north by residential property off of Ken Rose Terrace and Meadowlark Lane Extension, and to the west by Horse Hill Road and associated residential properties. The second forest block continuing north from the IBA (Forest Block No. 2) lies to the northwest of Forest Block No. 1 diagonally across Horse Hill Road, which forms its eastern boundary. Forest Block No. 2 is further bounded by Houpert’s Way and Break Neck Hill to the south, Kelseytown Road to the west, and Chittenden Hill to the north. It encompasses approximately 575 acres (233 ha). Forest Block No. 3 lies north of Chittenden Hill Road, which forms its southern boundary. It is further bounded by Stevenstown road to the east, Tower Hill Lake and associated residences to the north, and both agricultural land and forest land (Cockaponsett State Forest Blocks) to the west. This forest block encompasses approximately 520 ac (211 ha) but is part of a larger contiguous forest tract as it abuts an existing Cockaponsett State Forest block to its northwest.

TABLE 5-1. FOREST INTERIOR BIRD SPECIES RESIDENT WITHIN SOUTHEASTERN CONNECTICUT FORESTS	
Broad-winged Hawk	<i>Buteo platypterus</i>
Barred Owl	<i>Strix varia</i>
Hairy Woodpecker	<i>Picoides villosus</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>

Acadian Flycatcher	<i>Empidonax virescens</i>
Red-breasted Nuthatch	<i>Sitta canadensis</i>
White-breasted Nuthatch	<i>Sitta carolinensis</i>
Brown Creeper	<i>Certhia americana</i>
Veery	<i>Catharus fuscescens</i>
Hermit Thrush	<i>Catharus guttatus</i>
Black-throated Green Warbler	<i>Dendroica virens</i>
Cerulean Warbler	<i>Dendroica cerulea</i>
Black-and-white Warbler	<i>Mniotilta varia</i>
Worm-eating Warbler	<i>Helmitheros vermivorus</i>
Ovenbird	<i>Seiurus aurocapillus</i>
Louisiana Waterthrush	<i>Seiurus motacilla</i>
Hooded Warbler	<i>Wilsonia citrina</i>
Canada Warbler	<i>Wilsonia canadensis</i>
American Redstart	<i>Setophaga ruticilla</i>
Scarlet Tanager	<i>Piranga olivacea</i>

(Askins et al. 1987)

Development within this forested landscape corridor begins to disrupt the continuity of this landscape feature eroding its value to forest interior birds. Within the forest blocks contiguous to the IBA, a residential subdivision has been proposed for a forest block west of Grove Beach Road (Figure 5-2), and the Pequot Drive Industrial Park has bisected the forest immediately north of I-95, between the IBA and the southern most state-owned parcels of the Cockaponsett Forest.



Figure 5.2. Residential Subdivision along Grove Beach Road to the west of the IBA.

Any proposed development within this corridor should preserve the contiguous forest and

natural ground covers as much as is practicable, rather than clear-cutting the entire parcel and landscaping with non-native grasses and plantings. The loss of forested land within the migratory/dispersal corridor adjacent to the IBA could be mitigated by protecting or conserving compensation lands with comparable habitat within unprotected gaps within or adjacent to the Cockaponsett landscape to the north of the IBA or within or adjacent to the Connecticut Water Company lands to the northwest of the IBA.

5.1.3 Invasive or non-native plants/animals

Non-native and Invasive Plants

Introduction and proliferation of non-native organisms are of management concern because the introduced species have potential to impact the biotic interactions of the native flora and fauna communities. Biotic interactions such as competition, predation, disease, parasitism, and mutualism may be altered to the detriment of native species. Resultant effects on communities may be manifested in the increased frequency of disease, altered primary and secondary production, altered trophic structure, altered decomposition rates and timing, disruption of seasonal rhythms, shifts in species composition and relative abundance, shifts in invertebrate functional groups (e.g. food for secondary consumers); shifts in trophic guilds (e.g., increased omnivores); and increased frequency of hybridization.

In recognition of the impact of non-native plants on our floristic composition in the state, Connecticut recently enacted legislation barring the sale, use, and cultivation of specific non-native plants species that are known to be particularly widespread and invasive and are causing impact to native habitats (Public Act No. 03-136). Additional legislation allows for enforcement against the ban on the importation, movement, sale, purchase, transplantation, cultivation, or distribution of these plants (Public Act No. 04-203).

Non-native invasive plants are prolific within portions of the IBA. They include herbaceous, liana, shrub, and tree species. Some representative non-native invasive plant species noted during a cursory inspection of the IBA include those listed in Table 5-2. More species are known or likely to exist. Despite known impact to the native floristic composition of the state, some non-native plant species still provide important habitat function to certain bird species. For instance, multiflora rose provides suitable nesting cover for shrubland birds at the site. Therefore, care must be taken not to impact species of conservation concern that utilize this special habitat coverage during removal or control projects (Refer to Section 8.2.6).

Multiflora rose is a thorny perennial shrub of medium height, with compound leaves that are divided into 5-11 oval toothed leaflets. It has arching stems that can root at the tip, allowing it to form dense thickets. A medium bush is capable of producing 500,000 to 1,000,000 seeds. The plant is very adaptable and able to grow in a wide range of soil, moisture, and light conditions. It is found in successional fields, forest edges, stream banks, and roadsides. It is generally not found in standing water or extremely dry habitats. Multiflora rose spreads quickly, forming impenetrable thickets that exclude native plant species. It invades areas that have been subjected to land disturbance, and impedes succession. Studies have show that it is highly competitive for soil nutrients, and it has lowered crop yields in adjacent field plantings (IPCNYS, 2002).

Japanese barberry is a shade tolerant, dense, thorny shrub with abundant red berries. The plant reproduces from prolific seeds, rhizomes and layering (branches root into new plants as a result of prolonged soil contact). Japanese barberry, once established, can grow to form large thickets that displace native wildflowers, shrubs and tree seedlings. Infestations of this plant have also been found to cause soil pH changes (IPCNYS, 2002).

Common reed is a perennial wetland grass that can grow up to 13 feet tall. It is characterized by a rhizomatic root system, which allows for aggressive reproduction. As a result, this species forms dense monospecific stands that displace native vegetative species (IPCNYS, 2002). This highly invasive plant invades areas where the soil salinity drops below 18 ppt (www.dep.state.ct.us/olisp) displacing native marsh vegetation that obligate marsh species such as salt marsh sparrows and Willets use to build nests (King, 2006). Studies also show that fewer birds reside in marshes that are dominated by common reed compared to those with short-grass meadows (Benoit & Askins 1999; Shriver 2002). Currently, common reed is located along the western edges of the marsh margins, in association with residential developments, and at the landward limits of the Menunketesecuk River marsh system and the upper (i.e., upstream) reaches of the Gatchen Creek marsh systems. Further spread of this plant should be controlled where possible.

Asiatic Bittersweet and Japanese Honeysuckle invade disturbed upland habitats. These vines typically colonize edge habitats, where they grow rapidly and cover nearby shrubs and/or trees, eventually shading them out (IPCNYS, 2002). Introduced from Asia in the mid-1800s, these vines have become especially abundant in coastal locations in the Northeast and have infested thickets and woodlands of many formerly natural areas, changing the plant community structure.

Various invasive honeysuckle species (e.g., Morrow's honeysuckle), are non-native shrubs. Some are relatively shade intolerant. They typically occur in forest edges, pastures, abandoned fields, disturbed woodlots, and other open habitat. Fly or Morrow's honeysuckle is known to invade fens, bogs, and lakeshores and can rapidly invade a site by forming a dense shrub layer that suppresses native woody and herbaceous plants. Leaves emerge on fly honeysuckle during early spring, and foliage remains until November. Infestations of the plants lead to a decrease in available light and a reduction in soil moisture and nutrients. The plant may also release toxic chemicals into the soil that inhibit the growth of adjacent native plants. (IPCNYS, 2002).

Porcelainberry (*Ampelopsis brevipedunculata*) is currently listed as a potentially invasive plant on the official Connecticut invasive plant list. As of November 2007, the Connecticut Invasive Plants Council is considering placing porcelainberry on the list of banned invasive plants in Connecticut. This species is native to northeastern Asia. It was introduced into the US in 1870, with the earliest CT record a specimen collected in Bridgeport in 1905. This plant now grows in numerous sites in Connecticut. Being a bird-dispersed species that produces copious amounts of small, 2-4 seeded fruits that germinate easily; it is expected to continue to spread with ease throughout the state, aided by a number of wide-ranging birds including American Robin, Gray Catbird, and Northern Mockingbird which readily consume the seeds of porcelainberry. Other attributes render this species an effective competitor. It can climb high into forest canopies, grows rapidly, its seeds will germinate below parent plants, and it can form

dense thickets, often obscuring the supporting vegetation. In thickets dense enough, it could impact forest floor species or prevent the germination or proliferation of spring ephemerals (D. Ellis, personal communication). Seeds may be viable in the soil for several years, therefore effective control of large infestations is likely to require dedication of time and resources for follow-up treatment. Treatment often requires repeated measures during the growing season and for several years afterwards to fully eradicate the plant. The plant is bird-dispersed via ingestion of fruit and subsequent regurgitation or defecation of seeds elsewhere. Therefore, the prevention of flowering, fruiting, and hence the production of mature seeds will help control or reduce its spread.

TABLE 5-2 SOME INVASIVE PLANT SPECIES WITH SIGNIFICANT COVERAGE WITHIN THE IBA

Common Name	Scientific Name	Location within the IBA	Potential Control ⁷	Reference for Further Control Details/Information
SHRUBS				
Multiflora rose	<i>Rosa multiflora</i>	Throughout old field areas and around SBMNWR headquarters	Mechanical and chemical methods Frequent repeated cutting or mowing (3-6 x per year) for two to four years; herbicide application ¹ Control via conservation grazing with Exmoor Ponies	¹ http://www.nps.gov/plants/alien/fact/romul.htm
Japanese barberry	<i>Berberis thunbergii</i>	Woodland borders	Mechanical control (removal of individual shrubs) in early spring ¹ Cutting with Triclopyr applied to cut-stump Control via conservation grazing with Exmoor Ponies	¹ http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/b... , http://plants.usda.gov/ ² http://webapps.lib.uconn.edu/ipane/browsing.cfm?descriptionid=26
Autumn Olive	<i>Elaeagnus umbellata</i>	Throughout old field portion of former homestead on Murdock Hill	Sprouts vigorously after cutting, so effective management requires removal of roots or cutting/girdling the stem and then application of an herbicide like triclopyr	http://www.hort.uconn.edu/cipwg/art_pubs/Guide/x12autumn.html
Honeysuckle spp.	<i>Lonicera</i> spp.	Throughout old field portion of former homestead and portions of adjacent forests on Murdock Hill	Repeated defoliations in one season to deplete root energy reserves (spring cutting, followed by repeated mowing in July August or foliar herbicide applications)	http://www.caf.wvu.edu/~forage/5412.htm
Winged Euonymous	<i>Euonymous alatum</i>	Entrance drive at SBM NWR headquarters and numerous adjacent parcels along frontage with Old Clinton Road; sporadic locations within the forest at Murdock Hill	Sprouting vigorously after cutting or burning. Therefore, effective management via stem cutting requires subsequent application of an herbicide like glyphosate. Toxic to some animals – protect	http://www.klines.org/joanne/Archive/Plant_Pages/plant_pages_30.html

⁷ Be sure to heed all health and safety warnings, permitting requirements, and environmental/ecological recommendations associated with any chemical control method. Information for herbicides can be found at http://www.pesticideinfo.org/Search_Chemicals.jsp

TABLE 5-2 SOME INVASIVE PLANT SPECIES WITH SIGNIFICANT COVERAGE WITHIN THE IBA

Common Name	Scientific Name	Location within the IBA	Potential Control ⁷	Reference for Further Control Details/Information
			conservation grazers against poisoning by installing barriers	
LIANAS				
Porcelainberry	<i>Ampelopsis brevipedunculata</i>	Old field and forest borders around SBMNWR headquarters	Mechanical and chemical methods have been used successfully to control porcelainberry infestations. Hand pruning in the fall or spring helps to prevent flowering and thus seed formation the following season. Vines can be cut to prevent seed formation and further damage to trees. Systemic herbicides (Triclopyr [e.g., Garlon 3A and Garlon 4] and glyphosate [e.g., Roundup and Rodeo]) are also effective ¹ . Both methods together likely most effective and likely required for large infestations. Large stems cut low should be treated with a systemic herbicide to prevent re-sprouting ²	¹ http://www.nps.gov/plants/alien/pubs/midatlantic/ambr.htm ² http://www.dcnr.state.pa.us/forestry/invasive/tutorial/Porcelainberry_M_C.htm
Asiatic or Oriental Bittersweet	<i>Celastrus orbiculatus</i>	Throughout old field portion of former homestead and portions of adjacent forests on Murdock Hill at SBMNWR headquarters	Hand removal where practical; cut vines and spot treatment with herbicide (100% Roundup)	http://www.inhs.uiuc.edu/chf/outreach/VMG/rlbitter.html
Japanese Honeysuckle	<i>Lonicera japonica</i>	Various locations at the edge of the old field and along trails through the old field, portions of adjacent forests on Murdock Hill esp. at old well site.	Herbicide application only effective control but necessitates attention to proper timing. Some herbicides ineffective	http://tncweeds.ucdavis.edu/esadocs/documnts/lonijap.html
HERBS				
Japanese knotweed	<i>Polygonum cuspidatum</i>	At entrance sign, northwest corner of parking lot at SBMNWR headquarters	The best control strategy is a combined integrated strategy with mowing or cutting: 1) Cut stalks down to 2" and immediately apply a 25% solution of glyphosate or	http://www.cdca.ca.gov/phpps/ipc/weedinfo/polygonum-knotweeds.htm

TABLE 5-2 SOME INVASIVE PLANT SPECIES WITH SIGNIFICANT COVERAGE WITHIN THE IBA

Common Name	Scientific Name	Location within the IBA	Potential Control ⁷	Reference for Further Control Details/Information
			triclopyr to the cross section of the stems. 2) Cut or mow infestations when the plants reach early bud stage (late spring or summer), treat re-growth in the fall with glyphosate or triclopyr.	
Common reed	<i>Phragmites australis</i>	Freshwater wetland seeps largely along the western side of the salt marsh Southern limit of IBA behind commercial facilities along State Route 1. Southeastern corner of IBA within excavated basin	Glyphosate application and removal of dead plants	http://www.nap.usace.army.mil/Projects/LCMM/Summary%20of%20Common%20Questions%20Concerning%20Phragmites%20Control.pdf#search='phragmites%20control'

Non-native Birds

Several bird species have been introduced to the United States beginning with the settlement of the New World by colonists. Many of those species (Rock Pigeon, European Starling, House Sparrow) have become established within the urban landscapes of the nation and also occur within the IBA. Some of these non-native species have been implicated in the decline of some of our native bird species. The European Starling and the House Sparrow compete with many of our native bird species for nesting cavities. Aggressive non-native bird species such as the European Starling and House Sparrow should be discouraged from nesting in nest boxes provided for other targeted bird species on-site by choosing the appropriate design of the nest box for the target species, proper placement of the nesting boxes, and monitoring usage of the box. Volunteers should be sought to monitor nest box programs and discourage nesting by introduced species.

Mute Swans are a non-native waterfowl species that, at high densities, can deplete submerged aquatic vegetation, with potential impacts on native species. The species is also aggressive during the breeding seasons, which can lead to competitive exclusion of native waterfowl near swan nests. Mute Swans (*Cygnus olor*) frequent the open water areas of the IBA at various times during the year. Control measures for Mute Swan include egg shaking, hunting, and trapping. Most control methods are in-effective (other than sustained hunting over decades) and controversial due to the perception of the general public of the swan as a gentle, graceful, aesthetically pleasing animal and due to the apparent lack of good evidence that there are real effects on other species. (Ellis and Elphick, 2007). Another controversy surrounding waterfowl management centers on control of the rapidly expanding non-native nesting populations of Canada Geese. High densities of non-migratory geese have been fouling lawns and waterways with their excrement, forcing landowners and managers to consider the various alternatives available for goose population control. Geese also appear to flatten marsh vegetation in places, which could conceivably affect marsh nesting birds like sparrows (C. Elphick, personal communication).

Non-native Mammals

Other introduced mammals have also had a detriment to our native avifauna. Domestic house cats , dogs, and rats, especially. Pets should be discouraged from sensitive habitats within the IBA such as salt marshes, and early successional shrubland via fencing (effective at excluding free-roaming dogs), signage, education and via a voluntary program of keeping cats indoors modeled after the one sponsored by the New Jersey Audubon Society.

Dr. David Pimental and his colleagues of Cornell University calculated the economic valuation of impact from non-indigenous animals including domestic cats. His research estimated there to be 63 million domestic cats in the United States of which approximately 30 million are considered allowed to roam loose or are feral. These feral cats are estimated to capture approximately 570 million birds/yr at an estimated value of 17 billion dollars (Pimental et al., 2000). Loose/feral cats can have an even greater impact on local populations of small mammals (Hammerson, 2004).

Local residents should be educated of the following truthful facts about cats and wildlife:

- ◆ Cats with bells on their collars still capture and kill wild birds and animals

- ◆ Even well-fed cats kill wildlife
- ◆ Wildlife injured by cats rarely survive, even if they escape; and
- ◆ Outdoor cats are at risk of exposure to many hazards including disease, parasites, and vehicles (www.njadubon.org).

Outdoor cats should at least be spayed or neutered. Rats should be discouraged from congregating within sensitive areas of the IBA by keeping these areas clear of human food wastes and by denying picnicking and general access to these areas.

5.1.4 Predators

Numerous native predators of birds abound, even in the suburban environment. Raccoons, opossums, skunks, and squirrels prey on eggs and nestlings. To keep these opportunistic predators at low densities and to prevent them from lingering in the IBA, the grounds of the Salt Meadow Unit should be kept clean of trash and human food wastes, especially during the breeding/nesting season. Picnicking within the refuge should be limited to an area adjacent to the refuge headquarters where it can be monitored by refuge staff. Refuge personnel should request patrons to carry out trash from anything that is carried in. Alternatively, the use of trash containers that are animal resistant should be considered. If the latter is chosen, maintenance crews should provide trash removal services promptly.

5.1.5 Cowbird Parasitism

The Brown-headed Cowbird (*Molothrus ater*) is a brood parasite in North America, meaning that instead of building their own nests, and incubating their own eggs and rearing their own young, they instead lay their eggs in the nests of other bird species and rely on these host species to incubate and rear the foster cowbird chicks. It has been documented that over 220 species of birds have been host to cowbirds with cowbird chicks successfully reared by over 150 host species, the majority of which are Passerines (“songbirds”).

The rates of nest parasitism vary locally. However when rates are high, parasitism may negatively impact the local populations of some host species. In some regions of the Midwest and Northeast, brood parasitism has had a detrimental effect on local bird populations. Although the impact of cowbird parasitism does not appear to be as intense in Connecticut as in some Midwestern states such as Illinois, continued forest fragmentation may accelerate the proliferation of these parasites (Askins, personal communication). Some birds species, such as the White-eyed Vireo (*Vireo griseus*), are more frequently victimized by cowbird parasitism than others (DeGraaf and Rudis 1983). Increased brood parasitism was identified as one possible cause for population declines in Connecticut’s White-eyed Vireo populations (Clark, 1994).

Variables that impact parasitism rates include local land-use practices, habitat quality, and breeding behavior of the host species. Brown-headed Cowbirds are perceived by land managers, conservationists and citizens as a serious threat to North American songbird populations. Cowbird parasitism has been implicated as a major factor in the population declines currently exhibited by a number of Neotropical migrants. As a result, cowbirds have been the subject of state and federal control programs over the past 25 years. But strong evidence in support of this implication may still be lacking. However the control of cowbirds can be quite expensive and since they are managed through lethal control,

cowbird management may not be well received by the general public and can be quite controversial. Further, recent studies have shown that the impact to host species may not be as great as once perceived for the following reasons:

- ◆ Many host species often re-nest and are able to make-up reproductive success lost to parasitism (However hosts with short breeding periods that begin the season raising cowbirds may not have sufficient time to re-nest); and
- ◆ Cowbird parasitism probably is not responsible for the continent-wide declines of many North American songbird species, as suggested by recent studies that have not refutably demonstrated the decline of host species where cowbird populations were increasing (www.audubon.org/bird/research/).

Therefore, control may only be warranted to restore local populations of high priority breeding species (e.g., Threatened and Endangered species) of passerines, of which the IBA currently has no known extant populations, except for possibly the Purple Martin. Furthermore, brood parasitism is virtually non-existent or extremely rare for *Ammodramus* spp. (Greenberg, et al., 2006; Elphick, personal communication). Within the IBA, cowbird control initiatives are unlikely to fix the underlying causes of any anticipated high rates of parasitism. The benefits are unlikely to outweigh the inevitable long-term financial costs, and the need for control to keep an endangered species viable until root problems can be corrected has not been identified as being applicable to the IBA. Cowbird control measures within the IBA are therefore not warranted at this time. However, congregations of cowbirds within the IBA should be discouraged by restricting bird feeding from April to November and limiting or restricting the use of feeds that typically attract cowbirds (e.g., cracked corn, millet, etc.). Adjacent landowners should be encouraged to do the same. An alternative to bird feeding, is to provide natural food sources that provide for other, more desirable species.

5.1.6 Hydrologic changes

Hydrologic changes to a water body include alterations to water volume and the temporal distribution of floods, low flows, tides. These changes to the basin's hydrology can result in altered flow extremes (both magnitude and frequency of high and low flows), increased maximum flow velocity, decreased minimum flow velocity, reduced diversity of microhabitat velocities, and fewer protected sites. The implications of these impacts/changes to habitat attributes should be assessed for any proposed action that could potentially impact the hydrology of the Menunketesuck River, such as dam removal, channel dredging or waterside development.

Sea level rise is another form of hydrologic change that could be detrimental to the breeding ecology of salt marsh avifauna, especially habitat specialists such as Saltmarsh Sharp-tailed Sparrow. Sea level rise can impact breeding success of the Saltmarsh Sharp-tailed Sparrow either directly via increased rates or duration of flooding or indirectly if the prolonged duration of flooding begins to impact the growth (density and per cent cover) of high marsh vegetation (see Sudden Marsh Dieback – Section 5.1.8).

Research done by Nydick et al. (1995) shows a faster relative sea level rise (RSLR) rate than accretion rate. The authors estimate that the rate of RSLR has increased to 2.9-3.3 mm/year during the last 300-400 years and that the “submergence index” (ratio of the rate of RSLR to marsh accretion rate) averaged 1.15 over the last 1000 years and increased to

around 1.5 over the last 200 years. If this current trend continues, high and middle marsh will become low marsh in a few centuries. If sea-level rates accelerate the area of marsh may decline more rapidly. Given the amount of developed habitat in the adjacent area, and the abrupt elevation change associated with the slope of the undeveloped areas, the scope for migration of the marsh inland seems quite limited. A reduced area of marsh would be expected to cause population declines in marsh-nesting species, especially Saltmarsh Sharp-tailed Sparrows (King, 2006). Computer simulations of future hurricane intensity and precipitation in a CO₂-induced warming environment predict increased intensity of rainfall (i.e., bigger storms that concentrate rain in time) for many areas of the world including the Atlantic basin (Knutson and Tuleya, 2004). This could also have an affect on breeding Saltmarsh Sharp-tailed Sparrows by pushing up tides that otherwise would not flood nests (C. Elphick, personal communication).

5.1.7 Potential Pollution

Typical pollution sources include leachate and wastewater discharge sources, leaking underground storage tanks, stormwater runoff, and the accidental (e.g., “spills”) or intentional (e.g., “dumping”) release of oil or chemicals within the watershed directly to the ground or an existing water body. Pollutants include nutrients (primarily nitrogen and phosphorus), organic and inorganic chemicals, heavy metals and other toxic substances, and wastewaters of extreme pH (either lower or higher than the receiving water), temperature, turbidity, and salinity. These inputs can result in expanded temperature extremes, increased turbidity, altered diurnal cycle of dissolved oxygen, increased nutrients (especially soluble nitrogen and phosphorus), increased suspended solids, increased toxics, and altered salinity within either the groundwater or receiving surface waters.

The Leachate and Wastewater Discharge Sources Inventory Map of the South Central Coast River Basins (CTDEP 1992) depicted former discharge sources proximal to the site within the local watershed drainage basin (Subregional Drainage Basin No. 5103) that includes the Site. These former discharge sources include failing septic systems in the Grove Beach area of Westbrook (adjacent to the IBA’s southwest corner) and widespread septic system failures in Clinton (outside of the IBA yet higher in the watershed). Failing septic systems are of conservation concern to the IBA in that they are a potential source of nutrients to the groundwater. Groundwater seeps occur around the perimeter of the IBA at the toe of slopes that lie adjacent to the marsh. These freshwater seep areas with high nutrient concentration encourage the colonization of common reed a plant known to have populations of non-native genotypes in the region and is considered invasive. Invasion of common reed into marsh habitats presents a conservation concern since the reed is known to create monospecific stands of that out-compete native vegetation of higher wildlife habitat and food value.

The railroad easement that bisects the marsh (Figure 5-3) is also another potential source of contaminants that could enter the marsh system. Historically, railroad lines and railyards are known sources of various contaminants including Polychlorinated Biphenyls (PCBs), Polynuclear Aromatic Hydrocarbons (PAHs), heavy metals, and Semivolatile Organic Compounds such as pesticides and wood preserving creosotes and pentachlorophenol.



Figure 5-3. A view of the Railroad Easement that Bisects the IBA

Stormwater generated on some of the local roadways in the area is discharged directly to the system via outfall pipes (Figure 5-4), and overland flow.



Figure 5-4. Stormwater Outfall Pipe (center) that Discharges to the Menunketesuck River along Nolin Road.

5.1.8 Disease

West Nile Virus/Eastern Equine Encephalitis

Disease concerns include those potentially impacting bird species and those that may

impact humans while birding. West Nile virus, spread by mosquito vectors is of paramount concern in recent years as it can have acute (lethal), effects on various bird taxa. Since mosquitoes are the vectors of human parasites, they are of management concern. Larval and pupae mosquitoes may occur in seasonal or temporary pools within the IBA and surrounding areas. Since 1999, the Connecticut Agricultural Experiment Station has established permanent mosquito monitoring stations within various coastal communities including Westbrook where a monitoring station lies proximal to the IBA at a location just north of I-95 (Michael Thomas, personal communication) from June to October. Mosquitoes are collected from traps set at these monitoring stations, identified to species level, and then sent to a virology laboratory to test for West Nile Virus. Results of monitoring are available through the Connecticut Agricultural Experiment Station.

Tick-borne Illness

Ticks are also vectors of parasites that cause disease in humans such as Rocky Mountain spotted fever, rickettsiae, monocytic and granulocytic ehrlichiosis, babesiosis, Lyme disease, and approximately six other diseases for which pathogens or other causative agents have been identified. Tick associations with other pathogens are not yet clearly understood or defined. The most common carriers of tick-borne diseases in the northeast are the Black-legged Ticks (*Ixodes scapularis* and *I. pacificus*) two species responsible for transmission of Lyme disease, granulocytic ehrlichiosis, and babesiosis (Stafford, 2004). However, other species of ticks may also act as vectors. The White-footed Mouse (*Peromyscus leucopus*) and White-tailed Deer are considered major reservoir hosts for Lyme disease. Birders and other refuge visitors should be warned via signage of the potential for ticks in the woodland, grassland, shrubland, salt marsh and other heavily vegetated areas of the IBA. Signs posting the warning of tick borne illness may also help to deter people from entering closed areas of the refuge.

Rabies

The occurrence of rabies in wildlife, especially raccoons and foxes, is a potential management concern. The public should be informed that any wild animals encountered in the IBA should not be fed, touched, or harassed. Additionally, human food wastes should not be discarded in the refuge and other public areas of the IBA so as to prevent attracting opportunistic scavengers that may also carry rabies.

Sudden Dieback

Sudden dieback is a name used to describe the undetermined cause of *Spartina* mortality exhibited by some marshes in eastern North America. To date, the cause of the dieback is unknown. Various biotic and abiotic factors are the focus of study among the researchers in estuarine ecology that are currently studying this phenomenon. These factors may be affecting the marsh vegetation independently or in one or more synergistic roles. Among the biotic factors suspected include:

- ◆ Increased herbivory by the purple marsh crab (*Sesarma reticulatum*) in response to predator decline (Cape Cod, MA)
- ◆ Herbivory by marsh snails (southern US marshes)
- ◆ Pathogenicity caused by an unknown species of fungus in the genus *Fusarium* (Louisiana marshes, perhaps marshes in the northeastern states)
- ◆ Opportunistic organisms such as nematode worms that become pathogenic once the host was stressed by other factors

Abiotic factors that may be operating alone or in concert with one or more pathogens include the following:

- ◆ Heat stress
- ◆ Sea level rise
- ◆ Other unforeseen factors associated with global climate change

5.1.9 Hunting

The benefits and potential impact of allowing hunting within the SBM NWR has been addressed in an Environmental Assessment (EA) prepared pursuant to the National Environmental Protection Act (NEPA) of 1969. The alternatives analysis presented in this document evaluates the environmental impacts of establishing and conducting a waterfowl hunting program at SBM NWR Great Meadows Unit (GMU), another unit of the refuge located outside of the IBA within Stratford, CT.

Although the EA addressed the impact of waterfowl hunting only at GMU, many of the same alternatives, opportunities, and potential impact issues are relevant or applicable at SMU. However, until opportunities are assessed and approved by the Refuge Comprehensive Conservation Plan (CCP) all other Units of the SBM NWR will remain closed to hunting (USFWS, 2007).

5.1.10 Insufficient Scientific Knowledge

Insufficient scientific knowledge regarding wildlife species distribution, abundance, and condition is a concern identified for a variety of habitats of greatest conservation concern, (including tidal wetlands) in Connecticut (CT DEP, 2005). The lack of marine flora and fauna from inclusion on Connecticut's Endangered, Threatened and Special Concern Species list (CTDEP 2004) is likely not due to the secure conservation status of marine flora and fauna but rather a reflection of the lack of understanding of the distribution, abundance, and condition of marine species. For this reason, scientific inventory, monitoring, and research should continue to occur within the IBA and similar habitats throughout the state.

In summation, natural biotic (predation, disease, parasitism, competition, succession) and abiotic (hydrologic changes, storms, seasonal extremes in temperatures, etc.) factors that may negatively impact bird populations are part of the natural processes in which birds have evolved. Robust populations can usually recover from these impacts. Clearly the greatest threats to the upland bird habitat within and adjacent to the IBA is the threat of further development of forested areas, and the continued introduction, proliferation, and spread of non-native invasive plant and animal species. These two factors both equate to the loss of habitat or diminished habitat value.

5.2 Management opportunities

Opportunities to manage the IBA in such a way as to improve the overall avian habitat quality center largely on conservation, invasive species control, and enhancement of existing habitat attributes, as well as implementing

“Opportunities to manage the IBA in such a way as to improve the overall avian habitat quality center largely on conservation, restoration, and enhancement of existing habitat attributes, as well as implementing measures to improve the overall habitat ‘matrix’ of the IBA”.

measures to improve the overall habitat “matrix” of the IBA. Increasing environmental awareness of the necessity or goals of management will be paramount to the success of future management opportunities.

5.2.1 Establishment of IBA Stewards

Due to the popularity of the refuge to local birders, there are a number of people in the area that frequent the IBA, are avid birders, are active in the local Audubon societies and are knowledgeable in the basic principles of avian ecology. Some of these people may be able and willing to act as IBA stewards. Some stakeholders have expressed their willingness to provide some degree of stewardship (Refer to Appendix A). Certainly the potential list of stewards does not stop there. It could also include individuals or representatives of local church, scouting, or other civic groups, as well as hunters, anglers, and other outdoor enthusiasts. The role of the stewards could include the following:

- ◆ Work closely with Audubon staff, landowner(s), and the local community to strengthen and implement the conservation plan to ensure the long-term viability of the target birds and their habitats.)
- ◆ Work with the Director of Bird Conservation to develop on-site bird inventory/monitoring efforts.
- ◆ Initiate educational outreach to foster community support for the IBA site. *Citizen Science* programs that engage people in learning about birds and their conservation are recommended.
- ◆ Work collaboratively with the landowner(s) of the IBA to safeguard and enhance avian habitats on the site.
- ◆ Assist in resource management programs at the IBA. These may include birdhouse construction, installation, and maintenance; exotic plant or pest control; habitat restoration; and native plantings.

The benefits to adopting such a program include:

- ◆ Participation in meaningful science leading to bird conservation
- ◆ Exciting project for members that combines science, education and birding
- ◆ Recruitment tool for enlisting new members and volunteers
- ◆ Community-based program
- ◆ Creative new public outreach opportunities
- ◆ Ongoing support from *Audubon's* science and education staff

5.2.2 Improvement of IBA Matrix

Through coordinated efforts between stakeholders, IBA stewards and refuge maintenance staff, existing habitats within the IBA could be improved or enhanced, to benefit avifauna. There are various management measures that can be implemented to increase habitat value without impacting existing uses of the IBA.

Planting native shrubs with fruits that benefit avifauna is one such way. An important aspect of matrix improvement is to assure that not only is food available for the species of conservation concern but also that the following is considered:

- ◆ A variety of food types are present supplying all feeding guilds (e.g., insectivores, granivores, frugivores, piscivores, nectarivores, carnivores, etc.) with sustenance
- ◆ Food items such as fruits and mast are available at varying times throughout the seasons
- ◆ Food items present a variety of nutritional options for consumers, and
- ◆ Food plants are located in areas where they are able to maximize their production without being outcompeted by low value or invasive competitors.

The relative nutritional content of food-producing plants beneficial to avifauna that occur within the IBA and some examples of flora within the IBA that provide food high in this nutritional category are presented in Table 5-3.

Examples of shrub species with high value to avifauna that thrive in coastal areas of southern New England, and the species to which they are beneficial are provided in Table 5-4.

TABLE 5-3. RELATIVE NUTRITIONAL CONTENT OF FOOD PRODUCING PLANTS THAT OCCUR WITHIN THE IBA		
Nutrition Category	Some Examples of Flora within the IBA that Provide Food High in this Nutritional Category	Avifauna benefited
High fat (Lipid) content	Flowering dogwood, spicebush, sassafras, arrowwood, woodbine	Thrushes (except American Robin), Gray Catbird
High protein	Solomon's seal, spicebush	American Robin, Eastern Kingbird, Great Crested Flycatcher
High carbohydrate	Black cherry, highbush blueberry, pokeweed, spicebush, and grapes	Cedar Waxwing
Emergency Sustenance Foods (Low nutrient or less palatable foods that are retained on the stem late into winter when other food is scarce)	Maple-leaved viburnum, green briar, winterberry, sumac, bayberry, juniper	Winter residents, wintering individuals of normally migratory species, early returning spring migrants

TABLE 5-4 RECOMMENDED SHRUB SPECIES FOR COASTAL SOUTHERN NEW ENGLAND WITH IMPORTANCE TO AVIFAUNA		
Recommended Species	Avifauna benefitted	Comment
Highbush Blueberry (<i>Vaccinium corymbosum</i>)	34 spp. of birds including Gray Catbird, American Robin, Eastern Bluebird, Orchard Oriole	Requires well-drained sunlit sites
Canadian Serviceberry (<i>Amelanchier canadensis</i>)	Downy Woodpecker, Hairy Woodpecker, Gray Catbird, Eastern Bluebird, Northern Cardinal, American Robin, Brown Thrasher, Swainson's Thrush, Veery, Wood Thrush, Eastern Towhee, Cedar Waxwing, Baltimore Oriole and other songbirds	Grows in a variety of habitats from swamps to rocky dry hillsides. Early spring blooms attract insects and pollinators and thus are important to insectivores
Sumacs (<i>Rhus glabra</i> , <i>R.</i>	Ruffed Grouse, Ring-necked Pheasant, Wild Turkey, Eastern	Not a preferred food but an important winter sustenance

<i>copallina</i> , <i>R. typhina</i>)	Bluebird, Northern Cardinal, Gray Catbird, Purple Finch, Northern Flicker, Northern Mockingbird, Eastern Phoebe, American Robin, Brown Thrasher, Hermit Thrush, various other songbirds	especially later in the winter season when other foods have been depleted
Dogwoods (<i>Cornus stolonifera</i> , <i>C. florida</i> and <i>C. ammomum</i>)	Ruffed Grouse, Wild Turkey, Eastern Bluebird, Northern Cardinal, Gray Catbird, Purple Finch, Northern Flicker, Yellow-breasted Chat, American Robin, Brown Thrasher, Hermit Thrush, Gray-cheeked Thrush, Cedar Waxwing, Red-eyed Vireo, Warbling Vireo, Pine Warbler various other songbirds	Fruits are highly valuable to avifauna including Neotropical migrant passerines. Some of the fruits may persist into winter
Hawthorns (<i>Crataegus</i> spp.)	18 spp. including American Robin, Northern Cardinal, Blue Jay, and other songbirds especially Fox Sparrows and Cedar Waxwings	The dense thorny branches of this shrub make it an exceptional coverage for nesting birds
Brambles (<i>Rubus allegheniensis</i> ; <i>R. hispidus</i> , et al. spp.)	49 spp., esp. Wild Turkey, Ruffed Grouse, Gray Catbird, Cedar Waxwing, Veery, Orchard and Baltimore Orioles, Yellow-breasted Chat	Exceptional coverage for nesting (<i>R. allegheniensis</i>);
Bayberry (<i>Morella</i> [<i>Myrica</i>] <i>pensylvanica</i>)	Eastern Bluebird, Gray Catbird, Brown Thrasher, White-eyed Vireo, Red-bellied Woodpecker, Tree Swallow, Yellow-rumped Warbler	Especially important component in the diets of Tree Swallows and Yellow-rumped Warbler
Viburnums (<i>Viburnum acerifolium</i> , <i>V. dentatum</i>)	Ruffed Grouse, Wild Turkey, Pileated Woodpecker, American Robin, Brown Thrasher, Great Crested Flycatcher, Cedar Waxwing, Gray-cheeked and Hermit Thrush	Fruits available during fall migration

A notable component of Connecticut's coastal forests is the prevalence of a dense liana layer (Dowhan and Craig, 1976). Native lianas such as biers (*Smilax* spp.), grapes (*Vitis* spp.), and Virginia creeper (*Parthenosissus quinquefolia*) should be retained for their value as food and cover.

Portions of the IBA (e.g., Murdock Hill, slopes and edges of lawns along the Menunketesuck River) currently vegetated with dense stands of invasive species could be cleared and replanted with native food-bearing plants. Since some dense tangles of invasive shrubs may have rather high value as cover or concealment for nesting passerines, any shrubs replacing them should also provide high value cover or concealment to replace that lost by clearing the invasive species. Native shrubs offering high value cover at southern New England coastal forests include hawthorn, Juniper, *Smilax*, and brambles.

Smaller trees with high wildlife and aesthetic value should also be considered where appropriate. Trees that are especially valuable would provide insect pollinated flowers that coincide with spring migration (April and May) and fruits that ripen to coincide with

fall migration (late August-October). Some native trees that would provide these values and are either native or non-invasive include: flowering dogwoods (*Cornus florida*), Canadian serviceberry, and certain crab apples (*Malus* species and hybrids). Other small flowering trees with bloom timing that coincides with spring migration, but provide fruit at a less desirable time would also benefit spring insectivorous migrants. Examples of trees in this group would include various viburnums such as nannyberry (*V. lentago*) wild raisin (*V. cassinoides*), and maple-leaved viburnum (*V. acerfolium*). In addition to providing enhanced habitat for migrating insectivorous and frugivorous birds, the addition of such attractive trees would be of high aesthetic value and enhance the visual appearance of the properties where they are planted. Additionally, opportunities to replace lawn with vegetation of higher value to birds and butterflies could be explored where such landscaping changes won't interfere with existing uses of the property, and where welcomed by private land owners both within and adjacent to the IBA.

Nest boxes could be added to provide suitable nesting sites for American Kestrel, Barn Owls, and Eastern Screech-Owls at locations along the forest/marsh edge⁸. Boxes would need to be constructed to the proper specifications for the intended targeted species. Construction of nest boxes could be a potential education/outreach project involving scouts, school children, etc. Volunteers to monitor the usage of and to maintain the nest boxes would greatly enhance the likelihood of success in attracting the desired species.

Outside of the refuge boundaries, there are specific areas that would be suitable for matrix improvement thereby improving the overall habitat within the supporting landscape. These areas are listed below and then described in more detail:

- ◆ Woodland on the western side of the marsh and to the north of the IBA;
- ◆ Commercial properties along Pequot Park Road to the north of the IBA and across Interstate 95
- ◆ Residential parcels with lawns contiguous with Menunketesuck River, and
- ◆ Adjacent/alongside of the railroad right-of-way that bisects the IBA.

The railroad bank that bisects the refuge includes large rip-rap patches devoid of vegetation, providing opportunity to create a linear coastal upland feature within the marsh. This bank could be planted with herbaceous vegetation typically found along the back dune beach environment typical of the Connecticut coastal environment. These plant species would need to be low and slow growing so as not to invade the traffic envelope of the railroad⁹. Vegetation planted here would help stabilize the slope, provide additional habitat for coastal species and prevent the establishment of invasive species. Species recommended for this area include bayberry, smooth sumac, beach plum, shinning sumac, Carolina rose (*Rosa carolina*). The red cedar, poison ivy and other native vegetation growing along the railroad embankment that is unlikely to invade the traffic envelope, should be retained.

5.2.3 Forestry Management

⁸ Additional monitoring to determine presence/absence of least shrew should be conducted prior to enticing additional small-mammal eating raptors from residing within the IBA

⁹ The traffic envelope consists of standard vertical and horizontal clearance points set by the railroad(s) operating on the track

Research conducted by Dr. Eben Goodale addressed the effect of shelterwood and thinning treatments on bird diversity and abundance in the Yale Forest. His preliminary conclusions (in press) suggest that undisturbed forests tend to have higher avian species diversity when compared to shelterwood stands and stands subject to thinning. He attributed this to the fact that undisturbed stands tended to have a greater density of snags and conifers, and also had a more developed shrub layer (predominantly *Kalmia* in the Yale Forest). Forests managed as undisturbed treatments, favored forest interior species such as Scarlet Tanager (in deciduous forests) and Black-throated Green Warbler (in conifers). Undisturbed forests were often found in hard to log areas, such as saturated wetland soils, boulder fields, or steep hillsides. Undisturbed forests in these areas were often the preferred habitat of Northern and Louisiana Waterthrushes. Ground nesters, such as Ovenbirds, and species that favor forests with a dense shrub layer such as the Black-throated Blue Warbler preferred undisturbed forests and stands subjected to thinning over shelterwood stands. Downy Woodpeckers were an example of a species that prefers thinned stands over shelterwood and undisturbed stands. In stands managed via thinning, more early successional species were encountered, while the species composition of shelterwood managed stands tended to be more dynamic.

Opportunities to conduct forestry management in a way that is beneficial to wildlife, should be explored within the forested areas of the Refuge and other conservation holdings within and adjacent to the IBA. Forestry management techniques directly affect avifaunal composition. An overview of typical forestry management practices is provided in Table 5-5.

TABLE 5-5. TYPICAL FORESTRY MANAGEMENT OPTIONS AND THEIR ASSOCIATED BENEFITS, CONCERNS, AND APPLICABILITY WITHIN THE IBA				
Treatment	Definition	Benefits	Concerns/Constraints	Applicability
Clearcutting	Complete cutting/harvest of all trees within a management area or unit	<ul style="list-style-type: none"> • In some applications, a beneficial and efficient way of regenerating trees and other vegetation (an esp. effective silvicultural tool for regenerating stands of shade intolerant species) • all growing space and resources available for the next generation • Potential high financial benefit from generation of even-aged trees, facilitating marketability • Mimics natural disturbance (e.g., fire, hurricane damage, etc.) 	<p>Drastic change to landscape cover – which can be prolonged if conducted improperly (e.g., forests can be turned to grasslands, etc.)</p> <p>If conducted improperly, a potential detriment to habitat value and downgradient water quality</p>	Not needed/ recommended for IBA since conservation of forest cover is a priority and management units (e.g., forest blocks) are too small to realize benefits
Shelterwood	A very heavy thinning, selecting for trees with high mast or growth potential. Uncut trees retained as seed source, shelter from wind and direct sunlight	Potential benefit to select for trees with high wildlife value while removing those with minimal value	Typically requires several cuttings, increasing management costs and labor	Not recommended for IBA due to high labor and management costs compared against benefit to avifauna
Crown Thinning	The removal of trees from the middle and upper crown classes in order to create gaps (typically low-value or diseased trees only removed)	<ul style="list-style-type: none"> • Allows for penetration of sunlight to lower crown classes, and to enhance growth of select trees from mid-canopy layers 	<p>Requires a skilled forester</p> <p>Would impact avifauna of higher foraging and nesting requirements</p>	Not recommended for IBA due to the impact to canopy avifauna

		<ul style="list-style-type: none"> Achieves a higher value of removed trees and promotes the faster growth of remaining trees 		
High Grading	The removal of dominant trees in a stand (typically the biggest and most highly valued)	Maximum short term profits realized	Long term stand profitability impacted as energy for growth is transferred to poorer quality trees in the understory	Seldom recommended for most applications
Improvement Thinning (Recommended for IBA)	Trees of different sizes and species are removed to reduce the stocking level and to improve the overall quality of the forest for the chosen objective(s)	<p>Provides more space and resources to the most desirable trees</p> <p>Beneficial management tool for recreational, aesthetic, timber profitability and habitat improvement objectives</p> <p>Allows for multiple objectives (timber income, maintenance of wildlife, protection of soils and downgradient receptors)</p> <p>Improves overall stand health</p>	Value from removed trees barely matches financial costs of conducting the thinning	Likely a viable forestry management strategy for forested blocks within and adjacent to the IBA
Seed Tree	The removal of all trees except for a few "seed trees" resulting in the eventual production of an even-aged stand (differs from shelterwood in that remaining trees do not affect the microclimate at the ground level).	Trees left provide seed for regeneration	<p>Typically there are often too few seed trees left to be of much use in generating new trees.</p> <p>Some site preparation needed to promote new tree growth</p>	Not recommended for IBA since conservation of forest cover is a priority and management units (e.g., forest blocks) are too small to realize benefits
Thinning from below (low-	Removal of lower canopy trees and shrubs freeing up nutrients,	Leads to an increase in crown and diameter growth most	Since the decisions about which individual trees to remove are	Not an appropriate management treatment for

thinning)	light, space, and water for use by the remaining trees.	<p>useful when all the trees in the stand are merchantable</p> <p>Has aesthetic value to some in park-like settings</p>	<p>determined solely by diameter alone, there is little opportunity to deliberately allocate growing space to meet objectives</p> <p>Removal of small trees and shrubs significantly reduces wildlife value within the management unit</p> <p>Likely not an economically viable option, generates little short term cash flow and adds little to the ultimate long-term financial return.</p> <p>Removing small trees and shrubs provides little additional growing space to the larger ones.</p> <p>The removal of all trees of similar size may actually eliminate one or more tree species that happen to grow and develop naturally at the site at a slower rate</p>	areas of high wildlife habitat value such as the IBA
Thinning from the middle	All trees from a middle strata are removed from a management unit to reduce the stocking level.	Sapling sized trees can grow to fill the newly available space in the middle canopy.	<p>May create a higher proportion of shade tolerant species.</p> <p>The habitat and food sources for wildlife in the upper canopy and near the ground can be retained, but midstory-dependent species may be adversely impacted by removal of preferred foraging and nesting height structure</p>	

Source: <http://www.forestryexplorer.psu.edu/management/index.html>

5.2.4 Providing Habitat Linkage

The forested areas of the IBA form the gateway of a linear forest network that bisects the state from the coast, northward through the Cockaponset State Forest complex, and continuing northward across the Connecticut River through the Meshomasic State Forest and Bolton Range, and into Massachusetts. Here the corridor links the forested areas associated with central Massachusetts such as the Quabbin Reservoir watershed. Further north the corridor enters New Hampshire where significant forest cover still exists linking the corridor to protected areas of the White Mountains National Forest and beyond, still northward up into Maine and Canada.

This almost contiguous forest landscape is relatively rare in the highly urbanized east coast “Megalopolis”. It has tremendous value as a migratory corridor to migrating forest species, and as breeding habitat to resident obligate forest interior species of birds and other animals that require extensive home ranges (Wilcove, 1987; Askins et al., 1987). Therefore, the existing forested coastal areas of the IBA should be maintained to benefit transitory woodland migrant avifauna, and forest interior breeders.

The IBA’s salt marsh habitat is also an important stepping stone for coastal migrants that may move from one salt marsh to the next during northward spring and southbound autumn migratory movements.

5.2.5 Enhancement of Anadromous Fish Runs

Menunketesuck River offers potential as an anadromous fish restoration site. Systems such as this are typically sought out by the National Oceanic and Atmospheric Administration (NOAA) Restoration Center, LIS Restoration Team (Jim Turek, personal communication). Interest in these coastal drainages by NOAA lies primarily in the restoration and enhancement of fish passage for two herring species, alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). Some herring may be entering the system now, but are likely strays from other systems, and the numbers are likely small. The dam at Chapman Pond located upstream of the IBA poses a barrier to fish movement into the pond for spawning.

Based on the initial interest in the site by the NOAA LIS Restoration Team for anadromous fish restoration, Chapman Pond may be a good candidate site for inclusion in the NOAA Community-Based Restoration Program. In this program, “strong partnerships are developed to accomplish meaningful, grassroots, habitat restoration activities that simultaneously promote an abiding conservation ethic and the wise stewardship of living marine resources” (www.nmfs.noaa.gov).

5.2.6 Tidal Regulation

The manipulation of tides in Connecticut salt marshes began during the colonial period. As early as the 17th century farmers were ditching marshes to help drain standing water and increase yield of salt meadow cord-grass. During the 19th century, coastal impoundments were created by damming coastal drainages. These impoundments filled as tidal waters entered the pond through one-way tide gates during high tide, and then drained via narrow sluiceways that powered the waterwheels of adjacent mills. Mosquito ditching, beginning soon after the Civil War and peaking during the 1930s, was practiced as an attempt to drain standing waters from the marsh surface, in order to control these

disease vectors (Rozsa, 1995a). These activities, along with indiscriminate filling and dredging during the 1950s through 1970s have historically been responsible for the proliferation of salt intolerant plants, especially the invasive Common Reed loss of important wildlife attributes, and a disruption in ecological function of the marsh systems.

Enactment and enforcement of the Clean Water Act in 1972 which regulated dredging and filling of the nation's waterways, and Connecticut's abandonment of ditching mosquito control in 1985 set the stage for restoration of Connecticut salt marshes. Restoration activities have typically involved the re-establishment of unimpeded tidal flow into the marsh, and removal of tide gates.

Despite the benefits of restoring unimpeded tidal flow in marsh restoration, there may be instances in the near future where and when unimpeded tidal flow may not be desirable. For instance in the case of Saltmarsh Sharp-tailed Sparrow conservation, increasing tidal elevations predicted as a consequence of global climate change may impact the sparrow by resulting in a loss of suitable nesting habitat (i.e., high marsh zones). SMU provides a unique opportunity in that the tidal flow could be regulated by controlling the height of the tide using a tide gate installed at the Amtrak trestle span bridge over the Menunketesuck River. The negative impact of tidal restriction due to tide gates are typically associated with marsh subsidence (due to increased mineralization of organic matter in the sediment, once the sediment is dried [aerated]), and a decrease in water quality (due to the production of sulfuric acid from the oxidation of pyrite concentrations in the sediment leading to acidification of tidal creeks) (Anisfeld, 1997). Hypoxia may also occur under these conditions due to the biochemical oxygen demand of the leachate (Rozsa 1995b). Reduced tidal flows can also promote the spread of the invasive common reed. Tidal flows would need to be carefully monitored to allow some degree of inundation to match historic conditions before the tide gates are fully closed during high tide.

The potential negative impact associated with the artificial manipulation of tides in this manner would need to be weighed against the benefits of Saltmarsh Sharp-tailed Sparrow conservation, and would likely be viewed negatively by some state and federal regulators – given the time, energy, and money spent in the past to remove tide gates in the region. Nevertheless, a prudent conservation planner would at least closely assess the potential benefits and impacts associated with this alternative among other available options such as artificial accretion, or coastal land acquisition for the expected landward migration of salt marshes with the predicted sea level rise.

6.0 Current Conservation Activities

By virtue of the fact that the IBA contains a large USFWS Refuge within its boundaries, the following priority conservation actions for Connecticut habitats, as identified in the CCWCS (2005) are currently being met for a large portion of the IBA:

- ◆ Conservation of breeding population of coastal greatest conservation need (GCN) species
- ◆ Protection of Diamondback Terrapin habitat
- ◆ Implementation of wetland restoration and enhancement projects that benefit GCN spp.
- ◆ Conservation of breeding populations of GCN early successional bird species

6.1 Land Acquisition

Long term plans by the USFWS are to potentially acquire additional lands for the expansion of the refuge within the IBA. Land acquisition for conservation purposes in Westbrook is championed by The Westbrook Land and Conservation Trust. Founded in 1968 the trust has acquired approximately 98 acres in Westbrook and has approximately 150 supporters. Their mission is

“The preservation of natural resources through the acquisition of real property and the continued stewardship of that property. As well, the promotion of conservation, education, and scientific study regarding land and natural resources, all for the benefit of the public, to lessen the burdens of government.”¹⁰

The Westbrook Land and Conservation Trust has acquired small parcels of land in the area and likely will continue to look for possible land purchases adjacent or proximal to the refuge. Additional land purchases should focus on the following:

- ◆ Lands within the IBA boundary,
- ◆ Undeveloped land that abuts the IBA,
- ◆ Land within the Menunketesuck River watershed
- ◆ Forested land north of the IBA that forms a migratory corridor to the Cockposett State Forest System.

For protection of area-sensitive forest interior bird species, focusing attention on forested parcels adjacent to Murdock Hill is probably preferable, since this forest block is an important gateway to an interior migratory pathway for forest birds traveling in a northbound orientation during spring migrations through the state.

To benefit salt marsh species, acquisition of land along the western border of the marsh and in the upland peninsula that separates Gatchen Creek and the Meunketesuck River should be foremost to prevent development from occurring at the edge of the marsh, to protect water quality, and to prevent the establishment or further spread of common reed.

¹⁰ http://www.ltanet.org/findlandtrust/one.tcl?pc_id=1475

6.2 Management

6.2.1 Estuarine Habitats

One of the most significant and successful conservation activities that has occurred within the IBA is the creation of open water areas in the salt marsh under the CTDEP's Integrated Marsh Management (IMM) Program in order to control potential disease-carrying mosquitoes. Mosquito control is a cooperative effort among the CTDEP Wildlife Division, the Connecticut Agricultural Experiment Station (CAES), the Department of Health, and – in the case of activity within the SBM NWR – the USFWS as well. The strategy of the CTDEP's IMM program is to use Open Marsh Water Management (OMWM) as one aspect of an integrated pest management approach to controlling mosquitoes. Low ground pressure equipment is used to excavate shallow pools and channels on the marsh surface in order to create habitat for mosquito-eating killifish and other wildlife. The pools – which are not connected to the extensive mosquito ditching grid work excavated in the 1930s – do not drain fully during low-tide and so provide refugia for the killifish during low tides. These pools, at the same time enhance the habitat of the marsh for numerous water birds such as *Calidris* sandpipers, Glossy Ibis, herons, egrets, Willets, plovers, teal, Mallards, American Black Ducks, and a host of other water birds.

The use of OMWM can also help to restore the hydrology of the high marsh and prevent the proliferation of undesirable vegetation (such as common reed and cattail) within this habitat zone. OMWM typically results in the improvement of tidal flows and the creation of salt pannes; two activities that increase the salinity concentrations within the salt marsh. This helps to control the spread of Common Reed and cattails since these species are intolerant of salinity levels that exceed 18 parts per thousand (ppt) (Rozsa, 1995c). In some cases, existing mosquito ditches are plugged. In other cases, small pools are excavated to form small natural-looking pools with tapered bottoms. Foraging Great and Snowy egrets strongly preferred pools within salt marshes and rarely used mosquito ditches (Trocki and Paton, 2006). However, the jury is still out regarding the habitat value of mosquito ditches to some avifauna. Recent investigations of postfledgling Saltmarsh Sharp-tailed Sparrow habitat use revealed patterns that differ from that previously described in the literature, which perhaps was based upon averaged observations across varying stages in the species' life history. For instance, young Saltmarsh Sharp-tailed Sparrows may move to nearby mosquito ditches shortly after hatching, and by doing so may benefit from added concealment of the taller marsh vegetation growing along these ditches (Hill 2008). Channels and ditches and their associated vegetation are also important foraging sites for Saltmarsh Sharp-tailed Sparrows (Greenlaw and Rising, 1994; Post and Greenlaw 2006; Hill 2008). Therefore, the practice of filling mosquito ditches as a marsh restoration technique should not continue until the value of mosquito ditches to target avifauna of conservation concern has been fully investigated.

6.2.2 Terrestrial Habitats

Ester Lape's former summer estate on Murdock Hill, which became the headquarters of the SBM NWR, formerly contained an extensive lawn area to the south of the residence. Rather than maintain this area as a mowed lawn with low floristic structure of little habitat value, refuge staff have allowed the area to revert to shrubland, initially for American Woodcock conservation. However, as a shrubland inclusion within a

predominantly forested landscape, the shrubland management area provides value to “interior-edge” avifauna as defined by Askins et al. (1987). This management area has conservation value to those species of avifauna that exploit natural ecotones which develop along transitional zones between major habitat types. Continued management of this area as a mid-successional shrubland is recommended, for the benefit of interior edge species. Interior edge species, identified by Askins et al. (1987), recorded from southeastern Connecticut forest tracts are listed in Table 6-1. These same species are likely to occur within the IBA, and benefit from continued maintenance of the shrubland conservation area, which contains a well-developed edge ecotone between the shrubland and surrounding forest.

There are also high priority shrubland species that use the areas around the refuge headquarters, including Brown Thrasher, Blue-winged Warbler, Indigo Bunting, Prairie Warbler and Field Sparrow

Stakeholders have developed a list of key elements to be included in recommended management of the IBA. They are:

- ◆ Minimal disturbance of existing beneficial flora and habitats
- ◆ Addition of quality native species where applicable
- ◆ Removal/control of invasive flora
- ◆ Limited access/use (i.e., no recreational use other than passive conservation-based or natural history forms of recreation)
- ◆ Safe walking paths and viewing stops
- ◆ Installation of educational signs
- ◆ Placement of bird perches and breeding boxes in appropriate places
- ◆ Maintenance of existing conditions, and
- ◆ Implementation of a multi-taxa management approach

TABLE 6-1. INTERIOR-EDGE BIRD SPECIES RESIDENT WITHIN SOUTHEASTERN CONNECTICUT FOREST TRACTS	
Ruffed Grouse	<i>Bonasa umbellus</i>
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Northern Flicker	<i>Colaptes auratus</i>
Eastern Wood-pewee	<i>Contopus virens</i>
Eastern Phoebe	<i>Sayornis phoebe</i>
Great-crested Flycatcher	<i>Myiarchus crinitus</i>
Blue Jay	<i>Cyanocitta cristata</i>
Black-capped Chickadee	<i>Poecile atricapillus</i>
Tufted Titmouse	<i>Baeolophus bicolor</i>
Carolina Wren	<i>Thryothorus ludovicianus</i>
Blue-gray Gnatcatcher	<i>Poliptila caerulea</i>
Wood Thrush	<i>Hylocichla mustelina</i>
Gray Catbird	<i>Dumetella carolinensis</i>
White-eyed Vireo	<i>Vireo griseus</i>
Yellow-throated Vireo	<i>Vireo flavifrons</i>
Red-eyed Vireo	<i>Vireo olivaceus</i>
Common Yellowthroat	<i>Geothlypis trichas</i>

Northern Cardinal	<i>Cardinalis cardinalis</i>
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
Eastern Towhee	<i>Pipilo erythrophthalmus</i>
American Goldfinch	<i>Carduelis tristis</i>

Askins et. al. (1987)

6.3 Monitoring

According to Paul Capotosto, a wetlands restoration biologist with the CTDEP Wetland Habitat and Mosquito Management (WHAMM) program, the CT DEP currently conducts marsh accretion/subsidence monitoring within the tidal marshes of the IBA, using sediment-erosion table (SET) devices. This monitoring is essential in predicting future changes in marsh surface elevation and hence the expected changes in vegetation community composition.

The IBA is an important site for rare and uncommon bird species throughout the year and, therefore, is valued by birders as an important destination for counting birds during the annual Christmas Bird Count. The Christmas Bird Count is an annual event that serves as a de facto monitoring effort that has identified winter bird population trends since its inception in 1900. Data from the Christmas Bird Counts are available through the National Audubon Society. The refuge should continue to serve as a count destination.

The site should be entered as a sightings location for eBird¹¹. This tool will allow observers to track their sightings at this location online and input their data to a centralized database, accessible to not only other birders, but also researchers, educators, naturalists, and other interested parties/persons of the general public.

6.4 Research

Research within the IBA has been conducted in the past by scientists from some of the local universities. Elphick et al. (2005) conducted research within Salt Meadow Unit on the ecology of Connecticut's two extant salt marsh-breeding sparrows with special concern status during the breeding seasons of 2002 and 2003. They found the site to support an average (n=5 study plots) density of 15 birds per hectare plot – a low density in comparison with some of the larger marshes studied in LIS (i.e., Hammonasset Beach State Park, Great Island, and East River). They found no evidence of Seaside Sparrow nesting activity at SMU during the 2002-2003 survey effort.

Other results of this investigation are summarized in Table 6.2.

TABLE 6-2. BREEDING ECOLOGY STUDY RESULTS (2002-2003) FOR CONNECTICUT'S TWO EXTANT SALT MARSH-BREEDING SPARROWS OF SPECIAL CONCERN ¹²		
Parameter	Seaside Sparrow	Saltmarsh Sharp-tailed Sparrow

¹¹ <http://www.ebird.org>

¹² Based upon data obtained and averaged from seven CT sites (one of which includes the IBA). SMU yielded no data for breeding Seaside Sparrows.

HABITAT SELECTION		
Preferred nesting zones	<i>Spartina alterniflora</i>	<i>Spartina patens</i>
REPRODUCTIVE SUCCESS		
Rate of nest survival	38-44%	26-30%
Major cause of nest failure	Undetermined, but presumed to be largely predation	Flooding (60% of all failed nests)
Length of breeding season	55d (2002) 64d (2003) ¹³	75d (2002) 78d (2002)
Mean date of clutch completion	27 June	27 June
Mean Eggs per nesting attempt	3.7	4.0
Average hatching date	7 July	11 July
Average fledging date	16 July	21 July
DISPERSAL AND SHORT-TERM MOVEMENT		
Intramarsch movement	Most recaptured on same hectare plot	Typically moved around in marsh (usually less than 500 m distance between capture locations)

Source: Elphick et al. (2005)

Inter-marsh movement was documented for Saltmarsh Sharp-tailed Sparrow with the recapture of a bird at Hammonasset Beach State Park, 6 km west of its original banding location at SMU. Numerous other inter-marsh movements have now been detected between marshes in Connecticut (Elphick et al. unpublished data).

Research by Dr. Chris Elphick and his graduate students is on-going and is currently centered on the following topics related to the breeding ecology and conservation of these species:

- ◆ Testing alternative mechanisms for area-sensitive marsh occurrence patterns,
- ◆ Describing movement behavior and determining how it influences attempts to effectively monitor and predict distributions of salt marsh sparrows,
- ◆ Evaluating the effects of social cues in determining settlement patterns,
- ◆ Determining how salt marsh sparrows respond to different restoration activities and assessing whether sparrows can be used as an indicator of restoration success,
- ◆ Estimating population viability, especially in response to sea-level rise.

Further research at SMU and other Connecticut marsh locations will add to existing data sets which may eventually help predict the consequences of habitat change, or help toward the creation of a model that can be used to predict the distribution and abundance of salt marsh-breeding sparrows.

6.5 Public Outreach/Education

Current public outreach and education measures that occur at the IBA consist of the following:

¹³ Shorter season here might not be significant and may just be an artifact of the smaller number of nests/birds tracked

- ◆ Nature activities and environmental education programs sponsored by various environmental organizations such as SoundWaters, Audubon Connecticut, and others
- ◆ Community service projects conducted by volunteers (e.g., Potapaug Audubon Society)
- ◆ Community signage, and
- ◆ Bird/nature walks led by local Audubon Society members.

A number of organizations in the area provide public education concerning the site. The Menunkatuck Audubon Society leads bird walks and related educational trips to Salt Meadow Unit and other nearby coastal locations. The Society has also planned Biodiversity Days in Madison and Guilford to inform the public about the multitude of life forms that occur in the area. The group also organized a workshop at Hammonasset Beach State Park that taught participants about salt marsh soils, birds, invertebrates, and plants. The DEP and the Connecticut Sea Grant Extension Program collaborated with the Society to make this event happen.

A series of signs have been erected throughout the SBM NWR providing management information about the refuge. Additional signage could provide information regarding the natural communities of the refuge and the habitat management techniques conducted at the refuge to date. Other signage could outline the history of the refuge and acknowledge the cultural significance of Ester Lape's summer residence.

The Potapaug Audubon Society sponsors a program at the Stewart B. McKinney National Wildlife Refuge entitled "Walk on the Wild Side". This program has grown in popularity and by its third year (September 16, 2006) over 150 people participated in the event. Participants are led on a one-mile hike around the refuge's trail, stopping at various stations along the way. Each station has a theme and is manned by a volunteer who provides information, demonstration or both on a natural history topic. The program in 2006 included live animals (a Barred Owl, assorted song birds, baby opossums, baby squirrels, frogs, salamander, turtles, etc.). A bird banding demonstration, a wildlife drawing demo, and an invasive species plants demonstration were also included, as was a nature hunt for children¹⁴. The high attendance level of this program demonstrates its effectiveness in providing public outreach and education.

¹⁴ <http://www.potapaugaudubon.org/news.html>



Figure 6-1. Observation Platform Overlooking Salt Marsh at the Stewart B. McKinney National Wildlife Refuge

7.0 Conservation Goals

There are many opportunities for conservation planning within the IBA. The goals of conservation planning within this area should be as follows:

- ◆ Balancing environmental, educational, and maintenance needs at the Refuge
- ◆ Enhancing the IBA's natural habitat for resident and migratory birds and other wildlife
- ◆ Stabilizing and increasing populations of priority bird species that make this area an IBA
- ◆ Engaging people as stewards to ensure long-term protection and management of the IBAs sensitive bird habitats, and
- ◆ Educating the public about the importance of this area for birds, and encouraging individual action aimed at attracting beneficial birds and wildlife.

Development should be steered away from areas that are of high value within and adjacent to the IBA. Quality bird habitat that is permanently lost during a construction process should be replaced with at least an equivalent amount of similar migratory stopover habitat, contiguous with the habitat that is impacted by the project.

Property owners within the Pequot Park Road industrial park should be encouraged to manage their properties in a way conducive to providing additional habitat attributes to Neotropical migrant birds.

7.1 Stewardship Adoption

A goal of the conservation planning process is to identify potential site support groups and empower local residents to be better stewards of the IBA. Since the site is one of 27 IBAs in Connecticut and the staff and resources of Audubon Connecticut and the USFWS are limited, stewardship of this site will be most efficient if local groups and individuals participate in the conservation of the IBA. The goals of stewardship adoption groups should be effective bird conservation via the following:

- ◆ Enacting effective conservation planning,
- ◆ Coordinating habitat management/restoration,
- ◆ Establishing open-space and resource allocation priorities,
- ◆ Establishing easements and other land instruments for resource protection,
- ◆ Participation in public education and outreach, and
- ◆ Natural resource monitoring (e.g., seasonal avifaunal usage) at the site.

Several habitat improvement projects have occurred in the refuge in the last few years. Approximately five groups or individuals, identified from the stakeholders list (Refer to Section 3.0) have indicated a willingness to participate in an IBA stewardship program and are listed below:

- ◆ USFWS personnel at SBMNWR
- ◆ Audubon Connecticut
- ◆ Connecticut DEP
- ◆ Potopaug Audubon Society
- ◆ Friends of SBM NWR

7.2 Land Acquisition

Land acquisition opportunities may include direct purchase (as existing undeveloped lands are sold by their owners), acquisition of lands via charitable means (gifts from conservation minded land owners), estate planning, or through acquiring development rights, conservation easements, or both.

The goal of further acquisition should be for parcels around the salt marsh to prevent development along the marsh edge, and parcels within and adjacent to the north of the IBA in order to conserve the connectivity of the IBA to the Cockaponsett corridor.

7.3 Habitat Management Measures

Since the primary importance of the refuge is twofold (i.e., as important breeding or foraging habitat for coastal birds – especially CT DEP listed species, and as migratory stopover habitat along a coastal flyway, the existing acreage of the IBA should be optimized to enhance or conserve the special habitat attributes for resident and migratory bird species, especially species of conservation concern. The framework for habitat management measures should include, at a minimum, the following:

- ◆ Matrix improvement
- ◆ Preserving special habitat attributes within existing habitats
- ◆ Invasive plant species control
- ◆ Continued limitation of public access in sensitive conservation areas
- ◆ Prevention and enforcement of off-leash dog-walking at the refuge

Connecticut is fortunate in having a talented pool of experts in the field of conservation biology within the regulatory community, academia, non-governmental organizations (NGOs) and elsewhere. Many of the stakeholder respondents represent these groups and offered their expertise/advice in further management planning of the IBA's habitat. The future of habitat management at the Salt Meadow Unit IBA is also particularly bright in that the core of the IBA lies within lands currently under management jurisdiction of professional wildlife management personnel at the USFWS who also have a close and amicable working relationship with personnel at CT DEP.

Specific measures for managing each of the major habitat areas are provided in this conservation plan in Section 8.0 as a starting point from which further discussion and input among the talented pool of stakeholders is encouraged.

7.4 Monitoring

There has been informal but regular monitoring of the avian migratory stopover usage of the refuge and adjacent areas. Informally, the IBA serves as an important site for the following monitoring efforts:

“Since the primary importance of the refuge is twofold (i.e., as important breeding or foraging habitat for coastal birds, and as migratory stopover habitat along a coastal flyway, the existing acreage of the IBA should be optimized to enhance or conserve the special habitat attributes for resident and migratory bird species, especially species of conservation concern.”

- ◆ Christmas Bird Counts
- ◆ Hawk watches, and
- ◆ Spring Census

More formal monitoring practices are warranted to document this usage.

Perhaps the most important monitoring that should be conducted at the IBA is the implementation of a program that would track the key species that resulted in the IBA designation. Currently, no long-term organized monitoring occurs within the marsh. The DEP has done some monitoring in relation to their management activities on the nearby East River Wildlife Management Area but this work ended in 2006, only 5 years after the management was completed. A lot of restoration work has been completed at nearby Long Cove but no consistent monitoring has been done to track avian use of the marsh or to track vegetation change. Little is known about many of the listed bird species (i.e., other than Saltmarsh Sharp-tailed Sparrows) using the IBA. The majority of the data on bird use in the Salt Meadow Unit Marsh system was collected by individuals over the years without any collaboration or systematic methods.

A clear priority, therefore, is to create a monitoring scheme to gauge population trends of salt marsh sparrows and other marsh birds. Simultaneously, tracking vegetation change in the marsh would provide useful information that could help to explain any changes in marsh bird populations. A new salt marsh bird monitoring scheme aimed at marsh birds similar to that proposed by Conway and Droege (2006), with minor modifications aimed at obtaining better information on salt marsh sparrows should be employed.

One of Dr. Chris Elphick's PhD students, Trina Bayard, and Chris Field from Audubon, CT conducted half day training sessions at Hammonasset Beach State Park this year to explain both data collection protocols and the rationale for their design to avian monitoring volunteers. Expanding on the protocol put forth by Conway and Droege (2006), the monitoring protocol required (a) restricting surveys to occur during the weeks immediately after high spring tides when reproductive activity peaks, and (b) include the collection of behavioral data directly related to nesting activity in order to focus explicitly on nesting birds. These training sessions marked a pilot season for the monitoring project, and involved one half-day training session to start, and two half day training sessions to follow up at the end of the season. The monitoring protocol was based on the National Marsh Bird Monitoring Project with some modifications to make it more focused on Salt Marsh Sharp-tailed Sparrows. Additional focal species included Seaside Sparrow, any waders, Glossy Ibis, and Marsh Wren.

If these pilot activities are successful, Audubon Connecticut should facilitate and encourage the involvement of volunteer groups to continue monitoring activities into the future with expanded coverage to include SMU and other appropriate sites. Volunteers could be recruited from local stakeholder groups, such as the Menunkatuck Audubon Society and Connecticut Ornithological Association,

Other areas where monitoring data may be lacking include: shorebird use of the salt pannes and salt meadow areas during migration, use/importance of the IBA to wading birds; waterfowl use of marshes at all times of the year, and landbird use of adjacent forest tracts during migration and the breeding season.

Additionally, long term monitoring for least shrews at the site should be instituted. The least shrew monitoring must be done in conjunction with the DEP as this is a protected species (state endangered) in CT with extremely limited distribution. Since it must be trapped for identification, a qualified, state-permitted, and approved wildlife biologist would need to conduct this monitoring effort. To supplement traditional trapping efforts, owl pellets collected from the vicinity of the IBA should be inspected for evidence of least shrew, specifically the upper tooth rows which contain only four unicuspid teeth (separating it from the genus *Sorex*), three of which are visible from the side. This morphological feature along with the braincase that is rounded from behind distinguish *Cryptotis* from *Blarina*. This form of monitoring can be an effective way of identifying the presence of least shrews in an area, even when mammalogists have failed to detect the presence of these shrews via trapping and searching efforts (Whitaker and Hamilton, 1998).

To establish a valuable baseline of the salt marsh and other habitats, detailed mapping and monitoring of plant communities and the locations of state-listed plant species would aid in measuring changes to the natural systems over time. These changes may be both positive (e.g., via restoration efforts) and negative (via marsh dieback or sea level rise).

If such monitoring schemes are implemented, activities should be coordinated to keep disturbance to the marsh low, and would likely require a permit from the USFWS, since access to the marsh is best obtained via the refuge, and a majority of the salt marsh lies within the boundary of the SBM NWR. Data on the occurrence of all state-listed species should be entered into the DEP's Natural Diversity Data Base and provided to other DEP employees charged with the management of these species. Parties that potentially could help conduct bird surveys within the IBA include the Menunkatuck Audubon Society, Potapaug Audubon Society, Connecticut Ornithological Association, and New Haven Bird Club.

Monitoring of marsh accretion rates using the SET devices/methodology or other appropriate methods should continue in order to expand the data set over a greater time period. An expanded data set would more accurately predict future changes in marsh elevations due to climate change. This information is essential in predicting the resultant vegetation changes that can be expected in response to sea level rise, and the effect that these vegetation changes would have on marsh nesting birds.

7.5 Research

The IBA offers a multitude of research opportunities for students, universities and state agencies. Since the refuge and other stakeholders stand to benefit from the results of research conducted on the habitats within the IBA, the refuge should continue to encourage scientific research within the refuge itself. For instance, scientific research that provides hard data on the existing natural resources within the refuge would be invaluable in determining potential impacts from proposed development projects within, adjacent to, or proximal to the IBA, or for providing baseline data from which to monitor future changes/trends.

Potential research falls into two areas: 1) studies that directly examine the birds that use

the marsh and examine the likely future quality of the habitat, and 2) studies that determine the importance of upland habitat for migratory and breeding birds of conservation concern. Considerable work on salt marsh sparrows is already under way through Dr. Chris Elphick's research. Preliminary population estimates have been made, but much refinement is possible, especially through the collection of detailed home range information. Further demographic studies focusing on survival and dispersal would complement the breeding data already collected, and allow for long-term population persistence to be estimated under various future scenarios.

Additionally, there is a need to answer several questions regarding the creation of pools in the salt marsh and the effects of Open Marsh Water Management. Questions that need to be addressed include: (1) How are ponds used by salt marsh sparrows? (2) Does pond creation adversely affect sparrows? (3) If there is a conflict between the needs of sparrows and pond creation, are there areas that are unsuitable for sparrows where ponds could be created? (4) Do ponds create high quality foraging habitat for shore birds, waterfowl, and wading birds? Previous studies have only examined the number of birds that use ponds; additional studies that examine foraging performance and time allocation would allow one to assess the quality of these habitats relative to other foraging habitats.

Other areas that warrant further research include items from the following list:

- 1) As is true for Connecticut salt marshes generally, additional research into the impact of sea level rise and associated marsh subsidence would be valuable in order to better predict future changes in marsh vegetation and flooding patterns, and their subsequent consequences for birds.
- 2) An analysis of large, privately owned, undeveloped lands in the watershed to identify the sites where protection would best preserve the integrity of the marsh watershed. These sites could then be made a high priority for acquisition.
- 3) Testing the success of restoration activities at SMU in terms of creating feeding habitat for migratory shore birds and wading birds? This site is thought to receive unusually high shorebird use for a Connecticut marsh of its size, but detailed documentation of bird numbers and habitat quality has not occurred. Such research could potentially help guide other restoration projects in the state. Surveying bird numbers at this site is an activity where the work of amateur birders could be especially helpful.
- 4) Why are Seaside Sparrows absent from SMU as a breeding resident? Is it because the marsh size or habitats within the marsh are too small to support a sustainable population? Are other special habitat attributes of this species lacking from the marsh? This topic is an active area of research by members of Chris Elphick's research group.

Additional efforts should also be made to search for rare, but cryptic species that could occur in the IBA (e.g., rails, bitterns, etc.). Recommendations for finding these species include the use of tape call-back surveys (e.g., see Conway and Gibbs 2005), and searches conducted during the highest spring tide when birds are most likely to be visible at marsh edges (Noble Proctor, pers. comm.). This is another area where the activities of amateur birders could contribute significantly.

The priority conservation goals identified by the CCWCS (2005) that are applicable to the IBA include the following:

- ◆ Determine the distribution, abundance, and breeding success of the American Black Duck and assess winter habitat use.
- ◆ Monitor GCN coastal wetland birds in coordination with PIF and Colonial Bird Monitoring Protocols

Outside of the avian conservation realm, the IBA could serve as a suitable research site to address research needs in the conservation biology of other resident taxa, particularly species of conservation concern. For instance, the area is designated as essential fish habitat for Windowpane. This flatfish supports a federally managed fishery in the northeast. The following research needs associated with this species are proposed by Chang et al. (1999):

- ◆ “Studies to determine if the windowpane population is a unit stock or multiple stocks (e.g., genetics, otolith, cohort analysis).
- ◆ Windowpane spawning times and locations, and spawning habitat requirements (e.g., high salinity).
- ◆ Studies (tagging, more efficient gear to catch younger fish) to determine seasonal use of estuaries (residency during colder months) and nearshore waters.
- ◆ Habitat requirements for windowpane eggs, larvae, and juveniles, and
- ◆ Growth rate studies”

Perhaps the SMU IBA would be a suitable site to address some of these research needs, if the IBA does, in fact, support a population of Windowpane.

Similarly, if the site is found to contain a population of least shrews, it may serve as an ideal location to address the research needs for this species.

Additional priority conservation goals identified by the CCWCS (2005) that are applicable to the IBA include the following:

- ◆ Identify and map existing habitats, particularly spawning and nursery habitats and quantify use by estuarine species
- ◆ Determine value of existing habitats to resident fish and invertebrate populations
- ◆ Determine and monitor the distribution, abundance, habitat use, and condition of GCN species invertebrate species
- ◆ Research effect of riparian buffer width on water quality and stability of habitats in aquatic systems

7.6 Public Outreach/Education

Community service provides an avenue for continued public outreach and education. Local school and community groups should be notified of potential restoration or maintenance projects that can benefit the IBA. Students that may be considering pursuing a career in environmental science should be encouraged to volunteer in habitat maintenance, enhancement, or restoration projects at the refuge. Other civic groups that could be encouraged to volunteer with habitat restoration projects include scouting

groups, church groups, and youth organizations. Educating neighboring landowners about land management techniques that are bird-friendly should be a conservation priority.

The site should be nominated for inclusion on the Connecticut Coastal Birding Trail, a project currently being developed by the CTDEP Wildlife Division. The Connecticut Coastal Birding Trail is a highway-based trail through the coastal areas of Connecticut. The concept was developed in recognition of the fact that approximately 69 million residents nationally participate in wildlife viewing, according to a survey cosponsored by the U.S. Forest Service and the NOAA. The trail will identify and lead birders and nature enthusiasts to sites with public access (such as wildlife refuges, parks, historic sites, water bodies and recreation trails) where they can see many of the nearly 400 species of birds that breed within or migrate through Connecticut each year. In addition to leading people to some of Connecticut's prime bird habitats the trail will lead tourists past historic sites thereby introducing them to Connecticut's New England charm and cultural heritage. The Connecticut Coastal Birding Trail will allow travelers to see birds in their natural habitat, while also providing opportunities to communicate important conservation messages and promote nature activities.

8.0 Action Plan

Stakeholders stressed the need for comprehensive inventories of all major taxa within the IBA prior to commencement of management strategies or techniques. They also stressed that it was imperative for any recommended management techniques for the IBA to be consistent with Connecticut's Comprehensive Wildlife Conservation Strategy (CTDEP 2005).

8.1 Stewardship Adoption

Stewardship adoption is an integral part of implementing an IBA conservation plan. All stakeholders listed in Section 3.0 can be potential stewards. Garden clubs, fisherman, and other interested parties or individuals are also potential stewards. Due to the number of stakeholders identified for the IBA, organization of stakeholders into stewardship adoption groups seems prudent. One potential strategy for organization is to divide stakeholders into 4 major groups: science; natural resource management; education; outreach. Within each of these four groups, the participating stakeholders could vote to identify group leaders. The group leaders would then be responsible for identifying short and long term goals for management of the IBA. Each group could meet regularly to plan and implement projects. Group leaders would also meet with other group leaders at advisory committee meetings so that all can decide on collaborative ideas, efforts, goals, and endpoints. Groups could establish regular community information meetings to keep the public informed.

Regardless of the strategy for stewardship adoption, the goal for stewardship adoption should be to identify potential stewards, formulate a consortium of stewards familiar with the conservation needs and goals of the refuge and establish a forum in which the stewards can assimilate and relay information to stakeholders. The public should be informed through printed mailings such as newsletters or brochures, signage at the IBA, e-mail, or a combination thereof. Volunteers and local residents should be engaged in the restoration and conservation planning process.

Current members of the Potopaug Audubon Society should be urged to become IBA stewards. They are familiar with the natural resources of the IBA and the special habitat features that are important to the avifauna. They are also likely to work well with refuge personnel and other stakeholders within the IBA since they already interact with refuge staff and have manned, organized, and sponsored events at the refuge. The stewardship adoption group could also provide focus in areas adjacent to and outside of the refuge where refuge personnel may not be able to commit time or funds.

The recommended procedure/expectations for implementing a stewardship adoption program within the IBA should follow those outlined by **Audubon** CONNECTICUT in the Important Bird Area Stewardship Adoption Program, which is summarized as follows:

1. Create an **IBA Committee** with a chairperson to act as the main contact. Fill out the simple adoption form (available upon request) and return it to Audubon.

2. Work closely with Audubon staff, landowner(s), to strengthen and implement the IBA conservation plan to ensure the long-term viability of the target birds and their habitats.)
3. Work with the Director of Bird Conservation to develop on-site bird inventory/ monitoring efforts. Data collected will help document the occurrence, relative abundance, breeding status, long-term changes in populations, and/or habitat relationships for birds inhabiting the site. Audubon staff will provide any necessary assistance in establishing methodology, training, data forms, data analysis and other support, as needed.
4. Initiate educational outreach to foster community support for the IBA site. *Citizen Science* programs that engage people in learning about birds and their conservation are recommended.
5. Work collaboratively with the landowner(s) of the IBA to safeguard and enhance avian habitats on the site. When threats facing birds and/or bird habitat arise members of the **IBA Committee** will immediately inform Audubon Connecticut's Director of Bird Conservation. Ideally, the adopting organization will take a leadership role in their local community to minimize the adverse impacts of any threats. Under ideal circumstances, Audubon Connecticut, the adopting organization, the landowner(s), and many other groups will work together on an ongoing basis to ensure the long-term viability of the IBA.
6. Assist in resource management programs at the IBA. These may include trash clean up, birdhouse construction/ installation, exotic plant or pest control, habitat restoration, and native plantings.
7. Make a minimum commitment of three years to provide program continuity.

Whatever the strategy used for organization, it is suggested that flexibility be provided for interested parties to help shape initiatives. There are ample opportunities for stewards to help address environmental issues within the IBA. For instance, stewards might help address the need for invasive plant species control.

8.2 Land Management

An integrated management plan should be prepared for the IBA. This management plan would essentially meld management planning measures identified by refuge personnel as conservation and management goals appropriate to the Service's mission with those measures chosen to serve the greater IBA. The integrated management plan would provide details for all stakeholders that hold interest in the IBA.

For instance it could be used by homeowners to obtain the details on proper grounds keeping techniques that would not impact the habitat within the IBA. Habitat

management measures designed to enhance or maintain a specific habitat type, successional stage, or composition, will likely benefit some species while discouraging others (Payne and Bryant, 1994).

The integrated management plan should be detailed as needed for proper management of the IBA. The plan should include the following elements as suggested by Payne and Bryant (1994):

- ◆ Management objectives
- ◆ Inventory and arrangement of plants, plant communities, and wildlife
- ◆ List of plants needed for planting to enhance wildlife habitat and procedures for proper planting and care
- ◆ Timber harvest methods and improvements for avifauna and other wildlife, and
- ◆ A program to protect the habitats from fire, insects, disease, and other disturbances as appropriate.

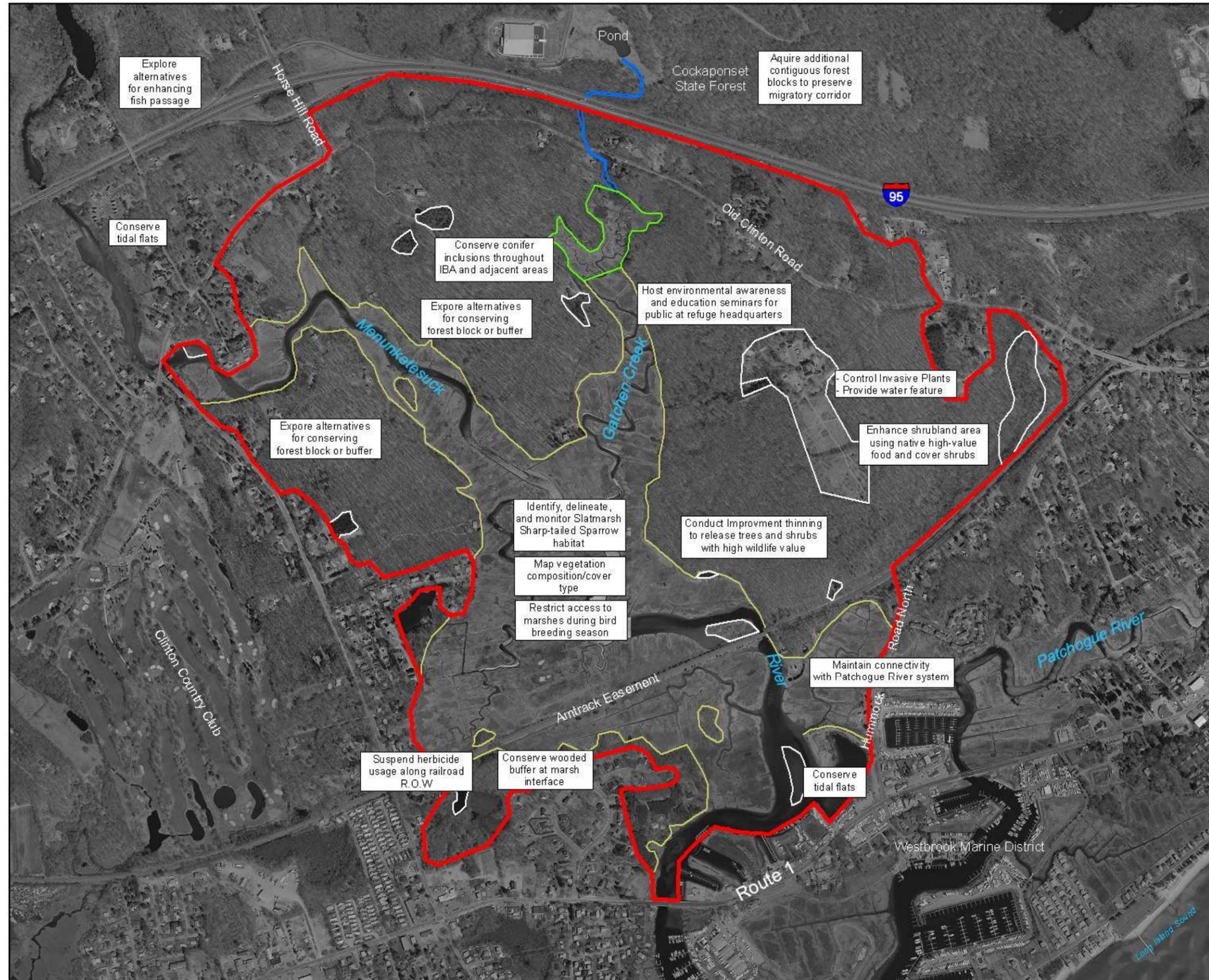
The management plan should delineate the IBA into discrete management units, since some management techniques prescribed for one management unit may not be suitable for another. For instance, dogs that are not on leashes are excluded from the refuge, and human access is limited to the forest trails on Murdock Hill. Access to the salt marsh by people is prohibited without first acquiring a permit, so as not to impact the habitat, the listed species that depend upon them, or both.

The approach to management within the IBA should be adaptive. Any management measures implemented should be monitored preferably by quantitative means, or if constrained by man-power and cost, by qualitative measures. Good monitoring practices should be encouraged. Any good monitoring protocol, whether by quantitative or qualitative measures, should be structured about the following framework:

- 1) It should serve to evaluate management actions and guide future management decisions
- 2) It should include a clearly defined management objective paired with a clearly defined monitoring objective, and
- 3) It should be capable of continuing long term, be repeatable, practical, and efficient¹⁵

Specific recommendations for species of management concern are outlined in Appendix E. Habitat-based recommendations are discussed below and are summarized in Figure 8-1.

¹⁵ www.stewardshipnetworkwebcast.org "Monitoring Ecological Restoration: Simple Techniques to Guide Adaptive Management". Broadcast via World Wide Web on 8 Aug 2007.



*Salt Meadow Unit
Important Bird Area
Conservation Plan
Westbrook, Connecticut*

**General Habitat Improvements/
Management Recommendations**

- Acquire additional contiguous forest blocks within and adjacent to IBA
- Improve stormwater drainage systems in surrounding watershed to reduce nutrient input into system
- Prevent deposition of fill and unconsolidated soil debris adjacent to wetland edge
- Control Invasive plant species within and adjacent to IBA
- Conduct baseline inventory of all flora and fauna within IBA and adjacent protected habitats
- Monitor marsh surface elevations
- Continue hosting conservation-based scientific research on Saltmarsh Sharp-tailed Sparrows and conservation concern
- Monitor forest for deer browse impact



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8.2.1 Forests

The existing forested areas of the IBA should be conserved where possible to maintain the forested gateway to the linear forest migration pathway that bisects the state. The existing forested coastal areas of the IBA should be managed to benefit transitory migrants, but without impacting resident species of greatest conservation need. To increase the habitat value of existing woodlands, the following management measures should be considered:

- ◆ Selective harvesting of low wildlife value trees (e.g., black locust, tree of heaven) to release beneficial mast-producing tree species such as black cherry, white oak, American beech, etc.
- ◆ Elimination or control of non-native invasive plant species (Refer to Section 7.3.2)
- ◆ Development of asymmetrical soft edge ecotones as opposed to hard, abrupt induced edges
- ◆ Replacement of invasive shrub understory vegetation with native mast-producing shrubs with fruit of high nutritional value to avifauna, and suitable to the coastal climate and existing soil type within the IBA
- ◆ Chose plants that fruit asynchronously during migration time so that a food source is available throughout the migration season. Include plants with food sources that will linger into the late winter season (e.g., *Ilex verticillata*, *Rhus typhina*, etc.)
- ◆ Monitoring for deer overgrazing to determine if the forest is subject to excessive mortality of seedlings (erect an enclosure pen to establish a baseline from which to compare against unprotected areas of the forest), and
- ◆ Increase habitat value by establishing, conserving, or enhancing existing habitat attributes that benefit wildlife. Examples include the following: establishing coniferous inclusions (Figure 8-2) within a deciduous forest or releasing existing conifer groves within the existing forests, creating sporadic canopy gaps in closed canopy woodlands, conserving rock or wood piles, retaining dead branches with cavities, and standing dead wood in general (Refer to Appendix C for a comprehensive list of habitat attributes and to which species they are important).

Various invasive plant species were noted within the IBA and in some areas invasive shrubs were observed invading into the forest interior from edge infestations. The rate of infestation has been shown to depend upon the status of the edge itself. For instance, recently cleared forests have undeveloped edges. Studies have demonstrated that rates of invasive species colonization of the forest interior are greater across a thinned forest edge versus an intact, floristically developed edge. One reason for this is that the structure of vegetation on the edge influences wind-dispersal of seeds across the edge. Cadanasso and Pickett (2001) demonstrated that an edge with intact vegetation can function as a physical barrier to seed dispersal, and concluded that “the structure of vegetation on edges can influence the function of edges as barriers to seed flux into the forest interior”. Therefore, should previously forested areas within or adjacent to the IBA (or the forested migratory corridor which links the IBA to the Cockaponsett State Forest complex) be cleared, the forest edges should be “sealed” with native shrubs, vines, and understory trees and non-native plants should be removed to prevent the dispersal of invasive plant species into the forest interior. Prime sites for the encouragement of this conservation management practice are the lots along Pequot Park Road Industrial Park

and the proposed subdivisions along Grove Beach Road.

8.2.2 Shrubland

Existing shrubland within the IBA is an important habitat for native avifauna. Management, at a minimum, should focus on protecting these areas from being cleared for other uses and impact from invasive plant species. To protect or increase the habitat value of existing shrublands, the following management measures should be considered:

- ◆ Plant native shrubs of high wildlife value (i.e., those shrubs that provide appropriate cover, food in the form of hard and soft mast, and flowers to attract insects)
- ◆ Plant appropriate shrubs for soil and moisture conditions
- ◆ Prune shrubs as required to keep trails open, improve plant health, and maximize yield
- ◆ Control establishment and spread of invasive plant species



Figure 8-2. Conifer inclusions add vegetational diversity within the predominantly Deciduous Forest of Murdock Hill

- ◆ Replace wildlife value lost through removal of non-native species (e.g., replace *Rosa multiflora* with a native woody, thorny fruit producing shrub such as *Rubus allegheniensis*).
- ◆ Monitor for the potential impact of deer grazing on the native shrubs, seedlings, and saplings within the forested areas of the refuge, and
- ◆ Encourage development of native shrub-dominated ecotones between forest and lawn interface, and between forest and water's edge along the shores of the salt marsh system.

8.2.3 Intertidal Flats

The intertidal flats within the IBA provide foraging for various shore birds, gulls, and coastal birds. Management of this area is essential for attracting migratory shore birds and resident coastal birds and as habitat for their invertebrate prey. Therefore, protection of these habitats should be a conservation priority. The following conservation goals for these habitat areas should be considered:

- ◆ Prevent or minimize loss of intertidal flats due to marina expansion, dredging, erosion, filling, re-grading, channelization, etc.
- ◆ Protect sediment quality by preventing the discharges of oil and chemicals into the watershed system
- ◆ Prevent loss of intertidal flats due to coverage or conversion by in-water structures (docks, piers, platforms, quaywalls, etc.), and
- ◆ Inform the public as to the importance of the intertidal flat habitat via signage and outreach.

8.2.4 Lawn areas

Most of the lawn areas within the IBA and Menunketesuck River are associated with residential areas. Homeowners should be educated in the proper management and care of lawns so as not to introduce surplus nutrients into the system that can impact water quality or encourage the growth of common reed. Land owners should be informed that to do so not only impacts the habitat quality of the system but also can impact the vistas of the open marsh from their property and thereby detracts from the aesthetic value of their property. The benefits of the lawn area conversion to natural habitat on the refuge grounds could be conveyed to the public via signage.

Proper lawn care practices (e.g., limited pesticide and fertilizer usage) will help to improve the water quality in the watershed and therefore will benefit birds that use the estuarine and marine habitats adjacent to these lawn areas. Organic lawn care practices should be considered to help reduce the nutrient loading to the salt marsh areas of the IBA to prevent colonization by common reed which has occurred at locations along the western shore proximal to residential parcels.

Private residents within the IBA could be informed via a display at the Refuge, at Westbrook Land Trust sites, via direct mailing of flyers or brochures, or a combination of strategies. Facts about lawn care costs can be presented in the display or in a presentation, and could include the following from Bormann et al. (1993):

- ◆ A lawnmower pollutes as much in one hour as does driving an automobile for 350 miles.
- ◆ 30 to 60 percent of urban fresh water is used for watering lawns (depending on city).
- ◆ \$5,250,000,000 is spent on fossil fuel-derived fertilizers for U.S. lawns.
- ◆ 67,000,000 pounds of synthetic pesticides are used on U.S. lawns.
- ◆ 60,000 to 70,000 severe accidents result from lawnmowers.
 - ◆ 580,000,000 gallons of gasoline are used for lawnmowers.
 - ◆ \$25,000,000,000 is spent for the lawn care industry.
 - ◆ \$700,000,000 is spent for pesticides for U.S. lawns.
 - ◆ 20,000,000 acres are planted in residential lawns.

8.2.5 Salt Marsh

The importance of the salt marsh habitat should be conveyed to the public via signage and outreach. Land within the IBA should be managed so as to protect the water and sediment quality of the system. The drainages in the watershed are susceptible to water quality impacts due to accidental, intentional, or incidental releases of oil, chemicals, and nutrients. Once within the water column and sediment, these materials can have direct or indirect toxicological impact to the avifauna that depend on the system for food, drinking, bathing, and cover. In addition, turbidity caused by sedimentation can reduce the visibility of waterfowl searching for their prey fish within the water column and can cause physical damage to fish by irritating or clogging gills. To protect the water quality of the system the following measures should be considered:

- ◆ Establish and maintain a vegetated buffer along the edge of the salt marsh and along the drainages that enter the system. This recommendation is paramount in controlling non-point source pollution entering the system and in the prevention of the establishment of invasive species. This may require working with adjacent landowners to replant vegetation in areas where lawns and retaining walls lie along the watercourse
- ◆ Limit further construction of retaining walls along the Menunketesuck River and adjacent marshes. These retaining walls create induced “hard” habitat edges between the river and adjacent habitats, especially in areas with low gradient shorelines and in protected coves and inlets where vegetation is already established
- ◆ Incorporate improvements to stormwater infrastructure that discharge directly to the system (e.g., replace ineffective or defective catch basins with deeper sump basins, install hydrodynamic separators downgradient of a series of ten or more catch basins, install scour pads or plunge pools at outfalls eroding existing banks, re-vegetate any existing denuded grassed swales, create new swales in appropriate areas, install sedimentation ponds to intercept sediment before discharge to Menunketesuck River or Gatchen Creek, use oversized culverts where possible to replace broken, or ineffective culverts as necessary
- ◆ Maintain existing storm sewers by periodically cleaning clogged catch basin sumps, culverts, and other drainage structures of accumulated sediment, garbage, and other refuse
- ◆ Discourage use of lawn chemicals, pesticides, and fertilizers within the watershed and provide education/training for the correct use of same
- ◆ Implement storm sewer stenciling program to educate the public of the fact that some storm sewers discharge directly to the Menunketesuck River and its tributaries
- ◆ Remove and dispose any dredged sediments generated from future channel maintenance projects in accordance with local, state, and federal regulations, and
- ◆ Incorporate Best Management Practices (BMPs), for the prevention of erosion and sedimentation, into all dredging, site development, redevelopment, and major landscaping projects within the local watershed.

Other conservation recommendations that could improve this area of the IBA include the following:

- ◆ Protect and conserve fringing wetlands and natural edges

- ◆ Consider bioengineering techniques in place of any future rip-rap or waterside retaining wall replacements or repairs
- ◆ Advocate for the restriction of development along the edge of the marsh
- ◆ Encourage landowners to establish natural vegetated buffers, and
- ◆ Support the Westbrook Land and Conservation Trust in the acquisition of property or conservation easements for open space as it becomes available.

8.2.6 Grounds keeping

Proper grounds keeping is essential to maintaining the IBA and adjacent areas as productive habitat. Not only will implementation of proper grounds keeping techniques help to conserve the IBA habitat it will also provide aesthetic benefit to the refuge. The following measures should be considered as standard grounds keeping procedures to conserve the wildlife value of the IBA:

- ◆ To provide proper care and prevent injury to desirable plants within the refuge, refuge maintenance supervisors and personnel should be trained on the proper pruning and mowing techniques to be used on the vegetation within the IBA
- ◆ Proper disposal of trimmings and clippings will prevent the spread of invasive species and reduce impact to colonizing native plants
- ◆ The tall trees on-site should be cared for under the direction of an arborist. When they do not pose a threat to refuge visitors, standing dead trees or dead limbs should be left in place as potential habitat for cavity nesting bird species and as feeding substrate for trunk gleaners. Otherwise they should be removed by tree care experts. Diseased trees may need to be removed and destroyed from time to time in order to prevent the spread of the disease pathogen to other trees
- ◆ Plants that represent native flora and communities in Connecticut, are suitable to the ecoregion's existing soil types and climate, are hardy to sea spray or coastal flooding (where applicable), and are relatively easy to maintain should be preferred
- ◆ Trees and other plantings that are considered invasive and plant replacement specimens that can provide the same intended function that are either native, or not invasive or potentially invasive. This will allow for the removal of such specimens without loss of intended function, e.g. shade, wildlife habitat, fall foliage, general aesthetic improvement.
- ◆ Select plants that provide nutritious food (especially for the various feeding guilds – granivores, frugivores, nectarivores, herbivores), suitable cover, protective nesting sites or a combination thereof should be incorporated into landscape plantings as well, and
- ◆ Maintain existing boxes for desirable bird species such as Purple Martins, Tree Swallow, and Eastern Bluebird. Erect additional boxes for Barn Owl and bats. Bat boxes could help the proliferation of insectivorous bats in the area as an added natural means of mosquito (and other insect) control to supplement the WHMM efforts.

8.2.7 Invasive species Management

The IBA contains a number of non-native invasive plants. Elimination of all these species from the IBA habitats would be labor intensive. Due to the use of the

groundwater by residential parcels for drinking water supply, and other sensitive environmental receptors, the application of herbicides should be avoided whenever alternative control measures are feasible. Even pesticides in use and approved for use today for controlling invasive species may have insufficient toxicological studies supporting their safe use in certain habitats. New scientific evidence associates various potential teratogenic, carcinogenic, and mutagenic effects and various toxicities with pesticides in use today¹⁶.

Selection of an apparent feasible control method should be based upon cost, available labor, effectiveness, limitations, response of the target plant species and availability of follow-up monitoring, control, and replacement with native shrub species. The primary goal in invasive species management at the IBA should be consistent with the efforts of the Invasive Plant Atlas of New England (IPANE) assessment group. That is: “No New Invasions” either for new invasive species in the region (e.g., black swallow-wort [*Cynanchum louiseae*], mile a minute weed [*Polygonum perfoliatum*], etc.) and for new satellite invasion areas of existing invasive species (e.g., porcelainberry, Japanese honeysuckle, etc.). Stewards can assist refuge personnel by being vigilant to colonization by additional non-native invasive species.

The secondary focus of control efforts should be along the invasion front of existing infestations within the refuge to halt their spread and to contain the invasion. Efforts could then expand inward from there toward the invasion center as resources allow. However, care must be taken not to impact the habitat of species of conservation concern during control or removal projects. For instance, removal of multiflora rose could impact shrubland birds via removal of suitable nesting habitat and cover. It would be prudent to inventory all non-native invasive plant species, assess their extent, coverage, and possible impact; to prioritize species based on the urgency and need for control; and to find suitable native or non-invasive analogs that will replace the habitat functions lost upon the removal of the target invasive species. It may be desirable in some instances to establish the replacement vegetation species on-site first to provide the functions that will eventually be removed.

The refuge within the IBA should be explored as a potential demonstration site for conservation grazing. Conservation grazing is the use of animals such as Exmoor and Dartmoor Ponies, and various breeds of goats to control the spread of invasive plants. The duration of grazing is determined by the species used, the herd size, food availability, and if other plant species are present for which conservation is desirable. For instance Exmoor and Dartmoor Ponies seem to prefer thorny plants like multiflora rose and barberry. Goats eat a plethora of plant species and may be effective at controlling other invasives within the IBA. Goats have the added advantage of being able to access areas that other grazers avoid, such as along and atop stone walls. Goats also are fond of eating poison ivy and can be used to control the spread of this native vine in areas where human contact is frequent. Portable electric fencing can be used to contain the animals within the intended area for grazing. One note of caution: Certain species of plants like cherry, maple, and *Euonymus alatus* (the latter being quite abundant in some areas of the IBA) can be toxic to some animals. Animals can be protected from these plants by fencing or

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<http://www.ocfp.on.ca/local/files/Communications/Current%20Issues/Pesticides/Final%20Paper%2023APR2004.pdf>

physical barriers. Conservation grazing may be feasible within the IBA since livestock agriculture is still well established within Middlesex County, and this use of livestock may represent a future market for herders.

It would be unrealistic to think that all invasive plant species can and will be removed from the IBA permanently. The surrounding residential parcels offer abundant opportunity for seed dispersal to the refuge from non-native ornamental and other colonizing invasive plant stock. However, given the fact that the grounds of the IBA were formerly used for ornamental gardens and therefore likely for the disposal of garden trimmings, cuttings, clippings, excess mulch and other landscaping waste, a major avenue of invasive species colonization to the area has now been eliminated now that Ester Lape's former estate is under ownership by the USFWS, and non-native invasive plants are no longer planted on site.

One of the concerns that the IBA will be faced with in the fight against non-native invasive plant species is the fact that many parcels within the IBA have disturbed soils from past cut, fill, and re-grading activity. Disturbed soils typically become a more generic medium that has no distinct soil profile and little to no soil structural development. Invasive species are successful colonizers of disturbed soils. Therefore, within the IBA it is important to advocate the re-vegetation of disturbed soil areas quickly with native plants in order to prevent the establishment of non-native species or to at least give the native species a chance to compete effectively with non-native invasive plants that may enter the area through natural dispersal means.

It is recommended that large infestations of non-native invasive plants be delineated. For some infestations, such as stands of common reed with non-native genotypes, this may easily be done via remote sensing (i.e., using aerial photographs/images) at an appropriate scale). Delineation of invasive plant infestations will establish a baseline which will be useful in calculating potential rates of spread and resultant impact to habitat. Other infestations may not be as easily delineated and therefore would require ground based methods such as GPS survey.

8.2.8 Dredge and Fill Activities

Proposed dredge and fill projects within coastal waters will necessitate the acquisition of state and federal permits. The extent and scale of proposed dredging projects should be limited to existing navigation channels, and boat basins associated with existing marinas located along State Route 1, and to habitat enhancement projects such as maintenance dredging to remove road sediment from wetlands and surface water bodies within the IBA. Clean sediment could be dispersed at approved sites via permit, used for capping of exposed contaminated sediment generated by other projects in the region, beach nourishment, or expansion of shoals in known coastal waterbird breeding colonies. Dredged material reuse options are contingent upon physical composition of the material, chemical constituents within the media, cost, availability and capacity of reuse/recycling/disposal facilities, biota potentially impacted by dredge and disposal activity, and regulatory conditions/considerations. Dredging and dredged material disposal are regulated by the CTDEP Office of Long Island Sound Programs (OLISP) and the USACOE and requires approval from both agencies. Approval typically involves, at a minimum, coordination with NOAA National Marine Fisheries Service

(NMFS), EPA, and CT DEP Fisheries.

Proposed impact avoidance and minimization techniques and practices should be implemented during dredging in an effort to avoid, reduce, or minimize the anticipated impacts to the susceptible species during dredging and dredged material disposal operations. Implementation of these practices would ensure that impacts to the fisheries resources within the project areas as a result of the dredging and disposal operations would be limited, temporary and reversible, and therefore, insignificant on a regional basis. Dredging in the project area should be prohibited during critical time periods of sensitive environmental receptors within the system (e.g., diadromous fish runs, shellfish spawning, benthic fish spawning, etc). Adherence to this “environmental window” would substantially avoid or minimize most impacts to marine fisheries in and adjacent to the dredging and disposal areas.

8.3 Land Acquisition

The town should carefully consider any existing and potential future opportunities to preserve land adjacent to or proximal to the refuge, with a focus on lands along the western and northern limits of the IBA, upstream reaches of the Menunketesuck River and its watershed, or forested lands directly north of the IBA.

Stakeholders should strive to support the town, the Westbrook Land and Conservation Trust and the USFWS’ attempts to acquire undeveloped parcels adjacent to the IBA, and investigate incentives for beneficial management of adjacent and proximal land by private landowners.

To the extent possible, further development on currently undeveloped land adjacent to and surrounding the refuge should be prevented through acquisition of the land, acquisition of the development rights, or other means. In the absence of available land for acquisition, stakeholders should also consider the following:

- ◆ Investigating incentives for beneficial land management on private lands adjacent to key bird areas of the IBA (e.g., the Pequot Park Road Industrial Park.
- ◆ Consider the use of conservation easements and purchase of development rights as potential land protection tools to be considered for properties abutting the refuge and IBA
- ◆ Sponsoring educational programs for landowners
- ◆ Strict enforcement of zoning for the protection of coastal wetlands
- ◆ Work with the Congressional delegation to advocate for appropriation of funds to implement the Stewardship Act, and
- ◆ Nomination of the IBA for inclusion in the Long Island Sound Stewardship Initiative¹⁷

¹⁷ A goal of the Stewardship Initiative workgroup is to develop a process for regular reviews of and, if appropriate, updates to the list of Long Island Sound Stewardship Areas. The periodic review process will include a method for soliciting and incorporating feedback from the public. Currently Duck Island is included on the list of Stewardship Areas. The IBA may be included as part of this area since it is connected ecologically, but it is not indentified as such in the Stewardship Atlas. Inclusion should be confirmed via the proposed periodic review process
<http://www.longislandsoundstudy.net/stewardship/index.htm>

8.4 Monitoring/Research

The refuge within the IBA is an ideal location for establishment of an avian monitoring program for spring and fall migrants of shore birds, waterfowl, and waders in the salt marsh habitat, and Neotropical migrant passerines in the upland habitat. A standardized monitoring program would provide extremely useful information identifying which migrants move through the IBA, and would document the relative frequency and abundance of these species. This would be an ideal project for volunteers because it would involve counting the number of passage migrants during spring and fall migrations, an activity that fits well with recreational birding. The protocol would need to be more standardized than for general recreational birding during the migratory period, but the rewards for observers would be the same. A monitoring program would also permit refuge personnel to assess the effectiveness of the planting and management of vegetation to support those migrants.

“The Salt Meadow Unit IBA is an ideal location for establishment of an avian monitoring program for spring and fall migrants of shore birds, waterfowl, and waders in the salt marsh habitat, and Neotropical migrant passerines in the upland habitat. A standardized monitoring program would provide extremely useful information identifying which migrants move through the IBA, and would document the relative frequency and abundance of these species”.

A review of the state Natural Diversity Data Base (NDDDB) maps and files revealed known extant populations of federal or state endangered, threatened, or special concern species and historical records of rare species within the IBA. The information obtained from the NDDDB may not necessarily be based upon comprehensive or site-specific field investigations, and the change in species distributions over time necessitates periodic updates of the database. Since the salt marsh is among the most extensive tracts of marsh land in Connecticut, it has a high potential for hosting rare plants. It is recommended that a comprehensive botanical inventory be completed within the boundaries of the salt marsh before any large scale management or disturbance activities occur in an effort to document the presence/absence of rare flora and fauna.

Surveys for least shrews should be continued as funding allows. Research on Saltmarsh Sharp-tailed Sparrows should continue. Research for other species of greatest conservation need as identified by the CCWCS (2005) should be encouraged. Researchers should coordinate among themselves so that the presence of the various research groups do not impact rare species especially during sensitive seasonal periods in their life histories (e.g., courtship, nesting, spawning, etc.).

Monitoring to determine the effectiveness of any replacement restoration plantings associated with invasive species removal/eradication is recommended. Monitoring efforts should focus on percent mortality of planted shrubs, percent coverage, dominance, and other parameters with which to gauge success (e.g., performance/effectiveness against re-establishment of invasives). The spread of aggressive non-native plant species should be monitored to determine the degree of control required to allow the restoration plantings to become successfully established. Monitoring of bird nest boxes would provide valuable information regarding the effectiveness of the boxes for attracting target

species, and to determine the status and condition of the boxes from season to season.

Areas within the IBA should be made available for student research and monitoring projects. Data provided by researchers in the fields of ecology (e.g., plant ecology, marine ecology, benthic invertebrate ecology, etc.), avian biology, fisheries biology, benthic invertebrate biology, marine and freshwater modeling, and other sciences related to natural resource management could greatly contribute to the knowledge of the system. On-going monitoring and research data obtained via university research projects may be a cost effective way for the refuge personnel to obtain data upon which to base future natural resource management decisions.

Currently, there are various on-going programs that provide monitoring opportunities in which individuals or stewardship adoption groups may participate and receive professional training. They are summarized as follows:

8.4.1 The Invasive Plant Atlas of New England (IPANE) Program

The Invasive Plant Atlas of New England is a project designed to provide comprehensive and timely information about the status and distribution of invasive plants in New England. The goals of the project are multi-faceted but are generally designed to:

- ◆ Facilitate education and research that will lead to a greater understanding of the dynamics of plant invasions
- ◆ Support the early detection of new invasions, and
- ◆ Enable rapid management responses to new invasions.

The project has produced a web-accessible atlas¹⁸ that includes images and descriptive information regarding the invasive and potentially invasive flora of New England. Collection databases constructed from herbarium specimens and current field records are used to document the dates and locations of invasive plant occurrences. This information has been used to generate maps that depict the distribution and spread of invasive plants across New England. As a result of the IPANE project, an on-line interactive resource has been produced that is accessible to the public. This resource is available to and may provide comprehensive information to students, researchers, land managers, conservationists, scientists, government agencies, the green industry, and the interested public. Volunteers in the IPANE project are periodically trained to inventory habitats throughout New England in an effort to determine the presence and absence of invasive plant species. The data collected by the professionals and volunteers within the program are used to continually update the collection databases (Mehrhoff et al., 2003). Survey areas are based on USGS 7.5 minute series topographic quadrangles. Within these quadrangles, numerous public-accessible lands are selected by the coordinator and assigned to a volunteer for inventory. The refuge headquarters on Murdock Hill and surrounding areas accessible to the public (Land Trust, Cockapsett Forest blocks) are excellent survey locations for this program, if it has not already been covered by a volunteer. Volunteers could be trained through the IPANE program to survey the IBA for invasive plant species and to monitor the site via repeated surveys over time.

8.4.2 Citizen Science Monitoring Projects

¹⁸ <http://nbii-nin.ciesin.columbia.edu/ipane/>

Citizen science monitoring projects were initiated in order to allow citizens to contribute to the understanding of bird distribution. These projects were designed to provide an avenue of information sharing in recognition of the fact that birders spend considerable time outdoors observing avifauna throughout the year in varied habitats. Citizen science projects are available for willing participants throughout the various seasons. Some of the more successful and long-running projects that have generated large data sets through the years are summarized below. Additional information on Audubon's Citizen Science projects can be found at <http://www.ebird.org> or <http://www.birdsource.org>. Not only do these projects help provide the information necessary for effective conservation, they also get people out and directly involved with Important Bird Areas.

Christmas Bird Count

The Christmas Bird Count was the first "Citizen Science" bird monitoring project. Since its inception in 1901 it has generated data that continues to this day to help scientists better understand the population trends and movements of birds. The IBA lies within the radius of the Old Lyme – Old Saybrook Christmas Bird Count. This count has a long history, including participation by the famed naturalist and ornithologist Roger Tory Peterson. It encompasses the shoreline area and Lower Connecticut River from Hammonasset Beach St. Park in Madison to the Old Lyme coastline and up the CT River to Selden Island and Deep River. People interested in helping out in this count should contact the Potapaug Audubon Society, P.O. Box 591, Old Lyme, CT 06371.

Breeding Bird Surveys

The United States Geological Survey (USGS) Breeding Bird Survey was designed by researchers at the Patuxent Wildlife Research Center, (then the Migratory Bird Population Station) in Laurel, MD during the 1960's. The BBS was designed to provide a continent-wide perspective of avian population change. Routes along secondary roads were randomly selected in order to collect data on bird distribution within regional representative habitats. Today there are approximately 3,700 active BBS routes across the continental U.S. and Canada, of which nearly 2,900 are surveyed annually. The surveys are conducted during the peak of the nesting season, primarily in June in our region (Southern New England). Each BBS route lies along 24.5 miles of roadway with a total of fifty stops at 0.5 mile intervals along the survey route. At each stop the observer conducts a three-minute point count to record all birds heard or seen within 0.25 mile of the stop.

Despite some statistical limitations, the survey produces an index of relative abundance of breeding bird populations that has provided a valuable source of information on bird population trends on both a regional and continental scale. For instance, the data is sensitive enough to depict the range-wide decline of some species (e.g., many grassland birds), the periodic population declines of some birds due to unusually harsh winter weather, and the decline of Neotropical migrant birds in many regions of North America.

Table 8-1 provides relative abundance data for all species seen along a BBS route in Westbrook, Connecticut. The data provided for "birds/route" are averages of the total counts along the route for the period 1989-1998. Web links embedded in Table 8-1

provide connections to graphs illustrating the changes in relative abundance over time for the species along the route and the region that are available at the USGS Patuxent Wildlife Research Center website.

Researchers in charge of the program recognize that the “continued success of the BBS is a direct result of the efforts of the state and provincial BBS coordinators, and of the thousands of volunteers who conducted surveys each year.” (Sauer et al. 1997).

TABLE 8-1. SPECIES LIST FOR NORTH AMERICAN BREEDING BIRD SURVEY ROUTE WESTBROOK, CT			
<u>Species</u>	<u>Birds/route</u>	<u>Route Population Change 1966-2005</u>	<u>Regional Change (Data for distinct US states or Regions)</u>
<u>Double-crest. Cormorant</u> <i>Phalacrocorax auritus</i>	4.21	<u>Route Change</u>	<u>Regional Change</u>
<u>Great Blue Heron</u> <i>Ardea herodias</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Snowy Egret</u> <i>Egretta thula</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Green Heron</u> <i>Butorides virescens</i>	0.63	<u>Route Change</u>	<u>Regional Change</u>
<u>Black-crn. Night Heron</u> <i>Nycticorax nycticorax</i>	0.38	<u>Route Change</u>	<u>Regional Change</u>
<u>Yellow-crn. Night Heron</u> <i>Nyctanassa violacea</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Glossy Ibis</u> <i>Plegadis falcinellus</i>	0.13	<u>Route Change</u>	<u>Regional Change</u>
<u>Turkey Vulture</u> <i>Cathartes aura</i>	0.88	<u>Route Change</u>	<u>Regional Change</u>
<u>Canada Goose</u> <i>Branta canadensis</i>	1.50	<u>Route Change</u>	<u>Regional Change</u>
<u>Mute Swan</u> <i>Cygnus olor</i>	0.17	<u>Route Change</u>	<u>Regional Change</u>
<u>Wood Duck</u> <i>Aix sponsa</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>American Black Duck</u> <i>Anas rubripes</i>	0.46	<u>Route Change</u>	<u>Regional Change</u>
<u>Mallard</u> <i>Anas platyrhynchos</i>	4.96	<u>Route Change</u>	<u>Regional Change</u>
<u>Osprey</u> <i>Pandion haliaetus</i>	0.21	<u>Route Change</u>	<u>Regional Change</u>
<u>Northern Goshawk</u> <i>Accipiter gentilis</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Red-shouldered Hawk</u> <i>Buteo lineatus</i>	0.17	<u>Route Change</u>	<u>Regional Change</u>
<u>Broad-winged Hawk</u> <i>Buteo platypterus</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Red-tailed Hawk</u> <i>Buteo jamaicensis</i>	0.38	<u>Route Change</u>	<u>Regional Change</u>

**TABLE 8-1. SPECIES LIST FOR NORTH AMERICAN BREEDING BIRD SURVEY ROUTE
WESTBROOK , CT**

<u>Species</u>	<u>Birds/route</u>	<u>Route Population Change 1966-2005</u>	<u>Regional Change (Data for distinct US states or Regions)</u>
<u>American Kestrel</u> <i>Falco sparverius</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Ring-necked Pheasant</u> <i>Phasianus colchicus</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Wild Turkey</u> <i>Meleagris gallopavo</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Northern Bobwhite</u> <i>Colinus virginianus</i>	0.13	<u>Route Change</u>	<u>Regional Change</u>
<u>Clapper Rail</u> <i>Rallus longirostris</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>King Rail</u> <i>Rallus elegans</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Killdeer</u> <i>Charadrius vociferus</i>	0.29	<u>Route Change</u>	<u>Regional Change</u>
<u>Ring-billed Gull</u> <i>Larus delawarensis</i>	0.17	<u>Route Change</u>	<u>Regional Change</u>
<u>Herring Gull</u> <i>Larus argentatus</i>	6.92	<u>Route Change</u>	<u>Regional Change</u>
<u>Great Black-backed Gull</u> <i>Larus marinus</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Rock Dove</u> <i>Columba livia</i>	2.13	<u>Route Change</u>	<u>Regional Change</u>
<u>Mourning Dove</u> <i>Zenaida macroura</i>	33.83	<u>Route Change</u>	<u>Regional Change</u>
<u>Black-billed Cuckoo</u> <i>Coccyzus erythrophthalmus</i>	0.42	<u>Route Change</u>	<u>Regional Change</u>
<u>Yellow-billed Cuckoo</u> <i>Coccyzus americanus</i>	0.46	<u>Route Change</u>	<u>Regional Change</u>
<u>Chimney Swift</u> <i>Chaetura pelagica</i>	8.50	<u>Route Change</u>	<u>Regional Change</u>
<u>Ruby-thr. Hummingbird</u> <i>Archilochus colubris</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Belted Kingfisher</u> <i>Ceryle alcyon</i>	0.79	<u>Route Change</u>	<u>Regional Change</u>
<u>Red-bellied Woodpecker</u> <i>Melanerpes carolinus</i>	4.25	<u>Route Change</u>	<u>Regional Change</u>
<u>Downy Woodpecker</u> <i>Picoides pubescens</i>	5.13	<u>Route Change</u>	<u>Regional Change</u>
<u>Hairy Woodpecker</u> <i>Picoides villosus</i>	1.00	<u>Route Change</u>	<u>Regional Change</u>
<u>Northern Flicker</u> <i>Colaptes spp.</i>	6.25	<u>Route Change</u>	<u>Regional Change</u>
<u>Pileated Woodpecker</u> <i>Dryocopus pileatus</i>	0.13	<u>Route Change</u>	<u>Regional Change</u>

**TABLE 8-1. SPECIES LIST FOR NORTH AMERICAN BREEDING BIRD SURVEY ROUTE
WESTBROOK , CT**

<u>Species</u>	<u>Birds/route</u>	<u>Route Population Change 1966-2005</u>	<u>Regional Change (Data for distinct US states or Regions)</u>
<u>Eastern Wood-Pewee</u> <i>Contopus virens</i>	2.71	<u>Route Change</u>	<u>Regional Change</u>
<u>Acadian Flycatcher</u> <i>Empidonax vireescens</i>	0.25	<u>Route Change</u>	<u>Regional Change</u>
<u>Willow Flycatcher</u> <i>Empidonax traillii</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Willow/Alder Flycatcher</u> <i>Empidonax spp.</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Least Flycatcher</u> <i>Empidonax minimus</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Eastern Phoebe</u> <i>Sayornis phoebe</i>	4.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Grt. Crested Flycatcher</u> <i>Myiarchus crinitus</i>	4.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Eastern Kingbird</u> <i>Tyrannus tyrannus</i>	3.46	<u>Route Change</u>	<u>Regional Change</u>
<u>White-eyed Vireo</u> <i>Vireo griseus</i>	0.38	<u>Route Change</u>	<u>Regional Change</u>
<u>Yellow-throated Vireo</u> <i>Vireo flavifrons</i>	0.79	<u>Route Change</u>	<u>Regional Change</u>
<u>Warbling Vireo</u> <i>Vireo gilvus</i>	1.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Red-eyed Vireo</u> <i>Vireo olivaceus</i>	8.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Blue Jay</u> <i>Cyanocitta cristata</i>	27.67	<u>Route Change</u>	<u>Regional Change</u>
<u>American Crow</u> <i>Corvus brachyrhynchos</i>	32.88	<u>Route Change</u>	<u>Regional Change</u>
<u>Fish Crow</u> <i>Corvus ossifragus</i>	1.21	<u>Route Change</u>	<u>Regional Change</u>
<u>Purple Martin</u> <i>Progne subis</i>	0.88	<u>Route Change</u>	<u>Regional Change</u>
<u>Tree Swallow</u> <i>Tachycineta bicolor</i>	2.00	<u>Route Change</u>	<u>Regional Change</u>
<u>N. Rough-winged Swallow</u> <i>Stelgidopteryx serripennis</i>	0.42	<u>Route Change</u>	<u>Regional Change</u>
<u>Bank Swallow</u> <i>Riparia riparia</i>	0.46	<u>Route Change</u>	<u>Regional Change</u>
<u>Barn Swallow</u> <i>Hirundo rustica</i>	25.58	<u>Route Change</u>	<u>Regional Change</u>
<u>Black-capped Chickadee</u> <i>Poecile atricapillus</i>	15.58	<u>Route Change</u>	<u>Regional Change</u>
<u>Tufted Titmouse</u> <i>Baeolophus bicolor</i>	18.50	<u>Route Change</u>	<u>Regional Change</u>

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WESTBROOK , CT**

<u>Species</u>	<u>Birds/route</u>	<u>Route Population Change 1966-2005</u>	<u>Regional Change (Data for distinct US states or Regions)</u>
<u>Red-breasted Nuthatch</u> <i>Sitta canadensis</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>White-breasted Nuthatch</u> <i>Sitta carolinensis</i>	4.38	<u>Route Change</u>	<u>Regional Change</u>
<u>Brown Creeper</u> <i>Certhia americana</i>	0.13	<u>Route Change</u>	<u>Regional Change</u>
<u>Carolina Wren</u> <i>Thryothorus ludovicianus</i>	4.96	<u>Route Change</u>	<u>Regional Change</u>
<u>House Wren</u> <i>Troglodytes aedon</i>	10.79	<u>Route Change</u>	<u>Regional Change</u>
<u>Winter Wren</u> <i>Troglodytes troglodytes</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Sedge Wren</u> <i>Cistothorus platensis</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Marsh Wren</u> <i>Cistothorus palustris</i>	7.46	<u>Route Change</u>	<u>Regional Change</u>
<u>Blue-gray Gnatcatcher</u> <i>Poliophtila caerulea</i>	0.29	<u>Route Change</u>	<u>Regional Change</u>
<u>Eastern Bluebird</u> <i>Sialia sialis</i>	1.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Veery</u> <i>Catharus fuscescens</i>	1.79	<u>Route Change</u>	<u>Regional Change</u>
<u>Wood Thrush</u> <i>Hylocichla mustelina</i>	12.88	<u>Route Change</u>	<u>Regional Change</u>
<u>American Robin</u> <i>Turdus migratorius</i>	52.88	<u>Route Change</u>	<u>Regional Change</u>
<u>Gray Catbird</u> <i>Dumetella carolinensis</i>	23.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Northern Mockingbird</u> <i>Mimus polyglottos</i>	15.67	<u>Route Change</u>	<u>Regional Change</u>
<u>Brown Thrasher</u> <i>Toxostoma rufum</i>	0.96	<u>Route Change</u>	<u>Regional Change</u>
<u>European Starling</u> <i>Sturnus vulgaris</i>	83.88	<u>Route Change</u>	<u>Regional Change</u>
<u>Cedar Waxwing</u> <i>Bombycilla cedrorum</i>	4.54	<u>Route Change</u>	<u>Regional Change</u>
<u>Blue-winged Warbler</u> <i>Vermivora pinus</i>	3.63	<u>Route Change</u>	<u>Regional Change</u>
<u>Yellow Warbler</u> <i>Dendroica petechia</i>	7.58	<u>Route Change</u>	<u>Regional Change</u>
<u>Chestnut-sided Warbler</u> <i>Dendroica pensylvanica</i>	0.33	<u>Route Change</u>	<u>Regional Change</u>
<u>Magnolia Warbler</u> <i>Dendroica magnolia</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>

**TABLE 8-1. SPECIES LIST FOR NORTH AMERICAN BREEDING BIRD SURVEY ROUTE
WESTBROOK , CT**

<u>Species</u>	<u>Birds/route</u>	<u>Route Population Change 1966-2005</u>	<u>Regional Change (Data for distinct US states or Regions)</u>
<u>Black-thr. Blue Warbler</u> <i>Dendroica caerulescens</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Black-th. Green Warbler</u> <i>Dendroica virens</i>	0.38	<u>Route Change</u>	<u>Regional Change</u>
<u>Pine Warbler</u> <i>Dendroica pinus</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Prairie Warbler</u> <i>Dendroica discolor</i>	1.29	<u>Route Change</u>	<u>Regional Change</u>
<u>Black-and-white Warbler</u> <i>Mniotilta varia</i>	1.38	<u>Route Change</u>	<u>Regional Change</u>
<u>American Redstart</u> <i>Setophaga ruticilla</i>	0.79	<u>Route Change</u>	<u>Regional Change</u>
<u>Worm-eating Warbler</u> <i>Helmitheros vermivorus</i>	0.67	<u>Route Change</u>	<u>Regional Change</u>
<u>Ovenbird</u> <i>Seiurus aurocapillus</i>	6.83	<u>Route Change</u>	<u>Regional Change</u>
<u>Louisiana Waterthrush</u> <i>Seiurus motacilla</i>	0.42	<u>Route Change</u>	<u>Regional Change</u>
<u>Common Yellowthroat</u> <i>Geothlypis trichas</i>	8.63	<u>Route Change</u>	<u>Regional Change</u>
<u>Hooded Warbler</u> <i>Wilsonia citrina</i>	0.08	<u>Route Change</u>	<u>Regional Change</u>
<u>Scarlet Tanager</u> <i>Piranga olivacea</i>	2.50	<u>Route Change</u>	<u>Regional Change</u>
<u>Eastern Towhee</u> <i>Pipilo erythrophthalmus</i>	4.29	<u>Route Change</u>	<u>Regional Change</u>
<u>Chipping Sparrow</u> <i>Spizella passerina</i>	13.88	<u>Route Change</u>	<u>Regional Change</u>
<u>Field Sparrow</u> <i>Spizella pusilla</i>	2.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Grasshopper Sparrow</u> <i>Ammodramus savannarum</i>	0.04	<u>Route Change</u>	<u>Regional Change</u>
<u>Song Sparrow</u> <i>Melospiza melodia</i>	16.79	<u>Route Change</u>	<u>Regional Change</u>
<u>Swamp Sparrow</u> <i>Melospiza georgiana</i>	0.38	<u>Route Change</u>	<u>Regional Change</u>
<u>Northern Cardinal</u> <i>Cardinalis cardinalis</i>	25.42	<u>Route Change</u>	<u>Regional Change</u>
<u>Rose-breasted Grosbeak</u> <i>Pheucticus ludovicianus</i>	2.50	<u>Route Change</u>	<u>Regional Change</u>
<u>Indigo Bunting</u> <i>Passerina cyanea</i>	0.46	<u>Route Change</u>	<u>Regional Change</u>
<u>Bobolink</u> <i>Dolichonyx oryzivorus</i>	1.13	<u>Route Change</u>	<u>Regional Change</u>

**TABLE 8-1. SPECIES LIST FOR NORTH AMERICAN BREEDING BIRD SURVEY ROUTE
WESTBROOK , CT**

<u>Species</u>	<u>Birds/route</u>	<u>Route Population Change 1966-2005</u>	<u>Regional Change (Data for distinct US states or Regions)</u>
<u>Red-winged Blackbird</u> <i>Agelaius phoeniceus</i>	40.13	<u>Route Change</u>	<u>Regional Change</u>
<u>Eastern Meadowlark</u> <i>Sturnella magna</i>	1.92	<u>Route Change</u>	<u>Regional Change</u>
<u>Common Grackle</u> <i>Quiscalus quiscula</i>	47.96	<u>Route Change</u>	<u>Regional Change</u>
<u>Brown-headed Cowbird</u> <i>Molothrus ater</i>	10.83	<u>Route Change</u>	<u>Regional Change</u>
<u>Orchard Oriole</u> <i>Icterus spurius</i>	0.29	<u>Route Change</u>	<u>Regional Change</u>
<u>Baltimore Oriole</u> <i>Icterus galbula</i>	13.17	<u>Route Change</u>	<u>Regional Change</u>
<u>Purple Finch</u> <i>Carpodacus purpureus</i>	0.58	<u>Route Change</u>	<u>Regional Change</u>
<u>House Finch</u> <i>Carpodacus mexicanus</i>	45.67	<u>Route Change</u>	<u>Regional Change</u>
<u>American Goldfinch</u> <i>Carduelis tristis</i>	5.25	<u>Route Change</u>	<u>Regional Change</u>
<u>House Sparrow</u> <i>Passer domesticus</i>	43.92	<u>Route Change</u>	<u>Regional Change</u>

Source: USGS Patuxent Wildlife Research Center

Mortality Monitoring

A number of biotic and abiotic factors can cause the mortality of wild birds. One particular biotic factor of concern is the possibility of mortality due to introduced disease, such as the highly pathogenic Asian H5N1 avian influenza or “Bird Flu”. Although there are no confirmed Asian H5N1 cases in North America, a number of Low Path H5N1 outbreaks have occurred on the continent including some in the USA and even CT. The CTDEP has recently increased efforts toward surveillance of mortality events by conducting weekly surveys for dead birds. Mortality events that involve a large number of wild waterfowl or shore birds (as opposed to individual birds that a citizen might encounter dead on their property) serve as an early detection measure that could help to protect domestic poultry and other resources, and remains the focus of the DEP surveillance program. “Backyard birds” (e.g., robins, sparrows, pigeons, cardinals etc.) are not considered to be highly susceptible to Bird Flu, and therefore are not the focus of the program. Citizens are encouraged to be vigilant for dead water birds (gulls, shore birds, waterfowl), and to report those dead birds to Min Huang of the CTDEP through the CT Fluwatch dead bird website¹⁹.

¹⁹ <http://www.cfwwildbirdmortalityreporting.ct.gov>

8.5 Public Outreach/Education

The SBM NWR and Potopaug Audubon Society personnel lead the charge in providing outreach and education. The information kiosk at the refuge headquarters explains the mission of the service and highlights milestones in fish and wildlife conservation throughout the nation's history. Consistent with its mission, the refuge provides passive recreation such as nature viewing and photography, and provides environmental education and by hosting public programs (e.g., local Audubon chapter meetings/outings). This activity should be supported by backing congressional funding to further this mission and by training volunteers for specific tasks at the refuge (e.g., routine maintenance and grounds keeping) thereby freeing refuge personnel for tending to their various management tasks directly relating to the conservation of fish and wildlife.

The Town of Westbrook is currently in the process of revising their Master Plan of Conservation and Development. Stakeholders should be urged to provide input during the planning process so that the Town can develop appropriate conservation goals that ideally would recognize and incorporate the conservation goals identified for the IBA.

Stakeholders could fund or seek funding for additional outreach opportunities such as a web-based view cam that monitors the development of young birds at a nest (e.g., an Osprey nest) or other active bird habitats (e.g., a salt panne).

Stakeholders should consider teaming to provide educational outreach to private landowners within the IBA and adjacent areas. Outreach could occur in the form of a lecture series to be held at the refuge, town library, or other community center. Potential topics to be presented or programs to initiate should focus on what actions private property owners or civic groups could undertake to benefit both themselves and the IBA such as the following:

- ◆ Water quality control: Recruit Scouting or youth groups to conduct storm sewer stenciling and encourage property owners to maintain a natural shoreline habitat that retains riparian vegetation, coarse woody debris, shoals, bars, undercut banks, and other natural riparian features.
- ◆ Proper septic system maintenance: the local health department has a slide presentation on this topic, the slides of which can be viewed on-line. However, homeowners could benefit from a personal presentation of the topic by a qualified sanitarian who could answer direct questions. Refuge staff could also present jointly to explain how the refuge and its unique habitats could benefit from properly functioning septic systems in the watershed.
- ◆ Mosquito control around the home
- ◆ Use of native plants in landscaping and for bird/butterfly-scaping their yards
- ◆ The conservation status of specific animal taxa, with a focus on Connecticut's species of greatest conservation need (e.g., box turtles, wood turtles, terrapins, various bats, birds, dragonflies, butterflies, etc.)
- ◆ Seasonal specific programs such as the benefits of bats, spiders, owls, and snakes which would likely have higher attendance if presented just before Halloween.

A recommended public outreach/education goal should be to expand the interpretive signage within the IBA. A sign should be provided at the entrance to the refuge informing the public that the refuge grounds are part of a larger IBA. The signage would relay the information presented in Section 4.5.2 regarding the change in avifaunal community composition with the seasons. Locations/ideas for additional signage could include the following:

- ◆ At the viewing platform overlooking the salt marsh to explain the benefits of the OMWM program and its value in mosquito control; the value of salt pannes to marsh fisheries, waders, waterfowl, and shore birds; the breeding ecology of the Saltmarsh Sharp-tailed Sparrows; and other pertinent topics of salt marsh ecology pertinent to the site
- ◆ At various locations along the toposequence of Murdock Hill denoting change in forest vegetational communities with toposequence
- ◆ At the toe of the slope of Murdock Hill adjacent to a groundwater discharge zone and freshwater plant community explaining hydrology of the landscape
- ◆ Within the forests explaining the value of large forest blocks to Neotropical migrants and resident forest interior species
- ◆ At the refuge headquarters explaining the cultural significance of the site
- ◆ At the apex of Murdock Hill explaining the geologic formation of the Murdock Hill Drumlin and adjacent salt marsh
- ◆ Within the shrubland management area identifying the shrubland species of special concern and or the concern associated with invasive plant species
- ◆ At other marsh vistas explaining the now or expected changes in marsh structure in response to sea level rise .

In addition to the viewing platform and interpretive signage, an observation blind constructed along a trail within the shrubland management area would offer visitors a chance to see birds and other wildlife while minimizing the chance of disturbance. Wildlife viewing blinds are especially effective when placed in such a way as to provide a view of a valuable food resource for the wildlife such as fruiting shrubs, a water feature, or a feeding station.

Complete Nomination for Inclusion on CT Birding Trail

The refuge within the IBA was nominated for inclusion on the CT Birding Trail²⁰. Essentially, the state steering committee uses the following criteria to evaluate nominations for further assessment:

- ◆ Abundance, diversity, or richness of bird species and other natural attractions
- ◆ Sensitivity of the natural or cultural resources of the site
- ◆ Whether or not the site offers safe public access
- ◆ Whether or not access may be arranged through public ownership or willing private owners
- ◆ Amenities and support services (whether present, planned or nearby) available to visitors
- ◆ Availability of local partners or sponsors to help with management and maintenance
- ◆ Current tourism infrastructure (dining, lodging, etc.) present nearby, and

²⁰ Guidelines for site nomination are available at: http://www.fermatainc.com/conn/nomination_form.html

- ◆ Geographic distribution/dispersal in relation to other sites.

The IBA, has met many of these criteria. It offers an abundance, diversity, or richness of bird species and other natural attractions; it is safely accessed via State Route 1 and Interstate 95; the refuge within the core of the IBA is staffed with professionals that maintain the refuge lands; there is public parking at the refuge; and restaurants and businesses along Route 1 provide many of the other requisite amenities (gasoline fueling stations, restaurants and other services). Considering that 18 million Americans travel at least a mile out of their way during the year to view birds, and spend \$32 billion annually on gear, services, and trips, inclusion on the Connecticut Birding Trail can direct tourist revenue into the local economy. However, supporting documentation is still lacking to complete the nomination of the IBA/refuge for finalizing the nomination. Stakeholders (Audubon Societies) should be engaged to assist the CTDEP sequester this information.

Recordation of Sightings

A project developed by the Cornell Lab of Ornithology and the National Audubon Society, eBird, provides a simple way for birders to record their sightings in North America. Information entered into the eBird Database can be retrieved at any time by the person recording the data. Birders can also access the entire historical database to find out what other eBirders are reporting from various sites across North America. Data collected from backyards, as well as from notable birding destinations are eligible for entry. Sightings collected from the SMU IBA that are entered into the database will help to promote education and outreach since the cumulative eBird database will be used by not only birders, but also scientists, conservationists, educators, and others searching to find out more about the status, distributions, and movement patterns of birds in North America²¹.

²¹ <http://www.ebird.org/content/About/WhatIsEbird.html>

9.0 Evaluation (Measures of success)

Feedback from the public will be one measure of success to gauge the effect that designation of the areas as an IBA and implementation of the IBA conservation plan will have on bird conservation. Feedback can be solicited through response forms attached to or incorporated in newsletters, brochures, or e-mailings. Reduction in the number of complaints issued by stakeholders in response to resource management decisions that impact the IBA would be another measure of success.

Hard data collected as a result of any monitoring efforts that may be implemented within the IBA will demonstrate and quantify the degree of success obtained from restoration efforts. Surveys can be generated and circulated to stakeholders to solicit feedback on restoration efforts. Measures of success that can be quantified include but are not limited to the following:

- ◆ Population size of listed species increasing over time.
- ◆ Native species richness stable or increasing
- ◆ Additional acres protected
- ◆ Stewardship Adoption Group(s) formed and mobilized
- ◆ Number of people involved as stewards
- ◆ Number and scale of stewardship actions completed
- ◆ Area impacted by invasive plants decreasing, and
- ◆ Populations of nuisance bird and wildlife species decreasing
- ◆ Completion of the nomination of the site to the Connecticut Birding Trail
- ◆ Number of natural history/heritage lectures and programs shown to or conducted for the public at refuge headquarters within the IBA

Sightings data collected from birders using the IBA and reporting their sightings to eBird could also be used as a measure of success. The data entered could be monitored over time to determine species richness trends across or within seasons, document occurrences (frequency and duration) within the IBA and to perhaps identify population trends. The names and contact information of people entering their sightings could help document tourism usage.

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APPENDIX A

GOVERNMENTAL ORGANIZATIONS

United States Fish and Wildlife Service

The USFWS is a major land owner of record within the IBA.

Andrew French

Rick Potvin – Refuge Manager

Connecticut Department of Environmental Protection

Jenny Dickson

Wildlife Division

Sessions Woods WMA

P.O. Box 1550

Burlington, CT 06013-1550

DEP's wildlife division manages the wildlife resources of the State to provide stable, healthy populations of diverse wildlife species, including endangered and threatened species. The wildlife division provides technical assistance and education for privately-owned habitat, state forests and wildlife management areas. DEP is leading the development of the Connecticut Coastal Birding Trail. The CTDEP is also a land owner of record within the IBA.

Paul Capotosto

DEP - Office of Long Island Sound Programs

79 Elm Street

Hartford, CT 06106

(860) 424-3034

The CT DEP Office of Long Island Sound Programs (OLISP) has a unit dedicated to wetland restoration and mosquito management. Working together with the DEP Wildlife Division and other stakeholders, tidal wetlands within the State have been restored, enhanced, and created for the benefit of water dependent flora and fauna. In addition OLISP has a full-time coastal habitat restoration coordinator who pursues funding for projects, and coordinates with other state, federal and non-profit organizations on the tidal restoration projects²².

Connecticut Agricultural Experiment Station

123 Huntington Street

New Haven, CT 06504-1106

Mosquito Management Program

Mike Thomas

(203) 974-8500 <mailto:michael.c.thomas@po.state.ct.us>

Town of Westbrook

Planning Department:

Westbrook Town Hall

866 Boston Post Road

²²/www.ct.gov/dep/cwp/view.asp?a=2705&q=323828&depNav_GID=1625

Westbrook, CT 06498

Jay Northrup - Town Planner - Phone: (860) 399-3046
Tom O'dell

NON-GOVERNMENT ORGANIZATIONS

***Audubon Connecticut**

185 East Flat Hill Road
Southbury, CT 06488
Patrick Comins, Director of Bird Conservation

Audubon Connecticut is the state office of the National Audubon Society. Audubon's mission "is to conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and the earth's biological diversity." Audubon sponsors educational programs and advocates on behalf of the protection of birds. Audubon is the U.S. partner of BirdLife International in implementation of the worldwide IBA program.

***Potapaug Audubon/Friends of the Salt Meadow Unit**

potapaugaudubon@gmail.com

Established in 1979, Potapaug Audubon Society is a chapter of Audubon (the National Audubon Society). The majority of the membership of the Potapaug Audubon Society reside in the towns around the Connecticut River Valley area such as East Lyme, Old Lyme, Lyme, East Haddam, Salem, Colchester, Old Saybrook, Essex, Deep River, Chester, Haddam, Westbrook, Clinton and Killingworth. Potapaug Audubon Society members act as stewards at the Stewart B. McKinney National Wildlife Refuge Salt Meadow Unit by maintaining bluebird nest boxes; by building, monitoring, and maintaining Osprey nest platforms; and by assisting in the renovation of the historic cabin at the refuge which will be used as an interpretive center and contact point for visitors²³

Westbrook Land Conservation Trust

PO Box 1124 Westbrook, CT
06498-1124.
Phone: (860) 399-5432
E-Mail: westbrooklct@yahoo.com

The Westbrook Land Conservation Trust is also a land owner of record within the IBA.

Trust for Public Land

Alicia Betty
Lisa Bassani

"The Trust for Public Land (TPL) is a national, nonprofit, land conservation organization that conserves land for people to enjoy as parks, community gardens, historic sites, rural lands, and other natural places, ensuring livable communities for generations to come"²⁴
TPL is also a land owner of record within the IBA.

²³ <http://www.potapaugaudubon.org/index.html>

²⁴ http://www.tpl.org/tier2_sa.cfm?folder_id=170

Connecticut Ornithological Association

314 Unquowa Road
Fairfield, CT 06430
Steve Mayo, President
49 Sunswyck Rd
Darien, CT 06820

The Connecticut Ornithological Association (COA) is “an all-volunteer not-for-profit organization which strives to promote interest in Connecticut birds and to publish scientifically accurate information about them. COA looks to the future and works closely with other conservation organizations to protect the state's birds.” Members of COA are regular visitors to the IBA. The COA has had occasional field days and identification seminars the latter of which could be held at the refuge headquarters within the IBA.

New Haven Bird Club

P.O. Box 9004
New Haven, CT 06532
Dori Sosensky, President

The New Haven Bird Club, established 1907, is one of the oldest birding groups in the U.S. and is affiliated with the National Audubon Society and the Audubon Council of Connecticut. It is dedicated to recreation and education in bird watching and to the conservation of natural resources.

Menunkatuck Audubon Society

Suzanne Botta, President
49 Silver St. Apt. D
Branford, CT 06405
Sbotta@mail.yellowstone.net

Mattabeseck Audubon Society

418 Tater Hill Rd
East Haddam, CT 06423
860-873-9304
Alison Guinness, President
wjguinness@snet.net

***Save the Sound**

18 Reynolds Street
East Norwalk, CT 06855
Dr. Richard Orson, Save the Sound Habitat Restoration

This organization (originally founded in 1972 as the Long Island Sound Taskforce) was affiliated first with the Sierra Club, then the Oceanic Society, before becoming an independent organization in 1989. The organization changed their name to “Save the Sound, Inc.” in 1995 and merged with Connecticut Fund for the Environment in September of 2004. The mission of Save the Sound is “the restoration, protection, and appreciation of Long Island Sound and its watershed through advocacy, education and research”. They are headquartered in Norwalk, CT and foster a variety of programs in education, research, and advocacy which are funded by membership contributions, individual and corporate donations, foundations and government grants.

The Nature Conservancy

Adam Welchel, Director of Conservation Science - 860/344-0716, ext. 340

The Nature Conservancy is “a conservation organization working around the world to protect ecologically important lands and waters for nature and people”²⁵.

Connecticut Waterfowlers Association

David Proulx - President

Paul Capotosto - Treasurer

The Connecticut Waterfowl Association, Inc. is “a volunteer, tax deductible, nonprofit 501(c)(3), state wide conservation organization founded in 1967 by a group of concerned and dedicated conservationist and outdoor enthusiasts” whose mission is to “preserve, reclaim, and enhance wetland and wildlife habitat in the state of Connecticut in a manner that promotes the wise use of our natural resources and the progress of society”²⁶.

Connecticut Butterfly Association

P.O. Box 9004

New Haven, CT 0652-0004

Carol Lemmon

INDIVIDUALS

Dr. Lawrence Gall – Yale University

***Dr. Robert Askins** – Connecticut College

Dr. Dave Wagner – University of Connecticut Department of Ecology and Evolutionary Biology

Milan Bull – Connecticut Audubon Society

Stakeholder Comments and Recommendations

Stakeholders were encouraged to provide input into the development of the Conservation Plan through interviews and surveys. Following is a summary of initial comments, concerns and suggestions received from stakeholders.

Important Habitat Features

- Coastal Forests
- Extensive tidal salt marsh
- Shrublands, particularly management area of the Stewart B. McKinney Wildlife Refuge

Key Issues and Potential Threats

- Development of natural areas adjacent to IBA and along that provide key habitat.
- Pesticides, fertilizers, non-native invasive plants and untreated stormwater runoff from developed areas that border terrestrial and marine habitats.

²⁵ <http://www.nature.org/aboutus/?src=t5>

²⁶ <http://www.ctwaterfowlers.org/>

- Rising sea levels, increased storm severity associated with climate change and coastal development
- Invasive plant species (e.g., Phragmites, Tree of Heaven, etc.)

Recommendations

Physical

- Protection of threatened and endangered species populations
- Conduct more thorough baseline inventory of natural habitats and communities
- Maintain and enhance habitat for migratory birds to the fullest extent possible, including coastal scrub which was identified as highly productive migratory stopover habitat .
- Avoid or mitigate any reduction or adverse impact to migratory stopover habitat. However various stakeholders emphasized the fact that habitat management should be based upon a multi-taxa approach and management proposed to benefit avifauna should consider potential impact to other fauna.
- Replace invasive species of vegetation with native species of high value for native nesting and migrating birds.
- Control/prohibit dogs from wildlife refuge.

Educational

- Increase community awareness of the ecological importance of the IBA to cultivate stewardship, explain the value of, and garner support for conservation efforts.

Organizational

- Designate land use areas within the IBA for use in future planning and siting of conservation areas
- Form a local stewardship group to effectively monitor and advocate for the protection of bird habitats of the IBA.
- Investigate potential conservation easements and/or purchases of proximal lands that would provide ecological links to the IBA. Possible areas include: “the Ledges”, forested blocks in between existing blocks of Cockaponsett Forest and adjacent to, between, or connecting Westbrook Land trust parcels.

General

- Prevent further development within the IBA and within the habitat corridor to the north of the IBA, where appropriate.
- Minimize nutrient enrichment, point, and non-point source pollution within the Menunketesuck River watershed.
- Ensure that all management recommendations are consistent with Connecticut’s Comprehensive Wildlife Conservation Strategy and the USFWS mission.

APPENDIX B

COMPREHENSIVE CHECKLIST OF BIRDS OBSERVED OR EXPECTED TO OCCUR WITHIN THE IBA

Bold indicates species that occur regularly in the salt marsh and the season in which they occur. Other species on the list are possibilities that might be seen in the marsh or in the adjacent upland areas. More surveying needs to be conducted to get a complete list of species and abundance data.

* - Confirmed or suspected nester in the marsh

E - Endangered in Connecticut

T – Threatened in Connecticut

SC- Special Concern in Connecticut

Species	Spring	Summer	Fall	Winter
Snow Goose	X		X	
Canada Goose *	X	X	X	X
Mute Swan	X	X	X	X
Wood Duck	X		X	
Gadwall	X		X	X
American Wigeon	X		X	X
American Black Duck*	X	X	X	X
Mallard *	X	X	X	X
Blue-Winged Teal	X		X	
Northern Shoveler	X		X	
Northern Pintal	X			
Green-Winged Teal	X		X	X
Canvasback	X		X	
Redhead	X		X	
Ring-Necked Duck	X		X	
Greater Scaup	X		X	
Lesser Scaup	X		X	
Bufflehead	X		X	
Common Goldeneye	X		X	
Hooded Merganser	X		X	
Ruddy Duck	X		X	
Ring-Necked Pheasant	X	X	X	X
Wild Turkey	X	X	X	X
Pied Billed Grebe	X		X	X
Double-Crested Cormorant	X	X	X	
Great Cormorant				X
American Bittern (E)	X		X	X
Least Bittern	X		X	
Great Blue Heron	X	X	X	X
Great Egret (T)	X	X	X	

Species	Spring	Summer	Fall	Winter
Snowy Egret (T)	X	X	X	
Little Blue Heron (SC)	X	X	X	
Tricolored Heron			X	
Green Heron	X	X	X	
Black-Crowned Night Heron	X	X	X	
Yellow-Crowned Night Heron (SC)	X	X	X	
Glossy Ibis (SC)	X	X	X	
Turkey Vulture	X	X	X	X
Osprey (N)	X	X	X	
Bald Eagle (E)	X		X	X
Northern Harrier (E)	X		X	X
Sharp-Shinned Hawk (E)	X		X	X
Cooper's Hawk	X	X	X	X
Northern Goshawk	X		X	X
Red-Shouldered Hawk	X	X	X	X
Broad-Winged Hawk	X	X	X	
Red-Tailed Hawk	X	X	X	X
Rough-Legged Hawk			X	X
American Kestrel (SC)	X		X	X
Merlin	X		X	X
Peregrine Falcon (E)	X		X	
Clapper Rail (N)	X	X	X	
King Rail (E)	X	X	X	
Virginia Rail	X	X	X	
Sora	X		X	
Common Moorhen (E)	X		X	
American Coot	X		X	X
Black-Bellied Plover	X		X	
American Golden Plover			X	
Semipalmated Plover	X		X	
Killdeer	X	X	X	
Greater Yellowlegs	X		X	
Lesser Yellowlegs	X		X	
Solitary Sandpiper	X		X	
Willet*	X	X	X	
Spotted Sandpiper	X	X	X	
Whimbrel			X	
Semipalmated Sandpiper	X		X	
Western Sandpiper	X		X	
Least Sandpiper	X		X	
White-Rumped Sandpiper	X		X	
Baird's Sandpiper			X	
Pectoral Sandpiper	X		X	
Dunlin	X		X	X
Stilt Sandpiper			X	
Short-Billed Dowitcher	X		X	

Species	Spring	Summer	Fall	Winter
Long-Billed Dowitcher			X	
Wilson's Snipe	X		X	
American Woodcock	X	X	X	
Wilson's Phalarope			X	
Ring-Billed Gull	X	X	X	X
Herring Gull	X	X	X	X
Belted Kingfisher	X	X	X	X
Red-Bellied Woodpecker	X	X	X	X
Yellow-Bellied Sapsucker	X		X	X
Downy Woodpecker	X	X	X	X
Northern Flicker	X	X	X	X
Hairy Woodpecker	X	X	X	X
Pileated Woodpecker	X	X	X	X
Olive-Sided Flycatcher (SC)	X		X	
Eastern Wood Pewee	X	X	X	
Yellow-Bellied Flycatcher	X		X	
Acadian Flycatcher	X		X	
Alder Flycatcher	X		X	
Willow Flycatcher	X	X	X	
Least Flycatcher	X		X	
Eastern Phoebe	X	X	X	
Great Crested Flycatcher	X	X	X	
Eastern Kingbird	X	X	X	
Northern Shrike				X
White-Eyed Vireo	X		X	
Yellow-Throated Vireo	X	X	X	
Blue-Headed Vireo	X		X	
Warbling Vireo	X	X	X	
Philadelphia Vireo	X		X	
Red-Eyed Vireo	X	X	X	
Blue Jay	X	X	X	X
American Crow	X	X	X	X
Fish Crow	X	X	X	X
Horned Lark	X		X	X
Purple Martin (T)	X	X	X	
Tree Swallow	X	X	X	
Bank Swallow	X	X	X	
Northern Rough-Winged Swallow	X	X	X	
Cliff Swallow	X		X	
Black-Capped Chickadee	X	X	X	X
Tufted Titmouse	X	X	X	X
Red-Breasted Nuthatch	X		X	X
White-Breasted Nuthatch	X	X	X	X
Brown Creeper	X		X	X
Carolina Wren	X	X	X	X
House Wren	X	X	X	

Species	Spring	Summer	Fall	Winter
Winter Wren	X		X	X
Marsh Wren*	X	X	X	
Golden-Crowned Kinglet	X		X	X
Ruby-Crowned Kinglet	X		X	X
Blue-Gray Gnatcatcher	X	X	X	
Eastern Bluebird	X	X	X	X
Veery	X	X	X	
Gray-Cheeked Thrush			X	
Bicknell's Thrush	X		X	
Swainson's Thrush	X		X	
Hermit Thrush	X		X	X
Wood Thrush	X	X	X	
American Robin	X	X	X	X
Gray Catbird	X	X	X	X
Northern Mockingbird	X	X	X	X
Brown Thrasher (SC)	X		X	
European Starling	X	X	X	X
American Pipit	X		X	X
Cedar Waxwing	X	X	X	X
Blue-Winged Warbler	X	X	X	
Golden-Winged Warbler	X	X	X	
Orange-Crowned Warbler			X	X
Nashville Warbler	X		X	
Northern Parula (SC)	X		X	
Yellow Warbler	X	X	X	
Chestnut-Sided Warbler	X		X	
Magnolia Warbler	X		X	
Cape May Warbler	X		X	
Black-Throated Blue Warbler	X		X	
Tennessee Warbler	X		X	
Yellow-Rumped Warbler	X		X	X
Black-Throated Green Warbler	X		X	
Blackburnian Warbler	X		X	
Pine Warbler	X		X	
Prairie Warbler	X		X	
Palm Warbler	X		X	
Bay-Breasted Warbler	X		X	
Blackpoll Warbler	X		X	
Cerulean Warbler	X		X	
Black-and-White Warbler	X	X	X	
American Redstart	X		X	
Worm-Eating Warbler	X	X	X	
Ovenbird	X	X	X	
Northern Waterthrush	X		X	
Louisiana Waterthrush	X	X	X	
Kentucky Warbler	X		X	

Species	Spring	Summer	Fall	Winter
Connecticut Warbler			X	
Mourning Warbler	X		X	
Common Yellowthroat	X	X	X	
Hooded Warbler	X		X	
Wilson's Warbler	X		X	
Canada Warbler	X		X	
Yellow-breasted Chat (E)	X		X	
Scarlet Tanager	X	X	X	
Eastern Towhee	X	X	X	X
American Tree Sparrow	X		X	X
Chipping Sparrow	X	X	X	
Field Sparrow	X		X	X
Savannah Sparrow (SC)	X		X	X
Vesper Sparrow (E)	X		X	
Saltmarsh Sharp-tailed Sparrow *(SC)	X	X	X	
Seaside Sparrow (SC)	X		X	
Fox Sparrow	X		X	X
Song Sparrow	X	X	X	X
Lincoln's Sparrow	X		X	
Swamp Sparrow	X	X	X	X
White-throated Sparrow	X		X	X
White-crowned Sparrow	X		X	
Dark-eyed Junco	X		X	X
Snow Bunting	X		X	X
Northern Cardinal	X	X	X	X
Rose-breasted Grosbeak	X	X	X	
Indigo Bunting	X	X	X	
Dickcissel			X	
Bobolink	X		X	
Red-winged Blackbird*	X	X	X	
Eastern Meadowlark (SC)	X		X	X
Rusty Blackbird	X		X	
Common Grackle	X	X	X	X
Brown-headed Cowbird	X	X	X	X
Orchard Oriole	X		X	
Baltimore Oriole	X		X	
Purple Finch	X		X	
House Finch	X	X	X	X
Common Redpoll	X		X	X
Pine Siskin	X		X	X
American Goldfinch	X	X	X	X
Evening Grosbeak	X		X	X
House Sparrow	X	X	X	X

APPENDIX C

SPECIAL HABITAT ATTRIBUTES AND THE AVIFAUNA THEY BENEFIT

Special Habitat Attributes¹ and Bird Species that Require or Prefer Them²

Habitat Attribute	Explanation of Attribute (where applicable)	Species that Prefer these Attributes
FOREST COMPONENTS		
Canopy Closure:		
<15%	very open canopy	Eastern Bluebird, Red-headed Woodpecker, Indigo Bunting, Orchard Oriole, Baltimore Oriole
15 – 30 %	open canopy	Whip-poor-will
31 – 70%	intermediate canopy	flycatchers, Blue-Gray Gnatcatcher, American Redstart
>70%	closed canopy	Brown Creeper, Ruby-Crowned Kinglet, Wood Thrush,
Perch Types:		
High exposed	supracanopy nesting and exposed hunting sites	raptors (buteos, eagles, kestrels)
Low exposed	exposed hawking sites low to the ground	Flycatchers, warblers, kinglets, waxwings
Overstory Inclusions:		
Deciduous	One tree or group of deciduous trees in a coniferous stand	Flycatchers, kinglets, warblers, waxwings
Coniferous	One tree or group of coniferous trees in a deciduous stand	Long-eared Owl, Saw-whet Owl, various passerines for roosting/cover; crossbills feed on large cones
Tree Boles:		
Dead ≥6 in dbh – adjacent to water		Downy Woodpecker, Black-capped Chickadee
Live ≥12 in dbh – adjacent to water		Red-bellied Woodpecker, Yellow-bellied Sapsucker
Live ≥18 in dbh – adjacent to water		Warbling Vireo
Dead and soft < 6 in dbh – general forest		Downy Woodpecker, Red-breasted Nuthatch, Black-capped Chickadee
Dead and hard, 6 to 12 in dbh – general forest		Downy Woodpecker; Tree Swallow in cavity trees
Dead and hard, 12 to 18 in dbh – general forest		Hairy woodpecker; Saw-whet and Screech Owls (in cavity trees w/DBH >12’)
Live, columnar decay, 8 to 12 in dbh – general forest		Red-bellied and Hairy Woodpeckers
Live, broken top, 12 to 18 in dbh – general forest		Screech Owl in cavity trees; Red-bellied and Hairy Woodpeckers
Live, broken top/large limb, >18 in dbh – general forest		Screech Owl in cavity trees; Red-bellied and Hairy Woodpeckers
Live, hollow > 20 to 24 in dbh – general forest		Screech Owl in cavity trees; Red-bellied and Hairy Woodpeckers
Midstory Layer:	Woody vegetation 10 to 30 feet in height	American Redstart, Wilson’s Warbler, Chestnut-sided Warbler, Rose-breasted Grosbeak

Habitat Attribute	Explanation of Attribute (where applicable)	Species that Prefer these Attributes
Shrub Layer:	Deciduous seedlings, saplings, shrubs 2-10 ft in height	Black-Billed Cuckoo, Yellow-Billed Cuckoo, White-Eyed Vireo, Catbird, Mockingbird, Brown Thrasher, Yellow Warbler, Chestnut-sided Warbler, Yellow-rumped Warbler (winter), Mourning Warbler, Yellowthroat, Hooded Warbler, Towhee, Rose-breasted Grosbeak, other passerines
	Coniferous seedlings, saplings, shrubs 2-10 ft in height	Palm Warbler, Cardinal, Purple Finch, Nashville Warbler, other passerines
	Mixed deciduous and coniferous seedlings, saplings, shrubs 2-10 ft in height	Wild Turkey, Nashville Warbler, Prairie Warbler, Fox Sparrow, other passerines
	Ericaceous shrubs 2-10 ft in height	Canada Warbler, Fox Sparrow numerous passerines attracted to fruiting <i>Vaccinium</i> spp.
	Wetland shrubs	Willow Flycatcher, Wilson's Warbler, Canada Warbler, Yellow-breasted Chat, Yellow Warbler, Grackle, Rusty Blackbird, Goldfinch, Song Sparrow, Swamp Sparrow,
Ground Cover:	<30 % Upland herbaceous ground cover 0 to 2 ft – sparse	Various thrushes, Ovenbird
	30 to 75 % Upland herbaceous ground cover 0 to 2 ft – intermediate	Various thrushes, Ovenbird
	>75% Upland herbaceous ground cover 0 to 2 ft – abundant	Connecticut Warbler (fall migration); various sparrows,
Duff and Ground Layer:	Forest litter and moss	Wild Turkey, Woodcock, Whip-poor-will, ovenbird (migration), thrushes
	Exposed soil	Wild Turkey (for grit); variety of other birds for dusting
	Rocky forest floor	
	Dead and down woody debris – trees, larger limbs and branches	Wrens (foraging substrate and cover),
	Waterside decaying logs – basking sites adjacent to water	Waterfowl (resting sites)
Subterranean Habitats:		
Boulder fields		Wrens
Cobbles		
Sand and Gravel		
Loams		

Habitat Attribute	Explanation of Attribute (where applicable)	Species that Prefer these Attributes
Silts		Rough-winged and Bank Swallows; Belted Kingfishers (adjacent or proximal to water)
Clays		Rough-winged and Bank Swallows; Belted Kingfishers (adjacent or proximal to water)
Mast and Fruit:		
Hard Mast	Nut Bearing Trees	Wild Turkey, Blue Jay, Woodpeckers
Soft Mast	Fleshy fruit producing trees and shrubs	Waxwings, thrushes, mimic thrushes, finches (eat seeds inside fruit),
Miscellaneous Features:	Seeps	Woodcock; robins (in winter); Veery (migration)
	Vernal/autumnal temp. pools	Spotted and Solitary Sandpipers; Snipe; Woodcock, various passerines for bathing
	Woods roads (unpaved)	N/A
	Slash piles	wrens, sparrows and finches
	Gravel pits or exposed soil sites	Wild Turkey, Mourning Dove, Sparrows, Redpolls, Juncos
	Log landings	wrens
UPLAND NON-FOREST COMPONENTS		
Opening Type:	Lawns, golf courses, etc.	Mourning Dove, Killdeer, Flicker, Chipping Sparrow, Brown-headed Cowbird, Red-tailed Hawk, American Robin, blackbirds, grackles, Starling
	Cultivated cropland	N/A
	Fallow Field	Short-eared Owl, Kestrel, Eastern Kingbird, Tree Sparrow (winter), Field Sparrow, Vesper Sparrow, Savannah Sparrow, Grasshopper Sparrow, Bobolink, Indigo Bunting, Eastern Meadowlark, swallows, Purple Martin, shrikes
	Pasture	N/A
	Blueberry field	N/A
	Gravel Pit; exposed soils, excavations	Wild Turkey, Mourning Dove, and Finches (for grit); swallows (wet mud for nest building); Horned Lark, Snow bunting, Lapland Longspur
	Log landing	Wrens and sparrows
	Other _____	
WETLAND AND AQUATIC COMPONENT		
System:	Palustrine (Vegetated Freshwater) Wetlands	Willow Flycatcher, Barred Owl, Wood Duck, Black Duck, Mallard, Blue-winged Teal; Common Snipe, Woodcock, Veery, Canada Warbler, Northern Waterthrush
	Lacustrine (Lakes)	N/A
	Riverine (Menunketesuck River, Gatchen Creek)	Great Blue Heron, Louisiana Waterthrush, Acadian Flycatcher

Habitat Attribute	Explanation of Attribute (where applicable)	Species that Prefer these Attributes
	Estuarine (Menunketesuck River Lower Reaches)	Pied-billed Grebe (winter), Double-crested Cormorant, Herons, Egrets, Gadwall, Black Duck (winter), bay ducks, occasional sea ducks, gulls, terns, Osprey
	Marine (off-shore)	Common Loon, Horned Grebe, Red-necked Grebe, Double-crested Cormorant, Sea Ducks, Gulls, Terns, other coastal birds (occasionally Gannets, Shearwaters, Jaegers, Alcids)
Water Depth:		
Open Water	Limetic zone >6.5 feet (2m)	Loons, grebes, diving ducks, cormorants
Aquatic Bed	Littoral zone <6.5 feet (2m) with submerged aquatic vegetation (SAV) present	Feeding substrate for diving and dabbling ducks; geese and swans, shorebirds, grebes, cormorants
Emergent Wetland	Littoral zone <6.5 ft (2m) e.g., <i>Typha</i> or <i>Scirpus</i> present	egrets, herons, Glossy Ibis, Gadwall, Black Duck, Willet, rails, Marsh Wren, seaside and Sharp-tailed Sparrows.
Scrub-shrub wetland	Littoral zone <1.5 ft (0.5 m)	Green Heron; Black-crowned Night Heron
Seasonally wet/flooded		Shorebirds, herons, egrets, waterfowl
Intermittent drainage (springs and seeps)		Woodcock, snipe, veery
Bottom Composition:	Bedrock	Feeding substrate for Purple Sandpiper (winter)
	Boulder-Cobble	Feeding substrate for Purple Sandpiper, Ruddy Turnstone (winter), American Oystercatcher (cobble areas in summer)
	Gravel-Sand	American Oystercatcher, Ruddy Turnstones, plovers, sandpipers
	Silt-Organic	plovers, sandpipers
Adjacent Riparian Vegetation	Aquatic Bed	waterfowl, coastal birds, Osprey, herons, egrets
	Unconsolidated Shore	plovers, sandpipers, gulls, terns, Merlin (winter foraging), Peregrine Falcon
	Emergent Wetland	Herons, egrets, Black Tern (migration), rails, sharp-tailed sparrows, Seaside Sparrow, Marsh Wren, Red-winged Blackbird
	Moss-Lichen wetland	N/A
	Scrub-shrub wetland	Green Heron, Black-crowned Night Heron,
	Forested wetland	Red-shouldered Hawk, accipiters, Red-bellied Woodpecker, Screech Owl, Spotted Sandpiper, Louisiana Waterthrush
	Upland non-forest	Solitary and Spotted Sandpipers (nesting); waterfowl (nesting);
Other Attributes:		

Habitat Attribute	Explanation of Attribute (where applicable)	Species that Prefer these Attributes
Structures	Building crevices, chimneys, overhangs, shelves, ledges, etc.	Rock Pigeon, Starling, House Sparrow, Chimney Swift (chimneys); American Robin and Eastern Pheobe (ledges and shelves),
Nest Boxes	Requires appropriate design for target specie(s)	Barn Owl, Barred Owl, Starling, Eastern Bluebird, Black-capped Chickadee, Tufted Titmouse, White-breasted Nuthatch, Tree Swallow, Purple Martin, House Wren, House Sparrow
Flower Beds	Red tubular flowers	Ruby-throated Hummingbird
	Composites that have gone to seed	Variety of passerines incl. woodpeckers, Blue Jay, Black-capped Chickadee, Tufted Titmouse, White-breasted Nuthatch, Goldfinch, Pine Siskin, House and Purple Finches, Grosbeaks, Cardinals, various sparrows
Conifer Cones	Large Cones such as Spruce and Pitch Pine	Crossbills (winter)

1 Adapted from DeGraaf and Yamasaki, 2001

2 From one or more of the following sources: Terres, 1980; DeGraaf and Yamasaki, 2001; DeGraaf et. al. 1991;

APPENDIX D

CT NATURAL DIVERSITY DATABASE CORRESPONDENCE



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION



Bureau of Natural Resources
Division of Wildlife
79 Elm Street, 6th Floor
Hartford, CT 06106
Natural Diversity Data Base

August 12, 2007

Mr. Anthony J. Zerbe
Maguire Group, Inc.
One Court Street
New Britain, CT 06051

re: Important Bird Conservation Plan for
Stewart B. McKinney National Wildlife
Refuge Meadow Unit in Westbrook,
Connecticut

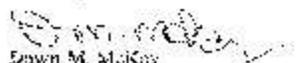
Dear Mr. Zerbe:

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided for the proposed Important Bird Conservation Plan for the Stewart B. McKinney National Wildlife Refuge Salt Marsh Unit in Westbrook, Connecticut. According to our information, there are records for State Threatened *Actitis macularia* (snowy egret) and State Special Concern *Nyroca hirundo* (tern-like tern) and *Actitis macularia* (snowy egret) from the vicinity of the project boundaries. We also have historic records for State Endangered *Orquiza perisoreus* (least shore) from this area of Westbrook. I have sent your letter to Jerry Dickson (DEEP Wildlife #014-675-8133) for further review. Mr. Dickson will write to you directly with his comments.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department's Geological and Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, update existing data. Such new information is incorporated into the Data Base as it becomes available.

Please contact me if you have further questions at 434-1252. Thank you for consulting the Natural Diversity Data Base. May be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEEP for the proposed site.

Sincerely,


Dawn M. McKay
Biologist/Environmental Analyst

cc: Jerry Dickson, NDDB # 15610

Division of Wildlife
79 Elm Street, 6th Floor
Hartford, CT 06106
Tel: 860-434-1252
Fax: 860-434-1253

APPENDIX E

AVIFAUNA OF MANAGEMENT CONCERN AND OPPORTUNITIES FOR POTENTIAL BENEFICIAL MANAGEMENT

Avifauna of Management Concern and Opportunities for Potential Beneficial Management

Species	Constraints to Conservation Through Habitat Improvement	Opportunities for Potential Beneficial Management
Common Loon	No suitable wintering or breeding habitat within IBA	Enhance anadromous fish runs on the Menunketesuck River
Pied-billed Grebe	Lack of extensive submerged aquatic vegetation beds	Reduce anthropogenic sources of sedimentation and turbidity to allow establishment of submerged aquatic vegetation beds
Great Egret	Distance of salt marsh (foraging habitat) from breeding colonies (offshore islands)	Protect salt marsh habitat and other coastal wetlands
Snowy Egret	Distance of salt marsh (foraging habitat) from breeding colonies (offshore islands)	Protect salt marsh habitat and other coastal wetlands
Little Blue Heron	Distance of salt marsh (foraging habitat) from breeding colonies (offshore islands)	Protect salt marsh habitat and other coastal wetlands
Yellow-crowned Night Heron	Distance of salt marsh (foraging habitat) from breeding colonies (offshore islands)	Protect salt marsh habitat and other coastal wetlands
American Black Duck	Impact associated with hunting and use of lead shot	Maintain/Protect existing coves and tributaries along Menunketesuck River; inform hunting community on the conservation status of this species
Sharp-shinned Hawk	None identified	Allow establishment of natural edges and ecotones between various habitats
Northern Harrier	Limited extent of salt marsh does not meet the minimum area requirement for nesting harriers	Conserve salt marsh as winter foraging site
Peregrine Falcon	Lack of nesting site attributes (cliff faces, tall buildings or bridges)	None Identified
Northern Bobwhite	Loss of eggs and young by domestic pets, rats, and other opportunistic predators	Not a recommended site for management of this species
Black Rail	Lack of grasslands adjacent to salt marsh habitat	Protect existing salt marsh; prevent conditions that encourage growth and spread of <i>Phragmites</i> ; control <i>Phragmites</i>
Clapper Rail	Invasive species (e.g., <i>Phragmites</i>)	Protect existing salt marsh; prevent conditions that encourage growth and spread of <i>Phragmites</i> ; control <i>Phragmites</i>
American Golden Plover	Unsuitable breeding site. IBA lies south of known breeding range and lacks breeding habitat (northern tundra);	Protect intertidal flats and salt marsh as migratory stopover site
Piping Plover	No suitable habitat noted within IBA	N/A
American Oystercatcher	No suitable habitat noted within IBA	N/A
Solitary Sandpiper	Limited extent of freshwater wetlands	Conserve, maintain, protect existing salt pannes, woodland pools, and mud flats
Upland Sandpiper	No suitable breeding habitat within IBA. Limited stopover habitat	N/A
Whimbrel	No suitable breeding habitat within IBA.	Protect existing salt marsh as migratory stopover habitat

Hudsonian Godwit	No breeding habitat within IBA. Limited stopover habitat	None identified
Marbled Godwit	No breeding habitat within IBA. Limited stopover habitat	None identified
Ruddy Turnstone	No breeding habitat within IBA. Limited stopover habitat	None identified
Red Knot	No breeding/ migratory stopover habitat in IBA.	None identified
Sanderling	No breeding/ migratory stopover habitat in IBA.	None identified
Stilt Sandpiper	Outside range of normal occurrence, limited habitat	Protect/conservate salt pannes
Buff-breasted Sandpiper	No breeding habitat within IBA. Limited stopover habitat	Protect, conserve mud flats and salt marsh
Short-billed Dowitcher		Protect/maintain intertidal flats
Wilson's Phalarope	Outside range of normal occurrence, limited habitat	Protect/maintain intertidal flats and salt pannes
Least Tern	Breeding habitat – barrier beaches, sand spits, and spoil islands – does not occur within the IBA	Establish/ enhance existing anadromous fish runs; protect water quality within Menunketesuck River
Roseate Tern	Unsuitable for breeding due to persistent and heavy human and pet disturbance, competition with gulls	Establish/ enhance existing anadromous fish runs; protect water quality within Menunketesuck River
Common Tern	Unsuitable for breeding due to persistent and heavy human and pet disturbance, competition with gulls	Establish/ enhance existing anadromous fish runs; protect water quality within Menunketesuck River
Black Skimmer	Development of downstream reaches of Menunketesuck River may preclude estuarine reaches from providing suitable foraging habitat.	Establish/ enhance existing anadromous fish runs; protect water quality within Menunketesuck River
Black-billed Cuckoo		Conserve/develop dense undisturbed shrub thickets
Common Barn Owl	Requires structures for nesting	Construct and install suitable nest box ²⁷
Northern saw-whet Owl	Needs area of coastal thickets	Conserve coastal thickets and Juniper groves for winter cover
Short-eared Owl	Limited extent of salt marsh apparently unsuitable as nesting habitat	Conserve salt marsh areas as winter foraging habitat; reduce human disturbance
Whip-poor-will	vulnerability to abundant predators (rats, cats, dogs, raccoons, etc.) and deer overgrazing	Maintain low, dense undisturbed shrub thickets adjacent to forest openings
Red-headed Woodpecker	Competition with starlings for nesting cavities	Conserve limbs or trees with natural cavities
Hairy Woodpecker	Forest fragmentation; loss of mature woodland	Protect forest interiors and large forest blocks; Conserve/manage larger dead or dying trees
Olive-sided Flycatcher	IBA does not offer preferred habitat or special habitat requirements	Not a recommended site for management of this species
Willow Flycatcher	Brown-headed Cowbird parasitism	Maintain dense understory at shrubland management area
Eastern Wood-Pewee	Brown-headed Cowbird parasitism	Conserve forest interiors and large forest blocks
Acadian Flycatcher	Limited closed canopy forested riparian habitat	Conserve forests along upper reaches of streams within the watershed
Least Flycatcher	Brown-headed Cowbird parasitism	Protect large forest blocks and forest

²⁷ If IBA contains a population of Least Shrew, then it may not be desirable to attract and encourage nesting Barn Owls

		interior as breeding and migration habitat
Great Crested Flycatcher	None identified	Protect forested areas as breeding and migration habitat
Eastern Kingbird	None identified	Maintain tall shade trees overhanging open water
Horned Lark	Lack of barren land habitat with little to no disturbance	Protect salt marshes as potential migratory stopover habitat
Purple Martin	Competition with other colonial cavity nesting species (e.g., House Sparrow)	Maintain suitable breeding boxes; evict non-native House Sparrows from nest boxes
Marsh Wren	Limited habitat	None Identified
Sedge Wren	Limited habitat; outside of breeding range	IBA not a suitable site for management of this species
Wood Thrush*	Forest fragmentation; Brown-headed Cowbird parasitism; invasive plants	Protect large forest blocks and forest interior; Maintain or increase woodland areas with sapling/shrub understory; release <i>Prunus serotina</i> ; plant native, fruiting shrubs.
Bicknell's Thrush	Does not breed in IBA. IBA lies south of known breeding range in New England and lacks breeding habitat (spruce/fir forest)	Maintain/protect forest areas as potential migratory stopover habitat
Veery	Forest fragmentation; Brown-headed Cowbird parasitism; invasive plants	Protect large palustrine forested wetlands and forest interior; maintain or increase woodland areas with sapling/shrub understory
Brown Thrasher	Loss of shrubland habitat	Conserve or enhance coastal thickets and shrub ecotones throughout IBA; control invasives.
Gray Catbird	Predation from house cats, raccoons, etc in residential areas; cowbird parasitism;	Maintain dense understory for cover; provide fruiting shrubs for food; control invasives
Blue-winged Warbler	Cowbird parasitism	Maintain/protect existing ecotones and early successional habitat
Golden-winged Warbler	Preferred breeding habitat – damp fields of dense vegetation including thick grass, clumps of brushes and briars, deciduous damp woods (DeGraaf and Yamasaki, 2001) – limited within the IBA; Brown-headed Cowbird parasitism; competition with Blue-winged Warbler	Conserve moist shrubby areas as potential migratory stopover habitat
Chestnut-sided Warbler	Limited areas of early successional shrubland/ understory ecotones for both breeding and migration cover	Maintain early successional shrubland/ understory ecotones
Cape May Warbler	Unsuitable breeding site. IBA lies south of known breeding range and lacks breeding habitat (spruce/fir forests)	Maintain; conifers and forested areas migratory stopover habitat
Black-throated Blue Warbler	Forest fragmentation; Brown-headed Cowbird parasitism; invasive plants	Maintain/enhance shrub layer within forests as migratory stopover habitat
Blackburnian Warbler	Unsuitable breeding site. IBA lies south of known breeding range and lacks breeding habitat (spruce/fir forests)	Maintain; conifers and forested areas as migratory stopover habitat
Pine Warbler	Limited conifer forest area	Protect tall pines within and adjacent to IBA

Prairie Warbler	Limited xeric early successional habitat; Brown-headed Cowbird parasitism	Maintain early successional shrubland areas as migratory stopover habitat
Bay-breasted Warbler	Unsuitable breeding site. IBA lies south of known breeding range and lacks breeding habitat (spruce/fir forest)	Conserve forested areas as migratory stopover habitat
Cerulean Warbler	Forest fragmentation; Brown-headed Cowbird parasitism; invasive plants	Conserve coastal forest as a gateway to migratory corridor
Black-and-White Warbler	Forest fragmentation; Brown-headed Cowbird parasitism; invasive plants; deer overgrazing; mammalian predation	Conserve large forest blocks and forested interior
Prothonotary Warbler	Limited nesting habitat; outside (north) of normal breeding range	Protect large palustrine forested wetlands; conserve standing dead wood with natural cavities
Worm-eating Warbler	Forest fragmentation; Brown-headed Cowbird parasitism; invasive plants	Establish/maintain shrub layer and understory within forested hillsides
Ovenbird	Forest fragmentation; Brown-headed Cowbird parasitism; invasive plants	Conserve large forest blocks and forested interior
Louisiana Waterthrush	Limited riparian habitat for breeding	Conserve forest cover along upper reaches of Menunketesuck River and Gatchen Creek
Canada Warbler	IBA lies outside of typical breeding areas in CT (Clark, 1994)	Maintain dense shrub layers within wetland systems inside the IBA
Yellow-breasted Chat	Limited dense shrubland coverage along a freshwater drainage; Brown-headed Cowbird parasitism	Conserve thickets in riparian wetlands
Scarlet Tanager	Forest fragmentation; Brown-headed Cowbird parasitism	Conserve large blocks of mature forests and forest interiors
Eastern Towhee	Brown-headed Cowbird parasitism; invasive plants	Conserve/maintain dense shrublands and <i>Smilax</i> thickets
Seaside Sparrow*	Limited extent of low salt marsh habitat	Protect existing salt marsh as migratory stopover habitat
Saltmarsh Sharp-tailed Sparrow	Sea level rise; spread of invasive plants	Conserve existing high salt marsh areas which are used by this species for breeding, post breeding dispersal, and migratory stopover habitat; prevent conditions that encourage growth and spread of <i>Phragmites</i> ; control <i>Phragmites</i>
Nelson's Sharp-tailed Sparrow	Sea level rise; spread of invasive plants	Conserve existing high salt marsh areas as migratory stopover habitat
Grasshopper Sparrow	Required breeding habitat – expansive dry grasslands dominated by warm-season grasses interspersed with bare ground patches – does not occur within the IBA	Providing shrub land interspersed with grasses and forbs will benefit mixed-species flocks of sparrows during winter and migration. These flocks sometimes include this species at coastal locations
Savannah Sparrow	Limited extent of grasslands within the IBA	Grassy areas at coastal locations may provide some limited wintering habitat
Ipswich Sparrow	Required breeding and wintering habitat – dunes dominated by beach grasses, do not occur within the IBA	N/A
Vesper Sparrow	Required breeding habitat – expansive, dry, sparse, warm-season grasslands interspersed with bare ground patches – does not occur within the IBA	Providing shrub land interspersed with grasses and forbs will benefit mixed-species flocks of sparrows during winter and migration. These flocks sometimes include this species at coastal locations
Henslow's Sparrow	Believed extirpated from Connecticut	Conserve salt marsh edges, prevent

	(CTDEP, 2004). No suitable breeding habitat in IBA (expansive dense herbaceous vegetation with moderate amounts of moisture)	establishment and spread of <i>Phragmites</i> from development
Field Sparrow	Limited habitat – dry old field areas – within the IBA	Conserve/maintain late successional “old field” grasslands. Providing shrubland interspersed with grasses and forbs will benefit mixed-species flocks of sparrows during winter and migration. These flocks sometimes include this species at coastal locations
Swamp Sparrow	Limited area of dense shrub/scrub wetland with native understory	Conserve/maintain dense understory within wetland areas as breeding and migratory stopover habitat
Dickcissel	IBA lies outside normal breeding range.	Providing shrub land interspersed with grasses and forbs will benefit mixed-species flocks of sparrows during winter and migration. These flocks sometimes include this species at coastal locations
Eastern Meadowlark	Required breeding habitat – expansive, dry, warm-season grasslands interspersed with thick areas – does not occur within the IBA	N/A
Rusty Blackbird	Unsuitable breeding site. IBA lies south of known breeding range and lacks breeding habitat (boreal bog wetlands)	Conserve palustrine scrub/shrub wetlands as potential winter habitat
Orchard Oriole	Cowbird parasitism; Loss of tall shade trees	Conserve and protect some taller trees amidst dry, early successional habitat
Baltimore Oriole	None identified	Maintain/protect existing tall shade trees esp. those adjacent to water
Purple Finch	No suitable breeding habitat	Conserve conifers which provide roost areas during migration