An Ecological Inventory of Pattagansett Marshes Preserve East Lyme Connecticut

by

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The Nature Conservancy Connecticut Chapter

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I. INTRODUCTION

Pattagansett Marshes Preserve, owned by The Nature Conservancy, Connecticut Chapter, is situated in East Lyme, Connecticut. During the summer of 1975, an ecological inventory was conducted on the preserve as part of the Student Internship Program, sponsored by the Connecticut Chapter. This report and the accompanying maps present the results of the inventory.

Pattagansett Marshes lies at the mouth of Pattagansett River, a small coastal stream that feeds into Long Island Sound (latitude 41°18'0" north, longitude 72°13'30" west, USGS Topographic Map, Niantic Quadrangle, 7.5 minute series, 1958, photorevised 1970). The preserve occupies 48 acres of land, with another 18.5 held in conservation easement. Access to the marsh is by foot along Old Black Point Road, although automobiles bearing Conservancy identification can be parked in the lot owned by the Old Black Point Association. Watts Island, in the middle of the marsh, can be reached by boat at high tide.

The preserve, which occupies approximately half of the marsh area, was acquired by donation, purchase, and easement. Three pieces, ranging in size from 1.5 to 13.8 acres, were donated in fee simple between 1966 and 1972. The donors of this land were James J. Wadsworth, Alice W. Strong, Trowbridge and Alice Strong, Ernest and Marion Bigelow, Huntington and Rosemary Lyman, Anne and William Carlin, David H. Malmfeldt, Frederic L. Way, and Roderick Washburn. Purchases of land in fee simple were made from Russel D. Reddig, Margaret B. Smith, Stephen, William, and Anna Bond, and Dr. John T. Lambert, in parcels of 5 to 12 acres. Conservation easements were given to the Conservancy on 18 acres of land owned by the Old Black Point Association, and one-half acre owned by Russell and Barbara Brown.

The preserve consists of a mixture of tidal salt marsh, xeric coastal forest, primary sand dunes, and island rock outcrops. With this diversity of habitat, the area is able to support a rich and varied flora, which attracts numerous birds, fish, and invertebrates. The estuary is a particularly productive ecosystem, with constant flow of nutrients and energy exchanges. The preserve contains a large rocky island known as Watts Island, as well as a series of smaller outcrops known as Long Ledge in the southwest. Along the southern perimeter there is a primary dune with numerous rock outcrops, which closes the mouth of the estuary.

The land surrounding the preserve is developed for low density residential and summer houses, except for the more built-up area at Giant's Neck to the west. Old Black Point Road runs down the eastern side of the marsh. The Penn Central Railroad tracks border on the north side of the marsh, and the Old Black Point Association Beach Club property lies to the south along the primary dune. To the west are several rocky islands—Griswold Island, Huntley Island, and Long Rock—used for summer homes and in-season anchorage for pleasure boats.

Pattagansett Marshes lies in the northern temperate zone, but its climate is made somewhat milder by its coastal location. The annual mean temperature for the area is 49.3°F; the annual mean precipitation is 45.73 inches. The mean tide level is 3.0 feet, and the frost-free growing season 190 days (source: U.S. Department of Commerce Climatological Data, 1970, Groton Station).

The geology, soils, water, vegetation, and fauna were inventoried by

six students and a soil scientist. Evan Griswold, an ecologist from Yale University, surveyed the vegetation and flora with the assistance of Amy Zinsser, a volunteer. Mary Barrett and Wendy Silver, geologists from Wesleyan University under Professor Dupré, conducted water quality tests in June and August, and they mapped the bedrock and surficial geology in July. Diane Calabrese and Veronica Picchi, entomologists from the University of Connecticut under Professor Slater, surveyed the Hemiptera (Insecta) or true bugs present from June 1 to mid-October, as an index of the stability and diversity of the area. The soil survey was conducted in August by Phillip Gale, soil survey party leader in the Soil Conservation Service. The Student Internship Program was coordinated and directed by Charles Scott and Arthur Weissman of The Nature Conservancy.

II. HISTORY

The geologic and natural history of Pattagansett Marshes follows closely the typical pattern of post-glacial sea-level rise. Pattagansett represents a section of drowned coastline with sediments washed into protected bays to form the basis for marsh-building by grasses and other marsh plants. As the last glacial ice departed from the area, swift-running meltwater laid down coarse sand and rocks to form an underlayer of glacial debris upon which the present marsh rests. Over the centuries, the marsh has kept pace with the gradual rise in sea level. The presence and continuation of Pattagansett Marshes relies on its protection from direct wave action by the primary dune to the south. This dune has been built by littoral currents carrying sand along the shore and depositing it as the water slows down after rounding Black Point. Should this protective dune be removed, the marshes behind would soon erode away.

The area of the Pattagansett River and marshes was first peopled by Niantic Indians, who used the shoreline during the spring and summer months for fishing, hunting shorebirds and waterfowl, and growing crops. Much of the fish was dried for the winter, while the rest was either eaten or used for fertilizer. The Indians also harvested the extensive shellfish beds in the marsh.

With the coming of the English settlers, the Indians withdrew from the area or settled on reservations. Black Point was one such reservation. In 1672, Black Point was set aside for the Niantics to fish, hunt, and grow corn.

The farmers in the area used the marshes to graze their cattle and cut salt hay, which they did first by hand and later with horse-drawn machinery. Special wooden platforms had to be fitted on the horses' shoes to prevent them from sinking into the boggy peat. The hay was usually stacked on ricks on the marsh to dry above the tides.

Over the years fishing grew in importance as a commercial enterprise in the area. Boats from Niantic, Old Lyme, and New London would come into Niantic Bay to fish. Between 1840 and 1880, there were as many as fifty boats from Niantic alone. These were small sailing and rowing craft.

In 1852 railroad tracks were laid to the north of the marsh and trains began service. The first tracks across the marsh were laid on stout wooden pilings driven into the peat and underlying gravel. These pilings did not restrict the normal flow of the tides as the present roadbed now does. These pilings can still be seen today running parallel to the present tracks.

In 1870, the Luce brothers made fish oil and fertilizer in a small plant on Giant's Neck, just to the west of the Pattagansett River estuary. Fish were especially abundant during the alewife and salmon runs in the spring. Shad, menhaden, bass, and bluefish could also be caught in the marsh and off-shore waters.

By the late 1890's, Black Point was established as a resort community, and attracted summer visitors from New York, Hartford, and Philadelphia. The Black Point Association was formed to regulate access to the Point and to govern the activities of a thriving resort community. Little has changed there since that time, except for the increase in houses and paved roads. The Beach Club cabanas were constructed on the dune sometime in the 1920's and have been maintained through the years as a swimming area for the summer people.

A fire burned the dune forest in 1970 and destroyed the vegetation from the Beach Club parking lot to the middle of the dune, south of the road. Another fire burned parts of Watts Island, beginning on the headland and running across the marsh to the hummocks. This occurred seven or eight years ago.

III. PHYSICAL ENVIRONMENT

Geology

Pattagansett Marshes Preserve lies in the Eastern Highland region of Connecticut in a metamorphic area that has been thoroughly studied and mapped by the U.S. Geological Survey. Information from their maps of the Niantic quadrangle was used in the study of the Pattagansett Marshes.

The preserve is underlain by five different metamorphic bedrock formations. From oldest to youngest (and west to east on the preserve) these units are: biotite granite gneiss, Alaskite gneiss, Mamacoke Formation, Monson Gneiss, and Brimfield Schist. The former two are of Pre-Pennsylvanian age, the latter three of Pre-Silurian age. The units are part of a syncline whose axis runs through the Brimfield Schist formation.

The biotite granite gneiss is found on the tip of the primary dune and throughout all of Long Ledge. It is also present on the mainland to the north. It is a grey, medium-grained granite gneiss composed of quartz and oligoclase and lesser amounts of microcline and biotite.

To the east lies the Alaskite Gneiss, an orange-pink to light-grey, fine- to medium-grained equigranular gneissic granite composed of approximately equal amounts of quartz, microcline, and albite to sodic oligoclase. This unit is present under the dune, on the western side of Watts Island, and on the mainland to the north.

The next youngest unit, the Mamacoke Formation, is also present under the dune, underlying Watts Island, and on the mainland.

The Monson Gneiss, the next unit to the east, underlies part of the dune, Watts Island, the westernmost corner of the island to the north of Watts Island, and the mainland. It is grey to dark-grey, medium- to coarse-grained, distinctly to indistinctly layered, and locally massive. The mineral components of the Monson Gneiss are biotite, hornblende, quartz, and plagioclase.

The fifth unit, Brimfield Schist, is not present in outcrops on the preserve, but the U.S.G.S. map indicates that it underlies the eastern side of Watts Island and the smaller island to the north. Black Point is underlain by this grey to dark-grey, sillimanite- and garnet-bearing schist and gneiss.

The surficial deposits on the Pattagansett Marshes Preserve are less varied than the bedrock types. Loose to compact, silty, sandy, stony till covers the upland western portion of Watts Island. The primary dune is covered by well-sorted sand and gravel beach deposits at water's edge and well-sorted dune sand farther up. The remainder of the preserve is covered by salt-marsh deposits of partly decomposed organic material mixed or interbedded with estuarine silt, mud, and sand. This unit is probably less than ten feet thick, according to information from the U.S.G.S. surficial geology map of the Niantic quadrangle.

Soils

The majority of the soils of the Pattagansett Marshes system are classified as Tidal Marsh soils. The specific soil at this marsh is Westbrook peat, which lies along the coastline and is flooded during high tides. It occurs in flat marshy areas vegetated by various salt marsh plants, especially

Spartina patens and Spartina alterniflora. The death each year of the roots and stems of these plants adds organic matter to the soil, keeping pace with the gradual rise in the mean sea level.

Marsh peat is exposed to the air during low tides, and is covered again at high tide. Because of this periodic flooding at short intervals, and because of the fineness of the material of which it is made, this soil is constantly wet. It consists of several inches to a few feet of boggy organic material overlying sandy or loamy mineral deposits, in particular, glacial tills. As a consequence of lying so near the coast, the marsh peat at Pattagansett has a high salt content. Also, because of the constant wetness of the soil, it is severely lacking in oxygen and high in sulfides, giving the peat the familiar "rotten egg" odor. Only directly around the marsh grass roots is there any oxidation of the soil.

On the south end of the marsh is a sandy primary dune held in place by beach grasses above the high tide line and a low, shrubby coastal forest community behind the beach. The soil here is well washed, coarse sand with a thin black humus layer at the surface. This soil is excessively well-drained with a very low cation exchange capacity. Consequently, the plants derive some nutrients from the thin organic layer at the surface, but mostly from aerosols borne in from the ocean by the wind.

On Watts Island, behind the small sand beach on the southwest side, coarse sand has been washed by waves over the peat and has formed a semicircular ridge. This ridge is approximately 25 inches thick and vegetated by Phragmites communis and Iva frutescens, indicating the micro-elevation difference on this area of the marsh.

The soils on the headland and hummocks of Watts Island are classified as Hollis sandy loam with rock outcroppings. The soil here is very thin and stony with variable slope. These areas are vegetated by xeric coastal forests of stunted oaks, shadbush, and other associated trees, shrubs, and herbs. The vegetation for the most part reflects the edaphic conditions, especially the understory shrubs and herbs which tend to have narrower ecological niches.

Water

Pattagansett Marshes is an estuarine-tidal marsh system at the mouth of Pattagansett River. The river is a small coastal stream that drains from the Eastern Connecticut Basin; it originates in the upland area of northern East Lyme and runs for about five miles, touching the city of Niantic, until it flows into Long Island Sound. Thus, water in the marsh is influenced both by the cycle of tides that bring in salt water from the Sound, and by the fresh water that flows from upland areas distant from the marsh.

Once in June and again in August, water in various locations of the preserve was tested for temperature, pH, dissolved nitrate and phosphate, dissolved oxygen, and suspended sediment. In August, water in the marsh was also tested for coliform bacteria and for heavy metals content. The results of these tests indicate that water quality is high, except that suspended sediment and iron content are excessive, as to be expected in a marsh (see Fig. 1).

Tests were made in three different types of habitat: a tidal pool on rocks at the end of the dune, a salt panne in the marsh, and the marsh itself.

The water tended to be fairly alkaline, with pH's well above 7. The dissolved oxygen content was high in the marsh itself, but lower in residue pools, as expected from stagnation. While nitrate and phosphate concentrations were negligible, suspended sediment values were very high, indicating that precipitated salts and peat are mixed in the water. Heavy metals concentrations, as measured by atomic absorption spectroscopy, were 0.2 ppm for copper, 0.1 ppm for zinc, 0.05 ppm for manganese, and 0.6 ppm for iron; maximum concentrations for drinking water are 1 ppm, 5 ppm, 0.05 ppm, and 0.3 ppm, respectively.* Only iron is above the recommended level, but excessively high values may result from experimental error, since saline and brackish waters contain sodium, which causes interference in the test.

Qualitative tests for coliform indicated that the water was not contaminated. Most of the coliform was Escherichia freundii, which is of non-fecal origin. These results coincide with the Bathing Beach Survey tests conducted by the State Department of Health in 1974, which found water in the marsh free of pollution. For example, at testing stations around Watts Island, average coliform content per 100 ml. ranged from 10 to 50. Around the dune and beach, values were between 8 and 10. Sanitary bathing water has a coliform count less than 200.

*Heavy metals tests were performed by Beth Penney, another student intern.

Fig. 1 Results of Water Quality Tests

	Date	Time	Weather	Temperature	pH	Nitrate	Phosphate	Dissolved Oxygen	Suspended Sediment
Tidal pool on rocks	6/17/75	12:30	cloudy	23°C	8.6	negligible	negligible	3.88 ppm	-
Salt panne	6/17/75	1:30	cloudy	26.8°C	7.8	negligible	negligible	4.64 ppm	-
Marsh	6/17/75	1:00	cloudy	26.8°C	8.4	negligible	negligible	7.0 ppm	22,600 ppm
Marsh	8/13/75	12:00	sunny	25.5°C	8.1	negligible	negligible	6.16 ppm	16,800 ppm

	Date	Coliform Bacteria	Copper	Zinc	Manganese	Iron
Marsh	8/13/75	*Escherichia freundii* Variety II (non-fecal)	0.2 ppm	0.1 ppm	0.05 ppm	0.6 ppm

IV. VEGETATION AND FLORA

The vegetation of the Pattagansett Marshes Preserve can be divided into four clearly definable units. To the south of the marsh lies a classic example of a stabilized primary dune. The vegetation on this dune reflects the excessively dry condition of the soil, which is for the most part made up of coarse sand. It is also characterized by a pruned appearance, which is a function of the nearly constant salt-laden winds. The marsh vegetation follows the typical pattern for coastal salt marshes in Connecticut, with a definable gradient of wetness and salinity that closely mirrors differences in the micro-relief of the marsh surface. On Watts Island there are three patches of xeric coastal forest, dominated by oaks, hickories, and other plants that reflect the thin, dry soil. Along the eastern edge of the marsh, between the salt meadows and Old Black Point Road, is a strip of trees and shrubs on fairly moist soil. Red maple, cottonwood, black gum, and oaks dominate the overstory here.

Salt Marsh

Seventy-five to eighty per cent of the land area within the Pattagansett Preserve is occupied by salt marsh. This low, wet flat area is frequently flooded at high tide. It is also exposed to extremes in temperature and salinity during the course of a day. These factors limit the number of species of plants which can grow here. The majority of the marsh surface is dominated by the Spartina grasses: patens or salt meadow grass, and alterniflora or saltwater grass. Spartina alterniflora is found in two distinct forms here. Along the creeks and ditches, where the water level reaches at each high tide, a tall form grows to a height of 3-4 feet. Another stunted form grows in shallow depressions in the marsh surface known as pannes. This form is usually no more than a few inches high.

Often associated with the stunted form are other salt-tolerant plants. Among these is another grass, Distichlis spicata or spike grass, Salicornia europaea or glasswort, and Limonium carolinianum or sea lavender. Seaside plantain and arrow grass are also found in these pannes, where the vegetation is normally slightly less dense than on the higher salt meadows. Sea lavender sometimes grows very thickly over these areas, forming low clouds of tiny purple flowers in early August through September.

Spartina patens is the dominant and most frequently encountered species on Pattagansett Marshes. It forms a dense mat of cover which takes on a tousled look by the end of July. For the most part, the salt meadow grass prefers the higher and drier sites of the marsh that are not usually flooded at high tide. In mid-July, it sends up its flowering stalk with a 3-4 inch dark reddish spikelet. It is the first marsh grass to flower and can be easily recognized by this trait. Distichlis is often found in close association with salt meadow grass and is next in abundance on the marsh. It can be recognized by its lighter green hue and preference for moister areas of the peat; as the leaves mature, they tend to curl at the end in a characteristic way. Flowering comes late in the season, beginning around the middle of August when the tall S. alterniflora is also sending out its flowers. Late in the summer, one may find tiny pink seaside gerardia and slender salt-marsh asters poking up through the "cowlicks" of salt hay. Seaside goldenrod may also put out its yellow blossoms on the salt marsh.

Toward the upland, and around higher areas of the marsh surface, Juncus gerardii, or black grass, occurs in patches and belts of various sizes.

Large stands of black grass are found toward the north end of Watts Island, and especially surrounding the patches of Iva frutescens (marsh-elder) which grow there. Black grass—which is not a grass at all, but a rush—derives its name from the dark green of the stem and the dark brown, almost black seed capsules borne in clusters at the top. Patches of this plant are particularly conspicuous in the light green of S. patens and Distichlis.

Iva frutescens occupies the highest portions of the marsh, and is found along the upper borders and along the edges of the mosquito ditches where low levees have built up from sediment trapped by S. alterniflora. Extensive stands of marsh-elder occur on Watts Island, where variations in relief enable it to find a foothold. On the southwest portion of the island, Iva grows on sand that has washed over the peat to form a low, semicircular ridge. It also grows next to rock outcroppings in the marsh, as well as the outermost border of the dry forested hummocks on the island. Panicum virgatum, or switch grass, is often found with Iva at the upper borders of the marsh.

Along the eastern border of the marsh, below Old Black Point Road, freshwater runoff and seepage from the upland causes some changes in the marsh border vegetation. In this brackish interface between the fresh seepage and the tidal salt water, plants more adapted to this situation dominate. Phragmites communis, or tall reed grass, grows in clumps of 30-60 feet in diameter, and appears to be aggressively extending its hold out into the Spartina marsh. Along this edge may also be found Typha (cattails), softstem bulrushes (Scirpus validus), common threesquare (Scirpus americanus), and spikerush (Eleocharis palustris). The presence of big burreed (Sparganium eurocarpum) along the southern portion of the marsh border indicates the freshwater nature of the community here. This pattern is repeated all along the marsh border interface.

Border

The border area itself, between the paved road and the salt marsh, is a varied shrub and forest community averaging approximately 50 feet in width. The trees found here are red maple, black gum, cottonwood, black cherry, hickory, and oak. Oaks and black gum dominate the tree layer of the border, except at the south end where red maple and cottonwood dominate. In the shrub layer, the border is occupied by high bushes of Clethra alnifolia, Viburnum dentatum, Alnus rugosa, Ilex verticulata, and Myrica pensylvanica. Rhus radicans, or poison ivy, is abundant here and shares the rest of the border zone with various other shrubs listed in the Appendix. The herb layer is a mosaic of small patches and intermixing of plants. Field mustard and milkweed are common in the open spaces, as is the tall, prominent Joe-Pye weed.

Several paths and roads open through the border to the marsh. Along these openings, and especially along the earth fill roads into the marsh, the border vegetation extends into the salt meadows. The general character of this zone is one of sufficient moisture and nutrients to support a great diversity of plant species, especially in the shrub and herb strata.

Stabilized Dune

The stabilized dune community occupies the southernmost border of the Pattagansett Marshes. It serves to protect the marsh from the direct onslaught of the ocean and to trap sediments upon which the marsh can build. The dune is composed of a broad sandy beach on the south side, running from the Black Point Beach Club west to a rock outcropping. The action of wind

and waves has thrown up a steep primary dune behind the beach, which is initially stabilized by beach grass (Ammophila) and other beach species along a strip about 15 feet wide. At the western end of the beach the dune is rock-rapped for about 25 feet to prevent a breach in the dune at that point. Above the rock-rap stands a dense clump of Rosa rugosa approximately 100 feet long.

The xeric rock outcropping at the end of the point is vegetated only in narrow fissures where enough soil has accumulated to support plant life. Bayberry, orache, goldenrod, spikerush, poison ivy, and beach plum all may be found here in a stunted condition, due to the shallow soil and pruning effect of the wind.

Behind the beach grass lies a dense coastal forest community composed mainly of shrubs, with a few scattered trees taller than 15 feet. These too are shaped by the salt-laden winds and appear from the beach like a well clipped hedge. The dune forest occupies a north-facing slope with soil that is composed mainly of coarse sand with a thin organic layer on the surface. It occupies the area from the dune crest to the edge of the Spartina marsh to the north, and it is bisected by a sandy road from the Beach Club parking lot to the end of the point at the Rosa rugosa patch. A patch continues to the beach on the south side and to another crescent beach on the north.

The western end of the dune is dominated by Rosa rugosa with an admixture of Rhus radicans, Myrica pensylvanica, Prunus maritima, Rhus copallina, and Vaccinium angustifolium. Both pink and white varieties of R. rugosa are found here. Along the north side of this patch above another stretch of rock-rap are various other shrubs and herbs, including Sambucus canadensis, Rosa carolina, Rhus radicans, Achillea millefolium, and Teucrium canadensis.

From the end of the road east, the vegetation becomes very dense, especially along the upper edge of the dune where the wind shears the branches. The top of the dune is dominated by bayberry, beach plum, and catbrier. Mixed with these shrubs are dewberry vines and pasture rose, which make the vegetation nearly impenetrable, except for the numerous rabbits which inhabit this "brier patch."

Behind this initial 15-30 feet, the effect of the wind diminishes and the trees, mainly black cherry, begin to dominate. Bush honeysuckle dominates in the understory, and the trees support thick vines and creepers. Shadbush and winged sumac also comprise part of the tall shrub stratum along the western portion of the dune. The eastern half, south of the road, was burned in 1970, destroying the tree cover and encouraging the fire-adapted vegetation to take over. Bayberry and huckleberry are particularly abundant here. In this burned area, rabbits appear to be heavily browsing the Smilax and seem to be creating and maintaining open sandy patches in the cover.

On the north side of the road to the marsh edge is a high shrub community with patches of grasses and forbs. The species composition follows the rest of the dune fairly closely with the addition of the open grass toward the salt marsh border. Sassafras albidum increases its cover percentage markedly in this zone.

Xeric Coastal Forest

The coastal forest communities are found on Watts Island on a rocky headland at the west edge of the island, and on two hummocks which protrude from the center of the marsh. The vegetation reflects the thin soil and rock

outcroppings of these areas. The headland has also been burned and shows evidence of this event in numerous stump sprouts. Mr. William Carlin of Old Black Point reports that these fires occurred on the island about 7 or 8 years ago. Stump sprouts on the north end of the headland can be aged at about fifteen years, indicating that there was an earlier fire at that time.

The xeric headland of Watts Island is bordered on the west by a strip of eroding salt marsh, dominated by S. patens, J. gerardii, and S. alterniflora. This strip is from 6 to 60 feet in width. Sea lavender is frequent here and forms dense clumps along the edge of the eroding peat. Rockweed (Fucus vesiculosis) attaches itself to the edge of the peat as well as along the more rocky margins of the headland.

Above this marsh is a bare rock zone in which small cracks and fissures harbor several different kinds of plants, including poison ivy, bayberry, black grass, late low blueberry, switch grass, and goldenrod. A rock outcropping extends all along the west edge of the headland.

To the east of the rocks is the coastal forest community, dominated by white and black oak, shadbush, mockernut hickory, and speckled alder in the tree stratum. The shrub layer is dominated almost exclusively by black huckleberry (Gaylussacia baccata) and late low blueberry. Winged sumac, pasture rose, beach plum, and poison ivy occupy the southern end of the forest area, bordering the bare rock.

A ridge runs along the top of the headland from north to south. This is vegetated by nearly pure stands of huckleberry and shadbush with scattered oaks and sassafras. Poison ivy and bayberry are abundant along the lower margins of this zone on the north end of the headland. Along the top of this ridge are several bare rock outcroppings, the margins of which are covered by rock spikemoss (Selaginella rupestris), which forms dense carpets over the rock.

Toward the north end of the headland on the east side of this ridge is a steep rock face approximately 15 feet high and 60 feet long. Below this face stands a dense grove of Clethra alnifolia under larger oaks and hickories. Mountain laurel also makes up part of the understory in this wetter area with apparently deeper soil.

The hummocks occupy ancient hilltops which have been drowned by the rising sea level and surrounded by salt marsh. Concentric bands of vegetation surround the interior oak-hickory forest. The outer band is composed of pure Iva which marks the border of the marsh. Interior to this zone is a band of poison ivy which grows to 6 feet and is very dense. The middle of the hummocks are occupied by mixed shrubs and stunted trees, dominated by oaks and shadbush.

The south hummock consists of a low rock outcropping 3-4 feet high. It is approximately 140 feet north to south by 95 feet east to west, and best shows the concentric bands of vegetation. On the west side of the hummock there are wide patches of black grass in the marsh. Above the Iva may be found several groundsel tree bushes (Baccharis halimifolia), another shrub commonly associated with the upland borders of salt marshes. It is the only location of the marshes, however, where this particular species is found. The forest zone is dominated by scarlet oak and shadbush. Also present are white oak, black cherry, and post oak. The oaks are growing from stump sprouts, indicating that the hummock was subjected to fire over a

decade ago.

The north hummock is slightly over twice as large as the south hummock, and the soil appears to be able to support much larger trees. A 50-60 feet band of Iva surrounds the hummock, with poison ivy and winged sumac intermixed on the south end. Shadbush and sassafras dominate the understory, except at the extreme north where pepperbush becomes more abundant. White oak, mockernut hickory, and scarlet oak dominate in the tree layer, with black oak and sassafras also abundant. There are large patches of huckleberry, poison ivy, and bayberry in the shrub stratum, while asters, goldenrod, and bracken fern make up the largest component of the herb layer. A small camping or picnic area at the south end of the hummock contains a stone fireplace and woodpile. Around this disturbed spot the vegetation is composed mainly of low grasses. There is also evidence here of extensive browsing by deer on sassafras and white oak.

The vegetation of Long Ledge follows closely that of the other rock outcroppings. A large patch of poison ivy on the middle island should be watched closely, as it appears to be spreading rapidly.

V. FAUNA

General

Pattagansett Marshes Preserve supports a rich community of fauna, particularly of birds and invertebrates. The tidal flats, dune thickets, and rocky forests are excellent habitat for waterfowl, song birds, and shore birds. Many species of saltwater fish and shellfish use the marsh as a breeding ground, while numerous insects reside in the diverse habitats and various host plants found in and around the marsh.

In this study, a formal survey was made of the insect order Hemiptera. The specific relationship between these insects and their host plants provide useful ecological data about the preserve, since changes in the number and kinds of these species may indicate changes in the dynamics of the vegetation. Thus, an inventory of this kind serves as a basis from which future changes may be measured.

During the summer, an informal record was kept of other animal species noted in the field. This appears in Appendix A. Of particular note are the many shore birds present at each visit to the preserve. The diversity of bird species at Pattagansett Marshes is borne out by a more formal survey of wildlife conducted by John Tobin, an undergraduate at University of Connecticut, during the fall of 1970. He found over 80 species of birds, with an abundance of waterfowl represented. Osprey were sighted flying around Watts Island, where they have been known to nest in the past. Thus, the two formal faunal surveys to date reveal a wide range of species which inhabit the area.

Hemiptera

The familiar stink bugs, squash bugs, and pondskaters are just a few of the approximately 20,000 species of the insect order Hemiptera (Heteroptera). Around 900 species of this order probably occur in Connecticut. Insects of this group have in common the presence of sucking mouthparts: some suck plant juices, others suck the body fluids of insect prey. Most members of the order are terrestrial, but a few groups are totally or partly aquatic.

Immature Hemipterans after hatching from eggs undergo a gradual transformation to the adult stage, looking and living very much as an adult during each developmental stage, but lacking wings.

The association of these insects with plants, either to feed directly or to locate prey, is often specific. Thus, many of them have become crop pests—for example, the familiar chinch bug, Blissus leucopterus (Say). However, knowledge of numbers and kinds of Hemipterans present in an area provides a good index of the stability and diversity of the area, because of this specific association with plants.

Sampling for Hemipterans was done approximately biweekly between June 10 and October 11, 1975. Vegetation in the area was either swept with an aerial net or beaten to cause insects to fall onto a sheet. Aquatic areas were sampled with a dip-net. Hemipterans were aspirated from the nets and sheet and killed either in 95% alcohol or in a cyanide jar. Immature insects were not retained because the keys needed for identification do not exist.

Insects were mounted and identified using a combination of sources

listed in the Bibliography. No quantitative collecting was done, so numbers reported are relative. The preserve was arbitrarily divided into areas of major vegetation types, and a record was kept of the location in which various Hemipterans were collected.

During the period of collection, 49 species representing 10 families of Hemiptera were collected at Pattagansett Marshes. Almost half of the species collected (24) belong to the family Miridae. The least represented of the families collected are the Reduviidae (see Appendix A).

In alphabetical order the families and species collected are as follows:

-Anthocoridae

This is a small family of Hemiptera, and only about 40 species occur in North America. These true bugs dwell in diverse places: decaying and living vegetation, nests of birds and mammals. Some are predaceous (Blatchley 1926).

Orius insidiosus (Say)

Feeding record: general predator on small arthropods (Slater MS).

Xylocoris vicarius Reuter

Habitat record: beneath boards and other cover (Blatchley 1926).

-Corixidae

The members of this aquatic family are commonly known as water boatmen. Corixids probably eat a combination of microscopic animals and plants.

Trichocoria verticalis Fieber

Enormous populations of this saltwater species inhabit the salt pannes at the preserve. They are probably an important base of the aquatic food chain.

-Lygaeidae

Members of this family are commonly referred to as seed bugs because of their feeding habits. This is the second largest family of Hemiptera in North America (Blatchley 1926).

Antillocoris pillosus (Stal)

Feeding record: grasses (Blatchley 1926).

Blissus arenarus arenarus Barber

Feeding record: various species of sand grass (Blatchley 1926).

Cymus angustatus Stal

Feeding record: various species of Carex and Juncus.

Ischnodemus falicus (Say)

Populations of this species much larger than those indicated by the actual number collected were present on the grasses along the road on the dune on June 10, 1975. The numbers of this species were considerably reduced on all later collecting dates.

This species is supposed to feed on grasses and sedges along the margins of ponds and lakes (Blatchley 1926).

Kleidocerys resedae (Panzer)

Feeding records: Betula, Typlea, Spiraea, Rhododendron (Slater MS).

Ortholomus scolopax Say

Feeding records: flowers of weeds, goldenrods, and other Compositae (Blatchley 1926).

-Miridae

This is the largest family of Hemiptera (Blatchley 1926). Mirids are commonly called leaf bugs. Typically they are phytophagous, but some tend to be predaceous.

Amblytylus nasutus (Kirscb.)

Feeding record: blue grass meadows (Slater MS).

Ceratocapsus nigrocephalus Knight
No biological information.
Ceratocapsus pilosus Knight
Feeding records: hornbeam (Ostrya virginiana (Mills)), burr oak Quercus macrocarpa Mich. (Blatchley 1926).
Deraeocoris fasciolus castus Knight
Feeding record: associated with and predaceous upon the beech aphid, Phyllophis fagi (L.) (Blatchley 1926).
Lopidea heidemann Knight
Feeding record: elm, yarrow (Acrillea millefolium L.) (Blatchley 1926).
Lopus decolor (Fallen)
Feeding record: on sedges (Blatchley 1926).
Lygus lineolaris (Beaur)
This is commonly known as the tarnished plant bug. It feeds on a variety of plants and damages many economically important plants.
Mecomma gilvipes (Stal)
Habitat record: rank herbage in moist shaded situations (Blatchley 1926).
Megaloceraea recticornis (Geoff)
Feeding record: foxtail (Chamaeropsis glauca L.)
Mesomeris cutulus Reuter
Feeding record: wild rice (Blatchley 1926).
Neolygus caryae Knight
Feeding record: Carya, numerous hardwoods (Slater MS).
Neolygus tiliae Knight
Feeding record: flowers of smooth sumac, Rhus glabra L., linden (Blatchley 1926).
Oedancala dorsalis (Say)
Feeding record: Carex and Cyerus.
Orthotylus catulus van Duzee
Feeding record: cudweed (Blatchley 1926).
Phytocoris exemis Reuter
Habitat record: grasses in waste places, foliage, ash and hickory; may be predaceous (Blatchley 1926).
Psallus variabilus (Fallen)
No biological data.
Stenodema vicinum (Prov.)
Habitat record: low herbage along woods (Blatchley 1926).
Stenodema tripsonosum Knight
Habitat record: grasses and meadows along roadsides (Blatchley 1926).
Stenotus binotatus F.
Habitat record: breeds on orchard grass (Dactylus glomerata L.) (Blatchley 1926).
Taedia adustus McAtee
No biological information.
Trigonotylus americanus Carvalho
This species occurred in abundance on the salt grasses on the marsh areas of the preserve.
Trigonotylus confusus Reuter
This species occurred with T. americanus at the preserve.
Trigonotylus slateri Carvalho
This species also occurred with T. americanus.
Xenoborus neglectus Knight
Feeding record: Fraxinus nigra.

-Nabidae

These slender-bodied bugs are often referred to as damsel-bugs. Only 21 species occur north of Mexico (Blatchley 1926). They feed on other insects and could be considered beneficial, if they occurred in greater numbers.

Lasiomerus annulatus (Reuter)
Habitat record: mesic undergrowth habitats (Blatchley 1926).

Nabis americoferus Carayon

Habitat record: grass clumps in xeric conditions (Slater MS).

Nabis roseipennis Reuter

Feeding record: grass- and herb-inhabiting insects (Blatchley 1926).

-Pentatomidae

These true bugs are called stink bugs because of the foul smelling substance they exude when disturbed. Some members of the family feed on plants, others feed on insects.

Banasa calva (Say)

Feeding record: holly and deciduous trees (Blatchley 1926).

Banasa dimidiata (Say)

Feeding record: deciduous trees (Blatchley 1926).

Euschistus tristigmus (Say)

Habitat record: pines, beach washup (Blatchley 1926).

Mormidea lugens F.

Habitat record: common mullein (Verbascum thapsus L.) - probably hibernates amidst the pubescent leaves (Blatchley 1926).

Podisus maculiventris (Say)

The feeding habits of this stink bug make it particularly beneficial to man. It preys upon such insect pests as the Colorado potato beetle, elm leaf beetle, striped cucumber beetle, asparagus beetle, web-worm caterpillar, and codling moth larva.

Rhytidolomia saucia (Say)

Habitat record: grasses on the edges of salt marshes (Blatchley 1926).

-Phymatidae

These insects lie in wait in the heads of flowers of the Compositae to attack nectar feeding insects. Thus they have been commonly called ambush bugs (Blatchley 1926).

Phymata erosa (L.)

No biological information.

-Reduviidae

Members of this family are commonly referred to as assassin bugs. In the tropics some members of the family carry disease, but in Connecticut they can be considered beneficial because they feed on other insects (Blatchley 1926).

Ploiaria simplicipes Uhler

No biological information.

-Saldidae

Saldids or shore bugs live in damp places where they prey on other such insects.

Micracanthia floridana D & C

Pentacora hirta (Say)

Pentacora sphacelata (Uhler)

At the preserve these three species were common on the mud flats and particularly abundant in the relatively open areas where slender grass wort grew. P. sphacelata was also common on the rocky ledges at the end of the dune. All three species are fast-moving and are best collected at high tide, when they are forced up onto the stems of grasses.

-Tingidae

The members of this family derive the name lace bugs from their reticulate upper surface (Blatchley 1926). All species feed on plants, sucking juices from the underside of leaves.

Corythuca cydoniae (Fitch)

Feeding record: various species of Tosaceas (Blatchley 1926).

Corythuca marmorata Uhler

On August 17 this species was particularly abundant on Solidago species along the dune road and the mud flats behind the dune. The populations were much larger than the sampling indicates.

Sea-side goldenrod is the usual host for this species, although it sometimes does damage to cultivated members of the Compositae (Blatchley 1926).

Only a small number of the salt marsh mirids present on the salt grasses were actually collected. Any single sweep of the salt grass with an insect net yielded 10-20 Trigonotylus species. The vegetation near the beach is diverse with respect to area, and most of the Hemipterans were collected here. As more plants reached maturity near the end of the summer growing season, however, there was a shift in the Hemiptera fauna from a predominance of sap feeders to seed feeders and predators. This was reflected in the sharp drop in the percentage the Miridae made up of the entire Hemiptera catch. Groups that feed on other insects, such as the predaceous Nabidae and Reduviidae, while never numerous, appeared in relatively higher numbers than earlier in the season.

All specimens collected have been placed in the insect museum of the University of Connecticut at Storrs. Access to the specimens is through the curator of the museum.

VI. PRESENT USE

The Pattagansett Marshes are presently used for a variety of recreational activities, including fishing, hunting, swimming, water-skiing, and walking. There is no commercial fishing here and it is doubtful that an area this small could support it. The surrounding area is residential and seasonal-residential to the east of the marsh, and residents along Old Black Point Road keep small boats tied up to posts in the marsh or maintain docks and floats at the marsh edge. There are also two rock and earth fill ramps from the road to the edge of the marsh. A small stationary houseboat is kept at the end of one of these ramps.

The Old Black Point Association maintains a beach club at the dune to the south of the marsh, with a paved parking lot, cabanas, and a large wooden dock extending from the beach. The association also maintains the road from the parking lot to the end of the dune by trimming back the shrubs once a summer.

To the north of the marsh lies the railroad right-of-way and tracks. The small opening under the tracks appears to be a favorite fishing and crabbing spot. To the west is a harbor where summer residents anchor their small craft.

At low tide, the extensive sand shoals and mudflats are used by clam diggers and scallop stalkers. At high tide, water-skiers enter the shallow bay and tidal creeks. This appears to have a disturbing effect on the birds that use the marsh for resting and feeding. It also contributes to the erosion of the marsh peat along the edges of the tidal creeks.

Several other studies of the marsh were in progress during the summer of 1975. These included the study of the behavior of marsh fishes by a student from the University of Connecticut, and migratory bird tracking by the Department of Environmental Protection. The marsh is also used quite extensively for outdoor education classes by local schools.

VII. MANAGEMENT CONSIDERATIONS

Management of the Pattagansett Marshes should be concerned mainly with the limitation of access to the area, the amount of traffic the marsh can withstand, and the problem of wildlife disturbance by recreationists. It is recommended that The Nature Conservancy acquire ownership or easement of the dune area to control access and use. Erosion of the dune may proceed rapidly once the vegetation cover is removed, due to the highly erodible nature of the soil. This is especially evident now on the path from the small parking area at the end of the road to the beach.

The marsh surface is also subject to damage by excessive traffic, especially by motorbikes. It is recommended that all area residents be informed of this fact and confine such activities to other places.

Water-skiing, too, is a disturbance to the wildlife, as well as a factor in the excess erosion of the edges of the tidal creeks. If ospreys, herons, and other marshland birds are to be productive in this area, such disturbance should be minimized, if not eliminated.

There was evidence of camping on the headland and north hummock of Watts Island. Such activity has no doubt contributed to the fires on the island and is not consistent with the goals of natural area preservation.

Outdoor education classes and pertinent scientific research should be encouraged as an appropriate use of this preserve. However, since access is already so easy, new trails onto the area should not be considered at this time.

VIII. CONCLUSION

Pattagansett Marshes Preserve is one of the outstanding natural areas in Connecticut. It is highly productive in the plant and animal populations it supports, and represents a dwindling resource along the Connecticut coastline. Such salt marshes are limited in number, due to heedless depletion of these areas in the past. Fortunately, the Pattagansett Marshes have been preserved for the future, and will continue to provide habitat for plants, fish, birds, and invertebrates.

The preserve is unusual in its diversity of habitats. There are four or five distinct vegetative communities present in an area of less than 100 acres. Habitats range from rocky xeric forests to a tidal marsh-estuarine system, and include edge communities, beaches, and a primary dune. Located on the coast and also at the mouth of a freshwater river, the marsh encompasses a wide range of salinity levels, thus increasing the number of species which it can support.

Such an intensely productive and diverse area must be protected as well as admired, and it is particularly important that adverse uses be restricted, if not eliminated. As mentioned in the previous section, some of the recreational activity on the preserve is destructive, such as water-skiing or motorbike riding. Other human impacts on adjoining property, such as filling of the marsh, can completely upset the delicate natural systems that have evolved over time. The houseboat that summers near the preserve can contribute undue pollution to the waters, and is not compatible with the natural quality of the area.

One way to restrict such adverse uses is to acquire control of more land in the marsh, either through easement or through outright ownership. This should be done particularly along the strip next to Old Black Point Road. With public access to tidal areas, however, ownership will not be sufficient to protect the preserve. There must be an affirmative public relations campaign to educate the public in the existence and purpose of the preserve. This can begin with more posting of the preserve boundaries, so that people are aware that the marsh is a plant and animal refuge. Then, the local management committee might consider making a brochure of the preserve, or getting coverage about it in local newspapers.

This study represents only the beginning of the research that could be done on Pattagansett Marshes Preserve. Because the study was made in summer, the floral species list is necessarily incomplete, and further botanical research could be performed at other times during the year. In addition, the following studies are recommended on the preserve at some future time:

1) More wildlife research: an exact inventory of birds nesting on the preserve; a survey of small and large mammal populations.
2) Hydrological research: an examination of the sources and watershed of Pattagansett River; the interaction between tidal fluxes and freshwater discharge; drainage patterns from land surrounding the marsh.
3) Sedimentology: exact measurements of aggradation or degradation of the marsh sediments and the beach.
4) Continuous monitoring of water quality: should include precise coliform counts, as well as tests for radioactive contaminants.
5) Exact survey of human use: who uses the preserve, when, and in what way?

These studies, along with the base inventory represented in this report, will provide future researchers and managers of Pattagansett Marshes with valuable information, which can only enhance the significance of this unique natural area.

APPENDIX

A. SPECIES LIST

N.B. Frequency of species refers to occurrence on preserve.

Flora

1. Salt marsh

		Abundant	Common	Occasional	Rare
Algae					x
Aster tennuifolius	Saltmarsh aster				x
Atriplex patula	Halberg-leaved orache		x		
Baccharis halimifolia	Groundsel tree				x
Brassica rapa	Field mustard		x		
Carex lyngbyei	Lyngbye sedge			x	
Distichlis spicata	Spike grass	x			
Eleocharis palustris	Common spikerush			x	
Gerardia maritima	Seaside gerardia				x
Glaux maritima	Sea milkwort				x
Iva frutescens	Marsh-elder	x			
Juncus gerardii	Black grass		x		
Limonium carolinianum	Sea lavender		x		
Linaria vulgaris	Butter-and-Eggs		x		
Panicum virgatum	Switch grass		x		
Phragmites communis	Reed grass		x		
Plantago juncoides	Seaside plantain			x	
Pluchea purpurescens	Saltmarsh fleabane				x
Ruppia occidentalis	Widgeon-grass				x
Salicornia europeae	Slender glasswort		x		
S. virginica	Woody glasswort		x		
Scirpus americanus	Common threesquare			x	
Solidago sempervirens	Seaside goldenrod	x			
Sparganium eurocarpum	Big burreed				x
Spartina alterniflora	Saltwater grass	x			
S. patens	Salt meadow grass	x			
Spergularia marina	Sand spurrey			x	
Sueda maritima	Sea blite			x	
Teucrium canadense	Germander			x	
Triglochin maritima	Arrow grass			x	

2. Stabilized dune

a. Rock outcropping

Achiliea millefolia	Yarrow			x	
Atriplex patula	Halberg-leaved orache			x	
Celastris scandens	Bittersweet			x	
Eleocharis rostellata	Walking spikerush		x		
Fucus vesiculosis	Rockweed		x		
Juncus gerardii	Black grass			x	
Linaria canadensis	Blue toadflax				x
L. vulgaris	Butter-and-Eggs	x			
Myrica pensylvanica	Bayberry	x			
Panicum virgatum	Switch grass		x		
Prunus maritima	Beach plum		x		
Rhus radicans	Poison ivy	x			
Rosa carolina	Pasture rose			x	
Rumex crispus	Curled dock			x	
Solidago sempervirens	Seaside goldenrod		x		

		Abundant	Common	Occasional	Rare
b. Beach					
Ammophila brevigulata	Beach grass	x			
Arenaria peploides	Sandwort			x	
Artemesia stelleriana	Dusty miller			x	
Atriplex arenaria	Seabeach orache			x	
A. patula	Halberd-leaved orache		x		
Cakile edentula	Sea rocket		x		
Brassica rapa	Field mustard		x		
Oenothera biennis	Common evening primrose		x		
Salsoa kali	Saltwort			x	
Teucrium canadense	Germander		x		
Xanthium echinatum	Beach clotbur			x	
c. Dune forest					
Achillea millefolia	Yarrow		x		
Amelanchier canadensis	Shadbush		x		
Aster sp.	Aster		x		
Brassica rapa	Field mustard	x			
Celastris scandens	Bittersweet		x		
Convulvulus arvensis	Field bindweed				x
Gaylussacia baccata	Black huckleberry	x			
Hypericum perforatum	Spotted St. Johnswort			x	
Juniperus virginiana	Red cedar			x	
Lepidium campestre	Cow cress			x	
L. virginicum	Peppergrass			x	
Lonicera xylosteum	European bush honeysuckle		x		
Myrica pensylvanica	Bayberry	x			
Panicum sp.	Panic grass			x	
P. virgatum	Switch grass		x		
Parthenocissus quinquefolia	Virginia creeper		x		
Prunus maritima	Beach plum		x		
P. serotina	Black cherry			x	
Rhus copallina	Winged sumac		x		
R. radicans	Poison ivy	x			
Rosa carolina	Pasture rose		x		
R. rugosa	Wrinkled rose		x		
Rubus flagellaris	Prickly dewberry		x		
Rumex acetosella	Sheep sorrel			x	
Sambucus canadensis	Elderberry			x	
Sassafras albidum	Sassafras		x		
Smilax rotundifolia	Common greenbrier	x			
Smilicina stellata	Starry false-solomon's seal			x	
Solidago juncea	Early goldenrod			x	
S. sempervirens	Seaside goldenrod	x			
Spirea latifolia	Meadowsweet				x
Teucrium canadensis	Germander	x			
Vaccinium angustifolium	Late low blueberry		x		
Verbascum thapsis	Common mullein			x	
Viburnum dentatum	Southern arrowwood		x		
Vitus sp.	Wild grape			x	

		Abundant	Common	Occasional	Rare
3. Border					
a.Trees					
Acer rubrum	Red maple		x		
Alnus rugosa	Speckled alder		x		
Amelanchier canadensis	Shadbush		x		
Carya tomentosa	Mockernut hickory			x	
Elaeagnus commutata	Russian olive				x
Juniperus virginiana	Red cedar			x	
Lonicera japonica	Japanese honeysuckle		x		
Nyssa sylvatica	Black gum	x			
Parthenocissus quinquefolia	Virginia creeper		x		
Populus deltoides	Eastern cottonwood			x	
Prunus serotina	Black cherry		x		
Quercus alba	White oak		x		
Q. coccinea	Scarlet oak			x	
Q. rubra	Northern red oak		x		
Q. velutina	Black oak			x	
Rhus glabra	Smooth sumac			x	
R. typhina	Staghorn sumac			x	
Robinia pseudoacacia	Black locust			x	
Sassafras albidum	Sassafras			x	
Tilia americana	Basswood				x
b.Shrubs					
Arctium minus	Common burdock			x	
Cephalanthus occidentalis	Buttonbush		x		
Clethra alnifolia	Coast pepperbush		x		
Cornus stolonifera	Red-osier dogwood			x	
Ilex verticulata	Winterberry	x			
Myrica pensylvanica	Bayberry	x			
Parthenocissus quinquefolia	Virginia creeper		x		
Phragmites communis	Common reedgrass	x			
Phytolacca americana	Pokeweed			x	
Sambucus canadensis	Elderberry			x	
Rhus copallina	Winged sumac		x		
R. radicans	Poison ivy	x			
Rosa multiflora	Multiflora rose				x
R. palustris	Swamp rose		x		
R. rugosa	Wrinkled rose			x	
Rubus occidentalis	Black raspberry			x	
R. phoenicolassius	Wine raspberry			x	
Smilax rotundifolia	Common greenbrier		x		
Spirea latifolia	Meadowsweet			x	
Vaccinium corymbosum	Common highbush blueberry			x	
Viburnum dentatum	Southern arrowwood		x		
c.Herbs					
Achillea millefolia	Yarrow		x		
Apios americana	Groundnut				x
Asclepias purpurescens	Purple milkweed			x	
A. syriaca	Common milkweed		x		
Aster novae-angliae	New England aster		x		

		Abundant	Common	Occasional	Rare
Atriplex patula	Halberd-leaved orache			x	
Brassica rapa	Field mustard	x			
Celastris scandens	Bittersweet		x		
Centaurium pulchellum	Centaury				x
Cirsium vulgare	Bull thistle				x
Commelina communis	Asiatic dayflower		x		
Cuscuta gronovii	Dodder				x
Daucus carota	Queen Anne's lace		x		
Dennstaedtia punctilobula	Hayscented fern			x	
Erigeron annuus	Daisy fleabane				x
Eupatorium maculatum	Spotted Joe-Pye weed			x	
E. perfoliatum	Purple boneset				x
Heracleum maximum	Cow-parsnip				x
Hypericum perforatum	Common St. Johnswort			x	
Hibiscus palustris	Swamp rose-mallow		x		
Impatiens capensis	Spotted touch-me-not		x		
Ipomea pandurata	Wild potato-vine				x
Iris prismatica	Slender blue flag				x
Juncus effusus	Soft rush			x	
Lactuca canadensis	Wild lettuce				x
L. floridana	Blue lettuce				x
Lepidium campestre	Cow cress			x	
Lonicera japonica	Japanese honeysuckle	x			
Lychnis alba	Evening lychnis				x
Lysimachia terrestris	Yellow loosetrife				x
Lythrum salicaria	Purple loosetrife			x	
Mentha spicata	Spearmint				x
Oenothera biennis	Common evening primrose		x		
Pilia pumila	Clearweed				x
Polygonum sagittatum	Arrow-leaved tearthumb				x
Plantago lanceolata	English plantain			x	
P. major	Common plantain		x		
Pteridium aquilinum	Bracken			x	
Rumex crispus	Curled dock			x	
R. obtusifolia	Broad dock				x
Rubus flagellaris	Prickly dewberry		x		
Saponaria officinalis	Soapwort			x	
Scutellaria epilobiifolia	Marsh skullcap				x
Sochus arvensis	Field sow-thistle				x
Solanum carolinense	Horse-nettle				x
S. dulcamara	Nightshade			x	
Solidago juncea	Early goldenrod		x		
S. sempervirens	Seaside goldenrod		x		
S. tennuifolius	Slender-leaved goldenrod			x	
Symplocarpus foetidus	Skunk cabbage			x	
Tanacetum vulgare	Common tansey				x
Taraxacum offinilis	Common dandelion			x	
Thalictrum polygamum	Tall meadow rue				x
Thalypteris palustris	Marsh fern			x	
Teucrium canadense	Germander		x		
Yucca filamentosa	Yucca				x

4. Xeric Coastal Forest

a. Trees

		Abundant	Common	Occasional	Rare
Acer rubrum	Red maple			x	
Betula populifolia	Grey birch				x
Carya tomentosa	Mockernut hickory			x	
Juniperus virginiana	Red cedar			x	
Pinus rigida	Pitch pine				x
Prunus serotina	Black cherry			x	
Quercus alba	White oak	x			
Q. coccinea	Scarlet oak			x	
Q. stellata	Post oak				x
Q. velutina	Black oak	x			
Sassafras albidum	Sassafras	x			
Tilia americana	Basswood				x

b. Shrubs

Alnus rugosa	Speckled alder			x	
Amelanchier canadensis	Shadbush	x			
Berberis thunbergii	Japanese barberry				x
Clethra alnifolia	Coast pepperbush	x			
Comptonia peregrina	Sweetfern				x
Gaylussacia baccata	Black huckleberry	x			
Kalmia latifolia	Mountain laurel		x		
Lonicera xylosteum	European honeysuckle			x	
Myrica pensylvanica	Bayberry		x		
Parthenocissus quinquefolia	Virginia creeper			x	
Rhus copallina	Winged sumac			x	
R. glabra	Smooth sumac				x
R. typhina	Staghorn sumac			x	
Rosa carolina	Pasture rose			x	
R. rugosa	Wrinkled rose			x	
Vaccinium angustifolium	Late low blueberry	x			
V. corymbosum	Common high blueberry			x	
Viburnum dentatum	Southern arrowwood			x	
Vitus sp.	Wild grape				x

c. Herbs

Achillea millefolia	Yarrow		x		
Brassica rapa	Field mustard	x			
Cirsium vulgare	Bull thistle				x
Cladonia cristellata	British soldiers			x	
C. tenuis	Slender reindeer moss				x
Collinsonia canadensis	Horse-balm				x
Convulvulus sepium	Hedge bindweed			x	
Hypericum perforatum	Common St. Johnswort		x		
Impatiens capensis	Spotted touch-me-not			x	
Lychopodium tristachyum	Ground pine				x
Oenothera biennis	Common evening primrose		x		
Panicum virgatum	Switch grass		x		
Pteridium aquilimum	Bracken	x			
Rubus flagellaris	Prickly dewberry			x	
Selaginella rupestris	Rock spikemoss			x	

			Abundant	Common	Occasional	Rare
Solanum	dulcamara	Nightshade			x	
Solidago	sempervirens	Seaside goldenrod		x		
S.	tennuifolia	Slender-leaved goldenrod				x
Teucrium	canadense	Germander		x		

Fauna

1. Birds

VI-10-1975 - D. Calabrese

herring gull
red-winged blackbird
glossy ibis
common egret

VII-2-1975 - P. Tallerico (volunteer)

herring gull
ring-billed gull
common merganser
common egret
red-winged blackbird
yellow throat
purple finch
yellow warbler
robin
Eastern kingbird
barn swallow

VII-17-1975 - D. Calabrese

herring gull
barn swallow

VII-28-1975 - E. Griswold

yellow warbler
green heron

VII-29-1975 - D. Calabrese

green heron
brown thrasher

VII-29-1975 - E. Griswold

tree swallow
snowy egret

VII-31-1975 - E. Griswold

snowy egret
laughing gulls
American egret
greater yellow legs
cow birds
ring-billed gull

VIII-1-1975 - E. Griswold

Nashville warbler
great blue heron

VIII-5-1975 - E. Griswold

red-breasted merganser
mute swan with 6 cygnets
mallard with 7 ducklings
kingfisher and nests
rough-winged swallows
osprey

VII-28-1975 - VIII-10-1975 - E. Griswold

herring gulls
red-winged blackbirds
least and common tern

2. General

ribbed mussels	- marsh
blue mussels	- rocky coast
barnacles	- rocks
periwinkles	- rocks
marsh snails	- salt grass
lady crabs	- marsh
dog whelk	- rocks
razor clams	- salt marsh
deer mouse	- along Old Black Point Road
rabbits	- along Old Black Point Road
deer	- Watts Island

3. Hemiptera

Date	Family	Species	Number	Specific Area (see Fig. 2)	Host Plant
VI-10-1975	Corixidae	Trichocorixa verticalis Fieber	2	4	aquatic
		Trichocorixa verticalis Fieber	8	11	
	Lygaeidae	Ischnodemus falicus (Say)	25	3	
		Cymus angustatus Stal	2	4	
	Miridae	Stenodema vicinum (Prov.)	8	11	
		Trigonotylus americanus Carvalho	10	11	
	Nabidae	Nabis roseipennis Reuter	2	3	
	Pentatomidae	Rhytidolmia saucia (Say)	1	4	
	Saldidae	Micracanthia floridana D&C	2	11	
	Tingidae	Corythuca cydoniae (Fitch)	7	3	
VI-17-1975	Corixidae	Trichocorixa verticalis Fieber	24	3	aquatic
	Lygaeidae	Cymus angustatus Stal	7	5	
	Miridae	Megaloceraea recticornis (Geoff)	8	4	
		Trigonotylus americanus Carvalho	8	4	
		Amblytylus nasutus (Kirscb.)	5	5	
		Oedanado dorsalis (Say)	2	5	
		Stenotus binotatus F.	1	4	
		Neolygus caryae Knight (?)	2	4	
		Neolygus caryae Knight (?)	1	5	
	Pentatomidae	Mormidea lugens (F.)	2	4	
		Mormidea lugens (F.)	2	4	
	Saldidae	Pentacora hirta (Say)	5	4	
		Pentacora sphacelata (Uhler)	10	4	
		Pentacora sphacelata (Uhler)	3	4	
	Tingidae	Corythuca cydoniae (Fitch)	6	5	
		Corythuca marmorata Uhler	5	4	
VII-2-1975	Corixidae	Trichocorixa verticalis Fieber	20	11	aquatic
	Lygaeidae	Blissus arenarus arenarus Barber	1	2	
		Ortholomus scolopax (Say)	1	11	
	Miridae	Stenodema tripsonosam Reuter	4	11	
		Trigonotylus confusus Reuter	19	12	
		Trigonotylus confusus Reuter	5	11	
		Trigonotylus confusus Reuter	3	3	
		Mecomma gilvipes (Stal)	1	6	
	Nabidae	Nabis americolor Carayon	1	11	
	Saldidae	Micracanthia floridana D&H	13	6	aquatic
		Pentacora sphacelata (Uhler)	5	6	aquatic
VII-17-1975	Lygaeidae	Ischnodemus falicus (Say)	1	3	
	Miridae	Lopus decolor (Fallen)	10	3	
		Megaloceraea recticornis (Geoff)	1	3	
		Amblytylus nasutus (Kirscb.)	4	3	
		Orthotylus catulus van Duzee (?)	2	3	
		Ceratocapsus nigrocephalus Knight	2	3	
		Phytocoris eximis Reuter	1	3	
		Trigonotylus americanus Carvalho	2	3	
		Trigonotylus confusus Reuter	7	1	
		Trigonotylus confusus Reuter	3	5	
		Trigonotylus slateri Carvalho	1	5	
	Reduviidae	Ploiaria simplicipes Uhler	1	3	
	Tingidae	Corythuca cydoniae (Fitch)	6	3	
		Corythuca marmorata Uhler	36	4	Solidago sp.

Date	Family	Species	Number	Specific Area (see Fig. 2)	Host Plant
VII-29-1975	Anthocoridae	Orius insidiosus (Say)	1	3	
	Miridae	Lygus lineolaris (Beaur)	2	4	
		Lopidea heidemann Knight	1	3	
		Mesomeris curtulus Reuter	3	3	
		Trigonotylus americanus Carvalho	11	4	
		Taedia adustus McAtee	1	3	
		Neolygus tiliae Knight	2	3	
		Neolygus tiliae Knight	1	4	
		Deraeocoris fascialus castus Knight	1	3	
		Ceratocapsus pilosus Knight	1	3	
	Nabidae	Lasiomerus annulatus (Reuter)	2	3	
	Pentatomidae	Banasa calva (Say)	1	3	
		Mormidea lugens (F.)	1	3	
		Podisus maculiventris (Say)	1	3	
	Phymatidae	Phymata erosa (L.)	1	3	
	Tingidae	Corythuca cydoniae (Fitch)	4	3	
VIII-13-1975	Anthocoridae	Orius insidiosus (Say)	1	3	
		Xylocoris vicarius Reuter (?)	1	3	
	Lygaeidae	Antillocoris pillosus (Stal)	1	3	
		Kleidocerys resedae (Panzer)	1	3	
	Miridae	Psallus variabilus (Fallen)	1	3	
		Taedia adustus McAtee	1	3	
		Ceratocapsus pilosus Knight	3	3	
		Neolygus caryae Knight	1	3	
		Neolygus tiliae Knight	1	3	
	Nabidae	Lasiomeris annulatus (Reuter)	1	3	
	Pentatomidae	Euschistus tristigmus (Say)	4	3	
		Banasa dimidiata (Say)	1	3	
	Phymatidae	Phymata erosa (L.)	1	3	
	Tingidae	Corythuca cydoniae (Fitch)	1	3	
		Corythuca marmorata Uhler	2	3	
IX-13-1975	Corixidae	Trichocorixa verticalis Fieber	10	4	
	Anthocoridae	Orius insidiosus (Say)	3	3	
	Lygaeidae	Ischnodemus falicus (Say)	10	3	
	Miridae	Stenodema vicinium Provancher	3	3	
		Trigonotylus americanus Carvalho	1	3	
	Nabidae	Nabis roseipennis Reuter	3	3	
	Pentatomidae	Mormidea lugens Fabricius	2	4	
	Phymatidae	Phymata erosa (Linnaeus)	4	3	
	Tingidae	Corythuca cydoniae (Fitch)	3	3	
		Corythuca marmorata Uhler	2	3	
X-11-1975	Anthocoridae	Orius insidiosus (Say)	2	3	
	Corixidae	Trichocorixa verticalis Fieber	10	4	
	Lygaeidae	Ischnodemus falicus (Say)	10	3	
	Nabidae	Nabis roseipennis Reuter	2	3	
	Phymatidae	Phymata erosa (Linnaeus)	1	3	

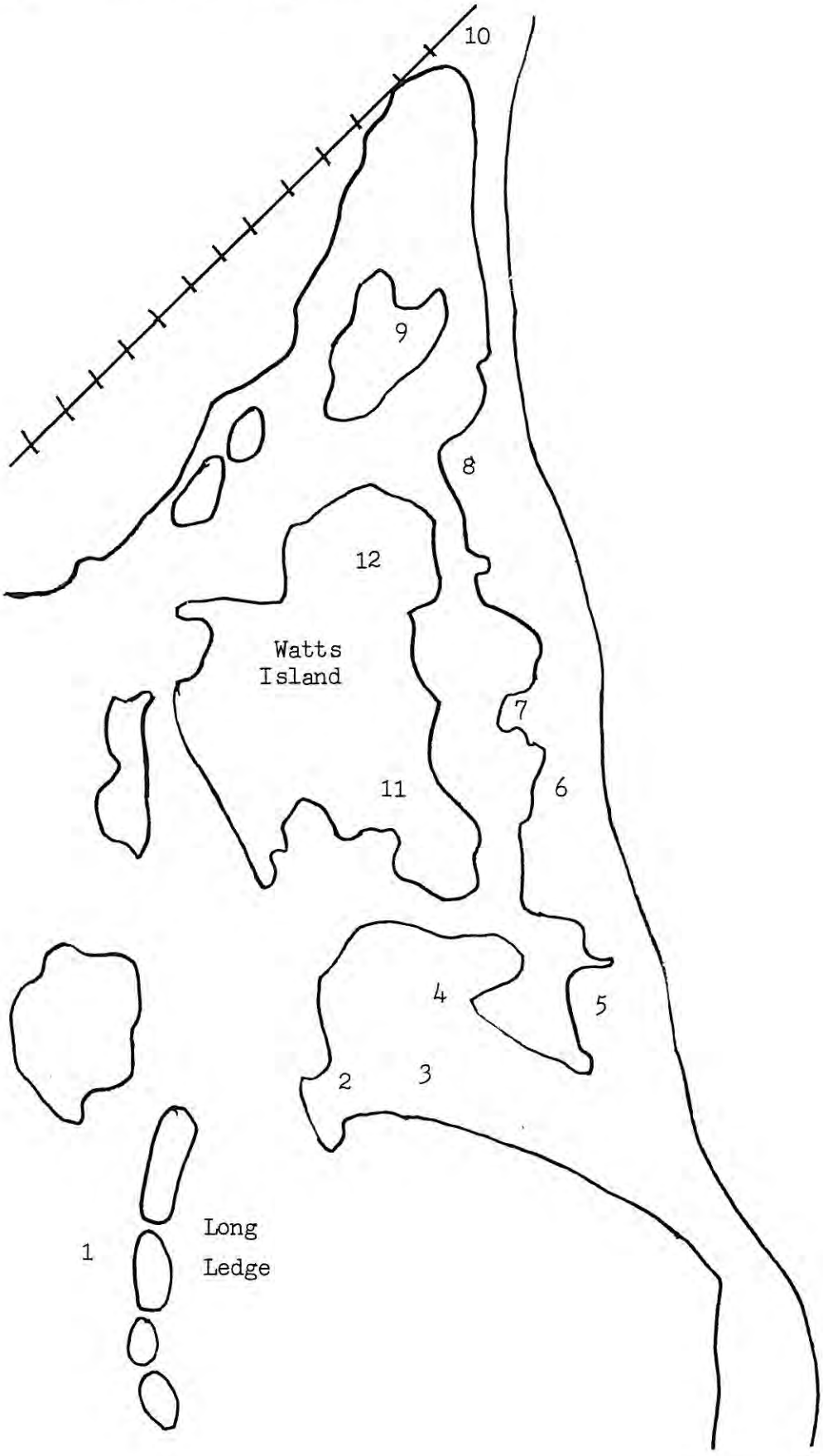

Fig. 2 - Specific Areas of Collection for Hemiptera at Pattagansett Marshes

APPENDIX

B. List of Maps Accompanying Report

Feature	Scale
Base Topographic Map	1:2400
Surficial Geology Map	1:2400
Bedrock Geology Map	1:2400
Soils Map	1:2400
Vegetation Map	1:2400
Use/Special Features Map	1:2400
Surrounding Property Ownership Map	1:4800

Maps were drawn by L. Svennungsen.
Soils map was compiled by the Soil Conservation Service from a special site survey of Pattagansett Marshes.
Surrounding property ownership map was compiled from town ownership maps located in East Lyme Town Hall.

APPENDIX

C. List of Slides Taken at Preserve

By Evan Griswold

1. Marsh tidal creeks - Watts Island
2. Marsh pothole and tidal mud banks
3. Black grass (Juncus gerardii) in flower
4. Marsh surface with pothole
5. Zonation of marsh vegetation along elevational gradient
6. Zonation of marsh vegetation above tide line
7. Intertidal zone on rock outcropping - rockweed, barnacles, etc.
8. Xeric rock outcropping from north side of dune
9. Xeric rock outcropping - top view
10. Marsh patch on north side of rock rap - end of Black Point Beach
11. Marsh pothole with widgeon-grass

By Diane Calabrese and Veronica Picchi

(Area numbers refer to Fig. 2 in Appendix A)

1. Area 1 - Rock ledges
2-6. Area 3 - Tip Old Black Point peninsula
7. Area 3 - Solidago sp. - host of the Tingid: Corythuca marmorata
8-15. Area 3 - (14 shows V. Picchi in background with beating net)
16-18. - Old Black Point Association Beach
19-20. Area 4 - Salt marsh
21-22. Area 4 - Spartina spp. - hosts of the Mirids: Trigonotylus spp., Megaloceraea spp., and Stenodema spp.
23. Area 3 - Grass host of the Lygaeid Ischnodemus falicus
24-25. Area 4 - Salt pannes - inhabited by the Corixid Trichocorixa verticalis
26-27. Area 4 - Slender grasswort in mud flat on marsh - these areas inhabited by various species of Saldids
28-29. Area 2 - Rock pools - Saldids inhabit these pools
30. Area 7 - Phragmites - hosts of various Mirids and Lygaeids
31. Area 3 - Rhododendron harboring Pentatomids
32. Area 4 - Sea lavender on marsh

APPENDIX

D. References

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