D. Vegetation

In developing this Open Space Conservation and Recreation Plan, three sets of living organisms which occupy the land, water and skies of Mashpee provide a focus for our efforts. They are the plants and the animals with which we share our Town, and the humans, ourselves and our neighbors. In this section we will look at the Town's primary plant habitat types, their needs for survival, their value to wildlife and their ability to provide for outdoor recreation and other human needs.

We could not exist without plants. It is they who have created and maintain most of the life-giving oxygen in the atmosphere. They help provide for the proper balance of carbon dioxide as well, keeping earth's temperatures in a habitable range. They make our air cooler and more humid than it would otherwise be. Because they alone have the ability to organize inorganic substances (minerals in the water and soil, carbon dioxide from water or air) into organic foods, they provide almost all of our food, either directly as grains, fruits, vegetables etc. or indirectly through the animals which feed on them. They provide lumber for our homes and medicines for our illnesses. They provide shade in summer, the beauty of flowers and the mantle of green without which our planet would be a barren place indeed.

Living in a coastal environment, we can easily distinguish two general habitat regimes. One lies upland and inland and is a world dependent on fresh water and a fairly sheltered existence. The second lies at the edge of the sea and is dominated by salt water and exposure to the sometimes violent power of the sea and ocean storms. Within each area, variations in surficial geology, soils, groundwater elevations and microclimate combine to create a multitude of habitats which are occupied by distinct plant communities. For the purposes of this plan, we will describe four general categories of plant habitats: upland forests and fields, freshwater wetlands, ponds and stream corridors and the edge of the sea. Each will be further broken down into distinct plant communities. One of our conservation planning goals is to preserve viable examples of each of those communities.

Among the plant species which occur in Mashpee, a few are among the only living representatives of their species. Such plants have received special attention from both the state and federal governments and listing as endangered species, threatened species or species of special concern by the Massachusetts Natural Heritage & Endangered Species Program. Protecting those species is a primary goal of this plan.

Much of the plant life we see around us is not native to the area, nor even to North America. From trees to "wildflowers", many of the plants we take for granted as part of our natural environment were imported by man from Europe and the Far East. In addition, there are our agricultural crops, clearly not a natural occurrence, but vital to our existence. Most of the Cape was cleared of its original forests and converted to agricultural use until, after a few short generations, the thin forest soils were worn out and the farms were abandoned. Almost all of that land has reverted to our "second growth" forest of oak and pitch pine. In Mashpee, agriculture was less predominant, but there were still surprisingly large areas under cultivation as recently as fifty years ago, with strawberries a popular crop. Today, there are no farms of significant size in the town and commercial agriculture is primarily limited to cranberry production. However,

there are still prime agricultural soils available for future agricultural use. As world and national population increases, transportation becomes more expensive and more and more people prefer organically grown crops to those of the factory farms of the west, there may be greater reason to keep areas of prime soils free of development for future generations. Protection of such areas where possible is another goal of this plan.

1. Upland Forests and Fields

The inland area of Mashpee is naturally dominated by forests of various types, with only a few open areas whose existence is largely dependent on man. Where groundwater lies close to the surface, wetland habitats exist, while other unique environments occupy pond and stream edges.

In 1951, Mashpee had 13,128 acres of forest land according to aerial photo interpretation by the Department of Forestry and Wildlife Management at the University of Massachusetts. By 1971, that was reduced to 11,415 acres. Only 8,753 acres remained in 1990 according to the same source. By 1999 forest cover had been further reduced to 4,514 acres, indicating a loss of 8,614 acres to development in those 48 years, or two-thirds of the 1951 forest. Further forest clearing has occurred in the eight years since the 1999 survey was done. In addition, having been based on aerial photography, those numbers cannot recognize additional hundreds of acres for which subdivision and development plans have already been approved but not yet implemented. We have almost reached the point that our privately-owned forest land has been used up, and only those 4000 or so acres wisely purchased and preserved by the Town, state and federal government are left for our children.

Aside from farmland, golf courses, playgrounds and power line corridors, all of which are the result of human activity, there are very few open fields in Mashpee. The 1951 aerial survey showed 232 acres of pasture and 74 acres of abandoned farm fields. By 1971 pasture land had been reduced to 47 acres and abandoned fields to 62 acres. By 1990 only 8 acres of pasture land remained, along with even fewer abandoned fields, the rest having disappeared as a result of land development or natural reforestation. As a result, open fields do not constitute a significant element of our natural environment and will not be mentioned further here except to note that there are two rare plant species that apparently inhabit some of our power line rights-of way. Little Ladies' Tresses (*Spiranthes tuberosa*) is a member of the orchid family which is on the state's watch list. Mattamuskeet Panic-grass, an endangered species found in Mashpee in 1989, grows where the power line corridor was originally cleared through a wet area.

While even the remaining forests of 4,500 acres sound like a large area, in a historical context and in relation to their former wildlife value they represent a radical change in the natural and scenic character of the town. However, radical changes in our forest cover have been nothing new since the Pilgrims landed at Plymouth.

When they made that landing, they arrived at a place that had been cleared as farm fields by the native Wampanoag of the area. Such clearing, accomplished by cutting or burning, was fairly common in the area, including Mashpee, as the Wampanoag lived off farming as well as hunting, fishing and shellfish harvesting. It is also said that they burned the underbrush in forests to improve their chances in hunting deer and other game. However, the new colonists cleared

forests for farming much more efficiently with their axes and on a much larger scale. As their population grew, so did the removal of the area's native forests.

Other colonial pursuits also took their toll on the woodlands. Heating European-style homes demanded enormous quantities of firewood, since each household needed about 40 cords of hardwood each year. Building those homes, as well as barns, fences and other structures, also consumed large numbers of the best trees. The largest, straightest white pines were claimed by the king to serve as masts for the royal navy. Soon other wood-intensive industries staked their claim on the forests of southeastern Massachusetts, such as salt-making, glass-making, shipbuilding, the rendering of whale blubber, iron foundries and the making of lampblack. By 1800, most of Cape Cod, including much of Mashpee, had been cleared of its forests and presented a radically different landscape of open fields and meadows. Old photographs of the Town show few trees, with vistas we can only imagine today.

Those ancient forests that existed prior to 1620 were quite different than the scrubby woods we know today. Giant hardwoods and white pines predominated, with hickory, red oak, elm, holly beech and hemlocks growing to great heights and girths and the cool, shaded understory containing little of the dense brush and briar common today. In wetter areas, red maples and tupelos were common along with large Atlantic white cedar swamps.

When most of those valuable trees were cleared, only a few pockets of their relatives were left, along with less desirable species such as smaller oaks and pitch pine. With the gradual abandonment of farming on the Cape after the Civil War, it was those species that were in a position to reclaim the fields. Gradually, this "second growth" forest cover took over most of Mashpee's land area. By 1951, 89% of Mashpee's land area had returned to forest, according to aerial photo interpretation done at that time. Interestingly enough, though, of the 13,128 acres of forest in the town, 8928 acres, or 68%, was 20 feet or less in height, indicating that it had only recently begun to grow back. By the time air photo interpretation was done again in 1971, only 9.7% was that small, with 70.9% being 21-40 feet in height and another 19.2 % in the 41-80 foot range. Those numbers remained about the same when the next round of photos was done in 1980. Thus, it has only been in the last 50 years or so that Mashpee's forests have taken on the character that is now so familiar to us. As noted above, however, we have again taken to cutting down the forest we so recently regained, this time not for farming and fuel, but for subdivisions and commercial development.

The air photo interpreters broke Mashpee's forests into four general categories based on the dominance of hardwoods or softwoods. In 1951, the largest portion of Mashpee's forest was pure (although short) hardwood, primarily oak, covering 4576 acres, or 34.9% of forested land. By 1980, the last time detailed forest type interpretation was done, hardwood acreage had shrunk to 2099 acres, or 19.7%. Forests where hardwoods constituted 50-80% of trees covered 3608 acres in 1951 (27.5% of forest cover) vs. 2969 acres (27.9%) in 1980. Together, areas of hardwood dominance declined from 62.4% in 1951 to 47.6% in 1980. Softwoods, which in Mashpee are primarily pitch pine, covered only 632 acres (4.2%) in pure stands in 1951. That figure increased to 1135 acres and 10.7% in 1980. Mixed forest with pine predominating rose from 4312 acres and 32.8% in 1951 to become the most common type in 1980 at 4443 acres and 41.7%.

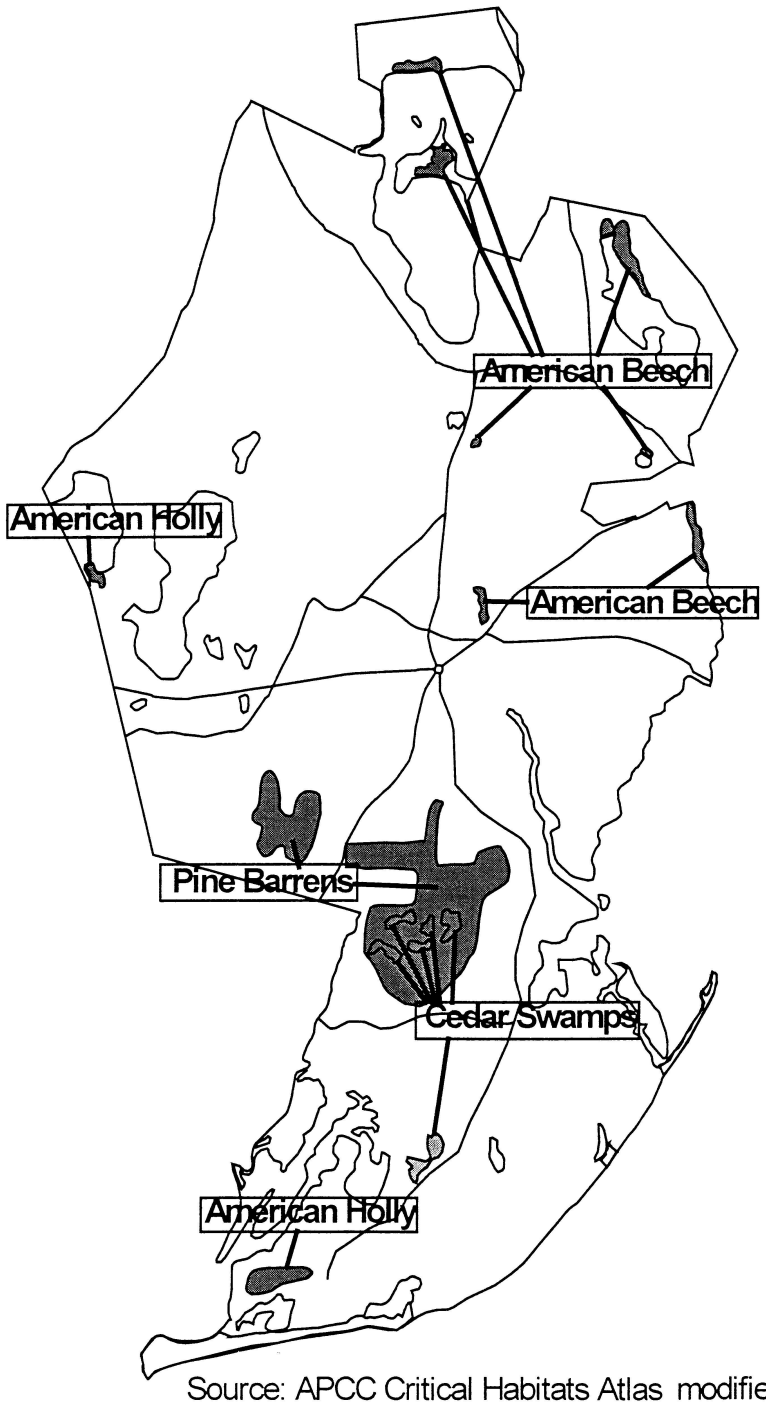
Such mixed forests, whether pine or oak predominate, constitute by far the largest plant community in the town. They constitute almost 70% of our forest cover. The largest portion is **mature oak / pitch pine forest**. A much smaller portion, constituting one of Mashpee's most valuable plant communities because of its rarity, is **pine barrens**, covering about 300 acres in the area between Route 28 and Great Neck Road South and in an area west of the Quashnet river just north of the Falmouth town line. Broom Crowberry (*Corema Conradii*) and Bushy Rockrose (*Helianthemum dumosum*) are both state-listed species of special concern which have been seen in our pine barrens. The **mature oak forest** community makes up the largest portion of our pure hardwood stands. The **American beech forest,** which appears in pockets primarily along the town's eastern edge, on Mashpee Pond and on portions of the upper Mashpee River, is arguably our most beautiful forest community. Along with **American holly forest**, it is a rare woodland community which makes up about 200 acres of hardwood forest. Holly forests can be found on the south side of Ashumet pond and north of Sedge Lot Pond at South Cape Beach. The cool **white pine forest** community, with its soft floor of pine needles, is located primarily on Mashpee pond and along the Mashpee River corridor and makes up about half of our pure softwood forests. The other half is the pure **pitch pine forest**, scattered in pockets throughout the town. Map 4-23 illustrates our rare pine barrens, American beech and American holly forests along with the town's remaining mature Atlantic white cedar swamps.

All of our forest communities provide valuable habitat for a variety of species. The pine barrens are particularly critical to the Coastal Barrens Buck moth (*Hemileuca maia maia*), listed as a threatened species in Massachusetts. The pine barrens are also home to Eastern Box Turtles (*Terrapene carolina carolina*), listed as a species of special concern and another moth listed as threatened, Gerhard's Underwing Moth (*Catocala herodias gerhardi*). Large expanses of unbroken forest, such as cover the area between Route 28, Route 151 and Carriage Shop Road in Falmouth are critical to many nesting forest birds such as the black-and-white warbler. Other forest breeding birds in Mashpee include ruffed grouse, bobwhite quail, mourning dove, common flicker, hairy and downy woodpeckers, blue jay, black-capped chickadee, wood thrush and pine warbler. Our forests also play host to bats, skunk, red fox, red and gray squirrels, chipmunk, cotton tail rabbit, white tail deer, raccoon, opossum and our newest wash-ashore the eastern coyote.

Our forests are not particularly suited to lumbering, as the predominant species have little value and we are far from sawmills. Firewood is the only significant potential commercial use for most of our trees. However, recreational opportunities are excellent except in the densest shrub oak thickets of the pine barrens and where briars and poison ivy dominate. Our soils and generally flat terrain are well suited for walking trails and the nature study and recreational opportunities they provide. While hunting is becoming more and more difficult due to encroachment by new residential development, there are still a few large forest tracts where deer and game birds are present. Both careful development of new trails and maintenance of forest tracts of at least 50 acres for hunting (and 300-500 acres to support deer herds) are important objectives of this plan.

Rare Woodland Communities

Map 4-23



Source: APCC Critical Habitats Atlas modified by Planning Dept.

2. Freshwater Wetlands

Interspersed throughout our forested uplands, in glacial kettleholes and valleys, are a variety of freshwater wetland communities. They have been discussed previously relative to their geologic origins and relation to our water resources. However, our freshwater wetlands are also made up of a number of distinct plant communities. While there are a number of possible classification schemes for those communities, such as the National Wetlands Inventory classifications, we will use seven types that are easily recognized by the layman.

Most spectacular are our **Atlantic white cedar swamps**. Five are located in the South Mashpee pine barrens, creating a unique juxtaposition of hot, dry scrub oak barrens and cool, shady cedar wetlands. Two others are located off Great Oak Road, in the Jehu Pond Conservation Area, surrounded by our typical oak / pine forest.

At one time, very large cedar swamps dominated the upper portion of the Quashnet River. The 30 acre Town cranberry bog in Johns Pond Park was once a cedar swamp. Just south, a 60 acre cedar swamp was one of the first Mashpee properties sold off to non-natives after creation of the town in 1870. The cedars were cleared and the swamp was converted to cranberry production. In the late 1970s the Quashnet Valley Country Club golf course was partly built on the old cranberry bogs. Because the central portion of the bogs along the river was too wet for golf course use, it was left to return to nature and has become prime songbird habitat, gradually becoming overgrown with red maples and - white cedars! Nature seems to be bringing things full circle to reestablish the old cedar swamp.

Over the centuries, some of our cedar swamps have built up islands of decayed organic materials that result in their being higher and dryer in the center, with a sort of "moat" surrounding them. They are known to serve as protected refuges for whitetail deer. They also host some unique plants for this area, including orchids, which can make the difficult trek into their interior well worth the effort in the right season. While great care must be taken to avoid disrupting this habitat and its' wildlife, the development of an interpretive boardwalk through one of our cedar swamps would be a valuable addition to the town's passive recreation and outdoor education facilities.

The pine barrens' cedar swamps are fringed by an open wet transition zone dominated by sphagnum, high bush blueberry, leatherleaf and, occasionally, carnivorous Sundew plants (*Drosera rotundifolia*). (The Sundew is an interesting little plant whose leaves are covered with glandular, sticky hairs. Small insects become entrapped on them and, by their struggling to escape, cause an increase in the flow of the glandular fluid which causes their death. The plant slowly consumes the juices of these victims, several of which may usually be found on the leaves of healthy plants.) On the dry upland side of this transition, sheep laurel, leatherleaf and blueberry predominate before the shrub oaks take over farther upland. This transition zone presents one of our most attractive landscape types. At the edge of one cedar swamp located on Holland Mill Road, the transition zone is much larger and constitutes, according to Cedar Swamp expert Aimlee Laderman, an entirely separate plant community she terms a **wet heath**. In this area, the leatherleaf and sphagnum are joined by extremely stunted high bush blueberry and

cedars living under very acidic conditions. Some of the cedars found in the heath off Holland Mill Road are over 40 years old but no more than four or five feet in height!

Other kettle holes, abandoned cranberry bogs and river and pond edges are home to **wooded swamps** dominated by red maple and other water-tolerant tree species. Prime examples are located in long-abandoned cranberry bogs along the Mashpee River south of Route 28. The threatened Northern Parula warbler (*Parula americana*) breeds in that area, using the moss-like lichen "Old-Man's Beard" (*Usnea spp*.) that hangs from the maples to build its' nest. Along with cedar swamps and some other shallow wetlands, red maple swamps also provide habitat for the Spotted Turtle (*Clemmys guttata*) a state-listed species of special concern.

In slightly wetter areas which cannot physically support large trees or where succession from a more open wetland has not proceeded as far, **shrub swamps** have developed, primarily in kettleholes. Excellent examples exist on the U. S. Fish & Wildlife Service's Mashpee National Wildlife Refuge property off Great Hay Road in South Mashpee, further north along the same road in the South Mashpee pine barrens, just north of the Kids Club building on Great Neck Road North and east of Turner Road south of Old Barnstable Road. These serve as ideal habitat for many songbirds and also serve as watering holes for deer and other mammals. The threatened Water-willow Borer moth (*Papaipema sulphurata*) lays its eggs at the base of water-willows found in some of our shrub swamps in early fall. The eggs hatch in late May and immediately bore into the stems of fresh willow shoots, where they feed for most of the summer. Pupation occurs inside the stem in mid-August and the moth emerges in mid to late September with about three weeks to find a mate before it dies.

Some shrub swamps, as well as more-open **freshwater marshes** and some wooded swamps, are also **vernal pools**, which either dry up completely in the fall or during dry years or are so small, shallow or isolated from other water bodies that they cannot support fish populations. With no fish present, reproduction is safe for wood frogs and mole salamanders that, along with fairy shrimp, depend on such places for the survival of their species. Their presence helps identify vernal pools and is a prerequisite for formal certification by the state's Natural Heritage and Endangered Species Program. To date, 38 vernal pools have been certified in Mashpee, as mapped on the October 1, 2006 *Priority Habitats and Estimated Habitats* map published by the Massachusetts Natural Heritage & Endangered Species Program. They exist in a variety of settings, including wooded swamps, shrub swamps, freshwater marshes, abandoned cranberry bogs and road drainage areas. A prime example of a marsh/vernal pool is located on the U.S. Fish & Wildlife Service's Mashpee National Wildlife Refuge property just north of Amy Brown Road. Other fresh water marshes that are not vernal pools can be seen on the north side of Great Flat Pond, in an abandoned cranberry bog along Abigail's Brook and on the Quashnet River in Johns Pond Park. The American Bittern (*Botaurus lentiginosus*) lives among the cattails, bullrushes, sedges and grasses of our freshwater and brackish marshes.

Abandoned cranberry bogs are located throughout the town, both along rivers and in isolated kettle holes. Although they do not technically constitute a distinct wetland type, being in a brief transition from agriculture to one of the other wetland types, they are so numerous at this point in our natural history that they are worth a separate mention. Most still bear a thick ground cover of Cranberry plants (*Vaccinium macrocarpon*) gone wild that still produce their annual crop and

distinguish them from other freshwater wetlands. In most, Sphagnum moss (*Sphagnum sp.*)has grown in, along with a variety of grasses and shrubs such as leatherleaf, laurel and blueberries. In wetter areas, steeplebush, cattails or phragmites have grown up. A variety of ferns, including Bracken (*Pteris aquilina*), Cinnamon (*Osmunda cinnamomea*), Sensitive (*Onoclea sensibilis*) and Marsh (*Dryopteris thelypteris*) can be found along with beautiful Blue Flag Iris (*Iris versicolor*), sedges, cattails, Virginia Creeper (*Psedera vitacea*), the omnipresent scourge Poison Ivy (*Rhus toxicodendron*) and the fascinating carnivores the Sun Dew (*Drosera rotundifolia*) and Pitcher Plant (*Sarracenia purpura*). In bogs that are drier or have been abandoned for a longer period, red cedar, white cedar, red maple, pitch pine and other tree species have begun to shade the area. . It is this very variety of plant type present during their transition from human use that makes them so fascinating and attractive. Some abandoned bogs along the lower Mashpee River can only be distinguished from the surrounding forests by the remains of the bog ditches that still flow from groundwater seeps. At the other extreme, a series of bogs in the Santuit Pond Preserve, actively farmed only ten years ago, has been flooded through destruction of control dams by vandals and have effectively become shallow ponds with emerging vegetation representative of pond shores and deep water marshes. Washburn Pond, on great neck road north, is an abandoned cranberry bog fed by the Mashpee River that is actively maintained for its fishery by its owner, Mass. DFW. The presence along their edges of abandoned bog maintenance roads that have continued to be used by walkers or off-road vehicles makes many of these abandoned bogs obvious candidates for walking and interpretive nature trails.

A number of active **cranberry bogs** still operate along the Childs and Quashnet Rivers and Quaker Run (Willowbend Country Club's 11.63 acres), as well as on the northern and eastern shores of Santuit Pond (Baker bogs 2.62 acres, Brackett Bog 6.39 acres). The large series of bogs in the Santuit Pond Preserve on the south and east side of the Pond and along the Santuit River have either lain fallow (15.84 acres) or been flooded (12.94 acres), as noted above, since they were acquired in 2002. The Conservation Commission's Quashnet River bogs in John's Pond Park (30.37 acres) have been maintained, but their crop could not be marketed due to contamination from the Massachusetts Military Reservation. The military has constructed and operated a groundwater treatment facility adjacent to the bogs, and recent sampling indicates clean water in some of the bogs. The Commission is soliciting proposals from bog operators for those bogs, but is concerned that all of the bogs are part of the same hydrogeologic system. Full cleanup of all the bogs is desirable before the Quashnet bogs can be brought back to full production and the berries can be accepted for marketing by the Ocean Spray cooperative. Meanwhile, the Commission's small bogs along the Childs River (6.03 acres) are still in production and generate some revenue from leases to commercial growers.

Only 27 acres of Mashpee cranberry bogs are still in active commercial production, vs. 392 acres in 1951. Another 48 acres are maintained in reasonable condition but are not in active production. While the use of various herbicides, pesticides and fertilizers makes them a less-than-ideal habitat for most wildlife, they do host ducks in their ditches who enjoy eating the various water weeds that thrive in the fertilized environment, geese that raid the berries in the fall, muskrats and insect eaters such as bats and swallows that scour their open skies for food. Well-maintained bogs can also be very attractive and their maintenance roads provide an opportunity for walking when open to the public.

3. Pond and Stream Edges

The vegetation along pond and stream edges is in many cases similar to that of freshwater wetlands. However, the presence of open or rushing water and the plants that live in or adjacent to the water make them quite different as a plant community and wildlife habitat.

Riverine corridors serve as ideal wildlife movement corridors because they usually provide a continuous path supplied with food, water and shelter. They are also key "edge" habitats, providing a variety of plant community types from forest, to swamp, to marsh to open water, among others. We have discussed forests and wetlands previously. Along the edge of our streams, a variety of plants which live on or in or adjacent to the water create an entirely different community. In shady, narrow river sections, plants like Jewel-weed (*impatiens biflora*) and willows are of primary importance. The Jewel-weed, which is one of the touch-me-nots, overgrows the shoreline and provides cool, deep shelter for trout and other fish. Its bright orange flowers also attract countless bees, wasps, flies and other flying insects, many of which blunder into the water to become food for the fish. Water mosses also cover the banks in some areas, while in more open areas sedges and cattails predominate, bordered on their upland side by willows and blueberries, then by tupelos, hollies, red cedar and the more common forest trees.

In the water itself, duck weed (*Lemna minor*), a stemless and leafless plant which is one of the simplest and smallest of flowering plants, floats on the surface where the current is not too strong. As its' name suggests, it is a favorite food for ducks. Other plants such as pond-weed (*Potamogeton natans*) and water-wort (*Elatine americana*) stay rooted to the bottom or edge of the stream. Water-wort, one of the most common species along the Mashpee River, grows in dense mats which keep the water cool by shading and provide excellent shelter and forage for fish. Bladderwort (*Utricularia vulgaris*), which is more common in smaller streams and bog ditches, catches protozoans, flat worms, rotifers, small crustaceans etc. in its bladder and digests them. Its presence thus indicates a rich supply of fingerling fish forage.

Some of the same plants inhabit our **pond shores** and waters. Many smaller ponds whose shorelines are protected from wind and wave action or the impacts of human activities have quite dense and varied vegetative edges and much submerged and floating vegetation. Trout Pond, located just south of Route 28 west of the Mashpee River, is a good example of such a pond. Aside from the usual shrub swamp vegetation which tends to line the shores of such ponds, it hosts sedges, duck weed, bladderwort, pond moss (*Dichelyma capillaceum*), pond-weed, water silk (*Spyrogira sp.)* and water weed (*Elodea canadensis*). Pond-weed is one of the most valuable freshwater plants, as it is one of the principal foods of wild ducks and is an important source of fish forage and shelter. Elodea is another important pond species, providing excellent pasturage and shelter for aquatic herbivores.

Another type of pond shore, more open and fragile, exists along the edge of some of our larger ponds. Because pond water levels in Mashpee are directly tied to groundwater elevation, they can be lowered for many months or years when precipitation is low. Pond shores become exposed and dry for many seasons, killing off most typical wetland and pond-shore plants. When precipitation increases, water levels rise and dry land plants face the same fate. A few rare plants, however, have the ability to deal with such radical environmental conditions. Redroot

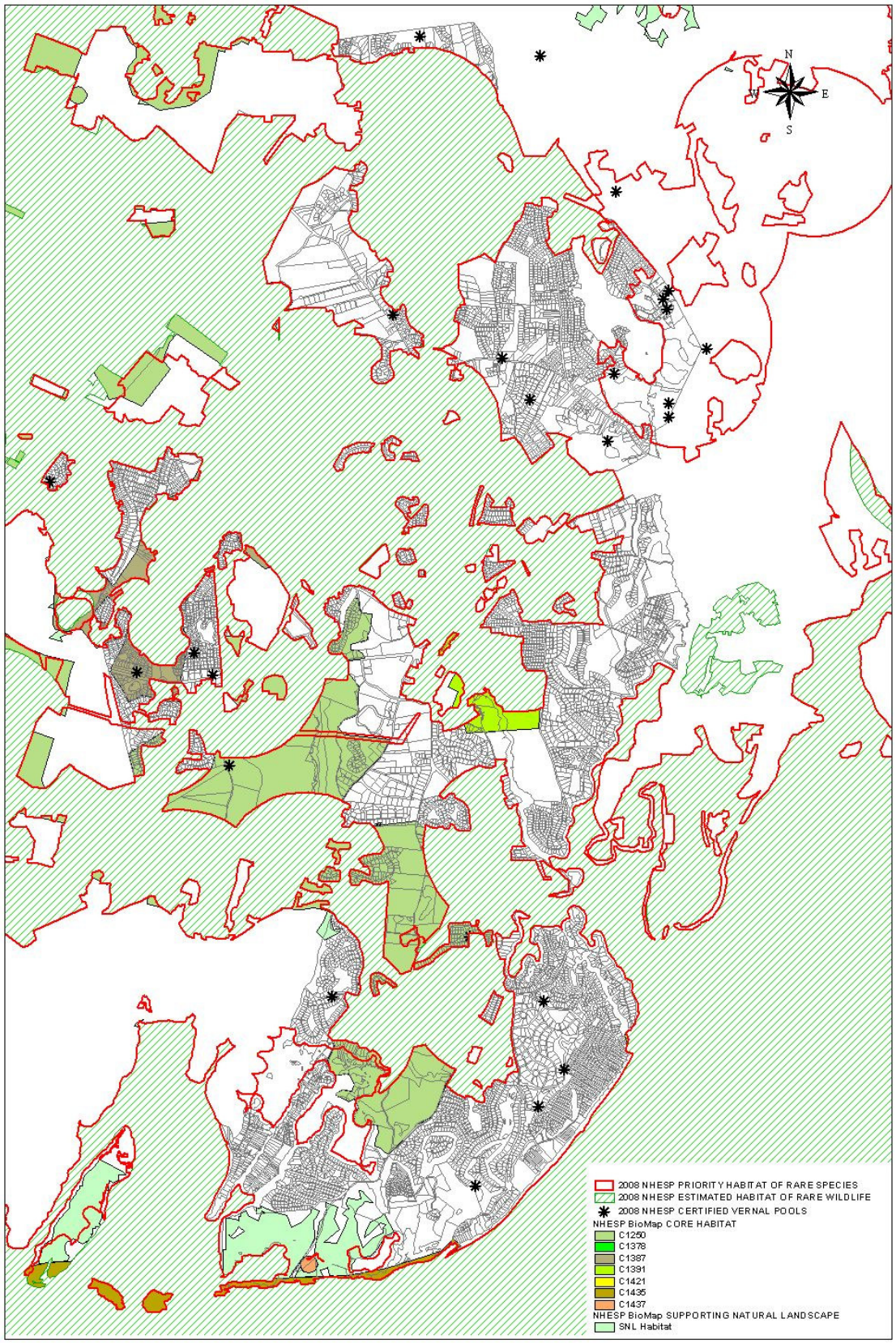
(*Lachnanthes caroliana*) is one such plant which can be found in Mashpee. Listed as a species of special concern by the state, it is usually found in linear bands along the middle to upper margins of the shore or in shallow coves.

The threatened Inundated Horned-sedge (*Rhynchospora inundata*) has also adapted to the unpredictable water level fluctuations of our ponds by regulating seed germination, growth, flowering and fruiting to respond to periods of drought and re-inundation. The Subulate Bladderwort (*Utricularia subulata*) and Wright's Panic-grass (*Dichanthelium wrightianum*), both species of special concern, also occupy this niche. Pondshore Knotweed (*Polygonum puritanorum*), another species of special concern last verified in Mashpee in 1916, appears in dense linear colonies along the pond shore after the water level drops dramatically. Hyssop's Hedge Nettle (*Stachys Hyssopifolia*) is a watch list species which is found along the shores of our ponds. These plants and their habitat are one of our rarest and most threatened plant communities and demand our best efforts at their protection.

Plant & Wildlife Habitat

Mass. Natural Heritage & Endangered Species Program October 1, 2008

Map 4-24



Back of 11”x17” Map 4-24