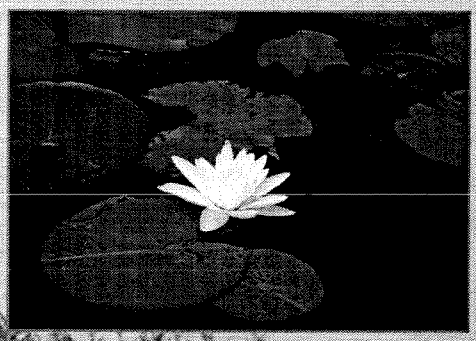
Appendix C

Plant inventory information for Lovers Lake and Stillwater Pond

A Qualitative Survey of Pond Shoreline Vegetation and Anthropogenic Threats at Eleven Freshwater Ponds in the Pleasant Bay Area of Critical Environmental Concern

Chatham & Orleans
Massachusetts



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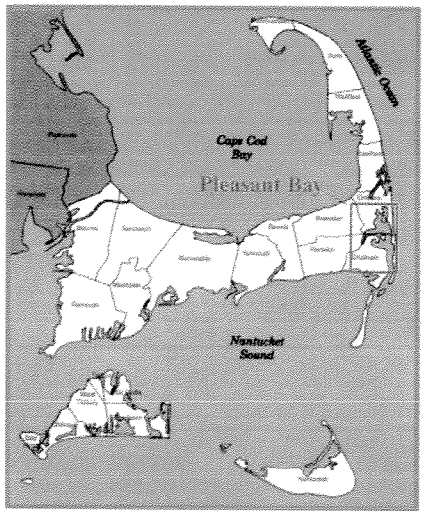
1.0 INTRODUCTION

The Pleasant Bay Resource Management Alliance ("Alliance") contracted with Horsley & Witten, Inc. to identify and document natural resources along the respective shorelines of 11 freshwater bodies located within the Pleasant Bay Area of Critical Environmental Concern (ACEC). These 11 freshwater bodies, located within the Towns of Orleans and Chatham, have hydrologic connections to the Pleasant Bay estuary.

The purpose of this study was to collect baseline data identifying and documenting the presence and distribution of natural resources, including rare, indigenous and invasive species of plants and animals in direct proximity to the shoreline. These data will complement existing information from past studies and are intended to assist the Alliance in developing recommendations for regulatory agencies concerning environmental guidelines and development mitigation within these freshwater bodies.

2.0 PLEASANT BAY AREA OF CRITICAL ENVIRONMENTAL CONCERN



Areas of Critical Environmental Concern (ACECs) are places in Massachusetts that receive special recognition because of the quality, uniqueness, and significance of their natural and cultural resources. These ACECs are so designated by the State's Secretary of Environmental Affairs.

The Pleasant Bay ACEC was designated in 1987 for its outstanding regionally significant natural resources, including pristine barrier beaches and barrier islands, approximately 1,200 acres of salt marsh, thousands of acres of tidal flats, numerous fresh and saltwater ponds, a significant estuarine habitat, and a wealth of biodiversity.

Cape Cod is located within a transition zone between northern temperate boreal species and Mid-Atlantic temperate coastal species, and contains species that are at the northernmost or southernmost limits of their natural ranges. The ACEC is therefore representative of an ecological transition zone that differs from mainland Massachusetts and has an unusual concentration of state-listed species. There are 12 documented state-listed Threatened or Endangered species within the Pleasant Bay area, and more than 16 species listed as Species of Special Concern in Massachusetts also occur in the ACEC (Luchonok and Sorenson, 1993).

3.0 METHODOLOGY FOR DATA COLLECTION

Horsley & Witten conducted shoreline surveys by non-motorized boat, walking shoreline transects, and meander surveys around each of the following ponds over the course of the 2002 growing season: Lover's Lake, Stillwater Pond, Mill Pond, Minister's Pond, and Fox Pond in the Town of Chatham, and Sarah's Pond, Little Quanset Pond, Crystal Lake, Pilgrim Lake, Gould Pond and Uncle Seth's Pond in Orleans. Field investigations focused on characterizing the habitat within 100 feet of the water's edge of each pond.

Field surveys were conducted on June 21, July 2, 10 and 11, August 5 and 13, and September 11, 2002. Prior to conducting field investigations, Horsley & Witten reviewed existing information, studies and literature regarding the resources in order to develop a field evaluation plan. Each pond was surveyed a minimum of two separate times. Data were collected on plant communities and, when deemed significant, associated fauna when the latter were observed. The focus of the data collection was to document the pond shore communities, with emphasis on native, rare, and invasive plant species. Specific emphasis was made on areas exhibiting pristine vegetative community habitats. Data were also collected on communities that are facing threats from invasive species, sedimentation, nutrient input, or other types of human alteration.

3.1 Rare Species

An important goal of this baseline study was to document the occurrence of "state-listed" species, i.e., those that are defined by the Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (NHESP) as Endangered, Threatened, or Species of Special Concern. These species are protected under the Massachusetts Endangered Species Act regulations at 321 CMR 10.00. Species whose primary habitat falls within wetland resource areas are also protected under the Massachusetts Wetlands Protection Act regulations (310 CMR 10.00). It is especially important for the maintenance of biodiversity that occurrence of such species be documented for future protection. Additional efforts were made to document any species that are currently on the "Watch List – Uncommon or Rare Massachusetts Plants" (April 1990).

NHESP defines state-listed species as follows:

Endangered species are defined as native species which are in danger of extinction throughout all or part of their range, or which are in danger of extirpation from Massachusetts, as documented by biological research and inventory.

Threatened species are native species that are likely to become endangered in the foreseeable future, or which are declining or rare as determined by biological research and inventory.

Species of Special Concern are defined as native species which have been documented by biological research or inventory to have suffered a decline that could threaten the species if allowed to continue unchecked, or which occur in such small numbers or with such restricted distribution or specialized habitat requirements that they could easily become threatened within Massachusetts.

Watch List species are those native species that are believed to be very uncommon or rare, undergoing severe population decline, and/or for which information is lacking on a number of current sites. The Watch List also contains species that have been removed ("delisted") from the official state list of "Rare Native Plants of Massachusetts" (i.e., as designated above).

3.2 Invasive Species

Purple Loosestrife *(Lythrum salicaria)*

An all-too common problem in many wetlands and waterbodies on the Cape is the rapid proliferation of non-native, invasive plants that threaten the integrity of our native flora. Where Barnstable County was once a "hotbed" for botanical research due to its unique floral and faunal diversity and pristine nature, the ratio of native versus non-native species is today approximately 60:40 (Svenson and Pyle 1979). While not all exotic plant species are invasive or aggressive in growth habit, in many cases alien taxa from Asia or Europe out-compete Cape Cod's indigenous plant communities, at times completely overgrowing and creating a monoculture in place of a diverse, native plant community.

Several emergent plant species meeting the definition of exotic and invasive habits were documented during our Pleasant Bay study. The two most common species were purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*). While neither of these invasives poses an immediate threat to rare pondshore species within the study area due to the small populations of these invasive species that could be readily managed or eliminated from these areas, Mill Pond, with its hitherto undocumented population of Plymouth gentian (*Sabatia kennedyana*) also provided shoreline habitat for both the loosestrife and common reed in close proximity to the rare gentians.

Invasive non-native plants can gain a foothold by several means: nutrient inputs from stormwater runoff, particularly nitrates and phosphates from lawns, golf courses, and cultivated fields and cranberry bogs, sub-standard septic systems and cesspools, and erosion-borne sediments from disturbed banks and artificially created beaches. Boat propellers that have been in ponds infested with aquatic invasives, such as milfoil

(*Myriophyllum spicatum*) and hydrilla (*Hydrilla verticillata*), can infest previously pristine ponds. Even well intentioned shorefront owners can create an invasive problem by planting 'pretty' species such as yellow flag (*Iris pseudacorus*) or purple loosestrife, which are sold commercially by some nurseries.

Mitigation measures that are often effective in reducing or eliminating the invasion of non-native species include:

- Preserving native shoreline vegetation to filter nutrients and other water-borne sediments (i.e., buffer strips);
- Implementing erosion control measures, including native plantings, and elimination of stormwater runoff conduits and culverts;
- Using low or non-phosphate detergents;
- Establishing limitations on lawn areas, especially on slopes bordering the water bodies;
- Upgrading substandard septic systems;
- Thorough cleaning of boats and other recreational craft of any plant debris from off-Cape ponds and lakes; and
- Discouraging feeding of waterfowl that can spread invasive plants via fecal dispersal.

3.3 Natural Community Types

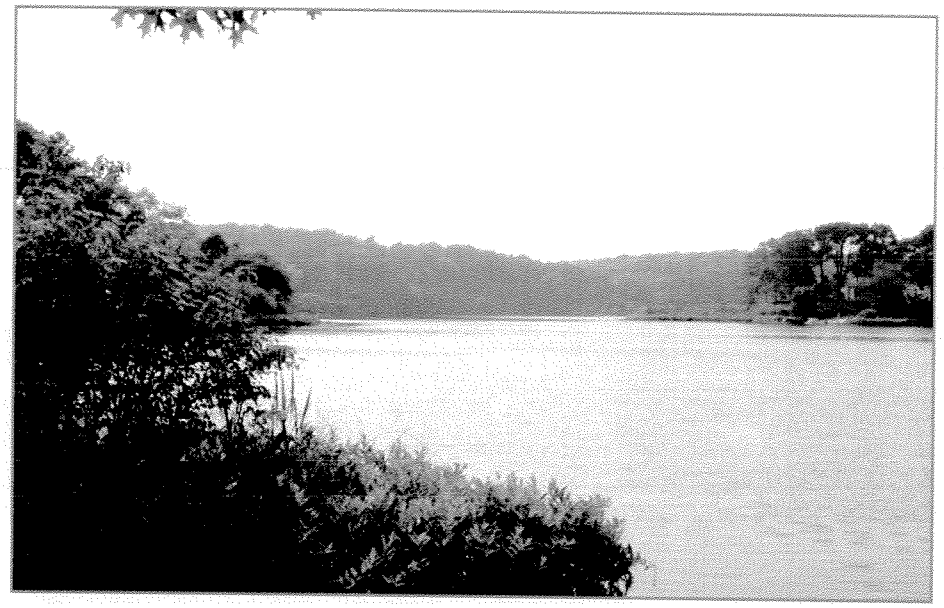
One of the goals of this study was to document the presence of exemplary habitat communities as defined by The Nature Conservancy and the NHESP. Two such habitats were observed among the freshwater bodies within the Pleasant Bay ACEC: the New England Coastal Plain Pond Shore Community and the Atlantic White Cedar Swamp Community. A description of each community type is provided below.

3.3.1 New England Coastal Plain Pond Shore Communities

New England Coastal Plain Pond Shore communities are unique to southeastern Massachusetts, Rhode Island, and parts of Long Island. According to the recently released BioMap by the Massachusetts Natural Heritage and Endangered Species Program (NHESP, 2001), this community is ranked G2-S2 by the NHESP, meaning that this community is both globally and state imperiled, with only 6-20 occurrences statewide. A total of 43 rare plant and animal species have been documented within this community type. These species are specially adapted to the desiccation-inundation effects of the seasonal hydrologic cycles evident in the yearly rise and fall of the water table.

The subject ponds within the ACEC are characteristically located in gradually sloping depressions lacking any outlet or inlet within the glacial outwash plain. Such ponds are directly hydrologically linked to the underground aquifer through the highly porous, sandy soils derived from the outwash parent material. Thus pond levels fluctuate considerably from year to year, depending on the hydrologic cycle, precipitation, surface water level

Lover's Lake



Location	Located south of Old Comers Road and north of Old Queen Anne Road in Chatham, Massachusetts. The lake is accessed at the end of the Lover's Lake Circle cul-de- sac and at the boat landing at the end of Lake Shore Drive.
Size	36 acres (Massachusetts Great Pond)
Geologic origin	Kettle Pond-Outwash Parent Material

Vegetation Communities

Lover's Lake is one of the largest freshwater ponds within the Pleasant Bay ACEC, and reaches a total depth of 10.09 meters (approximately 33 feet).

Aquatic and emergent vegetation documented within Lover's Lake consists of spatterdock (*Nuphar variegata*), pickerel weed (*Pontederia cordata*), water willow (*Decodon verticillatus*), ribbon-leaf pondweed (*Potamogeton* epihydrus), narrow-leaf cattail (*Typha angustifolia*), wide-leaf cattail (*Typha latifolia*), bayonet rush (*Juncus militaris*), soft rush (*Juncus effusus*), and Olney three-square (*Scirpus americanus*).

A field of pickerel weed
(*Pontederia cordata*)

Fifty-one (51) plant species were observed within 32 Families. The peripheral vegetation consists of pitch pine (*Pinus rigida*), bayberry (*Myrica pensylvanica*), oaks (*Quercus* spp.), smooth alder (*Alnus serrulata*), sweet pepperbush (*Clethra alnifolia*), arrowwood (*Viburnum dentatum*), with rod (*Viburnum nudum* var. *cassinoides*), elderberry (*Sambucus canadensis*), winterberry (*Ilex verticillata*), highbush blueberry (*Vaccinium corymbosum*), and swamp azalea (*Rhododendron viscosum*). A complete list of species observed during the 2002-growing season is provided in Appendix B.

The two **non-native** species documented during field investigation were curly dock (*Rumex crispus*) and peppermint (*Mentha piperita*).

A culvert beneath Old Comers Road connects Lover's Lake with Stillwater Pond, and a tributary from Frost Fish Creek is located on the northern shoreline.

Pond Use

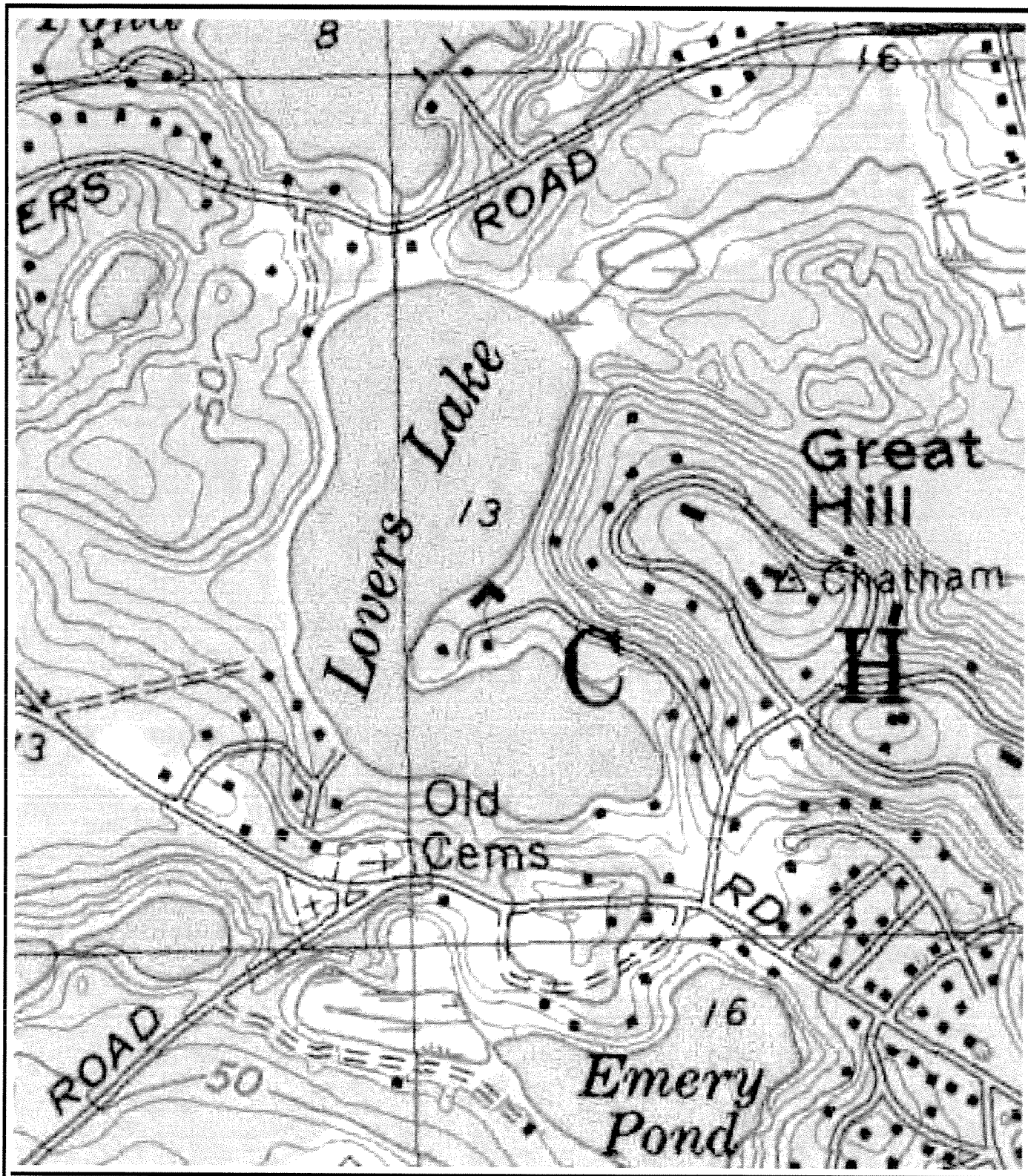
Lover's Lake is used recreationally for swimming, boating, and passive recreational activities. Several small beach areas are scattered along the pond periphery. Numerous docks and boats were observed on the lake, along with floating rafts for swimming activities. The residential surroundings have disrupted and fragmented lakeshore vegetation where docks, clearings and small beach areas have been constructed. Historically the pond has been stocked with game fish including brook trout and smallmouth bass.

Potential Significant Wildlife Habitat

The surrounding shoreline community of water willow may provide habitat for the Water Willow Stem Borer (*Papaipema sulphurata*), a Threatened species in Massachusetts, and globally restricted to southeastern Massachusetts. The Stem Borer utilizes the water willow as a larval food source.

General Comments

Lover's Lake is surrounded by residential development, and as a result, several areas immediately upgradient of the pond shoreline have been cleared of natural vegetation for lawn and landscaping. Use of fertilizers and existence of individual septic systems are potential sources of nutrient loading to the lake. This potential nutrient input may be reflective in the presence of "nitrophyle" (nitrogen-loving) vegetation dominating the shoreline.



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Lovers Lake
Chatham, Massachusetts

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Figure 9.

Plant Inventory: Lover's Lake, Chatham, Massachusetts

Family	Scientific Name	Common Name	Notes
ONOCLEACEAE	*Onoclea sensibilis*	sensitive fern	
PINACEAE	*Pinus rigida*	pitch pine	
NYPHAEACEAE	*Nuphar variegata*	yellow water lily	
MYRICACEAE	*Myrica pensylvanica*	bayberry	
FAGACEAE	*Quercus alba*	white oak	
	Quercus velutina	black oak	
	Quercus coccinea	scarlet oak	
BETULACEAE	*Alnus serrulata*	smooth alder	
CLUSIACEAE	*Triadenum virginicum*	marsh St. Johns wort	
SALICACEAE	*Populus deltoides*	eastern cottonwood	
	Salix bebbiana	Bebb's willow	
	Salix nigra	black willow	
	Salix spp.	willow	
CLETHRACEAE	*Clethra alnifolia*	sweet pepperbush	

Plant Inventory: Lover's Lake, Chatham, Massachusetts

Family	Scientific Name	Common Name	Notes
ERICACEAE	*Rhododendron viscosum*	swamp azalea	
	Vaccinium corymbosum	highbush blueberry	
PRIMULACEAE	*Lysimachia terrestris*	swamp candles	
ROSACEAE	*Rosa palustris*	swamp rose	
	Prunus serotina	black cherry	
	Amelanchier canadensis	shadbush	
LYTHRACEAE	*Decodon verticillatus*	swamp loosestrife	
AQUIFOLIACEAE	*Ilex verticillata*	winterberry	
VITACEAE	*Vitis labrusca*	fox grape	
POLYGONACEAE	*Rumex crispus*	curly dock	Non-native
ACERACEAE	*Acer rubrum*	red maple	
ANACARDIACEAE	*Toxicodendron radicans*	poison ivy	
BALSAMINACEAE	*Impatiens capensis*	jewelweed	

Plant Inventory: Lover's Lake, Chatham, Massachusetts

Family	Scientific Name	Common Name	Notes
APIACEAE	*Sium suave*	water parsnip	
ASCLEPIADACEAE	*Asclepias incarnata*	swamp milkweed	
LAMIACEAE	*Mentha arvensis*	field mint	
	Mentha piperita	peppermint	Non-native
	Lycopus virginicus	water horehound	
SCHROPHULARIACEAE	*Gratiola aurea*	golden hedge hyssop	
CAMPANULACEAE	*Lobelia cardinalis*	Cardinal flower	
CAPRIFOLIACEAE	*Viburnum dentatum*	arrowwood	
	Viburnum nudum var. *cassinoides*	witherod	
	Sambucus canadensis	elderberry	
HYDROCHARITACEAE	*Elodea canadensis*	Canadian waterweed	
POTAMOGETONACEAE	*Potamogeton epihydrus*	ribbon-leaf pondweed	
TYPHACEAE	*Typha latifolia*	wide leaf cattail	
	Typha angustifolia	narrow-leaf cattail	

Plant Inventory: Lover's Lake, Chatham, Massachusetts

Family	Scientific Name	Common Name	Notes
PONTEDERIACEAE	*Pontederia cordata*	pickerel weed	
JUNCACEAE	*Juncus effusus*	soft rush	
	Juncus canadensis	Canada rush	
	Juncus militaris	bayonet rush	
CYPERACEAE	*Scirpus americanus*	Olney three square	
	Eleocharis obtusa	spike-rush	
	Carex scoparia	tufted sedge	
	Carex lurida	lurid sedge	
POACEAE	*Holcus lanata*	velvet grass	
	Deschampsia flexuosa	common hairgrass	

Stillwater Pond

Location	Located east of Training Field Road, off Stillwater Road, Chatham, Massachusetts
Approximate Size	16-18 acres (Massachusetts Great Pond)
Geologic origin	Outwash plain, kettle pond

Vegetation Community

Stillwater Pond is one of the larger ponds in the Pleasant Bay ACEC. Formed as a kettle pond during the last ice age, Stillwater Pond reaches a depth of 14.68 meters (approximately 48 feet). The topography surrounding the pond is gently to moderately sloping, with the exception of the southwest side, which rises more steeply.

Stillwater Pond's shoreline is dominated by aquatic and emergent vegetation. Water willow (*Decodon verticillatus)* surrounds the ponds shoreline and is only fragmented in areas where natural vegetation has been cleared to the water's edge and in places where docks have been constructed. Large populations of (*Pontederia cordata*), white water lily (*Nymphaea odorata*), and spatterdock (*Nuphar variegata*) exist along the pond periphery. Other emergent and aquatic vegetation observed include common water milfoil (*Myriophyllum sibiricum*), wide-leaf cattail (*Typha latifolia*), soft rush (*Juncus effusus*), and Olney three-square (*Scirpus americanus*).

Pink variety of water lily
(*Nymphaea odorata*)

Several non-native, **invasive** species were noted within and adjacent to Stillwater Pond. Stands of common reed (*Phragmites australis)* were observed among dense populations of wide-leaf cattail (*Typha latifolia*) in the northeastern, northwestern, and southwestern sections of the pond. Purple loosestrife (*Lythrum salicaria)* was observed among areas of water willow (*Decodon verticillatus*) along the northern and eastern shorelines. Additionally, a pink variety (probable escaped cultivar) of *N. odorata* was noted in the pond .

Observed species within the shrub community included bayberry (*Myrica pensylvanica*), alder (*Alnus* spp.), pussy willow (*Salix discolor*), sheep laurel (*Kalmia angustifolia*), sweet pepperbush (*Clethra alnifolia*), red chokeberry (*Aronia arbutifolia*), arrowwood (*Viburnum dentatum*), with rod (*Viburnum nudum* var. *cassinoides*), elderberry (*Sambucus canadensis*), and the non-native, **invasive** species, Tatarian honeysuckle (*Lonicera tatarica*) and Morrow's honeysuckle (*Lonicera morrowii*). A complete list of species observed during the 2002 growing season is provided in Appendix B.

Stillwater Pond is hydrologically connect with Lover's Lake through a culvert beneath Old Comers Road, and is connected to Rydlers Cove by a small inlet on the northern shoreline.

Pond Use

Stillwater Pond is used for passive recreational activity and boating. Five private docks with non-motorized boats were observed around the pond. The water willow and pickerel weed were fragmented only in areas were the docks were constructed.

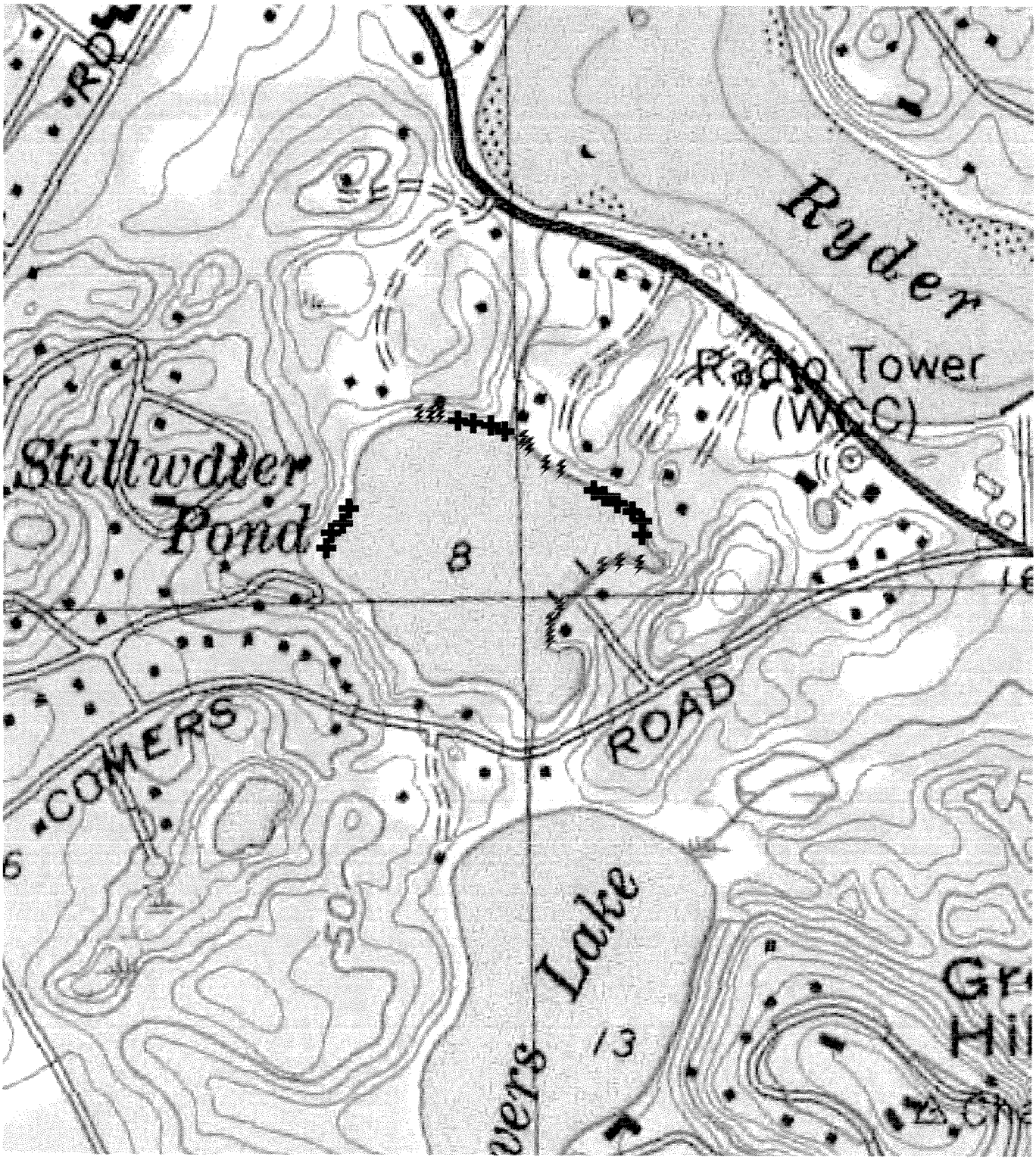
Potential Significant Wildlife Habitat

As is the case in the other ponds within the Pleasant Bay ACEC the presence swamp loosestrife suggests the potential habitat for the Water-willow Stem-borer (*Papaipema sulphurata*), a Massachusetts Threatened Species (see Appendix C).

General Comments

As stated above, purple loosestrife and common reed and other nitrophyles are evident where the shoreline has been disturbed and fragmented by the construction of docks and the clearing of vegetation for lawns to the waters edge. Lawn and landscaping adjacent to the pods edge may potentially be contributing excess nutrients within Stillwater Pond.

Invasive species should be monitored and managed as necessary to protect the native plant community.



Purple loosestrife (Lythrum salicaria)- Invasive

Common Reed (Phragmites australis)- Invasive

N

60 0 60 120 180 Meters

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Stillwater Pond
Chatham, Massachusetts
Approximate Distribution of
State-Listed and Invasive
Plant Species

9/26/02 JLC
File: x://Pleassant Bay/gis/acec.apr

Figure 12.

Plant Inventory: Stillwater Pond, Chatham, Massachusetts

Family	Scientific Name	Common Name	Notes
OSMUNDACEAE	*Osmunda cinnamomea*	cinnamon fern	
ONOCLEACEAE	*Onoclea sensibilis*	sensitive fern	
PINACEAE	*Pinus rigida*	pitch pine	
NYPHAEACEAE	*Nuphar variegata* *Nymphaea odorata*	yellow water lily white water lily	 (possible escaped pink variety)
MYRICACEAE	*Myrica pensylvanica*	bayberry	
FAGACEAE	*Quercus alba* *Quercus coccinea*	white oak scarlet oak	
BETULACEAE	*Populous deltoides* *Alnus* spp.	eastern cottonwood alder	
SALICACEAE	*Salix discolor*	pussy willow	
CLETHRACEAE	*Clethra alnifolia*	sweet pepperbush	
ERICACEAE	*Kalmia angustifolia*	sheep laurel	

Plant Inventory: Stillwater Pond, Chatham, Massachusetts

Family	Scientific Name	Common Name	Notes
ROSACEAE	*Rosa virginiana*	Virginia rose	
	Prunus serotina	black cherry	
	Aronia arbutifolia	red chokeberry	
	Rosa multiflora	multiflora rose	Non-native, **Invasive**
FABACEAE	*Trifolium repens*	white clover	
HALORAGINACEAE	*Myriophyllum sibiricum*	common water milfoil	
LYTHRACEAE	*Decodon verticillatus*	swamp loosestrife	
	Lythrum salicaria	purple loosestrife	Non-native, **Invasive**
ACERACEAE	*Acer rubrum*	red maple	
ANACARDIACEAE	*Toxicodendron radicans*	poison ivy	
LAMIACEAE	*Lycopus virginicus*	water horehound	
PLANTAGINACEAE	*Plantago minor*	common plantain	
CAPRIFOLIACEAE	*Lonicera tatarica*	Tatarian honeysuckle	Non-native, **Invasive**
	Lonicera morrowii	Morrow's honeysuckle	Non-native, **Invasive**
	Viburnum dentatum	arrowwood	

Plant Inventory: Stillwater Pond, Chatham, Massachusetts

Family	Scientific Name	Common Name	Notes
CAPRIFOLIACEAE (cont.)	*Viburnum nudum* var. *cassinoides*	withe-rod	
	Sambucus canadensis	elderberry	
JUNCACEAE	*Juncus effusus*	soft rush	
CYPERACEAE	*Scirpus americanus*	Olney three square	
	Carex lurida	lurid sedge	
POACEAE	*Phragmites australis*	common reed	Non-native, **Invasive**
TYPHACEAE	*Typha latifolia*	wide-leaf cattail	
PONTEDERIACEAE	*Pontederia cordata*	pickerel weed	
SMILACACEAE	*Smilax glauca*	cat greenbrier	
	Smilax rotundifolia	common greenbrier	