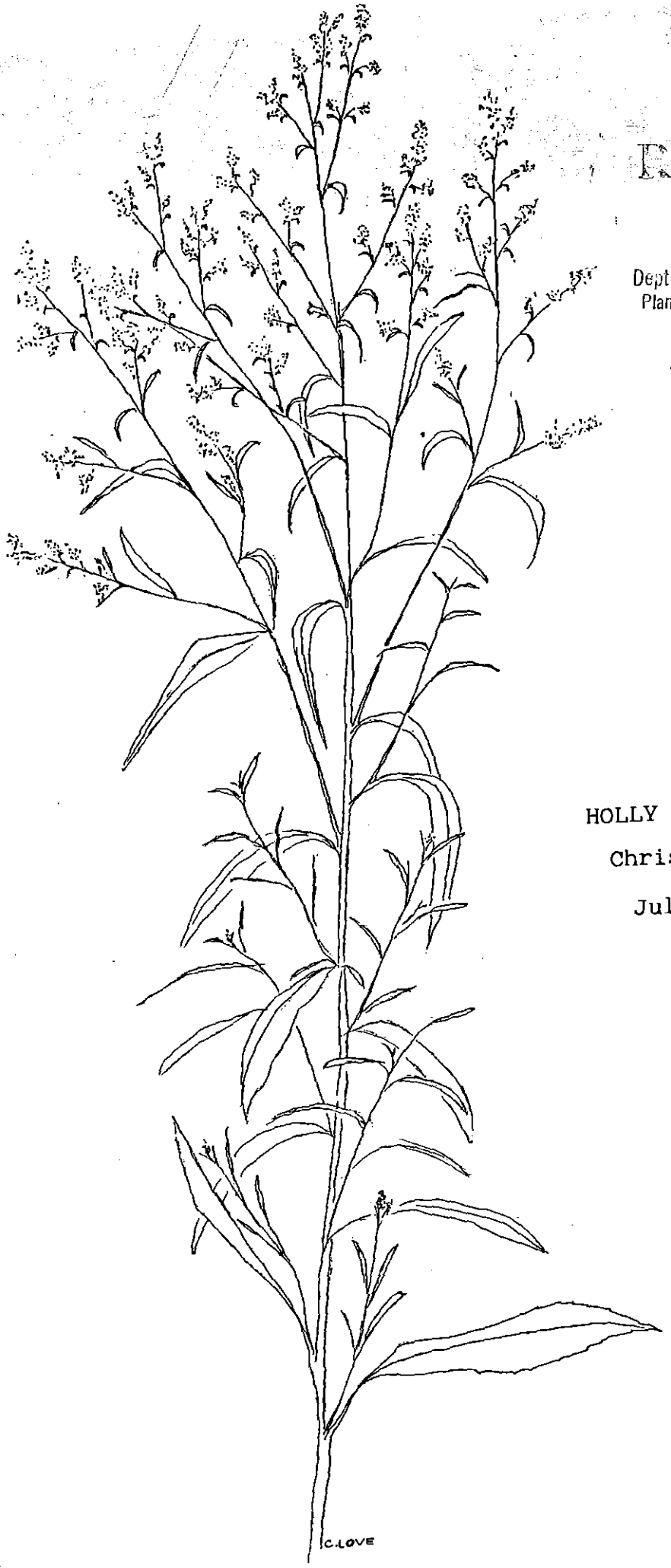


HOLLY POND MARSH

Christie Love

July, 1986

HOLLY POND MARSH

Introduction

Holly Pond, approximately 1½ by 1 mile at the mouth of Connecticut's Noroton River and forming the border between Stamford and Darien on Long Island Sound, is about to receive a new adjustable set of tidal gates so that the Pond may increase its tidal flushing, and hence, better its water quality. A marsh vegetation survey was undertaken from mid May through mid July, 1986, for the purpose of documenting the vegetation before the present tidal gates (which cannot be raised or lowered) are replaced.

Holly Pond's geology and history will be discussed briefly to provide a background for the present status of marsh vegetation, followed by some predicted impacts of tidal gate lowering. The report concludes that changing the tidal gates may risk upsetting a vital and healthy ecological balance.

Recent Geology

Glaciers contributed to the existence of the Holly Pond marshes with the formation of Long Island, Long Island Sound, and with the rise in sea level of melting glaciers.

After the last great ice sheet began to retreat from New England, about 16,000 years ago, it dumped ground up bedrock and debris it had scoured from points North onto an eastwest running long sandy strip of terminal moraine, now called Long Island (Bell, 1985. p79). The melting glacier formed Glacial Lake Hitchcock on the north of the moraine, and, eventually, the expanding ocean and rising lake level flowed into each other transforming the lake into Long Island Sound (Bell, 1985).

Initially, the sea level rose so rapidly there was no chance for tidal marshes to develop. During the past 3,000 - 4,000 years

the coastal submergence has slowed to a rate of only 10 cm. per century (Niering, 1961). The combination of this slowing and of the protection provided by Long Island against the wrath of ocean storms allowed salt marsh vegetation to keep pace with submergence along Connecticut's bays and inlets (Bell, 1985).' Fine, muddy sediments from the Noroton River, instead of being swept off by crashing ocean waves and tidal currents were dumped at its mouth and helped create and nourish the marshes along the edges of Holly Pond.

Today, submergence continues and as the tidal sand, silts and clays get trapped in the saltwater grasses, the marshes expand inland by inundating fresh water vegetation.

History

Holly Pond's history can be traced from its original existence as a natural bay, to its being dammed for water power - which created a thriving village on Cove Island - to today's quiet residential community and Town owned public beach and recreation area.

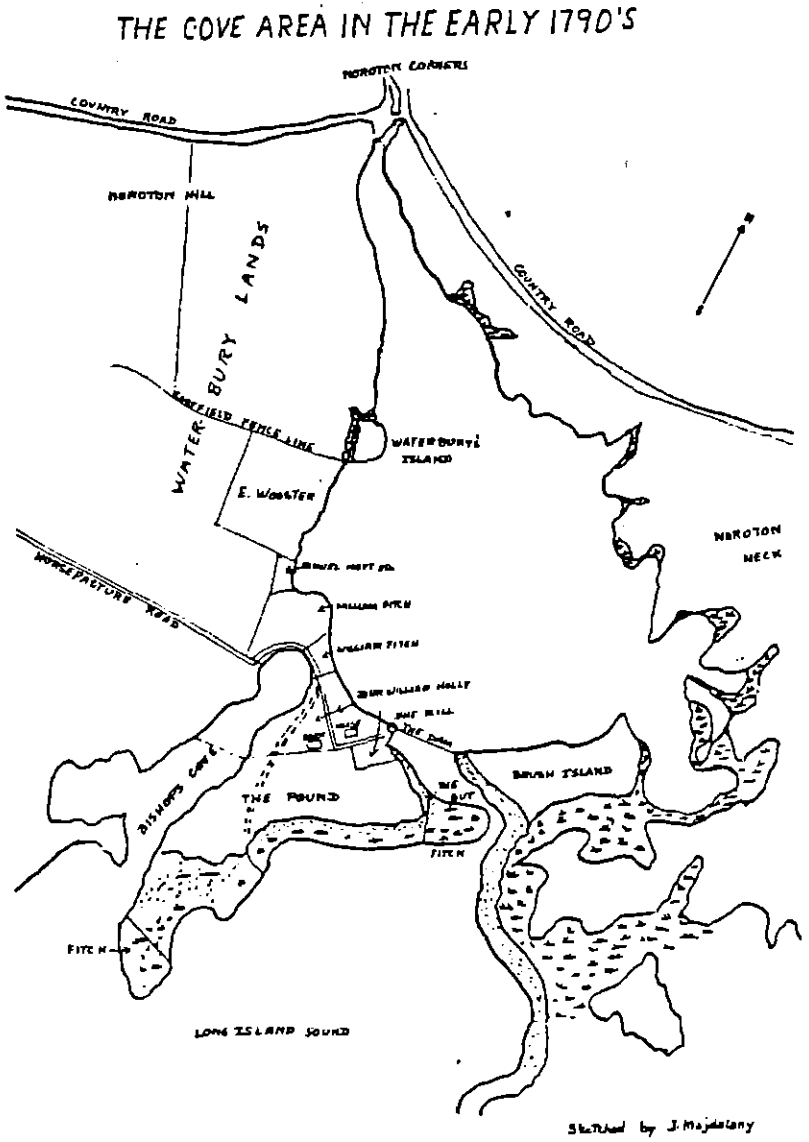
Holly Pond was originally Noroton Bay, which was deep enough to allow sailing vessels to tie up at the mouth of the Noroton River. By 1641, colonists from Wethersfield, the first Connecticut colony, began settling in Stamford. There were probably many more marshes in existence on the bay then than there are today. For example, in 1688, David Waterbury acquired an island, now Weed Circle, where to the north and west salt marshes thrived, but were later filled to connect the island to his adjacent property on the mainland (Majdalany, 1979). (Compare maps 1 and 2).

The first dams erected at the mouth of Noroton Bay, 1796 and 1800, were for water power. Later dams and tidal gates, 1934 and the mid 1960's, were built to preserve aesthetics and to maintain the Pond as a recreational resource for the land owners and for the City of Stamford.

In 1796 William Fitch and John William Holly built a dam that brought tidal power to their grist mill. Whenever the tide ran out, millstones would rotate to grind flour (Majdalany, 1979). The pond created by the dam "flooded most of the tidal swampland and formed an irregular coastline with peninsulas jutting out between salt meadow or shallow water" (Nash, 1974. p7). In 1800 a second gristmill and dam was built at the north end of Bishop's Cove, making Cove Island a man-made island. (See maps 1 and 2.) Every three years the mill owners agreed to open the dams to flush out the Pond. Eeling and crabbing were popular pastimes in the millpond.

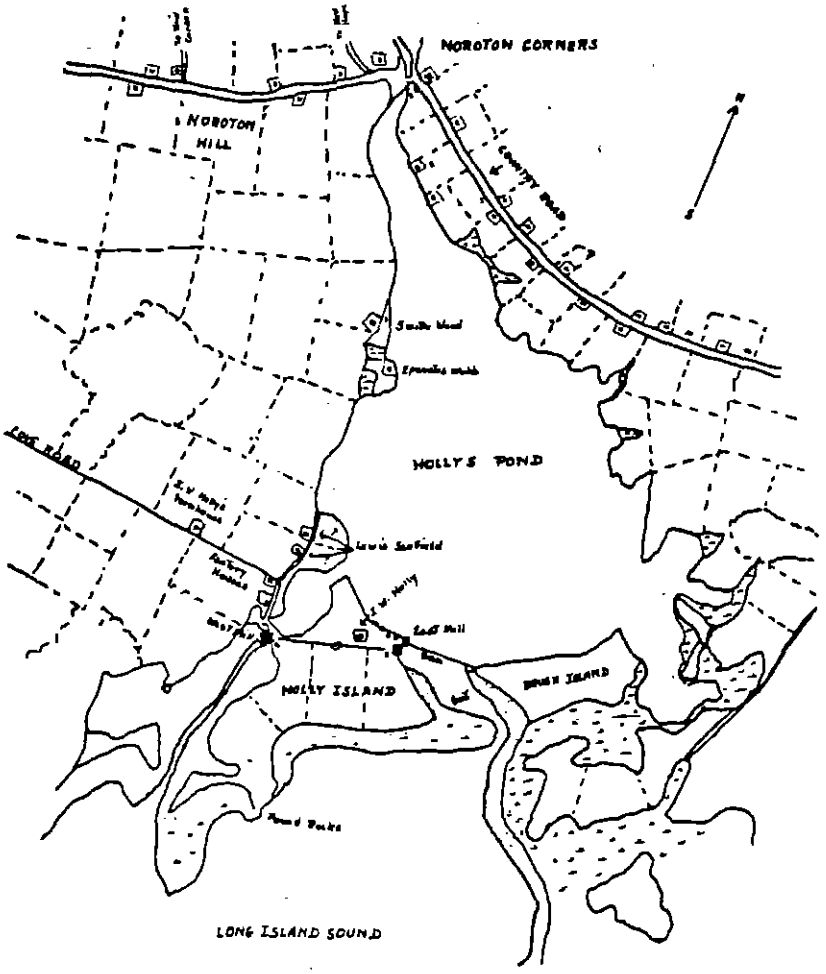
In 1830 the mills stopped using water power when emphasis was shifted from the flour business to the dye extract business. (See maps 3 and 4. Also of some interest are some of the 1890 marshes USGS felt were large enough to put on their map - scale 1 inch equals approx. 1¼ miles.) From 1860 to 1919 the Stamford Manufacturing Co. became the largest dye extract business in the world, but the business was abruptly ended by a fire in 1919 (Majdalany, 1979).

The original dams/gates fell into disrepair, and after a long controversy between Stamford and Darien over financial responsibility, new tidal gates were finally installed in 1934.



Map 1 Holly Pond approximately 1796

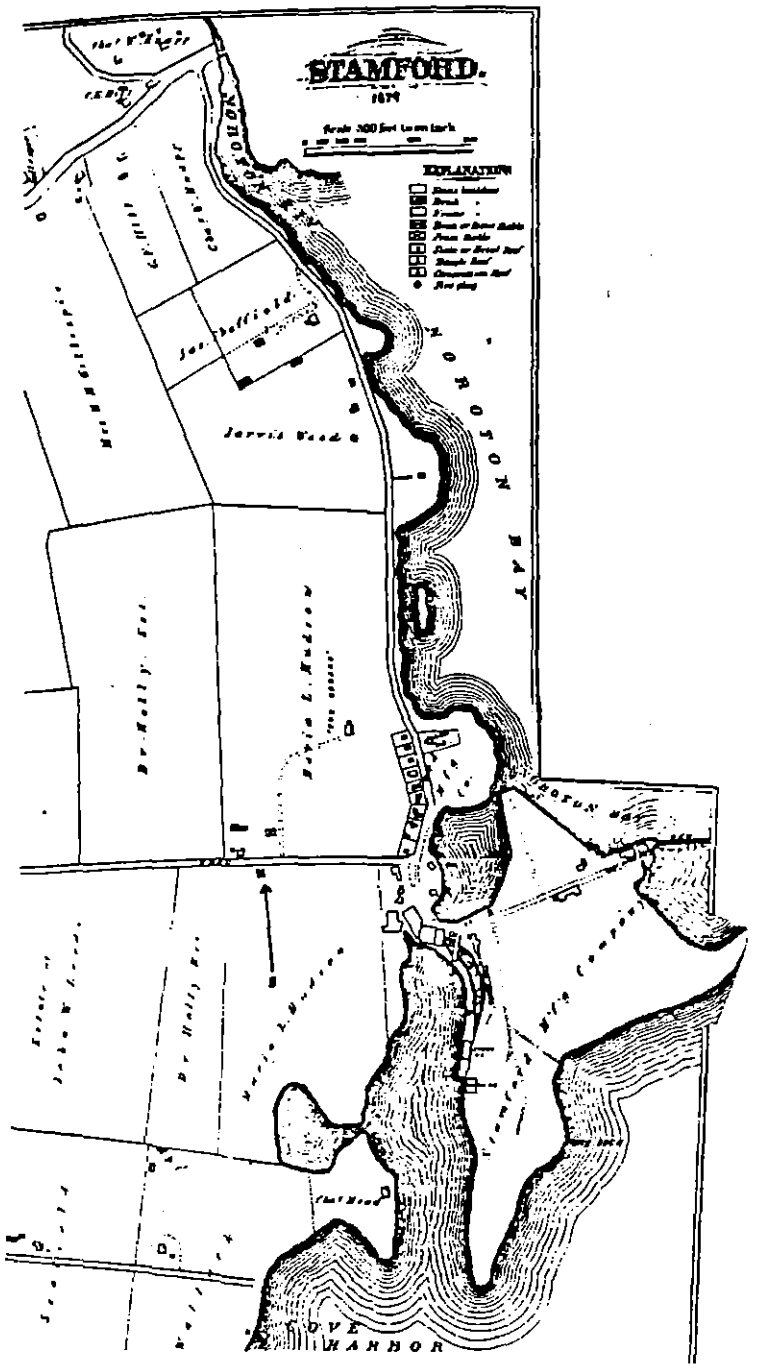
(Majdalany, 1979 p.10)



TOPOGRAPHIC SURVEY MAP
NO. T-20 1836
with names added

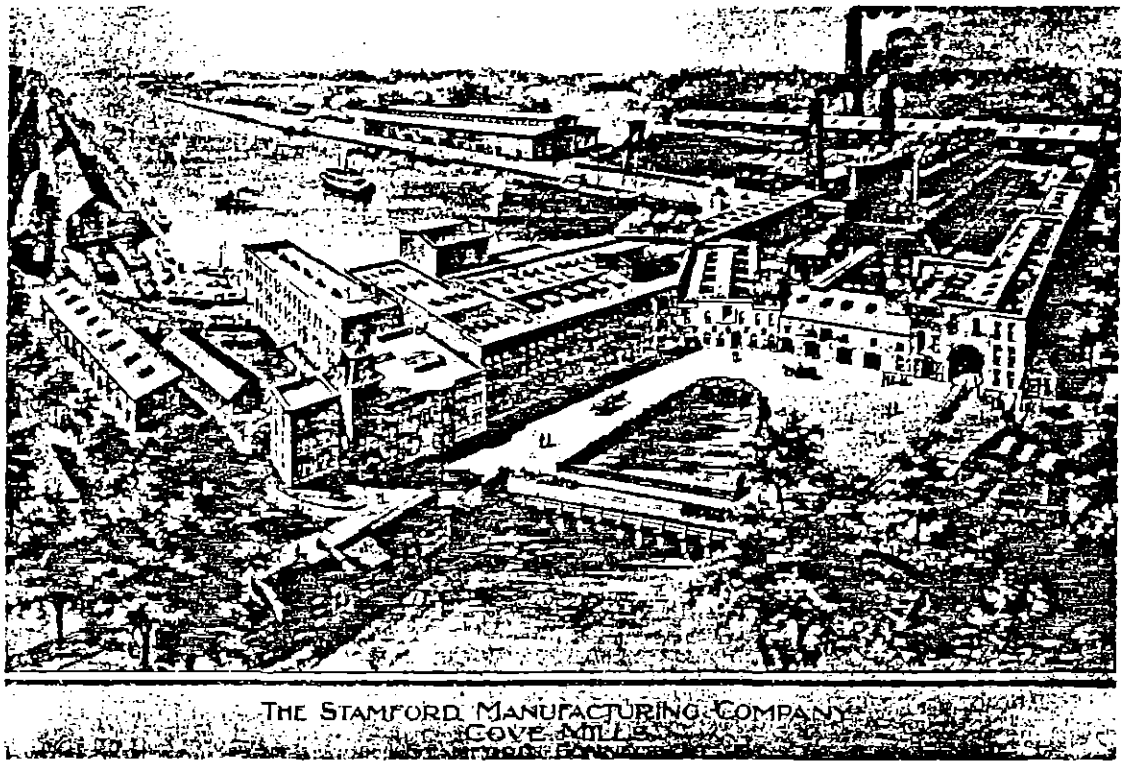
Map 2 Holly Pond 1836

(Majdalany, 1979 p.35)



Map 3 Holly Pond (Stamford side) 1879

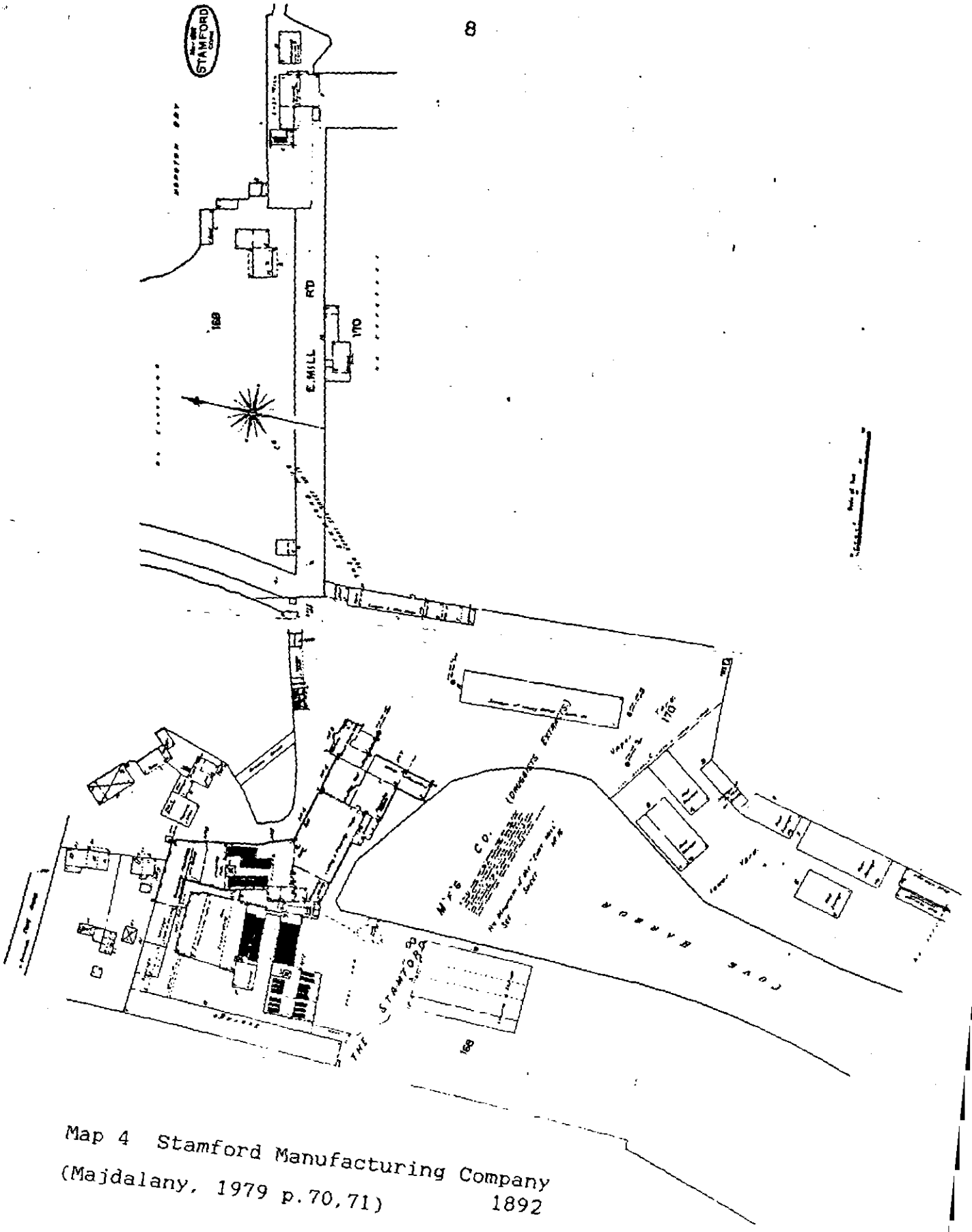
(Majdalany, 1979, p.60)



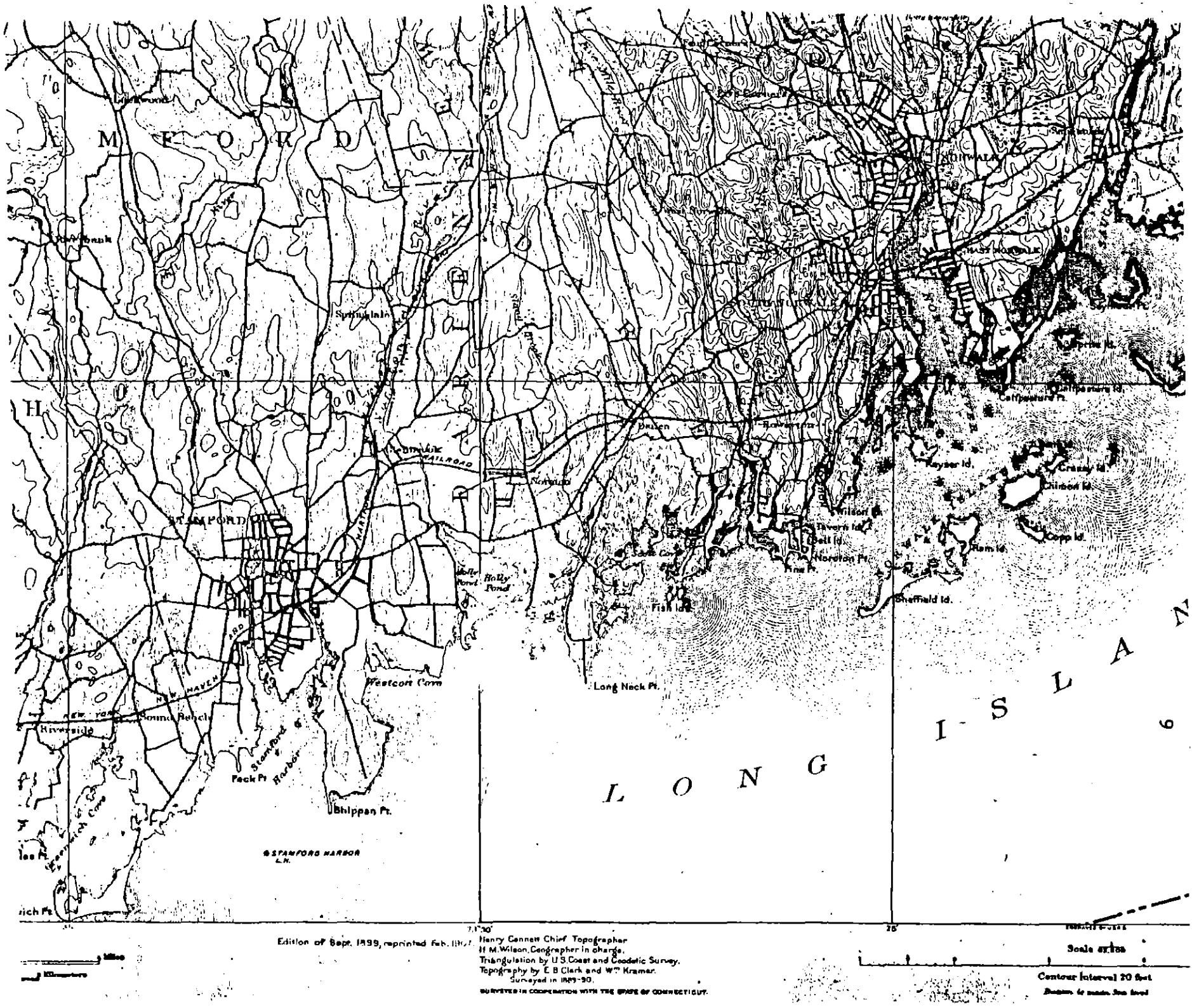
Painting made c. 1890. View looking southwest from the island. Courtesy of Mr. Payson

Stamford Manufacturing Company 1890 - Illustration of Map 4

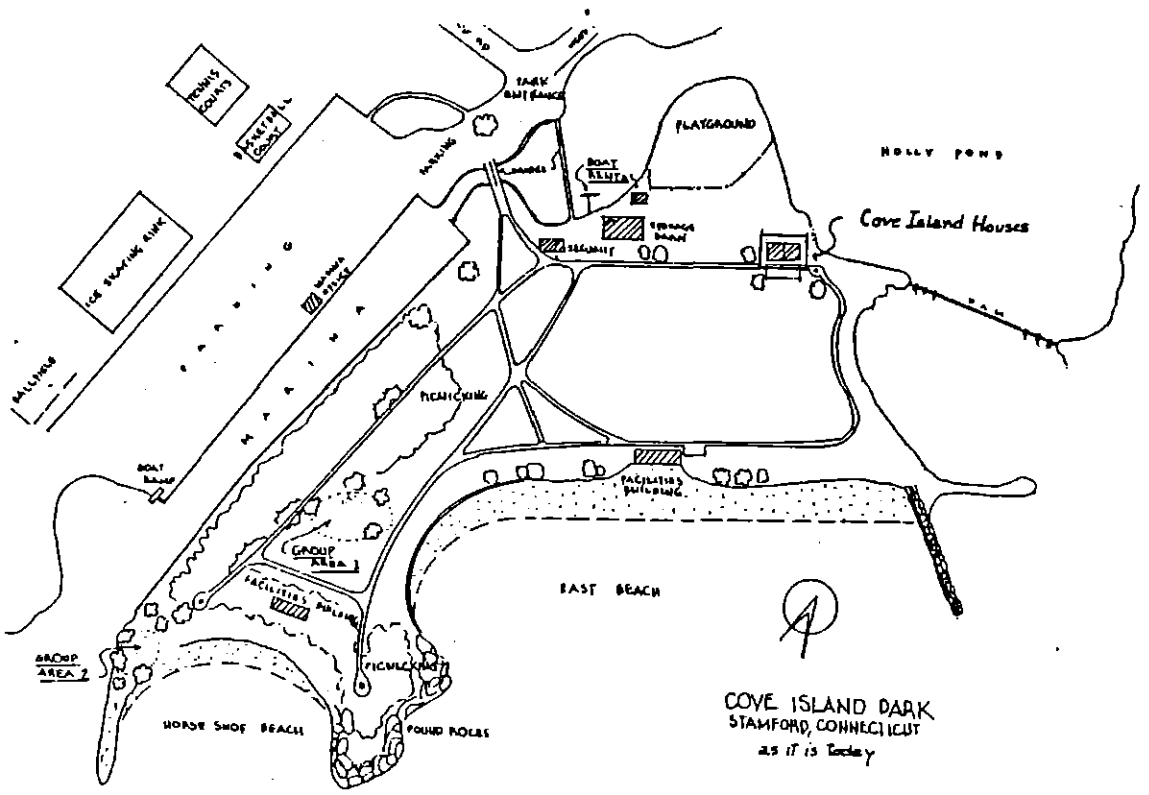
(Majdalany, 1979 p.99)



Map 4 Stamford Manufacturing Company
(Majdalany, 1979 p.70,71) 1892



Map 5 1890 USGS Holly Pond marshes
(on file at DEP, Hartford, Ct.)



Map 6 Cove Island 1979

(Majdalany, 1979 p.99)

Unfortunately, these and part of the dam were damaged in the 1938 hurricane. For 22 years the Pond became a bay again. At high tide it could be used for boating, but at low tide mudflats became exposed, unsightly and odorous (Nash, 1974). GET THIS INFO.

In the mid 1960's (an accurate date could not be determined), new gates were installed, which changed the area from a bay back to a pond again. Thus, Holly Pond has had approximately twenty years to develop its present vegetation and wildlife status, parts of which are the main subject of this report. This is a relatively brief period in the long historical perspective, but would probably be one in which significant changes occurred or might still be occurring.

Today, 1986, new tidal gates have been planned which can be raised and lowered, thereby enabling greater or lesser flushing action in the pond to occur, presumably to improve the health of vegetation and the quality of water in the pond. (Map 6 shows Cove Island in 1979, almost as it is today.)

Marsh Vegetation

The Holly Pond marshes appear very healthy. After a three month (May - July, 1986) observation of the marsh vegetation, it seems that enough water flows over the dam during the high tides to reach all the little marshy inlets around the perimeter of the Pond. An experiment in early July indicated that water reaches a height of at least 1½ feet above the dam at high tide, and that fresh saline Sound water is being flushed into the Pond approximately every 3 hours and out of the Pond approximately every 3 hours. But even at dead low tide, water continues to fall from the Pond into the Sound. 3 IN 9 out ??

What part of tide cycle.

The existing marsh vegetation will be discussed - first the marsh pattern, then the marshes around Holly Pond, followed by a brief narrative on the two marshes south of the dam.

- The Marsh Pattern -

The marshes along the edges of Holly Pond follow a familiar distict pattern - a low marsh, a high marsh, and a transition border, followed by upland vegetation where space permits.

The low marsh which normal tides flood twice a day, consists solely of saltwater cordgrass, (Spartina alterniflora). For the most part, the low marsh's saltwater cordgrass forms a band 5-20' wide, but it also grows in patches within low spots on the high marsh, or along mosquito ditches carved into the high marsh.

The high marsh is ~~subjected~~ flooded by ~~to~~ higher tides twice monthly, called spring tides. (Spring tides create higher than normal tides because at full moon and new moon the sun and the moon are pulling the earth in a straight line.) This marsh consists mainly of salt-water meadow grass, (Spartina patens), usually with spikegrass, (Distichlis spicata) mixed in, and patches of blackgrass (Juncus gerardi) growing near the transition border. Also, saltwort, (Salicornia bigelovii) is normally found in low spots or shallow ditches in the high marsh, and orach (Atriplex patula) can be found scattered throughout the high marsh.

The transition border is ~~subjected~~ flooded by ~~to~~ exceptionally high tides. Marsh elder (Iva frutescens) marks the transition border, always banded on the upland side by tall peppergrass (Lepidium latifolium). And commonly at the base of the peppergrass and marsh elder, grows seaside goldenrod (Solidago sempervirens). Often, if there has been a disturbance, common reedgrass (Phragmites australis) grows here, too.

(The tall peppergrass was difficult to identify because it is neither listed in any saltmarsh book, nor is it in Peterson's wildflower book. Two other marshes - Todd's Point and Cos Cob millpond, Greenwich, Ct. - were visited to determine if it was as common as it is at Holly's Pond. No such species existed in either marsh. Could it be indigenous to Holly Pond? It is definitely a salt ~~marsh~~ species there, since it grows along the entire perimeter of Holly Pond, as well as on the more saline Sound side of the dam. Here, it can be found along the transition border of the marsh just south of the western end of the dam on Cove Island (it gets mowed, though!) and along the marsh on Horseshoe Beach.)

Beyond the transition border, upland plants grow, such as bayberry, (Myrica pensylvanica) and poison ivy (Rhus radicans).

- Marshes around Holly Pond -

The marshes on the Stamford side are not as extensive as those on the Darien side. But, all the marshes pretty much conform to the aforementioned four stages of marsh growth, even if there is only room for the first, or first and second stages. For the Stamford side of Holly Pond, a seawall parallelling Weed Avenue forms the western perimeter. Mostly only the first stage of the marsh, or saltwater cordgrasses grow at the base of the wall.

There are seven larger marshes all growing on the Darien side, that include all four marsh patterns. These marshes and bordering fringes are protected under the ~~1969 State~~ Tidal Wetland ~~legislation~~. The marshes are delineated on a map filed with The Stamford Environmental Protection Board, and a permit is required

from DEP, and sometimes the Army Corps of Engineers, to fill or develop a marsh. (Marshland not designated State Tidal Wetlands are regulated under local inland wetland statutes.)(personal communication, Cooper, 7/21/86.)

Some of the seven marshes have individual characteristics. The northernmost one, three properties south of Catalpa Terrace on properties 9,10,11 and 12 on the Tidal Wetland Map, is quite low, because, instead of a 5-20' band of saltwater cordgrass, it is composed of an approximately 100'' square block of saltwater cordgrass. (Marsh vegetation maps made in conjunction with this report are also on file with EPB.) In the marsh located in properties 21,22 23 and 24, just south of the culvert on Nickerson Lane, the two ditches nearest the Lane have been filled, transforming the familiar cordgrasslined ditches to short high meadow saltwater meadowgrass and blackgrass.

All of the marshes are healthy. The presence of millions of fiddler crabs is one indicator to this observer. They recycle minerals and organic matter, as well as provide nourishment for marine life. Stamford residents have told of how much better the low tide eeling and crabbing is compared to four years ago. Some of the hard and soft shelled blue crabs are a record-breaking 6-7" across. Other Stamford residents exclaimed how much more numerous the flatfish were in Holly Pond now, than before.

The saltwater cordgrass, inundated by high tides daily, is a verdant dark green and grows in ½" wide ribbon-like strands, often 3-4' tall at the edges of the pond. The fine, delicate brighter green saltwater meadowgrass, 1-2' tall, which usually edge the cordgrass in wide expanses, is only inundated during higher tides twice monthly. Spikegrass and blackgrass also look exceedingly healthy in their large amoeba-like patches or scattered throughout the high marsh.

Tall Peppergrass (Lepidium latifolium)

Nickerson Lane Marsh

Other indications of good health was the presence of saltmarsh species like saltwort and orach on the high marshes. So, there is enough saltwater reaching these areas to maintain a healthy and lovely salt marsh community.

Erosion did not appear to be a problem on Holly Pond, except in areas where there was disturbance - like, lawn cutting piles or excessive Canadian geese. The rhizomes of the grasses help to anchor the mud of the marshes to keep it from eroding. In addition, layer upon layer of ribbed mussels help strengthen the shoreline at many locations along the shores of Holly Pond.

- Marshes South of the Dam -

The two marshes just south of the western end of the dam on Cove Island are worthy of mention because they each have individual characteristics.

The northmost marsh, nearest the dam, has a great diversity of vegetation. It follows the familiar marsh pattern with a low marsh wide band of saltwater cordgrass. Then the high marsh is covered with saltwater meadowgrass, with great long patches of saltwort growing between the high and low marshes and in patches throughout the high marsh due to a higher salinity on this side of the dam. Ten percent of the high marsh meadowgrass is dotted with sea lavender (Limonium nashii carolinianum) whose August blossoms will transform the marsh to a soft lavender. Another 1-3% of the highest part of the high marsh is occupied by sea blite (Suaeda maritima) with minute pale green flowers, and sea pinks (Sabatia stellaris), whose tiny pink flowers will add a gay touch

to the lavender hues. Also here, on the highest part of the high marsh, but actually growing on the high marsh and not really forming a typical transition border, are a few clumps of marsh elder - probably this stunted strain has adapted to a great deal of saltwater dunking.

The second marsh south of the dam, south of the spit, is simply several large clumps of saltwater cordgrass. But, upon examining the 1968 Tidal Wetland aerial, it becomes obvious that today's marsh has greatly diminished in size from then. It must be less protected and thus more subjected to the vagaries of ocean currents and storms. This area, south of the spit, however, must be very healthy, because most of the fishermen dig softshelled clams from here - for bait and for human consumption.

Other overall general signs of health was the presence of a variety of different forms of life that made up a balanced food chain. Besides fiddler crabs and ribbed mussels, there were horseshoe crabs, spidercrabs, quahogs, razor clams, whelks, moon snails, boatshells, and periwinkles. And, as for birds, there were herring gulls, ring-billed gulls, mute swans, one bufflehead, a few northern shovelers, one cormorant, snowy egrets, great egrets, mallards, canadian geese, and spotted sandpipers. All contributed to a vital and bustling marsh.

Impacts

Two major occurrences may take place if the tidal gates are lowered for periods of more than a week at a time. (Scientific study or research must be done to determine the length of time gates could be lowered so as to achieve the goal of lowering, while at the same time doing the least damage to the vegetative ecological balance.) First, parts of the marshes may dry out,

because the distance the high tide pond water reaches would be less. And second, the sediments that will be flushed from the pond may be dropped on the south side of the dam.

- Dried-out Marshes -

Impacts of having parts of the marsh dry out would be two-fold: transition vegetation would encroach onto the high marsh and reedgrass would expand rapidly.

Transition vegetation such as seaside goldenrod, marsh elder and tall peppergrass would invade the saltwater meadowgrass high marsh. This type of encroachment occurred at the Pine Creek Salt Marsh in Fairfield, Ct, as documented by Dr. Tom Steinke, Conservation Director, when the marsh was diked in 1969. "Almost immediately the vegetation on the diked-off marsh began to change" (Bongiorno, 1984).

The low and high marsh grasses are the major photosynthesizing grasses and are much more productive toward the overall food chain and health of a saltmarsh then transition vegetation. A complex food chain is established that depends partly on the detritus contributed by marsh grasses, which, in turn, depend on the tide's fluctuation. Salt marshes are one of the most productive spots on earth.

Another impact of allowing the marsh to dry out would be a new spurt of vitality in the already present reedgrass. Reedgrass has already encroached upon four of the larger marshes on the Darien side of Holly Pond. It is an aggressive tall grass that sends out long runners (rhizomes) - sometimes as long as 20 feet - grows rapidly and reaches heights of 5-15 feet. It tends to dry out a marsh, presenting a severe fire hazard. Also, it reduces the diversity of marsh vegetation, and contributes little to de-

Common Reedgrass (Phragmites australis)

Present Tidal Gates and Dam

tritus. Furthermore, it has little wildlife value - few bird or animals nest here or eat reedgrass rhizones. Reedgrass is an indicator that there has been a disturbance - either that the water in the salt marsh has been lowered or made less salty (Brown, 1981).

- Flushed Sediments -

A second major impact that could occur if the tide gates are lowered are increased sediment on the Sound side of the dam, changing the character of the marshes there.

By lowering the gates a few feet, some bottom areas in the Pond could be scoured and cleansed allowing new loose sediments, as well as those sediments that have built up behind the dam to be swept through the new low gate height after the tide turns. These sediments could be dropped on the south side of the dam. The impact on the marsh nearest the dam that presently hosts diverse salt tolerant vegetation, may, in effect, be that it gets filled, with the result that little vegetation but saltwater cordgrass may remain. The marsh south of the spit may disappear, on on the other hand, could build up to provide a high marsh. In both cases, the vegetative ecological balance may suffer a setback until a new status quo is reached, for better or worse.

Conclusion

The results of this three month spring vegetaion survey show a very vital, enriched, and healthy Holly Pond.

Meddling with the tidal gates would probably result in major ecological changes and should thus be a well thought out act. However, conditions may change in the near or distant future whereby the option to raise or lower tidal gates at Holly Pond would be desirable.

In any case, a tidal gate committee should be formed - including a botanist, a biologist, and other knowledgable experts as well as a few local residents - to oversee any decision that interferes with the delicate balance now reached by the present marsh vegetation due to the existing tidal fluctuations.

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SPECIES LIST

Low Marsh Vegetation:

Saltwater cordgrass (Spartina alterniflora)

High Marsh Vegetation:

Saltwater meadowgrass (Spartina patens)
Saltwort (Salicornia bigelovii)
Sea lavender (Limonium carolinianum) — NASH II
Seaside plantain (Plantago maritima)
Blackgrass (Juncus gerardi)
Orach (Atriplex patula)
Sea blite (Suaeda maritima)
Sea pink (Sabatia stellaris)
Spikegrass (Distichlis spicata)

Transition Vegetation:

Switchgrass (Panicum virgatum)
Seaside goldenrod (Solidago sempervirens)
Marsh elder (Iva frutescens)
Grounsel tree or sea myrtle (Bacchis halimifolia)
Water Hemp (Acnida cannabina)
Red fescue grass (Festuca rubra)
Common reedgrass (Phragmites australis)
Marsh mallow (Hibiscus palustris)
Tall peppergrass (Lepidium latifolium) — Not a transition zone plant; grows in areas not mowed!

Upland Vegetation:
Herbs:

Hoary cress or whitetop (Cardaria draba)
Star of Bethlehem (Ornithogalum umbellatum)
Yellow iris (Iris pseudacorus)
Curled dock (Rumex crispus)
Poison ivy (Rhus radicans)
Evening lychnis (Lychnis alba)
Milkweed (Asclepias syriaca)
Beach rose (Rosa rugosa)
Nightshade (Solanum dulcamara)
Goosefoot (Chenopodium album)
Wild onion (Allium vineale)
Silvery cinquefoil (Potentilla argente)a
Greenbrier (Smilax sp.)
Bladder campion (Silene cucubalus)
Early meadow rue (Thalictrum dioicum)
Yarrow (Achillea millefolium)
Beach pea (Lathyrus japonicus)
White sweet clover (Melilotus alba)
Privet (Ligustrum sp.)

Upland Vegetation:
Herbs:

Jewelweed (Impatiens pallida) capensis
Broom (Cytisus scoparius)
Virginia creeper (Parthenocissus quinquefolia)
Bindweed (Convolvulus sp.)

Shrubs:

Swamp fly honeysuckle (Lonicera oblongifolia) ch
Sweet brier (Rosa eglanteria)
White rose (Rosa multiflora)
Japanese honeysuckle (Lonicera japonica)
Scentless mockorange (Philadelphus inodorus)
Winged sumas (Rhus copallina)
Poison sumas (Rhus vernix) ——— ? R. typhina or R glabra
Bayberry (Myrica pensylvanica)
Red raspberry (Rubus idaeus)
Common elderberry (Sambucus canadensis)
New Jersey tea (Ceanothus americanus)

Trees:

Tree of heaven (Ailanthus altissima)
White mulberry (Morus alba)
Black cherry (Prunus serotina)
Box elder (Acer negundo)
Red maple (Acer rubrum)
Elm (Ulmus sp.)
Sassafras (Sassafras albidum)
Apple tree (Prunus malus)
Red cedar (Juniperus virginiana)
Eastern white cedar (Thuja occidentalis)
Pin oak (Quercus palustris)
Red oak (Quercus rubra)
Eastern cottonwood (Populus deltoides)
Large-toothed poplar (Populus grandidentata)
Princess tree (Paulownia tomentosa)
Black oak (Quercus velutina)
White oak (Quercus alba)