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Comments from Tim Visel – Sept 2009
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Introduction

Hammonasset Beach located in Madison, Connecticut is an active and large barrier beach system. Its watershed and tidal wetlands/salt ponds have been significantly changed since colonial times. Today, the barrier beach extends from Webster Point, Madison to the eastern tip of what is called Cedar Island, Clinton. The Hammonasset Barrier Beach once contained two barrier inlets, one east of the center of what can be called the main beach and a smaller barrier beach system which formed Sandy or (today) Cedar Island. The two inlets were called Dowd's Creek at Hammonasset and at Clinton Harbor, "the Dardanells" as the inlet was locally known. (The term barrier beach inlet is a rather new term, so colonial and historical references that referred to creeks in fact functioned more like episodic barrier inlets, frequently opening and closing during storm events.

The shape of Hammonasset Beach itself is determined by geologic history, the glacial period and terminal/recessional marines. Its bowl-like feature sets the stage for classic barrier inlet formation, a split in the sediment transport system or littoral drift. This split can be plainly seen from aerial photographs – large accumulations of sand to the east of a granite groin at Tom's Creek at the western park edge, and large accumulation of sand to the west of Meigs Point Groin at the eastern end. A split transport system creates a weak "section" in the middle as currents take sand east or west from the center. This split can be seen during powerful "Nor'easters" coastal storms as the normal drift to the east is interrupted by a sudden movement

* Please not as of September 2009 no committee consensus has been reached in terms of habitat modification in terms of building habitat capacity for reef fish or shellfish. The view expressed here is not the EPA Habitat Workgroup for protection of shoreline or creating new habitat for fish or shellfish.

to the west. Hammonasset is likely a connection of two separate barrier beaches each with its own dynamic transport system. The Dowd's inlet can be found on colonial maps as a separate and distinct opening east of Tom's Creek. According to local oral history (Mr. Emil Miller), Dowd's inlet was filled along with a salt pond during the construction of the Grand Pavilion prior to the opening of the State Park. Its remaining watershed and smaller salt ponds were again filled in the 1960's by dredge/fill, and in the 1970s with gravel parking, and finally again with the construction of a large paved parking lot now known as "East Beach". The remaining Dowd Creek inlet and watershed area was connected to the east branch of Tom's Creek with a straight 1,500 foot long lateral tidal ditch. Little, if any, of the original inlet, creek or salt pond system survives today.

Sediment Transport – Inlet location

According to maps, aerial photographs and oral history, the inlet and salt pond were located[1] much in the same area as the two West Beach bathhouses and the newest paved parking lot. That is the "weakest" area that is subject to the worst erosion and loss of beachfront as waves split or attempt to re-split the beach into two beaches, as it will always do, especially during storms. In general, fixed permanent structures should be avoided or moved back from the beachfront. Inlets were subject to large corrective forces such as hurricanes. The Dowd's inlet was active in the 1880's and 1890's, but over time, such openings, removed from extensive fresh water drainage, tend to heal or "close" moving landward. Tom's Creek does function as a creek because, at low tide, it has sufficient flow to cut an "ebb channel". Dowd's Creek did not cut its own channel acting more like a salt pond, and this opening would open and close as the storm events. Colonial landowners often sought to permanently close inlets such as these for transportation and to prevent periodical flooding of farm fields behind the beach. The original opening to Niantic Bay between East Lyme and Waterford, for example, once had three such openings but only one remains today. The others were filled and paved for ease of transport, both vehicle and train, in the late 18th and early 19th centuries.

Barrier beach inlets also have been diked with often-extreme unfortunate consequences. The North River Inlet between Situate and Marshfield is a very famous case history study of building such dikes, and for nearly a century, deeply divided this coastal community. On Hammonasset Beach, the location of the Parks "Grand Pavilion" and the Clam Shed were just west of the Dowd's Creek barrier inlet. Because of the climatic and temperature charges and sea level rise, the barrier beach inlet may again reopen. A second weak section existed just west of the 1964 Pavilion (since removed), and in the early 1970's, this beach front was also breeched, but was quickly closed by state park staff using bulldozers.

In the late 1970's, the State of Connecticut sought to expand parking at the West Beach bath houses. To do this, they excavated an area behind the beachfront, and I watched as hundreds of old poles 4 to 6 inches in diameter, were exposed. At the time, I thought I was seeing[1] the remains of a colonial bridge, but now realize that it was an old Native American fish trap that had been preserved in the acid muck

of the previous tidal environment. I recall the state park had to send many of its large green dump trucks to carry all the poles from the site. Mr. Miller once told me of a fish trap in the area, but always thought it was Sound side, not in a salt pond behind the beach. The practice of trapping fish in such a tidal breach/salt pond was common by Native Americans. Fish would enter such a salt pond on the incoming tide and be trapped by a big brush fyke trap net. Salt ponds were actually preferred for such "vee fykes" were common to catch alewife, flounder and eels. Many have been found in Maine where the "V" stone wall configuration can be seen on aerial photographs. At the time, I first thought that the original salt pond was being created or restored. My enthusiasm waned as fill was trucked from the site, which yielded a silt-like gray to black sand with many clam and oyster shells, only to be replaced with crushed stone. It was very evident that this area was tidal and even the excavation itself soon filled with seawater, and it became more of a dredging operation that an excavation one. My disappointment yielded a letter to the Army Corps about several projects in 1979 and the need to rebuild, not fill in such salt ponds.

Erosion Control – CT Coastal Embayment Board Discussion

After Hurricane Gloria, the Connecticut Coastal Coves and Embayment Board briefly discussed the Hammonasset Beach issue. Two suggestions surfaced. The first was creation of two new rock groins, one toward Tom's Creek which entrance had been "stabilized" in 1925 and the other towards Meigs Point. Placement is critical and similar stabilization projects actually increased scouring/erosion in Rhode Island for salt ponds. The groins should not be placed at the convergence of the two transport currents. Groins also could slow the erosion if combined with a dredge project similar to the one in the 1960's. A downside was normal erosion/accretion on either side of the new groin. This is often called "step or ladder beaches," and some famous photographs from Florida illustrate the impact of a series of groins and jetties on shoreline sediment transport processes.

A second option was the offshore placement of cut granite blocks 8′ X 4′ X 2′ high. They would be placed 800 feet shoreward of the low tide line. They would act to

[1] According to Emil Miller, former park resident, the location of the Grand Pavilion was largely decided by the trolley rail line into the park; straight to the beach was the least costly route. Personal Communication T. Visel, 1968 circa.

disrupt the surge of water during storms by reducing the wave energy as an "underwater breakwater" directed toward the beachfront. This option would not stop only slow the recessional/erosion movement of the beachfront that creates the split which can become the barrier inlet. All agreed that without intervention, the beachfront would continue to recede, eventually splitting the beachfront dune line in this area which it has done twice since the 1950's. A suggestion was made to place further offshore in case they became popular recreational fishing areas as often is the case with more permanent breakwater projects. (They often enhance the habitats for reef fishes.)

Environmental History

Evidence does indicate the presence of Native American coastal fishing village(s) 1,500 to 2,000 feet offshore of the current high tide line. The 1960's hydraulic dredge operation pumped hundreds of artifacts ashore with the fill. If estimates are correct, since the colonial period, Hammonasset Beach has eroded an average of 2 feet/yearly (from 1900 to 1955, 200 feet; since 1955, around 100 feet). The age of the offshore site is suspected to be around 900 to 1100 AD placing it in the proximity of its current offshore location.

Using a standard slope angle (which changes from summer to winter) of 1 to 4, a 6 foot erosion event signals a high tide line about 24 feet beyond the erosion artificial tide line. Within the last 10 years, several erosion events have exceeded six feet, which places the natural new high tide line at 15 feet under and beyond the existing bath houses. Excavation of dredged sand and fine grain silt nearby (which it appears contained hundreds of Native American artifacts) has prevented the loss of the existing boardwalk and bath houses This slows but does not stop the natural processes to open the Dowd's Creek cut. The fine grain silt is not the proper size for the active transport system wave energy and is quickly washed away.

"Natural" Corrections and Storm Events

The geologic history and sea level rise does point to a gradual receding shoreline that includes Hammonasset Beach. The recession is not a constant condition, but the beach subject to "large corrections," usually storm related. Massive corrections occur after hurricanes. Some literature does include references to the "safety valve feature" that barrier inlets absorb and dissipate massive storm energies (probably why they reopen), and that once closed, set the stage for broader area erosion or severe point erosion as wave and storm surge energy has "no place to go." While the western end of Hammonasset Beach continues to erode, Meigs Point to the east blocks much of the transport system, and the beach there has actually grown over time.

Beach "nourishment" activities temporarily postpone corrections and require frequent and sometimes massive intervention. Many researchers feel that the shoreline should be allowed to retreat and with it, a dune line which acts as a partial "sand bank" during these storm events. Windblown sand accumulates and creates "dunes" which are temporary and subject to movement and destruction themselves. The stabilization of the beachfront and boardwalk prevents the "sandbank" dune line to form. In powerful storms, waves cut and withdraw sand from the dunes lessening erosion events. There is no dune line here to provide the "loan" of sand during storms, so any energy is subject to creating more severe sand/sediment loss. This aspect is well known and has led to some positive and extensive dune restoration projects at the Beach. These have very successful and are considered a model for other states. In this case, fill was dumped behind the dune line and native plants replanted. Wood walkways have lessened the impact of foot travel, and today it is hard to tell these modified habitats from the natural ones.

<u>Fifty-Year to One Hundred - Year Storms – Future Events in Connecticut</u>

We have cyclic storms of powerful historic magnitude consequences. They are described as 50 – 100 - and even 500-year storms. They leave lasting and memorable impacts beachfronts. Several freestanding Hammonasset boardwalks have been lost to such events. The 1938 hurricane and three hurricanes after, between 1955 to 1960 left terrific damage to the boardwalks. The 1918-20 boardwalk pilings (stumps) can be seen after Nor'easters today, some 10 feet below the extreme low tide line. With today's perspective, the first State Park boardwalk would appear today as a lateral fishing pier separated by 50 feet by water from the current beach, that is how far the beach has receded in a century. In 1965, a large dredging operation filled in and expanded beaches eroded from the 1938 and 1955 hurricanes; to stabilize the Tom's Creek entrance, three jetties have been built since 1920.

In a century from now, Hammonasset should again be two beaches. Waves should break beyond the edge of the "new" paved parking lot. And the two remaining bathhouses should be just history.

In the event of a 50-year of 100-year storm, the absence of a sandbank in the area predicts the next correction could be catastrophic. It could happen tomorrow, to quote the Weather Channel. A major reestablishment of the Dowd's Creek entrance could occur after such a storm.

Part I
Broaden Project Scope Parameters

<u>Habitat Restoration Initiative Guidelines</u>

The above history illustrates three areas of concern regarding the modifications of "healthy" habitats and alteration of "natural" processes and habitat creation. The State Park has a long history of all three: intervention (alteration), habitat (natural process) modifications (mitigation), and habitat creation (erosion control). It may be necessary for these activities to occur in order to restore the natural processes or recreate the lost habitat. If citizens or the State of Connecticut wish to restore "populations" of living marine resources, the environmental habitat history needs to be considered. The State and prior colonial use altered the natural processes here for quite some time. Road building and public use such as agriculture and recreation has, on many occasions, altered the natural processes at Hammonasset. Not all actions have been damaging and, considering overall ecology, some have been good. A tremendous dune building effort in the 1970's recreated a dune ecology that continues to flourish and support a rich ecosystem of wildlife. Salt ponds have been excavated and enlarged, and salt marshes and tidal inlets reestablished. It is important to weigh the long term impacts of resource loss in terms of habitat value to citizens without debating the consequences of the loss itself. For example, many of the State's salt ponds were filled for agriculture, transportation or development. To excavate upland for salt pond creation may act to replace that habitat while destroying a healthy upland habitat. In many cases, is impossible to restore lost habitats simply because its use is so different or its cost astronomical. For instance, converting road causeways back to salt marshes or tidal ponds is not practical.

Specific Examples of Habitat History – Habitat Creation Meigs Point Groin - 1955

To alter the natural erosion processes, the State of Connecticut built the Meigs Point Granite Groin. Constructed of cut granite blocks over a stone core, the groin quickly became a popular recreational fishing spot. Once the pre existing habitat was changed – the granite blocks were quickly covered with the typical ecosystem profiles organisms of structures in marine reef habitats. I would say that the groin has supported millions of recreational fishing hours. Today provides a richer and different habitat structure than it did before. The carrying capacity of reef fish organisms has been enhanced by this created habitat which continues today.

Habitat Mitigation – Chase Pond - 1979

One of the most popular estuarine bird watching areas in New England is largely the result of habitat mitigation. In exchange for the loss of healthy habitats resulting from road construction at the State Park, Chases Pond was excavated and tidal connection improved (Army Corps of Engineers, August 1979). The resulting Chases Pond habitats quickly adjusted to the habitat mitigation that included the dredging of upland and fill to enlarge the pond. I feel that most bird watches are unable to distinguish the natural part from the man-made sections of the Pond today. It is a rich estuarine tidal habitat enhancement environment that supports a different species profile than before.

<u>The Dune Rebuilding Project of the Late 1970's</u>

A series of serious storms and Nor'easters caused destruction of much of the existing dune line from the 1964 pavilion to Tom's Creek. It was rebuilt over a series of four years by dumping fill behind the beachfront. This habitat enhancement has been so successful only a trained ecologist would realize it was not natural but created by man. The State of Connecticut trucked in hundreds, perhaps thousands, of dump truck loads of clay to form a new artificial dune line over about a mile of beach front strategically placed back from the beach front, once the clay had stabilized by absorbing water and hardening, loose sand was placed at the base and shore/coastal plants soon followed. In the years after this habitat creation, these dunes continue to support a wide variety of wildlife and native plant species. I am certain this has enhanced organisms richness and diversity in these areas.

Habitat Creation, Enhancement and Mitigation Discussions
Part II
Possible Changes in State Policies

Restoring Populations May Require Additional Habitat Studies

In order to fully utilize all restoration options, it is necessary to know the capacity of various marine habitats. Without the carrying capacity figures, no measure can be made to assess habitat values. Habitat enhancement can increase populations when the carrying capacity of a given habitat type is increased or enhanced. The carrying capacity is sometimes referred to as a heritage value; in this case, the quantity of a given organism a given habitat type can support. This is especially true with our lobster Homarus americanus. The ability to sustain population densities is directly related to the size and type of bottom structure – more structure is often recognized to yield more lobsters and visa versa. To release stage four lobsters into barren feature-less bottom will exceed the carrying capacity, and most of the small lobsters will perish for lack of cover. If the bottom habitat was enhanced first before the release, in this case by adding structure, the population of lobsters that habitat theoretically could sustain will be increased. This is an example of extensive aquaculture. In areas of high lobsters fecundity and poor lobster habitats (less or no structure), increasing the carrying capacity can have more of a positive impact than recruitment. It is often the case that recruitment potential is almost in every case higher than habitat capacity. Oystermen in the 18^{th} and 19^{th} centuries increased the habitat carrying capacity of the northern or American Oyster Crassostrea virginica here in Connecticut. It was learned that a tremendous amount of oyster spat was wasted in the water column landing and perishing upon substrates unsuitable for survival. See Appendix 3.

Oyster growers soon found by experiments that enhancing favorable habitats with clean dock-dried shell and placing it precisely when oyster larvae needed a clean substrate upon which to set could yield up to 50,000 spat/bushel of shell. The success of such habitat enhancement is legendary, and Connecticut was soon producing millions of bushels of seed oysters. Connecticut had more structure-dependent fish also. Oyster growers had increased the carrying capacity of the Connecticut shoreline for oysters, and they did it in a measurable way. Southern coastal states have for decades sought to increase the carrying capacity for reef fishes, a popular recreational fishing opportunity, by use of submerged structures – building debris, old transportation vehicles and vessels. It is hard to determine the economic value in terms of the recreational boating and fishing industry, but it is in the billions of dollars.

The lobster resource here in Connecticut is in steep decline. One of the ways it can be rebuilt to sustainable levels is by constructing artificial reefs to create habitat. The carrying capacity of high profile reefs (structure) is some 12 times as large as smooth bottoms. That is why lobster fishermen seek out structure by which to place traps. Increasing the number of mature size lobsters may allow for reproductive success but, without increasing the habitat carrying capacity, it will not ensure a quantitative increase in lobster populations. However, the combined impacts of capacity enhancement by way of food and shelter from the lobster traps themselves, have many feel altered the population dynamics of the lobster resource by driving the natural size distribution from larger to smaller and increasing the number (density) of sub-legal lobsters in specific habitat types.

One of the challenges of natural resource management is the identification of primary and secondary limiting factors. They may include habitats for life cycles, sufficient food availability, reproductive success (recruitment) and predator/prey relationships. Disease outbreaks often occur when the population is sustained beyond the normal carrying capacity. It is speculated that the huge number of lobster traps in northern waters has enhanced the habitat carrying capacity several fold, beyond what is a normal yet smaller population of larger lobsters. At the same time, this increase drives the average size of the lobsters smaller than what could be considered natural and feeding them at the same time. Two centuries ago, the Cape Cod lobster fishing grounds and the Maine coast were exhausted by over-fishing; as fishing pressure increased, a general decrease in lobster size occurred[2]

In the 1880's, lobsters between six to ten pounds were not unusual; smaller ones, two pounds or less, were often thrown back in waters five fathoms deep or less (30 feet). We have Colonial reports of capturing three and four foot lobsters by use of spears. Lobsters between five to ten pounds were common at the start of the trap fishery before the Civil War. Hard fishing pressure had reduced both the number and size of lobsters within three decades of inshore trap fishing. While size regulations and VNotch restrictions maintained a new and different population distribution, they did not increase the habitat. However feeding sub-legal lobsters and providing cover (structure) with the traps themselves did increase the carrying capacity in certain habitat types. With the natural biology of the lobster, which is typically cannibalistic, increasing the food supply alone could enhance survivorship. Habitat studies that include demonstration projects to increase lobster populations in light of the resource decline should have merit.

Little difference can be seen to placing shell to catch oysters' spat; favorable habitat for oyster growth will be "enhanced," and a new population of seed oysters "created." The loss of clean shell can be mitigated by cultivating or washing off silt from oyster beds which could be considered an altered natural process. The guidelines continue a past pattern of highlighting a conservation analytical approach to resource restoration. While this approach certainly has merit, especially with preserving natural resources such as in protected or wildlife area

[2] See appendix (2)

designations, this model most often was designed to prevent or restrict natural resource use. It is difficult to make this same model work for the enhancement/restoration of resources or populations when its design fundamentally is to "protect them" from use or loss.

Anyone who have ever turned the soil, watered plants during a drought or planted seeds has practiced some form of habitat mitigation, enhancement or creation.

The current "green" application of roof gardens is one of the newest and potentially largest habitat mitigation examples of modern time, which seeks to both restore natural water cycles and respiration of plant life. Grassed waterways, retention basins and aquatic recharge ponds were created to restore surface and groundwater tables. Millions of birdhouses and nesting platforms have been built to restore habitats and wildlife ecology.

These are just a few of examples of successful interventions to restore natural resources or increase specific populations. The Habitat Restoration Initiative should consider modified approaches and include them in the revised policy/guidelines for Long Island Sound.

Part III
Habitat Restoration Guidelines and Comments

Discussion

The habitat restoration guidelines often lock applicants into specific sites. I feel we should be looking at target populations, assemblages and the habitat carrying capacity for such organisms. The carrying capacity for various habitat types remains largely unknown and unstudied in Connecticut.

Such activities when combined in a pilot project or small-scale demonstration experiment can provide valuable information on population assemblages as our state faces global warming and sea level rise. The first three items listed under "activities not recommended for funding (page 9): Habitat creation, modification of healthy habitats and alterations of natural processes" fail to recognize that they occur with or without our permission. Sea levels rise and global warming has modified "healthy" habitats have altered all combine to "natural" processes and created new habitats here for quite some time, all combine to create an "environmental habitat history." The area in the former Dowd's Creek region of Hammonasset Beach, after very serious storms, exposed two large peat bog banks, very old remnants of a marsh. In the peat itself was roots and fibers as well as thousands of holes that appear to be created by mollusks. No doubt at one time it had been "healthy" but has been eroded by a receding coastline, one that has been receding for over a thousand years.

Therefore, removal of habitat creation, habitat modification and alteration of natural processes from consideration restricts efforts to restore populations when the natural environment is itself undergoing change. These are important tools to remove from the HRI toolbox. To include them would certainly require a broadening of the concept, beyond existing programs which have focused upon tidal restrictions and installation of fish passage ways, positive outcomes in their own right but well established before the LISS or even the DEP came into existence. (See Appendix 4)

Several of the not recommended activities do occur, in fact, in the state. The interpretation of "healthy" itself is debated often with no clear outcomes. Excluding these activities from consideration ignores the positive outcomes of man-made interventions. I think the "artificial" nesting platforms for osprey come to mind as an important modification to help restore a population, in this case, the osprey. This example shows the positive benefits outweighed the negative for instance, herring and alewife might have a different opinion if able to respond. Without these "tools," the habitat values of ecosystems, which today remain largely unknown or at least in many cases, poorly understood, are subject to conflicting goals. Site-specific restoration is often impossible, and while natural habitat exchanges occur, there often is no acceptable way to measure them. For example, the environmental services from vertical artificial reefs would be enormous, but I find them rarely referred to as a positive benefit. We could create habitats to restore or enhance reef fishes in the coastal zone, but with habitat creation off the table, one would need to find a degraded reef and, even if located, would need to promote one habitat value (reef fishes) over another of unknown value which would need to be defined against an unknown measure. (See Appendix #5).

To remove these items from consideration eliminates to a large extent an important way to restore populations of organisms that are specific to a certain habitat. Most of the estuarine and near coastal recreational and commercial fish species are dependent (associated) with sub-tidal and tidal shore habitats. It also ignores the habitat values created by human activity as well as those degraded or destroyed. These policies also fail to recognize the extent of habitat acreage there is no longer a viable or practical way for which to restore. I feel the three examples found in Hammonassett State Park illustrate this concept. A new project (and a good one), started in 2004, excavated several acres of fill from the 1965 dredge/fill operation in order to nourish the beach and to create a new salt flat marsh environment. This project illustrates the successful implementation of #1, habitat creation and #2, modification of "healthy" habitats. The previous created habitat was a sandy upland with successional cedar trees, low scrub and bittersweet. It supported typical wildlife, many species of birds, rodents and predated prey species, such as rabbits and fox. This created habitat over marsh appeared to be healthy and well established.

Excavation of the site started in 2005 continuing until about 2007. A new habitat was created - a tidal salt marsh and tidal flat environment. Although the previous habitat values appeared to be good (healthy), they were changed to reflect a more coastal habitat, a habitat that once was prevalent in the area. It is, however, a temporary habitat as sea level continues to rise. The area will again be transitioned into an active beach front/dune line habitat as the beachfront continues to recede.

History shows us that nature, not man, is the largest habitat destroyer as well as creator, enhancer and mitigation at the same time, and that habitat creation, enhancement and mitigation is not something to avoid but to explore. Habitat changes are long term and dynamic; we can create habitat types that may or may not duplicate exactly natural habitat values, but we need to know what they are so we may be able to accurately determine the benefit. The artificial reef breakwater habitat/services is significant, but carrying capacities of them in our waters remains largely unknown/unstudied.

Many harbors have been dredged in Connecticut, but the environmental services after dredging is nearly non-existent in the scientific literature. Much effort has been expanded in the construction of anadromous fish passage ways, but monitoring is often slight and annual "fish census" activity needs to be reestablished. We need to fill these "holes" and linking these similar tasks of habitat creation, mitigation and enhancement is a method to do this. In this way, we may be able to address the issue of "sustainability" and resource restoration. Fishing habitats, like those described above, may provide clues to this process. The guidelines appear to narrow the focus to such an extent that it may seem easier to many to let "Mother Nature do it." We may be missing an historic opportunity to study the environmental services of shellfish/finfish habitat associations by failing to study the cleaning, reshelling and cultivating of natural oyster beds. The nitrogen removal services from structures such as docks and pilings has never, to my knowledge, been addressed here in Connecticut. A realistic and sustainable approach to navigational dredging, especially in smaller tidal rivers, needs to be renewed in terms of habitat value and balancing them with user groups and resource utilization.

The current guidelines place much of the responsibility for determining habitat values upon the applicant. Attaining and compiling complex technical information is often beyond the capacity of the general public or civic group. This requirement can limit the opportunity for smaller groups or associations to participate in this program. It continues to place barriers between the marine resources and the citizens of Connecticut.

Timothy C. Visel

Appendix 1

State of Connecticut

State Geological and Natural History Survey

Bulletin No. 46

"The Physical History of the Connecticut Shoreline"

By Henry Staats Sharp A.M.

Hartford – Published by the State

1929

Superintendent W. E. Britton Ph.D.

Agricultural Experiment Station, New Haven

Press of The Wilson H. Lee Company,

New Haven, CT

CONNECTICUT GEOL. AND NAT. HIST. SURVEY
Bull. No. 46 - History of Connecticut Shoreline
HAMMONASSET BEACH.

In Hammonasset Beach in Madison the people on Connecticut own one of the longest and most beautiful stretches of sand beach in their State. As mentioned in Chapter I they have in this a self-supporting State Park maintained and operated for their benefit, and the writer strongly urges every resident or visitor in Connecticut who may not have beach privileges elsewhere, to visit and enjoy the excellent beach available here. The outer two-thirds toward Hammonasset Point is a tombolo uniting the Point to the mainland. The former stands about 20 feet above sea level and is composed of till containing many huge boulders, which form the shore as far as West Rock in Clinton Harbor. Offshore boulders and shoals testify to the former greater extent of the till, which, before the building of the tombolo and deposition of the marsh, must have appeared as an island at a considerable distance from the mainland. At low tide the surface of the beach averages 100 feet in width and slopes seaward about seven degrees. Behind the beach is usually found an area of dune sand of considerable width but little height. These dunes have been breached in a number of places on the western side of the Beach, and material has been carried three or four hundred feet back over the marsh. These breaks usually take place during winter storms at which times the marsh and low upland on which the park buildings stand may be partly inundated.

THE MADISON SHORELINE

The remaining shore of Madison shows no feature of great interest. As a rule it is composed of the stratified sands and gravels of low plain, which has suffered severe erosion, although the larger part is now protected by seawalls. Shorefront acreage is extremely valuable here, and the shore defenses are proportionately expensive. Immediately west of Hammonasset Beach the rapid wasting of the shore has caused the abandonment of a road, and the caving banks indicate the source of much material for that Beach. The shoreline in glacial material is occasionally interspersed with a brief stretch of bedrock, which invariably makes a slight projection and can be regarded as a contraposed shoreline. Tuxis Island and Gull Rock are rock islands, which were probably at one time largely or entirely covered by loose material. According to Mrs. Wilson Coe of Madison, Gull Rock was formerly tied to the mainland by a tombolo on which grew beach plums, while Tuxis Island could be reached by stepping from stone to stone at low tide. The upland here is said to have retreated at the rate of a foot a year before strenuous efforts at protection were made. At Hogshead Point the upland ends, and the shorefront is formed by a low bar of sand lying before the extensive East River marshes. In many places considerable areas of marsh appear outside the cordon of sand showing the retreat of the latter over the marsh surface. The end of this bar at East River shows two minor recurved hooks extending out into the marsh and denoting the former position of the shoreline, when the drift of material was more directly northward.

Appendix 2

<u>Lobster Habitat Carrying Capacity – Tim Visel – September 2009</u>

This summer I have contacted several organizations seeking more up to date information on the carrying capacity of various types of lobster habitat. By the end of September 2009 no responses as yet have arrived. Until I have more recent studies I'm using notes from a 1978 fishery economics course at the University of Rhode Island for estimates of habitat capacities.

The example below provided by a guest lecturer who used a 60 foot circle dropped over a certain habitat type (the example was a drinking glass on a desk). The circle when placed over smooth featureless bottom yields less than one pound/year (harvest size). Cobble stone/kelp circle – 3 to 5 lbs/year with more structure such as small stones – glacial boulders 5 to 8 lbs/year. Large boulders/reefs up to 12 lbs/year of harvest size lobsters. For the carrying capacity the highest value can be one 12 lbs or 12 - 1 pound lobsters. Nature tended toward larger lobsters. This can be considered a background or heritage value.

Today, lobster fishers seek out habitats with structure so the above capacities may seem smaller that actual but the difference between smooth featureless bottoms (no structure) to those if that contain a high degree of structure should yield 12 times as much lobster each year. Lobsters can be trapped on sandy and even muddy bottoms as they search for food or burrow into muddy bottoms for shelter. The lobster fishery has enhanced the carrying capacity of the existing habitat by providing both, food/shelter and maintaining a constant reproductive population (gauge limits and the Vnotching of female egg bearing lobsters). Food availability among rocks/ledges is slight but provides key habitat as lobsters increase in size. This is not to say the other habitats are not important but similar to the oyster industry with supplemental shell, balance is needed to sustain lobsters at different stages of their life cycle.

Lobster Habitat Carrying Capacity – Fisheries History United States Fish Commission

The Fisheries and Fishery Industries of the United States by George Brown Goode, Assistant Secretary of the Smithsonian Institution and A Staff Associates, Section V, History and Methods of the Fisheries, in two Volumes, with an atlas of two Hundred and Fifty-Five Plates, Volume II, Washington, Government Printing Office 1887.

The Lobster Fishery – Page 701

South Harpswell, ME – Between 1850 and 1855, at South Harpswell, the fishermen were accustomed to go out two in a boat, each boat setting from fifty to seventy-five traps, and obtaining a daily average of from 400 to 500 lobsters of marketable size. All lobsters weighing less than 2 pounds were thrown away, and the remainder were sold to the canneries at an average price of 3 cents each in the spring, and 2 cents each in the fall, the canneries agreeing to take only those above 2 pounds weight. The fishing season lasted from March until May, and again from September until about the middle of November. When the factories were closed, the fishermen sold to the smacks running to New York and Boston, scarcely any of the lobsters being disposed of to Portland parties. The smacks paid about the same prices as the canneries, beginning in the early spring at 3 1/2 to 4 cents, and falling later as low as 1 1/2 cents, when the lobsters had become more abundant. Frequently, when the markets were dull, the fishermen, after culling out all lobsters under 2 pounds in weight, would bring the remainder to the smacks, where about one-third more in number would be rejected, only the larger individuals being bought. This would happen only late in a season, or during a very dull market. Marketable lobsters then averaged about 3 1/2 pounds each.

At all points along the coast, from Cape Small Point to Pemaquid Point, the fishermen are agreed in saying that formerly lobsters were very abundant and of large size, and that overfishing has reduced them both in size and in numbers. They are quite unanimous in the opinion that if the present State law is continued, it will be better for the fishermen.

Appendix 3

Department of Commerce, Bureau of Fisheries
Hugh M. Smith, Commissioner

The Oyster and The Oyster Industry of The Atlantic and Gulf Coasts

By E. P. Churchill, Jr.
Assistant, U.S. Bureau of Fisheries

Appendix VIII To The Report of the U.S. Commissioner of Fisheries for 1919

Bureau of Fisheries Document No. 890

In tracing the history of any oyster bed, reference must be made to the nature and characteristics of the young oyster as it develops from the egg. As has been explained on page 13 embryo oyster is a minute organism endowed with certain feeble powers of locomotion, which are sufficient for awhile to keep it suspended in the water and permit its being carried by the currents. In some cases it may be carried several miles from its parents before the setting stage is attained. The chances are many that when this happens it will lodge on mud and end its story, for so small is the larva at this state that a mere film of ooze suffices to stifle it. If however, by rare good fortune it, at this time or just before, comes into contact with a shell, pebble, twig, rocky ridge, or other clean body, whether at the bottom or not, it speedily attaches itself and continues its growth.

So abundant is the supply of larvae in any prolific oyster region that ordinarily several or many will attach to each square inch of clean surface, and a shell may furnish attachment for a hundred or more. Under such circumstances there soon begins a struggle for existence that is nonetheless rigorous for being purely passive. As the young oysters grow there is not room for all, and the more vigorous ones, themselves distorted by the crowding, overgrow, stifle, starve, and eventually kill those of slower growth or less advantageously situated. At the end of the first year there has developed a cluster of perhaps from two to a dozen young oysters growing on the original shell, all projecting upward and crowding one another into long, narrow shapes. Upon the projecting mouths of these shells there is another set of spat on the succeeding year, and as this grows some of the survivors of the earlier generation are in their turn crowded and killed. The result of this is that in the course of a few years there is formed a cluster like an inverted pyramid with its apex being gradually driven into the mud by the increasing weight above, while its broad base is made up of several generations of living oysters attached to the dead shells which constitute the middle parts. The oysters around the edge where they have room to grow are often of fair shape and quality, while those more centrally located are irregular, long, narrow, and usually poor, owing to their crowded condition and difficulty in obtaining food.

Appendix 4

Report of The Commissioners Concerning the Protection of Fish In the Connecticut River

To The General Assembly, May Session, 1867.

Printed by Order of the Legislature.
Hartford: Case, Lockwood and Company, Printers. 1867.

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The disappearance of salmon in the Connecticut river is of much earlier date than in the Merrimack; nor was it gradual, but comparatively sudden. In 1797 they were abundant; within a dozen years after they had nearly or quite disappeared. The cause of this rapid extinction was a dam, whose effect was precisely that of the one at Lawrence, though its relative position was entirely different. Just below the mouth of Miller's river, may yet be seen the ruins of this fatal barrier, erected about 1798 by the Upper Locks and Canals Company. It was sixteen foot high, and stretched entirely across the river. The extinction that followed makes a precise parallel with that already cited in the Merrimack river. For some few years, till about 1808, salmon were caught at the falls. The first year they were in great numbers, being headed off by the new obstruction, but, within a dozen years, their extinction was complete, and for the last fifty-five years

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The salmon has been unknown, except as a straggler, in the Connecticut. It may be asked, how an impassable barrier, placed at Miller's Falls, one hundred miles from the mouth of the river, should have caused the immediate extinction of the salmon, whereas a similar barrier, near Bristol, on the Pemigewasset, at about the same distance from the mouth of the Merrimack, should simply have shut out the fish from so much of the river as lay above the day, while below they continued to flourish; for they were numerous a dozen miles above Concord, N.H., some thirty years since ? The answer to this question is a complete illustration of those special conditions which are absolutely essential for the propagation of salmon. The Connecticut has a long and gently declining course; it deposits the fertile alluvium of a sluggish stream. The Merrimack has about the same fall, but in a much shorter course; it deposits the coarse, barren silt of a strong current. The waters of the one were too quiet and too little aerated to hatch the salmon spawn, except in the mountain branches; while in the other, many of the middle tributaries, and parts even of the main river, were doubtless suitable for spawning beds, when the fish were cut off from the upper sources.

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Fish-ways may be made in two modes; the pass, which is simply a sloping trough; or the stair, which is a series of steps, whereof each is a water-tank; (see plate). In the first case, the fish rush up the sloping trough; in the second, they jump from step to step, aided by the flowing sheet of water, which makes a serious of little falls in its decent. The pass is more simple, cheaper and less likely to get out of order; but the stair gives better chances to the fish to rest in their ascent, and is, therefore, more fitted for high dams, and for fish of less activity than the salmon- for example, the shad. Several modifications may be introduced in the construction of both.

The alewife will run up a fish-way of moderate width, as is proved by the success of the one below Mystic Pond; so, too, will salmon, which have been seen to force their way through water so shallow, that their back fins showed above the surface, and then rush up the apron of a dam six feet high. But it is to be feared that shad will be shy of any fish-way that is not approached by a channel, a dozen feet wide and a couple of feet deep. Further more, some mill canals are obstructed by locks, which would be a serious impediment.

The lower end of the way should rest in a large pool, not less than three fee in depth, and which, by its lower level, would be full, even when the river about it was shallow.

Appendix #5

THE HARTFORD COURANT: Monday, October 19, 1992 *1

Clinton

Official opposes shellfish plan

Restoration move called too limited

By Sam Libby
Courant Correspondent

Clinton – The director of the state Department of Environmental Protection's Long Island Sound Office is recommending denial of a shellfish commission request for as much as $100,000 to restore local shellfish beds.

Shellfish commission members said Monday they would notify residents and local, state, and federal representatives in an attempt to override the recommendation.

A similar request for state funding of shellfish restoration was made last year by the commission. But members of the state's Coves and Embayments Program denied the request, saying all new shell that would be placed in the harbor to restore shellfish beds would sink beneath the harbor's sediments.

The Coves and Embayments Program has the authority to appropriate state money to enhance the biological diversity and recreational resources of the state's coast.

When the state denied the request last year, the shellfish commission, through volunteer labor and shell donated by Talmadge Brothers Oyster Company of Norwalk, succeeded in restoring shellfish beds in the Hammock and Indian rivers.

"We know shellfish restoration works in Clinton Harbor," commission member Ed Lang said. There is no reason why the state should deny Clinton money that is supposed to be spent on biological diversity and recreational use of the shoreline, he said.
The recommended denial was written by Arthur J. Rocque, assistant DEP commissioner and director of
the Long Island Sound office, in a letter to First Selectman Paul Austin.

Rocque and the shellfish commission's activities "constitute a single-species management project…Such aquaculture projects simply do not meet the broader ecosystem concerns of the program…unless it can be specifically shown that the proposed target location supported historic oyster beds, the project would constitute habitat creation rather than restoration."