**Do we need to reestablish Local Alewife Committees?**
**ISSP and Capstone Project Research Areas for High School Students**
**Submitted to the EPA-DEP Long Island Sound Study Stewardship Committee**
**November 18, 2011**

**1) Fisheries History 2) Restorational Stewardship 3) Biological Fish Census**

**Timothy Visel, The Sound School Adult Education and Outreach Programs**
**October 2011**
**A Proposal for Stakeholder Stewardship to Increase The Alewife Fishery**

**Building a Powerpoint or Poster for a Local Habitat History**
**Revised to 2012 Adult Education – IMEP/Capstone The Lost Uncas Alewife Weirs November 2013 – Capstone Proposal, April 2014**

Alewife in Madison and Guilford – A Coastal Habitat and Fishery History for Alewife

In doing some extensive research in the early 1980's in the town of Guilford (The Guilford Keeping Society) I was able to access boxed files contained a letter and some documents that describe a rare armed conflict between the New Haven Quinnipiac Native American Tribe and the Hammonassetts, a tribe generally referred to as a peaceful tribe over the right to set up brush fykes for Alewife, then a 1600's "fish of value". According to the notes and 3x5 index cards (old rewritten accounts from the first Guilford area settlers) a dispute over the right to catch Alewife in what is today called the West and East Rivers occurred. The Quinnipiacs claimed the right to set brush fykes in the East River and the Hammonassets opposed this and sought to protect this valuable spring food supply as theirs by fighting over it. These fykes were of the stone/basket type set in the upper reaches of streams where they Alewife could be easily seined with nets made with natural fiber twines (see appendix).

According to the letter and notes the Quinnipiacs invaded with a force of about 80, (then a large army), and made it all the way to Westbrook at Pachaug (River?) when the battle stalled and fell back to Guilford and finally turned after three days, retreated west and were pushed back by a force sent by Uncas of Montville then a protectorate of the Hammonassets (1600s). About 40 total the combined force although outnumbered the Hammonassets knew the territory well and pushed the Quinnipiacs back to the West River, Guilford. After a long stalemate, a compromise was reached: Alewife fishery in the West River went to the Quinnipiacs, the Alewife fishery in the East River (Kuttawoo) to the Hammonassets. What seemed to be the theme is that both groups turned to the Guilford

Original paper - Alewives: Once the Fish to War Over?
Presented at Hammonasset Festival Oct. 1 & 2, 2011
Hammonasset State Beach, Madison, CT

settlers to help with a truce. Several cards mentioned how surprised that some like this would lead to armed conflict over fish, not land (cultural and society differences were apparent even then). No mention of casualties, but this conflict was most likely more a stealing of supplies or poaching snared animal traps then producing causalities in Guilford. In pre colonial New England Rivers then were convenient and unmistakable boundaries – the Native American town lines centuries ago. It is through these Native American boundaries were picked up by the first setters and rivers today continue to delineate jurisdictions such as the East River between Guilford and Madison today. The early runs of Alewife were prized as food as they were rich in oil (calories) and relatively easy to catch (the fish after all came to you). They were also valuable to the first Connecticut inhabitants as well.

Alewife and Conflict – A 1600's Fish of Value

I have tried for several years to find another source to confirm this report about this conflict and have been to date unsuccessful. The account does seem plausible – the original land area in what became largely Guilford was purchased three times, once from the Quinnipiac area representatives, the Hammonassetts and again from Uncas representing the Hammonassetts. Other reports give evidence that the land ownership was questioned and a source of conflicting views and claims. The first Guilford deed purchase was September 29, 1639 and the second September 20, 1641 and finally a third purchased December 1641. It is the third deed that is the most interesting as it mentions the privileges and royalties of fishing – which is curious because no mention of fisheries appear in the written deed descriptions before but in this deed both the setting of deer traps (greatly feared by cattle owners and "wares" (colonial version of fish weirs) are highlighted and immediately proceed a clause which details how the Queliappyack (Quinnipiac) lay claim to this same land.

It is one of the few clues that survive today and documents that fishing weirs were set in the rivers of early Guilford and the Quinnipiac claim next to this clause may perhaps be just merely a coincidence. I think however the third deed was made necessary by this fishing right (weir) conflict among others. The exact citation from the History of Guilford and Madison by Bernard Christian Steiner (1897) on page 32. Has this deed article #3 this clause "with all rights, privileges or royalty of fishing and that it shall not be lawful for the said Uncas or any of this men, or any others from him to set any traps for Deare (deer) in the said lands or any wares (weirs) in the Rivers for to catch fish." This detail leads me to believe it was included to "quiet" any remaining claims to set Alewife weirs, and perhaps any other "conflicts."

It was common to prelude rights as a deed covenant (article) as to assure those colonial "deeded rights" are clear, a term still used today. It could be argued that just mention of them in a deed and following quickly two previous ones that this area was a point of

contention. In fact a later Guilford deed contains another reference to fishing as it relates that it continues only subject to English laws and also several later deeds for larger purchases. Later deeds do mention that hunting fishing and fowling is at liberty according to law. Guilford's (then later Madison) deep tidal rivers the West River (or Menunkatuck) headwaters begin in Quonepaug Pond. East River (or Kuttawoo) headwaters exist in Northwestern Madison. A seine fishery in Quonepaug Pond (West Pond) existed until 1817 – most certainly for Alewife (Steiner pg 184). In fact Menunkatuck is sometimes attributed to menhaden (Steiner 27) a relative of the river herring and alewife – rather then menhaden, fish then familiar to eighteenth centuries historical writers if that name is based upon Native American fisheries it is most likely a reference to alewife. It is important to remember that the early settlers to this area were farmers – not fishers and much confusion exists between herring species and fishing gears are found in many old texts.

The most likely clue to the early alewife fisheries in Guilford was that reference to the seine fishery in Quonepaug Pond – perhaps the alewife spawning ground for the West River. It's continued productivity is significant. As such much for the colonial records mention agricultural interest concerns, soil types, and manure value of fish/seaweed and oyster shell or drainage. Much of the history of these fisheries include industrial uses for oil, animal feed and fertilizer – not food. While white fish (menhaden) would rise in huge commercial importance in Guilford and Madison – so much so that Madison's town seal still carries this fish in recognition of its role in town history. Shad fishing was regulated by Guilford February 24, 1794 – although it was considered a low quality food many did depend upon it although its use was a feed mostly for pigs. The West, East and Hammonasset Rivers did have runs of alewife and shad but for the first European settlers of the area such fish was considered good fertilizer and not fish for food. The primarily interest was the quick establishment of an agricultural society and little published material exists that fully describes (in detail) early Native American fisheries.

The Lost Stone Weirs of Uncas -

I'm certain however of the existence of these alewife stone and wood weirs remain in some streams and perhaps with some additional research could provide important answers to questions regarding these first fisheries. Accounts may be contained in town hall records – Alewife runs were later bid out or leased by local town committees, such as those in East Lyme- Niantic. In the later colonial period salted and smoked alewife did find its way to food value and commerce.

The Clinton, Madison, Guilford and Westbrook areas most likely have the remains of alewife weirs. With the number of subtidal streams in these towns chances are that one or more of these weirs still exist, perhaps drowned in an old mill or ice pond above the tidal areas. Some history projects might include research available records, family journals or town records and such reports add to the foundational information we have today.

I mention this now because of the event I attended last year (2009) in Guilford and saw many alewife, just below a mill dam on the West River, a rare event to see them in daylight. Perhaps the Guilford High School students can do what Daniel Hand High School students did in the late 1980's and build an Alewife fish way or monitor an existing one. A fish way has been established in the East River. It was exciting (for me at least) to see something that caused a serious yet brief conflict four centuries also, the last time I saw alewife in the daytime was in 1989. It was good to see that they can still swim in our streams, perhaps a future restoration project for the high schools – a monitoring program for the West River Guilford or possibly Fence Creek in Madison.

When I attended the social function at the Martin Bishop Field last year on Long Hill Road in Guilford, CT, it was a great afternoon. Knowing the history of the legendary Alewife Run in Guilford (It is I believe the only suggested Native American Quinnipiac - Hammonasset Indian Conflict - over the right to catch Alewife in Guilford streams). I noticed a pond at the edge of the property. Curious, I went over to examine as it resembled the Hummers Ice Pond in Madison the site of the Daniel Hand High School Alewife Project in Madison (1987-89). At the foot of a concrete apron in a small down stream pool was 20 to 30 Alewife! They were trying to jump the concrete apron to reach the dam which unfortunately was to high to allow them to the pond and potential spawning grounds. But they were there and rare chance to see this event. No one at the gathering had seen this before and Alewife is now a closed/protected fishery in Connecticut (since 2002). They usually travel up stream at night to avoid predation so to see them in broad daylight was very rare, these fish are just a portion of those who have tried, they will eventually tire and be swept down stream to be eaten by predators (new returning fish will come the next day, etc - it (the run) lasts for weeks). The exciting news is that the water flow temperature and oxygen levels were such that they traveled thousands of miles and almost made it! I'm not familiar with the watershed but the pond looks like an old mill pond - just like Hummers Pond in Madison and perhaps suitable for a Guilford High School student monitoring project? As an example the Daniel Hand High School project is on our Adult Education Workshop directory - which is available on our website www.soundschool.com its paper #11. We have had some discussions regarding Daniel Hand High School students watching the Fence Creek alewife run as an old fish census or fish "count" two years ago. Project Shellfish/Finfish Student Monitoring - It would be great to see this run monitored and learn more about how effective it is. (For a write up of this project including a 2004 replacement of the Daniel Hand Student Denil plywood fish way see Appendix #4).

Alewife was one of the first fish Native Americans would see, and after a long cold and harse winter, low on food they were a welcome sight no doubt. It was in all respects a life saver – food resources were low and a relatively easy catch, the fish came to you – you didn't have to chase it. What you did need was a trap – a series of stones that acted to funnel fish into a concentrated space, therefore making them susceptible to nets, spears and in some cases basket fykes – one most effective method was a haul seine in a deep area or pool just above the stone weir – returning fish going back out to sea were caught

in wing brush basket fykes set at the lower reaches of the streams. Stone weirs concentrated them on the return up stream to ponds and spawning and nursery waters. It is these areas that contained Native American weirs – very similar to modern day "fish ladders."

These basket fykes a much smaller version of the coastal stone/brush weirs that were so effective with concentrating fish after spawning (usually in salt ponds or deep freshwater glacier ponds). Glacier ponds like Tuxis Pond in Madison – the site of a once productive Alewife Run itself or salt water ponds in the area we now call Hammonasset. A large salt pond would occasionally open and be sealed from the sound – called Dowd's Creek by the First Madison/Guilford setters of "Hammonasset Plains" the region that was the area in and around Griswold Airport/Hammonasset State Park today. These kettle ponds as they were known on the Cape are very valuable Alewife spawning and nursery areas.

Alewife – needed a pond or freshwater headwater lake in which to spawn – the very valuable spawning sites were those closest to the shore, salt ponds that turned fresh were perfect – a long stream shallow subjected them to predators, both from land and sky (Osprey love alewife) and a tiring swim. Alewife is the food fish of many land and sea species especially striped bass. But once in a narrow shallow stream they were vulnerable to almost all of land mammals predators including mink, raccoon and weasels.

I have watched alewife swimming along the sand catching a wave to reach a salt pond brook complex in Rhode Island that was only two foot wide and one foot deep. Behind the Bonnet Shore Bathhouses was a several acre salt pond, called Wesquage Pond and the fish entering it each night was numbered in the thousands. From the width of the freshwater brook in day time you would never guess the number of returning fish each night. We were catching a few each night with bamboo leaf rakes, a wave would strand an alewife on the sand and the flipping was attracting another predator, Osprey so we had to race to the fish – we needed live bait then because offshore huge strippers were also interested in this activity and live bait alewife was once a popular striped bass bait. Once in awhile we would hear the rushing of large fish attack the Alewife offshore that were approaching the Beach, the constant swooping of Osprey made getting and keeping bait fish difficult. At times they even (the Osprey) pulled them out of our buckets.

An Alewife Run at Hammonasset?

At Hammonasset, the Dowds Creek Salt Pond wasn't really creek – it was a barrier inlet that opened and closed with storms – the inlet would reopen and over time "heal" or close. The salt pond was filled for the Trolley line into the park (1920s) and the old inlet was redirected into a straight drainage ditch which is still visible to the north into Tom's Creek – in fact, much of the current West Beach asphalt parking lot today is the site of Dowds Creek inlet and salt pond. It was bridged according to Emil Miller a former park resident (the Miller family homestead is still at the end of Dudley Lane in Madison but now resides on State Park land) for the fish companies which set out long haul seines from

the shores after the Civil War. The long haul fishery (a Native American fishery continued by European settlers) sought mainly the White fish or Menhaden – the Madison town seal still has this fish on it – signifies the tremendous commercial importance of this fishery menhaden to the early Madison settlers. It was cold during this period and the Alewife runs were very good until the late 1880s but by 1915, the Alewife was in steep decline during a hot period in our recent climate history. High heat appears to directly impact Alewife runs when it turned colder here in the 1940s Alewife populations recovered (see Clinton Harbor and the Great Heat).

Along Hammonasset Beach the long haul seine fishery needed to move nets and equipment quickly behind the dune line along the beach to set and haul the seine. The first wagon trails behind the dunes where made to position nets and gather seaweed. The Dowds inlet would be in the way and quick movement to catch a school of fish in shallow water was an opportunistic event, to catch them – dory type skiffs had to be quickly launched – the net set fast as several people helped haul it back (sometimes a capstan) or had to move to pre existing four pile cashons. These were built along the beach and in the 1970s still pointed out by Mr. Miller after serious storms but these four post arrangements now only seen at the lowest of tides and the severest of storms. One four piling set was still visible at the end of Nepture Avenue (1970s) but were once common along the shores in Madison. In Miller said that this was most likely the same type of hauling stations or cart ways that allowed hauling and ways for off loading fish at high tide. They were simple structures narrow docks and timber ramps that allowed the off loading of fish from dories. A wood corduroy or cord in a row road that consisted of trees over the sand to the road behind the dune line.

Mr. Miller called them "hauling stations for the nets" thus the term long haul seines which we still use today. These were long seines set out to encircle a school of fish and had to be a shore fishery. In the salt ponds seines were effective for alewife also and in one nearby town East Lyme electors once bid on the rights to particular coves upon which to seine them. Salted alewife then was the potato chip and salted peanuts of today – pickled, salted and smoked this delicate and oil rich flavorful fish was served in taverns with as a snack (heavily salted no doubt) by the tavern owners, wife – thus the term "alewife" or so the saying goes. I have heard this many times (the food use is correct) and the term just struck. The Alewife scientific term is Alosa pseudoharengus a member of the herring family. Other accounts give a similar sounding Native American name "a loof" as the true name for alewives.

Shore Fisheries Put Out to Bid

Saltwater fisheries a century ago such as alewife were pursued by landowners (farmers) or shared out as a percentage of the catch. A series of hauling stations were build in the lower CT River away from shore to avoid this landowner "tax." As rights to fisheries were assigned to adjacent landowners, this was the case in CT until the 1890s. During this period a series of legislative changes transferred the fishing right of landowners and towns

eventually to the state. This change is the history of the Marine and Inland Fisheries of CT now part of the Dept of Energy and Environmental Protection (DEEP).

Years ago when I watched the excavation for the Hammonasset West Beach parking lot I thought I was witnessing the restoration of the Dowd's tidal inlet and salt pond. Mr. Miller claimed that stories told to him mentioned this area once had so many alewife. But instead after digging out the salt pond the crushed stone arrived (after taking many dozens of tapered wood poles came by a drag line bucket dredge perhaps an early bridge or most likely a historic salt low oxygen preserved fish weir) and dozens of truck loads of fill topped with asphalt. I was disappointed and penned a letter to the Army Corps of Engineers about the process (not that positive as I recall) but I feel its important that people realize Hammonasset was not just one long continuous beach, the inlet appears on a very old map called the 1852 Whiteford County map. This map clearly shows the Dowds Creek next to Tom's Creek at the Western Park edge today) and further west Fence Creek is also shown. For practical purposes, Hammassett Beach was at times two beaches.

Commercial Importance of Coastal Alewife Runs and Coastal Processes

That is the history of the barrier beaches, they often have weak places that break and close or "heal" over time. A similar process has occurred with the barrier split that today connects Cedar Island to Hammonasset State Park on the 1792 Blodget map, Cedar Island does not exist. Storm energy can be quite severe and weak beach fronts often break, the worst erosion today at Hammonasset basically is the same area that used to contain Dowd's Creek inlet (for an in depth study of the Dowd's Creek area see publication #50. on our Sound School website). This is the area that would split Hammonasset into two beaches. It would also provide spawning habitat for the Alewife be reopening salt pond inlets. The effects of these storms could also reduce habitat and a famous habitat altering storm the Portland Gale of 1898 (The Steamship Portland was lost during this storm) and much can be found in Massachusetts Alewife fishery history. The alewife fishery was one of the first capture fisheries and early colonial history of New England an colonial reports assigns much interest to them. If it was valued it was named and we have so many herring ponds, herring rivers or alewife coves in our fisheries history providing evidence of such early importance. Alewife Cove today is for example, the current border between Waterford and New London, Connecticut.

In periods of cold and energy, there was a tendency for Dowds inlet to reopen.
This is the breach that Mr. Miller referred to as being filled (not bridged) for the Trolley Line expansion in to Hammonesett park in the 1920s. Other areas also would close and reopen in response to coastal energy and the 1898 storm called the "Portland Gale" would have a huge impact upon habitat quality for many species. The severe gale (most likely a level 1 Hurricane by today's standards) raked the New England Coast for two days November 26 to 28, 1898 and the changed the New England coastline forever in many areas. People would quickly notice a breach closing as the ruin of the alewife run and using teams of oxen reopen them. This was done in eastern Connecticut as well as several

southern Rhode Island salt ponds. Excellent habitat histories of this practice can be found on the Cape and Islands Alewife fisheries.

One potential excerpt from Dr. David Belding's 1920 "A Report upon the Alewife Fisheries of Massachusetts" refers to the Alewife habitat impacts storms on the Eel River at the South end of Plymouth Harbor. The eel river formerly had its source in Great South Pond (but) the storm of 1898 closed its Plymouth Harbor outlet and the stream broke through into the Cape Cod Bay, where it continued to discharge until 1903, when it was restricted to its natural course – the closing of the mouth of the stream for four succession years is thought to have ruined the fishery." There is an outstanding narrative available on the internet that reviews the history of Eel river available today and is from the Pilgrim Hall Museum. The closures often occurred during periods of heat and little energy. When it turned colder energy levels increased and barrier spits broke or inlets "reopened."

The 1898 storm would breach Hammonasset Beach reopening Dowds inlet and also the Dardanelles inlet to the east making Clinton Harbors Cedar Island truly an Island once again. A 1790 map called the Blodget map in DEEP documents shows that Cedar Island does not exist later maps would show it as both as island and peninsula. Hammonasset's Barrier Beach changing ecology would be the subject of a 1929 Connecticut geological study and is found in the appendix #1.

The Alewife Fisheries of Massachusetts were carefully detailed and Dr. David Belding's 1920 report describes early fishing and harvest practices on Pg 119 – The Alewife Fisheries of Martha's Vineyard provides an excellent example.

> "The alewife fisheries of Martha's Vineyard assume an important commercial aspect and well illustrate the ability of man to create a successful and lucrative fishery. Fishing is conducted exclusively in the brackish shore ponds, since there are but few streams upon the island. These ponds are connected with the ocean by artificial openings at the proper time in the spring and fall, thus permitting adult fish to enter for spawning and the young to return to salt water in the fall. Alewives are taken by seining in these ponds, and the fisheries are controlled under long-term leases by various private companies, usually composed of riparian owners."

In the late 1890's the both CT smelt and Alewife fishery failed and was largely absent until the late 1940s. This period saw several habitat/species shifts – one of which was the Alewife – it got hot during the summers here when the climate cooled slightly, beginning in the late 1940s Alewife numbers improved and by the 1950s could again be found in nearly all CT streams but not like any thing as the abundance level 1870s. The 1870s was a period of extreme cold here in New England and these cold water species did well in areas not blocked by dams. Dams at the time 1820 to 1890 produced an economic boom, manufacturing. So the commercial importance of anadromous fish were pitted against those same industries that needed water for power, cooling and draining away waste. That led the first report and a call for Connecticut to establish Fish Commissioners

who in a May 1867 report to legislature highlighted to problems of dams blocking migratory routes. That is found in Appendix 3.

The "Great Heat" and Habitat Loss – 1880 to 1920

Perhaps no other fish has been so impacted by coastal development than the Alewife, its runs were close to the coast, salt pond and those tidal streams that were fed by glacier ponds – while shad and salmon migrated dozens if not hundreds of miles to reach suitable spawning areas – alewife was a coastline event, and didn't usually travel miles inland in cool deep water streams such as the Connecticut River. That habitat niche being occupied by a close relative also called a "River Herring" or the Blue Back Herring Alosa – aestivalis. Much of the most productive Alewife runs, such as the Bride Brook run in East Lyme or the Bonnet Shores run at Wesquage Pond, Rhode Island are fed by colder groundwater aquifers and such tend to be cooler in the summer. Early fisheries biologists did not realize the impact of climate upon these fisheries but it did puzzle them – the unexplained periodic abundance. The heat waves in New England beginning about 1890 and the strongest in 1896 (see the Great Heat Wave of 1896 and the Rise of Theodore Roosevelt National Public Radio series) started to impact these 3 to 5 year cycle fish. A poor recruitment in 1901 would show up as diminished return in 1906. The1898 Portland Storm described earlier would most impact near coastal habitats – those salt pond and barrier beaches and would cause a 1903 reduction which occurred. After a decade of warmth, the fishery failed in 1913-1914 and would not recover until temperatures turned cooler here in the 1940s. A similar drop in the 1850s also following a period of warmth and a general decline in shad and herring prompted Connecticut legislators to ask questions about the protection of the herring island fishery just after the Civil War.

On page 1 of the 1867 report lists the primary subject – sea fish, herring shad salmon including Alewife. In accordance with a resolution passed by the General Assembly, May Session, 1866, concerning "The Protection of Fish in the Connecticut River," &c., the Commissioners beg leave respectfully to report:

The resolution states, that His Excellency the Governor been authorized to appoint two commissioners to consider the subjects;
1st. Of the protection of sea fish in the Connecticut River. Others were listed in priority and much attention to the poor condition of the shad fishery.

The foundation was to become our modern fisheries agency (Marine Fisheries, Inland Fisheries) began with an effort to save herrings and document the habitat changes caused by dams and pollution. Much of the report focuses upon fish ways to get returning from sea fish over those obstructions (dams) as this passage from (page 19) details:

"The alewife will run up a fish-way of moderate width, as it 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-way that is not approached by a channel, a dozen feet wide and a couple of feet deep. Furthermore, some mill canals are obstructed by locks, which would be a serious impediment."

The chief causes of destructive impacts such as pollution were also detailed in a simple but effective suggestion as detailed below (pg 23) – substances should not be thrown at all into the water.

The causes of destruction are chiefly as follows:
1st. Impassable dams. Over these fish-ways may be built with little waste of water.
2d. Pollution of water by lime, dyes, soap, saw-dust, and other mill refuse. Much of all these should not be thrown at all into the water. As to the dirty water from wool or cloth washing, it may be continued to one side of the river by a plank screen placed opposite the race-way.
3d. Destruction of young fish by mill wheels, which may be avoided by a lattice placed across the mouth of the mill canal.

The next issue listed is fishing and details a series of season, gear restrictions, limits and closed areas. In other words much of the habitat loss or destructive activities such as pollution were acknowledged but in terms of public policy – the report would focus upon the impacts of fishermen, not habitat loss or pollution. This policy would remain largely unchanged for the next century until 1967 when the US Fish and Wildlife changed its policy of harvest restrictions to habitat improvement. In other words the fishers could only harvest what the habitat could produce – no habitat, no fish, and no fishers for that matter. Restoration of habitat became a priority not harvest restrictions. The Duck Stamp and hunter user group habitat policy had a similar beginning.

Effects of Pollution

Less than two decades would pass and the impacts of pollution would become well known from that 1867 report. Quoting from a State Board of Fisheries and Game 1965 study. "In the Eighteenth Report of Fish Commissioners of the State of Connecticut, 1884, there appears the first major reference to the concern of Connecticut conservationists about the possible effects of pollution. It is there noted that perch had always been abundant but were giving way to less desirable fish. Striped bass at half a pound were common twenty years previous, and ten pounders occasionally were caught. The report blames the scarcity of desirable fish to pollution in the main river and its tributaries. The report closes the section as follows: "As long as the river receives so much poison from factories and so much sewage from cities it is probable that the supply of fish will remain small in quantity and poor in quality."

Habitat quality and habitat quantity continue to perplex fishery regulators even today and

most overfishing events (which do occur) follow habitat failure events. For example we used to have an abundant species King fish here in Connecticut. It's a cold water migratory species that has completed disappeared from our waters but was never the subject of a large directed fishery. It was not over fished it just was that the cooler habitat it needed, no longer exists in our waters.

Connecticut's Fishery History – A Sudden Return of Alewife

In a Connecticut Board of Fisheries and Game (precursor to DEEP) report titled: A History of the Connecticut River And Its Fisheries by Douglas D. Moss then Chief of the Fish Division, wrote about the Alewife fishery in the 1960s but did not realize that the 1865 to 1965 period had two distinct cool periods and the 1890 to 1920 period of higher temperatures – but is perplexed by the higher catches in the early 1960s "There is no indication of the reason for this cyclic behavior, and questioned the validity of the catch reports, the section on the Alewife fishery is found on page 9–10 of his bulletin.

"The Alewife fishery in the Connecticut appears to come into prominence periodically. There is no indication of the reason for this cyclic behavior. It may indicate scarcity and abundance of this species, an increased demand for alewives specifically or an increased demand for cheap food. A perusal of catch records and value of catches from 1892 to 1916 does not indicate an extreme fluctuation in total yearly catch or value. That the total abundance of such a species should vary but little in the span of years seems to violate the rules of nature. Thus, it would seem that either these records derive from unreliable reports or that the fishery was underfished with only enough of its production being taken each year to supply the demand for the year. Commercial fishing for alewives on the Connecticut was discontinued about the time of the United States' entrance into World War. It was profitably resumed in 1948 when two canneries reported receiving from Connecticut a total of a little more than a million pounds of alewives. This is believed to be practically the entire catch from Connecticut. It seems odd that from 1903 through 1916 the reported catch of the fishermen of the river seldom dropped appreciably below three-quarters of a million pounds or rose over one and one-quarter million pounds and that, after a lapse of thirty years when little or no alewife fishing occurred, this figure of one million pounds should be reported from accurate cannery records."

It is interesting to note that the author never connected abundance to habitat quality, either the catch records were faulty, or the fishery was "under fished." Climate and energy impacts were not often reviewed – only the visible conditions, you could see the dams blocking migratory runs or see polluting substances in the water. But over time habitat conditions do begin to emerging as patterns, the reemergence of the Alewife fishery in the late 1949 after its failure in 1916 must have been perplexing to Director Moss. The truth is another species bay scallops that benefits from coastal energy storms and cooler temperatures, at the height of the mini cold period, 1955 between a series of devastating hurricanes beginning in 1931 bay scallop production would surge. At the middle of the severest winters and storm filled falls bay scallop production would soar to

450,000 pounds a CT record – twelve years before the Clean Water Act of 1967. When you look at the habitat history (quality and quantity) you do see patterns of abundance related to climate factors.

Recent Habitat Concerns – Climate Change

In 1971 the winters here began to warm and the number of storms declined – Bay scallop production fell during this warming – scallop populations in CT are thought to be very low today. Shell middens – shell heaps left by Native Americans are great biological records of production – shell heaps of large oysters indicate maturing older oysters, many small oyster shells signs of a recent oyster set, the same for scallops. A good number in some midden layers and then fewer in layers or none. The seasonal or cyclic aspect to some fisheries doing better or worse based upon climate could be contained in such shell piles. The should be viewed as such – certainly much research has been invested in oyster bed ecology but little connection made to concurrent temperature and energy systems. The Alewife would be subject to these cycles and periods of cold and energy also and would sustain higher fisheries than warm and quiet periods. The habitat quality issue during these periods is of great importance to properly evaluate restoration efforts.

Some shell middens indicate changes in shellfish abundance – when scallop shells were numerous, oyster shells often were scare or of smalls sizes scarce. Oysters like heat and thrive during periods of relative calm. They often grow to large sizes during these periods. Many reports from fishermen at the turn of the century often mention that when hard clams are prevalent, oysters were not and vice versa. The shallow alewife "short runs" would be subject to greater thermal warming pollution. It is curious that the Douglass Moss report did not mention this habitat quality concern – someone in the Connecticut State Board of Fisheries and Game (June 1962) raised this thermal way issue 50 years ago – in terms of cold water fish species in the Hammonasset River a ground water or "cool water river" (one of a few in CT) and is found in Appendix 2.

Habitat Improvements – Artificial Fisheries –

Probably the best source of information on our efforts to improve alewife habitats is found in the comprehensive review by Dr. David Belding in his report to the Massachusetts legislature in 1920. On page 22 of his landmark report, he reports in great detail artificial fisheries on the middle of page 22.

"Alewife fisheries have been artificially created in streams or ponds where no alewives were previously found by the simple expedient of connecting these ponds by canals either directly with the salt water, as on Martha's Vineyard; or through coastal streams, as in the case of Nine Mile Pond Stream in Barnstable, thus affording accessible spawning grounds.

Many natural alewife fisheries have been aided artificially by extra canals, ditches and sluiceways constructed for the purpose of facilitating fishing methods, and of increasing

the decreasing supply in the coastal streams. Outlets which have become closed through natural changes have been artificially opened, and the fish permitted once more to frequent their old spawning grounds. In certain instances the headwaters of one stream have been joined to another by an artificial ditch, e.g., Snipatuit Pond and Mattapoisett River, John's Pond and Quashnet River, Long Pond and Herring River (Fig. 2).

On Nantucket and Martha's Vineyard the simple procedure of opening the brackish water ponds to the ocean by cutting short ditches through the. sandy beach has been followed (Fig. 1). Owing to the shifting sand these ditches require reopening nearly every year. The alewife industries on Nantucket and Martha's Vineyard are good illustrations of the ability of man to create successful fisheries artificially. Since but few streams are found on these islands, the important fishing centers are located in the large ponds near the salt water. The artificial or partly artificial fisheries in Massachusetts naturally fall into three groups:

Town-managed. — Very few artificial fisheries are now operated for the public, because the majority have been developed under long-term leases.

Privately owned. — More often these fisheries are owned outright by the individual or corporation who first acquired through legislative action the right to create the fishery, e.g., Nine Mile Pond Stream in Barnstable, and Childs River in Falmouth.

Fig. 1. — Outlet to ocean, Squibnockct Pond, Martha's Vineyard.
Fig,. 2. — Wooden runway at outlet, Long Pond, Harwich

Leased. — Under the Acts of 1839 the Fish and Game Commissioners were given the privilege of leasing the great ponds for a suitable period of time, for the purpose of cultivating useful food fish. The system of leasing shore ponds for maximum periods of twenty years by incorporated companies for the purpose of establishing alewife fisheries has been popular on Martha's Vineyard, and special privileges have been given by the towns in which these ponds are located. The important fisheries on Martha's Vineyard, e.g., the Mattakessett Creeks at Edgartown, and Tisbury Great Pond at West Tisbury, have operated under such special legislative acts. These semi-private fisheries have reached a most successful state of development."

Madison Restoration Efforts – Capstone Projects for High School Student Research -

Do we need local Fish Committees or "fisheries stewards" for Alewife restoration projects?

Steve Gephard and Tom Savoy of DEEP in the late 1980s evaluated Tuxis Pond and Hummers Pond both in Madison for an Alewife restoration project, Tuxis Pond a deep glacial kettle pond had a Alewife run up until 1900 about when the Main Street removed a bridge and buried a substantial length of the Tuxis Brook below what is Route 1 today. The presence of a tide gate at Middle Beach west (post 1938) made the Alewife run restoration here is difficult if not impossible.  Fence creek to the east looked better, it

didn't have a glacier freshwater pond but and old pasture converted to a ice pond with a dam but needed a modest fish way. Daniel Hand High School students built the plywood fish ladder with plans provided by Steve Gephard in 1990 (plywood donated by Tuxis Lumber resin donated by Beebe Marine both of Madison). A stronger more permanent aluminum fish ladder was installed by DEEP in 2004 (see Appendix #4). Our state biologists cannot do it alone, alewife runs need to be checked, streams walked, pools created and obstructions cleared – this take time, energy and planning. Most importantly a return of Connecticuts forest cover which is now estimated at 72 to 78 percent has nearly filled some small streams with leaves. These small streams now need to be "dug out." That used to occur during a period when they were valued for commerce (food) as evidenced by colonial herring or alewife town committees and later as high quality (bait) to catch food – mostly for large striped bass on Cape Cod. Do runs (ladders) work and how strong is the return – each year – that also remains unclear and would need a yearly sampling or census. How many and what size/age fish or of the return is something that would be very helpful information to fishery managers. This effort could include citizen monitors, high school students and science classes.

A survey of existing habitat and potential habitat needs to be determined, streams that could or do currently have runs, areas that could be a habitat restoration or preparation project and finally can we identify potential habitat creation sites. And after restoration, can we build that stewardship or monitoring capacity that could help sustain this fishery? That is something that local towns used to do (for a similar role see the operation and function of Connecticut municipal shellfish commissions). High school students may be able to do this as a class or perhaps a Capstone project, local ground truthing to photo document potential areas for further study – do we need on a local or regional level fish committees – once in every coastal town with a duty to regulate and monitoring fish runs such as those that used to exist? It's difficult to answer as it is both an education and a public policy issue. Often a fish ladder is installed but the approach needs to be cleared of leaves which in very hot weather can release sulfide compounds.

Dr. Belding's report (1920) details how his investigation in Massachusetts was organized and what sources of information he deemed important. Although his recommendations are nearly a century old they remain pertinent and valid today and his methods of investigation are reproduced here:

Study question or plan of work -

- "The simultaneous decline of the alewife and shore fisheries suggests that there is a direct relation between the two, and that the success of the fishing towns along the coast in a considerable measure is dependent upon the flourishing condition of the alewife fishery."*

The requisite steps in the reconstruction work are:

(1) An unobstructed and uncontaminated passageway from salt water to the spawning grounds

(2) Artificial restocking of depleted streams and the creation of new fisheries in favorable localities.

(3) Adequate and efficient methods of regulating the fishery.

* Note (his description reads that other cold water species were in decline at the same time most likely. Winter flounder and bay scallops – they were usually called shore fisheries, also declined in The Great Heat 1880-1920 now connected to the Northeast Atlantic Oscillation NAO).

Methods of Investigation – The work consisted of three parts: (1) a survey of the coastal streams; (2) a statistical study of fishing methods; and (3) an investigation of the life-history and habits of the alewife.

The survey comprised a biological examination and personal inspection of each stream, with maps and descriptions of all important features. Special emphasis was placed on the condition and accessibility of the spawning grounds, the location of dams, presence or absence of fishways, the volume of water in the stream, and possible sources of pollution, both trade waste and sewage. The life history and habits were observed at the spring runs, on the spawning grounds and during artificial hatching.

The various methods of operating the fishery under town control were studied from the standpoint of efficiency and the resulting effect upon general conditions in the different streams. The testimony of members of herring committees, operators of fisheries, fish dealers and townspeople interested in the fisheries, was taken, and the town records were examined for local regulations. Statistics, both past and present, were gathered from all available sources, including town documents, fish committee reports and various legislative enactments." From Belding 1920 -

Local groups and High School students may help
increase alewife populations –
A Massachusetts Case History

In the spring, 1982, I asked to be assigned to the Massachusetts Division of Marine Fisheries, Extension Agency. I wanted to learn more about the Cape Cod fisheries, Sherrill Smith and Joseph DiCarlo were the DMF extension fisheries people at the time. Sherrill did the shore fisheries, clams, oysters and Joe, inland- herring and alewife runs. I was interested in both, but new to my employment with the Cape Cod Extension Service of UMASS. I went to meet with Mr. DiCarlo – "Buzzy" as the lobsterman and striped bass fishermen on Cape Cod called him. We met in the Sandwich office and explained my knowledge of herring runs from my limited exposure to Connecticut and Rhode Island

alewife runs in the late 1970s. I soon found out I didn't know much about them, in fact, a few hours with Joe and I soon realized how little, very little I knew.

Over the next few weeks, I would accompany him on his visits to the runs from Bourne to Eastham. He liked the Cape runs; they had these deep kettle ponds or "great ponds," the glacial remains of a giant ice cube that when melted, created these cool, deep ponds. Rain and runoff in the spring with ice melt provided a good clean flow. The second choice was salt ponds; here the entrance was a problem, closed by storms such as the one in Dennis that had a Natural Resource Officer restore the flow with backhoe, and in a few minutes a small heap of sand was quickly gone and exit flow restored. Before backhoes, Mr. DiCarlo said it was drawn scoops (sounded like the metal drag line dredge buckets) by a team of oxen. Joe claimed that backhoes were easier. I agreed.

The third type was the ones that needed the most work they were Mr. DiCarlo explained were the "long runs", the ones that needed graduated pools, or ladders to get fish over the top of a dike or dam. These are the ones that were large, but needed constant oversight. The Cape was in the midst of a draught so low flows were a concern, the other was water management on the Cape as this had become an divisive issue, and had basically three types of dams, old mill dams once needed for water driven machinery, now often recreational use or public water supply, ice pond dams, those that naturally did not impound water but were created habitat from drowned fields or pasture for the production of ice a century ago and newer ponds dug or created dams for the cranberry industry. Low flows during this time were a concern, everyone was trying to stockpile water, and drinking water had also become scarce, he was concerned about the fish they needed that strong exit flow in the spring. Without it, the pools would become isolated and "ladders would dry up." I remember him saying that he had never seen it so bad; in the old days you would just pull a weir board on a pond and let the water flow out. That was no longer the case.

Today he needed the dam owner's permission, one run in Falmouth the flow was down to a trickle, he had pulled a board and allegations of water theft soon surfaced. In times past, the local "Fish Committee" (I would find out later that these runs were so important they had a local herring or fish committees very similar to the still in place for the local shellfish committee). The local herring or fish committee regulated fish runs in the town. Flows, seasons, catch limits, everything. Sometimes appointed by the town government but now the State of Massachusetts within his division handled it, but he saw changes; he saw people "lining up for the water" and the volunteers, he needed to walk the streams looking for problems seemed less and less every year. The local connection to the fishery was being lost and that concerned him greatly.

The runs with created habitat, although very productive (mill, ice and cranberry ponds) needed a lot of work, they were the "long runs" and had to get past several obstacles, fish would get tired "beat up" and arrive to the spawning habitat in poor conditions or some years not arrive at all. A few years ago it was leaves, the Cape had a recovering "forest

cover" and more trees with more people raking them. In the 1970s, people dumped leaves into low points, like brooks and streams because they could not burn them any longer (Connecticut history also) when they couldn't burn them- I got them (meaning in his runs).

People dumped so many leaves along the runs that some were completely blocked jamming both ladders and pools during a heavy rain had been the source of horrific washouts, and people blamed the runs, but it was because the brackish streams were clogged with sticks, brush, trees and leaves. He just couldn't keep all the runs clear. When I walked with him, a come along (hoist) was a constant companion, to pull a tree out that had caught other sticks and leaves in a stream. Some crossovers were good, logs had created pools but fallen trees with branches caught all the sticks and leaves "brushes" he called them – they quickly jammed the flow, eliminated the deep water stream, turning it into a googy soft leaf and stick filled mass like a sponge – One run I remembered he cleared what was a long abandoned ice pond now the source of a cranberry water reserve system for summer water. The herring run had been abandoned in the 1960s, and property owners had changed, but the marshes and shallow pools had created a large mosquito breeding area and the new owner was being "eaten alive" by mosquitoes so the interest in eliminating all these muddy pools (having oystered among the marshes in CT since grade school, I could equate with the eaten alive concept). One of the suggestions was to eliminate the widening exit streams (his term) when filled with logs, leaves and sticks form mini dams, and strong flows tended to widen them, he called "widening" leaving shallow isolated pools of water that would breed mosquitoes.

Mr. DiCarlo explained that over time the deep areas are filled with debris, so the flow widens (causing some of those washouts mentioned earlier) when that happens, side shallow poorly drained pools in hot weather become a problem, so in this case, the run was being cleaned and cleared for two reasons, restore the alewife run, restore the natural drainage channel and eliminate mosquitoes (breeding habitat). But the work needed was enormous and related to the slope elevation and stream velocity. This was one of the those long runs, he had to first find the natural channel, and false channels were created when sticks and logs blocked the older deeper sections, and redirected normal stream flows the leaves tended to sponge the water physically blocking fish and dispersing a runoff instead of a strong flow. If the drop was quick, he hoped the stream would self clear, after the big logs were dragged out, but if it was a "long run" and shallow with no sharp drop of elevation then it was a large amount of work, branches would trap silt and bury sticks, leaves in mats, sometimes feet deep, it (the bottom) would look like a stream channel, even with sand and gravel, but it is false and underneath a maze of sticks, leaves exits – breakthrough's were a constant concern, a step on what looked like hard channel quickly followed by a snap and then a step or fall into this soup (my father would call this "quicksand" while trout fishing but it really wasn't, just a similar experience). In the heat of summer this leaf rot would smell of sulfur – a potential to create a sulfide "block."

A pole or pipe was something that was a handy tool when walking a leaf filled stream for a restoration survey. He needed volunteers to restore such long runs, I believe this was in Mashpee, but only had a few showed on that Saturday; years ago he could get 20 or 30 people to help on a weekend (most striped bass fishers). But he just didn't get the volunteers to help and this had concerned him there was just no way he could do it all (the run above would be two to three years before the stream could support alewife again, the stream had "narrowed" and during years two and three would need rebuilt stone pools, stone walls in a Vee to pool water for the returning fish. He came across the remains of such historic pools, called stone weirs left by the Native Americans, they worked well, and newer techniques modified them, but clearing the trees and brush and rebuilding pools, shallow (gradual slopes) were the hardest and made returning fish more vulnerable to predators (and our harvests). The fish just couldn't swim long periods without a rest, a deeper pool or slow moving water was necessary. Step runs, the velocity of the stream seems to create them and helped keep them clear but long shallow runs, sometimes straightened years ago by agriculture and cranberry culture tended to fill with leaves many of which had these years ago wooded dams (weirs) sluice ways with top planks with a notch cut, but someone had to be ready to adjust the planks on sluice ways and many had abandoned this method. Today pools created by stone, and in some areas, poured concrete. Many of the fish ladders that needed pools concrete were used, instead of layered up natural stone during the 1950s and 1960s on Cape Cod.

The point of his "talk" to me was it took more than the ladder to make a run successful, it had to be checked, stream walked, debris cleared, evaluate stream function with fish counts (did the fish actually use it) transplants (although he had found that a new run had many "bump into" fish from neighboring runs who got lost or felt the flow first and decided good enough) and fry pond surveys (now termed young of the year). The final analysis was it took a lot of effort for this to happen. Years ago people kept records of the alewife runs, written surveys like maps of the stream itself that's how people valued them back then. But he felt that was changing on the Cape, he needed more volunteers, but was getting less and less (1982-83). He had even gone to the technical high schools (I believe the one in Harwich) and asked about their involvement but was not that successful. He was hopeful about the future, but strongly felt it would take a re-energized volunteer and local response. He longed for the time herring has their own town committees. Most of the support he did have came from the commercial lobstermen and recreational striped bass fishermen. They still valued the alewife, and were willing to "help out."

The project in Hummers Pond Madison in many ways was the application of working with Mr. DiCarlo. I had sponsored a series of workshops at the Cape Cod Extension Service in the hopes of increasing his volunteer pool. Each time I learned more about his work and dedication to these fish, I hoped someone at the Massachusetts Division of Marine Fisheries has documented his knowledge somehow. We are losing much of our fisheries history and Mr. DiCarlo held a lot of it especially for Alewife.

The concept of involving high school youth in potential Alewife Projects when I returned to the University of Connecticut was actually Mr. DiCarlo's- he needed temporary plywood sluice ways as he called them. He knew that the technical high schools had shops (wood shops) so that cutting and completing plywood sluices (some of the pools in this low flow on the Cape had become small dams themselves. He needed several -- two or three chambers and to stake them in a stream when the draught ended they would be "pulled" – those of marine glue he felt could make them last 4 or 5 years. By that time, the draught would be over or at least he hoped it had. He thought high school classes would be ideal to study and monitor Alewife runs. He had learned that the Cape Cod Technical High School had a fisheries program led by Dana Eldridge who used nets seines. One of the projects he was considering was shallow water science survey for alewife fisheries – new pond juveniles or young of the year (YOY) as they are called today. Before I was to see that program finalized I turned to Connecticut and employment with the University of Connecticut Cooperative Extension and NOAA Sea Grant Marine Advisory Service at Avery Point in Groton. A write up of the Madison project is found in appendix #11, The Hummer Pond Project on our Sound School publication website. (Steve Gephard and Tom Savoy of DEP were a great help with fish way design and transplants. Nancy Balcom of Uconn Sea Grant finished the project for me when I left in 1990).

Capstone Projects for Area Students –

Several potential projects exist for Sound School and regional High School students

1) History – we know that Alewife weirs were built in the East, West Rivers in Guilford/Madison. Also in the Indian River in Clinton, Oyster River and South Cove, Old Saybrook and Westbrook. Historical records or reports may be located that provide additional information – in fact it might be able to find the remains of a Alewife trap in the East River – if it hasn't been covered by a pond.

   Local fisheries histories also – Alewife capture fisheries in the colonial periods, for these towns local historical society like the Charlotte Evarts Historical Library in Madison or the Guilford Keeping Society - Guilford, Connecticut can be important sources of old reports.

2) Restoration/Stewardship – check existing fish ways ladders – are they working, can fish be observed using them? Are the runs walked and mapped? Do they contain winter "street sand" or leaves that needs to be removed to restore proper flows. This is part of a habitat stewardship effort with civic groups and organizations. Conservation Commissions and Coastal Land Trusts might wish to sponsor such student research. The students would then report back to the sponsoring agency (community service).

3) Biological Fish Census – Do the alewife spawn and can fry or young of the year be seined (small mesh seine) and identified in ponds above the fish way or ladder. This is a climate and biological perspective of habitat quality.

These are just some of the possible Capstone Projects at this time.

If you are interested in a Capstone Project please review the State Dept of Education website http://www.sde.ct.gov/sde/cwp/view.asp?a=2702&Q=322264 and look for the Capstone fact sheets of contact your high school guidance counselor for more information. For more information about this paper or to comment – share information or ask questions please email me at tim.visel@new-haven.k12.ct.us.

## Part 2
## The Hummus Pond – Daniel Hand High School Example

List of Appendices

Appendix 1 Connecticut Shoreline Madison Coastal Processes -1929

Appendix 2 The Hammonasset River – A New England Cold Water River – Thermal Pollution – CT State Board of Fisheries and Game -1962

Appendix 3 Report of the General Assembly 1867 Fish Passage and Protection with special reference to the Connecticut River including designs for fish passage pools.

Appendix 4 Replacement of the Daniel Hand High School Student Built Fish Ladder (1990) 2004 New Aluminum Denil type Hummers Pond Fence Creek Watershed, Madison, CT Long Island Sound Study

Appendix 5 The Madison Hummers Pond Alewife Project – Description and Timeline

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

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 – Impact of Warm Temperatures and Drought Upon Fisheries Habitats

## Hammonasset River

The Hammonasset River, rising in the town of Durham, is obstructed by a large dam creating the Hammonasset Reservoir at Route 80 in the towns of Madison and Killingworth. This reservoir is owned by the New Haven Water Company. Below the dam, the Hammonasset River has a history of populations of shad, alewives, white perch, striped bass, tomcod, and sea-run brown trout. There is one small barrier below the Hammonasset Reservoir: the abandoned dam at the old Paper Mill Pond site has practically disappeared, and no longer impounds water.

Fairly intensive study of this stream system in connection with the sea-run brown trout investigation has indicated that the new Hammonasset Reservoir has contributed to the deterioration of water quality through warming and irregular flows. These factors, plus the establishment of a warm-water fish population in the reservoir which, in turn, has encroached upon stream habitat, have eliminated evidence of natural populations of trout. The only recommendations that can be made regarding this system would be to assure for constant flows out of the reservoir and to eliminate the remnants of the abandoned dam at the old Paper Mill site. Some blasting could improve conditions for fish passage at this abandoned dam site and thus open up an additional five miles of stream for brown trout and shad.

CONNECTICUT STATE BOARD OF FISHERIES AND GAME
JUNE 1962

Appendix 3 – Impacts of Dams Upon Fish Runs -

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 feet in depth, and which, by its lower level, would be full, even when the river about it was shallow.

This pool and the current of pure water from the pass, would attract fish, which might further be directed to the spot by a slat weir, stretching toward the center of the stream. The head of the pass should be similarly arranged, so that the young fish might go down by the proper route and not be carried over the dam and killed.

From the Report of the Commissioners Concerning the Protection of Fish – In the Connecticut River and Counties to the General Assembly. May Session 1867 – Printed by Orders of the Legislative, Hartford, CT. Case Lockwood & Co., Printers, 1867

Appendix – Notes regarding the types of fish ways that may
be built in particular, those that are suited for the
Alewife – Pages 19-20 – reference Mystic Pond, 1867

Fence Creek Hummus Pond Update 2004 EPA Long Island Sound Study

LONG ISLAND SOUND STUDY HABITAT RESTORATION INITIATIVE
HABITAT RESTORATION TECHNICAL MANUAL 15
HUMMERS POND DAM FISHWAY REPLACEMENT

**State:** Connecticut
**Town:** Madison
**Habitat Type:** Riverine Migratory Corridor
**Stream Name:** Fence Creek
**Miles Restored:** 1.1 – As an Adaptive Management project, this site cannot be applied toward the Long
Island Sound Study's 10-year habitat restoration goal.
**Cause of Degradation:** An aging wooden Denil fishway on Hummers Pond Dam in Fence Creek was no
longer capable of safely passing fish.
**Project Description:** The wooden Denil fishway was replaced with an aluminum Denil fishway.
**Targeted Fish Species:** Alewife.
**Implementation Partners:** Connecticut Department of Environmental Protection - Inland Fisheries Division
(lead); Kensington Acres Condo Association.
**Funding Provided By:** U.S. Environmental Protection Agency 104(b)(4) Program Grant awarded to the
Connecticut Department of Environmental Protection.

This new aluminum fishway replaced the pre-existing wooden structure that had fallen into disrepair
Appendix 5

## The Madison Hummers Pond Alewife Project

A Brief History of the Hummers Pond Alewife involvement in Restoring Alewife Runs Project begins in 1982. Workshops conducted at Cape Cod Extension Service, UMASS Cooperative Extension with Joseph DiCarlo, Mass. Division of Fisheries, stressed the involvement of volunteers and civic groups in Alewife Run Management for the University of Massachusetts. The same year the Town of Madison removes by way of a backhoe approximately 20 large dump truck loads of street sand from Tuxis Brook behind the Union Trust Company as it had been identified as a source of flooding. The Tuxis Brook had local history of supporting an alewife run to about 1900. The stream flow had been significantly restored and the concept of Alewife run restoration was periodically discussed at local shellfish commission meetings in Madison. Two of the shellfish commission members, Pat Russos and Ronald Paffrath were interested in the project and by 1984; Alewife restoration was a frequent Madison Shellfish Commission topic. Ron Paffrath and I would walk Fence Creek as an alternative site after many engineering obstacles were discovered in Tuxis Brook. A tide gate near Wyndy Brook Lane and the presence of a long culvert under Route 1 by a supermarket made Alewife Restoration here (Tuxis Brook) difficult. Steve Gephard of the CT Dept of Environmental Protection wrote a report for Tuxis Pond September 23, 1985 and suggests Hummers Pond as a good alternative. In 1987, Ron Paffrath wrote a research paper for Wesleyan University titled, "The Return of the Alewife" with a detailed map of the Fence Creek Brook from Hummers Pond Lover's Lane to Route 1, Madison finds no serious Alewife Run obstructions. Mr. Paffrath's report is copied to the Madison Board of Selectmen and to various town agencies for permitting.

This appendix appears in a write-up of the full project on the Sound School website (http://www.soundschool.com/directory.html) as Paper #11, The Hummers Pond Alewife Restoration Project. -Details of a Fish Run Project in Madison, CT, 1978 to 1989.

This appendix is included here for students reviewing a Capstone Project, giving some idea of the planning and town and state agencies involved in this effort.

The good news here is that in 2004, the Plywood Denil Fishway built by Daniel Hand High School students in 1989 was replaced by a new aluminum Denil Fishway and is pictured on page 15 of the Long Island Sound Study Habitat Restoration Initiative Annual Summary for Year 2004.

That information is found in appendix #4.

- Project History- Hummus Pond Project Fence Creek, Madison

In December of 1982, the Town of Madison removed accumulating silt, street sand and brush from a portion of Tuxis Brook (to alleviate perennial downtown flooding). The removal of debris gave rise to the concept of trying to restore an alewife run in the town of Madison. Several Madison residents recalled hearing stories of catching herring in the center of town, from Tuxis Brook around the turn of the century. In 1987, Ron Paffrath, former Chairmen of the Madison Shellfish Commission, wrote a paper for Wesleyan University entitled, "The Return of the Alewife," and used it to support a local effort for such a fish restoration project in Madison. His paper helped initiate conversations about Hummers Pond, which we walked together in April of 1987.

Approvals/Contacts
Approval by current dam owners:
Mr. Wilford Taylor, Jr., 88 Lovers Lane
Signed Permission April 4th 1988

See Appendix
August 28th, 1988, Kensington Acres North
Appears by Ballot A Revised plan of a fish ladder
Edward Brennan, Association President
(61 in favor, 9 opposed) reports overwhelming support Friday, September 23, 1988

See Appendix
State Technical Report
Mr. Steve Gephard, September 23, 1985
Potential for Alewife Restoration to Tuxis Pond, Madison
See Appendix
Endorsement by Local Agencies Groups
Approval April 8th, 1988 Madison Exchange Club
Ernest W. Small, Chairman Projects & Aims – See Appendix agreed to cover cost of project $200
Approval, June 22nd, 1988 Madison Land Trust (by vote of members)
Special Meeting – CT Light & Power Auditorium, Carl Schmidt, President

Work Plan outline – See Appendix C
First Transplant of Pre-spawned Adults From East Lyme

With the assistance of DEP staff, Mr. Tom Savoy, Tim Visel assisted by Ernest Small, Barry Eastland and Fred Korsmeyer, about 75 adult alewife were seined at the Brides Brook run in East Lyme and transported by a tank trailer to the Kensington Acres parking lot. A "bucket brigade" moved fish to the pond for release. The project plan was expanded to

include two years of pre-spawned adults followed by installation of the fish ladder in the early spring of 1991. Plans for a box type fish ladder (made available by Steve Gephard), were provided to staff and students of Daniel Hand High School of Madison, Connecticut.

Mr. Steve Gephard of the CT Dept. of Environmental Protection provided the design for a multi-baffle fish ladder (about 12 to 14 feet long or wide) depends on run length and rise height of the dam. Final measurements would need to be taken. He suggests the local high school wood shop class could build it, perhaps as a special project. The plans were made available to Daniel Hand High School. Before construction could begin, Tim Visel leaves The Sea Grant Marine Advisory Program for a school coordination effort for Bridgeport Public Schools. Nancy Balcom of UCONN Sea Grant steps in and coordinates the final remaining fish ladder installation effort during 1990-1991.

Early Project History

1974 - 1978 Conversations with Madison residents Ralph Clark, Charles Schroeder, and Charles Beebe confirm historical accounts of herring in Madison's tidal streams – Tuxis Brook in the center of Madison.

1982 Tuxis Brook cleaned of build-up silt and street sand from center of town beyond Union Trust Bank by the town of Madison; proper flow restored.

1984 Meeting with Stewart MacMillen, Director of Public Works, Flood and Erosion Control programs for streams – He believes it to be a good way to reduce flooding during heavy rains. (Remove built-up street sand from winter application.)

1985 Mr. Jonathan Cole, Assistant Engineer Public Works Dept, Town of Madison – Siltation of Streams and Creeks (Feb 1985) correspondence about rebuilding fish runs in Madison. Steve Gephard, Fisheries Biologist DEP Fisheries (Maine) writes report – subject potential for alewife restoration to Tuxis Pond, Madison, Sept 23, 1985 (recommends Hummers Pond instead). Ron Paffrath, Tim Visel walk Fence Creek and Hummers Pond – October.

1986 Mr. Robert Hincks – Madison Summer Resident asks for information on restoring Alewife runs Dec. 15 1986. He provides 1962 (June) CT State Board of Fisheries and Game – was interested in the Hammonasset River.

1987 Ronald Paffrath writes a research paper titled "The Return of the Alewife" for Wesleyan University. Copy of report sent to First Selectman Donald LaChance June 15, 1987.

1987 Plan presented to Mr. Warren Sinclair, Kensington Homeowners Association in April, for possible alewife/smelt restoration to Hummers Pond.

Donations and Volunteers - Tuxis Lumber Company, a local hardware and lumber company, donated the Quik-crete® cement and plywood; funds from the Exchange Club purchased polyester resin and fasteners for students at Daniel Hand High School. Volunteers from the Exchange Club and Madison Land Trust helped install the fish way, which students had built as part of their woodworking class. Mr. Bruce Beebe prepared the plywood fish ladder with resin to improve its lifespan.

1988 – Workshop and concrete work begins – Bypass 12 inch pipe installed weir board passage provided for fish ladders

1989 – Nancy Balcom of University of Connecticut Sea Grant secures permits 1990 – 91 – Daniel Hand High School students build fish ladder

1991- Madison Land Trust and Exchange Club volunteers install fish ladder

Press Articles

"Clearing Underway" - Shoreline Times, December 9, 1982.

"Groups Support Sought in Restoring Fish to Pond" – Hartford Courant, June 25, 1988.

"Madison Residents Reconsider Plan for Alewives" - Hartford Courant, August 25, 1988.

"Herring Restoration Workshop Tonight" – Shorelines Times, June 22, 1988.

"Fish Run to be Constructed at Madison Pond" - Hartford Courant, Sept. 24, 1988.

"The Biology and Life History of the Alewife" – Connecticut Currents Sea Grant Marine Advisory Service - Spring 1989.

"Officials Transport Alewives to Hummers Pond" - Hartford Courant, April 19, 1989.

"Land Conservation Trust Earns Better Community Award" – Shorelines Times, June 7, 1989.

"Alewife Restoration Project Progresses as Fish Way Installed" – Connecticut Currents Sea Grant Marine Advisory

Service – Spring, 1991.

Project Timeline

1988- Alewife Restoration – Striped Bass Enhancement Pilot Project, Madison, CT for the Exchange Club of Madison, April 6th 1988.

Madison Land Conservation Trust Information Workshop - June 22, 1988.

Carl M. Schmidt, President (Herring Restoration) endorses project, May 19, 1998.

Support letter: Friends & Company, Mr. Richard Evarts

Herring Restoration, May 18, 1988.

Kensington Acres North, Owners Association. Agrees to support the Alewife Restoration Project, October 26, 1988.

Presentation, January 17th, 1989; Madison Land Trust

April 17th, 1985: DEP Report (Tom Savoy and Steve Gephard)

Transplant 50 adult alewives into Hummers Pond from Brides Brook in East Lyme.

Dam stonework completed by Tim Visel, August, 1989 with Guidance from Raymond J. Visel an excellent stone mason..

Tim Visel leaves University of Connecticut Sea Grant Program, 1990.

Steve Gephard provides plans to Nancy Balcom (for Daniel Hand High School), who now coordinates restoration effort with woodshop class, Daniel Hand High School, 1990.

Fish ladder brought to Beebe Marine, Madison, where it is coated with polyester resin, April 1, 1991 (thanks to Bruce Beebe).

Fish ladder completed and installed – coordinated by Nancy Balcom, Sea Grant Marine Advisory Program, on March 15, 1991.

Final project team members:

Daniel Hand High School Industrial Arts students Craig Bravi, John Regan, Ryan Deschenes, Randy Lilly, Bill Boyd of Madison Land Conservation Trust, woodworking teacher Daniel Hauberger.

April 8, 1988

University of Conn.
Sea Grant Marine Advisory Program
Avery Point Campus
Groton, CT 06340

Attention: Tim Visel

Dear Tim:

Many thanks for speaking to the Madison Exchange Club on the Alewife Restoration Project this past Wednesday, April 6, 1988.

You have become our club's most popular speaker.

Yours truly,

Ernest W. Small
Chairman Projects and Aims

Mr. Wilford Taylor, Jr.
88 Lovers Lane
Madison, CT 06443

April 4, 1988

Timothy C. Visel
Sea Grant Marine Advisory Program
University of Connecticut
Avery Point Groton CT 06340

Dear Tim:

Thank you for your recent phone call regarding progress on the Alewife/Striped Bass project. I'm interested in seeing this effort move along and give D.E.P. marine fisheries staff and Sea Grant researchers access to my property this spring for transplanting herring into Hummer's Pond.

You may wish to conduct your studies as soon as possible. Good luck with the project.

Sincerely
Wilford Taylor, Jr.

February 12, 1982

Mr. Joseph DiCarlo
Division of Marine Fisheries
Shawmet State Forest
Route 130
Sandwich, MA 02563

Dear Joe:

On behalf of the Cape Cod Extension Service and the Cape Cod Natural Resource Officers, I would like to thank you for your most interesting and educational presentation on Fish Run Management. By all accounts, your slide-lecture discussion was found to be excellent.

Thanks again.

Sincerely,

Timothy C. Visel
Regional Marine Resource Specialist

To: Tim Visel, Marine Resource Specialist, Marine Advisory Service

From: Steve Gephard, Fisheries Biologist, DEP – Fisheries (Marine)

Date: September 23, 1985

Subject: Potential for alewife restoration to Tuxis Pond, Madison

On September 15, I visited Tuxis Pond in Madison. In the past, we have discussed the possibility of establishing an alewife run into this pond. My initial response to my on-site visit is that the chances for such are dim.

The pond has no clearly defined outlet stream. Using a topographical map as a guide (photocopy attached), I tried to find an outlet for the pond. My initial suspicion was that it flowed under the road to the east of the pond, into the swamp, and into Fence Creek.

I did find a small, choked channel on both sides of Scotland Road, but found no trace of it near the pond. The ground on both sides of the street immediately to the east of the pond is high and dry. The only other possibility for an outlet would be a buried pipe, which alewives would not utilize. Likewise, if the pond drains to any other direction, it would have to exit via a buried pipe, unless I was unable to find a stream.

On the day of my visit, the pond was exceedingly turbid. I do not know if this is the normal condition or whether the turbidity was caused by bulldozer activity on the SE corner of the pond. That poor water quality would not be suitable for alewife populations.

If you have knowledge of the pond and its outlet that would shed new light on this subject, we should discuss it. Otherwise, I suggest we look for different candidates for alewife restoration. Hummers Pond, a sizeable impoundment just above tidewater on Fence Creek, has good potential.

Cc: Pete Minta, Anatropous Fisheries Coordinator, DEP

SCHEDULE

Field Surveys

Adult fish transplant with DEP staff

Adult fish transplant 50-100 fish for spawning purpose

Seine survey – survey shallow areas for juvenile herring

Graduated pool construction. Three graduated pools will help adult alewives over the dam. The dam is about three feet high, requiring
three one-foot-high pools.

Transplant 250-500
adult herring

Transplant 250-500
adult herring

Look for returns; continue transplant program. Maintain stream free of brush/logs.

References

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Indian Fishing: Early Methods on the Northwest Coast by Hilary Stewart. University of Washington Press, Seattle, 1977.

Pictorial Guilford (A New England town in photographs). Text by James Lindsay, Published by Guilford Keeping Society, 1976. 171 Boston Street, Guilford, CT 06437, First Edition.

History of Guilford and Madison, Connecticut by Bernard Christian Steiner, 1897 Edition reissued by The Guilford Free Library in 1975.

History of The Indians Of Connecticut: From the Earliest Known Period to 1850, by John W. DeForest, published with the sanction of the Connecticut Historical Society, Hartford: Wm Jas. Hamersley, 1851.