Connecticut's Inshore Fisheries Problems and Opportunities: An Environmental History Review of Oyster, Flounder, Bay Scallop and Smelt Fisheries

Site Specific Habitat Considerations for Fisheries Restoration Projects – What the past can tell us

Bay Scallop, Flounder, Smelt and Oysters - Habitat Considerations

Proposal to: Sea Grant/Cooperative Extension Service
August 1988

Re-keyed with Appendix #2 October 2007

HRI Meeting November 14, 2007 Mamaroneck N.Y.

Timothy C. Visel – November 2007

Abstract: Connecticut's inshore fisheries have been well documented in the historical literature. Catch statistics also provide important data in reconstructing coastal fisheries. What often is overlooked is the user practices of site specific fisheries, a cove or river which alone represents a fraction of historical fishing effort but combined may provide a larger view of estuarine dependent habitat ecosystems.

The association of habitat to resource productivity is usually non specific relating to commonly accepted habitat associations. Most often the only site specific research conducted is environmental impacts reviews for coastal development. This approach is highly reactive and very often species specific. Such assessments routinely consider present observed conditions and only rarely survey over seasons. Thus it is possible to miss significant ecological habitat considerations without a historical time frame or reference. Site specific research is dependent upon other sources of historical information such as logs, newspaper accounts and past practice of user groups. Combined they can represent an environmental fisheries history. That is the topic of this paper.

An Environmental History Review

The winter or black back flounder catches in Connecticut are today but a fraction of harvests 105 years ago. Connecticut oyster production is just a fraction of what it was 100 years ago. Is this a coincidence, or is it a reflection of a common ecological habitat niche that has been lost or degraded? Perhaps survey/under video studies

could show this habitat relationship with other species. Flounder has long been associated with this shell/sand environment according to comments from oyster growers. Hard clams also seem to have benefited from past oyster Aquaculture practices.

Connecticut estuaries historically were important producers of bay scallop, smelt, flounder and oyster. Smelt and bay scallops are acutely sensitive to water quality changes and over time, retreated east as water quality declined. Today, they are non-existent as "fisheries". Oyster and flounder were more tolerant of poor water quality, but depended upon sessile specific environments – near shore areas with good currents required to keep bottoms “clean” and free of debris. Bay bottoms tended to be firm, consisting of sand, pebbles, shell and firm mud. They were dynamic systems subject to weather and storms, which provided the energy (mechanical) to maintain habitat diversity. We know the most about the conditions of bay bottoms in the oyster fishery – even to specific beds, planted oyster ground and coves. Because of the commercial cultivation of oysters, oyster growers, as any farming activity noted leased acreage conditions of habitat as factors of growth, survival productivity. They formed industry associations, held conferences, and at industry meetings presented oyster culture research. We also have from them extensive information on attempts to modify the habitat, especially efforts to change soft bottoms into hard, so that oyster culture could be sustained.

Single Species Versus Multiple Approaches to Habitat Restoration

Shellfish are thought to be indicative of estuarine health. Other estuarine species/plants indicators would include the eelgrass and clams (both hard and soft). Shellfish species appear to be good overall indicators of estuarine health, especially the oysters requirement of a silt-free environment needed to grow and reproduce. Eelgrass has declined severely in Connecticut. Connecticut soft shell clam production (commercial public grounds) ceased in the 1960’s. Today, in many Connecticut coves and bays, alteration of coastal ecology culverts and causeways, appear to be changing habitat profiles. Combined with excess nutrients and runoff, accelerated shifts in bottom types (from hard to soft) and from tidal current cleaned to areas of deposition have occurred. One of the most frequent habitat changes appear to burial by organic matter. This organic matter in 1980’s was termed “black mayonnaise” or black oze and usually had lower ph and

often-contained flounder which exhibited greater fin rot infections. This habitat shift appears to be more rapid in the last century accelerating in the 1950's. In review of Connecticut fishing statistics aside from losses in anadromous fisheries (such as salmon) and pollution (shellfish) inshore fisheries were relatively stable until the 1930’s. From the 1940’s, large harvest declines have been recorded for the smelt, bay scallop, flounder and soft shell clams.

Evidence in literary reviews and field observations indicate numerous site-specific habitats commonly associated with flounder and oyster have changed. Areas which were hard bottom and verified by field observations, now contain, in some instances, several feet of organic debris. No doubt nutrient enhancement and changes in tidal patterns with increased silt and road runoff are factors. Oyster growers noticed these changes as the industry declined from its record production levels at the turn of the century. Shellfishermen also reported similar concerns as coves showed the first eutrophication symptoms after World War II. This was especially true of Niantic Bay. (Most reports refer to large new growths of eelgrass or sea lettuce followed by sharp declines). Niantic Bay had a substantial bay scallop fishery that peaked in years of low eelgrass abundance. The Niantic Bay Scallop fishery was extensively studied by Nelson Marshall who went on to co-found the University of Rhode Island School of Oceanography. Niantic Bay and other eastern Connecticut coves showed early signs of siltation in the 1960’s.

This siltation concern is well documented in the scientific literature. As early as the 1880’s, references can be found about the demise of Hudson River oyster fisheries by silt. On pg 746, in the Report of the Natural History of Aquatic Animals (1887), US Fish Commission section 219: Physical and Vital Agencies Destructive to Oysters, the author notes:

“There is probably no worse enemy of the oyster culturist than this very mud or sediment. It accumulates on the bottom of oyster grounds, where in the revise of time, it may become deep enough to cause serious trouble. Especially is this true of ponds from which the sea ebbs, and to which flows through a narrow channel. The falling leaves from neighboring trees in autumn also contribute to the pollution as well as heavy rains which wash deterious materials into it.” The oyster fishery will provide the most documentation; the deeded or leased ground was

recorded and mapped. Production levels were published with often site-
specific references. Thus, it is possible to precisely locate an oyster bed or natural bed and record not only the current habitat but also examine the environmental history – the habitat below and impacts of eutrophication as a “now and then” picture.

In the 1980’s, I observed changes in plant/algae growth. In many cases in eastern CT, coves (with documented flounder fisheries and oyster beds) were
now being buried - in some cases by several feet of organic debris. In many cases, these areas had been subjected to greater amounts of nutrients. Several projects attempted to clear leaves/grass/sticks and other organic debris from the oyster beds, some had success and some did not. Perhaps a pilot project – a complete biological assessment of “before and after” on an old oyster habitat could prove a relationship to winter flounder. I was always interested in the habitat community and although I had numerous historical references that flounder lived either on or in the oyster habitat, not much can be found in the literature. Mapping the present habitat and history of anecdotal references could prove useful for potential inclusion into future LIS study habitat restoration projects. Changes in near coastal habitat has certainly impacted the oyster industry as buried natural oyster beds indicate, but other species dependent upon that habitat may have been impacted as well, such as black back flounder and the hard shell clam.

Raking tonging and hand dredging activities may have kept areas clean by moving leaves/sticks and organics on regular basis. These activities were stopped in many areas when water quality did not meet National Shellfish Sanitation Program Standards. During a period when cultivation became more important these beds weren't cultivated at all.

Cultivating oyster shell bases have been shown to improve oyster setting (Oyster Culture in Long Island Sound 1970; and How to Increase Oyster Production, 1983) by Clyde Mackenzie. But specific before and after studies are few and only occasionally are mentioned with other species associated with the oyster restoration/cultivation activities.
The process of dredging oyster beds, especially those in rivers natural beds tended to free the clutch of silt. This exposed the beds and the “black shells” in a low pH environment and therefore, biologically cleaned were ready

to accept oyster larvae. This process is described by accident in a US Fish Commission Report, pg 279: Oyster Fisheries of the Taunton River – 'A well-known lessee on the Freetown shore, thinking at the expiration of his lease (oyster) he would not be able to renew it preceded to dredge his whole land in the autumn, leaving it as barren a ground as possible for his successor. To his astonishment when his deed was renewed, he picked off an area 12,000 bushels when in the past yielded him 6,000 to 7,000 bushels. Hence, he concluded that the thorough scraping had done the bottom good."

In the 1983 Marine Fisheries Review article titled: How to Increase Oyster Production, Clyde Mackenzie, Jr., reviewed oyster cultivation practices from 1880 to present. In his paper, he notes "in Long Island Sound, most of the seed oyster beds lie along the Connecticut Coast, the remainder are in the mouths of a few Connecticut Rivers." These "natural" beds, the ones the industry depended so much for "seed" were located in areas most susceptible to human activities.

Many of the most important seed oyster beds in New Haven Harbor, for example, were filled in for road construction, others were impacted by road and rail causeways, while others by urban runoff. By 1960, most of the manmade seed oyster beds were abandoned because of lack of productivity. Mackenzie estimated that the oyster industry by the 1970's was spreading only 10% of shells to catch a set it had a century ago.

Aquaculture Techniques and The Benthic Community

The procedures utilized in shelling and cultivating seed oyster beds may have had additional ecosystem changes. Information from oyster companies tells of the appearance of the hard shell clam sets after scraping and shelling the bottom. The cultivation of the soil (substrate) followed by shelling could have increased pore-size in the soil and created greater soil/water circulation increasing pH. Massachusetts, Rhode Island, New York and Connecticut relate increases in the hard clam density after such techniques. Some of the most important bull rake hard clam grounds in Rhode Island and New York exist on previously planted oyster leases - those today still covered with remnant oyster shells.

The Oyster Bed as a Habitat Community

It would be interesting to include a review of the literature (perhaps a cooperative placement or special topics project) regarding the oyster reef community and the other species that occupy this ecological niche. One possible study could combine

spatfall tests and shelling a piece(s) of bottom and surveying what changes if any occur to the benthic community.

Today the management of fisheries is tending to be viewed more and more as a multi-species approach. The oyster industry can provide some connections to this management process detailing habitat enhancement, restoration or creation? Perhaps the oyster industry was practicing poly-culture a century ago and did they didn't even know it? The oyster habitat may have been a significant part of near coastal ecology which helped build an industry and also documented the negative impacts upon that ecology when it declined.

Appendix I

Associations of Flounder and Oyster Habitat

Timothy C. Visel, Coordinator
The Sound School Regional
Vocational Aquaculture Program

To begin with I was very fortunate to meet and talk with many oystermen including JR Nelson of Long Island Oyster Farms, George McNeil of McNeil Oyster Company, Clint Hammond on Cape Cod and Al Hufferton of Warren Oyster Company in Rhode Island. Included in my Sea Grant research were dozens of smaller oyster producers and seed oystermen (natural growers). My own experiences include some modest oyster culture and seed oystering here in Connecticut.

During my employment at three Universities I came to the conclusion that close habitat relationship exists between oyster natural/cultivated habitat and flounder populations. Not much is written about it however, Paul Galtsolf (1964 American Oyster) was the first to mention it, he did a lot of fieldwork on the issue out of Woods Hole. It would be interesting to see flounder catch statistics against oyster production, say 1880 to 1960 for Connecticut and perhaps Rhode Island.

What I have found is that the statements are all so familiar that one could believe its more than a coincidence and that both juvenile and adult flounder sought out this habitat. What I'm not certain about is that did we create more flounder by building more seed oyster beds? I have noticed flounder in the area when I seed oystered. We would get large flounder in our seed oyster dredges while working in the East and Hammonasset Rivers. Some of the comments below are generalized but reflect the same association, flounder and oyster beds. Some video filming I did with the Under Sea Research Program in the lower East River did show many small flounder but I left Sea Grant without a follow up study.

Some Histories – summarized conversations

George McNeil - owner operator McNeil Oyster New Haven and Clinton, CT (1970's)

1) New Haven - Oyster Beds (Private)
We used to get about 5 to 10 bushel of adult flounder each day in the dredges, they were large and given to the crew, spring started showing in New Haven the first or second week of March - Then by fall we would see small ones. People would fish (with poles) when we dredged - we would see them catch flounder and sometimes we had to chase them off because they were in the way.

2) Clinton (McNeil) – continued 1980's
Located business to the mouth of the Indian/Hammonasset River, Clinton Harbor - clean water. George told me the "Indian" river supported a fyke net fishery for flounder - very large. Over the natural oyster beds in the Indian River and harbor. People would spear flounder at low tide, always near the oyster beds. When we harvested oysters we always caught flounder in the dredges.

3) J. R. Nelson - Long Island Oyster Farm (1972 about) - We had a dredge boat for drills - called the Quinnipiac - suction dredges to pick up drills and starfish - flounder became a problem, also window (pane) flounder, crew kept them (to eat) small ones just got buried in the pile of starfish and lime water (the lime water would kill the starfish). Some days we would get hundreds of flounder, some much more off the seeds beds. Sometimes so much we just moved off it for awhile so as not to kill them (small flounders).

4) Albert Hufferton - Warren Oyster Co. (1980)

When the Connecticut oyster companies started planting seed oysters, the flounder came. The bottom was often soft, sticky - you couldn't stand in it but the companies in Wickford hardened the bottom with shell - then the oysters on top. Wow we had flounder! I mean in places - no fish, we had fish! (Flounder) lot's of small ones also - sometimes so thick we would catch them in the dredges.

5) Anthony Ronzo - Old Saybrook, CT (1982)
Note Seagrant Oyster River restoration project - cleaned up to three feet of black mayonnaise off oyster shell base - put down clean clutch. Comments of an Oyster River neighbor - Almost immediately I started catching flounder again where you cleaned, the bottom was shells and small oysters. The last time we caught flounder here was when I fished after the war (WWII) we used to catch flounders on the oyster tongs when we tonged oysters in the river - you could feel them when the tines hit them. If you kept the tongs closed you could spear them, sometimes we caught more flounder than oysters.

6) Clint Hammond Oyster River Chatham Mass 1982.
We purchased seed oysters (bedding stock) from Connecticut to plant. We cleared the bottom and planted the seed. This soon became a problem people started flounder fishing over the bed and dragging oysters with anchors. They would make a mess of the oyster bed with anchors - we asked them to stop but they would say this is where they big flounder are - and they were right! The flounders were just over the bed, what could we do, we let them fish.

7) Charles Beebe - East River, Madison (1975)
The river to oystering has been closed for awhile - the oyster beds are covered with leaves and the flounder spot is gone. We used to catch big flounder by the railroad bridge on the oysters. We would rake up some oysters and then fish the spot - sometimes we would smash the oyster and chum them with the oysters pieces, some days we would catch a 12 or more big ones that way. We can't do that (catch oysters) because the river is closed. We used to catch flounders in our seed dredges but that was in 1960's. There hasn't been any river flounder up at the bridge since then.

8) Norm Bender, Sea Grant Education Project

Tim Visel Norwalk Harbor (1986)

Project Oceanology Cruise Micky Weiss Captain
Thaxter Tewksbury crew

We were trawling 30 foot Wilcox flat net on sand near the channel. After 10 minutes we would catch 30 to 40 small flounder 2 to 3 inches in length. Micky was doing some population study so we were trying to come up with some size ranges. I noticed one of Bloom's oyster boats and Dave Hopp was on board. I asked if we could tow close to his seed bed - he called Hillard and said yes - it is was a short tow. We went inside of the bamboo oyster flags and made a four or five minute tow. The group started hauling - but we needed everyone - a big cod end, we finally got it in - all mostly small flounder 2 inches and up - 5 gallon pails at first but then started to throw as many as we could back overboard, I estimated 2,000 or more. We stopped measuring because it was just too much! Hillard (after) the boat returned asked that not to mention this - he had known that the seed beds had flounder in them - but was amazed at how many.

9) Louis Bayer - Quiambaug Cove Stonington 1988

We used to catch flounder here by the barrels we have reports that fykes were used here. I used to catch them (flounder) here along time ago. But the bottom is muck the oysters are gone, the clams are gone, it's smells bad, and no flounder in the cove. I gave up trying. The bottom in front of me (home) is soft muck now it used to be shells and sand.

10) Mr. Manwaring Pattagansett River, East Lyme 1988

Tim, we used to fish here (his property abuts the river) and now it is all muck. We would haul seine flounder at night and spear them also - catch them on worms incoming tide. But the river is filled with muck - the oysters are buried. You can find the oyster bed its near the railroad causeway (the Pattagansett was once 1,800 foot wide) it's all muck there now - if you fall overboard you would know. That is where we could catch flounders, over the oysters but you can't do that anymore, I haven't seen a flounder here since the 1950's. It’s all soft muck over the oysters now.

11) Larry Malloy - Oyster Company New London 1988 - Thames River

We could catch oysters and flounder together, they would come in to spawn. I think the dredging released food - they were here alright sometimes 2 or 3 in each oyster dredge - big ones! The oyster bed was alive with flounder, and sometimes we could dredge shell (buried shell for building a shell base) and get little ones. They were dead and we could watch the sea gulls get them when they went over.

Appendix 2

Cove and Embayment Historical Review
The Sounds Conservancy – Notes and Comments
Timothy C. Visel
Sea Grant Marine Advisory Program

Rekeyed for The Sound School
October 17, 2007
HRI Meeting – November 14, 2007

TO: Chris Percy, President
The Sound's Conservancy

FROM: Timothy C. Visel

SUBJECT: Cove and Embayment Historical Review Comments About
Finfish Shellfish and Water Quality – Suggestions for Proposal
The Sound's Conservancy Internships - September 10, 1989

Thanks for the call and concern. The concept of a fisheries history is a good one, if it is combined with actual field work/observations. What it looks like "today" from the surface reveals little without direct habitat observations or what it was in the past. The need is great, if we are to restore resources (and water is a resource I feel) we need to know what it was like in the past (so we have an idea of the loss, if any) and compare it to the present. This index can describe the habitats while the population assemblages/associations can be determined or at least estimated. I did have an opportunity to explore this concept several years ago.

When I was employed at UMASS Cooperative Extension on Cape Cod I had the opportunity to work with George Sousa and Art Gaines from Woods Hole. They developed a Salt Pond/Bay habitat index based on area 25% vegetation, 25% mud/shell, 25% sand, 25% pebbles or small rocks. According to these researchers that was the habitat matrix which yielded the greatest biological diversity. In areas that exceeded 50% vegetation we saw the abundance of finfish and shellfish greatly decline. Overall diversity also was less. We also recorded the best finfish and shellfish abundance in coves or ponds with over 50% mud/shell habitats (flounders and the softshell clam). These areas had currents and good tidal exchange so oxygen depletion was not a problem. The coves/bays with no "clear areas" consisting of sand/pebbles or small rocks showed much less diversity. Their seemed to be a direct relationship between clear or "clean" bottoms and productively especially in Green Pond which exhibited the characteristic of eutrophication and poor tidal exchange. The control was a salt pond on Martha's Vineyard – no nutrient or storm water runoff problems. I feel we need to have a similar index/profile here. Much discussion for many years has focused around the Anderson Nichols report and gaps in the local finfish and shellfisheries. Concerns about water quality were confirmed by Jim Citak

(Sept 20) and that also appears to be linked to our finfish shellfish loss. Please see attached letter that Tom Savoy and I just sent about smelt and them impact of chlorine. It is possible to begin to see the extent of the problem/situation. The past 3 years I have had some great Sea Grant Interns, Brad Burnam for the Madison Shellfish Commissions from Connecticut College, several from the William College – Mystic Seaport Program. Their reports were guided by systematic reviews of priority goals for coastal resources under the guidelines established by the DEP Coastal Cove and Embayment Program.

Perhaps in the future small research grants could target the fisheries habitat/water quality efforts of each town? The local historical societies are important sources for local fishing – maps also can be a big piece of the puzzle – it's the human effort – the enormous amount of time such an effort would take (I feel the task would require several paid interns not just one). While it is evident that local shellfish and finfisheries have been negatively impacted by nutrient enrichment, runoff and tidal restrictions, this isn't that new a problem I think Bill Niering hit it right on the head when he doubts Connecticut has the "political energy" to take on these issues. Another consideration is the habitat shift in the presence of eutrophication. As with some of the bays down south, like Mobile Bay – eutrophication hurts some organisms and benefits others. Thus it's hard to ring the alarm about flounder when the bluefishing is so good, etc. It gives the public the feeling "it's okay" or it's part of a cycle when in fact profound habitat shifts are occurring. If you lack the ruler – so to speak to measure the loss, you need to build the ruler first. The habitat index or profile could be that ruler – with it comes the fisheries history. Some of the changes are obvious – dams that blocked fish runs or dredge and fill operations. Trying to find out what original habitat associations profiles looked like then is now extremely difficult. It may be possible to "come close" with interns who will research specific habitats by compiling both data/information and users (resource) practices.

Water Quality Monitoring

Bathing Beach Tests (Branford example) – The texts for Branford Beaches conclude biological material (film) is being deposited upon the beaches – this could be just the beginning – Did Branford obtain a 1982-83 waiver from the Clean Water Act? See attached 9/13/82 article. A History

of Bathing Beach Tests might also provide a clue if runoff like on Cape Cod is increasing the counts. I have seen some early indications of this (increasing counts) in the Madison/Clinton area. Water quality monitoring also has implications for the NSSP action levels. Communities should begin long term monitoring of water quality levels – at least to determine the trend. Unfortunately the trend in many communities has been shellfish closures. A recent study "Contamination of New England's Fish and Shellfish (Coast Alliance June 1987) details this concern (lack of long term monitoring and on page 12 highlights this problem.

"The New England states must also develop long-term, comprehensive, coordinated in-the-field monitoring programs which are designed to help predict trends in contaminations, identify its coastwise spread, and aid in projecting the consequences of pollutant inputs. In 1986 no New England state has such comprehensive monitoring; most studies have been performed in response to a specific known problem. Now there must be an intensive search for problems before they build to the danger point."

Many communities such as Branford measure the current status but don't look at the trends. That information pointed to an alarming increase in bacteria counts but was isolated reference points – no one was drawing the graph. Long term water quality monitoring (Bathing Beach and NSSP) should be a part of a water quality history.

I have briefly sketched out an outline for your internship proposal (my ideas).

The Environmental Fisheries History –

1) Interviews/surveys of commercial and recreational fishermen
The user group often has insights about patterns and trends, especially to specific "spots." One of the best examples is the Hammonasset River – Clinton Harbor "Holiday Dock." Here winter flounder fishing is reknown and a popular spot. It gives a place where the resource users come. Interns could approach them with a modest question and answer format.

a) Other sources newspaper articles, journals, oral histories, almost every town has a town historical society – they often have papers, maps and

manuscripts that can provide information on local fishing. (1).

b) What's needed – local fish runs, shellfishing areas (maps) natural resource inventories. (2).

c) Review of the available literature – (John Volk's oyster set history for example).

Many local towns were written up in US Fish Commission Reports like Goode, Collins and Ingersoll others – some communities like Guilford have great local histories *, Nelson Marshall wrote extensively about Niantic Bay, etc. Coastal Towns such as Madison have a shellfish ground and deed book – like Groton which gives precise locations of the old deeded beds.

- (1) Some towns have finfish maps like Westbrook which show the location and fisheries practices "Fish Pounds" or "Clam Flats"

- (2) Many communities on Cape Cod had "natural resources officers" with detailed resource maps/inventories.

2) Initial Contacts to Civic Groups and Restoration Volunteers (By Interns)
Recently a group of volunteers have been trained in Waterford to look at winter flounder (Cove Watchers) (Based upon the RI Sea Grant "Pond Watchers") and the Madison Land Trust and Madison Exchange Club have expressed support for a project to restore Alewife to a pond in Madison.

Other groups locally based might be willing to participate in restoration activities "in their town" with a connection to resource. Another example is Guilford where shellfish resource issues (oysters) seem to be a reoccurring event. Mr. Dolan (oysterman) claims you need to know what was lost before you trying to restore it (Joe Dolan's article).

This study requires a great deal of effort and perhaps might be suitable for the old Soil Conservation Service Organization of local chapters – boards made up of volunteers. Such local "embayment" boards would consist of interested people representing user groups, marine owners, bait and tackle shops, fishermen's groups (like Trout Unlimited) Shellfish Commissions, Conservation Commissions, new Harbor Management Commissions and others. They

would be responsible in identifying local potential sites and provide user group information – see notation (1). At the same time the Cove and Embayment Board should look at in depth but small scale demonstration projects. They could be used as examples or models for other towns.

Chris Percy Section (1) Key Points

1. **Estuarine Indicators for Fisheries Histories**

   Although initially I felt that the hard shell clam would be a good indicator but after the arrest last fall in Rhode Island (bullraking in the Providence sewer discharge canal) I believe bay scallops might be better. Water quality also should be considered an indicator.

It appears from conversations with commercial and recreational fishermen – some who no longer fished but still attended fishing gear technology workshops at Avery Point, four species could be good estuarine embayment "indicators." They include winter (black back) flounder, oysters (natural beds) rainbow smelt and the bay scallop. These four species share some habitat associations – flounder and oysters seem very distinct (see appendix of observations). Bay scallops and smelt historically exist in the same water bodies but the habitat association is less defined, some of this could be linked to sensitivity to chlorine compounds. From some conversations good smelt runs were near or in bays/rivers in which scallops were also found. Tom Savoy DEP Marine Fisheries and I have recently asked for grant support (see attached proposal) to look at smelt. Wayne Castonguay, DEP Marine Fisheries is looking at the flounder habitat. No one it seems is looking at habitat associations for shellfish. To look at a potential test site (small) I have been talking to Dr. Robert Whitlatch and Dr. John Barclay to look at these habitat associations – especially around oyster/clam shells. These findings could have implications for shellfish restoration project considered by the Board, see attached proposal "What the Past Call Tell Us" I submitted to Cooperative Extension last year.

* Bacterial – Water Quality Records -
There appears to be a trend for increasing bacterial counts linked to natural drainage. In some of the Health Dept Records (Citak) bacterial counts increase overtime. Branford and Madison experiences might be typical. If so long term trends might trigger beach closings as counts

creep up overtime. I have already seen that in Madison and Branford. Therefore a "water quality history" might be something linked to a habitat or fisheries history. This is important to shellfish harvests especially recreational shellfisheries under NSSP guidelines. (I have many of the water quality tests).

* Dowd's Creek Project – Aside from population assemblages and species inventory – runoff contamination could be mapped. The wooden outhouses that prevented FDA reviews have been removed ([3]). The new fecal strip tests can detect wildlife and rainfall counts could establish a baseline or background number – something the shellfish industry has wanted for years. The Madison Shellfish Commission is supportive and so is the State Health Department.

You should look at the history of the State of Department of Health and its 60 years history of reducing mosquito borne virus and snail fever. When information on possible resurgence of malaria like diseases again in Connecticut the State still pursued ending traditional grid ditching techniques (3/8/85). This area seems to share both concerns, health and estuarine habitat quality. Their headquarters is located in Madison. It is well worth a visit and learn about marsh restoration with mosquito disease control.

([3]) Most of Hammonasset State Park had wood outhouses until the late 1970's. Their presence prevented any serious discussion of reopening the local area to shellfishing.

2. Habitat Shifts/Nutrient Enhancement

Presence of hard or firm bottom – sometimes shell covered (shellfish beds) provided a habitat community? What people have been reporting is the shift between a hard bottom community profile, to a soft euthropic condition (may or may not have seaweeds or algae growths). Increase in nutrient levels favors certain seaweeds like Ulva – or too much eelgrass? "This silt laden mess in certainly not preferred as a setting place as they leave the veliger stage, see attached article (2/10/83). This reported/observed bottom habitat shift needs to be confirmed. Mackenzie at NMFS has reported similar conditions (he has found buried oyster beds under organic debris and silt).

3. Water Treatment

Probably the most difficult permit conditions have been established (however reference the 1982 EPA article NYT Sept. 13, 1982). It is my understanding that many communities obtained 30 years waivers from the Clean Water Act? If so then they would expire in 2012? Looks like Connecticut is holding firm to expecting secondary treatment! That's great! But it seems that organics or nutrients may continue to be discharged at current levels for many years – decades? Many of the outfalls are in coves or near coves. They are most susceptible to this type of discharge.

4. **Baseline Information**

Without a good historical review and knowledge about the extent of the shellfish and finfish resources in these coves estuaries how can a consensus be reached on restoring something people today don't realize they once had? What about the habitat present today would it or could it support those associations in the past? According to some fishermen who fish Niantic Bay, part of the Upper Bay (River) have been filling in for years? (Bob Porter former Shellfish Chairman). Some of the Anderson Nichols sections reference studies from Narragansett Bay? I think we need better local information.