# Introduction/References

**Timothy C. Visel, The Sound School**

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"The Hydraulic Cultivation of Marine Soil to Enhance Clam Production" has been one of the most requested reports from our Adult Education and Outreach program directory. The report is actually a combination of 3 individual papers/slide presentations from 1985-1990.

The first is a fisheries history of hydraulic shellfish harvesting and slide presentation made possible by the cooperation of Mr. Francis (Frank) Dolan of Guilford CT and earlier information obtained from George McNeil of Clinton, CT. This information accompanied a slide show which was completed in 1986 and reshown twice four years later on August 27, 1990 at the Rhode Island Shellfish Conference and September 20, 1990 at the Madison Town Hall – Madison, CT. The August 27, 1990 presentation was titled "Shellfish Management and Restoration Programs in Connecticut."

The second is a section discussion regarding several environmental issues attributed to hydraulic shellfish harvesting – Appendix 1 is a literature search (references) for biological/environmental and fisheries technology (methods) as it relates to hydraulic or power clam dredging. This literature search was first conducted for the Madison Shellfish Commission and updated in October 1997 for the Rhode Island Legislative Commission for Aquaculture. It was rekeyed for Rhode Island Aquaculture Taskforce during a program organized by the Rhode Island Seafood Council in February of 1999.

The third section is a resource allocation/management study also in the town of Madison. This component details shellfish access issues following enormous sets of both oysters and clams on natural beds located within that community from the 1950 to 1980's. That was included to document jurisdiction and management – access conflicts. It was part of the Rhode Island Discussion on free and common fisheries – discussion for University of Rhode Island.

After several years of providing hard copies of these reports it was suggested that they become available as part of our publications/directory.

In 2005 all three sections were combined into one and put on our Adult Education and Outreach directory as #25 paper.

Of the three sections the one most referenced is the oral history of Mr. Dolan and his comments on the “marine soil” from which he harvested clams. His comments about “sour” or acid bottoms (pages 6 to 9) reference a widely observed habitat shift in many small coves and estuaries. Many small boat/inshore fishermen during this period observed the impacts of lowering pH and increased organics on bay bottoms and they were very concerned about it. Although Mr. Dolan’s method of determining bottom pH may have been what could be described as “unscientific” he had learned what was for him a good way to do a “soil test.” He urged municipal shellfish commissions consider claming an aquaculture activity clearly dependent upon good soil conditions for shellfish sets.

Finally, although these reports were compiled in the 1980’s while employed by the University of Connecticut Sea Grant program they are not official Sea Grant publications and do not have a Sea Grant publication number. **Hard copies are only available from The Sound School Adult Education program contact person Susan Weber, The Sound School 17 Sea Street, New Haven, CT 06519.**

Comments/suggestions are always welcome.

Individuals or groups interested in soil conditions suitable for the soft shell clam Mya should review papers written for the Long Island Sound Study Habitat Restoration Initiative titled “Softshell clam Habitat Creation and Associated Population Expansion Follows significant Marine Soil Cultivation/ Disturbances” also found on the Adult Education and Outreach Directory as paper # 23.

# The Hydraulic Cultivation of Marine Soil to Enhance Clam Production

**Compiled by Timothy C. Visel**
**Sea Grant/Marine Advisory Program**
**University of Connecticut Avery Campus Groton, CT 06340**

**Oral Histories: Dolan Shellfish Company Experiences with the Hydraulic Hard clam dredges, George McNeil soft shell production from New Haven Harbor**

Testimony and Supporting Appendices

(1) The Hydraulic Harvesting of the hard shell clam, Madison Presentation, September 20, 1990.
(2) Environmental concerns raised by shoreline residents – Madison – The Hard Shell Clam Fishery – newspaper and press reports.
(3) Resource Allocation issues and shellfish resource waste as raised by commercial shell fishermen in Madison waters – a review of comments and written records.

**Key words: hard shell clam, soft shell clam, increased shellfish productivity, marine soil cultivation practices, hydraulic and mechanical clam dredges, renewable natural resources, water quality issues, industry practices, shellfish management concepts.**

Abstract:

In the late 1950's and early 1960's hydraulic "wet dredge" hard clam harvesting equipment was introduced into Connecticut. This was a period of reduced oyster harvest and several large oyster companies, reequipped starfish map vessels and some production vessels for hydraulic harvesting of the hard shell clam (Quahog) *mercenaria/mercenaria* on leased and granted shellfish grounds. Shellfish operators soon noticed the differences in clam growth and clam setting when combined with light plantings of oyster shell cultch. This paper is the result of a presentation made in support of hydraulic clam harvesting when environmental concerns were raised about its continued use. Resource allocation/use questions were discussed as part of the presentation.

This paper reviews observations that hydraulic or mechanical manipulation of the soil changes chemical,

circulation and grain/pore sizes. Increases in pH seems to indicate increase growth and cultivation of suitable bottom types (soil) indicates increased hard clam sets. A review of the available literature highlighting these industry observations are found in Appendix #1 which was updated in 2005.

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**The Hydraulic Cultivation of Marine Soils to Enhance Clam Production**
**September 20, 1990 Special Meeting**
**Madison Town Hall, Madison CT**

**Timothy C. Visel, SGMAP**
**Environmental Fisheries History - Frank Dolan of Dolan Brothers**
**Company 1971-1986 (Slide show)**

**Also Presented To The Madison Shellfish Commission Public Hearing Madison Surf Club, Madison Waters and Work Conducted on Cape Cod**

Mr. Frank Dolan who co-owned a shellfish company with his brother, Joseph out of Guilford, Connecticut. On several occasions, I was able to accompany Mr. Frank Dolan oystering on the “Teal” “Laura and Ellen J.” three oyster boats owned by Frank and Joseph Dolan. Shellfish experiences included cultch planting, bottom cultivation, hydraulic clamming, relaying and oystering.

This article concerns the hydraulic harvesting of hard shell clams and is being submitted in support of written and oral testimony about the effects of hydraulic clam dredging. Madison has a rich shellfishing history that includes clamming for hard shells or round clams from its 6,000 acres of shellfish area. Recent experiments also have been conducted for determining the extent of subtidal soft shell clams in town waters.

## Hydraulic Dredging – Fisheries History
## Soft Shell Clam Harvesting

From what I have been able to learn, the clam dredge was preceded by the oyster dredge and early beam trawls. Beam trawls were mentioned in 1372 as England was recording complaints by its oystermen over oysters being taken by

such means. Often beam trawls were weighted by chain to scrape the bottom to catch clams. One practice that was utilized in Bridgeport and New Haven was to plow tidal populations of soft shell clams with a horse/oxen team and then at high tide drag a beam trawl over the clam beds. They caught tremendous amounts of soft shell clams, but the breakage was high, thus the term “soft shell.” The modern day version of this modified bream trawl/shellfish drag still can be found in commercial offshore scallop dredges and oyster dredges which use a combination of medieval chain mail and mesh netting. Previous to this point, most “steamers” were called

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“long clams” in Connecticut. We also know that clam plows were being used to cultivate tidal flats in Massachusetts and Connecticut for aquacultural purposes. In the 1870’s, one direct reference (pg. 590 History and Methods of the Fisheries Vol. II GPO 1887, The Fisheries and Fishery Industries of the United States, George Brown Goode, editor) describes this early practice.

“After many trials of all sorts of plows and cultivators, surface and subsoil and providing them unadapted to the turning of the dense, wet, heavy mixture of sand and mud, Mr. Wheeler Hawley (of Bridgeport, CT) succeeded in inventing a light plow, having a thin, narrow, steel mold-board, which did the work satisfactory after seeding the comments regarded the clams being shoulder to shoulder and growing slowly.” At one point, the US Fish Commission considered locating its first shellfish station in Clinton, Connecticut because of the tremendous softshell clam population in Clinton Harbor. Milford, Connecticut was selected instead.

According to George McNeil, an oyster grower from New Haven, the plowing of clam bar flats and light clam dredging continued until about 1910.

He attributed the decline from a lessening demand for salted softshell clams to be used as bait in the long line industry. This early clam dredge (from early terms drege

meaning “oyster net” and dredge “to draw”) is the antecedent of the oyster dredge. Clam cultivation by use of plows was to continue for another 25 years here in CT and on the Cape but proved to be uneconomical as the vast percentage of softshell of clams were used for bait and pig fodder and not for food. However, Mr. McNeil estimated that catches of soft shell clams in New Haven was once in the tens of thousands of bushels each year. A similar method of catching clams with nets has continued until modern times in the Carolinas. It is called “clam kicking.” In 1986 and 1987, the Madison Shellfish Commission used a Bourne/Yarmouth wand a hydraulic, single stream 5hp pump sampling device. Substantial/subtidal soft clam populations were found at Circle Beach, the flats off Fence Creek and the end of Hotchkiss Lane at Webster Point.

## Hard Shell Quahog Dredges Fisheries History
## Hard Clam Cultivation Practices

The concept would return in a different way a century later to harvest the hard shell or round clam. Earlier methods included hard tine weighted pole rakes made by the Quinnipiac Indians and other tribes. Long poles enabled them to rake deep water hard shell clams from salt ponds and coves such as the Niantic River between East Lyme and Waterford. Thus the first references to early clam dredges call them “drag rakes” and not dredges. The first clam dredges were attributed to Dutch oyster farmers of New York City who noticed quahogs or hard shell clams living under oyster shells that were harvested for the production of lime and street surfaces. Laws soon were enacted to end this practice as it was deemed to be harmful to the lucrative oyster business (page 518, George Brown Goode). The demand for seafood in a growing New York City soon caused clam dredging as a direct off-shoot of oyster shell dredging and, by 1870, emerges as a distinct “fishery.” An early account describes the clam dredge as being thrown overboard and when it has sunk into the sand it is “drawn” along the bottom, and taken up about once a minute, when the clams are extracted from the sand, washed and thrown into the vessel. This is, the account continues, exceedingly laborious work and four to five hours of it in one day is sufficient to use up the “stoutest scrapper” (US Fish Commission Report, 1887).

## Modern Clam Dredges

The literature review I was able to undertake, including the clam fisheries prior to World War II attribute the dry

dredge to have originated in New Bedford, Massachusetts. Apparently, some of the first powered fishing vessels experimented with a heavy dredge called the New Bedford rocking chair dredge. The concept was that vessels lacked sufficient power to cut through the bottom, so the boat was put into a fast forward, slow forward motion as to rock the dredge, causing it to chop into the bottom one bite at a time. It was slow and hard work-the cutting blade that cut into the bottom would often hit a boulder causing the boat to lurch, and the great weight of the dredge was necessary to keep it from jumping off the sea floor (which I am told it often did). After World War II, the shortage of fish greatly expanded the clam markets. More powerful engines were being installed resulting in less rocking and more direct sea bottom contact in a steady cutting motion. This new method caught more clams but greatly increased breakage – up to 40% of the clams were now being broken or crushed. This was caused by the fact that the cutting bar now was acting like a knife and striking the clam in the middle tended to cut the clam in half according to Mr. Dolan. Frank said that few Connecticut oyster growers would clam this way. It was punishing to the wood frame oyster boats, and George McNeil thought they would "rattle the boats apart." George also stated that the oyster business was far more valuable than clams and that Rhode Island had pretty much taken over the clam market by the 1940's. That would change dramatically in 1958.

## The First "Wet Dredges" for Hard Shell Clams

The hydraulic effects of pumped water into soil was well known in the mining industry. First applications were used to wash over burdens off silver and gold deposits and flume the flows for densities – the heavy constituents being the metals. In 1954, two researchers looked at reducing the clam mortalities with clam harvesting both soft and hard clams and taking the land-based hydraulics application pumped water to fluidize the bottom in front of the clam dredge. The first experiment was conducted in Massachusetts with a hydraulic manifold followed by traditional rakes for the collection of subtidal soft shell clams. This method allowed harvesting of never exposed subtidal population not that unsimilar to the horse and oxen plowing and beam trawls almost a century before. The early experiments with this manifold of water jets was quickly communicated to other New England states, and by 1956, manifolds were being welded to the dry rocking chair dredges with immediate implications; catches improved, the horse power required to tow the dredges decreased, and

mortalities dropped to under 8% and many times between 2% or less. According to Mr. Dolan, news soon spread to Connecticut with Massachusetts and Rhode Island fishermen quickly converting their dry to wet dredges. By 1958, oyster growers started to experiment with the so called hydraulic dredges. Mr. Dolan commented it couldn't have come at a better time. More people were coming to the shore as tourists, and they were able to market clams they just could not catch easily before. Most of the hard clams were in 15 to 25 feet of water. Waves and tides in the Sound made tonging and bullraking both difficult and economically unfeasible. The oyster industry was having a decade of poor oyster sets, and many oyster growers were "just hanging on." It also came during a period when hard shell clams "were everywhere" after the 1940's, and now in the 1950's, clam beds had matured such as the one off Madison. (Mr. Dolan states that the hard clam bed extended from Guilford Harbor to Tuxis Island and out to Madison Reef – some 600 to 800 acres. This was confirmed by surveys in the mid 1980's). He was disappointed in the response from Madison to attempts to harvest these deep water clam beds, and by the 1960's, most of the clams had died. He said he thought the clam bed off Madison was one of the largest in the country, and it was a shame to waste that much seafood. It also was frustrating because the waters off Madison were clean and certified for shellfishing. What I have been able to determine is that it was just not only Madison's beds that had dense concentration of hard shell clams but many areas in Connecticut had clam sets. It is just that Madison's beds were by far the largest. Repeated attempts by fishermen in Guilford who knew the extent of the beds were rejected by the Town of Madison. (Most of the clam beds were in Town of Madison waters.) Mr. Dolan said most of the clamming then was in the Thames River and Norwalk and Milford Harbors. He said the Thames River held more clams than any other river in New England. According to Mr. Dolan, by 1975, these offshore beds had "died out" but he could show me "how to bring them back."

**Clam Research in Town Waters**

In the late 1970's, I approached Mr. Dolan about surveying a section of Madison Town Waters as part of a shellfish management plan. He agreed only after the previous clam bed he purchased in 1961 would be finally approved by the Madison Shellfish Commission. This was done on July 5, 1983. I was able to accompany him on several occasions from 1975 to 1983 for shellfish surveys. I had clams (only

living ones) aged at the University of Connecticut. I also kept records on age distribution and bottom conditions. The first survey yielded only a very few living clams, all big “chowders.” In 1978, they were aged by slicing the shells and examining deposits (similar to counting tree bark rings). They were old – 30 to 40 years with some 50 or more. Mr. Dolan would work the dredges in circles and sometimes drop a marker buoy. Most of the first day yielded dead clam shells, some still paired but all dead. Frank asked that he be brought a pail of salt water and asked for some dredged shells to be brought to him. Taking two shells, he rubbed them vigorously together and placed them in the pail of water. A white cloud occurred and Mr. Dolan than said “what I thought; the bottoms gone sour.” I had heard this comment about bottoms before with inshore trawl fishermen in New York. He then repeated the “test” several times with the same results, a white cloud. The second survey was done in 1981, in the same location with mostly the same results – but we washed two boat loads of dead clam shells back on the beds. Tens of thousands of bushels had died according to Mr. Dolan. We dredged all day and found less than 30 live clams.

Mr. Dolan said that he believed the 1938 hurricane was responsible for the great widespread clam sets in 1939-41. He felt many of the clam predators were killed, and that areas that had muck accumulations had gone back to clean and sandy bottoms. He also felt the waves loosened the bottom that could get as hard as “pavement,” allowing the clams to “set in” better. The better bottoms had no such cloud from the shell test. He would need to bring in a light coating of shell several times to sweeten the bottom. The shape of the clam also told him a lot. According to Mr. Dolan, the “points” and “blunts” tasted different which he attributed to sweet or sour bottoms. Points were faster growing clams that had hard shells. Sweet meaning those bottoms which were slightly alkaline and sour for bottoms that had no shell cover. Blunts were often found in muddy or muck covered bottoms. I stated it seems you are controlling the pH of the bottom with shells just as a farmer does with agricultural lime. “Yes we are and <u>one more thing</u> think about the soil.” It was the first time I had heard the bottom referred to as soil. Then he steamed out beyond Charles off Madison, set the dredge, engaged the pump and then stopped it mid-dredge. By turning the water off, he took a chunk off the bottom in the dredge and hold hauled it up. It contained a piece of orange brown bottom – Clay; Frank explained, no good for clams. You could turn (meaning “cultivate”) this over and over again with no

clams – you cultivate the bottom we do, that is if the bottom is good – close to the beach is mud/sand we can work that, out deep is clay/sticky bottom and that rarely works. We learned that we could take good bottom and cultivate it using the dredge then shell it slightly and get a set of clams.

Mr. Dolan recounted how it was by accident that this was discovered. They had years of experience of catching hard clams under shell cover from oyster operations in New Haven Harbor. They initially thought the shells protected the clams from predation. Only later did the concept of controlling pH and examining soil structure for suitability develop for hard clam "aquaculture." They were farmers and rotated cultivated prepared "fields." It was just the same to him.

When the first hydraulic dredges can into existence, Connecticut clam production soared but consisted of almost entirely of market "chowders." In the first 5 or 8 years, everyone caught clams and, at times, there was a glut. Eventually all these chowders were caught and production declined. (He stated it was in the mid- 1960's.) From time to time, boats would rig up for clams, especially if the market price improved. On one of these trips, they returned to a bed in the Thames River to relay clams to clean water and, much to their surprise, they found small clams, thousands of small "necks" and seed. This was the same bed several years that before had only chowders. They believed that the hydraulic clam "cultivation" aspect had done some good. They then started to return to some of the other areas and found much the same thing. The shell cover aspect seemed to work on grounds with no shell cover and, if, the bottom was sticky (high clay) or had shells pitted and soft (the white cloud in the pail of water), the bottom was acid. They once had a shipment of river clams rejected because they tasted "bitter" and took them and planted them in Guilford for 3 months. The bottom had shells on it and other clams, and when resold, they were told they "tasted great." He never had the time to pursue this except if on acid bottoms they would often taste bitter, on shelly bottoms "sweeter." It wasn't proved. However if the bottom started to "sour," they would dredge up some buried oyster shells and scatter them on the clam bottoms. In one interesting conversation, he recalled a situation when they did this with oyster shell, and they didn't realize it had an oyster set on it. When they checked on the bed several months later, they discovered a good crop of seed oysters and moved it to the Hammonassett River so it wouldn't be

killed by starfish. It didn't take long for other clammers to realize that they could manipulate beds for setting. It worked most of the time but in some instances, it didn't, so they would need to "check it" every so often. Key to the production is that beds were rotated, cultivated, lightly shelled and then wait. Mr. Dolan said it was usually 5 to 7 years, again, depending upon the bottom conditions. They didn't publicized this feature. (It took a while to get Mr. Dolan even to confide in me. After all they had learned it the "hard way" and it was a competitive business.) Only recently have other researchers and industry people acknowledged this aquacultural practice. Recently, articles have appeared about the same practices on the east and west coasts and in Canada.

Mr. Dolan stated that during harvesting oysters, if they ran off the line (area of planted oysters), they would hit the clams under a thin layer of shells. The problem was they weren't worth that much (pre-1945). Everyone (oyster growers) knew hard shell clams set under the shells. It was a common occurrence in New Haven Harbor Mr.Dolan's beds were listed as Stone House in New Haven after a restaurant they owned.

He felt hard shell clams preferred a sandy soil closer to shore, and he rarely fished in waters over 30 feet deep. He could tell by squeezing a clump of mud; if it held a ball, he would say too much clay and not worth cultivating. They looked for old beds that still had clams believing if some were still alive the bed could support additional clams. Some of the densest clam beds he ever worked were in the Thames River in old oyster beds. If then contained clams, if they could be cultivated. Mud and sand, 80% sand, 20% mud over 50% mud, clams would grow slow – acid would dissolve the new shell. Mr. Dolan felt good sets followed storms, washed mud from the soil and also loosened the beds allowing dredges to catch better. He did note that the clams responded to dredging by burrowing deeper. He would move off the area and fish another when he returned all the clams were "at the surface again." The hydraulic action was a mini storm and that larger storms like hurricanes prepared bottoms for big wide spread sets even out to the deeper water. He felt it key to production that beds be "rotated" Mr. Dolan compared it to Christmas tree growing. Problems happened when the beds were harvested early. Newer people had this happen. It's hard to wait but not waiting wasted a lot of small clams; they were dislodged to be eaten by predators. Sometimes he would cultivate, and it could take 3 years to get a set.

They knew it worked because if they got off the area, the bottom would be hard and contain dead clams just like the previous conditions.

**Problems with Hydraulic Dredges**

One concern Mr. Dolan mentioned was regulations/control of the beds. He had seen clam beds ruined by continuous harvesting and not letting the crop mature. He stated that continual harvesting jets out seed clams for predators. In a very short time the person is in the business of raising "clam predators instead of clams." Once the area is cultivated, it needs to mature. Early harvesting can give the illusion of a good return, but he estimated that for every clam harvested, 100 small clams would be killed by predators. He gave an interesting example of a school yard and quarters. If you took a 12 quarters and threw them onto a grass-covered school yard, chances are they would all be lost and none recovered. Imagine if you took 10 thousand quarters and did the same thing – he guaranteed that people would become highly interested and attracted to this activity. He recounted that was the same thing that happens in the marine environment; early harvesting brings in predators, in some cases thousands of them (He thought the worst were blackfish and spider crabs) It can build up the predator population to a point that all the vulnerable clams, especially the small ones, can be killed. In one case, he remembered the spider crabs got so thick over the bed they couldn't dredge. When he returned weeks later, nearly all the small clams had been eaten. If the beds were cherrystones or larger, this "chum effect" is reduced. One of the suggestions was the area be divided into "lots" and testing made to determine when to open. It would maximum economic harvests and increase the percentage of clams to the Town of Madison. (Madison had asked that a percentage of the clam catch be relayed to shallow waters for recreational harvesters).

1) Blackfish were confirmed off Charles Island in Milford 1986 - the sound of the pumps brought them under the boat before water was actually delivered to the dredge.
2) First attracted to the beds were large adult flounder who he felt were getting sand worms and not clams as a result of the dredging. Sometimes people would fish by the boat for flounder and he could see them catching them.

## Environmental Conditions for Clams Notes and Observations

Mr. Dolan was willing to share his observations about hard clams from almost 50 years in the fishing business. He felt that hard clam offshore beds set well only two or three times in his lifetime, in the 1930's, 1950's and 1970's. He believed that they occurred after a hurricane or very bad winter (Northeasters). He also felt that the conditions were better in the rivers for sets, 2nd best was under oyster shells and lastly, in the offshore waters. When he cultivated (although he had caught both razor clams and surf clams in Connecticut), the only other commercial quantities of other clams he saw were soft shells off Ledyard and in New Haven. That was associated with hard clams; the soft shells were so thick they jammed the clam dredge making hard shell clamming impossible. If he hit the soft shells he had to stop. He would occasionally hit razor and surf clams off Guilford but not in any large quantities. He felt the dredge for hard clams was just too small to catch the others.

## River and Bank Edges

Mr. Dolan fished the Thames River from Montville to Green Harbor, New London. He felt sets occurred often but the bottoms turned mucky in the 1950's. He believed that over 50% muck could slow growth or kill clams. He also saw sea lettuce in Montville get so thick as to suffocate clams off the edge (away from the channel). He also observed clams with soft sticky bottoms, their shells were often pitted and were soft, very much unlike the clam shells from cleaner sandy mud. He felt that the clams off Montville and Ledyard were the most concentrated. The soft shell clam bed off Ledyard was over a 100 acres in size. The Connecticut River had too much fresh water for clams he felt.

He also found that heavy rains would wash leaves and sticks over the beds in rivers. One day little "trash" after a heavy rain a lot of debris etc. Rivers were good he thought because predators also were fewer. He felt the currents would clean off new edges preparing them for sets. That would occur after heavy rains.

## Near Oyster Leases

He (and the oyster growers) had seen multiple sets of hard shell clam occur under seed oysters for decades. Oyster set had been planted, and when harvesting the oysters with oyster dredges, they would always get some clams. In fact, they knew the oysters were getting "thin" when greater amounts of hard shell clams would come up. This is when the practice of cultivating and laying down shell started. If it was done on the edge of oyster ground, clams sets were nearly assured. Sometimes they just planted a thin layer of shell over an area with no cultivation. They often would get a set that way.

**Open Areas - Offshore**

These are the areas that obtained widespread sets but only very rarely. This was the type of clam bed off Madison. For them, he would just cultivate and leave them alone for a few years. Later he would cultivate and add shell if there was few shells. Usually they were enough dead shell on the bed so that. This didn't happen. However, if the shells were so old that they crumbled in his hand, he would add new shell (if he could get it). This was the most risky of the three habitats; sometimes he would get a set, yet some times it was a complete "blank," and he never knew why.

**Impacts of the Sea Bottom**

Mr. Dolan felt that hydraulic dredging was less harmful than dry dredges. Almost no clams were broken and the bottoms were cleaner after clamming. He likened it to raking the leaves off your lawn so the grass could grow. In Connecticut, he had noticed the tendency of the bottoms to go "sour" with muck. Green Harbor in New London where he said he found the densest and concentration of clams ever, went progressively to a muck sticky bottom. Once the clams were harvested, no small ones appeared and they tasted bad (see previous reference). What started off as sandy mud became sticky muck, some times so bad that the dredge get stuck in it. After a while, they started setting the dredge with full pump pressure to avoid this from happening. If the bottom was very sticky, they didn't even bother. The last time he sampled in Eastern Connecticut for the town of Groton, he stopped in at Green Harbor. The place he used to fish was full of leaves and sticks; he called it a "dead bottom." He tried for an hour to catch any clams but didn't even get one dead shell.

He thought the bottom had changed so much, he could not get down to the bottom he clammed 30 years ago. It was now extremely “soft.” He said the bottom was like jelly. One time he hit a patch in Green Harbor and harvested over 500 bushels of necks and cherries from an area about a third of an acre.

**Summary**

One of the things that bothered Mr. Dolan is that he could never see “his farm,” a problem I encountered with similar size operations. He often wondered what the area looked like before and after he dredged. He wondered about fish, (he used to catch flounders and blackfish in the dredges once in a while) and if they watched the dredge or came in right after it. He wondered if the bottom had sand worms in it – he thought it did. I was able to provide Mr. Dolan with a copy of a video oystering in the East River, but I don’t think he ever got to look at the “soil” he worked on his entire life.

## Introduction for Appendix 1-3

### The Cultivation of Marine Soils
### The Hydraulic Harvesting of the Hard Shell Clam Mercenaria mercenaria

**Timothy C. Visel**

In 1990, a concern was raised that hydraulic clam harvesting off the coast of Madison was environmentally dangerous to the water and sediments. The group which called itself Save our Shores claimed detrimental impacts ranging from increased heavy metals to the source of bacteria on bathing beaches. The research community weighed in and dismissed these claims. Pet waste it appeared was more of a threat to Madison beaches in the form of storm water runoff than hydraulic clamming.

The conflict in the end was more about noise than anything else and it was handled the way most noise issues were – regulations and municipal ordinances. It was also suggested that shellfish resource issues were a long standing problem in Madison. According to local shellfishermen policies that had existed for more than half a century were also to blame,” if I can’t harvest them

nobody else should" and references to his belief were found in the Town of Madison Shellfish records (see appendix #3). The town once founded by farmers and fishermen had become an affluent shoreline community and had a history of marine resource conflicts in recent years (Charlette Evarts, Town Historian). In 1972 and 1973 oysters began to set strongly in town waters. Natural growth harvestors (seed oystermen) asked to harvest seed oysters in major rivers and creeks – but were continuously opposed. Only after oysters grew to depths of 6 to 8 feet deep impacting navigation in Neck River did the town allow commercial harvests, but by then approximately 80 to 90 thousand bushels of seed oysters had died from overgrowth (1978). In 1971 most of Madison waters were closed to shellfish from bacterial contamination (runoff). This accelerated the waste of oyster resources as no relaying or transplanting programs were then underway. The waste of oysters in the East and Hammonasset rivers was enormous.

In March 1990 when the first concerns were raised I was employed by the University of Connecticut Sea Grant Marine Advisory Service and a life long resident in Madison. According to newspaper reports the conflict was very divisive one pitting wealthy shore front owners against people who liked to eat and harvest shellfish. The Madison Shellfish Commission had for 15 years under cooperative management efforts had a part of the commercial catches set aside for shallow recreational relays) which greatly had increased recreational permit sales – and the satisfaction of shellfishing a traditional fall activity for many Madison residents. It is in this context that the information is contained and with a slide show presented to the combined groups to demonstrate the techniques and impacts of hydraulic clam cultivation. The aquacultural aspects are included in appendix #1.
The environmental aspects are detailed in appendix #2. The resource allocation issues are reviewed in appendix #3

As it relates to the resuspension of bottom sediments clam fishermen claimed that storms and hurricanes resuspended more sediments that could possibly be accomplished by hydraulic dredging. The group opposing hydraulic clamming claimed serious long lastly negative environmental impacts. Several agencies provided testimony in support of hydraulic clam fishing.

Yet to this day, the association of increased resource enhancement and cultivation of marine soils refuses to go away. Rather than avoiding the issue we need to

objectively look at it and involve industry resource managers and regulatory agencies in these discussions. In that way, aquacultural cultivation practices can be discussed in a non emotional way with industry and resource managers. The practice of marine soil cultivation is continuously mentioned in research and industry accounts. I have listed some references as a way to demonstrate that Connecticut's example is not unique but forms part of a international research effort. They were included after my slide lecture presentation at the Town Hall on the equipment and different types of hydraulic dredges. I have summarized sections of these handouts below.

On a final note – one prediction.

One prediction that Mr. Frank Dolan a local shellfishermen made did come true but he did not live long enough to witness it. The State waters did pick up strong sets of mercenaria in 1987, following Hurricane Gloria and another following Hurricane Bob in 1992. The harvest of hard clams soared in 1994 and continued to the year 2000 following these widespread sets, and as he predicted this event would be followed by a decline just as the previous three cycles he had described. He told the group that storms changed the bottom and moved more sediment than the hydraulic clam dredge could ever accomplish. "On rough night from a southwest wind moves more silt than we could in a year."

Reference for the Cultivation of Marine Soils – Prepared for the Madison Shellfish Commission

Appendix #1 Aquaculture Aspects Associated with hydraulic clamming.

Note: Most of the shell fishermen that I have had the benefit of meeting and engaging in conversation all told me the benefits of "working the bottom" and negative associations of plants (Marine grasses) and decaying plant matter. They seemed to be both indicators, clean, relatively mud free habitat was good and thick grass or heavy accumulations of seaweed, sticks or leaves were poor or low productive habitats. There was consensus that clean good bottom can be ruined by excess plants, both terrestrial and marine. This was more prevalent in the regions that suffer from nutrient enhancement. The working the bottom aspect can be found in many clam fisheries, raking, tonging and dredging, only with hydraulic clamming did I find reference to the activity as a farming or cultivating activity aside from harvesting. In this way,

the area was prepared for a set or harvest." Much as terrestrial farmers cultivated and prepared "soil". I have listed some references for the process - We absolutely, need more research in this area. Most of the research today has been done by shellfish constables, shellfish commissions and the shellfishermen themselves. Although it is continuously mentioned by shellfish managers and the shellfish industry, it remains an area that is still poorly understood by the general public. As the concept of marine soil manipulation is often contrary to accepted norms and may infringe upon long standing environmental and regulatory provisions, it needs to have a historical context of shellfish utilization by early setters and of course native Americans. Much of the practice of hydraulic cultivation was utilized as a way to minimize the negative impacts of eutrophication and siltation.

**1) Biological Effects on Hard Clams of Hand Raking and Power Dredging**
**October 1953 - By John B. Glude and Warren S. Landers Fisheries #110 United States Dept of the Interior Fish and Wildlife Service**

"Narragansett Bay, Rhode Island, has supported an intensive commercial fishery for the hard-shell clam, Venus Mercenaria, known locally as the quahaug or quahog, for many years. Hand diggers, using tongs or bullrakes, are allowed to fish in any unpolluted waters in the State. Power dredgers have been restricted to the southern half of the Sakonnet River except for a short time during World War II when additional areas were opened to increase food production. Locations of fishing areas are shown in Figure 1.

Controversies continually arise between fishermen using power methods and those who harvest the clams by hand. Rakers and tongers claim that they are using the only method which do not harm the bottom or destroy young clams. They claim the dredges tear up the bottom, breaking many of the clams which are caught as well as those which go through the bag of the dredge and are left to die. They also believe the dredges bury the small clams so deeply that they are smothered, and that the bottom is sometimes plowed to such an extent that current action causes scouring which prevents a new "set" from surviving.

Dredges claim that they are merely cultivating the bottom and preventing it from becoming too compact for the clams to live. Dredging, they state, really improves the bottom,

inducing new sets and increasing the growth rate of those clams which are left.

Bottom samples confirmed the indications of the underwater photographs that surface appearance of the three areas was similar. Mixing of the sandy-mud layer and the underlying clay was more pronounced in both fished areas than in the control. Fished areas were also softer and had less odor of decomposition than the control. No differences in the above physical characteristics was observed between dredged and bullraked sections.

This experiment shows no biological basis for restricting either method of fishing."

**2) Fisheries Research Board of Canada 1962 -**

"The Martha's Vineyard hydraulic clam rake (Mya) is the proto type from which the present machine was developed. We believe the hydraulic rake, which operates on flats while they are submerged is a better harvesting tool. It causes so little damage to clam stocks that it must be ranked high as a saving gear. We wish to thank Dr. Matthiessen who in 1959 acquainted us with Martha's Vineyard fishermen who were using hydraulic rakes."

**3) Yankee Magazine October 1974 -**

"Rev. Richard Burton, founder of Project Dominion, demonstrates his homemade cultivator, seawater pumped through the device agitates the surface of an ecologically stagnant clam flat and adds oxygen and nutrients – resulting in a healthy set of clams." {Mya}

**4) Hydraulic Harvesting of Soft Shell Clams – Results of Soil Cultivation Experiments – MacPhail Model of the Hydraulic Rake – Page 9**

Bourne – Sandwich Shellfish Assn. September 8, 1980, March 20, 1981

"When the manifold was rolled across the bottom, gases formed from the decaying matter were observed bubbling to the surface. The substrate was devoid of the usual animal life, such as sea worms and the winkles. After pumping these areas, and removing the harvestable clams, the conditions improved remarkably. The surviving seed was able to return to the newly turned over bottom, while the dead shells and decaying matter remained on the surface.

The mortality rate of the remaining seed dropped drastically, and an increased growth rate was noted.

We have also encountered certain spots where this dying process is complete, and only the many clam shells remain beneath the substrate. Though the area has since repopulated with sea worms, and other marine life, as yet, no clams have re-set there. One explanation could possibly be taken from the 1930 Belding Report, which states: "Clams are usually absent from soils containing an abundance of organic material. Organic acids corrode their shells, and interfere with the shell- forming function of the mantle. Such a soil indicates a lack of water circulation within the soil itself, as indicated by the foul odor of the lower layers, the presence of hydrogen sulfide, decaying matter, dead eelgrass, shells and worms. If such a soil could be opened up by deep plowing, or resurfaced with fresh soil to a sufficient depth, it would probably favor the growth of clams."[1]

[1] Belding, David L. MD; The Soft-shell Clam Industry of Massachusetts, November, 1930.

**5) University of Maine Orono August 1984 – Development of a Harvester for seed clams**

"There had initially been some concern regarding damage to the fragile young clams, and disturbance of the flats themselves by the action of this hydraulic harvester. Both these aspects were studied. Samples of clams harvested by the machine were taken to Orono and placed in the shellfish laboratory running sea wakes system. After three days a count of dead clams was made and the percentage mortality calculated. For no sample was this figure over 5% a level considered acceptable by all concerned. Shell damage from the shore of the jetting {water} action is simply not a problem."

**6) Producing Clams for the US Market by Jim Conrad**
Aquaculture Magazine, May 1984 – Pg 38

"First of all, we own the bottom of the bay we work on," he says. "We own six acres and lease 1.5 acres from the State. Second, we till and groom the beds-clear off the overburden of mussel shells, take away predators, and keep digging up the substrate all the time. The reason we keep digging up the beds with hand diggers is that if you let the substrate sit, silt drifts over the beach, plugging up the pores so that water won't circulate through it. Then

the clams, three or four inches down, or even a foot down, no longer can survive because they can't get enough water filtering down to feed on. Then they start migrating upwards to a fairly thin layer at the surface of the beach. You can't get as many clams per acre if there are all in a thin layer at the beach's surface as you can if they area scattered through several inches of the substrate. We try to make the beach substrate 'fluffy,' like the soil of a well tilled agricultural field."

**7) Quahog Management**
Aquaculture Magazine, November/December 1988

"By using excellent management techniques, David A. Roach, Jr. of Westport, MA has increased this community's quahog production from 50,000 to 1,000,000 in five years, making Westport the fourth largest quahog producer in Massachusetts.

Roach has also implemented another new management program for the Westport River; he and his staff use a hydraulic dredge to turn over the river's bottom in areas that are either unproductive or have gone from good to poor production. This procedure changes the chemistry of the largest particle size, breaks up thick mud accumulation and releases sequestered nutrients."

**8) Getting more from your sediment bottoms**
**The effects of hydraulic harvesting - Aquaculture Today, 1988, pg 4 to 8**

**H.K. Rask Regional Marine Resource Specialist Cooperative Extension Service**
**University of Massachusetts**

"Pollution closures and the future shellfish resources are receiving increasing attention. In addition to closure restrictions, declining harvests can also be traced to poor setting and, especially, to the deterioration of bottom quality. The result is considerable acreages of nonproductive bottom sediments.

Cultivation a solution

One obvious solution is to cultivate the beds to improve sediment quality. This was well known over 100 years ago, but is almost totally neglected today.

In the past, horses or oxen often were used to cultivate the flats. Today this can be done hydraulically, and tremendous yields have been found in areas that have been hydraulically harvested or naturally disturbed. Recent work with hydraulic seed harvesters and other hydraulic gear also shows that cultivating the bottom enhances setting; good sets can also be found when storms, currents or dredging activities wash the sediments free of organic material and detritus.

There is a link here to the excellent sets of shellfish found in new sand deposited by storms or currents. Clams (Mya), for example, are a colonizer species and can quickly populate an empty area. New sand is not only free of decaying organic detritus, but is also free from predators. Hydraulic action can easily be seen to imitate some of these natural phenomena."

**9) A Marine Resources Management Plan for the State of Connecticut - July 1984**

**Department of Environmental Protection**
**Division of Conservation & Preservation**
**Bureau of Fisheries**
**Marine Fisheries Program**

"The condition of hard clam stocks on private commercial beds is enhanced by the seeding and predator control activities of the shellfish companies that own them. The hard clam is a productive species for aquacultural efforts and Connecticut waters are capable of sustaining much larger populations than they currently do. A major drawback to increased production of marketable clams is the limited amount of productive ground located in unpolluted water. The hard clam is probably the most abundant species available for recreational shellfishing in Connecticut at the present time."

**10) Connecticut Aquaculture Findings and Recommendations Aquaculture Commission - January, 1986**

**Compiled by John H. Volk, Chairman**
**Aquaculture Commission**

"In some locations in Connecticut, clams (Mercenaria) and oysters (Crassostrea virginica) are cultivated and harvested from the same leases. Commercial shellfish grounds in New Haven Harbor are an example of this.

Annually, in the late fall or springtime, juvenile oysters are transplanted off the setting beds. Prior to planting cultch (shell) in preparing the grounds for oyster setting, the leaseholder will work the beds with hydraulic clam dredges for a period of several weeks or more. This cultivation allows for a reduction of overcrowded and older Mercenaria populations present and seems to facilitate recruitment. In anticipation of oyster setting on these same grounds, large quantities of cultch (approximately 2,000 bushel per acre) are planted. This cultch cover, which provides a substrate for oyster larvae to settle upon and attach, also seems to provide some protection from predators for the Mercenaria populations in the sediments below. Thus, a shellfish farmer may reap the benefits of two crops from his one lease."

The following items have been added after the 1990 Slide Presentation. They are added only to illustrate continued references to hydraulic cultivation.

New to File – Updated References Clam Culture and Enhancement

**11) Department of Health and Human Services Public Health Service Food and Drug Administration**

September 22, 1992

Dear Mr. Stoecker:

You requested the Food and Drug Administration's position concerning the mechanical dredging of shellfish.

The Food and Drug Administration has no problem with the use of mechanical or hydraulic dredges for the harvesting of shellfish. In fact, the use of dredges to harvest clams and oysters from moderately polluted (restricted) waters for relaying (transplanting) into approved waters is a most efficient method as compared to hand raking, tonging, etc.

Most significant is that a renewable food resource is being removed efficiently and effectively from polluted waters so as not to be harvested illegally and placed onto the market where it can cause illness. The shellfish are then naturally purified in approved waters so they may be harvested for food use. Thus, a renewable resource is used, jobs are created, and there is a public health benefit as well.

Keep up the good work.

Sincerely,

Jerrold H. Mulnick
Senior Regional Shellfish Specialist

Copies: John Volk, CT AD
James Citak, CT AD

**12) Proceedings of the Third Rhode Island Shellfisheries Conference -
August 18, 1994**

Narragansett, Rhode Island
Published by Rhode Island Sea Grant
Habitat Enhancement as a Means to Increase the Abundance of the North Quahog, Mercenaria mercenaria

Shell Planting as a Habitat Enhancement Option

"Based on the distribution of quahog abundance and the environmental biology of quahogs, substrate modification – through the addition of shells to low-quahog-abundance sediments lacking shell—would appear to be an effective approach to habitat enhancement. Several anecdotal reports provide support for this approach. In Long Island Sound, for example, shell (cultch), distributed on the bottom to provide substrate for oysters to set upon, was also associated with increased quahog abundance (Volk, 1986). In the Broadkill River, Del., quahogs were found in an area that had been recently covered with surf clam shells to create oyster habitat (Maurer and Watling, 1973).

There have been three reported pilot-scale projects that added ("planted") shell to bottom sediments in order to increase quahog abundance. In North Carolina, in the early 1970's, Parker (1975) planted scallop shells at a density of .081 cubic meters (m3) of shell/m2 of bottom, and found that the average initial recruitment was 10 times greater in the planted shell than in an unshelled control. In 1989 in the Great South Bay, N.Y., 100 m3 of surf clam shells were planted in two 0.4-hectare (ha) plots located in muddy, low-quahog-abundance areas that lacked shells (Kassner et al, 1991). The planting, however did not result in increased quahog abundance, because the shell sank in to the bottom and the project's scale was deemed to

be too small to give meaningful results (Kassner, unpublished). In 1990, 120 tons of clam shell was planted in Barneget Bay, N.J., in six plots, each measuring 20m by 70 m (Cronin, 1990). Three of the plots were covered with "light" shell, while three unshelled plots served as controls. Three years later, the shelled plots had slightly more than five times more recruits than the unshelled control. (Clyde MacKenzie, National Marine Fisheries Service, Sandy Hook, N.J., (personal communication)

Jeffrey Kassner
Town of Brookhaven
Division of Environmental Protection
3233 Route 112
Medford, New York 11763

**13)) Atlantic Fish Farming July 21, 1997**
**"Sea Bottom Treatment Helps Clams"**

"If cultivating agricultural field before planting a new crop of potatoes or corn is essential to the commercial success of an agricultural farm, wouldn't the same apply to clam seeding activities for an aquacultural farm? The benefits of cultivating and enriching the soils for agricultural activities are well known and special treatment for specific crops are readily available. This knowledge and various applications have evolved from many decades of research, development and trials.

Aquaculture, however, is relatively new and although culture techniques have develop rapidly over the past decade, sea bottom treatment methods for shellfish aquaculture is still relatively unknown. Liquefying the sediment with the hydraulic rake mainly affects the upper 15 cm of the sea bottom. The affected areas area looser and this is evaluated by determining the bulk density and velocity of sediment samples or cores using an x-ray like piece of equipment called the Multi Track Sensor.

Within a two week period, most of the changes in the physical properties of the upper sediments have returned to their original state. It is believed that the rapid recovery is being driven by biological activity which may be influenced by the chemical characteristics of manipulated sediment."

The chemical and biological aspects of this research is only in its infancy and will be looked at in more detail

this summer in a project funded by the Canada NB Alternate Species Program. It has been documented, however, that sediment modification with the hydraulic rake does not kill newly settled clams and, in fact, may enhance their chance of survival when performed a short time before they settle. This suggests that sediment modification or cultivation of the sea bottom could, in fact, be beneficial to the development of clam culture. Providing a better environment for clams to achieve higher production has to include a better understanding of the sediment.

## Appendix #2
## Environmental Aspects Concerns Raised by Save our Shores a citizen group organized to fight hydraulic clam dredging

1. Clam Dredging increases odor and debris

Clam Dredging may increase odor and debris if the operation is working in sea grass or other vegetation. This occurrence in our waters is rare, and would likely limit harvesting hard clams harvesters have told me that they avoid vegetation because it blocks the dredge grills and muds up the dredge. In fact, they avoid areas with eelgrass and sea lettuce as they believe these can kill clams by increasing sedimentation and choking the clams, (silt is trapped in the blades of eelgrass). Several clam fishermen believe that sea lettuce is toxic to clams and avoid these areas at all costs. They do not seek vegetation areas as they are considered poor hard clam habitats.

2. Removal of clams will result in increased turbidity because clams eat silt.

Clams do not eat silt; they eat small microscopic plant life algae. Madison has had several summers of huge brown algae blooms, but that is not associated with clams or clam operations, but nitrogen enhancement and eutrophication processes. It is the brown algae that make the water look turbid –it’s quite noticeable at several town beaches. It can be seen from the air adjacent to much of the Connecticut shoreline.

3. Hydraulic clam dredging increases pollutants such as lead

Not so, especially if the area has been tested for heavy metals. Madison Shellfish was tested by the Dept of Health for metals in the 1980's. Madison metal counts except for zinc in the Hammonasset River were very low. Sung Feng of the University of Connecticut, has found metals in shellfish to be decreasing not increasing, and Madison tests confirmed low levels. Higher levels of lead can be found surround almost every home built before 1960 from paint, than sediments off Madison's shores.

4. Hydraulic clam dredging will cause bacteria and close our beaches

Hydraulic clamming does not cause bacteria nor would it lead to closing of beaches. Rain water runoff and ground water contamination from poorly designed domestic septic systems are more likely sources. Because of the concerns expressed about bacteria tests (counts) at Madison beaches, the town has committed to a long term bacterial extension study of runoff – storm sewer discharges surrounding each public beach. The study is in conjunction with the National Shellfish Sanitation Program and will be conducted by the Madison Shellfish Commission. Initial reviews realized that pet waste was responsible for high bacteria counts at East Wharf Beach, Madison. A few years previously a sanitary survey of the East Wharf Shellfish Depuration area has indicated pet waste contamination from a storm water/street basin pipe. After a heavy rain the pipe effluent had extremely high counts. It was then determined that the area was a popular pet walking area and subject to contamination in that way. Discussions centered around moving the storm water discharge pipe or creating its own leaching field under the east wharf parking lot (personal communication John Bowers, 1986). In fact, shell fisherman as a group, are probably the most environmentally concerned about water quality as their livelihood depends on it. One interesting fact is the first series of environmental lawsuits are brought by oyster companies in New Haven in the 1920's. There, oyster beds were polluted by sewage from the city causing them enormous financial losses. One landmark case, Lovejoy versus the City of New Haven went all the way to the Supreme Court. Mr. Lovejoy lost to the City of New Haven and the oyster business there lost its former prominence. But the final chapter is yet to be written. Lovejoy was finally overturned in 1967 by the Clean Water Act. So, if you research the clean water initiative, you will find arguments from the Lovejoy oyster case. And, most of the history of the Clean Water Act was based upon waters suitable for sustaining shellfish and

referenced decisions from numerous shellfish industry/clean water complaints.

Appendix #3 Resource Allocation issues

**Towns of Madison Resource Allocation issues and waste of shellfish reserves**

After the 1938 hurricane and hurricanes in the 1950's, clam sets occurred in a huge hard shell clam bed that extended from Half Acre Rock, easterly to rocks known as "the bishop," then easterly between Madison Reef to Tuxis Island and in a narrow band inside "outer Reefs" to Webster Point, Madison.

In the 1960's, fishermen approached the town of Madison about a permit to try a new type of clam dredge – the hydraulic dredge. The clams were beginning to perish and this new dredge could work in deeper waters. This is the text of a request (handwritten) by John E. Walston, Jr., a Guilford commercial fishing family, who had trawlers and operated the last of the Guilford whitefish trap nets. (The Madison Town seal has a menhaden on it for it was once Madison's most lucrative industry). This is the letter, as written:

Mr. John E. Walston, Jr.
5 Meadow Street
Guilford, CT,

March 7, 1966

Mr. Elmer Sonnichsen
Chairman of the Shellfish Committee
Madison, Conn.

Dear Sir:

I am interested in purchasing round clams in the waters of Long Island Sound under Madison's jurisdiction at a minimum water depth of your determination.

I am prepared to pay sixty cents (60c) per bushel at any interval you so desire: week or month.

I would also agree not to work the grounds during any summer months so as to avoid silting of any beaches and henceforth controversy with any waterfront land owners.

I am prepared to furnish upon request, references pertaining to my honesty and payment from previous dealings. I would also invite your committee to inspect my catches and or record books at any time, whether pre-arranged or otherwise.

If you are interested, I would like very much to take the chairman, committee or any other interested person on a spot survey of the area, so as to determine the amount of clams that might be available. I would also like an academic with your Board of Selectmen, to explain the situation in detail if they so desire.

May I hear from you soon?

Thank you.

Sincerely,
John E. Walston, Jr.

**Madison's reply, dated April 19, 1966**

April 19, 1966

Mr. John E. Walston, Jr.
5 Meadow Street
Guilford, CT

Dear Mr. Walston:

This is in reply to your letter of March 7th to Mr. Elmer Sonnichsen in which you stated your interest in purchasing the round clams in the waters under the jurisdiction of the Town of Madison.

The Board of Selectmen after discussions have found public reaction unfavorable to your proposal and feel Madison should not commit its resources in this manner.

Sincerely

Robert L. Adams
First Selectman

RLA: vd

Cc/ Elmer Sonnichsen
Robert Schmidt
Charles Schroeder, Jr.

By the time I surveyed these offshore areas with Mr. Frank Dolan – most of these clams were dead. We did find evidence of the clams out to the Red Nun #2, west end of Madison Reef to halfway between C I at the beginning of Madison Reef and Tuxis – running east to Tom's Rocks off Madison's Webster Point.

**Oysters – Neck East, Hammonasset and various creeks**

In 1971, Charles Beebe was a resident of Madison and owner of Beebe Marine at the East River section of Madison. His property was on the East River just north of the Route 1

Bridge. It was the week of my high school graduation, but he called me up and was very excited – so he brought me to the marina to show me something. It was an old hand oyster seed dredge and it was full of oysters. He was very excited about it, and calculated they were four or five years old. He said he hadn't seen a "set" like this in 20 years. The river he suspected was full of oysters, but had been closed to direct shell fishing since 1966. Mr. Beebe predicted many oysters would be lost if the river wasn't opened to transplanting. He arranged a meeting with the Dolans at the Sluice Creek the next day. The first time I met Frank "Nuke" and Joe Dolan. The Dolans agreed that oysters would start killing "each other." Mr. Dolan gave me an old newspaper to copy (1949) with exactly the same situation – huge overgrowth and many dead oysters. Mr. Joe Dolan said it was 1949 all over again. It's a cycle and now the river is loaded with oysters and starving to death. Attempts were made to open the commercial oyster activity in 1974. Madison would not open the beds until controversy arose when it was detailed that tens of thousands of bushels of oysters had already died. The following article prompted "Nuke" to show me what had happened to the clams in September 1978. That was the first time I went hydraulic clamming off Madison.

**Shoreline Times, page 5, August 29, 1978**

Title: Clam Diggers, Oystermen Struggle to Battle a Bushel of Problems

According to Charles Schroeder, the chairman of the Madison Shellfish Commission, the round clams or quahogs in the Sound off Madison are thriving because of the ban on commercial fishing. "Those people are after the money – that's all. They're concerned about. As far as leaving seed, if they see one clam down there, they'll go for it. The town has very little to gain from letting commercial fishermen in, and what I consider a great deal to lose."

Ed Lang, an oysterman and aquaculturist responded in the same article: "Lang says the clam beds become overcrowded and produce inferior clams. If they are not cleaned regularly, what good does it do to have these clams just sit and die? He reasoned. When the extent of the resource losses became public, Madison opened its waters to commercial fishing under shellfish management plan, the first municipal plan in Connecticut (December 1978).

**The Clinton Recorder – December 1, 1949**
"Oyster Problem is Not Simple"

**Guilford Has Rare Opportunity for Development**

"Reuben D. H. Hill, who has tonged oysters in East River and other Guilford waters for more than sixty years, estimates that there are now in East River 100,000 bushels of oysters, but that for the most part, they are worthless "heels" grown in overcrowded conditions. They might be of value only if broken apart and moved down the river where they might have more room and better feeding conditions.

**Dolan Would Invest**

Joseph S. Dolan Jr., who carries on probably the most extensive lobstering and fishing operations from Guilford harbor, says that he would like the opportunity to establish beds and raise oysters. He is interested primarily, he says, in grounds outside the river, either on a lease basis or preferably by developing the beds and paying a percentage of the profit to the town. The development of such beds requires a three or four year program; this must be done either by the town or by private enterprise before anyone can profit.

The improvement of oyster grounds, he asserts, has appeared to be everybody's business when times are hard, and nobody's business when people are prosperous. The people who most need the income from oystering in bad times are those who are in no position to maintain the development through thick and thin. He states that practically every town has had to grant some privileges to somebody in order that this difficulty may be solved.

Only when the growth of oysters restricted navigation did the 1949 oyster problem that Mr. Dolan spoke to me about, happened. The Army Corps of Engineers came and dredged the lower East River natural oyster bed."

**Shore Lines Times, April 12, 1979**

**Oyster Contract Goes to J. Dolan**

“The towns of Madison and Guilford have awarded a contract for the transplanting of oysters from the East River to Joseph S. Dolan, according to Nathan Walston, chairman of the Oyster Group Advisory Committee.

Of the five parties who bid for the contract, Dolan submitted the lowest bid. He will perform the transplants on a “load for load” basis; that is, Dolan will receive one boat load of oysters for every boat load transplanted for use by the towns.

Currently, the state will not certify the East River as an area where oysters may be raised for consumption due to the high level of pollution there, Walston said. In addition, the oyster population now in the East River is overcrowded and the “oysters are starving each other out.” This results in poor quality oysters, he explained. Because of the competition for food, the oysters have not reproduced in years, he added.”

And Shoreline Times article, April 8, 1982:

**“Some Oyster Areas Are Opened”**

In response to many questions that have been asked about this type of permit being granted, the chairman of the Madison Shellfish Commission, J. Milton Jeffrey, explained that the oysters lay in polluted waters and were not available to the local residents for their use. The natural growers harvest the oysters that have become extremely overgrown and sell them to others who have available waters in the Long Island Sound where the oysters can be set out to cleanse themselves, he said. It is the responsibility of the local commission to maintain the shellfish under its jurisdiction in the best possible condition; this requires the cleaning out of old beds, replacing shell and maintaining the best possible harvesting techniques, he explained.

Every fall, the commission transplants a number of bushels of oysters from polluted waters to clean waters off shore for taking by local residents. It is expected that this will be done again in the fall of 1982, Chairman Jeffrey said.

**Letter of August 8, 1983:**

S. Jackson Wommach,
14 Circle Beach
Madison, Conn.

Dear Sir:

“The 200 feet of Neck River along our property has been surveyed by a member of your commission (shellfish). Oysters 1 to 3” in size were found in abundance. These oysters have accumulated rapidly over several years’ to a depth of one to three feet. It was estimated that in excess of 1,000 bushels are in this area. We request these oysters be removed.”

**And “EDC endorses businesses eyeing restoration of River’s Shoreline**
**See Times, April 26, 1984**

Dredging, environmental impact, wetlands, an oyster bed said to be five to six feet deep, the future of the accessability to the West River waterway, and “swift and prudent” action of state, local, and federal agencies are cited by a few of the businesses as problems which need to be addressed and overcome.

They haven’t dredged the oysters out of the river in two to three years. We know there’s oysters down five or six feet deep. It’s been more than once we’ve sent out work boat our there” to remove a sailboat caught on top of the oyster bed, Mrs. Duhaime said.

That section of the river has been oystered before, she said, but the Board of Health closed it down due to pollution. State statures prohibit mechanical dredging, Mrs. Green said.

“But the type of dredging we’re talking about the ousters is scoop dredging – a hand operated mechanism,” Mrs. Duhaime said. “Let nature take its course, and encourage the town to dredge those oysters out.”

**Shoreline Times October 3, 1990**

They explained that hydraulic dredging has been going on in Madison since 1982, not since March 1990, when Dr. Morrow first noticed it, nothing however, seemed to satisfy the residents when a live demonstration showed the operations, thanks to a new muffler, to be almost soundless, and when lobstermen and harbor officials said the water was cleaner than before the clamming started. The real issues began to

emerge – residents began to say what they really feared was -- the loss of property values, as if the sight of a boat offshore would spoil the priceless view.

**Shoreline Times, September 30, 1992. Surf Club, September 24**

Morrow, the head of pathology at Yale University and Yale New Haven Hospital, was responsible for presenting the oppositions views on the ordinance at the town meeting. He said that shoreline residents independently grew concerned that toxic amounts of lead were stirred up along with the debris.

Yale Professor Karl Turekian said dredging would disturb the sediment from the bottom of the Sound, in the same way the sediment is disturbed by frequent storms.

Professor Frank Bohlen of the University of Connecticut said the dredges only dug into the ocean floor by a few inches, he said that any sediment stirred up would be very limited and would settle before reaching the beaches.

Madison Surf Club – (Mr. Dolan is a Madison Taxpayer) Public Meeting, September 24, 1992

Joe Dolan, Frank's brother, of Guilford, speaking at the Special Town Meeting said "Shell fishing is like forestry – you can have old big trees that shut out the younger ones, all little trees – because you cut down the big ones – or some mixture in-between. Closing it now is like putting a fence around the stumps – what you really need is to open it and plant new trees – it's all dead –the clams got old and died. That's no mystery.

We showed you what needed to be done, a lot of clams were wasted – Madison has wasted a lot of shellfish in my time, I can tell you that."