Oyster Enhancement

Tisbury Great Pond

The Tisbury Great Pond (TGP), located on the south side of the island is a brackish salt water pond. The pond is breached several times per year by man, or on occasion by the weather. The man made breaches are used to improve water quality by flushing and also to lower the pond's water level. High water levels can flood basements in the houses around the pond's edge. Much of the watershed in West Tisbury and Chilmark flows in the direction of this and the other ponds close to TGP along the south side of the island.

At the end of the 1990's the oyster fishery was productive in TGP. Most of the oysters were harvested on West Tisbury's side of the pond because of the amount of fishable area on the West Tisbury Side. Chilmark's side, although much smaller in fishable area, was also productive, and provided some good harvest years during that same time period. In 1999, oysters from TGP tested positive for the oyster disease Dermo. Dermo, harmless to humans, usually affects older oysters in a population, by either making them weak or by killing them. Oysters that do not die are usually too frail to spawn, causing several years of bad seed sets. In the summer of 2001, 95 % of the oyster population died from this disease. Only when oyster populations throughout the pond became very isolated, so the disease couldn't spread, did there seem to be any rebound from the disease.

Edgartown Great Pond had a similar die off of oysters from Dermo, but their oyster population rebounded to a very productive level. As quickly as the pond had become productive again, a second disintegration of oyster numbers was caused by overfishing and a macro-algal bloom. This algal bloom smothered oyster beds, cutting off oxygen and food necessary for survival. The rebound of the oyster populations prior to the second collapse was curious, considering that Dermo, once infecting a group, usually does not allow oysters to repopulate so quickly. Research was conducted on the populations from both Edgartown Great Pond and several other ponds that had the disease. What the research found was that Edgartown Great Pond oysters survive Dermo 17-19% better than the other populations tested.

During the winter of 2008 the MVSG wrote a grant proposal to the Edey Foundation to restore the oyster reefs in TGP. The program was approached in several ways:

- Planting shell called "cultch" on the bottom as a base substrate to plant oyster seed on. The shell base is also good for natural spat collection.
- Creating several "spawning sanctuary" cages to increase the likelihood of spat collection and spawning success.
- Collecting natural seed by creating cultch bags to be hung around spawning sanctuaries.
- Seeding, "Dermo Resistant", hatchery spawned single oysters. Some of which were grown out to larger sizes.
- Remote-set oyster spat on cultch bags to grow out and then field plant.

The Hatchery

This ambitious oyster restoration plan began in the hatchery by selecting Dermo-resistant oysters and conditioning them for spawning. The hatchery can control the conditions and feed oysters the appropriate food to make them release eggs at almost any time of the year. In the wild, the conditions for reproduction take place in the middle of the summer. Being able to raise juvenile oysters earlier in the growing season allows for a longer growing period. This can produce larger seed by getting a few extra months of growth, before they shut down for the winter. The hatchery workers spawn the oysters until they have enough eggs and sperm for the experiment. This process can take several days until selected oysters are spent. After eggs are fertilized, they become spat and are kept in large silos for a few weeks. Oysters filter a lot of water and require a lot of food, so a constant diet of algae allows oysters to grow quickly. The spat are monitored daily to see what stage they are in of their metamorphosis. The hatchery biologist can tell when oysters are ready to set. Setting is how and where oysters choose to attach for the remainder of their life. At this point, spat where either used for the Remote Set part of the project, or set on micro cultch in the hatchery where they were grown out in an up-weller.

Oysters releasing gametes in the hatchery.

Fertilized eggs were placed in silos.

Swimming oyster larvae just before set.

Oysters set on micro cultch at 200 microns.

Three millimeter seed ready for the up-weller.

Up-weller growout with 600,000 oyster seed.

Seed was placed in the up-weller at three millimeter.

Oyster seed ready to be distributed to the town.

Shell Reef Restoration

Historically the bottom of the TGP was covered in oyster shell which had accumulated over time. This shell was good in a number of ways: It gave oyster spat a place to set, it created small contours on the bottom of the pond to give seed a hiding place from predators, and it hardens the bottom by natural decomposition. Placing cultch on the bottom, making a shell base, increases survival of seed. A shell base gives oysters a good place to be planted away from silt covered bottoms. Generally, silt covered bottoms, are anaerobic and don't offer the best environment for oysters.
The goal for Chilmark's part of the program was to create two 200 yard sections of the ponds edge where the cultch could be spread. Sites were chosen by interviewing fisherman about historical production and overall good growth for each area. These areas can be seen on (Map 1-

5). Sea clam shell was purchased from Blount Seafood, in Rhode Island, and trucked back to the Vineyard. Shell was loaded in fish totes by hand and with the use of a tractor. Each truckload was brought down to the pond's edge at Sippiessa. Totes full of shell were then transferred to a skiff and transported across the pond to either of the two sites and spread. A total of 350 totes of shell were split between each of the two locations.

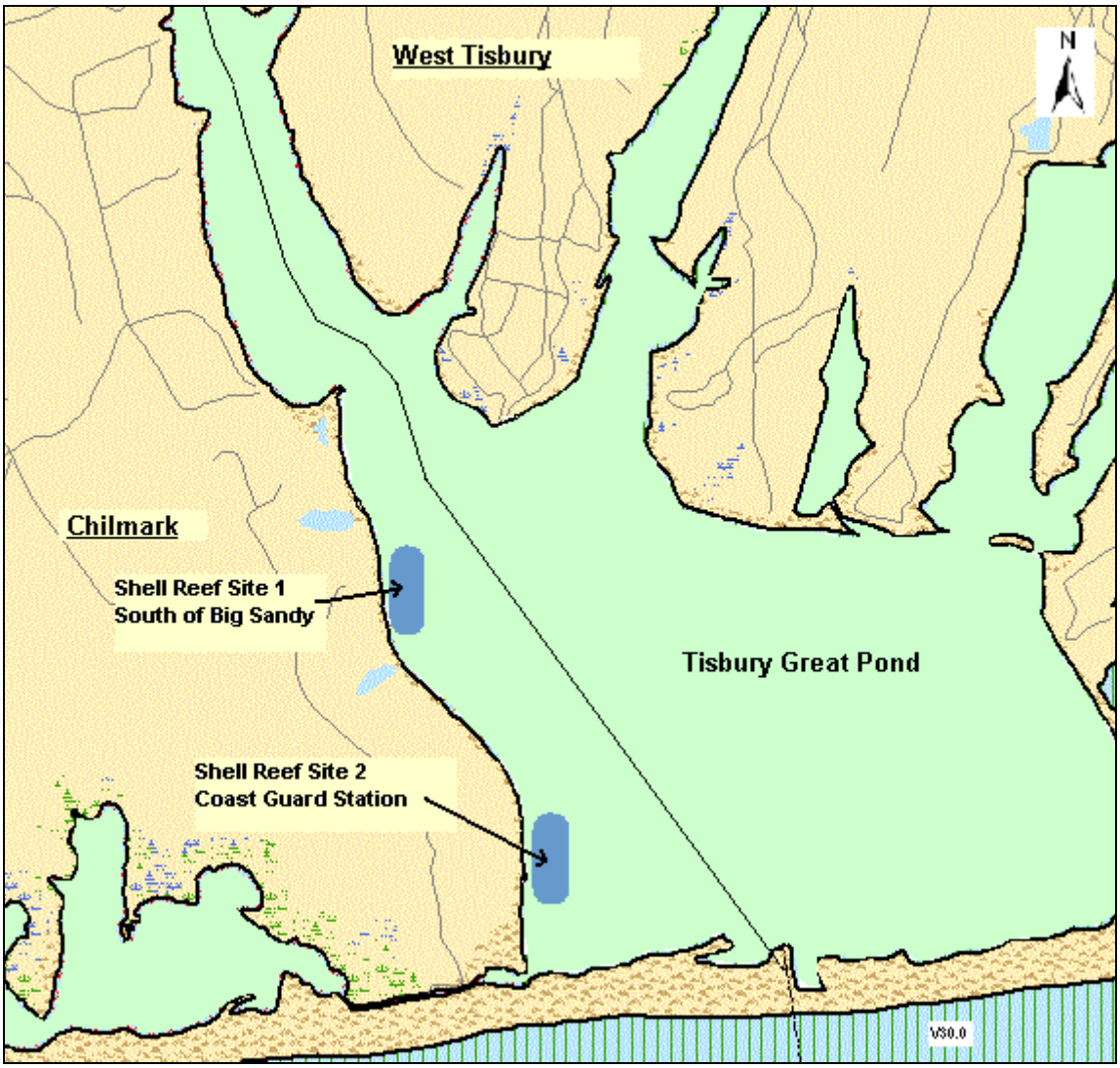
Shell was loaded in a truck ten totes at a time.

Totes of cultch ready to be spread.

Shell pile located at the Sippesse Landing.

Spreading Shell on Site 1.

The two sites on Map1-5 were shell reefs and transplant sites for the remote set and single oyster seed.



Map 1-5. Shell Reef Sites and Seed Distribution Areas.

Remote-Set

Oyster seed that was grown-out to one inch or larger are much less vulnerable to predation by mud and blue crabs. Predation is the number one limiting factor for shellfish restoration in Great Pond. The hatchery can produce millions of oyster spat at a very small size that, unless protected, will more than likely be eaten. There is a limit to the amount of time, equipment and effort that is available to grow spat past one inch. Fortunately the method of oyster restoration called "Remote Set" is an effective way to produce a large number of spat that can be protected from preying crabs.

The remote set starts by producing cultch bags for the oysters to be set on. Plastic mesh bags are made from lobster bait bag material. The mesh is cut to a one foot length and crimped at one end with a hog ring. Bags are then filled with shell and a six inch piece of twine attached to the tops so they can be hung on the grow-out rafts. The majority of shell used to fill the bags was from bay scallops and oysters. Four tanks were set up on Manter Point, along the pond's

edge, and filled with water and shell bags. The tanks were outfitted with an air manifold and air pump that kept water in the tanks agitated and oxygen rich. Oyster spat was brought to the pond, from the hatchery, and placed in the tanks a little at a time, until all of the cultch bags were covered.

Tanks were monitored daily and oysters fed a diet of algae until spat was visibly set on shells. After one week shell bags were taken out of the tanks and suspended from rafts at the Sippiessa landing, where they could be protected from wind and wave action which is damaging to the small shellfish. The rafts were tied together and monitored over the next three weeks for growth. A careful cleaning of bags, by lightly lifting them out of the water, was performed once per week to reduce bio-fouling. The oysters that were attached to the shell grew very quickly and it was apparent that almost every piece of shell had several spat attached to them. Spat can grow through the mesh of the plastic bags and can be very difficult to remove without killing them. It is also important to get the maximum amount of growth before this occurs. Bags were opened and their contents released on the shell reefs at the two sites along the western shore of Tisbury Great Pond. After two weeks, a few of the shells with oyster spat were recovered. Spat was continuing to grow and no mortality was observed.

Remote set tanks being set up on Manter Point.

Tanks filled with pond water and cultch bags.

Aerated water in covered tanks promotes set.

Rafts were strung together to hold shell bags.

Cultch bags attached to rafts.

Oysters covering bay scallop shells after 8 weeks.

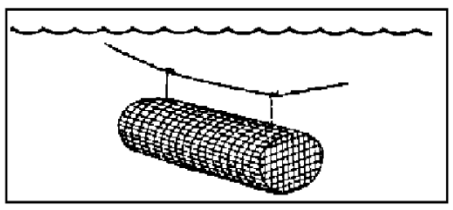
Cultch bags covered with juvenile oysters.

Bags overgrown by spat at 10 weeks.

The density of oysters on the shell is more than what is possible for survival of each individual. It is more likely that the faster growers will crowd out smaller oysters through competition. The density of spat per shell does however create a massive cluster that is much harder to eat than a single oyster seed. Clusters of oysters appear to survive better against predators than their single oyster counterparts.

It is hard to estimate the amount of oysters that will reach adult age through this form of oyster restoration. At the release stage, it was estimated that 300,000 oysters were released with an average size of 10mm. At the last check before waters cooled down and growth had stopped, some of the oyster spat had grown to 25mm. The two sites where oysters were released will not be opened to commercial or recreational fishing until further monitoring is completed.

Spawning Sanctuaries



As part of the grant, floating spawning sanctuaries were created to increase the natural seed set throughout the pond. By placing many adult oysters in the same area, the increase of spawning success increases. As eggs and sperm are released in the same area more fertilized eggs would be present throughout the pond.

Oysters were dredged up from the bottom and

selected by age class and placed in these sanctuaries. Older oysters were chosen for this experiment because they have been exposed to Dermo and have not died as a result of it. There were 15 sanctuaries placed at the site by the old Coast Guard Station. Each sanctuary was filled with 200 adult oysters.

It is hard to estimate the success of this part of the program, considering that there is no way to distinguish the oyster seed set from these sanctuaries, or from the other oysters in the pond. However, the natural set throughout the pond was particularly good this year. The seed set at the old Coast Guard Station site was better than any other area along the western shore of the Great Pond. There were better recruitments from natural collectors in this area, this year, compared to last year.

Natural Spat Collection

Oyster recruitment this year was good compared to last year. Oyster collectors were made by making envelopes with chicken wire and filling them with scallop and oyster shell. Collectors were then attached to the spawning sanctuary lines and on the spawning cages. By attaching collectors on these lines, it allowed less equipment to be used in the pond. A total of 100 natural spat collectors were deployed in this area during the first week in July. Collectors were checked at weekly intervals until the first seed was visible by eye on August 12. Recruits were kept in the bags until seed was large enough to release. All oyster spat collected by natural collectors were planted on the shell reef sites 1 and 2. An estimated 5,000 recruits were released at the end of October.

The number of natural collectors will be increased, along with the collection sites, during the 2010 growing season. The collection bags will be made larger and filled with more shell. If the program can produce 10,000 oysters per year just by natural collection, then one fisherman could fish for a month on those oysters. As with all of these efforts the Shellfish Department is trying to take some of the pressure off of the natural resource, so the stocks will rebound. If disease resistant oysters set on collectors, then it could be possible that stocks will not crash again from Dermo.

Recruits set on shells from natural collection.

Scallop shell with 30mm oysters spat attached.

Hatchery Spawned Single Oysters

Dermo Resistant strains of adult oysters were used to spawn the single oysters for this part of the program. Oyster seed was grown in the hatchery's up-weller until large enough to be transferred to the Tisbury Great Pond. Seed was placed in pearl nets at the beginning of October. The oysters ranged in size from 10mm-20mm and were hung on growout lines (Growout lines and lantern nets can be seen on Figure 4). Receiving seed at this late date made growout to a field plant size not possible. Some growth was noted at the end of November, but it was apparent that seed was going to need to be held for another season before being released.

Oyster seed placed in lantern nets.

Counting seed for each net.

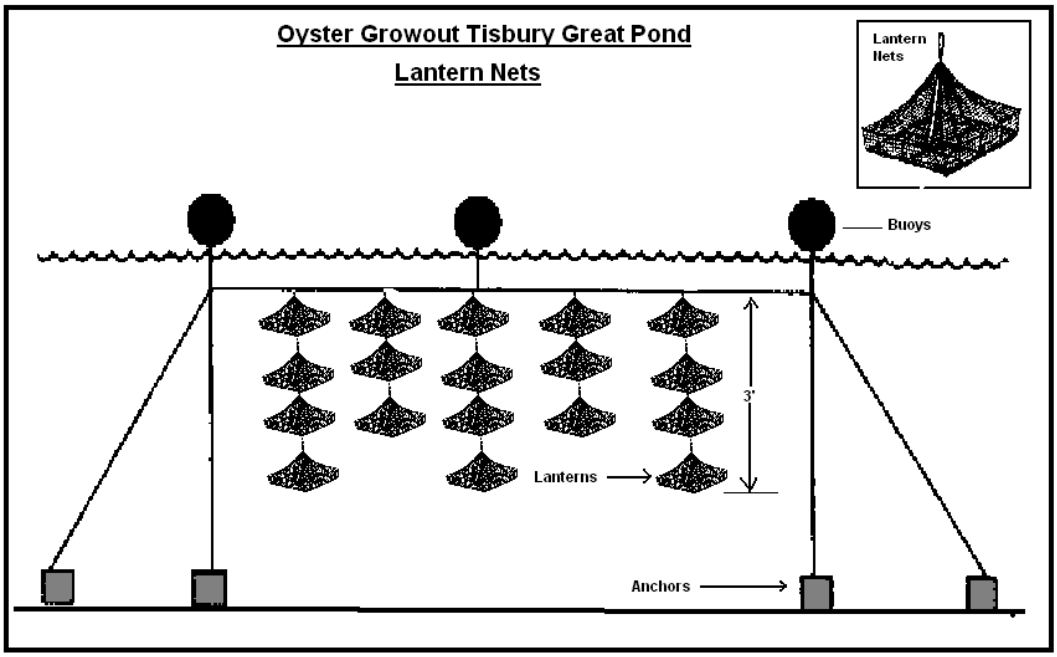


Figure 4. Growout lines were placed by the Coast Guard Station site and held over the winter.