Oyster Restoration

NOAA Restoration Efforts

NOAA is working on several fronts to reverse nationwide declines in native oyster populations and their habitats. Because oyster populations occur within state waters, NOAA does not have jurisdiction over the management of oyster fisheries. Rather, the agency's focus has been to fund research, monitoring, and habitat restoration to improve the understanding and stewardship of the nation's oyster resources. NOAA leads several programs involved in oyster research and restoration, key among them the NOAA Restoration Center, Sea Grant, and Chesapeake Bay Office.

Chesapeake Bay Oyster Restoration Program barge during oyster reef restoration activities. Photo credit: Chris Judy, Maryland Dept. of Natural Resources.

The NOAA Restoration Center has funded more than 75 oyster restoration projects in 15 states. Nearly 17,000 volunteers have participated in these restoration efforts. The Restoration Center is the only office in NOAA solely devoted to restoring coastal and marine habitats that support the nation's fisheries and other public resources. Restoration Center projects involve citizens and scientists in restoring oyster habitats and raising awareness of the important ecological role oysters play in coastal ecosystems. To learn more about specific oyster restoration projects, click here.

NOAA Sea Grant established an Oyster Disease Research Program to find solutions for oyster diseases. This long-term, national program supports innovative research to develop techniques for combating oyster disease in an effort to restore oyster populations and enhance stocks.

The NOAA Chesapeake Bay Office Oyster Restoration Program was established in 1999 to fund oyster restoration projects. The program works closely with federal and state agencies in Maryland and Virginia to implement large-scale oyster restoration in the Chesapeake Bay. To date, the Program has provided approximately $2.6 million in funding for projects to restore oysters. Restoration work involves hatchery production of oyster seed, bottom rehabilitation, and implementation of various management strategies including sanctuaries, harvest reserves, and tributary-scale genetic rehabilitation of oyster stocks.

Significant accomplishments to date include more than 60 acres of direct restoration - areas covered with clean oyster shell and then seeded with hatchery-produced young (spat-on-shell) oysters. Many more acres have been rehabilitated (sediment cleaned off historic bars to make the shell usable as substrate) by commercial watermen involved in restoration activities. In addition, the capacity and efficiency of the University of Maryland's Horn Point hatchery has been vastly increased by mechanizing much of the large-scale production of young oysters. NOAA funding has also provided the means to produce oysters for several community-based restoration projects. Total spat-on-shell production increased from 38 million in 2000 to 55 million in 2001. This program's goal for 2002 was 100 million spat, with an increase in capacity to 350 million in 5 years.

Restoration Planning and Techniques

The size and scope of oyster reef restoration projects, and the techniques used to implement them, are dictated by the goals of the project. Some of the major goals of a restoration project are to:

☐ Augment commercial harvest
☐ Serve as habitat.
☐ Improve water quality.
☐ Serve as spawner sanctuaries to increase or improve spat set in an area.
☐ Maintain or increase biodiversity.
☐ Restore ecological function.
☐ Provide a barrier to prevent beach or shoreline erosion. .
☐ Protect and enhance sea grass restoration projects.

The following are among the factors to consider during project planning for oyster restoration projects.

Site Selection:
Restoration efforts should include initial consideration of basic factors such as suitable substrate (hard enough to support cultch material), vestiges of previous oyster reefs, adequate spat set, fouling organisms, currents, predation rates, disease prevalence and intensity, salinity ranges, siltation rate, and tidal elevation (for intertidal sites) (Coen and Luckenbach 2000). Some phytoplankton surveys might also help ascertain if enough food is available for the oysters. The success of the project will depend on selecting sites with the proper attributes to allow oysters to survive, if not flourish. The amount of cultch material needed is directly related to the softness of the bottom, so this factor is extremely important.

Cultch material:
Once a suitable site is found, several techniques can be used to restore oyster reefs, but they all depend on a reliable source of cultch . The best material is oyster shell, but other substances have been used with varying degrees of success, including broken porcelain bathroom fixtures, clam shells, limestone marl, "reef balls," and even fly ash conglomerate (a by-product of coal-burning power plants). Oyster shell is often either unavailable or too expensive to purchase, and some restoration projects involve the collection and recycling of oyster shells (e.g., the SCORE program in South Carolina).

Reef construction:
Provided an adequate amount of cultch material is available, several specific techniques for restoring or rehabilitating reefs may be used.

Planting shell. In areas where recruitment is fairly predictable from year to year, large amounts of shell or other kinds of cultch material can be distributed for attachment of larvae (see example below under Examples of Oyster Reef Restoration). The exact dimensions and alignment of the shells should be guided by results from initial surveys regarding substrate type, currents, and other factors. Very large projects may also require the placement of such materials as limestone or rock to serve as a base for the reef, especially in areas with heavy wave action.

In some cases, shell is placed in mesh or wire bags and positioned in rows in the intertidal area to provide

attachment substrate for oyster larvae (see example below under Examples of Oyster Reef Restoration). As the oysters begin to grow, other organisms may also accumulate, providing the basis for an oyster reef community.

Hatchery production of spat. If spatfall is historically low in an area, it may be necessary to rely on an oyster hatchery to produce the required amount of spat. In this case, the cultch is usually placed inside mesh bags and immersed in tanks of mature oyster larvae (click here to see diagram of life cycle) that are ready to set. After larvae have attached, the bags are suspended from docks or rafts for a few weeks to allow the spat to grow, or the shells with spat are put into floats to allow for more growth (called "oyster gardening") before they are placed on the restored reef (e.g.,SPAT program on Long Island, NY).

Relocation of seed oysters. Another alternative in some states (e.g., Louisiana) is to obtain seed oysters from areas known to produce large amounts of seed oysters and transport them on barges to areas where they can grow to establish new reefs. Depending on the hardness of the bottom, shell or other material may be needed on-site before the seed oysters are placed.

Examples of oyster reef restoration

Below are a few examples of oyster reef restoration techniques.

Planting dredged shell for spat set. Photo credit: Chris Judy, Maryland Dept. of Natural Resources.

☐ In areas with known, reliable spat set, large amounts of shell may be used to provide cultch for oysters. The goal is to augment the commercial catch of oysters in Maryland. In this photo, large amounts of shell are being distributed quickly via high-pressure hoses.

☐ A linear reef may be constructed of shell and rock. The goal is to stabilize the shoreline while protecting sea grass plantings behind the reef; these plantings enhance stability and provide additional habitat for organisms.

☐ Oyster shell may be collected and bagged for use as cultch for spat set. The goal is establishment of new reef in intertidal areas, which will serve as habitat for oysters and associated organisms.

☐ In areas where spat set is nonexistent or unreliable, a hatchery may be used to provide seed oysters. The goal is to establish new reefs and improve water quality in the local area. In this case, restoration involves the Olympia oyster, native to the West Coast, which was nearly fished out in the 1800s.