U.S. Environmental Protection Agency
National Estuary Program

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Coastlines
April 2003 - Issue 13.2

Information about Estuaries and Near Coastal Waters

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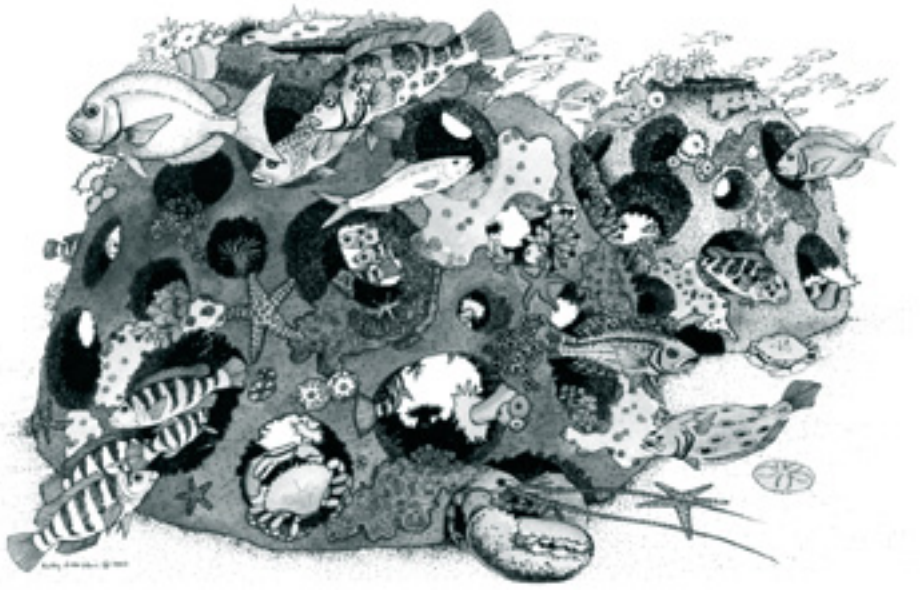
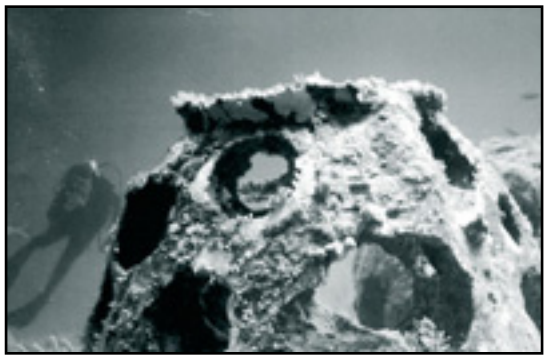
Sarasota Bay NEP Restores Reef Habitat

In Sarasota Bay, Florida, the Sarasota Bay National Estuary Program (SBNEP) has identified five major problems: stormwater, wastewater, fisheries, recreation, and habitat loss. The 1995 Comprehensive Conservation and Management Plan (CCMP) cites nutrient loading, metal contamination, wetland loss and loss of submerged aquatic vegetation as major concerns. Nutrient loading of Sarasota Bay in 1988 was approximately 400% greater than expected from a pristine undeveloped watershed, while metal contamination was significant. Since the 1950s, approximately 4,700 acres of bottom habitat in Sarasota Bay have been lost due to dredging and other activities, and 39% of tidal wetlands and 30% of the seagrass coverage has been lost. The CCMP also called for public education, Bay management, and further technical studies.



To restore subtidal habitat, the SBNEP has embarked on a program to construct artificial reefs. Such reefs provide valuable habitat for fish and other marine organisms, enhance recreational and commercial fisheries, and help to increase public awareness regarding natural resources in Sarasota Bay.



A Fishery Habitat Enhancement Task Force determined the best sites for artificial reefs in Sarasota Bay and the best methods and materials to use. This interagency project involves Manatee County, Sarasota County, the Southwest Florida Water Management District, the Manasota Basin Board, and the SBNEP. Artificial reefs were permitted in upper Sarasota Bay and northeast of Anna Maria Island. Over the past 6 years, over 2,000 reef structures have been placed by the SBNEP and other organizations.

Volunteer and educational organizations have also helped to install reef balls to restore reef habitat and raise awareness of Sarasota Bay. Reef balls have been used elsewhere in Florida to create artificial reefs (see Coastlines February 2000). The "Bay Balls" are concrete reef modules approximately 3 feet across and 2 feet high and weigh about 400 lbs. Other reef balls were modified by adding a ledge habitat to attract and support gag grouper.

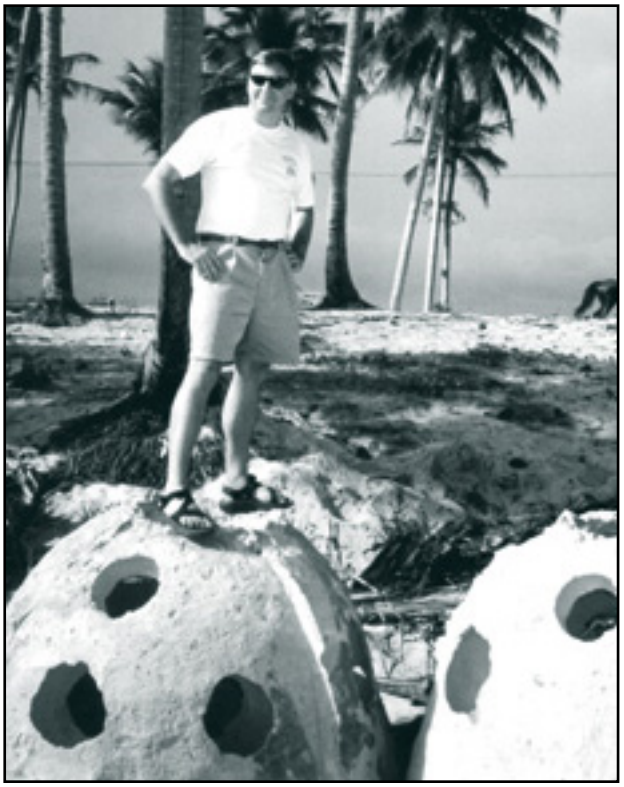
The deployment of such reef modules provides an opportunity to do valuable research on restoring the Bay bottom. Although researchers have studied the effectiveness of artificial reefs in offshore areas, very little research has been done on the effectiveness of nearshore artificial reefs. The SBNEP and its partners placed reef modules in clusters of various sizes and is monitoring these to determine optimum size and grouping of modules. The large number of reef modules will enable SBNEP to gather statistically significant data on effectiveness of reef restoration using reef balls.

During 2002, the SBNEP surveyed several established artificial reefs in Sarasota Bay. Over 25 fish and invertebrate species were identified, including gray snapper, gag grouper, sheepshead and stone crab. Although fish were abundant in the vicinity of the reefs (as attested by local fishermen), species diversity was low. A variety of artificial reef types would probably be needed to increase species diversity.

The SBNEP is also studying artificial structures that would provide juvenile fish nursery habitat. An early pilot project showed the potential value of deploying artificial reefs along hardened seawalls (e.g., seawalls and rip-rap); some types of structures had fish aggregations more than 100 times that of nearby areas that had no artificial reefs. In a recent shoreline survey, researchers found that over 200 miles of armored and altered shoreline exist. Altered shorelines typically do not provide enough complex or suitable habitat for fish.

The SBNEP and its partners are working to enhance habitat along altered shorelines by installing artificial reefs along shorelines and under docks (where feasible and permittable). Some reef modules may be provided to neighborhoods or municipalities through grants for reef placement along privately owned waterfront. Researchers will also study the value of using reef modules to restore the intertidal zone and to grow oyster beds. The SBNEP is working on obtaining "blanket" permits for neighborhoods and municipalities, to facilitate restoration.

Different types of artificial reef structures will be evaluated for their ability to provide fish habitat, cost effectiveness, and feasibility of deployment. They will be monitored to see how effective they are in increasing numbers of fish and biodiversity, whether they attract fish from other nearby areas, and whether the reefs are promoting survival of juvenile fish. The SBNEP hopes to restore reef habitat throughout the Bay, by partnering with private individuals, organizations, and government agencies. By fostering research and education and involvement by local diving groups, the SBNEP hopes to raise public awareness of the value of a restored Bay.



For further information, contact Gary E. Raulerson, Senior Environmental Scientist, Sarasota Bay National Estuary Program, 5333 N. Tamiami Trail, Suite 104, Sarasota, FL 34234; Phone: 941-359-5841; Fax: 941-359-5846; Email: Gary_Raulerson@ci.sarasota.fl.us; Website: www.sarasotabay.org EXIT disclaimer

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Census of Breeding Birds in the Maryland Coastal Bays

This year, the Maryland Coastal Bays Program will be helping out with an ambitious project to measure changes in breeding bird populations in the watershed.

In 1983, the Maryland Ornithological Society and other conservation groups gathered researchers and volunteers from around the state to conduct a 5-year survey of breeding birds in Maryland. In 1987, this landmark effort culminated in the 500-page Atlas of the Breeding Birds of Maryland and the District of Columbia. For each avian species, the atlas describes habitat requirements, distribution, abundance, and nesting characteristics. To help show trends, the atlas tracks historical distribution data starting in the mid-1800's, relative abundance, and past trend information.

For this second highly touted Ornithological Society effort, the Coastal Bays Program is contributing funding and volunteer staff time to study breeding birds in Worcester County. With the most diverse bird population in Maryland, the county and the coastal bays watershed are of particular interest to researchers. In addition to providing breeding habitat, Worcester County lies in the primary north-south migratory corridor along the East Coast for migrating ducks, raptors, wading birds

and songbirds.

In 1983, the survey showed that Worcester County not only had more avian species, but had more rare, threatened and endangered species than any county in Maryland. In this next round, scientists expect increases in several southern species and decreases in forest- and grassland-dependent species due to increased development. Pelicans, ibis, certain egrets and some songbirds continue to spread north as global temperatures increase.

Now, 20 years later, the time has come to again take a census of breeding birds in the state. Have their distributions changed? Are populations increasing or decreasing and why? Do certain habitats need to be protected?

The Coastal Bays Program hopes that new information on bird populations will help in updating management goals enumerated in the Comprehensive Conservation and Management Plan for the Coastal Bays. Some 20 management plan strategies deal directly with protecting bird species, and over 100 focus on preserving and restoring forest and wetland habitats. But without sufficient up-to-date data on individual species, scientists and managers have found it difficult to protect individual species. For example, requests to foresters and farmers to better protect habitat through the use of vegetated buffers and modifying forest-cutting practices have met with resistance. Updated information would help resource managers to persuade landowners that protection is needed.

The first breeding bird atlas was published some 35 years ago when the British Trust for Ornithology completed the first 5-year study of breeding birds in 1968. In 1975, the first North American atlases were completed for two Maryland counties, and in 1976, the first state atlas in Vermont was completed. Since then, nearly the entire continent of Europe has been surveyed for breeding birds, along with most of North America, including 36 states.

In Maryland, as in most states, study areas comprise 10 square miles and contain one or more observers. Each observer will spend 40 hours over the next five years observing and documenting breeding birds and classifying them as possible, probable, or confirmed based on 17 categories of behavior.

The work is highly touted in the coastal bays watershed because Worcester County has an abundance and diversity of bird species. In the 1983-1987 breeding bird survey, Worcester County had more of the following species breeding than any other county in Maryland: great and snowy egrets, little blue, tri-colored, and black-crowned night herons, northern harriers, clapper rails, American oystercatchers, willets, laughing gulls, herring gulls, great black-backed gulls, gull-billed terns, royal terns, common terns, Forster's terns, least terns, black skimmers, chuck-wills-widows, red-headed woodpeckers, boat-tailed grackles, seaside sparrows, salt marsh-tailed sparrows, summer tanagers, Louisiana waterthushes, ovenbirds, worm-eating, prothonotary, black and white, prairie, and yellow-throated warblers, yellow throated vireos, blue-gray gnatcatchers, Carolina wrens, brown creepers, and brown-headed nuthatches. A coastal bays habitat plan that is being developed will use the 2007 results to develop recommendations for habitat protection and improvement.

For further information, contact Dave Wilson Jr., Public Outreach Coordinator, Maryland Coastal Bays Program, 9609 Stephen Decatur Highway, Berlin, MD 21811; Phone: (410) 213-BAYS; Email: outreach@mdcoastalbays.org

For further information on the atlas, contact Walter Ellison at rossgull@crosslink.net or call 410-778-9568. The Maryland website is www.mdbirds.org/atlas.html or check on atlases in other areas at www.americanbirding.org/norac/.

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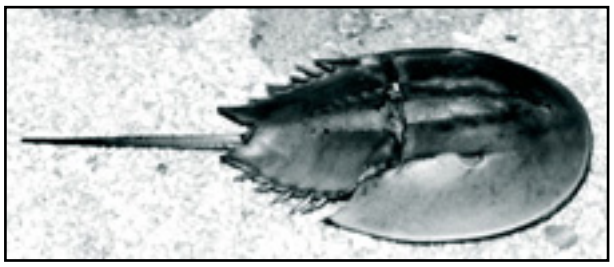
Horseshoe crabs: living fossils in peril?



Gretchen Ehlinger has heard the stories from fishermen and old-timers living along the Indian River Lagoon in Florida: masses of horseshoe crabs so thick they resembled one immense, shape-shifting organism scuttling along the lagoon floor.

"People tell me that there used to be thousands of horseshoe crabs in the lagoon," Ehlinger says. "We're not seeing that anymore."

Very little is known about the Indian River Lagoon horseshoe crab population, but there has been a noticeable decline in their numbers over the past 20 years. That worries Ehlinger, a doctoral candidate at Florida Tech who is wrapping up a five-year study of these enigmatic creatures.

"Horseshoe crabs have been around for millions of years without having to change much at all," Ehlinger says. "All of the sudden, they're having problems. This is worrisome because they're a good indicator of the health of the lagoon."

Despite its name, the horseshoe crab, Limulus polyphemus,belongs to the phylum Arthropoda and is more closely related to spiders and scorpions than it is to true crabs and crustaceans.

Horseshoe crabs are key players in the lagoon's complex food chain because their eggs are a major food source for juvenile sea turtles, migrating shorebirds, and many species of fish. Along the Atlantic coast, reproduction of horseshoe crabs is predictable in that the females generally spawn on gently sloping shorelines at high tide on the new moon and full moon in the spring.

Ehlinger's research has revealed that the horseshoe crab population in the lagoon, by contrast, does not follow the same pattern of spawning and larval hatching as seen elsewhere, most likely due to the lack of tidal influences.

"Although the horseshoe crabs in the lagoon are spawning, but it's sporadic," Ehlinger says. "This makes it more difficult to determine why the horseshoe crab population is declining."

A number of factors may be contributing to the decrease of horseshoe crabs in the lagoon: loss of habitat, an increase in muck and sediment, and human takings.

A few years ago, fishermen were seen loading truck beds full of horseshoe crabs for use as eel bait. This unchecked ravaging of horseshoe crabs likely impacted their populations, especially given the fact that it takes 9 to 12 years for them to reach maturity.

"The problem we're seeing now isn't just something that is happening now," Ehlinger says. "It's something that happened 10 to 20 years ago. There's a time lag between the cause and effects upon the population."

Meanwhile, Ehlinger is raising and studying horseshoe crabs in a lab at Florida Tech and sharing information with specialists in South Carolina. Canaveral National Seashore, which helped fund her research, will use the fruits of her labor to better protect and manage horseshoe crabs in Mosquito Lagoon.

"People don't realize how critical they are to the environment," Ehlinger says. "The more we learn about them, the better our chances of ensuring their survival in the lagoon."

For further information, contact Gretchen Ehlinger, Florida Institute of Technology; Phone: (321) 674-7983, Email: ehlinger@fit.edu

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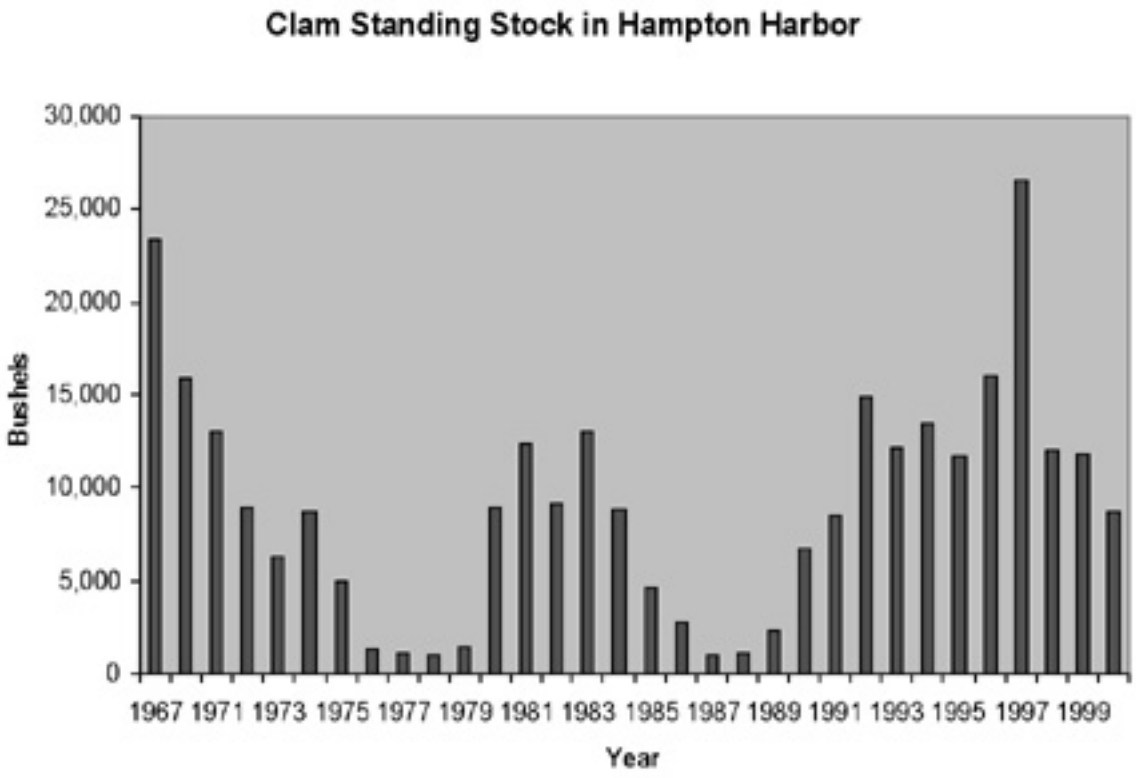
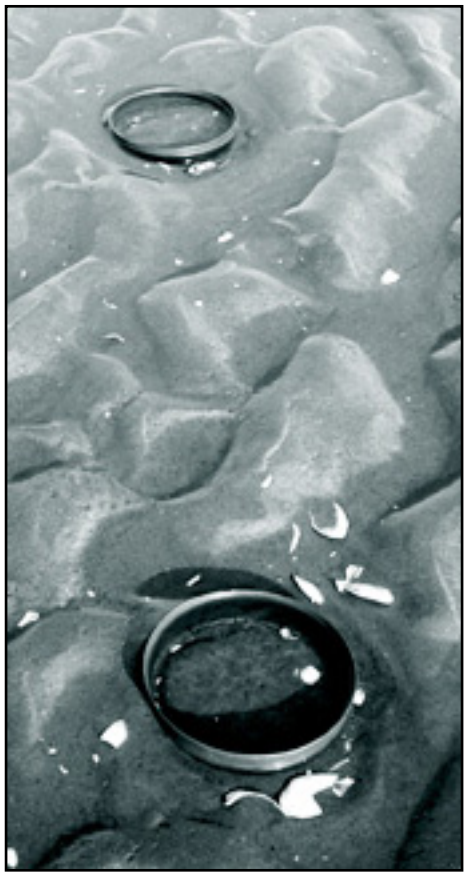
New Hampshire Juvenile Clam Studies Provide Insight into a Roller Coaster Population

Hampton Harbor in New Hampshire is known as the State's best bet for harvesting soft-shell clams, at least during some years. But in the past 30 years, the Hampton Harbor tidal flats, located about 45 miles northeast of Boston, have experienced dramatic highs and lows in standing stocks of clam populations. These have ranged from a high of 27,000 bushels in 1997 to less than 1,000 bushels in 1978 and 1987 (see chart). Overharvesting was suspected as the cause of these fishery crashes; however, recent studies suggest that there may be more to the story.

In 2001, the New Hampshire Estuaries Project (NHEP) called for proposals to "determine the cause(s) of juvenile soft-shell clam mortality in the Hampton/Seabrook Estuary". The NHEP wanted a research team to focus on understanding the causes of juvenile clam mortality because previous surveys suggested that clam larvae were settling in the harbor's substrate, but juvenile clams were not being recruited to the adult class. Researchers, clammers, and managers had compiled a list of possible causes for the juvenile clam mortality that included disease, human disturbance, winter kill, pollution, competition with other bivalves, and/or predation from wildlife.

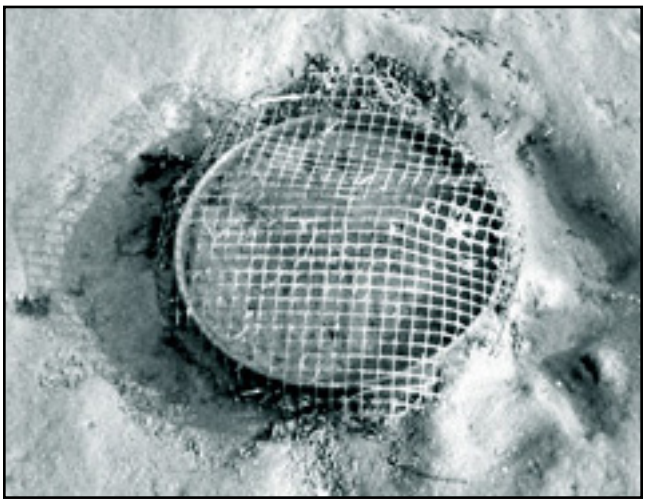




Dr. Brian Beal at the University of Maine at Machias was awarded the contract to conduct field research at three clam flats in Hampton Harbor. To understand what was happening to juvenile clams, Dr. Beal employed a series of field experiments from November 2001 to July 2002. He placed hatchery-reared, juvenile clams into 6-inch plastic plant pots filled with sediments from each flat, which were then buried to their rims in the tidal flats. Half the pots were stocked with high densities of clams to determine whether crowding affected survival. To assess effects of predation, Dr. Beal placed flexible plastic netting over some of the pots to exclude predators. He collared other pots with netting that extended 1 inch above the rim to contain clams dislodged by sediment erosion. Altogether, 360 experimental pots were placed in the harbor from November through March, and another 360 pots for the period from March to mid-July.

Wild and experimental clams were also tested for hematopoietic neoplasia, a common clam disease, to determine whether disease could account for diminished adult recruitment. The experiment was also designed to address potential differences in clam growth and survival with respect to tidal range.

Dr. Beal's studies suggested that sediment erosion by tidal and wind currents and predation by crustaceans, primarily green crabs, were significant factors that increased juvenile clam mortality. Strong currents dislodged many of the experiments and the unprotected clams were washed away. Predation by the non-native green crab (Carcinus maenas L.), a notorious juvenile clam predator, was observed in unprotected pots and pots with torn protective screening.



Dr. Beal's study is not the final step in understanding Hampton Harbor's clam stocks. More work needs to be done to quantify the effects of recreational clam harvesting, clam stocking, competition with other bivalves and other factors that will become apparent as work progresses. Dr. Beal's study represents the first experimental study in Hampton Harbor that tests specific hypotheses about local clam populations to offer resource managers quantitative data that may inform management decisions.

For further information, contact Dave Kellam, Project Assistant, New Hampshire Estuaries Project, 152 Court Street, Suite 1, Portsmouth, NH 03801; Phone: (603) 433-7187; Fax: (603) 431-1438; Email: dave.kellam@rscs.net

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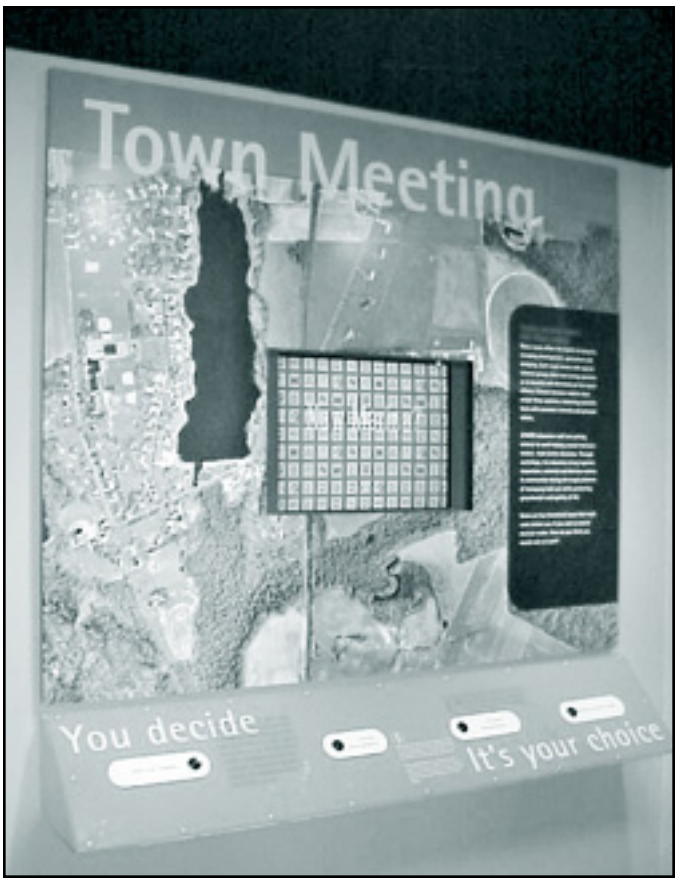
"Life on the Edge": A Town Meeting Approach to Outreach at the Jacques Cousteau NERR, New Jersey

Jacques Cousteau was a pioneer in both oceanography and marine education. With his filmed documentaries of deep-sea exploration, he brought the mysteries of the ocean into our living rooms and classrooms. Living up to his legacy, the Jacques Cousteau National Estuarine Research Reserve (JCNERR) recently opened its new Visitor Center in the Yacht Club of the Tuckerton Seaport, in Tuckerton, New Jersey. The new Visitor's Center is appropriately called "Life on the Edge". The project was funded by the National Oceanic and Atmospheric Administration, in collaboration with the Tuckerton Seaport, JCNERR, and the Institute of Marine and Coastal Sciences at Rutgers University, which manages the JCNERR.

The JCNERR encompasses over 114,000 acres in southeastern New Jersey, including a great variety of terrestrial, wetland and aquatic habitats within the Mullica River-Great Bay ecosystem. The Reserve is a patchwork of federal and state lands managed in partnership with a variety of agencies, which has in turn created opportunities for partnering in coastal outreach, as evidenced by the new Visitor's Center. Like the 25 other NERRs located throughout the U.S., the JCNERR was created to promote the responsible use and management of the nation's estuaries through scientific

research, education, and stewardship.



With little more than 1% of the Reserve subjected to human development, this area is one of the least disturbed estuaries in the densely populated urban corridor of the Northeastern United States. The Mullica River-Great Bay estuary is of special ecological value, as it is includes the New Jersey Pinelands forested ecosystem, coastal plain, salt marsh and barrier islands. The Jacques Cousteau Reserve hopes to preserve these high quality habitats and provide long-term research and monitoring to better understand and maintain the ecological health of these ecosystems.

"Life on the Edge" exhibits promote these goals by providing visitors with an understanding of the Mullica River-Great Bay Estuary ecosystem. Just as importantly, however, the exhibits create an inspiring, truly memorable visual and interactive experience that fosters a sense of stewardship and responsibility for the health of our estuaries.

The JCNERR also works closely with the coastal management community to ensure that the best science is available to help make informed decisions concerning New Jersey's coastal resources. By providing workshops and now the new Visitor's Center and its innovative approach to coastal outreach, marine educators can bring together the public, researchers, scientists and decision-makers to address tough problems such as managing land use while protecting natural resources.

"Life on the Edge" has been designed as a virtual walk through the estuarine system, from the headwaters of the Mullica River, through the Pinelands, into the Great Bay salt marsh ecosystem, and out into the open ocean. Visitors can come face-to-face with these habitats and experience the cutting-edge science that takes place within the Reserve -- through video interviews with scientists in the field, new aerial footage of the reserve, and an orientation area for families, school groups, and other visitors.

A unique feature of "Life on the Edge" is that visitors can participate in an exciting

new "Town Meeting" interactive experience. Here they can hear about different land use development scenarios and form their own opinions about how the land inside and outside the reserve should be used. Through this "Town Meeting" approach, the public can learn about coastal issues that New Jersey coastal managers could potentially face. Examples include fishing restrictions, marina development, dredging, increased agriculture, and timber harvesting in coastal watersheds. Stakeholders often have strong opinions concerning the pros and cons of the issue and its effects on the estuary. Coastal decision makers must weigh these issues and opinions, and balance scientific facts with human values and economic benefits before deciding on a course of action.

The "Town Meeting" approach works like this: the visitor is prompted to choose an issue and is then presented with the "voices" and "opinions" of stakeholders. Based on this input from stakeholders, visitors are then asked to decide for themselves how they would vote on the issue. The "Town Meeting" approach highlights the tough choices that the coastal decision-making community faces.

This type of interactive exhibit is expected to set a trend in marine education, by actively engaging visitors in coastal management dilemmas so that they can better understand the types of decisions needed to address coastal issues. The "Town Meeting" approach also illustrates how the JCNERR assists the coastal management community by presenting a forum for intelligent, informed discussion of real coastal issues.

Admission to "Life on the Edge" is free of charge for the public.

For further information, contact Lisa Weiss, Watershed Coordinator, Jacques Cousteau Coastal Education Center, 130 Great Bay Blvd, Tuckerton NJ 08087; Phone (609) 812-0649; Fax: (609) 294-8597; E-mail: weiss@imcs.rutgers.edu

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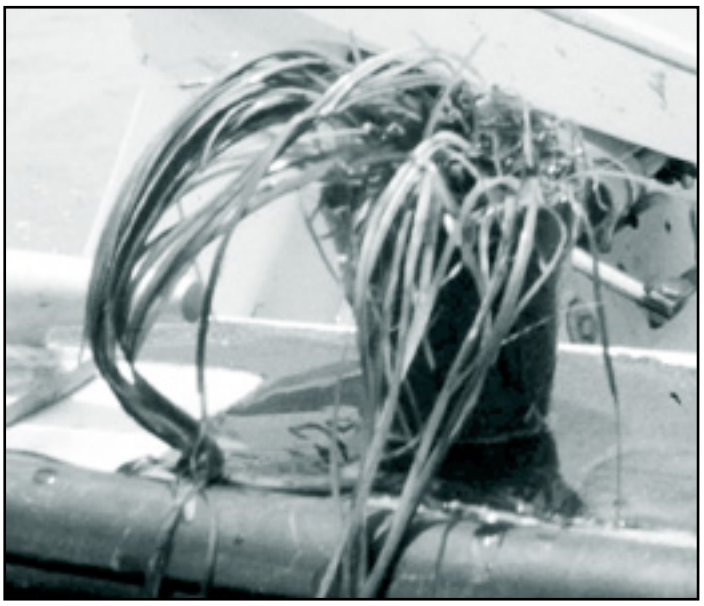
Submerged Aquatic Vegetation Being Restored in Chesapeake Bay

Anyone who fished or swam in Chesapeake Bay in the 1960s remembers huge amounts of "seaweed" clogging boat propellers, closing marinas, and generally making shallow water boating a hassle. However, in the next breath, people will often reminisce about the great abundance of fish and game that existed at that time. Few people understand that the two go hand-in-hand, and that submerged aquatic vegetation is even important to people who never go boating or fishing.



The loss of submerged aquatic vegetation (SAV) in many estuaries throughout North America has far-reaching effects, ranging from complete collapse of the scallop fishery in the Coastal Bays of Maryland and Virginia, to increased shoreline erosion and reduced food availability for wildlife and waterfowl. SAV has been gradually declining in Chesapeake Bay since the arrival of the first colonists. But a massive decrease in SAV occurred during the 1960's human population explosion in the Chesapeake watershed. Although there has been a significant recovery in SAV since then, we are still a long way from reaching even the most modest of our goals. To help improve the Bay's SAV populations, many difficult steps have been taken, and many more will be needed

before we can safely declare that SAV has been restored.

Many factors affect SAV distribution in the Bay today, from escalator dredge clamming to boat scarring to severe storms that damage SAV beds. However, scientists agree that these factors play a minor role compared to water quality, and particularly the clarity, of our Bay's water. People have long known that water quality is important for maintaining SAV health, and the biggest strides in restoring SAV have been related to improvements in water quality. In the Chesapeake Bay watershed, steps that have been taken to improve water quality include requiring better treatment of wastewater, reducing phosphate - a key limiting nutrient for algal growth - in detergents, reducing sediment runoff into streams by better managing forests, farms and logging, tightening regulations for septic systems, requiring developers to control erosion, and encouraging vegetated buffers along thousands of miles of streams that feed into Chesapeake Bay.

Even those who live and work far inland can affect and help restore SAV in the Bay. Improved farming practices offer one striking example. The amount of fertilizers used is now carefully managed to feed crops only what they need, reducing fertilizer runoff and reducing nutrient runoff into streams and the Bay. Better soil testing allows farmers to determine when fertilizers are needed and not needed. Improved poultry feeds are being developed to allow chickens to more efficiently utilize the nutrients in their food, resulting in chicken waste that is less nutrient-rich. Less soil is washing into streams due to the use of contour-farming, no-till farming, planting winter cover crops to control erosion, and fencing streams to keep cattle out. Many Federal and State Programs (e.g. Conservation Reserve Enhancement Program) work to create farmland that benefits wildlife. Every single one of these measures benefits the Bay's SAV by improving water quality.

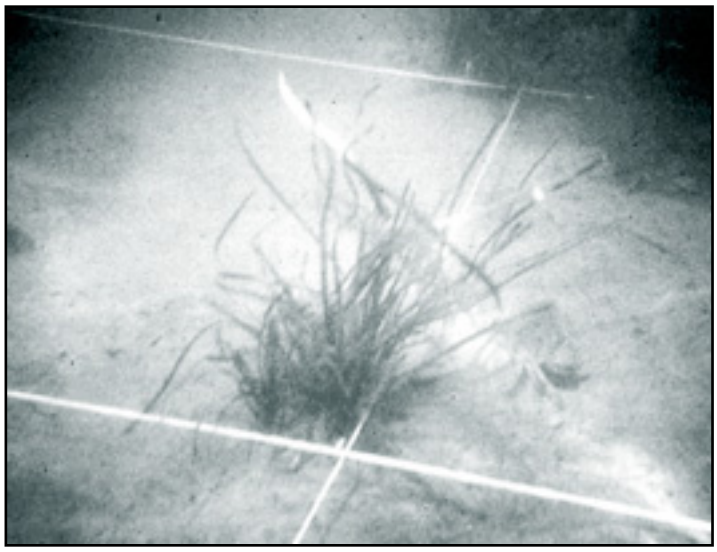
But is water quality improving in the areas where SAV grows? Two decades of monitoring by the EPA and the State shows substantial water quality improvements in some areas and continued degradation in others. However, the water quality monitoring program is designed to characterize entire watersheds and tributaries of the Bay, rather than shallow nearshore areas where SAV grows. As funding constraints place a limit on the number of monitoring stations, water quality in many shallow nearshore areas may not be well characterized.

In order to address these short-comings, the Chesapeake Bay Program is intensifying monitoring of near-shore water quality. Better monitoring technology is also being used, including continuous environmental monitors that measure water quality round the clock, towed monitoring instruments that are tracked by satellites as they collect spatial data over large areas, and computer models that are used to evaluate environmental data in light of SAV habitat requirements.

SAV issues are penetrating into Maryland schools as well. In 2002, 240 schools raised SAV through the joint efforts of the Maryland Department of Natural Resources (DNR) and the Chesapeake Bay Foundation. The Bay Grasses in Classes program teaches children how to grow SAV from seeds, and takes them out to plant the grasses themselves into in the Bay, thus teaching students about responsible stewardship.

Transplantation is also being used to increase the amount of SAV. Planting of SAV is so labor intensive that it is unlikely to result directly in significant bay-wide increases in acreage. However, strategic planting can effectively be used to jumpstart SAV restoration, by planting beds in areas that don't have populations of native species. With this in mind, the DNR has hosted two workshops in the past 3 years to compile state-of-the-art information on successfully restoring SAV. This information will be available on the DNR website (http://mddnr.chesapeakebay.net/savrrc/index.html EXIT disclaimer) to help people select SAV restoration methods that are most likely to succeed.

The DNR is also working with permitting agencies to develop a streamlined, one-stop permit application process that allows applicants to use the DNR website to apply for restoration permits. Currently Maryland has a complex multi-agency permitting process involving the DNR, Army Corps of Engineers, and other agencies. By speeding up the permitting of SAV restoration, the DNR hopes that more SAV will be saved and transplanted to other areas.



The Chesapeake Bay Program has been a prime supporter of SAV research. The Bay Program has continuously supported a group of SAV researchers and agency managers for several decades. In 1992, they helped develop an initial Bay-wide

goal of having 114,000 acres of SAV, reflecting the total SAV area that existed between 1971 and 1990. Using aerial photos from the 1930s through 1960s, Maryland and Virginia are currently revising their data on SAV abundance in the Bay prior to the widespread declines in the late 60s and early 70s. Since annual Bay-wide surveys began in 1985, SAV has substantially increased in many areas. In 2001, total SAV acreage in the Bay set a new record -- 77,800 acres.

Population increases in the Chesapeake Bay watersheds continue to pose the greatest challenges to water quality and SAV restoration goals, due to nonpoint source pollution. Even today, some rivers in Maryland and Virginia contain not a sprig of SAV. The wheels of recovery are in motion, but only time and monitoring will tell if enough is being done.

For further information, contact Michael Naylor, Maryland Department of Natural Resources, 580 Taylor Avenue, Tawes State Office Building, Annapolis, MD 21401; Phone: (410) 594-474; Email: mnaylor@dnr.state.md.us

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Controlling Bacterial Contamination in Barnegat Bay, New Jersey

In the last 6 years, the Barnegat Bay National Estuary Program (BBEP), in Ocean County, New Jersey has coordinated a partnership of federal, state, county, municipal, academic and citizen organizations to address nonpoint source pollution. One of their goals is to protect and restore waters used for shellfish harvesting and swimming. For the first time in 30 years, actions to reduce fecal contamination have resulted in improved water quality of more than 5,000 acres of shellfish waters, allowing unrestricted shellfish harvesting in the Toms River, a major tributary of Barnegat Bay.

Although stormwater runoff still carries bacteria into wetlands and coastal waters, water quality of swimming areas in Ocean County has improved. At some swimming areas, fewer bathing beaches have been closed than in previous years. This success is due to management actions to reduce bacterial pollution, described below, and to a public awareness campaign that includes weekly notification of elevated pollutant levels, a hotline for reporting illicit discharges, and a beach information website. These outreach activities help the public to understand where bacterial contamination comes from and what people can do to prevent such contamination.

Water quality at swimming beaches has also been characterized better, thanks to the combined efforts of these groups working with the Ocean County Health

Department, the Ocean County Utilities Authority and the New Jersey Department of Environmental Protection (NJDEP).

New Jersey Clean Vessel Program

Septic wastes pose a significant threat to water quality, considering that 1 gram of human waste contains approximately 100,000,000 fecal coliform bacteria (The federal standard for fecal coliform bacteria in approved shellfish harvesting waters is 14 fecal coliform bacteria colonies per 100 milliliters of water). Yet studies in the 1980s documented only 4 sewage pump-out facilities in all of coastal New Jersey. Since then, long-term cooperative efforts by BBEP partners have resulted in installation of more than 70 marine sewage pump-out facilities in Barnegat Bay and its tributaries.

Funding for the pump-out facilities was provided by the New Jersey Clean Vessel Program, which provided funds for construction, operation, and maintenance of pump-out stations, dump stations, pump-out boats and boater education programs. The New Jersey Clean Vessel Act Program is funded by the U.S. Fish and Wildlife Service (USFWS) and the NJDEP. This program is administered jointly by the USFWS, the NJDEP Division of Fish and Wildlife, the New Jersey Sea Grant, the Marine Trades Association of New Jersey, and other interested public and private entities. This state program provides 100 percent of the costs to install sewage pump-out facilities. A total of 75 percent of its funding comes from the federal Clean Vessel Act, which is derived from the Wallop-Breaux Fund and an excise tax on fishing-related items (e.g., motors, motorboat fuel, fish finders, tackle and pleasure boats). The state's "Shore-to-Please" license plate fund provides the remaining 25 percent.

Circle of Life Pump-Out Vessel

The BBEP also contributed funds for operating the "Circle of Life", the first sewage pump-out boat in New Jersey. For 5 years, this vessel has collected more than 52,000 gallons of sewage from 3,642 recreational boats in Barnegat Bay. This significantly reduces the public health threat due to boat discharges of untreated sewage.

The pump-out boat is operated in cooperation with the Borough of Seaside Park, the Ocean County Planning Department, Ocean County Sewage Authority, and the NJDEP. The Ocean County Utilities Authority provides free disposal of the sewage collected by the Barnegat Bay pump-out boat.

Due to the success of the "Circle of Life", two additional sewage pump-out boats were purchased for Barnegat Bay, and others were acquired for other coastal watersheds throughout New Jersey. These pump-out services are available free to the public.

Public Outreach Activities

Radio and TV announcements were broadcast throughout the New Jersey/New York area to promote the Circle of Life and pump-out facilities. These announcements featured US EPA Administrator, Christie Whitman, former governor of New Jersey. The BBEP provided a National Estuary Program mini-grant to Pete McLain, a citizen advocate who began the sewage pump-out boat program in New Jersey. The grant was used to develop and implement a public outreach program to encourage boaters, marina operators and local governments to use the "Circle of Life" and marina pump-out facilities. This outreach campaign, which also included multi-media advertising (marine radio, brochures, local events), has encouraged widespread public use of these facilities.

For more information, contact Dr.Bob Scro, Director, Barnegat Bay Estuary Program, Ocean County Planning Department, P.O. Box 2191, 129 Hooper Avenue, Toms River, NJ 08753;Phone: (732) 286-7877; Email: bscro@co.ocean.nj.us

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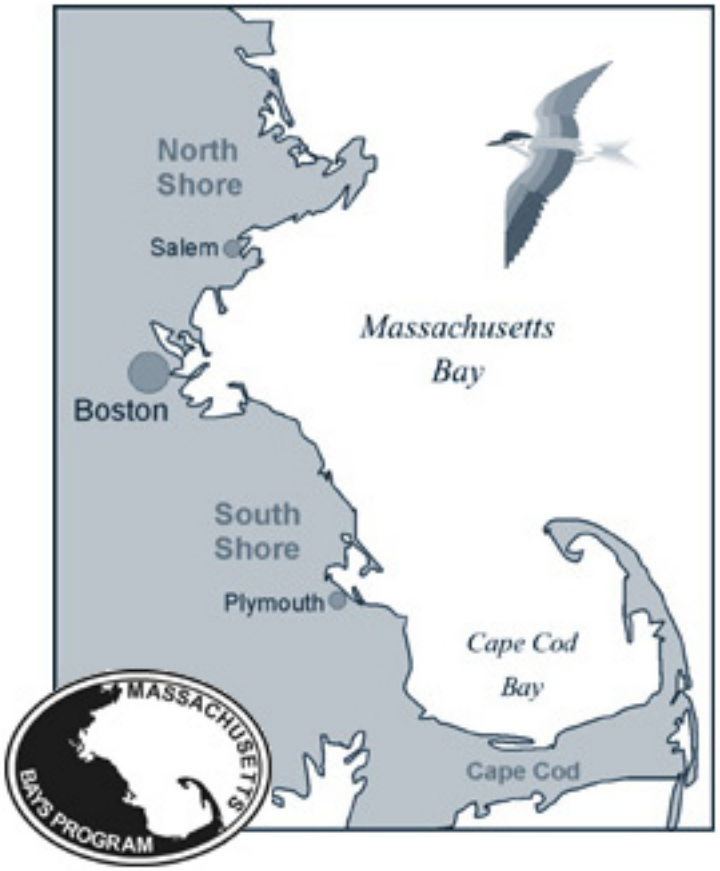
Massachusetts Bay National Estuary Program

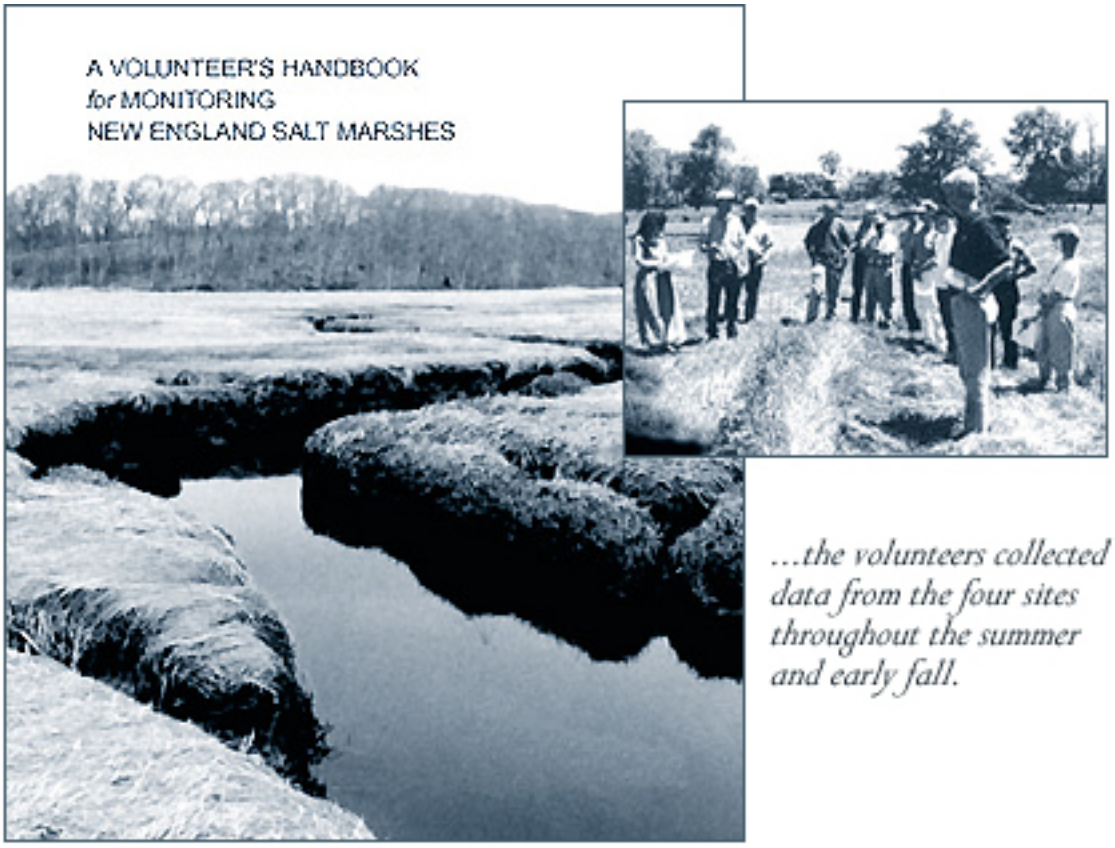
A Multimetric Approach to Monitoring Coastal Wetlands In Massachusetts and Cape Cod Bays

Introduction



Historically, many salt marshes in Massachusetts and Cape Cod Bays were filled to support residential development, roadways, or agriculture. Now salt marshes are recognized and protected as a critical coastal ecosystem, providing food, shelter, migratory corridors, and breeding and nursery areas for a huge number of coastal and marine organisms. Many commercially important species of fish and shellfish rely upon salt marshes for their early development, and the long term future of many of our offshore fisheries is linked to our salt marshes. While a large percentage of salt marshes has been lost to development, more than 36,000 acres of salt marsh still remain in the Massachusetts Bays region. Extensive salt marsh systems still exist on the North Shore north of Boston and on Cape Cod, and important "pocket marshes", or smaller salt marshes, occur throughout the region.

The Massachusetts Bays Program (MBP) is one of 22 nationally recognized estuaries in the National Estuary Program. The boundaries of the MBP extend from Salisbury on the Massachusetts-New Hampshire border, across Massachusetts Bay to Provincetown on the tip of Cape Cod, encompassing Massachusetts and Cape Cod Bays. Protecting and enhancing coastal habitat is one of 15 action plans in the 1996 Comprehensive Conservation and Management Plan (CCMP), and it continues to be a top priority action item.



Problem Formulation

While strict regulatory protection has nearly eliminated ongoing destruction of salt marsh, it was clear to MBP staff that salt marshes continue to be impacted by pollution, invasive species (e.g., Phragmites australis), and other ecological stressors. Ongoing development pressures and human activities in adjacent upland areas, and in particular nonpoint source pollution, appeared to be major culprits. However, clear scientific evidence to demonstrate a causal relationship between human activities and ongoing ecological impacts was largely lacking. Clear evidence of a causal relationship would help coastal managers to better protect these huge and complex ecosystems. What was desperately needed was an approach to document impacts of nonpoint source pollution on salt marsh functions and values.

Project Overview

The MBP and the Massachusetts Coastal Zone Management (MCZM) Program, along with several other partners, have been working together for the past seven years to develop a method for describing and assessing the condition of salt marshes. The goal was to develop an approach that would work for salt marshes in the Northeast, yet be transferable to other coastal areas. While our work is not yet complete, we can report on our progress.

We began with our belief that biology can provide the best indicators for ecosystem impacts. Our approach was based on identifying useful biological indicators of wetland conditions for salt marshes, such as vegetation, macroinvertebrates, birds, and fish. Using these indicators, we developed a rapid assessment tool to score land use impacts and to evaluate habitat. We then compared our site-specific biological data to these land use scores in order to assess habitat condition.

Our assessment approach relies on a multimetric method for evaluating the condition of biological assemblages in salt marshes. We examined multiple parameters (metrics) that represent assemblage features, status, or attributes that respond to disturbance. Metrics were chosen to integrate information from individuals, populations, guilds, communities, ecosystem levels, and ecological processes.

Several states have used multimetric approaches for biological surveys of lakes, streams, and rivers, but only recently have such approaches been used in ecological assessments of wetlands. Nearly all of the wetland research nationwide has focused on freshwater systems, while our efforts are one of a very few that address salt marsh tidal systems.

Because of the size and diversity of the Mass Bays coastal area, the MBP decided to work in five regions, each with their own regional staff. The five regions are: the upper North Shore from Cape Ann north to the state border, the lower North Shore from Cape Ann to metropolitan Boston, the Metro Boston region, the South Shore south of Boston, and Cape Cod. Much of our work was conducted in salt marshes on Cape Cod and the North Shore.

Even before the salt marsh assessment project got underway, one of the first CCMP action items was to inventory tidally restricted wetlands in each region. The purpose of the inventories was to identify wetland sites where tidal flows were restricted by roadways, undersized bridges and culverts, fill, and other man-made obstructions. Tidal restrictions are one of the major causes of ongoing salt marsh degradation because they decrease the amount of salt water flowing into and out of the marsh, changing the ecology from salt or brackish water to freshwater. These inventories will be used to prioritize and implement projects to restore tidal flow and improve coastal wetland habitats. The first inventories were completed for the North Shore, followed by those for the South Shore and Cape Cod. The final study of the Metro Boston region is in progress.

After completing the inventories, the local committees began to obtain funding and permits (federal, state, and local) to restore tidal flows at several high priority sites. One of the first questions that arose was how to demonstrate that salt marsh habitat

improves following restoration of tidal flow. Was there a way to document success?

The MBP staff felt that the multimetric salt marsh assessment method could be used to monitor the effectiveness of restoring tidal flow to an impaired wetland. The research team decided to adapt its methodology and train local citizens to see if they could collect the information to demonstrate whether or not habitat improved upon restoring tidal flow.

The US EPA provided funding for a volunteer training program for monitoring salt marshes using the multimetric approach. Training modules were developed for monitoring plants, birds, macroinvertebrates, tidal hydrology, water chemistry, and for assessing potential impacts from adjacent land uses. Salem Sound Coastwatch, a local non-profit partner for the MBP, was chosen as the local coordinator.

Four sites needing wetland habitat improvements were selected for focused studies. Each of the four sites included monitoring sites that were upstream and downstream of a tidal restriction; downstream sites were more "pristine" and unimpacted in comparison with upstream tidally-restricted impaired sites. We predicted that, over the course of restoration, the impaired upstream sites would come to resemble the downstream sites, if the project was successful in restoring tidal flow.

While the research team prepared training materials, Salem Sound Coastwatch received funds to hire a volunteer monitoring coordinator and to recruit volunteers. Since the local committees that had initiated the restoration projects were interested in demonstrating success, recruitment was easy. Schoolteachers and college students were also interested in participating.

In June and July of 1999, the research team conducted volunteer training. Following this, the volunteers, under the guidance of the volunteer coordinator, collected data from the four sites throughout the summer and early fall. In a parallel effort to evaluate the success of the volunteers in collecting valid data, the research team also collected data at the same sites on different days for comparison. At the end of the first field season, the data from both teams were analyzed and compared. The volunteers were also asked to provide detailed evaluations of the project.

Project Results

The research team received much valuable feedback from volunteers. While the volunteers' data for plants, tidal hydrology, water chemistry, and land use evaluations were similar to data collected by the research team, the information on macroinvertebrates and birds was not quite as comparable. The volunteers

themselves suggested many ways to improve the efforts, and these suggestions were incorporated into the second year of the study. The bird and macroinvertebrate monitoring data improved and fish monitoring was added. A third year of work further improved the program.

By now, many other groups had become interested in our volunteer salt marsh monitoring program. The research team, working with the volunteer coordinator, decided to produce a reference handbook for use by program participants and others. With a small grant from EPA, the research team was able to produce a detailed handbook which describes the approach, methods, and data analysis. The handbook was printed just in time for the 2002 field season.

Over the course of four years of monitoring at a number of sites, the volunteer groups succeeded in establishing baseline information for tidally restricted sites before restoration of tidal flows. Following restoration of tidal flows, improvements in habitat and water quality were documented at the four sites.

The real benefits from this project have been huge. First, volunteers learned how science is used to measure success and how they can contribute. Overall, a longer term sense of stewardship is developing among participants, as well as a better understanding of wetland ecology. The research team developed an easily used handbook that explains the methods and purposes of assessing wetland conditions (available on the MBP webpage http://www.massbays.org). The research team also benefited from the data, which were used to develop the various metrics. Methods were steadily improved over seven years in order to improve the predictive capability of the multimetric approach.

State and federal agencies continue to invest in wetland restoration, especially in coastal systems. It is important to be able to demonstrate that these efforts result in measurable success. Our research program hopefully provides a sound scientific basis for evaluating the success of wetland restoration. Salt marshes vary, so specific local approaches will need to be adapted to local conditions. However, the overall approach is valid and can be adapted for use elsewhere.

Lessons Learned

The results of this project provide clear evidence that habitat improvement and recovery takes a long time. Longer term monitoring over five years or more may be needed to fully document habitat improvements. Additional sites have been added to the monitoring schedule as restoration opportunities have arisen. The importance of long term monitoring and long term management and protection of coastal resources cannot be overestimated.

For further information, contact:

Jan Smith, Executive Director, Massachusetts Bays Program, 251 Causeway Street, Suite 900, Boston, MA 02114-2151; Phone: (617) 626-1230; Fax: (617) 626-1240; Email: massbays@state.ma.us For more information about the volunteer training program, check the handbook available on the web site or contact www.salemsound.org.

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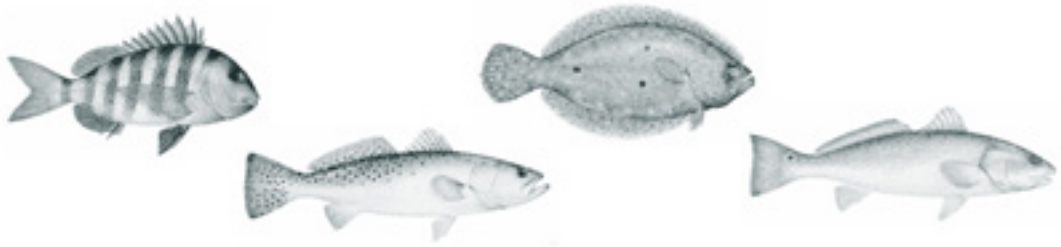
Fish Flash!



The Tampa Bay Estuary Program has produced a wallet card to encourage responsible fishing in the bay. The "Tampa Bay Ethical Angler Wallet Card" illustrates 12 of the most commonly caught fish in the bay - including Spanish mackerel, sea trout, snook and sheepshead - and provides information about bag limits, seasonal closures and other harvest restrictions for each species. The Florida Fish and Wildlife Conservation Commission helped to develop the card. The card is printed on durable latex paper and folds to the size of a credit card so anglers can carry it with them wherever they go. In addition to providing fishing regulations, the wallet card offers tips for ethical angling, and phone numbers to report fisheries violations, fish kills, or fish tags.

The card is available free upon request, and will also be distributed through many bait and tackle shops in the area. For more information, contact Nanette Holland at (727) 893-2765 or e-mail nanette@tbep.org. The wallet card will also be available on the Tampa Bay Estuary Program website at www.tbep.org. EXIT disclaimer

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EPA Celebrates American Wetlands Month

Wetlands are major hotspots of biological productivity because they provide habitat for a wide range of flora and fauna. Wetlands also offer great recreational opportunities for fishing, canoeing, bird watching, and ecotourism. They are critical for flood control, acting as buffers to absorb and reduce floodwaters and reduce property damage.

Over half of the nation's original wetlands have been lost or converted to other uses, with the rate of loss declining dramatically over the last 30 years. The Environmental Protection Agency is striving to achieve no net loss of the nation's wetlands, and to work towards an annual net gain through wetland restoration programs.

In May, 2003, the nation will celebrate American Wetlands Month. This year's campaign will focus on protecting some of the nation's more unique wetlands. The EPA, the Izaak Walton League (a national non-profit conservation organization) and other federal and local agencies, and non-profit groups have scheduled many activities around the country throughout the month.

A biennial Americans Wetland Conference will take place May 1-4, 2003 in Minneapolis, Minnesota. The conference, presented by the EPA and the Izaak Walton League, will feature training and networking opportunities in wetland conservation. Informative presentations, hands-on sessions and training workshops will be offered on many wetland topics, including conservation of ephemeral and isolated wetlands, wetland ecology and values, status of wetlands resources,

volunteer monitoring, education and outreach, restoration, mitigation, invasive species, conservation tools, and more. A calendar of nationwide events can be found at http://www.iwla.org/sos/awm/events. EXIT disclaimer

Additional information on wetlands and how you can help is available at: http://www.epa.gov/owow/wetlands.

Registration information for the American Wetlands Conference can be found at www.iwla.org/sos/awm/conference EXIT disclaimer. A draft agenda of the conference, detailed field trip descriptions, travel information, and more are available by email awm@iwla.org or call (800)BUG-IWLA (284-4952).

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Coastal Zone '03: Coastal Zone Management Through Time

The largest conference for the world's coastal resource management community will be held July 13 - 17, 2003 in Baltimore, Maryland. This biennial symposium attracts over 1,200 participants from around the world, and is the premier international gathering of ocean and coastal management professionals. The four major themes include: port and harbor management, regional land management, management response to coastal hazards, and management of aquatic resources. The weeklong event will also include field trips, a silent auction, numerous workshops, and a five-kilometer run to keep participants active and involved during the conference.

For registration and general information please visit www.csc.noaa.gov/cz2003/ EXIT disclaimer

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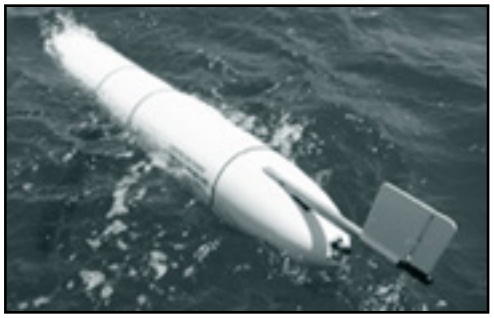
Technology vs. Nature: The War on Red Tide!!

You are quietly fishing in the Gulf of Mexico, when all of a sudden a 4-foot long yellow torpedo pops up next to your boat, bobs there for a few minutes, then drops back into the depths. What do you do? Call the Coast Guard? Dial 911?

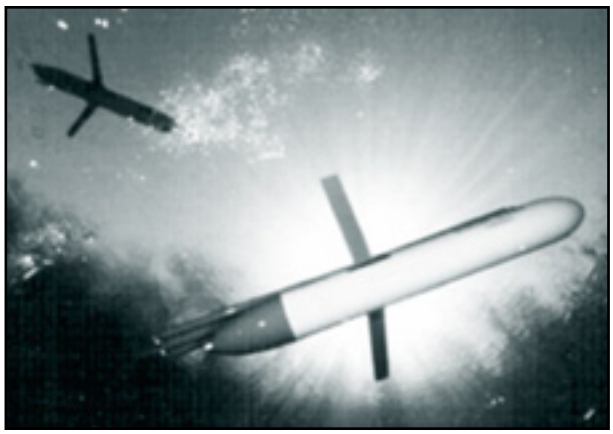
Stay calm. The "torpedo" is actually an autonomous underwater vehicle (AUV) known as a Slocum Glider. The Slocum Glider AUV is the Mote Marine Laboratory's latest attempt at early detection of red tides, caused by massive blooms of certain algae which produce toxins. The Webb Research Corporation in Massachusetts developed the $80,000.00 glider. The highly maneuverable, unmanned instrument is the first of its kind to be used in Gulf waters. Water quality data such as salinity, temperature and dissolved oxygen are transmitted to land-based scientists via satellite transmission, making water quality data collection safer and less labor-intensive.



The Mote Marine Laboratory, in collaboration with Rutgers University, hopes to use the instruments to help detect red tide (caused by Karenia brevis and other red tide organisms) and to collect water quality data to help scientists understand why the blooms occur in the Gulf of Mexico. The team's goal is to better inform the public and the fishing industry that a bloom is about to occur or is nearby. Such information can help coastal resource managers and others to alleviate the financial burden that results when shellfish are contaminated by red tides.

If the glider tests are successful, the Mote team will equip an instrument with a $20,000 miniature sensor that will search for red tide, while continually transmitting water quality data. The glider will monitor the area between Tampa Bay and Charlotte Harbor. The National Science Foundation (NSF) and National Oceanic and Atmospheric Administration are financing the gliders and the research, respectively.

For further information, contact Dr. Gary Kirkpatrick, Program Manager, Phytoplankton Ecology, Mote Marine Laboratory, 1600 Ken Thompson Parkway, Sarasota FL 34236; Phone: (941) 388-4441.



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Celebrating the Clean Water Act 30th Anniversary, October 2002 - 2003

In honor of the 30th Anniversary of the Clean Water Act, the Environmental Protection Agency's National Water Program has launched a yearlong celebration. The nationwide campaign will focus on educating the American people about safe drinking water, water conservation, water monitoring, watersheds, nonpoint source pollution (polluted runoff) and other water-related topics. EPA's outreach will emphasize the importance of clean water. Each month of the year will highlight a different aspect of the Act. Monthly topics include oceans, wastewater, stormwater and wetlands. Events have been scheduled around the nation, and posters, bookmarks, brochures, feature articles, commentaries, and other materials have been published in honor of the anniversary.

To learn more about the Clean Water Act and for more information on events in your area visit EPA website "The Year in Clean Water" at www.epa.gov/water/yearofcleanwater.