Education

Reserve and site staff work cooperatively to deliver a wide array of educational programs for environmental professionals, teachers, students and the public.

- The Reserve hosted three **Coastal Decision Maker Workshops** in 2003. These workshops provide technical information, tools and networking opportunities to coastal resource professionals:
  - Submerged Aquatic Vegetation Restoration, held in conjunction with the SAV Task Group of the Chesapeake Bay Program, brought together researchers and managers to learn about the latest tools and techniques. Presenters included Chuck Nieder from the Hudson River NERR on his bathymetry work and Mike Smart with the US Army Corps of Engineers, Environmental Research and Development Center.
  - Reducing Nitrogen Pollution from Septic Systems, co-sponsored by the Tributary Strategies Development Workgroup, focused on the impact of septic systems on water quality and providing information on the implementation of alternatives to conventional systems.
  - Research Conference at Jug Bay in which 19 presentations were delivered to county planning and zoning officials, staff from the Health Department and Public Works, land managers and others. Research covered a range of topics, including box turtles, mosquitoes, waterfowl populations, Lyme's disease, sedimentation, hydrology, West Nile virus and SAV restoration. All research was being conducted in the Jug Bay area of the Patuxent River. For abstracts, please contact Julie Bortz.

Coastal Training Program (CTP): This is a new national initiative to provide current scientific information and skill building opportunities to people who make decisions that effect coastal resources. The Program is in the preliminary stages of development. An Advisory Panel was formed and a market analysis and needs assessment will be conducted in 2004. Results from this assessment will help determine the direction of the CTP in Maryland.

Students participating in "A Blast from the Past"

Other Educational Activities:

- The Otter Point Creek Environmental Survey was refined with three schools participating. Students weigh the environmental and economic impacts of a local marina expansion. Activities take place in the classroom, on a pontoon boat and in a lab.
- "A Blast from the Past" was developed as a summer program in which students learned of the ways people lived around the Bay by conducting a fake archaeological excavation. A version of this program for educators was presented at the annual conference of the Maryland Association for Environmental and Outdoor Education. Please contact Bob Finton if you would like a copy of either of these activity guides.
- Staff presented a variety of hands on activities at the 6th annual Wade-In at the Anita C. Leight Estuary Center. Over 100 people learned about SAV identification, water chemistry and physics and microbiology.
- Jug Bay Wetlands Sanctuary staff developed a field guide to the reptiles and amphibians found at this component. It will be useful at Otter Point Creek as well.
- Special presentations with a focus on water chemistry, physics and SAV were made at the following events: Water Fest in Prince Georges County to three groups of 200 students each with local media on hand to record the program; Dolphin Day at Sandy Point State Park for elementary school students; the Maryland State Fair; and a Wade-In at the Chesapeake Bay Environmental Center.
- A traveling exhibit about the Reserve was created for the Coastal Zone '03 conference in Baltimore. Basic information about the components and about the Reserve's activities are presented.
- Staff participated in the review of Green School applications and assisted with an awards ceremony for 14 schools and the first ever Green Center award given to the Lathrop E. Smith Center in Montgomery County.

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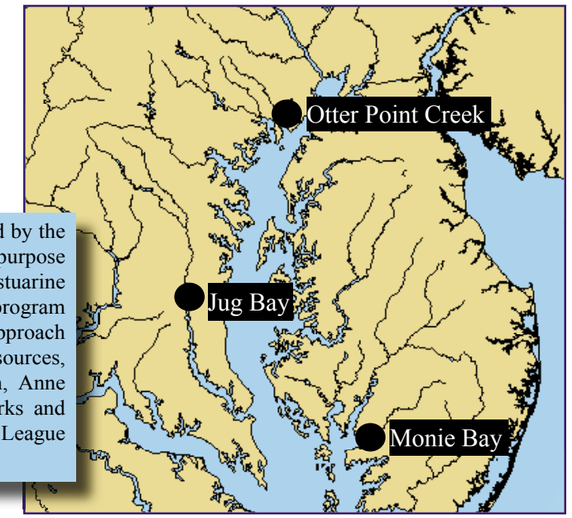
Chesapeake Bay National Estuarine Research Reserve in Maryland Annual Report, 2003



The National Estuarine Research Reserve System is funded by the National Oceanic and Atmospheric Administration. The purpose of the Chesapeake Bay NERR-MD is to manage protected estuarine areas as natural field laboratories and to develop a coordinated program of research and education. A cooperative management approach is used involving the Maryland Department of Natural Resources, Maryland-National Capital Park and Planning Commission, Anne Arundel County Recreation and Parks, Harford County Parks and Recreation, and Harford County Chapter of the Izaak Walton League of America.

Thanks to an energetic and creative staff, great partnerships and the work of many dedicated volunteers, 2003 was a year full of successes and accomplishments for the Chesapeake Bay National Estuarine Research Reserve in Maryland. The following highlights are just that-a snapshot of what actually occurred. What is often forgotten or overlooked is how much time and energy went into the planning and preparation for these events.

Volunteers

Tara Whittle and Morgan Angus
NOAA Environmental Heroes

Volunteers are essential to the Reserve's research, monitoring, restoration and education efforts. In 2003, almost 1700 citizens donated over 11,000 hours to the sites. Increasingly, volunteer efforts tie together the Reserve's research and stewardship programs. Highlights include:

- Tara Whittle and Morgan Angus, two volunteers from the Jug Bay Wetlands Sanctuary were honored with NOAA's Environmental Heroes Awards for their research on turtles and salamanders and for their assistance with the Reserve's Estuary LIVE internet broadcast.
- Grasses to the Masses workshops, held in conjunction with the Chesapeake Bay Foundation, train volunteers to grow submerged aquatic vegetation at home and then plant the SAV as part of a restoration effort. They became partners in a monitoring program. Water stargrass and wild celery were the species grown and planted.
- Citizens participated in efforts to restore wild rice at Jug Bay. Working with staff at Patuxent River Park, they repaired and installed fences and planted seeds-not an easy job when standing in 3 feet of mud! A similar project will be initiated at Otter Point Creek which has seen a similar decline in wild rice.
- Volunteers helped maintain the SAV grow out tanks and helped propagate plants in the greenhouse. They also assisted with restoration and research activities.
- Volunteer Appreciation Events were held at both Jug Bay Wetlands Sanctuary and at Otter Point Creek for over 150 volunteers.

Volunteers starting SAV seedlings

Volunteers Planting SAV

Research and Monitoring

Research

The Maryland Reserve increased its interest and involvement in the research and restoration of tidal, freshwater submerged aquatic vegetation. Reserve efforts focus on improving the current science of SAV restoration by testing several questions, including the following: 1) identifying the most suitable species or collection of species for restoration, 2) evaluating if monotypic plantings are more successful than a mixed planting, and 3) determining if greenhouse germinated plants (i.e. root bound) demonstrate a greater success rate than tank grown plants (i.e. bare-rooted or cuttings). Volunteers and student interns play an integral role in the grow out, maintenance, planting and monitoring efforts.

In August the Reserve joined with NOAA, the Chesapeake Bay Foundation and Aberdeen Proving Ground's Dive Team in an experimental boat planting of SAV at Otter Point Creek. The goal was to test the efficiency of using a mechanized boat versus hand planting of SAV using SCUBA divers and to determine if either method had a significantly different effect on restoration success. Complications encountered during the monitoring of the plants made evaluation of success difficult. However, the effort demonstrated once again the benefits of partnerships in SAV restoration.

A grid based sampling design with 60 sites was used in the Otter Point Creek marsh to set up long term SAV mapping and monitoring capable of tracking interannual changes in SAV populations. Estimates of percent cover by species of SAV, light attenuation and total depth were measured at each site. This work began in 2002 and will help document the colonization and expansion of non-native species, *Hydrilla verticillata*, at this site.

Another species of particular interest to the Maryland Reserve is wild rice, *Zizania aquatica*. Over several years Reserve staff, volunteers (from both Jug Bay Wetlands Sanctuary and Otter Point Creek) and others have assisted Greg Kearns of Patuxent River Park in restoring this species. This year a graduate student intern created several GIS data layers documenting the location of the exclosures and the recovery of the plant associated with the exclosures. Aerial photography was conducted to provide baseline mapping and to further document the areas being restored and the recovery of the plants.

Our partnership with Morgan State University in the Environmental Cooperative Science Center has led to plans for an overflight of the Monie Bay component to map submerged and emergent plant communities. This activity will also help determine a hyperspectral signature for *Phragmites australis* and test new technologies to measure fluorescence in the water column. Future plans call for determining a hyperspectral signature for wild rice at Jug Bay and land use/land cover imagery at Otter Point Creek.

Another demonstration of a successful partnership is the non-tidal loading study for the Bush River watershed being conducted by the Reserve, Harford County Department of Public Works and other groups within DNR. The goal is to identify the primary point and non-point sources of sediments and nutrients to the river for use in targeting restoration and improving management efforts.

Staff, volunteers and interns at Jug Bay Wetlands Sanctuary continued their studies on box turtles, two species of snakes, salamanders and other amphibians. They also continued mist netting of birds to determine which species occur in Jug Bay and specifically, which species use the scrub shrub habitat.

Graduate Research Fellows

The Reserve hosted two graduate students. Todd Chadwell conducted research at OPC on the colonizing mechanisms and rates of invasion by *Hydrilla verticillata*, a nonnative species. He examined the interactions between wild celery and hydrilla. Additional parameters such as flow, nutrient dynamics and plant densities were also documented to supplement his work.

Karen Phemister examined the affects of tidal infiltration on hydrodynamics in the marsh at Jug Bay. She is interested in how hydrodynamics might influence nutrient cycling in marshes. Her work will continue in 2004.

Coastal Estuarine Environmental Technology

One new project was funded by the Cooperative Institute for Coastal Estuarine Environmental Technology (CICEET). Mark Trice at the Maryland Department of Natural Resources, in conjunction with the University of Maryland, is working to develop a real-time, geographic information system (GIS)-based interface called DATAVIEW to provide mapping and visualization of point data during collection of water quality data with existing DATAFLOW equipment. This will make it possible to conduct targeted, adaptive, sampling while in the field. CICEET funds projects throughout the U.S. For more information go to: www.ciceet.unh.edu.

System Wide Monitoring Program (SWMP).

This is a national Reserve effort to set standards for detecting changes in the status, integrity and biological diversity of estuaries. The Maryland Reserve initiated the build out of our program which required the redeployment of dataloggers at two existing sites and the deployment of equipment at two additional sites. Working with DNR staff responsible for water quality monitoring throughout the Bay, the four sites have been collecting data every 15 minutes. Results are posted within a week and can be found at www.eyesonthebay.net. The four sites are Iron Pot Landing, Jackson Landing and Mataponi Creek in Jug Bay and Otter Point Creek. Three sites were operational during Hurricane Isabel and captured the impact of the tidal surge. Monthly nutrient and diel sampling were also initiated. Finally, the existing weather station at Jug Bay was upgraded and recalibrated, so water quality and weather events can be evaluated together.

Other Monitoring:

- An intern conducted tidal water quality sampling and SAV monitoring at 6 sites within the Otter Point Creek component. The goals were to determine the spatial variability of water quality, to provide pre and post restoration water quality data and to see if water quality was a strong determinant influencing SAV populations at the 6 sites.
- Preliminary SAV monitoring was conducted at Monie Bay on three dates to determine the dominant species of SAV and to document their location. Additional SAV groundtruthing took place at Jug Bay and Otter Point Creek components.

Volunteer Monitoring:

- Citizens, scout troops and school groups assist with efforts to assess ecosystem health within the Reserve by monitoring a variety of biotic and abiotic parameters.
- Tidal water quality was monitored by volunteers using a redesigned program at Otter Point Creek. This builds on existing data in an effort to characterize this component. The data will be analzed to determine if sites are statistically different from each other. Unique sites will be monitored permanently. Volunteers at Jug Bay Wetlands Sanctuary continued their water quality monitoring efforts for the 15th year.
- The fish seining program at OPC was expanded to include more intense training. Sampling occurs once a month from May through September. Each sampling takes about 5 hours. The goal is to collect baseline data to help develop a fish IBI (Index of Biological Integrity) for tidal species which is a way to assess the overall health of the fish community.
- The North American Amphibian Calling Surveys were conducted at Jug Bay and Otter Point Creek for the third year. Over 144 hours were donated by volunteers during three separate surveys in which they listened for and identified frogs by their calls. The survey is particularly important to OPC due to the increasing amount of development and consequent land use change in the watershed.
- Herp Searches: Reptiles and amphibians (herps) are good indicators of overall ecosystem health as they are sensitive to pollution and other ecological stressors. The Great Herp Search, now in its 5th year at OPC and 10th year at Jug Bay, is an effort to provide baseline population data to help determine the effects of land management practices on herp populations. Volunteers at Jug Bay also conduct routine herp searches. Salamanders are of particular interest at this component. A Jug Bay naturalist trained volunteers from Otter Point Creek in amphibian breeding biology and field capturing methods.
- Volunteers at OPC were trained in a protocol used at Jug Bay to monitor box turtles. The purpose is to obtain basic information about the box turtle population at OPC to see if urbanization is impacting the species.