Virginia

COASTAL MANAGEMENT

Protecting, Restoring, Strengthening Our Coastal Ecosystems & Economy

Spring / Summer 2002

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DEQ
Virginia Department of Environmental Quality
Virginia Coastal Program

Virginia's Coastal Resources Management Program links state, local, and federal efforts to create more vital and sustainable coastal communities and ecosystems. Virginia's coastal zone includes the 29 counties and 15 cities of Tidewater Virginia, and all tidal waters out to the three mile territorial sea boundary. The program includes state laws and policies to protect and manage Virginia's coastal resources, implemented by the Departments of Environmental Quality, Chesapeake Bay Local Assistance, Conservation and Recreation, Game and Inland Fisheries, and Health, and the Marine Resources Commission. The Department of Environmental Quality serves as the lead agency for the program.

Robert Burnley

Message From the Director……

As the new Director of DEQ, I am looking forward to strengthening our Coastal Program partnership with all of you who dedicate your time to managing Virginia's exceptional coastal resources. Much has been done but, as always, there is much still to do and we are under increasing pressure to measure our progress. For that reason we have established our biennial State of the Coast Report under a contract with the Virginia Institute of Marine Science (see back cover).

As Governor Warner institutes performance-based management in the Commonwealth, and with the federal Coastal Zone Management Act currently being considered for reauthorization with performance measurement requirements, we will be using this biennial review tool to track our progress. We'll be looking at goals of increasing wetlands, SAV, oyster reefs, public access and protected lands and decreasing the impacts of point and nonpoint source pollution and land conversion, to name a few. Another tool we are developing is "use conflict modeling" to ensure that we save appropriate space for all the activities that need to take place in our coastal waters (see page 4). It is my personal hope that we can also increase areas designated as "Exceptional Waters" and "Marine Protected Areas." The Virginia Coastal Program and its Policy Team will be working closely with NOAA this spring as the mid-Atlantic region becomes a test site for the national Marine Protected Areas Program.

As always, we are grateful for your help and interest. We hope you enjoy this issue of *Virginia Coastal Management*, in its new, magazine format.

Virginia Coastal Management

Spring/Summer 2002

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Please circulate this *publication* to other interested parties.

Virginia Coastal Management is also available on the Virginia Coastal Program Web site.

Cover photo: New signs in Chincoteague Bay, Virginia protect SAV (submerged aquatic vegetation) beds. See article, page 11. Photo by Mark Luckenbach, VIMS.

DEQ Virginia Department of Environmental Quality Virginia Coastal Program

NOAA

Virginia Oyster Heritage Program Continues to Shell Out

Status of Reef Construction Activity

Phase One of the Virginia Oyster Heritage Program is coming to an end and has resulted in construction of nine sanctuary reefs in the Rappahannock River in 2000 and 2001. Over three hundred acres of enhanced harvest area were cleaned and improved by the addition of cultch. Approximately five acres of reef were added to the seaside of the Eastern Shore in the summer of 2000 in South Bay, the Wachapreague area and near Metompkin and Cedar Islands. An additional ten acres were restored during 2001 (mostly in South Bay and Wachapreague).

"Phase One of the Virginia Oyster Reef Heritage Program has been more successful than anticipated," states Dr. James Wesson, Head of the Conservation and Replenishment Division at the Virginia Marine Resources Commission. "Not only do we have more than nine new sanctuary reefs in the Rapphannock and on Virginia's seaside, but the program's partnership base raised more than $3 million for oyster restoration over a two year period. The program and its partners have also served as a catalyst for the Baywide commitment for a 10-fold increase in oyster populations over the next ten years, and helped galvanize a Baywide strategy to meet this commitment."

The new sanctuary reefs were built using more than one million bushels of cultch, a combination of dredged fossil shells, shucked oyster shells, and surf clam shells. Within three of these new reefs, tests are being conducted to evaluate both broken, recycled concrete, and recycled local shells as reef construction materials. "Shell availability for oyster restoration efforts will continue to be one of the greatest challenges to the Virginia Oyster Heritage Program in the near future," explains Dr. Wesson. "However, the VOHP has also facilitated progress in addressing this issue. Initial results have shown that both the broken concrete and recycled shell that we are experimenting with perform similarly to fresh shells." Virginia received a permit to mine fossil shells in the James River in 2001.

Phase II of the VOHP reef construction effort will move restoration activities to a 12-mile, or 6000 acre, area of the middle Rappahannock River. This area has been mapped and gridded by the Virginia Marine Resources Commission (MRC) and surveyed for bottom condition, cultch condition, and oyster presence and size, by MRC and the Virginia Institute of Marine Science in November and December of 2001. Four sanctuary reef sites and 600 acres of potentially restorable harvest area were identified. Construction at these sites is slated for late spring and early summer of this year.

Shells for the Phase II effort will originate from several sources. Each one-acre reef will take approximately 100,000 bushels of shells to produce. As many as 300,000 bushels of fresh, shucked, house oyster and clam shells, will be barged to the reef construction sites. Fossil shells from the James River shell dredging project will also be used. "In order to complete phase II, the program will need at least $2.5 million dollars from federal, state and private sources," estimates Wesson. The Chesapeake Bay Office at

Reef Construction… *Continued on page 15*

Oysters Docking at Marinas

Dan Bacot at the site of York River Yacht Haven Marina's oyster garden. Photo courtesy of York River Yacht Haven.

York River Yacht Haven (YRYH), in its ongoing mission to be an environmentally friendly business, recently launched a pilot oyster aquaculture program. YRYH is a full-service 325-slip marina located on Sarah Creek, off the York River in Gloucester County. YRYH entered into the project in close collaboration with the Virginia Institute of Marine Science (VIMS), the Virginia Marina Resource Commission (VMRC), and the Chesapeake Bay Foundation (CBF) as a committment in support of both the Virginia Oyster Heritage Program and the Virginia Clean Marina Program.

Dan Bacot Jr., President of YRYH, incorporated "upwelling" shellfish aquaculture technology into a floating dock for 2-millimeter oyster seed. In July 2001 the cultivation of approximately 1/2 million disease resistant seed oysters began. During the last week of October 2001, 52 five-gallon buckets of oysters in the 1-2 inch range were transferred to oyster reefs built by the Oyster Heritage Reef Program!

This pilot project is providing valuable insight on the feasibility of integrating a commercial aquaculture operation into a marina environment, the level of environmental improvements due to water filtration by the oysters, and design factors which will improve production and cost effectiveness.

"The aquaculture project is an exciting experience! We are impacting the environment in positive ways, educating the boating public, and promoting Virginia's Clean Marina Program with all of its many benefits. The positive relationships we have built with the agencies and organizations that are involved has been a real pleasure. Very rarely is a business able to produce benefits of such variety and magnitude as we are seeing with the development of aquaculture at York River Yacht Haven," states Mr. Bacot.

With the data gathered from this initial venture, York River Yacht Haven will be able to incorporate aquaculture into future remodeling and expansion projects, provide valuable information to all project partners, as well as provide technical assistance to other marinas choosing to develop aquaculture projects.

Shallow Water Use Conflicts

By Laura McKay, Virginia Coastal Program Manager

As our coastal population grows, we are placing more and more demands on our nearshore, shallow waters. Shallow waters provide critical ecological functions and habitats. The reefs and underwater grass beds found there support a variety of finfish, shellfish, marine mammals, sea turtles and birds. We humans use these waters recreationally for swimming, boating, fishing, waterfowl hunting, wildlife watching and viewsheds. We also use them commercially for marinas and all kinds of fishing and aquaculture. As the types and frequency of uses increase, so does the potential for conflicts. How will we decide which use wins? Do we need to begin to (dare we say it?) "zone" the water the way we have zoned the land? Is there some other way that we can ensure that particular uses get the space and the conditions they need?

This is the question the Coastal Program brought to the Virginia Institute of Marine Science back in 1999. Our concern then was the perceived conflict between SAV restoration and clam culturing operations primarily on the Bayside of the Eastern Shore. Our concern has grown to encompass all uses and all coastal waters throughout Virginia. With grants from the Virginia Coastal Program, Dr. Carl Hershner and his staff at VIMS have begun creating a model that will allow us to see where uses could overlap and where conflicts could arise.

In order to build the model, VIMS laid out the following steps to be taken:

1. Identify all of the potential uses
2. Identify environmental conditions required for the uses
3. Map where conditions are appropriate for particular uses
4. Analyze the use conflict areas to determine if one use impacts or precludes the other
5. In areas of potential use conflict, weigh the ecological, social and economic value of each activity
6. Identify the policy options to optimize use of an area
7. Review existing legal and regulatory mechanisms
8. Involve stakeholders in development of a use plan.

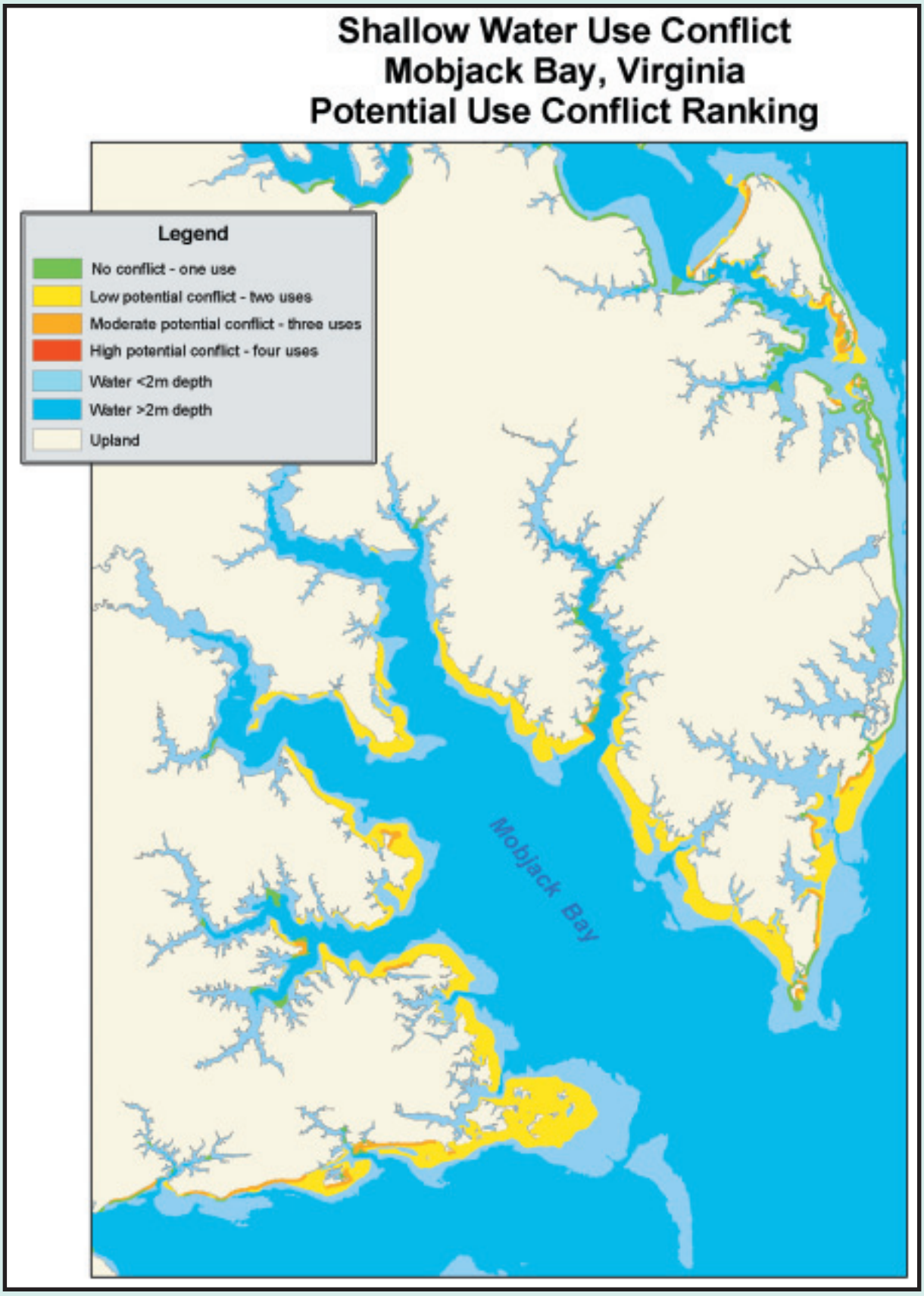
Clam aquaculture farm in Mattawoman Creek, Northampton County. Photo courtesy of VMRC.

This process, of course, is no small feat and there may still be many gaps in our understanding of required environmental conditions and their locations on a map. Nonetheless, we can begin to map some uses such as SAV habitat, good clam culturing areas and important bird foraging areas.

VIMS has already developed charts of required environmental conditions for shellfish aquaculture, fisheries and recreational swimming and boating. They have also produced maps of potential crab scraping areas, public and private shoreline suitable for recreational swimming, SAV potential habitat and suitable areas for recreational boating. The map opposite was developed by overlaying potential crab scraping, swimming, SAV, and recreational boating in Mobjack Bay and then color-coding areas by the number of potential conflicting uses that could occur. Thus we can see that there is, in Mobjack Bay, a fairly large area in yellow where there is low potential use conflict and a very small area in red where there is high potential conflict.

"It was also interesting," noted Carl Hershner, "that within the 532,353 estimated acres of shallow water (less than 2 meters deep) only 87,835 acres were modeled as suitable for the six uses mapped to date which include: oyster aquaculture, clam aquaculture, recreational swimming, crab scraping, SAV habitat and power boating. Furthermore, only crab scraping and SAV habitat occurred in similar areas. " As we continue to fill in the blanks in our model it will quickly become apparent what the spatial magnitude of our conflicts is. It will require our complete Coastal Program network of state agencies and local governments to flesh out this model.

The next step in this effort by VIMS and the Coastal Program will be to work closely with the Marine Resources Commission to enhance the protocol for identification of suitable aquaculture areas. The enhanced protocol will include riparian land use conditions, social factors and economic factors.



Map by Comprehensive Coastal Inventory Program, VIMS

Navigating through a Successful Start

Since the official kick-off of the Virginia Clean Marina Program in January 2001, nineteen marinas along the Virginia coast have pledged to make the changes necessary to reduce pollution and become designated as Virginia Clean Marinas. "All the partners in this effort are excited that Virginia's marina owners have embraced this voluntary program and recognize that their stewardship is critical for lasting environmental protection and the economic viability of their industry," states Jack Frye, Director of the Division of Soil and Water at the Department of Conservation and Recreation (DCR).

The first five marinas to achieve designation status were recognized on November 14, 2001 during the first annual Virginia Clean Marina Program Awards Ceremony held at the Two Rivers Yacht Club in Williamsburg, Virginia. Since then, one other marina was designated bringing the total to six. Each of these marinas received a certificate recognizing their achievement, and can now fly the Virginia Clean Marina flag at their facility.

The first six marinas to achieve designation each came up with different ways to promote a clean environment:

Hampton Public Piers in Hampton *developed written emergency procedures and a training protocol for their staff to reduce the response time needed to react to fires, coastal storms, fuel spills, sinkings, drownings, and other emergencies. They also took steps to educate their customers by including Clean Boating Tip Sheets in their welcome handouts.*

Ginney Point Marina in Cobbs Creek *applied for and received a Stormwater Permit and installed a ditch/trap system to control pollutants from entering the bay as stormwater runoff from its maintenance yard. To further ensure that pollutants do not enter the water, break-away fittings were installed on fuel hoses.*

Two Rivers Yacht Club in Williamsburg *educated their customers in two ways. First, the staff posted a list of recycling stations that allow their patrons an opportunity to recycle while educating them on the items that can be recycled. Second, the marina publicly recognized boats that had successfully completed the voluntary Coast Guard Auxiliary Safe Boating inspection. This inspection helps reduce the likelihood of oil spills or boat sinkings and their environmental impacts.*

Severn River Marina *located a fish cleaning station in a high water flow area in an effort to limit the amount of pollutant buildup (in the form of fish carcasses) in areas of the marina with low water turnover. The staff also installed an aluminum and glass recycling station that is emptied by the staff (there is no county recycling program in this region.)*

Salt Ponds Marina Resort in Hampton *developed a dockhand training manual and training schedule. Each staff member is now required to undergo annual training on fueling, emergencies, pumpout procedures, and other pertinent aspects of their job. After training, the staff member is required to sign a document indicating training content and training date. Furthermore, Salt Ponds Marina printed and prominently posted an environmental policy sign.*

Norfolk Yacht and Country Club *addressed issues at their fueling station, supply room, and their operation center. To help clean up small fuel spills, fuel absorbent pads were supplied to fuel dock attendants. To avoid large spills, break-away fittings were installed in the fuel hoses. An aluminum can recycling bin was installed. Stormwater and Spill Prevention plans were developed and a training schedule was implemented for the maintenance staff and the summer dockhands.*

Environmental Excellence Award Presented

Recipients of the Clean Marina designation also receive recognition as "Environmental Enterprises" (E2) through the Virginia Department of Environmental Quality's Virginia Environmental Excellence Program (VEEP). VEEP promotes the development and use of Environmental Management Systems (EMS) and Pollution Prevention (P2). "An effective EMS can provide benefits to any size facility or operation," stated Harry Gregori, DEQ's Director of Pollution Prevention & Compliance Assistance. "A clean marina with an EMS policy statement has the structure in place to challenge the marina to strive for 'continuous improvements' in environmental performance." DEQ's Ron Pinkoski provides EMS and P2 technical assistance in support of the Clean Marinas program. He can be reached at rjpinkoski@deq.state.va.us or 757-518-2007.

Photo by Harrison Bresee, VIMS.

Many Hands on Deck to Guide Program

Since the Program Launch in January 2001, Harrison Bresee, Virginia's Marina Technical Advisory Specialist has been funded by the Virginia Coastal Program and headquartered at the Virginia Institute of Marine Science Sea Grant Office (VIMS). He has been guiding marinas through the steps necessary to reach Virginia Clean Marina status. Bresee has received direction from the Marina Technical and Environmental Advisory Committee (MTEAC), a group of individuals with a diverse range of experience and expertise in marina related issues. From the outset, MTEAC guided the development of the Program, and in 2000, developed the Virginia Clean Marina Program Guidebook, which contains a wealth of information about preventing and reducing nonpoint source pollution impacts. The Guidebook was released at the launch of the program in January 2001, and a series of workshops were held last spring at various coastal locations to introduce people to the Program.

Represented on MTEAC, and partners with VIMS in establishing the Marina Technical Advisory Program (MTAP), DEQ and DCR recently celebrated approval of the Virginia Coastal Nonpoint Pollution Control Program (CNPCP). The establishment of the Virginia Clean Marina Program and MTAP contributed to the full approval of Virginia's CNPCP. For the past two years, DCR and DEQ have funded the Virginia Clean Marina Program and MTAP through a grant from the National Oceanic and Atmospheric Administration (NOAA) and the Virginia Coastal Program.

Virginia Part of a Regional and National Effort

While the primary focus of the Virginia Clean Marina Program is on working with local businesses and organizations in Virginia's coastal zone, the Program is also involved at a regional and national scale. Efforts are underway to identify opportunities to expand the Program beyond the coastal zone to the rest of the state. This includes working with DCR's Watershed Offices and the Tennessee Valley Authority.

At the regional level, DCR, DEQ and VIMS have been coordinating closely with Maryland, Delaware, Washington, D.C., and the National Park Service, as members of a regional workgroup, to identify and work on common goals concerning water quality in the Chesapeake Bay. Delaware is in the early phase of developing a program and has asked to use Virginia's Clean Marina Program logo. The logo and guidelines for its use by designated marinas were provided to the regional work group. Virginia's logo guidelines were recently adopted by both Maryland and Delaware.

The Department of Conservation and Recreation has also been promoting Clean Marina program activities at the national level. Virginia staff work with other coastal entities such as Connecticut, Guam, American Samoa, and Washington to develop clean marina programs, and have conducted a national survey of existing clean marina and boater education programs that sampled eleven states. Results of the survey show: 1) 8 states, the National Park Service & the Tennessee Valley Authority have established programs, 2) 6 states are considering developing a program, 3) 3 regional efforts are in place, and 4) the average annual cost applied to these efforts is approximately $87,000. DCR staff recently convened a meeting in Maryland with NOAA (Coastal Programs Division & Sea Grant), EPA, Boat U.S., Marine Environmental Education Foundation, Ocean Conservancy, and two consultants to discuss and begin evaluating how a more focused national effort would support and promote clean marina and boater education programs.

For additional information about the Virginia Clean Marina Program and these regional and national efforts, contact Mark Slauter at (804) 692-0839 or mslauter@dcr.state.va.us, Julie Bixby at (804) 698-4333 or jabixby@deq.state.va.us, or Harrison Bresee at (804) 684-7768 or hpbiii@vims.edu

More information is also available on-line at www.deq.state.va.us/vacleanmarina or www.vims.edu/adv/vamarina/index.html

Mark Slauter, Virginia Department of Conservation and Recreation and Harrison Bresee, Virginia Marina Technical Advisory Specialist contributed to this article.

Message of Support From A Marina Operator...

Pete Hall, President, The Tidewater Marine Trade Association and member of the Virginia MTEAC (Marina Technical and Environmental Advisory Committee).

Recently I was asked to elaborate on the benefits of being designated a Virginia Clean Marina. Many marina operators who have not yet signed on to work toward earning the Virginia Clean Marina designation ask, "What's in it for me?"

The main thrust of the Clean Marina Program is to promote environmental awareness and encourage marinas and boaters to become stewards of Virginia's waterways. We all know that marinas don't wantonly pollute the environment, yet people point a finger at us in any discussion of water pollution because they have the impression that marinas and boats are the cause.

Becoming a certified Virginia Clean Marina is one way to let the boating public know that you are committed to improving and maintaining water quality in the Chesapeake Bay. The boating public is becoming more and more environmentally conscious and looks to patronize marinas that share their views. Aside from the environmental benefits, the implementation of best management practices leading to Virginia Clean Marina designation will most assuredly mean increased business and economic growth for the marina industry. We as marina operators have been given the opportunity to avoid more government regulations by voluntarily adopting and implementing best management practices and common sense approaches to improving and maintaining water quality and living resources.

I liken the Virginia Clean Marina designation to the "star" rating system used for hotels. Boaters will come to look for the facilities that have been awarded the Virginia Clean Marina designation because they'll know they can expect certain things when they go there.

As President of the Tidewater Marine Trade Association of Virginia, I serve on the Marina Technical and Environmental Advisory Committee that developed the Clean Marina Guidebook. TMTA has supported the Virginia Clean Marina Program from its inception and will continue to do so through the programs presented at our monthly dinner meetings, articles in the TMTA News, and the sponsorship of seminars promoting the Virginia Clean Marina Program.

For additional information about TMTA or our participation in the Virginia Clean Marina Program contact me at tmta@inna.net.

From Spoils to Habitat

In coastal areas of Virginia, especially along the Virginia Inside Passage, shipping lanes were kept navigable into the late 1970's by placing dredged materials on existing marsh. Relative to the previous marsh ecosystem, these dredged material sites, or "spoil sites", are of little value to wildlife. In recent years, many of these inactive dredge sites have also become covered with dense, nearly monospecific stands of *Phragmites australis*.

Phragmites australis, or common reed, is a wetland grass found throughout Virginia. It is particularly abundant in the eastern regions of the United States, where it has rapidly colonized disturbed coastal areas. According to the Natural Heritage Program at the Virginia Department of Conservation and Recreation, it is strongly suspected that a non-native, aggressive strain of the species was carried to North America in the early 20th century. A recent study by Yale University has identified a native and non-native genotype of *Phragmites*, and distinguishing between the two strains in the field will be a future focus. It is surmised that this non-native aggressive strain, like most invasive species, is what continues to grow, reproduce, and spread quickly, out-competing other species.

Very difficult to control or eliminate, *Phragmites* dominated stands threaten more diverse, productive coastal habitats. "*Phragmites* is a serious threat to the pristine and best examples of tidal marsh communities in eastern Virginia," states Thomas Smith, Director of the Natural Heritage Program at the Department of Conservation and Recreation. In addition, survey work by the Virginia Institute of Marine Science shows that Phragmites colonization of constructed wetlands is a serious resource management concern.

This article focuses on a reclamation effort at two dredge spoil sites in Swash Bay, east of Wachapreague, on the seaside of Virginia's eastern shore. "The Swash Bay project is an excellent example of interagency cooperation and a combined interest and expertise to achieve a common goal – reclamation of native coastal habitat," states Dr. Donald Young, Professor of Biology at Virginia Commonwealth University (VCU) and Project Co-Director. "Without aggressive efforts to reclaim our native coastal habitats and "revegetate" disturbed areas like inactive dredge spoil sites, a *Phragmites* dominated community can persist indefinitely." Dr. Young and his team from VCU, along with Co-Director Barry Truitt with the Virginia Chapter of The Nature Conservancy, coordinated this effort with numerous state and federal agencies, including the Virginia Coastal Program and its agencies - the Department of Environmental Quality, the Department of Conservation and Recreation, the Department of Transportation, and the Department of Forestry - as well as, the Army Corps of Engineers and U.S. Fish and Wildlife Service. "Monitoring the success of the planted stock and the natural colonization of native species at both dredge spoil sites will aid in future reclamation efforts in coastal areas of Virginia," Dr. Young explains.

Prior to revegetating the two Swash Bay spoil sites, substantial site preparation was needed. The spoil piles were first treated with herbicide ("Rodeo", a short-lived herbicide) in an initial effort to eradicate, if not all, then a good portion of the dominating *Phragmites* population. This was done with support from the US Fish and Wildlife Service in the Fall of 1995. In May of 1996, the Division of Natural Heritage at the Virginia Department of Conservation and Recreation supervised a controlled burn of standing dead material on the spoils. The Army Corps of Engineers then graded the spoil materials at the two sites in 1996 and 1998 to approximate natural land forms that blended with surrounding salt marsh. The Virginia Department of Transportation allocated funds to revegetate the tidal influenced components of the graded spoil piles to develop functional salt marshes and wetlands.

The Virginia Coastal Program provided funds for revegetation of the two sites, the 9-acre "south site" in 1997 and the "6-acre "north site" in 1999, as well as initial monitoring of the upland portion of the South site during the summer of 1998. Native warm season grasses, trees and shrubs were planted to provide wildlife habitat, especially for migrating songbirds. Warm season panic grasses (*Panicum amarum* and *P. virgatum*) were planted in June. Trees and shrubs were planted in late autumn and during the winter. Wax myrtle (*Myrica cerifera*), bayberry (*M. pensylvanica*), silver leaf (*Baccharis halimifolia*), marsh elder (*Iva frutescens*), loblolly

1: Eastern red cedar, *Juniperus virginiana*
2: Southern wax myrtle, *Myrica cerifera*; Northern bayberry, *Myrica pensylvanica*

Photos by Virginia Witmer.

3: high tide bush, *Baccaris halimifolia*; warm season grasses

4: Swash Bay landscape, including native grasses *Spartina patens* and *Spartina alterniflora*.

Photos by Virginia Witmer.

pine (*Pinus taeda*) and eastern red cedar (*Juniperus virginiana*) were chosen because they are beneficial to wildlife and well-adapted natives of Virginia, especially along the Eastern Shore.

Although all species selected are considered to be hardy in coastal environments, the success of a revegetation effort like that at Swash Bay depends on physical and biological factors, which can affect the plants before they become established. Tidal surges from winter storms are exceptionally high, and spring tides may inundate low-lying areas of regraded sites, exposing the planted trees and shrubs to high salinity or burying them in deposits of tidal wrack. Soil erosion also occurs in these dynamic environments. During the summer months, extended droughts often kill the plants. The trees and shrubs may also be eaten by small mammals (e.g. rice rats) and deer. Additionally, *Phragmites* may deplete the soil of nutrients and water, leading to decreased growth and mortality of the adjacent native plants.

…the work at Swash Bay to date shows that planted stock may coexist with *Phragmites*, and that successful revegetation of dredged spoil sites is possible…

"The next step after planting the Swash Bay sites was to monitor the revegetated areas to evaluate success. Patterns of reduced growth and mortality were identified for all species and linked to key physical and biological factors. Furthermore, the two sites, which differ in time since planting, were compared to assess survivorship of the plants and natural colonization," explains Dr. Young.

To achieve this, the vegetation restored in the two upland sites was monitored through a combination of established plots and visual surveys. Through a network of sampling plots, plant mortality patterns and natural colonization by plant species could be related to patches of re-occurring *Phragmites* and soil/environmental factors.

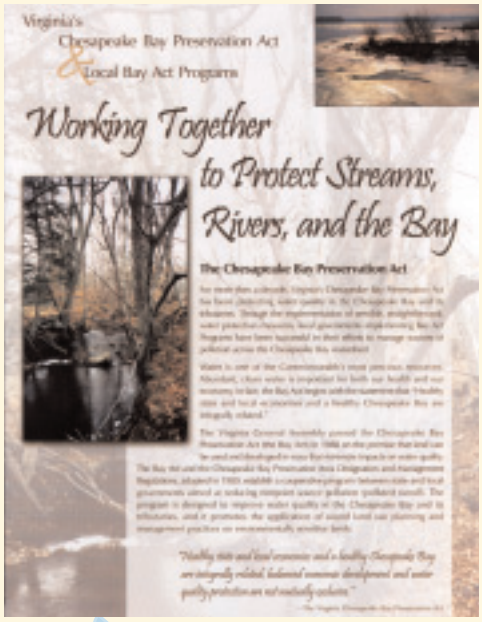
Thirty circular plots (3 m radius: ~28 m^2) were established at each site in late May, 2001. The plots were positioned to include a range of elevations and exposures. Each woody species was included in at least 10 of the plots at each site. The plots were examined in July and September 2001 to determine woody plant mortality, damage from mammal browsing, presence and percent cover of *Phragmites*, native species that naturally invade, and presence and percent cover of warm season grasses. Presence, percent cover and depth of tidal debris were also quantified for each plot. Soil samples were collected from the center of each plot and tested for chlorides (i.e. salinity).

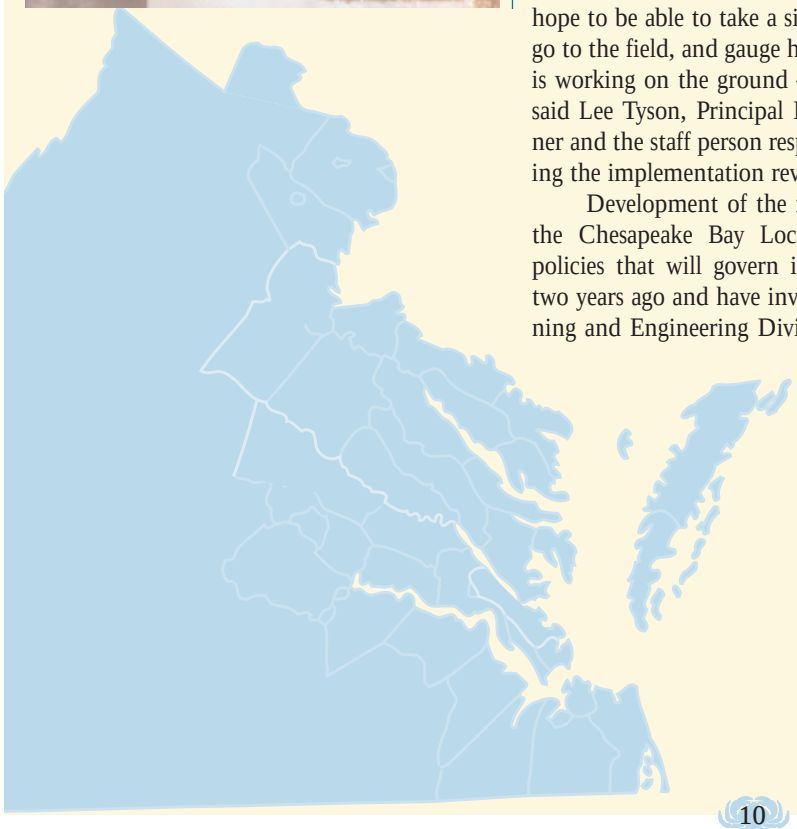
Most mortality occurred within the first year of planting. At the north site, flooding caused the greatest loss of planted stock whereas at the south site, most mortality was due to mowing or spraying of herbicide to control *Phragmites*. Mortality was not directly related to the presence of *Phragmites* at either site. "What is exciting for the partners in this project is that, based on three years of study at the south site, it appears that the planted stock may be capable of competing with the *Phragmites* that has persisted at both sites," explains Dr. Young. Establishment of woody species prior to removal of *Phragmites* may have been difficult due to the high density of *Phragmites*. According to Dr. Young, preliminary data collected prior to any site treatments showed greater species richness on the north site. The original *Phragmites* stand

Habitat from Spoils… *Continued on page 16*

Bay Act Implementation: Working with communities for a better Bay

The Chesapeake Bay Local Assistance Department is in the final stages of developing and testing a protocol to evaluate local government implementation of the Chesapeake Bay Act in 84 Tidewater Virginia localities.





"This has been a long time coming," said Martha Little, Chief of Environmental Planning. "The Department has examined program implementation in several forms over the years, but has never put together a way of comprehensively looking at each locality's day-to-day implementation of the Regulations." Such an examination is particularly appropriate now that the Act and its Regulations have been in effect for more than 10 years. The recent incorporation of the Bay Act into the Virginia Coastal Program also makes it timely.

This review of Chesapeake Bay Act implementation will be conducted by a staff planner, who will evaluate local programs in a number of areas, including: local Chesapeake Bay Preservation ordinances and mapping; policies and procedures related to the Resource Protection Area criteria set forth in the regulations; level of development activity occurring; program staff levels and administration; and, enforcement activities, such as the numbers of reported or investigated violations and complaints.

Staff members will also conduct site plan reviews and site visits on a wide range of development sites. The types of sites to be visited include single family dwellings, commercial and industrial projects, redevelopment sites, nonconforming lots and structures that have undergone redevelopment, water dependent facilities and shoreline erosion control projects. "We hope to be able to take a site plan for a project, go to the field, and gauge how well the program is working on the ground – in the real world," said Lee Tyson, Principal Environmental Planner and the staff person responsible for developing the implementation review mechanism.

Development of the review protocol, and the Chesapeake Bay Local Assistance Board policies that will govern its use, began nearly two years ago and have involved both the Planning and Engineering Divisions of the Agency, as well as local government practitioners. "It was very important to the Agency that we get input from the local government staff that are responsible for the day-to-day implementation of the Bay Act," said Little. "These are the people that are most directly responsible for seeing to it that the Act and Regulations are translated to real-world activities."

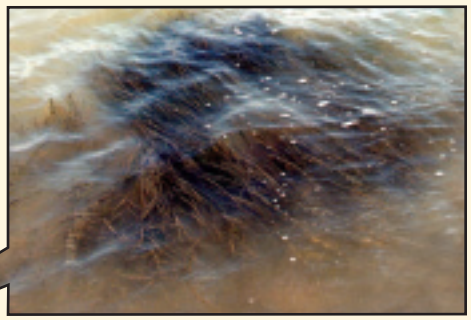
The staff of the Department tested the implementation review mechanism, at least in part, on two Hampton Roads localities and has used each of these test-runs to refine the practice. The Chesapeake Bay Local Assistance Board was impressed with the level of detail and information generated by the first of these test cases. The agency's eight locality liaisons are each expected to complete three or four evaluations a year. "I believe that the Department and the localities will both benefit greatly from seeing just what's been going on in Tidewater since the adoption of the Act," added Little.

Final review and approval of the program will rest with the Chesapeake Bay Local Assistance Board. For more information about this review program, please contact Martha Little at (804) 371-7504 or mlittle@cblad.state.va.us, or Lee Tyson at (804) 371-7500. More information on the Chesapeake Bay Local Assistance Department and its mission can be found at http://www.cblad.state.va.us.

Protecting Seagrass Beds in Virginia's Chincoteague Bay

Seagrass and other submerged aquatic vegetation (SAV) habitats contribute to many ecological functions, including sediment stabilization, nutrient transformation, primary production and feeding and nursery habitat for both recreationally and commercially important fish and shellfish. However, since the late 1960s and early 1970s, human activities worldwide have threatened these habitat areas. Increased coastal development, leading to high nutrient and sediment inputs, has altered water quality, which is a critical component in supporting healthy seagrass populations. In addition, concerns have been raised about the potential impact of various commercial fishing activities on seagrass beds.

Annual aerial surveys of seagrass beds in Chincoteague Bay, initiated in 1986 and



SAV, submerged aquatic vegetation. (above) Photo by Virginia Witmer. New SAV marker in Chincoteague Bay. (left) Photo Mark Luckenbach, VIMS.

supported in part by Virginia's Coastal Program, showed a remarkable increase in seagrass coverage from 2,100 ha in 1986 to 5,855 ha in 2000. However, in 1997 severe damage to the grass beds was noted and attributed to a type of hard clam fishing gear: modified oyster dredges. These oyster dredges were pulled by boats in these shallow grass flats in a circular fashion uprooting seagrass and creating large circular areas of unvegetated bottom, with some having diameters reaching 85 meters. Scarring increased from 10 scars in 1995 to 218 new scars in 1997. See photo.

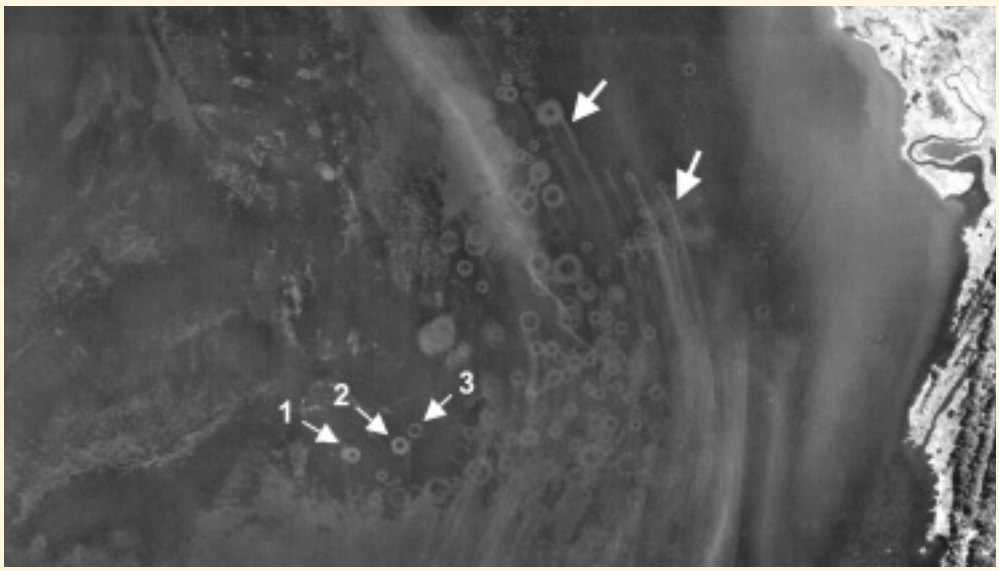
In October 1997, results on the intensity and extent of clam dredge scarring were conveyed to the Virginia Marine Resources Commission, which manages the Virginia coastal bays. Within a few weeks, the Commission added this issue to its monthly meeting, at which the public (including watermen) commented on the issue, expressed their concerns, and evaluated three alternatives for delineation of a protection zone that would prohibit dredging in seagrass beds in Chincoteague Bay. The result was regulation §4-VAC 20-1010 et seq. making it "unlawful for any person to use or have overboard any dredge in any areas of submerged aquatic vegetation or within 200 m of any areas of submerged aquatic vegetation, within those waters of Chincoteague Bay and Assateague Channel and Bay…" This protection zone went into effect on January 31, 1998, approximately three months after the Commission was first notified of the scarring. The Virginia seagrass protection zone was not delineated by markers in the field.

The Virginia protection zone in Chincoteague Bay was put into effect mid-way through the 1997-1998 clamming season. After that season, the 1998 photography (taken in July) revealed 13 new and discrete scars, which may have occurred before the regulation went into effect. Analysis of the recovery of scarring, again supported by a grant from Virginia's Coastal Program, showed that some scars require more than three years to revegetate to undisturbed levels. However, in the 1998-1999 season, an additional 9 scars were visible (compared to 218 new scars in 1997) and an additional 97 scars were visible in 2000. These scars were clear violations of the protection zone, yet legal prosecution was hindered by the fact that the zones were not physically marked with buoys or stakes.

As a result of the violations, and following a series of meetings between managers, scientists, and watermen, a new regulation (4 VAC 20-70-10 seq.) was approved in October 2001, superceding the older one. This regulation authorized the placement of distinct marker posts that with existing aids to navigation outlined a revised SAV protection zone for Virginia coastal bays, using straight lines instead of buffers. This updated zone encompasses 4,869 ha of bottom area, and was designed so that the protected areas were clearly defined. In the Virginia portion of Chincoteague Bay, the new zone protected 46% of the bay bottom. The markers, which had an identified symbol (SAV) denoting the restricted area, and paid for by a grant from Virginia's Coastal Program, were installed before the beginning of the December 2001 clamming season.

"Virginia's Coastal Program has been instrumental in seagrass protection in Virginia," states Dr. Robert Orth, Virginia Institute of Marine Science Biology Professor and well-known seagrass expert. "The Program's support has enabled seagrass restoration efforts for many years including monitoring the changes in seagrass distribution, identifying the damages to seagrass and it's recovery pattern, and finally, markers for the protected areas making it easier for law enforcement to manage the area."

For more information contact Dr. Robert Orth at (804) 684-7392; e-mail: jjorth@vims.edu



Aerial photography showing dredge scars in seagrass beds in Chincoteague Bay. The numbers point to some of the scars, while arrows point to sediment plumes caused by rays digging for clams in the scars. Photo courtesy of VIMS.

Understanding the Crab Behind the Controversy

Editor's Note: The following is part one of a two part series examining one of the most recognized icons of the Chesapeake Bay, the blue crab. Although the blue crab is a well-known figure, for some it remains one of the most mysterious creatures in the Bay. We've asked Dr. Rom Lipcious and his collegues at the Virginia Institute of Marine Science to summarize the blue crab's lifecycle, one of nature's most unique. Understanding the complicated lifecycle and environmental needs of the blue crab is critcal to successful long-term management of a sustainable fishery. In the next issue of *Virginia Coastal Management*, we will review the status of blue crab fishery management in Virginia.

The Blue Crab

by Rom Lipcius, Jacques Van Montfrons and Vicki Clark, VIMS

The blue crab's life cycle consists of five major phases. These phases include (i) a *larval phase* composed of 7-8 stages (zoeae) that are initially transported as hatchlings from the mouth of the bay to continental shelf waters, where they live for about one month; (ii) a *postlarval phase* consisting of a single megalopal stage that reinvades the bay's nursery grounds after larval development on the shelf; (iii) an *early juvenile phase* comprising about 7-10 stages (instars) that live predominantly in shallow structured or vegetated habitats (e.g., seagrass beds, marshes, oyster reefs); (iv) a *later juvenile phase* composed of another 7-10 stages that expands its habitable area into unvegetated habitats (e.g., mud and sand flats); and finally, (v) the *adult phase*, which is attained upon reaching sexual maturity.

The blue crab's activity begins in early spring, when the waters of the Chesapeake Bay warm and the crabs stir from their dormant state. All winter, the females have remained on the bottom of the Bay, most of them in the deepest water. The mature males have been buried in the sediments of the estuaries, and the juveniles have sheltered in shallow-water habitats. During this time, the crabs have not eaten or ventured far from their resting place. With the arrival of spring and warmer water temperatures, the male and female crabs begin to move away from their wintering grounds to look for food or seek out a mate.

Mating: A Once in a Lifetime Opportunity

Male and female crabs mate in the greatest numbers from spring to summer in the mid-salinity areas of the Chesapeake Bay and its tributaries. When a mature male, called a "jimmy," encounters a female that is about to molt to sexual maturity, the male performs a courtship dance. He stands high on the tips of his walking legs, waves his claws, and fans pheromones contained in his urine towards the female with his swimming paddles. If the female accepts his advances, she backs toward him. The male grasps the female with his first pair of walking legs and cradles her underneath his body. In this position, the mated pair is called a "doubler" or a "buck and rider." This embrace not only facilitates mating, but it also protects the female from predators and the paternity of the progeny. While being cradled by the male, the female will shed her hard outer shell, remaining soft and vulnerable for several hours. This *terminal molt* marks the female's transition into sexual maturity, and is usually the last time she will shed.

Adult blue crab consuming soft shell clam. Photo by Rom Lipcius, VIMS.

Immediately after she emerges from her hard shell, the female turns upside down so that their abdomens are touching. The female extends her hinged abdomen, exposing two *genital pores*. The male inserts his *gonopods* into the genital pores, transferring seminal fluid containing sperm in microscopic packets called *spermatophores* to the female. Each spermatophore contains several thousand sperm cells. The sperm packets are stored inside the female in sacs known as *spermathecae*. These sperm are believed to be viable for as long as the female lives. Although a female will mate only once, she may produce many fertilized egg masses during her lifetime from this single mating. Fertilization occurs each time a new egg mass is produced by the ovaries until the sperm reserves are depleted. Studies in Florida found that some female crabs produce as many as seven broods (sponges) in one year from a single mating, and up to 18 broods over 2 – 2 1/2 years. Chesapeake female crabs are capable of producing multiple egg masses over several years, though most will not produce more than one or a few masses due to their short average life span in Chesapeake Bay, typically 1 – 2 years.

The amount of sperm that a male crab transfers to a female during mating depends on both the size of the male crab and its mating history. Large males can produce larger amounts of sperm than their smaller counterparts. Regardless of their size, males that mate frequently will transfer less sperm to each individual female than males that mate less often. A large male can fully recharge his sperm stores in about 10 – 20 days. For the females, larger size at maturity can result in larger egg masses that yield more larvae. *Conserving healthy numbers of mature females and large males in the Chesapeake Bay is important to protecting the overall reproductive potential of the entire blue crab population.*

Migration: A Critical Journey

After mating, the male blue crab remains in the middle to upper Bay or its tributaries and continues to mate with other

females. The mature, inseminated female crab, now called a *sook*, leaves the male and moves toward higher salinity waters near the mouth of the Chesapeake Bay. In Maryland, females migrate south primarily during October whereas in Virginia waters, migration takes place following the spring "peeler run" after mating as well as in the fall. As she migrates, her ovaries produce eggs that are eventually fertilized by the stored sperm and transferred to the *pleopods*, which are hairy, leg-like structures located underneath her abdomen. This egg mass, the *sponge*, may contain from 750,000 to as many as 8 million eggs, depending on the size of the female crab. But even in the best conditions, it is thought that only a tiny fraction of these eggs will result in a mature adult. At first the sponge is a bright orange color, reflecting the amount of rich yolk in each egg. As the tiny larval crabs inside the eggs grow, they gradually absorb the yolk; the color of the sponge changes from orange to light brown, and finally to dark-brown or black. The color change occurs as the larvae use up the orange yolk, while at the same time two large black eyes develop on the sides of each larva's head. The larvae take about two weeks to develop inside the egg. During that time, the female completes her migration toward the mouth of the Chesapeake Bay. *This migration to higher salinity waters near the Atlantic Ocean reflects the blue crab's tropical marine origins and is critical for successful development of the larvae*. The eggs generally must hatch in water that is between 19 and 29 degrees Celsius (66 - 84 degrees Fahrenheit) with a salinity of 23 to 35 parts per thousand. (Open ocean water averages 35 parts per thousand.)

The Life History Stages of the Blue Crab, *Callinectes sapidus*

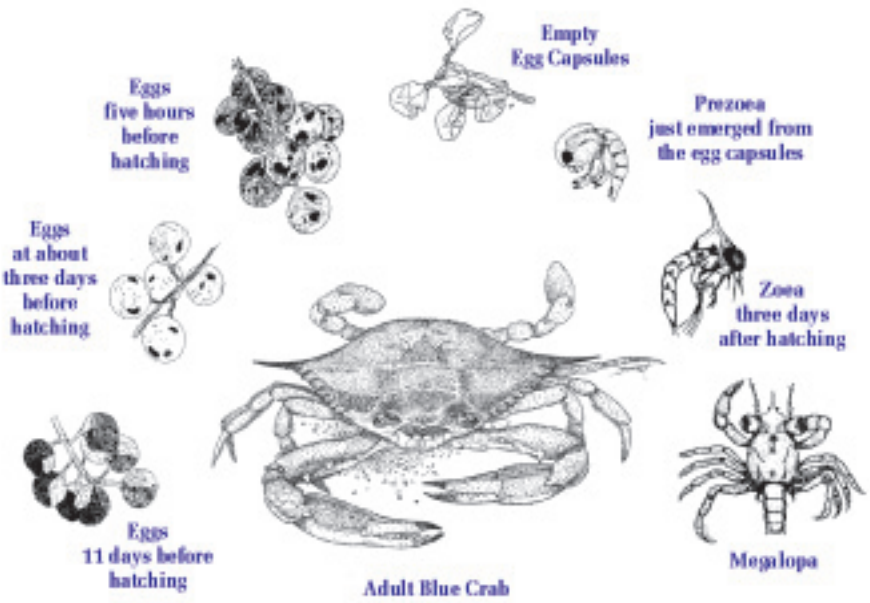


Illustration courtesy of VIMS.

Birth: From Microscopic Larvae to Tiny "First Crab"

The larval crabs, called zoeae, are microscopic in size and have an elongated shape, more like that of a shrimp than a crab. The eggs hatch during an ebb tide, and the tiny zoeae are swept from the mouth of the Chesapeake to the plankton-rich waters of the Atlantic Ocean's inner continental shelf. Here the zoeae drift with the currents, feed on smaller zooplankton, and grow rapidly, molting seven to eight times. After its final molt, the zoea undergoes a dramatic metamorphosis and takes on a more crab-like shape—the postlarva or *megalopa*. Megalopae are only about 1 millimeter wide (about the diameter of a paper clip wire), but they are strong swimmers and can cling to floating debris or walk on the bottom.

During their time in the ocean, usually about 1 – 1½ months depending on salinity and temperature, larval crabs are at the mercy of coastal currents, winds, and predators. *The postlarvae are subsequently transported by currents, tides, and their own movements back into Chesapeake Bay, where they seek suitable nursery grounds.* The invasion of megalopae into the estuaries is called *recruitment*, and occurs primarily at night during flood tides near the full or new moon in late summer and early fall.

Megalopae find their way to seagrass beds or other structured habitats that will provide food and shelter by currents and a variety of chemical cues. Here the megalopae settle onto the bottom, and molt into the "first crab" stage. A first crab has the basic shape of an adult blue crab, but the first crab's shell is only about 2.5 millimeters (0.1 inches) from point to point. These juvenile crabs may molt 18 to 20 more times over 14 to 18 months before becoming mature adults.

Molting: A Critical Moment in Time

Growth for blue crabs is not a simple matter. Like most arthropods, crabs have a tough outer shell called an *exoskeleton*, which provides protection from predators and the environment. When all the available space within the exoskeleton fills with tissue, the crab must shed its shell to expand in size. This process is called molting, or ecdysis. Just before molting, the crab's new skin begins to separate from the inner surface of the old exoskeleton. This can be seen as a white line on some body parts, especially around the paddle on the swimming legs. As the crab nears the point of molting, the white line turns pink, and then red. These color signs are cues to harvesters that the crab will molt in a few days or even a few hours. The crab may be harvested and held until it sheds, to be sold live on the soft crab market.

A molting crab is very vulnerable to predators, especially in the soft-shell stage when it cannot walk, swim, or use its claws. When it is time to molt, a crab seeks shelter such as a seagrass bed, a marsh edge, a submerged tree stump, or a depression in the bottom sediment. Molting begins when the top and bottom halves of the shell separate along the sides and in back between the swimming legs. The crab slowly backs out of the old shell, emerging with a soft, elastic new shell. As the crab's body absorbs water, the new shell rapidly expands. After several hours, the new shell becomes tough and leathery, and in a few days, the shell will be completely hard. The time it takes for the shell to harden depends primarily on

The Blue Crab… *Continued on page 14*

There's a Catch to this Dedication: Great Wicomico Public Fishing Pier

What would make a public fishing pier dedication complete? How about a 2-pound croaker within the first 15 minutes of the ceremony! Last September, this catch was the first of what the county hopes will be many memorable moments for visitors to the new 60 foot Great Wicomico Public Fishing Pier in Northumberland County. Located on the Potomac River at Glebe Point, it is the county's first public fishing pier. The opening of this much needed public access site attracted approximately 100 people, including every member of the Northumberland County Board of Supervisors and County Planning Commission, as well as Senator John H. Chichester, Delegate Albert C. Pollard, Jr. and Virginia Marine Resources Commissioner William A. Pruitt.

Construction of the pier began in July 2001 after careful consideration of its location. At the request of the county, the Northern Neck Planning District Commission (NNPDC), using a grant from the Virginia Coastal Program, evaluated three potential access sites for the pier by modifying the criteria used by the Virginia Marine Resources Commission to site marinas. Glebe Point was chosen and the Virginia Department of Transportation deeded the land to the county. The planning district commission then assisted the county in applying for a grant from the Virginia Coastal Program to construct the fishing pier and leveraged these funds to secure additional funds from the Recreational Saltwater Fishing Development Fund.

Photos by Robin Markham, NNPDC and Roger Mason, Jr., Rappahannock Record (inset photo).

To visit the new pier *from Richmond*, take US 360 to Burgess, and then take a right onto State Route 200 heading south towards Kilmarnock. Cross over the Great Wicomico River and take a right immediately after crossing the bridge to the access road that leads to the Great Wicomico River Fishing Pier. *To visit the pier from Kilmarnock*, take State Route 200 heading North towards Burgess, go past Wicomico Church and take the access road to the left before crossing the Great Wicomico River Bridge on Route 200.

The pier is handicapped accessible. Two picnic tables, a paved parking area and a portable bathroom facility enhance the utility of the pier, which is open from sunrise to sunset. Reports indicate that visitors, hoping for that next big catch, can be found fishing throughout the day. For more information on this project, please contact Stuart McKenzie of Northern Neck PDC at (804) 333-1900.

The Blue Crab… *Continued from page 13*

the temperature and salinity of the water. Crabs tend to harden faster in warmer, less saline water, and generally do not shed at water temperatures less than 18-19 degrees C. Young juvenile crabs molt as often as every three to eleven days; larger juveniles and adults molt every few months.

Blue crabs often lose an appendage due to encounters with predators or during competition with other crabs for food or mates. These lost limbs can regenerate during successive molts. Following the loss of a limb, a new one begins to grow as a small, fleshy *limb bud*. The limb bud produces an entirely regenerated limb, though considerably smaller in size than normal, after the next molt. After two successive molts, the regenerated limb approaches the size it would have been had it not been lost.

Seagrass Beds: A Critical Environment

Studies have shown that densities of juvenile crabs are about ten times higher in seagrass beds than in nearby unvegetated areas. In the absence of grassbeds, juveniles inhabit oyster reefs, coarse woody debris, clumps of algae, other areas with complex structure and marsh creeks. As the juveniles grow, they move farther up into the marshes, rivers, and tidal creeks. Juvenile crabs begin to arrive in Maryland waters late in the fall, when they reach about 25 mm or more in width. Grassbeds continue to be important to blue crabs throughout their life cycle, however, as shelter from predators during molting and mating and as a feeding area. After about one year, the juveniles approach maturity, and the life cycle begins anew as the newly matured crabs seek a mate to complete the reproductive cycle.

In the next issue of the *Virginia Coastal Management*, we will review the status of blue crab fishery management in Virginia.

Reef Construction… *Continued from page 3*

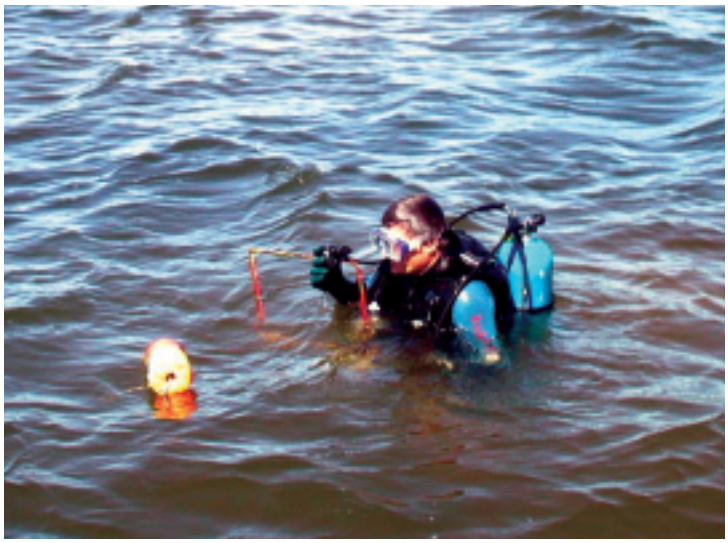
the National Oceanic and Atmospheric Administration will support a substantial portion of the Phase II work through a $955,000 grant to the Virginia Oyster Reef Heritage Foundation.

The Virginia Oyster Reef Heritage Foundation, formed to accept donations to Virginia's oyster reef restoration effort, has raised over $385,000 to date. A portion of the monies raised by the foundation will be used to match a challenge grant from the Virginia Environmental Endowment, which will pay for new monitoring and educational initiatives in the coming year.

The Next Big Step - Monitoring

Virginia's environment has suffered tremendously through a third year of low rainfall and drought conditions. This drought has further impeded restoration of Virginia's remaining wild oyster population. Low rainfall means higher salinity levels in the Bay and its tributaries. For the oyster, higher salinity means higher disease levels and mortality. It is important to note that even in a low disease year, Virginia's population of broodstock oysters is in such short supply that efforts at restoring our native oyster population are at best a very gradual and slow process. Development of natural disease resistance will take time. So how do we give the oyster the best head start we can?

"Monitoring is critical to the success of our reef restoration effort and is an important element of the Virginia Oyster Heritage Program," explains Dr. Wesson. Dive surveys conducted by Dr.



Jim Wesson of the Virginia Marine Resources Commission conducting a dive survey of a VOHP sanctuary reef to determine spat settlement, oyster size and productivity. Photo by Allen Godshall, VMRC.

Wesson and MRC on VOHP reefs in the Rappahannock, as well as on the seaside, show a promising start. "All nine reefs in the Rappahannock River received excellent spatset in 2001 and have significant populations of oysters," continues Wesson. Oyster larvae need a clean hard substrate on which to settle, and the restored reefs provide just that.

"We have already documented, in numerous places, 10-fold increases in spat abundance where substrate has been provided," observes Dr. Mark Luckenbach, Associate Director of the Virginia Institute of Marine Science Eastern Shore Laboratory. "However," stresses Luckenbach, "early post settlement mortality rates can be high from one reef to the next." Why? What makes one reef more productive than another? Numerous biological and physical factors will affect not only whether oyster larvae settle on a reef, e.g. type, condition and quality of substrate, but also whether spat survive and grow to adulthood, e.g. presence of disease and predators, as well as water quality conditions.

Phase I of the VOHP has set the stage for a comprehensive on-the-ground monitoring plan. The first reefs constructed by the VOHP will serve as an outdoor laboratory. Wesson, Luckenbach and others have already begun conducting targeted monitoring activities. Over the past year, with funds from Virginia Sea Grant, Dr. Luckenbach has been studying VOHP reefs in the Rappahannock to determine how size, shape and location effects the productivity of the reef, both for oysters and the other animals using the reef's habitat. "We have already observed how critical it is for an oyster reef to have a sustained population of live adult oysters to remain stable," explains Dr. Wesson. This exterior layer of live adult oysters naturally protects the interior layers of old shell. We need high spat settlement to ensure a sufficient number of spat survive to adulthood and in turn protect and stabilize constructed reefs." Reefs without live oysters are more susceptible to degradation from organisms such as boring sponges, which can pulverize the empty shells.

Over the coming months, the VOHP partnership will continue to watch the reefs carefully. "We are hopeful that our monitoring efforts will guide us toward an adaptive management strategy that can eventually overcome the devastating effects of oyster disease and overharvesting," concludes Laura McKay, Virginia Coastal Program Manager at DEQ, key partner in the VOHP effort.

For more information about the Virginia Oyster Heritage Program, please call Laura McKay, Coastal Program Manager at (804) 698-4323, or James Wesson, Virginia Marine Resources Commission at (757) 247-2121.

Omar of the Reef, a.k.a. Ben Gross, makes an appearance at the Virginia Oyster Heritage Program exhibit during the Science Museum of Virginia's annual Bay Days celebration, March 9-10, 2002. Photo by Virginia Witmer.

Habitat from Spoils… *Continued from page 9*

was less dense and the north site was more subject to disturbance from flooding due to the low profile of the landscape. "Shrub establishment was facilitated within the *Phragmites* dominated habitat at this site. Some woody species may be capable of competing with *Phragmites* if seedlings can avoid the environmental stresses (e.g. light and soil moisture) associated with a mature *Phragmites* canopy," explains Dr. Young. Work on constructed wetlands by the Virginia Institute of Marine Science has also shown that woody species can outcompete *Phragmites* in some areas.

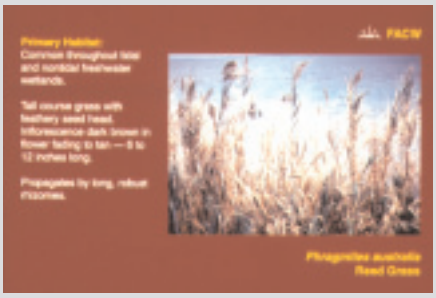
Based on four years of study at the south site and two years at the north site, it appears as if all shrub and tree species may survive on the graded dredged materials. According to Dr. Young, it is impossible to determine the extent to which *Phragmites* will reinvade or expand in cover and density at these sites. However, observations on the barrier islands as well as along the marshes of the Eastern Shore mainland indicate that established shrubs coexist with *Phragmites*. "Success of planted stock may be more closely related to planting within the range of salinity tolerance for each species, than to the abundance of *Phragmites* or the presence of wrack," concludes Young. "The planting schemes and species for both sites differed due to site differences in landscape. Perhaps most important for future revegetation projects is to ensure that planting schemes are not generic but instead are related to potential spatial/temporal variations in environmental parameters at individual sites."

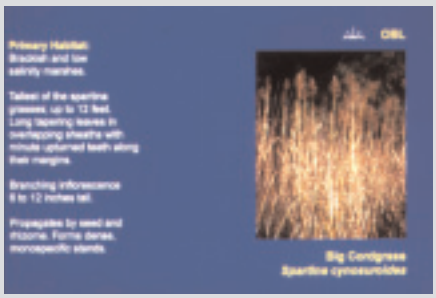
Despite a very intensive effort to eliminate *Phragmites* at both dredged materials placement sites in Swash Bay, it remains as one of the most abundant species. It may not be possible to eliminate this weedy grass from sites where it is heavily established. However, the work at Swash Bay to date shows that planted stock may coexist with *Phragmites*, and that successful revegetation of dredged spoil sites is possible provided these sites are first graded to approximate a natural landscape and preexisting *Phragmites* is aggressively managed. "To further assist with development of management plans and revegetation projects, it is recommended that both Swash Bay sites be sampled again in about three years; that would be four years post planting on the north site and seven years post planting on the south site," suggested Dr. Young.

"Most importantly, as of the fall of 2001, all species of the planted stock have survived in sufficient numbers to expect that they will continue to survive for the next few years. In addition to the planted stock, both sites have been naturally colonized by other coastal plant species. Wind, water, or birds disperse these species. Thus, plant species diversity and structural diversity have increased and should increase the diversity of wildlife," concludes Dr. Young.

For more information about this project, contact Donald R. Young at (804) 828-0079 or dryoung@vcu.edu or Barry Truitt at (757) 442-3049 or btruitt@tnc.org.

For More Virginia Information on *Phragmites*…





Phragmites australis (left), also known as reed grass or common reed, grows up to 12 inches in height. It is an invasive species that competes with ***Zizaniopsis miliacea*** (Wild Rice) and ***Spartina cynosuroides*** (Big Cordgrass). Wild Rice seed is a vaulable food source for birds, and Big Cordgrass is a valuable source of food and shelter for geese and muskrats. Photos from Virginia Tidal Wetlands Education Curriculum, developed by the VIMS Wetlands Program, with funding from the Virginia Coastal Program.

www.vims.edu/ccrm/phragmites/ - Virginia Institute of Marine Science, Center for Coastal Resources Management - recent VIMS research and a link to a volunteer *Phragmites australis* Inventory Program. This Web site includes a link to a brochure produced by the Rappahannock *Phragmites* Action Committee - a partnership formed in 2000 dedicated to halting the spread of invasive populations of *Phragmites australis* in the lower Rappahnnock River Watershed.

www.dcr.state.va.us/dnh/invinfo.htm - Natural Heritage Program, Department of Conservation and Recreation invasive alien plants page.

COASTAL CLIPS

Welcome to Our New Coastal Staff!

Julie Bixby recently joined the Coastal Program as a Coastal Planner. Julie has a background in environmental policy and planning, agricultural pest management, sustainability and education/outreach. She spent several years working for Cornell University's Cooperative Extension Integrated Pest Management Program in New York State and comes to Virginia from South Carolina where she completed a Master's degree in Earth and Environmental Resources Management at the University of South Carolina.

As a new Coastal Planner, one of Julie's responsibilities will be as the Program's coordinator of coastal nonpoint source pollution issues. Julie is currently helping to map out the Program's focus over the next few years. Julie is also looking forward to working with Virginia's other state and local coastal resource managers. Julie can be reached at (804) 698-4333 or jabixby@deq.state.va.us

Kendell Jenkins recently joined the Coastal Program as the new Coastal Specialist. Kendell's background includes a Bachelor of Science in Biology from James Madison University, followed by work as a field biologist. Kendell received her Masters in Biology from the College of William and Mary in May 2001, where her thesis research and published work centered on ornithology. Prior to joining us, Kendell worked in DEQ's Groundwater Management Program.

As the new coastal specialist, Kendell will maintain the Program's databases and assist with grants management activities. Kendell will also be the Program's Geographic Information Systems contact, and will work with the GIS specialists located in the Program's partner agencies and local governments. Her experience with GIS will enable the Coastal Program Office to analyze spatial data and produce maps with pertinent data layers. Kendell can be reached at (804) 698-4537 or kdjenkins@deq.state.va.us.

CBNERRSVA Has New Director!

The Virginia Institute of Marine Science recently announced the appointment of Dr. William G. Reay, Research Assistant Professor, as Manager of the Chesapeake Bay National Estuarine Research Reserve in Virginia (CBNERRVA). CBNERRVA is one of the 25 National Estuarine Research Reserves established through state-federal partnerships under the Coastal Zone Management Act, and is a sister program of the Virginia Coastal Program.

Dr. Reay (back row, 2nd from left) is surrounded by some of his staff (left to right): Joy Austin, Laboratory Supervisor; Bob Carroll, Marine Education and Outreach Coordinator; Carolyn Gardner, Administrative Assistant; Bill Roberts, Director of the Coastal Training Program; Frank Parker, Graduate Research Assistant; Eric Wooden, Monitoring Coordinator; and, Janet Nestlerode, Graduate Research Assistant. Not pictured are Scott Lerberg and Landon Ward, Graduate Research Fellows.

Lucky To Be Alive and Wild

The Virginia Marine Science Museum (VMSM) released one loggerhead and three Kemp's ridleys into the Chesapeake Bay on August 7, 2001. The loggerhead, named Lucky, had been cared for by the stranding team for more than a year following a traumatic shell injury. It was an exciting day and the culmination of an outstanding rescue and rehabilitation effort by the staff and volunteers of the stranding team.

The Virginia Marine Science Museum Stranding Program reported more than 450 animals in 2001 - the most ever in one year. This included record numbers of strandings for both marine mammals (128) and sea turtles (331). In comparison only 64 marine mammal and 189 sea turtle strandings were recorded in 2000. "Sea turtle strandings are rising dramatically and will require further study to determine why," states Mark Swingle, Stranding Center Curator.

Photos courtesy of Little Creek Naval Amphibious Base.

The VMSM Stranding Center has also increased its role in the rescue and rehabilitation of sea turtles, seals and cetaceans. The 2001 stranding response included 2 live sea turtle strandings and 12 live marine mammal strandings. One Kemp's ridley was rehabilitated and released and a loggerhead is currently in rehabilitation at the center. Of the marine mammals - 4 seals were rehabilitated and released. Regretfully, the remaining animals - all cetaceans – did not survive.

"The increase in live stranding response in 2001 was unprecedented in Virginia's stranding history. While the stranding center is a fully functional sea turtle rehabilitation facility, we will need to expand the facilty to treat the immediate medical needs of marine mammals before they are stable enough to be transported to a long term rehabilitation facility," concludes Swingle.

COASTAL CONTRIBUTIONS

Virginia Coastal Partners Workshop

Over 160 state, local and federal coastal resource managers, and military, business and nongovernmental organization representatives gathered in Williamsburg in December 2001. They came to explore the current status and trends of Virginia's coastal resources and help determine the future focus of Virginia's Coastal Program.

Special thanks to our partners CBNERRSVA for contributing the poster boards to the Coastal Showcase at the 2001 Virginia Coastal Partners Workshop. NERRS Director Willy Reay and his staff completed construction of the boards on-site. Workshop participants enjoy the exhibit area, a refreshment and the opportunity to mingle. Photos by Virginia Witmer.

The workshop's opening plenary included an address by John King, Chief of NOAA's Coastal Programs Division.

Five main sessions engaged all participants in discussions of water quality, coastal habitats, fish and wildlife, public access, and coastal planning and development. The PowerPoint presentations from these sessions are available on the Program's Web site at http://www.deq.state.va.us/coastal/

New No-Discharge Regulations on Horizon

by Mike Gregory, DEQ

The 2001 Virginia General Assembly directed the Virginia Department of Environmental Quality (DEQ) to work on a boating regulation entitled "Regulations governing the discharge of sewage and other wastes from boats" to be codified at 9 VAC 25-71-10 et seq.

The basis for the regulation is Section 62.1-44.33 of the Code of Virginia, which empowers and directs the State Water Control Board to adopt and promulgate all necessary rules and regulations for the purpose of controlling the discharge of sewage and other wastes from boats. The proposed regulation will address discharges of sewage and other wastes (bilge wastes, garbage, liquid wastes, decayed wood, sawdust, oil, etc.) from boats and implement enforcement of designated no discharge zones. No discharge zones are defined as waters where no discharges of sewage, whether treated or untreated, are allowed from boats. Before such a zone is designated by a state, it must receive EPA approval and certification that there are adequate marina pump out facilities in the area to receive holding tank wastes.

There is currently one designated no discharge zone in the state, in Smith Mountain Lake. While the motivation for promulgating the regulation at this time is to address enforcement of the Smith Mountain Lake no discharge zone, DEQ will draft the regulation to address boating discharges throughout the state including coastal areas, and will use the opportunity to update the current, ineffective boating regulation, 9 VAC 25-70-10 et seq.

Although this regulation directly impacts the boating community, marinas may be indirectly impacted should there be an increased demand for pump out facilities, especially if more no discharge zones are designated in the future. Due to inherent limitations on enforceability, implementation of this regulation will depend to a great deal on public awareness and good stewardship. It is hoped that local governments, marinas and boating or other recreational associations will assist in spreading knowledge of the regulation through signs, literature or other means to achieve a common goal - state waters free of pollution.

In July 2001, a Notice of Intent of Regulatory Action was issued. Three public meetings were held, and a regulation was drafted with the assistance of a technical advisory committee made up of interested citizens. The draft regulation has been reviewed by the Office of the Attorney General and presented to the State Water Control Board (SWCB). The SWCB has authorized public hearings be held. These meetings will be scheduled once Department of Planning and Budget and Executive Office reviews are completed. For more information regarding this regulation, please contact Mike Gregory, Department of Environmental Quality, at (804) 698-4065.

New Coastal Program funded Publications: "Multiple Benefits Conservation Plan"

Developed for the Southern Watershed Area Management Program (SWAMP) – Hampton Roads Planning District Commission; July 2000

This publication outlines a technique for the selection of wetlands mitigation sites that provide multiple benefits for the Chesapeake and Virginia Beach area southern watersheds. These include, but are not limited to: water quality protection, wildlife habitat enhancement, natural heritage resource protection, opportunities for compatible recreational activities, opportunities for nature-based tourism, opportunities for environmental education, potential wetlands compensation capability, storm water management, and ground water recharge.

Row crops grown on plastic mulch. Photo by Blake Ross.

"Protecting Water Quality: Best Management Practices for Row Crops Grown on Plastic Mulch in Virginia"

Prepared by Virginia Tech and Virginia Cooperative Extension – Virginia Department of Conservation and Recreation, Coastal Nonpoint Source Program; January 2002

This handbook is a state-wide guide to best management practices (BMPs) for protecting water quality with respect to row crops grown on plastic mulch. It will be used by producers and water quality specialists as a reference in selecting and implementing practices. Questions such as the following are answered: What are the potential water quality impacts of growing crops on plastic mulch? How will the implemented practices reduce pollutants from my field? What are the steps I need to take to protect water quality? What does a water quality protection plan look like? It is easy to read and provides lots of "why" and "how-to" assistance. Details, examples, and additional resources are included. For copies contact Mark Slauter at (804) 692-0839.

Check Out This Web site!

U.S. Commission on Ocean Policy Web Site - a 16-member group created by the Oceans Act of 2000 and subsequently appointed in July 2001 by the President, to undertake an 18-month detailed review of existing and planned ocean and coastal programs and activities in the U.S. and make recommendations to the President and congress on U.S. national ocean policy. Visit the Commission's Web site at www.oceancommission.gov.

New Smart Growth Primer Available

A new publication entitled Smart Growth: 100 Policies for Implementation, is now available. The primer is the latest in an ongoing series from the Smart Growth Network and the International City/County Management Association. The publication serves as a road map for states and communities that have recognized the need for smart growth, but are unclear on how to achieve it. The publication is available at www.smartgrowth.org/pdf/gettosg.pdf.

Interior Establishes E-Mail Outreach Service for Public

The U.S. Department of the Interior, Office of External and Intergovernmental Affairs, has established an e-mail outreach distribution list. The Office of External and Intergovernmental Affairs works with state and local governments, other federal agencies, and advocacy and non-profit organizations to get input for policies and programs implemented at the Department of the Interior. If you would like to subscribe to the e-mail distribution list and receive regular updates from the Office of External and Intergovernmental Affairs, please send your e-mail address to: Interior_News@ios.doi.gov.

New Coastal States Organization Poster available

Coastal Management - Business Isn't the Only Place that Needs Quality Management, a 36" x 9" poster featuring images illustrating facets of coastal management: recreational use; public access; coast and estuarine management; and historic preservation. Contact Notoya Russell (nrussell@sso.org) for your free copy(ies).

Reestablishing Dunes on Developed Coasts

An article appearing in Environmental Management entitled, "Reestablishing naturally functioning dunes on developed coasts," is now available from New Jersey Sea Grant. The paper assesses the potential for reestablishing natural dune habitat at a scale appropriate to municipalities and individual lots. The authors selected the New Jersey shore as a case study because of its variety of building styles, shore protection structures, and densities of development. The study identifies the locations, sizes, shapes, and duration of dune landforms and their relation to human structures, with an explanation of how changes in the perception of the values of coastal resources can be used to initiate programs to restore natural characteristics of dunes. To obtain a free copy of the 15-page paper, contact New Jersey Sea Grant at (732) 872-1300.

Virginia Coastal Program Projects

Information Available On-Line

If you're wondering where your coastal program dollars are going - "Go On-Line". Visit the Virginia Coastal Program Web site (www.deq.state.va.us/coastal/funding.html) for up-to-date information about current and past projects supported by Coastal Program grants. The on-line catalogue includes project descriptions, funding level, final project and product summaries, and contact information for projects funded since 1992.

Virginia State of the Coast Report to be Released!

Photo courtesy of VIMS.

"The Virginia coastal zone possesses a wealth of natural assets. The land is fertile, the climate is moderate, the estuary and coastal ocean are productive, and the setting is a world-class harbor in the middle of one of the world's greatest civilized seacoasts...

...The Virginia coastal zone is under stress primarily because it is excellent habitat for humanity. Expanding and shifting uses of the system have made it very difficult to sustain healthy fisheries, high water quality, and balanced uses...

...the future, while uncertain, is brightened by the fact that there has never been a greater collective interest in a positive outcome..."

(Virginia State of the Coast Excerpt)

"Virginia's coastal zone is the source of so much we value," explains Laura McKay Virginia Coastal Program Manager at DEQ. "From the impenetrable pocosins of the Great Dismal Swamp to the windy wilderness of the Eastern Shore's barrier islands, Virginia's coast is a national treasure. There are so many who use it, so many who depend upon it and we are entrusted to take care of it. The State of the Coast report is a tool to help us do that."

The State of the Coast report was prepared by the Virginia Institute of Marine Science's Center for Coastal Resources Management with input from all of the Coastal Program member agencies and localities. It addresses five core areas of coastal management including: wildlife and fisheries, habitat, planning and development, water quality and public access and information. The report will be updated every two years and be used to clarify coastal resource trends and management needs.

The Virginia State of the Coast report will be available this spring on the Virginia Coastal Program website (www.deq.state.va.us/coastal/). Limited hard copies will also be available by calling the Coastal Program at 804/698-4051.

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DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
VIRGINIA COASTAL PROGRAM

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