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Virginia Institute of Marine Science

The Virginia Wetlands Report

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Virginia's Nontidal Wetland Policy Debate: Reinventing the 1960's Wheel.

Dr. Carl Hershner

Wetlands management is once again the subject of intense public policy debate. The federal government's "no net loss" policy for wetlands, which is mirrored by the Chesapeake Bay Commission's Wetlands Policy, has focused the attention of both managers and interest groups on the wetland resources of the Commonwealth of Virginia. While most individuals have come to accept the neccessity for careful management of tidal wetland resources, management of nontidal wetlands does not currently share the same broad based understanding and support. There is, and there will be, a welter of seemingly conflicting information and "facts" offered by various parties as Virginia moves toward implementation of its policy for nontidal wetlands. The challenge of the debate, for both participants and observers, will be to avoid the seduction of simplistic and/or myopic arguments in the search for an appropriate management strategy.

It is interesting to note that the current debate about management of nontidal wetlands is recapitulating many aspects of the 1960's debate about managment of tidal wetlands. In particular, the debate was initiated by observations that man's activities were decimating the resource and by the assertion of scientists that the resource performs numerous valuable functions for the ecosystem. The second stage of the debate was the marshalling of evidence that conservation oriented management of wetlands would result in significant economic impacts. Counter arguments were developed identifying the economic benefits derived from preservation of natural wetlands. Eventually, the importance of economic arguments was greatly reduced as policy makers realized that wetland functions and values could not always be appropriately translated to an economic basis. Of equal importance was the realization that the short term monetary value of the natural resource always is less than the value of proposed development. The final formulation of policy was based on an acceptance of the best available scientific assessment of wetland importance as modified by the goal of sustaining essential economic development. The result is a policy which essentially conserves the natural resource by minimizing man's direct impacts.

The importance of this historic perspective is not the form of the concluding policy and management instruments, but rather the substance of the preceeding debate. It is entirely possible that the public interests in nontidal wetland resources will be best served by a management approach which differs significantly from the tidal wetlands approach. The point here is that the policy and its implementation were defined only after a thorough consideration of all aspects of the issue. Given the content of the current debate, as reflected in the media, policy makers and managers should have a sense of both de' ja vu and incompleteness.

The Southeastern Virginia Planning District Commission (SVPDC) recently published a report reviewing some of the economic impacts potentially resulting from the federal government's wetlands (particularly nontidal wetlands) management program. The report concluded that preservation of all nontidal wetlands in southeastern Virginia could produce significant detrimental impacts on the region's economic future. The report has received considerable criticism for its methods and conclusions, but it remains for many a startling view of the costs of regulation. While no one would seriously argue that regulation of natural resources has no demonstrable costs, it would be a grievous mistake to base a management policy on just the information contained in the SVPDC's report. The report only looks at one side of the economic issues, a fact acknowledged by the authors. Just as regulation has associated costs, failure to regulate a natural resource also has costs. For a resource like wetlands, these costs can include the loss to the public of wildlife habitat, foodweb support, water quality enhancement, flood and erosion buffering, open space, support for other industries such as tourism, etc. Many of these functions are difficult to evaluate appropriately in monetary terms and thus one can anticipate that the continuing economic arguments will not provide a satisfactory resolution of the policy and management debate.

As appealing as the economic arguments and/or others (such as private property rights or growth limitation) may be, none of them should form the sole basis for policy development. Good public policy for wetland resources must consider that the resource is nonrenewable, that the public interests in the resource extend indefinitely into the future, and that ownership of wetlands, and thus the impact of regulation, is not uniform.

Dr. Hershner is an Associate Professor and Director of the Wetlands Program at the Virginia Institute of Marine Science. ✤

Rejuvenation of the Virginia Oyster Industry*

Stocks of the native oyster species, *Crassostrea virginica*, in the Chespeake Bay have been depleted in part by the action of two diseases. These are *Haplosporidium nelsoni*, commonly known as MSX, and *Perkinsus marinus*, commonly known as Dermo. Despite the fact that these diseases have been present for approximately three decades and have been contributing to mortality throughout that period, the lack of natural recovery of the native oyster resource in the face of continuing disease pressure indicates that the native oyster has developed only a marginal level of natural resistance to this combination of diseases. If or when a significant improvement in this level of resistance will develop is unknown. The focus of investigations proposed here is the potential use of selected native stocks that have been exposed to extended stress with limited survival, non native oyster species that we strongly suspect have resistance to the endemic diseases, "manipulated" triploid forms of both, and possible hybrid forms to rebuild the Chesapeake Bay oyster resource and the industry which depends upon it. This is a long term, multi-component study. Research costs will be significant.

"The oyster (*Crassostrea virginica*) resource of the Chesapeake Bay has been in continuing decline since the turn of the century"

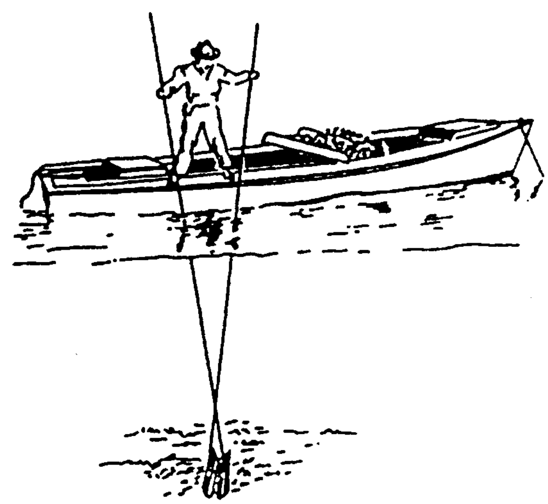
Prior to 1960, oyster production in Virginia averaged 3.5 million bushels annually and Maryland production averaged 2.2 million bushels annually. Production in the 1980's decreased from over 1.0 million bushels in 1981 to 315,000 bushels in 1987. MSX and *Perkinsus marinus* were at record high levels of abundance during 1986 and 1987 as a result of continuing drought conditions over the Chesapeake Bay watershed (Burreson and Andrews, 1988). During 1986 and 1987, estimated overall mortality on public beds in Virginia was between 70 and 90% each year, the highest values recorded in 28 years of continuous monitoring (E. M. Burreson. unpublished data. VIMS oyster disease monitoring program). The combined effect of both oyster diseases has been the recent elimination of commercial oyster production from essentially all waters in the Virginia portion of the Bay with the exception of three oyster bars in the upper James River. Many oyster bars in the Maryland portion of the Bay have also been denuded by the diseases. The remaining locations in Virginia, about 5% of the total public oyster grounds, are currently the subject of intense fishing pressure and are in danger of being fished out entirely. Between 1987 and 1989 approximately 90% of the entire Virginia harvest came from the upper James River. *P. marinus* continues to spread up the the James River and all beds are now infected. The magnitude of destruction and the economic implications are obvious.

In order to allow recolonization of downstream oyster beds, the distribution of diseases must be forced in a downstream direction by a continued increase of streamflow in the tributaries of the Chesapeake Bay. Given the drought conditions of the 1980s this would require a marked and sustained change in climatic condition in the watershed. Furthermore, a temporary increase in rainfall would result in only a temporary reduction in disease pressure. The life cycle and growth of the native oyster are such that even colonization of a presently denuded, high salinity oyster bed would require a minimum of three years without serious disease losses before a single crop of marketable oysters would be attained.

The subject of natural disease "resistance" and the development of disease "resistance" in cultured stocks of the native oyster, *Crassostrea virginica*, has received considerable attention. The notion that such resistance would allow recolonization of presently barren areas, with the ensuing rejuvenation of the industry, is untenable with respect to Chesapeake Bay for several reasons. Natural populations, with their enormous fecundities, have failed to produce extensive beds of resistant oysters through natural selection as evidenced by the continued and almost total absence of oysters from high salinity areas of the Bay. This is probably due, at least in part, to the large gene pool of unselected oysters, especially for MSX, in the upper reaches of the major tributaries in Virginia and in the upper portion of the Bay in Maryland. Efforts to select such strains by manipulative, selective breeding have resulted in some improvement in survival in response to challenge by MSX after 25 years of research (Ford and Haskin, 1987). Resistance to MSX is not correlated with the activity of a particular cellular or humoral defense mechanism (Douglass, 1977; Ford, 1986), but appears to be the result of an overall physiological superiority in which "resistant" oysters, by more efficiently utilizing available energy, are able to inhibit the development of the disease (Myhre, 1973: Newell, 1985; Barber et al., 1988a,b); however, these strains are potentially useless in Chesapeake Bay due to the presence of *P. marinus* as well as MSX. Resistance to both diseases is essential to rejuvenation of the oyster industry in Chesapeake Bay. The unusual intensification of both diseases in recent years and the resulting high oyster mortality dictate that the time required to select native *C. virginica* for resistance using traditional methods may not be adequate to deal with current economic needs. Alternative approaches to rejuvenate the industry must be considered.

Crassostrea virginica is the endemic species, and native diploid oysters are the obvious control against which to compare other species, triploid animals of those same species, and possible hybrid crosses. Induction of triploidy appears to increase growth rate following the first year of life and results in vastly reduced reproductive capability or essential sterility (Stanley et al., 1981). Reproductive activity diverts energy from growth. Reducing reproductive activity through triploidy has obvious advantages in terms of possible growth and disease resistance. Further, the enhanced growth associated with triploidy may produce a harvestable product in two years in the Chespeake Bay system instead of usual three, thereby also reducing disease-induced mortality.

The choice of *Crassostrea gigas* for triploidy and hybridization studies is based upon its well documented success as an introduced species



throughout the Pacific and Atlantic ocean basins (Mann, 1979, 1981). *C. gigas* is the basis of the largest oyster fisheries in the world. For example, during 1987 the leading oyster producing countries in the world were Korea and Japan with production of 303,233 and 258,776 metric tons respectively, this product being predominantly *C. gigas*. By comparison the United States, ranking third, produced 217,632 metric tons (a mix of *C. gigas* and *C. virginica*) and France, producing predominantly *C. gigas* after initial introduction of the species some 15 years earlier, ranked fourth at 123,162 metric tons. *C. gigas* is elegantly suited for hatchery production as demonstrated by the enormous success of the hatchery-based industry in the U.S. Pacific Northwest.

"Hatchery production in the Northwest far outstrips present oyster production from the entire Chesapeake Bay, a testament to both the success of *C. gigas* in hatcheries and the dismal state of the Chesapeake Bay industry."

A further insult to the Chesapeake Bay industry is the fact that a significant market opportunity exists on the East Coast which the native oyster cannot at present fill. Indeed, even the rapidly expanding west coast industry for *C. gigas* cannot totally fill this market and the United States has, since 1985, held the dubious distinction of being the world's leading importer of oysters in fresh and frozen form.

The native northern European oysters *Ostrea edulis* and *Crassostrea angulata* were decimated by disease in the mid 1970s. Production of the former fell from 15,000 tons to the present day level of 2,500 tons per year. Production of the latter fell from 60,000 tons per year to zero. The industry was saved from economic annihalation by the introduction of *C. gigas*. European production (most notably French, now at 140,000 tons per year of *C. gigas* and employing over 20,000 people) is presently over 80% C. gigas. Further, *C. gigas* apears resistant to challenge by both *Bonamia ostreae* and *Marteilia refringens*, diseases that continue to decimate native European oysters. The analogies with the Chesapeake Bay are painfully obvious; however, unlike previous "introductory studies" with *C. gigas*, we do not wish to simply focus on the use of diploid (i.e., reproductively competent) *C. gigas* in Chesapeake Bay waters. Rather, our approach is to responsibly examine all options to identify an oyster that has the desirable combination of maximum growth and/or disease resistance including diploid and triploid *C. vriginica* and *C. gigas*, and possible hybrids of the two species which therefore utilize only part of the total genome of each species. Note that the triploid or possible hybrid crosses may be incapable of further reproduction. Such reproductively compromised animals would only be valuable in a rejuvenation of the Chesapeake Bay industry as part of a hatchery based system following the model of the successful west coast industry.

Research is of little value unless the results are made available to the user. V.I.M.S. is unique in its three part role of education, research and service to the Commonwealth of Virginia. Interaction with industry is frequent, either through direct conversations of the investigators with industry or through the Marine Advisory Services personnel at V.I.M.S. It is relevent to note that much of the stimulus for this project has come from industry members who desire an alternative approach to present growout techniques to mitigate losses to diseases. Indeed, this is not so much a project that we intend to "eventually" give to industry so much as a project that we encourage industry (packers, planters and watermen) and State regulatory agencies to participate in on a continuing basis. It is important to note that through both private conversation and the public forum of the Virginia Marine Resources Commission all members of industry can participate in development of this program.

As our work continues we will make every effort to inform interested individuals of our progress (and failures) through formal meetings arranged and advertized by the Virginia Institute of Marine Science.

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*** Editors Note**

Condensed from "Rejuvenation of the Virginia Oyster Industry: genetic selection to improve survival in the face of disease challenge, hatchery production of oyster seed and alternative grow out methods" by Dr. Roger Mann, Mr. Michael Castagna, Dr. Eugene Burreson, Dr. John Graves, and Dr. Bruce Barber. **Copies of the full report can be obtained by writing, The Virginia Marine Resources Commission, Fisheries Management Division, P.O. Box 756, 2600 Washington Avenue, Newport News, VA 23607-0756**

The Living Marsh

Featuring plants and animals inhabiting or visiting the marsh ecosystem.

Yellow-crowned Night-heron
(*Nycticorax violaceus*)

The Yellow-crowned Night-heron is a 22 to 27 inch medium-sized heron. The adult is slate-gray with a black head, white cheeks, black bill, orange legs, and a yellowish crown. In flight the feet extend beyond the tail. The heron's call is a high pitched "quawk". It prefers wooded swamps and marshes and feeds by grabbing a fish with its bill, tossing it in the air and swallowing it head first. Its diet consists of crabs, crayfish, and fish.

Marsh Rabbit
(*Sylvilagus palustris*)

The marsh rabbit is about 14 to 18 inches long and is dark brown with a dark cinnamon nape and white belly. It has a very small grayish -brown tail, small feet, and short, broad ears. The marsh rabbit prefers bottomlands, swamps, and coastal waterways and feeds mainly on tender herbaceous plants (blackberry, panic grass, goldenrod, crabgrass, etc.). In the winter the marsh rabbit will feed on twigs and the bark of young trees.

American Oyster
(*Crassostrea virginica*)

Oysters are of various sizes and shapes. Oysters that grow on soft bottoms tend to be narrow and long, while those that grow in calm water on hard bottoms will tend to be more rounded. The oyster feeds by periodically opening its shell to filter out plankton from seawater. Filter feeding by oysters helps cleanse the bay waters. It has been estimated that before 1870 oysters were so abundant that the entire water volume of the Chesapeake Bay was filtered through them every 2 to 4 days. Today the oyster population is so depleted that the turnover estimate is every 325 days.

Oysters spawn from mid-June to October when water temperatures reach about 77 degrees F. They spend about two weeks as free-swimming larvae. During this time they develop minute shells and search for suitable hard surfaces upon which to attach. The first two or three months oysters are bisexual, but by the first winter most of them will become male. In another year, most will change to female. Once the rising water temperature triggers some male oysters to release sperm and some females to release eggs, a chain reaction occurs across the beds which causes most, if not all, the oysters to spawn. The eggs are fertilized and develop into larvae.

Oysters that settle in the high salinity areas of the lower Chesapeake Bay may grow out in 5 to 6 years, while those in low salinity waters may live 15 or more years.

Killifishes - bull minnows, mummichog, marsh minnow
(*Fundulus* sp.)

These minnows are thick-bodied with rounded or squared-off tailfins and an extended lower lip. Killifish are generally greenish brown and grow to about 5 or 6 inches but are usually found much smaller. Killifish generally stay close to shore and at high tide move into marshes to feed. A large portion of their diet is mosquito larvae, algae, and the larvae and pupae of flies. They will also feed on Saltmarsh Cordgrass, *Spartina alterniflora*, copepods, crustaceans (such as fiddler crabs), polychaetes (such as clamworms), fish eggs, beetles, snails, seeds, and other fish. Killifish serve as food for many animals that patrol the marshes. They are a favorite food of wading birds (herons and egrets), larger fish (striped bass, bluefish, eels, and flounder), and water snakes.

Saltmarsh Cordgrass
(*Spartina alterniflora* Loisel)

Saltmarsh Cordgrass is a perennial grass that appears to have at least two growth forms along the Atlantic Coast. The robust **tall form** ranges from 0 .75 to over 2 meters (4 to 7 feet) high and is restricted to the margins (levees) of tidal creeks, guts and other natural waterways. **Short form**, ranges in height from 0.10 to 0.5 meters (4 to 20 inches) and occupies poorly drained areas near the upper limit of the tides. A **medium form** is also recognized in some areas. Both forms have relatively smooth leaves and stems (culms). The leaves of both forms are 0.5 to 1.5 centimeters wide (0.25 to 0.75 inches) and up to 0.5 m long. Although the more robust form of this grass produces seeds, its primary means of propagation is by a massive rhizome system the produces many new sprigs. *Spartina alteriflora* is quite successful in spreading into previously unvegetated areas rather rapidly.

Spartina alterniflora occupies the lower part of salt and brackish marshes, between mean sea level and approximately mean high water. Saltmarsh cordgrass may also be a pioneer species in tidal freshwater marshes, especially after disturbance or drought caused salinity change. Dense stands are effective in buffering shoreline erosion.

Spartina alterniflora is one of the most productive plants of tidal wetlands. In fact, the organic matter produced by cordgrass is comparable to the world's average production of agricultural crops such as corn, wheat, or even sugarcane. Because *Spartina* grows in intertidal areas, it's detritus is flushed into receiving waters where it becomes a major component of the estuarine/marine food web. This community is also an important habitiat for an array of fauna including the juvenile stages of the blue crab. It also serves as vital nursery and spawning area for commerically important finfish.

For addtional information concerning Saltmarsh Cordgrass see VIMS Wetlands Program Technical Report - Flora Series 90-2.

RECENT COURT DECISIONS

Maryland.

Paul Jones, II pleaded guilty to one misdemeanor count of violating the Clean Water Act for impacting 86 acres of nontidal wetlands with 1,400 cubic yards of fill. U.S. District Judge Frederick Smalkin fined Jones $1 million, ordered $1 million paid to the National Fish and Wildlife Foundation, ordered restoration of the 86 acres of wetlands, banned Jones from hunting migratory wildfowl anywhere in the United States through 1991, restricted Jones from developing 2,500 acres of his property on Maryland's Eastern Shore, and placed Jones on 18 months probation.

Virginia.

S. Paul Hobbs was found guilty of violating the Clean Water Act for impacting 100 acres of Gloucester County's nontidal wetlands by clearing and ditching. U.S. District Judge Rebecca Smith fined Hobbs $300.00 and rejected the government's plan to have Hobbs restore the wetlands.

Virginia. *Zappulla v. Crown*

The Virginia Supreme Court ruled that the Virginia Marine Resources Commission has the authority to determine from the available evidence whether proposed facilities are in waters opposite the applicant's riparian lands, but solely for the purpose of determining the rights of the applicant **vis-avis** the Commonwealth and the public. The Virginia Marine Resources Commission does not determine any rights between private parties. Such determination of riparian apportionment between private parties lies with a court of chancery.

California. *Leslie Salt Co. v. United States*

U.S. Court of Appeals found that the federal district court improperly determined that the Army Corps of Engineers lacked jurisdiction under the Clean Water Act to require a California company to obtain a permit before draining and filling portions of its property, because: (1) corps' jurisdiction does not depend on how property acquired wetlands characteristics, (2) aquatic conditions existing on property were not abnormal, and (3) aquatic areas were adjacent to a culvert connected to a tidal watercourse. In addition, the U.S. Court of Appeals found that the federal district court improperly determined that the Army Corps of Engineers lacked jurisdiction under the Clean Water Act to require a California company to obtain a permit before draining and filling mineral dissolving and crystallizing pits used in salt production because: (1) corps has jurisdiction over artifically created waters as well as those that are naturally created, (2) pits do not qualify for limited exemption for waters used commercially, and (3) corps has jurisdiction even if water is found in pits only during certain seasons.

Special Note concerning the Clean Water Act Section 404 Regulatory Program and Agricultural Activities.

A Memorandum for the Field has been prepared by the U.S. Environmental Protection Agency and the Army Corps of Engineers to provide clarification on the applicability of the Section 404 regulatory program to agriculture. The Memorandum clarifies that if a farmer is producing crops on land that has been in cultivation in an ongoing manner and he uses normal farming practices, his activities generally do not require a permit from the Corps. The normal farming activity exemption means discharges associated with normal farming, ranching and forestry activities such as plowing, cultivating, minor drainage, and harvesting for the production of food, fiber, and forest products, or upland soil and water conservation practices (Section 404(f)(1)(A)). To be exempt, these activities must be part of an established, ongoing operation. For example, if a farmer has been plowing, planting and harvesting in wetlands, he can continue to do so without the need for a Section 404 permit, so long as he does not convert the wetlands to dry land. Activities which **convert** a wetland which has not been used for farming or forestry into such uses are not considered part of an established operation, and are not exempt. For example, the conversion of a bottomland hardwood wetland to crop production is not exempt. For additional information concerning this issue contact Mr. Bruce Williams, Chief, Permits Section, Army Corps of Engineers - Norfolk District (804) 441-7656.

STATUS OF WETLAND INVENTORIES (July 1990)

All inventories are 100% ground-truthed

1. Mathews Co. 1974, reprinted 1982
2. Lancaster Co. 1974, reprinted 1982
3. York Co. 1974, reprinted 1981
4. Northumberland Co. 1975
5. Prince William Co. 1975
6. King George Co. 1975, reprinted 1981
7. City of Hampton 1975
8. Stafford Co. 1975
9. Fairfax Co. 1976, reprinted 1982
10. City of Virginia Beach Vol.1 (Northlanding R. & tributaries) 1976
11. Gloucester Co. 1976
12. City of Newport News 1977
13. Accomac Co. 1977
14. Northhampton Co. 1977
15. Westmoreland Co. 1978 no imagery
16. Essex Co. 1979
17. City of Virginia Beach Vol.2 (tidal marshes) 1979
18. New Kent Co. 1979
19. Caroline Co. 1979
20. Spottsylvania Co. 1979
21. James City Co. 1980
22. Isle of Wight Co. 1981
23. Middlesex Co. 1981
24. Surry Co. 1981
25. City of Norfolk 1987
26. King William County & Town of West Point 1987
27. King and Queen County 1987
28. Prince George Co., Jan. 1989
29. City of Portsmouth. July 1989
30. City of Virginia Beach, v.3 Back Bay, January 1990

Unfinished inventories

1. Suffolk Co.
2. Chesterfield Co. & Cities of Petersburg & Colonial Heights
3. City of Richmond & Henrico Co.
4. Richmond Co.
5. Charles City County.
6. City of Chesapeake

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ANNOUNCEMENT

Due to the increase in circulation demand and the need to expand into all the issues pertaining to the wetland resources of the coastal plain of Virginia, **The Virginia Wetlands Report** will be replacing the **Wetlands Board Bulletin**. Please continue to submit questions and comments to Editors, The Virginia Wetlands Report, The Virginia Institute of Marine Science, Gloucester Point, VA 230672.

Partial funding provided by the Office of Coastal Resources Management, NOAA

WETLANDS RECIPES

Sauteed Killifish

1 dozen killifish (cleaned)
3/4 cup unbleached white flour
3 tbsp butter
salt and pepper to taste

Killifish can be found throughout the spring and summer in the shallow waters of salt marshes. A minnow trap or a net can be used to catch the fish. Clean the fish by making a longitudinal slit along the ventral surface, remove the viscera, and wash out the fish with fresh water. Pat dry with a towel and roll in flour. Place in a hot, greased pan and saute' over medium-high heat until fish are golden brown on both sides. Brown butter in another pan. Remove fish, place on a platter and pour over butter.

Easy Oyster Casserole

1 pt. oysters
1/4 lb. mushrooms
3 T. butter
1 can cream of mushroom soup
1/2 c. crushed oyster crackers
1 c. whole oyster crackers

Place oysters in colander to drain. Pick over to remove any bits of shell. cut stems from mushrooms and chop. Slice mushrooms caps. Saute mushrooms in 2 tablespoons of the butter until soft. Add mushroom soup and heat, stirring until smooth. Mix crushed oyster crackers with cheese. Place a layer of the crackers in the bottom of a well-buttered 1-quart casserole. Add a layer of oysters, then some of the mushroom soup mixture. Continue with remainder of cracker mixture, oysters and soup. Melt remaining tablespoon of butter. Add whole oyster crackers and mix. Top casserole with crackers. Bake at 350 degrees F (moderate oven) about 20 minutes or until hot and bubbly. Do not overcook. 4 servings. **(From VIMS Sea Grant Marine Advisory Service)**

This Issues Quote

"We have met the enemy, and they is us." **Walt Kelly in reference to polluters.**

"Wherever wetlands must give way to farming or development, they will be replaced or expanded elsewhere. It's time to stand the history of wetlands destruction on its head: From this year forward, anyone who tries to drain the swamp is going to be up to his ears in alligators." **President George Bush, 1989**

Wetlands Program
The Virginia Wetlands Report

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In this issue....

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