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The Virginia Wetlands Report

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MANAGEMENT OF VIRGINIA'S COASTAL DUNES AND BEACHES

By Thomas A. Barnard, Jr.

Since July 1 of 1980, dunes and beaches in Virginia have benefited from the protection afforded them under the Coastal Primary Sand Dune Protection Act (Sec. 62.1-13.21, Code of Virginia). Primary, in this sense, means closest to the water rather than largest or most prominent. The Act was modelled after the Virginia Wetlands Protection Act and as such, charges local wetlands boards with implementation of the management scheme. Beaches benefited only secondarily under the dunes act until 1989. The General Assembly, that year, defined and added beaches directly to the dunes act through changes in the existing "reaches" provisions which were then eliminated.

Virginia has some 142 linear miles of dunes scattered along its approximately 5,000 miles of tidal shoreline. Although found on both coastal and bay shorelines throughout the state, dunes are clustered in only eight of the 46 Tidewater localities. Beaches and dunes are natural storm energy dissipators and whether located along the barrier islands of the Eastern Shore or the bay shoreline of Willoughby Spit, they act to protect the land inshore and comprise a highly valued recreational resource.

Dunes are natural features that are found along all shorelines where there is a sand supply and sufficient wind to entrain and move sand around. Dunes are basically unconsolidated mounds of sandy soil and are generally colonized by plants which have been able to adapt to the extreme xeric conditions and salt spray. Once plants have colonized a dune, they hold the sand in place with their root and rhizome systems and trap additional sand by acting as a baffle to the wind, causing the sand brought from the beach and adjacent dune areas by winds to fall out and accumulate. This action allows the dunes to grow and the plants match this growth, thus creating a stabilized coastal feature.

Most natural dune fields take the form of broad, low undulating mounds of sand with differing vegetational character depending on distance from the water and degree of exposure to winds and salt spray. Through the judicious use of sand fences, grass planting and other techniques, man has built many of these natural low dune areas into higher, barrier dune lines immediately out of reach of normal storm waves.

Dunes are highly valued along coastal areas for their aesthetic appeal and the overall contribution they make as wildlife habitat and scenic vista. Dunes make their greatest contribution, however, as temporary erosion buffers and as barriers to coastal flooding. Dunes are recognized as reservoirs of sand which are able to nourish the adjacent beach during storm attack. During storms, the seaward toe of the dune is attacked by waves and sand is often transported across the beach and deposited in sandbars in the nearshore zone. Once the storm has passed, wave action brings the sand back to the beach where it is picked up by winds and redeposited in the dunes. Thus where one finds an adequate sand supply, the water, beach and dunes form an integrated unit which although highly dynamic in nature, functions to promote stable shoreline character.

When dunes and dune vegetation become damaged by natural events such as storms, overuse via pedestrian traffic, or manipulation to control dune height or migration, vegetative reestablishment is the only long term answer to dune stability. Sand fences can be very valuable in the short term. However, as the fence begins to deteriorate over a 1 to 3 year period, the dune also loses sand and structure unless planted or colonized with native vegetation (Woodhouse 1978). Vegetation not only slows wind velocities causing sand to accumulate around the plants, but also grows upward as the sand accumulates.

"Vegetation gradually establishes a root mat which helps to give the dune internal structure. For example, the roots of sea oats (*Uniola paniculata*) may reach all the way to the base of a dune."

Roots of some dune species may maintain contact with the shallow water table so that the plants are not as subject to drought as those with shallower root systems (Salmon et al., 1982). When devegetated areas are not repaired, winds move sand freely causing dunes to migrate rapidly or form breaches which allow storm surges to cut the dune. This allows flooding landward of the duneline and significant dune and perhaps, property destruction.

Once damaged areas have been repaired, it is important to control the damaging activities. Traffic over the dune must be stopped or limited to specific access areas, and these areas should have open-pile or on-grade walkovers. The advantage of the open-pile structure is that it allows the dune to continue to build.

Where development occurs in or adjacent to dunes, there may develop problems with migrating dunes or wind-blown sand impinging upon fixed man-made structures. These problems can be controlled and minimized by repairing damaged areas, thereby maintaining maximum vegetative cover. Where natural vegetation is maintained, sand movement can be controlled. Judicious use of sandfencing is very helpful in the short term, but must be used in concert with a vigorous revegetation program.

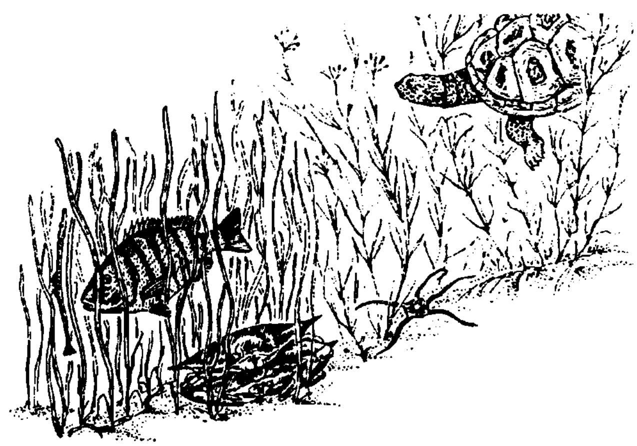
The dynamic and fragile nature of dunes, along with the extremely high monetary value of the Bay and Oceanfront property upon which dunes front, make their management a unique and highly challenging undertaking. Localities which have adopted the law administrate a program through their local Wetlands Board which requires a permit for any dune-disturbing activity. The Wetlands Board holds a public hearing and utilizes state standards and guidelines in deciding whether to issue, modify or deny applications for dune encroachment. In localities where the dunes ordinance has not been adopted, the Virginia Marine Resources Commission acts as the wetlands board. The eight localities in which dunes are found are Virginia Beach, Norfolk, Northampton, Accomack, Hampton, Mathews, Lancaster and Northumberland.

Literature Cited

Salmon, J., D. Henningsen and T. McAlpin. 1982. Dune Restoration and Revegetation Manual. Florida Sea Grant College Report Number 48. 60 pp.

Woodhouse, W. W. 1978. Dune Building and Stabilization with Vegetation. Special Report Number 3, U. S. Coastal Engineering Research Center. 112 pp.

Editor's Note:
The Wetlands Program at VIMS will be publishing a more detailed description of dunes and dune management in Virginia in the summer of 1991. ✦



SUBMERGED AQUATIC VEGETATION IN THE CHESAPEAKE BAY

by Kirk J. Havens

Submerged aquatic vegetation (SAV) refers to vascular plants such as eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*) that grow completely underwater, although portions of the plant may become exposed during extremely low tides. Because of their submerged existence, SAV has developed special adaptations to this type of habitat. The leaves and stems have thin-walled cells with large intercellular air spaces (aerenchyma cells) that provide buoyancy. In addition, the waxy cuticle usually found in terrestrial plants is absent in SAV. The waxy cuticle characteristic of terrestrial plants serves to help retain moisture. In submerged plants this is not necessary, and the lack of a waxy cuticle helps increase the exchange of water, nutrients, and gasses between the plant and the surrounding water. Submerged aquatic vegetation requires light to live and, thus, is found in shallow areas where sufficient light for photosynthesis can penetrate. This is generally less than six feet in the Chesapeake Bay region.

Different plant species have different salinity and temperature requirements. Some species such as wild celery (*Vallisneria americana*) and coontail (*Ceratophyllum demersum*) are freshwater plants that grow in the upper reaches of the Bay, while widgeon grass (*Ruppia maritima*) can tolerate salinities from slightly brackish to ocean strength (0.5 to 30 ppt.). Temperature also plays an important ecological role. In some species, seed germination requires a certain water temperature. High water temperatures in the summer cause eelgrass (*Zostera marina*) to lose its leaves. These shed leaves pile up on the beaches as they wash ashore each summer and fall.

Water currents, wave action, and soil substrate also influence species distribution. Some species lack a root system or are only weakly rooted and are found in protected, slow moving waters. Others, such as sago pondweed (*Potomogeton pectinatus*), have a dense root system that can withstand a higher wave and current energy regime.

Submerged aquatic vegetation serves a number of important ecological functions. It provides habitat and nursery areas for many species of fish and invertebrates. The leaves and stems provide protective cover for juvenile finfish and minnows. Juvenile blue crabs utilize the cover offered by SAV to undergo molting. Fish and shellfish also utilize submerged aquatic vegetation beds for food. The stem and leaf surfaces provide excellent attachment sites for algae, eggs and small invertebrates, which are fed upon by animals moving through the beds. Many other organisms can be found buried in the sediment among the plant roots. Submerged plants also remove nutrients such as nitrogen and phosphorus from the water. If nutrient input is high, SAV helps absorb these nutrients and reduce the potential for algal blooms.

Another valuable function that SAV performs is the removal of sediment from the water column. The baffling effect of the leaves and stems reduce wave energy and water current allowing the sediment suspended in the water column to settle out. This serves a dual role in water clarity and erosion control.

"Submerged aquatic vegetation has long been known to be an important food source for waterfowl. "

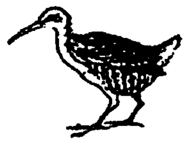
Several species of ducks, geese and swans feed on the seeds and tubers of submerged plants.

In the 1930's the population of the submerged aquatic plant eelgrass (*Zostera marina*) was dessimated by disease. By the 1940's eelgrass appeared to be recovering. In 1972 Tropical Storm Agnes resulted in a tremendous increase in turbidity and lowered salinities, which again damaged SAV beds throughout the Chesapeake Bay. Industrial pollution, agricultural herbicides, increased nutrient input and increased turbidity, sedimentation by adjacent upland development are possible causes for the continued decline in the SAV population. According to the U.S. Fish and Wildlife Service, SAV abundance has dropped by 66 percent since the late 1960's. However, recent 1989 data from researchers at VIMS show an increase from 20,119 hectares in 1987 to 24,134 hectares in 1989. This is an increase of about 20% with the largest increases occuring in the middle bay (north of the Potomac River to the Patapsco and Chester Rivers) and lower bay (south of the Potomac River to the Atlantic Ocean).

The recent signing of the SAV management policy by the governors of Virginia, Maryland, and Pennsylvania, the mayor of Washington, D.C., the EPA Administrator, and the Chesapeake Bay Commission Chairman and the drafting of an SAV implementation plan show the commitment of the Chesapeake Bay community in restoring submerged aquatic vegetation and a hope that the increase in SAV will continue. ✦

THE LIVING MARSH

Featuring plants and animals inhabiting or visiting the marsh ecosystem.



Rails

Julie G. Bradshaw

Rails are secretive, ground-dwelling birds of the marsh. They are generally solitary, and are heard more often than they are seen. Rails are compact and hen-shaped, with short tails and long toes. They have narrow bodies which enable them to move quickly through the thickly vegetated marshes in which they dwell.

There are six species of rails which occur in Virginia, from the diminuitive Black rail (5-6 inches long: sparrow-sized) to the larger King rail (15-19 inches). The King, Virginia, and Clapper rails resemble each other, with long, slightly down-curved bills, and rusty or brown bodies with black barring on their flanks. The Sora, Black, and Yellow rails have smaller, conical shaped bills and are light brown to black. Black rails and Yellow rails are very rarely seen. Relatively little is known of the biology of these two species.

Rails occupy a variety of marsh habitats. The Clapper rail is found in salt and brackish marshes. The Virginia and King rails primarily use fresh and brackish marshes. The Sora and Yellow rails are found in freshwater marshes. The Black rail occurs primarily in salt marshes, but may be found in more inland tidal marshes as well. All species may use salt marshes in migration and during the winter. Although they are weak fliers, some rails migrate long distances.

Rails feed in very shallow water and on mud flats exposed at low tide. Their diets are composed primarily of animals, including insects, crustaceans, mollusks, and frogs, but also include plant material.

Virginia, King, and Clapper rails breed in Virginia. Their nests are well-concealed and are built on platforms of plant material or fastened to a clump of upright marsh plants. Both sexes incubate the eggs over a 20-23 day period. The young of King and Virginia rails can fly within 2-2.5 months after hatching.

Recommended reading:

Bent, A.C. 1926. Life histories of North American marsh birds. U.S. Nat'l. Mus. Bull. no. 135. Washington, D.C.

Meanley, Brooke. 1969. Natural history of the king rail. North American Fauna no. 67. U.S. Department of the Interior, Fish and Wildlife Service. Washington, D.C.

Meanley, Brooke. 1985. The marsh hen: a natural history of the clapper rail of the Atlantic Coast salt marsh. Tidewater Publishers. Centreville, MD.

Terres, John K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf. New York.

(Julie Bradshaw is a senior marine scientist at the Virginia Institute of Marine Science)

Striped Bass (*Morone saxatilus*)

Lyle M. Varnell

Striped bass, or rockfish, are common inhabitants of Virginia's tidal waters. They are easily recognized by the seven or eight black stripes on each side of their bodies. Striped bass have been documented to reach six feet in length and 125 pounds; however, they are rarely found greater than 50 pounds. Their closest relative, the white perch (*Morone americana*), another common bay native, reaches sizes of only about one and one-half feet and four or five pounds. Striped bass may live more than 30 years.

Marine populations of striped bass occur on the east coast of North America from Nova Scotia to Florida, along the eastern Gulf coast, and from Puget Sound to Baja California along the Pacific coast. Landlocked populations are also common in inland waters. The east coast marine population of rockfish is composed of three stocks - the Hudson River stock, the Roanoke River stock, and the Chesapeake Bay stock. Estimates of the contribution the Chesapeake Bay stock makes to the overall East Coast population are from 50 to 90 percent. The actual percentage contribution is dependent on many factors; not the least of which is year-to-year spawning success.

Striped bass, like American Shad, alewife and blueback herring, are anadromous. That is, they spend most of their adult life in saline water and return to freshwater each year to spawn. Striped bass enter the bay in late winter-early spring and make their way up the tributaries. Spawning occurs from April to June, generally at or near the surface within the first 25 miles of tidal freshwater reaches (usually 0-3 ppt). Each striped bass female produces

THE THE LIVING MARSH (continued)

from 15,000 to 5 million eggs. Survival from egg to adult is dependent on many factors including temperature, salinity, predation, and water quality parameters such as dissolved oxygen, pH, and turbidity levels.

As rockfish mature, they move into more saline waters. Young-of-the- year striped bass generally concentrate in waters less than ten feet deep and near marshes, using these areas as nursery grounds. Most post-spawn adults return to coastal waters and many tend to spend the summer and early fall months in near-shore waters off the middle New England states. Migration to overwintering grounds off North Carolina occurs during late fall and early winter.

Striped bass are predators. Their diet includes mature and juvenile finfish, crabs, and other benthic fauna; many of which spend the majority of their lives in the marsh system.

(Lyle Varnell is a senior marine scientist at the Virginia Institute of Marine Science)

Arrow Arum
Peltandra virginica (L.) Kunth

Arrow arum is a robust, emergent, fleshy perennial plant, generally found in the intertidal zone of freshwater marshes and swamps. The plant has large, triangular or arrow-shaped leaf blades. The basal lobes may be half as long as the blade. The venation of the leaf consists of a prominent midrib and paired, downward trending veins into the basal lobes.

Peltandra is a major component of the total organic production of tidal freshwater wetlands reaching as much as 5 tons per acre per year for above- ground growth. Arrow arum is known to undergo rapid decomposition at the end of the growing season.

Arrow arum is found in wetland areas throughout the eastern United States. In nontidal situations it often borders lakes and ponds in the littoral zone and can tolerate shade in swamps and bottomland hardwood forests. In coastal areas, arrow arum usually grows in the soft sediments of the intertidal zone between mean sea level and mean high water and is limited to freshwater areas where salinities generally do not go above 0.5 ppt.

As a component of freshwater tidal wetlands, arrow arum is associated with spawning areas for anadromous fish such as the striped bass. The fleshy seeds are food for waterfowl such as the wood duck and black duck.

Editors note:
For additional information concerning Peltandra virginica see VIMS Wetlands Program Technical Report - Flora Series 90-6.

1990 PUBLICATIONS AVAILABLE FROM THE VIMS WETLANDS PROGRAM

The Virginia Wetlands Report Vol. V, No. 2. **Lead articles:** *Virginia's Nontidal Wetland Policy Debate: Reinventing the 1960's Wheel* **by Dr. Carl Hershner.** *Rejuvenation of the Virginia Oyster Industry* **by Dr. Roger Mann.**

Technical Reports:

- 90-1 *Animals of the Intertidal Sand and Mud Flats* **by K.J. Havens**
- 90-2 *Saltmarsh Cordgrass* **by G.M. Silberhorn**
- 90-3 *Cumulative Impacts of Shoreline Constuction Activities on Tidal Wetlands in Virginia* **by W.I. Priest et al.**
- 90-4 *Saltmeadow Hay* **by G.M. Silberhorn**
- 90-5 *Values of Tidal Wetlands* **by M. Wohlgemuth**
- 90-6 *Arrow Arum* **by G.M. Silberhorn**
- 90-7 *Survey of Compensatory Mitigation within the Tidal Wetlands of Virginia* **by T.A. Barnard and P. Mason**

RECENT COURT DECISIONS

McGown vs U.S.

A district court in Missouri held that federal district court will not review cease-and-desist orders issued by the Army Corps of Engineers restricting landowner's development of property under The Clean Water Act because: 1) federal appeals courts have determined that judicial review of administrative orders is not allowed until the United States acts to enforce the Water Act, 2) landowner's attempts to resolve disputes informally do not affect the court's jurisdiction, and 3) pre-enforcement review limitations are in effect even if a compliance order has not

The U.S. Supreme Court recently approved the U.S. Sentencing Commission guidelines for environmental crimes. Criminal convictions for environmental crimes now carry mandatory jail terms. Two cases have been decided under the new rules. The first case resulted in 21-month jail terms for two Florida individuals who were convicted of dumping fill material into a tidal wetland without a permit. The second case resulted in a 27-month jail term and a fine of $200,000 for illegally filling wetlands in Pennsylvania.

James City County vs Environmental Protection Agency and Army Corps of Engineers

A district court judge overruled a Federal Water Pollution Control Act section 404(c) permit veto by The Environmental Protection Agency (EPA) for the construction of a reservoir on Ware Creek in James City County, Virginia. The court held that the Environmental Protection Agency improperly vetoed a permit issued by the Army Corps of Engineers for construction of a reservoir for a new public drinking water supply. The court held that the EPA did not adequately demonstrate that practicable alternatives existed. The EPA had offered as alternatives a three-dam project involving the construction of three ponds in branches of the Ware Creek watershed, greater reliance on groundwater, desalinization of brackish water, and water conservation.

A district court in Maryland found a Mathews County environmental and marine consultant guilty of illegally filling 86 acres of wetlands on Maryland's Eastern Shore. The consultant was found guilty of five counts of violating the federal Clean Water Act. Sentencing will take place in April and could be as much as a 15 year prison term and $250,000 in fines.

ANNOUNCEMENTS

Tenth Annual Virginia Wetlands Management Symposium

The tenth annual Virginia Wetlands Management Symposium will be held on February 9, 1991 from 9:30 am to 4:00 pm in Turner Hall Auditorium at Hampton University. Registration Fee: $12.00 (non-refundable - includes registration, materials, coffee breaks and lunch)

Agenda

9:30 - 10:00	Registration (*coffee and doughnuts provided*)
10:00 - 10:15	Welcome and Opening Remarks (*Dr. Robert D. Bonner and Commissioner William A. Pruitt*)
10:15 - 11:00	Regional and General Permits (*U.S. Army Corps of Engineers*)
11:00 - 11:15	Break
11:15 - 12:00	Technical Advisors and Educators (*Dr. Carl Hershner*)
12:00 - 1:30	Lunch
1:30 - 2:00	Civil Charges and Penalties (*Mr. Chuck Roadley*)
2:00 - 2:30	Compliance Monitoring (*Mr. Chip Neikirk*)
2:30 - 3:00	Chesapeake Bay Preservation Act and local wetlands boards (*Mr. Stan Balderson*)
3:00 - 3:00	Wetlands Gains and Losses Update (*Mr. Kirk Havens and Mr. Walter Priest*)
3:30 - 3:55	Open Forum
3:55 - 4:00	Summary Remarks (*Mr. Robert Grabb*)

For additional information contact the Habitat Management Division of the Virginia Marine Resources Commission at 804 247-2200

WETLANDS RECIPES

Periwinkles in Tomato Sauce

Add 1 cup of periwinkles to 2 cups tomato sauce. Simmer over low heat for 30 minutes. Serve with bread, a soup spoon, and toothpicks.

Fiddleheads with Hollandaise Sauce

4 doz fiddleheads	*1 cup butter*
2 cups boiling water	*1 tbsp salt*
4 egg yolks	*2 tbsp lemon juice*

Wash and simmer fiddleheads in salted, boiling water until tender. Place egg yolks with 1/3 of butter in the top of a double boiler. Keep water hot, but do not boil. Stir butter and egg yolks constantly and keep adding butter until mixture thickens. As soon as the mixture is thick remove from heat and add salt and lemon juice while stirring constantly. Spoon out over fiddleheads.

(from Eating From the Wild, Anne Stewart and Leon Kronoff, 1975)

This Issues Quote

"Poor shad, where is thy redress... who hears the fishes when they cry?" ***Henry David Thoreau in a letter protesting dam building on the Concord River."***

The race between education and erosion, between wisdom and waste, has not run its course. George Perkins Marsh pointed out a century ago that greed and shortsightedness were the natural enemies of a prudent resources policy. Each generation must deal anew with the "raiders," with the scramble to use public resources for private profit, and with the tendency to prefer short-run profits to long-run necessities. The Nation's battle to preserve the common estate is far from won." ***John F. Kennedy from the Quiet Crisis by Stewart L. Udall, 1963.***

Wetlands Program

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Dr. Carl Hershner, Program Director

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In this issue....

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