Virginia Wetlands Management Handbook

Prepared by

Wetlands Program
Virginia Institute of Marine Science
The College of William and Mary

Thomas A. Barnard, Jr
Editor

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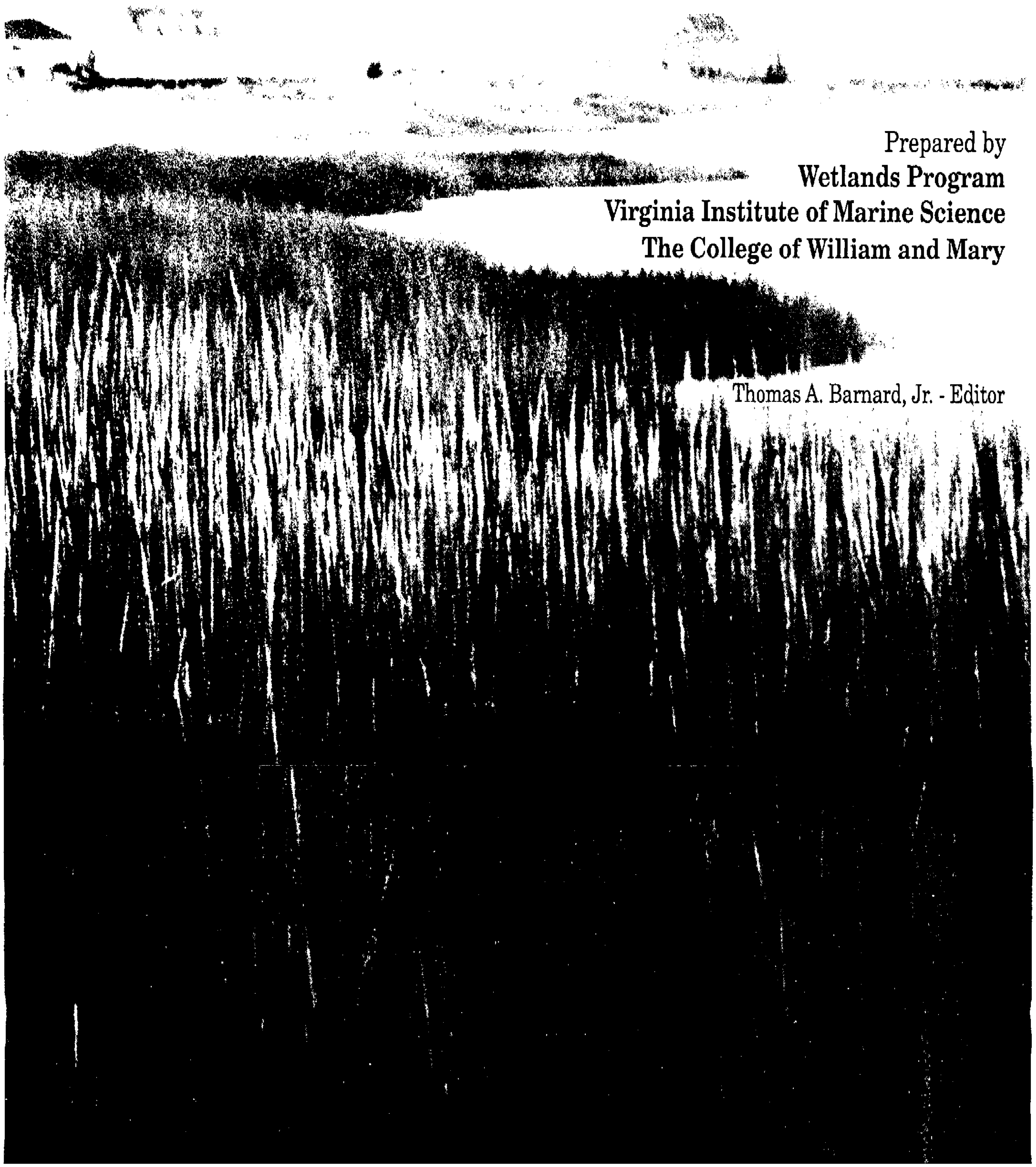
Program

Task 16

Final Product

Virginia Wetlands Management Handbook



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INTRODUCTION

This handbook has been compiled and edited for the purpose of serving as a standardized, ready reference for Virginia wetlands board members and the staff persons who support the boards' volunteer efforts. The handbook contains up-to-date copies of laws, guidelines, policies, and informational statements such as Attorneys' General opinions pertinent to wetlands and dune management in Virginia. In addition, technical reports and advisories published and distributed by the Wetlands Program of the Virginia Institute of Marine Science, College of William and Mary are included. Beyond these staples of Virginia coastal management, discussions of the permit process and the respective roles of the Virginia Marine Resources Commission and the Virginia Institute of Marine Science are illuminated. This latter information should be especially helpful to new appointees who wish to familiarize themselves with not only their specific roles as wetland and dune managers, but also with the overall shoreline management process within which the local wetlands boards play an integral role.

One of the primary motivations behind the production of this handbook is the need to institutionalize the experience and technical base accumulated during the 19-year operation of the wetlands program, given the necessary turnover involved with a decentralized volunteer management system. The handbook is also designed to be constantly updated and revised. **We urge each person who is issued one of these volumes to aid in keeping the handbook up-to-date by adding all new documents or reports to the appropriate notebook section as they are issued.**

These manuals are being provided to the localities and are intended to be assigned to each staff and board member position. The handbook is to be handed down to his or her successor as each board member or staff person leaves office. **Keeping the handbook updated is of great consequence given the importance of providing accurate and complete resource materials to new board appointees as soon as they assume their positions on the regulatory body.**

ACKNOWLEDGEMENTS

Cover Photograph—The picture of the wetlands, dunes and old Coast Guard station on Cedar Island, Accomack County, was taken by Mr. Walter I. Priest, III, VIMS Wetlands Program. The photograph embodies coastal management by depicting the changing face of the shoreline, wetlands and dunes along with man's presence and his attempts to control the natural system.

The following persons are gratefully acknowledged for their individual contributions, without which this handbook would not be possible:

Mr. Charles Dean and members of the Stafford County Wetlands Board.

Mr. Bryan David, Environmental Planner, Isle of Wight County.

Mr. Kenny Eades, Zoning Administrator, Northumberland County.

Mr. Robert Grabb and his staff in the Habitat Management Division, Virginia Marine Resources Commission.

Mr. C. Scott Hardaway, VIMS Division of Geological and Benthic Oceanography.

Ms. Kay Stubblefield and Ms. Sylvia Motley, VIMS APRC.

Ms. Ruth Hershner and Ms. Janet Walker, VIMS Publication Center.

Dr. Carl Hershner and members of the Wetlands Program of the Virginia Institute of Marine Science, College of William and Mary: Ms. Julie Bradshaw, Mr. Kirk Havens, Ms. Amy Hogge, Ms. Judy Hudgins, Ms. Pam Mason, Mr. Walter Priest, Dr. Gene Silberhorn, Mr. Lyle Varnell, Ms. Amy West and Ms. Maryann Wohlgemuth.

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Accomack County Wetlands Board

Contact Person:	C. M. Powell, Secretary Accomack County Wetlands Board County Office Building Accomac, Virginia 23301
Telephone Number:	(804) 787-5721
Fax Number:	(804) 787-2468
Meeting Time:	4th Thursday

Charles City County Wetlands Board

Contact Person:	Fred A. Darden County Administrator Charles City County P.O. Box 128 Charles City, Virginia 23030
Telephone Number:	(804) 829-2401 ext. 201
Fax Number:	(804) 829-5819
Meeting Time:	As Needed

Chesapeake Wetlands Board

Contact Person:	John King Chesapeake Wetlands Board Department of Planning P.O. Box 15225 Chesapeake, Virginia 23320
Telephone Number:	(804) 547-6176
Fax Number:	(804) 436-8356
Meeting Time:	3rd Wednesday

City of Colonial Heights Wetlands Board

Contact Person:	Vicky Minetree Office of City Planner 1507 Boulevard Colonial Heights, Virginia 23834
Telephone Number:	(804) 520-9275
Fax Number:	(804) 520-9338
Meeting Time:	As Needed

Essex County Wetlands Board

Contact Person:	Linda Lumpkin Assistant to County Administrator Essex County Bd. of Supervisors P.O. Box 1079 Tappahannock, Virginia 22560
Telephone Number:	(804) 443-4331
Fax Number:	(804) 443-4157
Meeting Time:	3rd Thursday

Fairfax County Wetlands Board

Contact Person:	Paula Stouder Staff Coordinator Fairfax County Wetlands Board Office of Comprehensive Planning Eighth Floor Centerpointe Bldg. 4050 Legato Road Fairfax, Virginia 22033
Telephone Number:	(703) 246-1332 or (703) 246-1382
Fax Number:	(703) 273-5089
Meeting Time:	1st Wednesday

Fredericksburg Wetlands Board

Contact Person:	D. R. Skinker City Wetlands Board 1818 Charles Street Fredericksburg, Virginia 22401
Telephone Number:	(703) 372-1010
Fax Number:	(703) 372-1158
Meeting Time:	4th Thursday at 7:30 P.M.

Gloucester County Wetlands Board

Contact Person:	Jean McFarland Gloucester County Wetlands Board P.O. Box 329 Gloucester, Virginia 23061
Telephone Number:	(804) 693-4040
Fax Number:	(at the library) (804) 693-1477
Meeting Time:	2nd Wednesday

Hampton Wetlands Board

Contact Person:	Patricia Thomas Planning Department 22 Lincoln Street Hampton, Virginia 23669
Telephone Number:	(804) 727-6142
Fax Number:	(804) 727-6895
Meeting Time:	4th Friday

Hopewell Wetlands Board

Contact Person:	Milton Martin, Secretary Hopewell Wetlands Board Department of Development 300 North Main Street Hopewell, Virginia 23860
Telephone Number:	(804) 541-2267
Fax Number:	none
Meeting Time:	As Needed

Isle Of Wight Wetlands Board

Contact Person:	Sandy Whitley Dept. of Community Development Secretary, Local Wetlands Board Isle of Wight Courthouse Isle of Wight, Virginia 23397
Telephone Number:	(804) 357-3191
Fax Number:	(at courthouse building) (804) 357-9171
Meeting Time:	3rd Monday or As Needed

James City County Wetlands Board

Contact Person:	Carolyn A. Murphy Code Compliance Officer James City County Wetlands Board P.O. Box JC Williamsburg, Virginia 23187
Telephone Number:	(804) 253-6622
Fax Number:	(804) 253-6663
Meeting Time:	1st Wednesday

King George Wetlands Board

Contact Person:	Rob Price Zoning Administrator P.O. Box 246 King George, Virginia 22485
Telephone Number:	(703) 775-7111
Fax Number:	(703) 775-5248
Meeting Time:	As Needed

King William County Wetlands Board

Contact Person:	David Whitlow King William County Wetlands Board P.O. Box 215 King William, Virginia 23086
Telephone Number:	(804) 769-4927
Fax Number:	(804) 769-4964
Meeting Time:	2nd Tuesday

Lancaster County Wetlands Board

Contact Person: Gil Unangst
P.O. Box 167
Lancaster, Virginia 22503

Telephone Number: (804) 462-5220
Fax Number: none

Meeting Time: 2nd Monday

Mathews County Wetlands Board

Contact Person: Sherry C. Ashe, Administrative Assistant
Mathews County Wetlands Board
P.O. Box 839
Mathews, Virginia 23109

Telephone Number: (804) 725-5025
Fax Number: (at library) (804) 725-7668

Meeting Time: 1st Wednesday

Middlesex County Wetlands Board

Contact Person: Cathy Wilson, Secretary
Middlesex County Wetlands Board
P.O. Box 423
Saluda, Virginia 23149

Telephone Number: (804) 758-4305
Fax Number: (804) 758-0061

Meeting Time: 2nd Tuesday

New Kent County Wetlands Board

Contact Person: R. Joseph Emerson, Jr.
New Kent County Wetlands Board
P.O. Box 50
New Kent, Virginia 23124

Telephone Number: (804) 966-9690
Fax Number: (804) 966-7135

Meeting Time: As Needed

Newport News Wetlands Board

Contact Person: Robert G. Bates
Port Development Administrator
City of Newport News
2400 Washington Avenue
Newport News, Virginia 23607

Telephone Number: (804) 247-8437
Fax Number: (804) 247-2389

Meeting Time: 3rd Monday

Norfolk Wetlands Board

Contact Person: Karla Marshall
Environmental Services
645 Church Street
Norfolk, Virginia 23501

Telephone Number: (804) 441-2152
Fax Number: (804) 626-1969

Meeting Time: 2nd Wednesday

Northampton County Wetlands Board

Contact Person:	John L. Humphrey, Secretary Northampton County Wetlands Board c/o Dept of Planning and Zoning Box 538 Eastville, Virginia 23347
Telephone Number:	(804) 678-5872
Fax Number:	(804) 678-5055
Meeting Time:	3rd Wednesday

Northumberland County Wetlands Board

Contact Person:	Kenneth D. Eades Zoning Administrator Northumberland County Courthouse Heathsville, Virginia 22473
Telephone Number:	(804) 580-8910 or 580-7921
Fax Number:	(804) 580-4321
Meeting Time:	1st Thursday

Poquoson Wetlands Board

Contact Person:	Deborah Vest, Secretary Poquoson Wetlands Board 830 Poquoson Avenue Poquoson, Virginia 23662
Telephone Number:	(804) 868-7151 ext. 25
Fax Number:	(804) 868-0512
Meeting Time:	3rd Wednesday

Portsmouth Wetlands Board

Contact Person:	Martha Little Department of Planning 801 Crawford Street Portsmouth, Virginia 23704
Telephone Number:	(804) 393-8836
Fax Number:	(804) 393-5230
Meeting Time:	2nd Thursday

Prince William County Wetlands Board

Contact Person:	Art Reynolds Prince William County Dept. of Public Works 4361 Ridgewood Center Drive Prince William, Virginia 22192
Telephone Number:	(703) 335-6820
Fax Number:	(703) 335-6828
Meeting Time:	As Needed

Richmond County Wetlands Board

Contact Person:	Bill Duncanson Land Use Administrator Richmond County P.O. Box 1000 Warsaw, Virginia 22572
Telephone Number:	(804) 333-3415
Fax Number:	(804) 333-3408
Meeting Time:	4th or last Thursday

Stafford County Wetlands Board

Contact Person:	Philip G. Thompson Stafford County Local Wetlands Board P.O. Box 339 Stafford, Virginia 22554
Telephone Number:	(703) 659-8668
Fax Number:	(703) 659-6824
Meeting Time:	3rd Monday

Suffolk Wetlands Board

Contact Person:	Scott Mills Wetlands Staff Dept. of Community Development Division of Planning P.O. Box 1858 Suffolk, Virginia 23434
Telephone Number:	(804) 925-6485
Fax Number:	(804) 925-6386
Meeting Time:	2nd Thursday

Virginia Beach Wetlands Board

Contact Person:	Lonnie Warren Office of the City Engineer Municipal Center Virginia Beach, Virginia 23456
Telephone Number:	(804) 427-4131
Fax Number:	(804) 426-5668
Meeting Time:	1st and 3rd Mondays

West Point Wetlands Board

Contact Person:	Tammy Carter Town of West Point Wetlands Board P.O. Box 152 West Point, Virginia 23181
Telephone Number:	(804) 843-3426
Fax Number:	(804) 843-4364
Meeting Time:	As Needed

Westmoreland County Wetlands Board

Contact Person:	Paul Jones Secretary-Coordinator Westmoreland County Wetlands Board P.O. Box 467 Montross, Virginia 22520
Telelphone Number:	(803) 493-0121
Fax Number:	(804) 493-9309
Meeting Time:	4th Wednesday

Williamsburg Wetlands Board

Contact Person:	Jack Hobbs Williamsburg Wetlands Board 401 Lafayette Street Williamsburg, Virginia 23185
Telephone Number:	(804) 220-6130
Fax Number:	(804) 220-6109
Meeting Time:	As Needed

York County Wetlands Board

Contact Person:	Cynthia Taylor Dept. of Planning & Community Development P.O. Box 532 Yorktown, Virginia 23690
Telephone Number:	(804) 898-0080
Fax Number:	(804) 898-4201
Meeting Time:	1st Wednesday

Laws of Virginia

Relating to the

Marine Resources of the

Commonwealth of Virginia

Chapter 2.1. Wetlands.

§ 62.1-13.1. Declaration of policy. - The Commonwealth of Virginia hereby recognizes the unique character of the wetlands, an irreplaceable natural resource which, in its natural state, is essential to the ecological systems of the tidal rivers, bays and estuaries of the Commonwealth. This resource is essential for the production of marine and inland wildlife, waterfowl, finfish, shellfish and flora; is valuable as a protective barrier against floods, tidal storms and erosion of the shores and soil within the Commonwealth; is important for the absorption of silt and of pollutants; and is important for recreational and aesthetic enjoyment of the people for the promotion of tourism, navigation and commerce.

Continued destruction of Virginia's coastal wetlands will greatly contribute to the pollution of the Commonwealth's rivers, bays and estuaries; will diminish the abundance of Virginia's marine and inland animals and waterfowl, finfish, shellfish and flora as sources of food, employment and recreation for the people of Virginia; will increase costs and hazards associated with floods and tidal storms; and will accelerate erosion and the loss of lands productive to the economy and the well-being of our citizens.

Therefore, in order to protect the public interest, promote the public health, safety and the economic and general welfare of the Commonwealth, and to protect public and private property, wildlife, marine fisheries and the natural environment, it is declared to be the public policy of this Commonwealth to preserve the wetlands and to prevent their despoliation and destruction and to accommodate necessary economic development in a manner consistent with wetlands preservation. (1972, c. 711.)

Cross references. - As to application of the Open-Space Land Act to wetlands, see § 10-156.

Law Review. - For survey of Virginia law on administrative law for the year 1971-1972, see 58 Va. L. Rev. 1159 (1972). For article assessing the adequacy of Virginia's water policy, see 14 Wm. & Mary L. Rev. 312 (1972).

For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973). For comment on nonpoint pollution control in Virginia, see 13 U. Rich. L. Rev. 539 (1979). For article, "The Unresolved Structure of Property Rights in the Virginia Shore," see 24 Wm. & Mary L. Rev. 727 (1983).

§ 62.1-13.2. Definitions. - For the purposes of this chapter, the following words shall have the meanings respectively ascribed to them:

(a) "Commission" means the Virginia Marine Resources Commission.

(b) "Commissioner" means the Commissioner of Marine Resources.

(c) "Person" means any corporation, association, or partnership, one or more individuals, or any unit of government or agency thereof.

(d) "Tidewater Virginia" means the following counties: Accomack, Arlington, Caroline, Charles City, Chesterfield, Essex, Fairfax, Gloucester, Hanover, Henrico, Isle of Wight, James City, King George, King and Queen, King William, Lancaster, Mathews, Middlesex, New Kent, Northampton, Northumberland, Prince George, Prince William, Richmond, Spotsylvania, Stafford, Surry, Westmoreland, and York; and the Cities of Alexandria, Chesapeake, Colonial Heights, Fairfax, Falls Church, Fredericksburg, Hampton, Hopewell, Newport News, Norfolk, Petersburg, Poquoson, Portsmouth, Richmond, Suffolk, Virginia Beach and Williamsburg.

(e) "Governmental activity" means any or all of the services provided by the Commonwealth or a county, city or town to its citizens for the purpose of maintaining public facilities and shall include but shall not be limited to such services as constructing, repairing and maintaining roads, sewage facilities, supplying and treating water, street lights, and construction of public buildings.

(f) "Vegetated wetlands" means all that land lying between and contiguous to mean low water and an elevation above mean low water equal to the factor 1.5 times the mean tide range at the site of the proposed project in the county, city or town in question; and upon which is growing on July 1, 1972, or grows thereon subsequent thereto, any one or more of the following: saltmarsh cordgrass (*Spartina alterniflora*), saltmeadow hay (*Spartina patens*), saltgrass (*Distichlis spicata*), black needlerush (*Juncus roemerianus*), saltwort (*Salicornia* spp.), sea lavender (*Limonium* spp.), marsh elder (*Iva frutescens*), groundsel bush (*Baccharis halimifolia*), wax myrtle (*Myrica* sp.), sea oxeye (*Borrichia frutescens*), arrow arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*), big cordgrass (*Spartina cynosuroides*), rice cutgrass (*Leersia oryzoides*), wildrice (*Zizania aquatica*), bulrush (*Scirpus validus*), spikerush (*Eleocharis* sp.), sea rocket (*Cakile edentula*), southern wildrice (*Zizaniopsis miliacea*), cattails (*Typha* spp.), three-squares (*Scirpus* spp.), buttonbush (*Cephalanthus occidentalis*), bald cypress (*Taxodium distichum*), black gum (*Nyssa sylvatica*), tupelo (*Nyssa aquatics*), dock (*Rumex* spp.), yellow pond lily (*Nuphar* sp.), marsh fleabane (*Pluchea purpurascens*), royal fern (*Osmunda regalis*), marsh hibiscus (*Hibiscus moscheutos*), beggar's tick (*Bidens* sp.), smartweeds (*Polygonum* sp.), arrowhead (*Sagittaria* spp.), sweet flag (*Acorus calamus*), water hemp (*Amaranthus cannabinus*), reed grass (*Phragmites australis*) and switch grass (*Panicum virgatum*).

The vegetated wetlands of Back Bay and its tributaries and the vegetated wetlands of the North Landing River and its tributaries shall mean all marshes subject to flooding.by normal tides, including wind tides, provided this shall not include hurricane or tropical storm tides and upon which one or more of the following vegetation species are growing or grows thereon subsequent to the passage of this amendment: saltmarsh cordgrass (*Spartina alterniflora*), saltmeadow hay (*Spartina patens*), black needlerush (*Juncus roemerianus*), marsh elder (*Iva frutescens*), groundsel bush (*Baccharis halimifolia*), wax myrtle (*Myrica* sp.), arrow arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*), big cordgrass (*Spartina cynosuroides*), rice cutgrass (*Leersia oryzoides*), wildrice (*Zizania aquatica), bulrush (Scirpus validus*), spikerush (*Eleocharis* sp.), cattails (*Typha* spp.), threesquares (*Scirpus* spp.), dock (*Rumex* sp.), smartweed

(*Polygonum* sp.), yellow pond lily (*Nuphar* sp.), royal fern (*Osmunda regalis*), marsh hibiscus (*Hibiscus moscheutos*), beggar's tick (*Bidens* sp.), arrowhead (*Sagittaria* sp.), water hemp (*Amaranthus cannabinus*), reed grass (*Phragmites australis*) and switch grass (*Panicum virgatum*).

(g) "Wetlands board" or "Board" means a board created as provided in § 62.1-13.6.

(h) "Wetlands zoning ordinance" means that ordinance set forth in § 62.1-13.5.

(i) "County, city or town" shall mean the governing body of such county, city or town.

(j) "Back Bay and its tributaries" means the following as shown on the U.S. Geological Survey Quadrangle Sheets for Virginia Beach, North Bay, and Knotts Island: Back Bay north of the Virginia-North Carolina state line: Capsies Creek north of the Virginia-North Carolina state line; Deal Creek; Devil Creek; Nawney Creek; Redhead Bay, Sand Bay, Shipps Bay, North Bay, and the waters connecting them; Beggars Bridge Creek; Muddy Creek; Ashville Bridge Creek; Hells Point Creek; Black Gut; and all coves, ponds and natural waterways adjacent to or connecting with the above-named bodies of water.

(k) "North Landing River and its tributaries" means the following as based on United States Geological Survey Quadrangle Sheets for Pleasant Ridge, Creeds, and Fentress: the North Landing River from the Virginia-North Carolina line to Virginia Highway 165 at North Landing Bridge; the Chesapeake and Albemarle Canal from Virginia Highway 165 at North Landing Bridge to the locks at Great Bridge; all named and unnamed streams, creeks and rivers flowing into the North Landing River and the Chesapeake and Albemarle Canal except the following: West Neck Creek north of Indian River Road; Pocaty River west of Blackwater Road; Blackwater River west of its forks located at a point approximately 6400 feet due west of the point where the Blackwater Road crosses the Blackwater River at the village of Blackwater; Millbank Creek west of Blackwater Road.

(l) "Nonvegetated wetlands" means all that land lying contiguous to mean low water and which land is between mean low water and mean high water not otherwise included in the term "vegetated wetlands" as defined herein and also includes those unvegetated areas of Back Bay and its tributaries and the North Landing River and its tributaries subject to flooding by normal tides including wind tides but not including hurricane or tropical storm tides.

(m) "Wetlands" means both vegetated and nonvegetated wetlands. (1972, c. 711; 1973, c. 388; 1974, c. 297; 1975, c. 268; 1979, c. 524; 1982, c. 300.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

Law Review. - For a note on purposes and types of wetlands regulation, see 58 Va. L. Rev. 876 (1972). For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973).

§ 62.1-13.2:1: Repealed by Acts 1974, c. 96.

Editor's note. - The repealed section was enacted by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

§ 62.1-13.3. Standards for use and development of wetlands; utilization of guidelines. - The following standards shall apply to the use and development of wetlands and shall be considered in the determination of whether applications required by this chapter should be granted or denied:

(1) Wetlands of primary ecological significance shall not be altered so that the ecological systems in the wetlands are unreasonably disturbed.

(2) Development in Tidewater Virginia, to the maximum extent practical, shall be concentrated in wetlands of lesser ecological significance, in vegetated wetlands which have been irreversibly disturbed before July 1, 1972, in nonvegetated wetlands as described herein which have been irreversibly disturbed prior to January 1, 1983, and in areas of Tidewater Virginia apart from the wetlands.

(3) The provisions of the guidelines promulgated by the Commission pursuant to § 62.1-13.4 of this Code shall be considered in applying the foregoing standards. (1972, c. 711; 1982, c. 300.)

Law Review. - For a note on purposes and types of wetlands regulation, see 58 Va. L. Rev. 876 (1972). For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973). For article, "The Unresolved Structure of Property Rights in the Virginia Shore," see 24 Wm. & Mary L. Rev. 727 (1983).

It was proper for aggrieved riparian owner to allege a violation of the Wetlands Act as a pendent state claim to its suit brought pursuant to the Clean Water Act, 33 U.S.C. § 1251 et seq. City of Norfolk v. Harold, 662 F. Supp. 959 (E.D. Va. 1987).

§ 62.1-13.4. Marine Resources Commission to develop guidelines. - In order to implement the policy set forth in § 62.1-13.1 and to assist counties, cities or towns in regulation of vegetated and nonvegetated wetlands, the Commission shall, with the advice and assistance of the Virginia Institute of Marine Science, which will evaluate wetlands by type and maintain a continuing inventory of vegetated wetlands, from time to time promulgate in accordance with the Administrative Process Act (§ 9-6.14:1 et seq.) guidelines which scientifically evaluate vegetated and nonvegetated wetlands by type and which set forth the consequences of use of these wetlands types. In addition, the Commission may promulgate regulations in accordance with the Administrative Process Act (§ 9-6.14:1 et seq.) which are necessary to carry out its powers and duties under the provisions of this title. In developing guidelines or regulations, the Commission shall consult with any affected state governmental agency. (1972, c. 711; 1982, c. 300.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

Law Review. - For survey of Virginia law on administrative law for the year 1971-1972, see 58 Va. L. Rev. 1159 (1972). For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973). For article, "The Unresolved Structure of Property Rights in the Virginia Shore," see 24 Wm. & Mary L. Rev. 727 (1983).

§ 62.1-13.4:1: Repealed by Acts 1974, c. 96.

Editor's note. - The repealed section was enacted by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

§ 62.1-13.5. Counties, cities and towns authorized to adopt wetlands zoning ordinance; terms of ordinance. - Any county, city or town may adopt the following ordinance, which, after January 1, 1983, shall serve as the only wetlands zoning ordinance under which any wetlands board is authorized to operate.

Upon notification by any county, city or town that such ordinance has been adopted, the Commission shall immediately forward to the wetlands board of such county, city, or town any application then pending before the Commission over which that wetlands board would have had jurisdiction, had such ordinance been in effect at the time of filing by the applicant; however, if so requested by the applicant, such application shall remain within the jurisdiction of the Commission.

Wetlands Zoning Ordinance

§ 1. The governing body of ...., acting pursuant to Chapter 2.1 of Title 62.1 of the Code of Virginia, for purposes of fulfilling the policy standards set forth in such chapter, adopts this ordinance regulating the use and development of wetlands.

§ 2. Definitions. - For the purposes of this ordinance:

(a) "Commission" means the Virginia Marine Resources Commission.

(b) "Commissioner" means the Commissioner of Marine Resources.

(c) "Person" means any corporation, association or partnership, one or more individuals, or any unit of government or agency thereof.

(d) "Governmental activity" means any or all of the services provided by this .... to its citizens for the purpose of maintaining this .... and shall include but shall not be limited to such services as constructing, repairing and maintaining roads, sewage facilities, supplying and treating water, street lights and construction of public buildings.

(e) "Vegetated wetlands" means all that land lying between and contiguous to mean low water and an elevation above mean low water equal to the factor 1.5 times the mean tide range at the site of the proposed project in this ....; and upon which is growing on the effective date of this act or grown thereon subsequent thereto, any one or more of the following: saltmarsh cordgrass (*Spartina alterniflora*), saltmeadow hay (*Spartina patens*), saltgrass (*Distichlis spicata*), black needlerush (*Juncus roemerianus*), saltwort (*Salicornia* sp.), sea lavender (*Limonium* sp.), marsh elder (*Iva frutescens*), groundselbush (*Baccharis halimifolia*), wax myrtle (*Myrica* sp.), sea oxeye (*Borrichia frutescens*), arrow arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*), big cordgrass (*Spartina cynosuroides*), rice cutgrass (*Leersia oryzoides*), wildrice (*Zizania aquatica*), bulrush (*Scirpus validus*), spikerush (*Eleocharis* sp.), sea rocket (*Cakile edentula*), southern wildrice (*Zizaniopsis miliacea*), cattails (*Typha* spp.), threesquares (*Scirpus* spp.), buttonbush (*Cephalanthus occidentalis*), bald cypress (*Taxodium distichum*), black gum (*Nyssa sylvatica*), tupelo (*Nyssa aquatics*), dock (*Rumex* sp.), yellow pond lily (*Nuphar* sp.), marsh fleabane (*Pluchea purpurascens*), royal fern (*Osmunda regalis*), marsh hibiscus (*Hibiscus moscheutos*), beggar's tick (*Bidens* sp.), smartweed (*Polygonum* sp.), arrowhead (*Sagittaria* spp.), sweet flag (*Acorus calamus*), water hemp (*Amaranthus cannabinus*), reed grass (*Phragmites communis*), and switch grass (*Panicum virgatum*).

The vegetated wetlands of Back Bay and its tributaries and the vegetated wetlands of the North Landing River and its tributaries shall mean all marshes subject to flooding by tides, including wind tides, provided this shall not include hurricane or tropical storm tides, and upon which one or more of the following vegetation species are growing or grows thereon subsequent to the passage of this amendment: saltmarsh cordgrass (*Spartina alterniflora*), saltmeadow hay (*Spartina patens*), black needlerush (*Juncus roemerianus*), marsh elder (*Iva frutescens*), groundsel bush (*Baccharis halimifolia*), wax myrtle (*Myrica* sp.), arrow arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*), big cordgrass (*Spartina cynosuroides*), rice cutgrass (*Leersia oryzoides*), wildrice (*Zizania aquatics*), bulrush (*Scirpus validus*), spikerush (*Eleocharis* sp.), cattails

(*Typha* spp.), threesquares (*Scirpus* spp.), dock (*Rumex* sp.), smartweed (*Polygonum* sp.), yellow pond lily (*Nuphar* sp.), royal fern (*Osmunda regalis*), marsh hibiscus (*Hibiscus moscheutos*), beggar's tick (*Bidens* sp.), arrowhead (*Sagittaria* sp.), water hemp (*Amaranthus cannabinus*), reed grass (*Phragmites australis*), and switch grass (*Panicum virgatum*).

(f) "Wetlands board" or "board" means a board created as provided in § 62.1-13.6 of the Code of Virginia.

(g) "Back Bay and its tributaries" means the following as shown on the U.S. Geological Survey Quadrangle Sheets for Virginia Beach, North Bay, and Knotts Island: Back Bay north of the Virginia-North Carolina State line; Capsies Creek north of the Virginia-North Carolina State line; Deal Creek; Devil Creek; Nawney Creek; Redhead Bay, Sand Bay, Shipps Bay, North Bay, and the waters connecting them, Beggars Bridge Creek; Muddy Creek; Ashville Bridge Creek; Hells Point Creek; Black Gut; and all coves, ponds and natural waterways adjacent to or connecting with the above-named bodies of water.

(h) "North Landing River and its tributaries" means the following as based on the United States Geological Survey Quadrangle Sheets for Pleasant Ridge, Creeds, and Fentress: the North Landing River from the Virginia-North Carolina line to Virginia Highway 165 at North Landing Bridge; the Chesapeake and Albemarle Canal from Virginia Highway 165 at North Landing Bridge to the locks at Great Bridge; all named and unnamed streams, creeks, and rivers flowing into the North Landing River and the Chesapeake and Albemarle Canal except the following: West Neck Creek north of Indian River Road; Pocaty River west of Blackwater Road; Blackwater River west of its forks located at a point approximately 6400 feet due west of the point where the Blackwater Road crosses the Blackwater River at the village of Blackwater; Millbank Creek west of Blackwater Road.

(i) "Nonvegetated wetlands" means all that land lying contiguous to mean low water and which land is between mean low water and mean high water not otherwise included in the term "vegetated wetlands" as defined herein and also includes those unvegetated areas of Back Bay and its tributaries and the North Landing River and its tributaries subject to flooding by tides including wind tides but not including hurricane or tropical storm tides.

(j) "Wetlands" means both vegetated and nonvegetated wetlands.

§ 3. The following uses of and activities on wetlands are permitted, if otherwise permitted by law:

(a) The construction and maintenance of noncommercial catwalks, piers, boathouses, boat shelters, fences, duckblinds, wildlife management shelters, footbridges, observation decks and shelters and other similar structures, provided that such structures are so constructed on pilings as to permit the reasonably unobstructed flow of the tide and preserve the natural contour of the wetlands;

(b) The cultivation and harvesting of shellfish, and worms for bait;

(c) Noncommercial outdoor recreational activities, including hiking, boating, trapping, hunting, fishing, shellfishing, horseback riding, swimming, skeet and trap shooting, and shooting preserves, provided that no structure shall be constructed except as permitted in subsection (a) of this section;

(d) The cultivation and harvesting of agricultural, forestry or horticultural products; grazing and haying;

(e) Conservation, repletion and research activities of the Virginia Marine Resources Commission, the Virginia Institute of Marine Science, the Department of Game and Inland Fisheries and other related conservation agencies;

(f) The construction or maintenance of aids to navigation which are authorized by governmental authority;

(g) Emergency decrees of any duly appointed health officer of a governmental subdivision acting to protect the public health;

(h) The normal maintenance, repair or addition to presently existing roads, highways, railroad beds, or the facilities of any person, firm, corporation, utility, federal, state, county, city or town abutting.on or crossing wetlands, provided that no waterway is altered and no additional wetlands are covered;

(i) Governmental activity on wetlands owned or leased by the Commonwealth of Virginia, or a political subdivision thereof;

(j) The normal maintenance of man-made drainage ditches, provided that no additional wetlands are covered and provided further that this paragraph shall not be deemed to authorize construction of any drainage ditch; and

(k) Outdoor recreational activities, provided that such activities do not (i) impair the natural functions of the wetlands, or (ii) alter the natural contour of the wetlands.

§ 4. (a) Any person who desires to use or develop any wetland within this .... (county, city or town), other than for those activities specified in § 3 above, shall first file an application for a permit with the wetlands board directly or through the Commission.

(b) An application shall include the following: the name and address of the applicant; a detailed description of the proposed activity and a map, drawn to an appropriate and uniform scale, showing the area of wetland directly affected, with the location of the proposed work thereon, indicating the area of existing and proposed fill and excavation, especially the location, width, depth and length of any proposed channel and the disposal area, all existing and proposed structures; sewage collection and treatment facilities, utility installations, roadways, and other related appurtenances or facilities, including those on adjacent uplands, and the type of equipment to be used and the means of equipment access to the activity site; the names and addresses of owners of record of adjacent land and known claimants of water rights in or adjacent to the wetland of whom the applicant has notice; an estimate of cost; the primary purpose of the project; any secondary purposes of the project, including further projects; the public benefit to be derived from the proposed project; a complete description of measures to be taken during and after the alteration to reduce detrimental offsite effects; the completion date of the proposed work, project, or structure and such additional materials and documentation as the wetlands board may deem necessary.

(c) A nonrefundable processing fee to cover the cost of processing the application, set by the applicable governing body with due regard for the services to be rendered, including the time, skill, and administrator's expense involved, shall accompany each application.

§ 5. All applications and maps and documents relating thereto shall be open for public inspection at the office designated by the applicable governing body and as stated in the advertisement for public hearing required in § 6.

§ 6. Not later than sixty days after receipt of such application, the wetlands board shall hold a public hearing on such application. The applicant, the local governing body, the Commissioner, the owner of record of any land adjacent to the wetlands in question, known claimants of water rights in or adjacent to the wetlands in question, the Virginia Institute of Marine Science the Department of Game and Inland Fisheries, the Water Control Board, the Department of Transportation and governmental agencies expressing an interest therein shall be notified by the board of the hearing by mail not less than twenty days prior to the date set for the hearing. The wetlands board shall also cause notice of such hearing to be published at least once a week for two weeks prior to such hearing in the newspaper having a general circulation in this .... (county, city or town). Every such advertisement shall contain a reference to the place or places within the county or municipality where copies of the proposed application may be examined. The costs of such publication shall be paid by the applicant.

§ 7. In acting on any application for a permit, the board shall grant the application upon the concurring favorable vote of three members of a five-member board or four members of a seven-member board. The chairman of the board, or in his absence the acting chairman, may administer oaths and compel the attendance of witnesses. Any person may appear and be heard at the public hearing. Each witness at the hearing may submit a concise written statement of his testimony. The board shall make a record of the proceeding, which shall include the application, any written statements of witnesses, a summary of statements of all witnesses, the findings and decision of the board, and the rationale for the decision. The board shall make its determination within thirty days from the hearing. If the board fails to act within such time, the application shall be deemed approved. Within forty-eight hours of its determination, the board shall notify the applicant and the Commissioner of such determination and if the board has not made a determination, it shall notify the applicant and the Commission that thirty days have passed and that the application is deemed approved. The term "act" referenced above shall be the action of taking a vote on the application. If the application receives less than four concurring favorable votes, for a seven-member board and three concurring favorable votes for a five-member board, this will be a determination to deny the permit.

The board shall transmit a copy of the permit to the Commissioner. If the application is reviewed or appealed, then the board shall transmit the record of its hearing to the Commissioner. Upon a final determination by the Commission, the record shall be returned to the board. The record shall be open for public inspection at the same office as designated by the applicable governing body for the purposes of § 5.

§ 8. The board may require a reasonable bond or letter of credit in an amount and with surety and conditions satisfactory to it securing to the Commonwealth compliance with the conditions and limitations set forth in the permit. The board may, after a hearing as provided herein, suspend or revoke a permit if the board finds that the applicant has failed to comply with any of the conditions or limitations set forth in the permit or has exceeded the scope of the work as set forth in the application. The board after hearing may suspend a permit if the applicant fails to comply with the terms and conditions set forth in the application.

§ 9. (a) In making its decision whether to grant, to grant in modified form, or to deny an application for a permit the board shall base its decision on these factors:

(1) Such matters raised through the testimony of any person in support of or in rebuttal to the permit application.

(2) Impact of the development on the public health and welfare as expressed by the policy and standards of Chapter 2.1 of Title 62.1 of the Code of Virginia and any guidelines which may have been promulgated thereunder by the Commission.

(b) If the board, in applying the standards above, finds that the anticipated public and private benefit of the proposed activity exceeds the anticipated public and private detriment and that the proposed activity would not violate or tend to violate the purposes and intent of Chapter 2.1 of Title 62.1 of the Code of Virginia and of this ordinance, the board shall grant the permit, subject to any reasonable condition or modification designed to minimize the impact of the activity on the ability of this .... (county, city or town), to provide governmental services and on the rights of any other person and to carry out the public policy set forth in Chapter 2.1 of Title 62.1 of the Code of Virginia and in this ordinance. Nothing in this section shall be construed as affecting the right of any person to seek compensation for any injury in fact incurred by him because of the proposed activity. If the board finds that the anticipated public and private benefit from the proposed activity is exceeded by the anticipated public and private detriment or that the proposed activity would violate the purposes and intent of Chapter 2.1 of Title 62.1 of the Code of Virginia and of this ordinance, the board shall deny the permit application with leave to the applicant to resubmit the application in modified form.

§ 10. The permit shall be in writing, signed by the chairman of the board and notarized.

§ 11. No permit shall be granted without an expiration date, and the board, in the exercise of its discretion, shall designate an expiration date for completion of such work specified in the permit from the date the board granted such permit. The board, however, may, upon proper application therefor, grant extensions.

§ 12. No permit granted by a wetlands board shall affect in any way the applicable zoning and land use ordinances of this .... (county, city or town). (1972, c. 711; 1973, cc. 382, 388; 1975, c. 268; 1979, c. 418; 1982, c. 300; 1985, c. 541; 1988 , c. 587; 1989, c. 360.)

Cross references. - As to adoption of coastal primary sand dune zoning ordinance, see § 62.1-13.25.

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

The 1988 amendment substituted "designated by the applicable governing body and as stated in the advertisement for public hearing required in § 6" for "of the recording officer of this _______ (county, city or town)" in § 5, added the next-to-last sentence in § 6 and substituted "same office as designated by the applicable governing body for the purposes of § 5" for "office of the recording officer of this ________ (county, city or town)" at the end of the second paragraph in § 7 of the Wetlands Zoning Ordinance.

The 1989 amendment, in § 3, deleted "and" at the end of subdivision (i), added "and" at the end of subsection 0), and added subsection (k); and made minor stylistic changes throughout the section.

Law Review. - For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973). For article, "Public Access to Virginia's Tidelands: A Framework for Analysis of Implied Dedications and Public Prescriptive Rights," see 24 Wm. & Mary L. Rev. 669 (1983). For article, "The Unresolved Structure of Property Rights in the Virginia Shore," see 24 Wm. & Mary L. Rev. 727 (1983).

§ 62.1-13.5:1: Repealed by Acts 1974, c. 96.

Editor's note. - The repealed section was enacted by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

§ **62.1-13.5:2. Administrative procedures.** - The Commission may, in conjunction with local wetlands boards and other affected state and federal agencies, develop administrative procedures to expedite the processing of applications for permits required under this chapter. In any case in which an application is received by the Commission for a permit over which a local board has jurisdiction under a wetlands zoning ordinance, the Commission shall forward a copy of the application to that board within seven days. (1982, c. 300.)

§ **62.1-13.5:3:** Not set out.

Editor's note. - This section, relating to emergency sand grading activities on non-vegetated wetlands located on the Atlantic Shoreline of Virginia Beach, was enacted by Acts 1984, c. 518. In furtherance of the general policy of the Virginia Code Commission to include in the Code only provisions having general and permanent application, this section, which is limited in its purpose and scope is not set out here, but attention is called to it by this reference.

§ **62.1-13.6. Appointment, terms, compensation, etc., of local wetlands boards; jurisdiction of county wetlands board over wetlands in town.** - A. In and for any county, city or town which has enacted or enacts a wetlands zoning ordinance pursuant to this chapter, there shall be created a wetlands board, which shall consist of five or seven residents of the county, city or town appointed by the governing body of the county, city or town. All terms of office shall be for five years each except that original appointments shall be made for such terms that the term of one member shall expire each year. The chairman of the board shall notify the governing body at least thirty days in advance of the expiration of any term of office, and shall also notify the governing body promptly if any vacancy occurs. Such vacancies shall be filled by the governing body without delay upon receipt of such notice. Appointments to fill vacancies shall be only for the unexpired portion of the term. Members may serve successive terms. Members of the board shall hold no other public office in the county or city except that they may be members of the local planning or zoning commission, directors of soil and water conservation boards, or local erosion commissions, or of the local board of zoning appeals. A member whose term expires shall continue to serve until his successor is appointed and qualified. When such members are appointed to a local wetlands board, their terms of appointment shall be coterminous with their membership on the local planning or zoning commission, soil and water conservation boards, or local erosion commissions or on the local board of zoning appeals.

B. If a town does not enact a wetlands zoning ordinance within one year from the time the county in which the town is found enacts a wetlands zoning ordinance, application for wetlands found in the town shall be made to the county wetlands board.

C. Any county, city or town which appoints a local wetlands board pursuant to this section may compensate the members of the board in accordance with such terms and conditions as the locality may prescribe.

D. Notwithstanding any other provision of this section, the Town of Dumfries in Prince William County may enact a wetlands zoning ordinance pursuant to the provisions of this chapter. (1972, c. 711; 1977, c. 15; 1978, c. 585; 1982, cc. 300, 446; 1983, c. 87; 1987, c. 62.)

Law Review. - For survey of Virginia law on administrative law for the year 1971-1972, see 58 Va. L. Rev. 1159 (1972).

§ 62.1-13.7. Officers, meetings, rules, etc., of wetlands boards; records and reports. - The board shall elect from its membership a chairman and such other officers as it deems necessary who shall serve one-year terms as such and may succeed themselves. For the conduct of any hearing and the taking of any action, a quorum shall be not less than three members of a five-member board, or four members of a seven-member board. The board may make, alter and rescind rules and forms for its procedures, consistent with ordinances of the county, city or town and general laws of the Commonwealth, including this chapter. The board shall keep a full public record of its proceedings and shall submit a report of its activities to the governing body at least once each year, and a copy of its report to the Commission. (1972, c. 711; 1977, c. 15; 1982, c. 446.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

§ 62.1-13.8. Local governing body to supply meeting space and services for wetlands board; removal of board member. - The governing body of the county, city or town creating a wetlands board shall supply reasonable meeting space for the use of the board and such reasonable secretarial, clerical, legal and consulting services as may be needed by the board. The local governing body is authorized to expend the necessary public funds. Any board member may be removed for malfeasance, misfeasance or nonfeasance in office, or for other just cause, by the governing body which appointed him, after hearing held after at least fifteen days' notice. (1972, c. 711.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

Law Review. - For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973).

§ 62.1-13.9. Permits required for certain activities; issuance of permits by Commission. - No person shall conduct any activity which would require a permit under a wetlands zoning ordinance unless he has a permit therefor. Until such time as the county, city, or town in which a person proposes to conduct an activity which would require a permit under a wetlands zoning ordinance adopts the wetlands zoning ordinance such person shall apply for a permit directly to the Commission except as provided in § 62.1-13.6 (B). If an applicant desires to use or develop wetlands owned by the Commonwealth, he shall apply for a permit directly to the Commission and in addition to the application fee required by the wetlands zoning ordinance, he shall pay such fees and royalties as provided in § 62.1-3.

The Commission shall process such application in accordance with the provisions of the wetlands zoning ordinance and the Commissioner shall sign such permit; provided, however, that the Commission shall have the authority to designate one or more hearing officers who may, in lieu of the Commission, conduct public hearings as required in § 62.1-13.5, and thereafter report such findings and recommendations to the Commission. (1972, c. 711.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

Law Review. - For survey of Virginia law on administrative law for the year 1971-1972, see 58 Va. L. Rev. 1159 (1972). For article, "Virginia Natural Resources Law and the New Virginia Wetlands.Act," see 30 Wash. & Lee L. Rev. 19 (1973).

§ 62.1-13.10. Commissioner of Marine Resources to review all decisions of wetlands boards. - The Commissioner shall review all decisions of the wetlands board and notify the Commission of any decision which in his opinion should be reviewed by the Commission. (1972, c. 711.)

Law Review. - For survey of Virginia law on administrative law for the year 1971-1972, see 58 Va. L. Rev. 1159 (1972). For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973).

§ 62.1-13.11. When Commission to review decision of wetlands board. - The Commission shall review a decision of a wetlands board made under a wetlands zoning ordinance when:

(1) An appeal is taken from such decision by the applicant for a permit or by the county, city or town where the wetlands are located; or

(2) The Commissioner requests such review. The Commissioner shall request such review only when he reasonably believes that the policy and standards of this chapter have not been adequately achieved or that any guidelines which may have been promulgated by the Commission have not been reasonably accommodated. In order to make such a request, the Commissioner must notify the board and the applicant and the county, city or town where the wetlands are located within ten days of receipt of notice to the Commissioner of the decision of the board.

(3) Twenty-five or more freeholders of property within the county, city or town in which the proposed project is located sign and submit a petition to the Commission, provided, such petition must include a statement of particulars setting forth those specific instances wherein the petitioners do allege that the board did fail to follow the policy, standards or guidelines of this chapter.

(4) Where not otherwise provided, the foregoing requests for review or appeal shall be made within ten days from date of initial determination by the board; and provided that the Commission shall hear and decide such review or appeal within forty-five days after notice of such review or appeal is received a continuance may be granted by the Commission on a motion of the applicant or the freeholders as specified in subdivision (3) of this section or the county, city or town where the wetlands are located. (1972, c. 711.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

Law Review. - For survey of Virginia law on administrative law for the year 1971-1972, see 58 Va. L. Rev. 1159 (1972).

§ 62.1-13.12. Procedure for review. - (a) The Commissioner shall cause notice of the review or appeal to be given to the board, to the applicant, to the freeholders specified in SS 62.1-13.11 (3) and to the county, city or town where the wetlands are located.

(b) The Commission shall hear the appeal or conduct the review on the record transmitted by the board to the Commissioner and such additional evidence as may be necessary to resolve any controversy as to the correctness of the record. And the Commission, in its discretion, may receive such other evidence as the ends of justice require. (1972, c. 711.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

Law Review. - For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973).

§ 62.1-13.13. When Commission to modify, remand or reverse decision of wetlands board. - The Commission shall modify, remand or reverse the decision of the wetlands board:

(1) If the decision of the wetlands board will not adequately achieve the policy and standards of this chapter or will not reasonably accommodate any guidelines which may have been promulgated by the Commission hereunder; or

(2) If the substantial rights of the appellant or the applicant have been prejudiced because the findings, conclusions or decisions are

(a) In violation of constitutional provisions; or

(b) In excess of statutory authority or jurisdiction of the wetlands board; or

(c) Made upon unlawful procedure; or

(d) Affected by other error of law; or

(e) Unsupported by the evidence on the record considered as a whole; or

(f) Arbitrary, capricious, or an abuse of discretion. (1972, c. 711; 1975, c. 467.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974. and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

Law Review. - For survey of Virginia law on administrative law for the year 1971-1972, see 58 Va. L. Rev. 1159 (1972).

§ 62.1-13.14. Notice of Commission's decision. - The Commission shall notify the parties of its determination within forty-eight hours after the appeal or review. (1972, c. 711.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

§ 62.1-13.14:1. Time for issuance of permit. - No permit shall be issued until the time within which a request for review or an appeal to the Commission may be made has expired; and, if any such request for review or appeal is made, no activity for which such permit is required shall be commenced until the Commission has notified the parties of its determination. (1973, c. 65.)

§ 62.1-13.15. Judicial review. - (1) An appeal from any decision of the Commission concerning an application for a permit granted or denied directly by the Commission, or from any decision of the Commission on review of or appeal from a decision of the board may be taken by the applicant, any of the freeholders as set forth in § 62.1-13.11 (3), or by the county, city or town where the wetlands are located as provided in (2) below.

(2) Judicial review shall be in accordance with the provisions of the Administrative Process Act (§ 9-6.14:1 et seq.). (1972, c. 711; 1982, c. 300; 1986, c. 615.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

Law Review. - For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973).

§ 62.1-13.16. Investigations and prosecutions. - The Commission shall have the authority to investigate all projects whether proposed or ongoing which alter wetlands. The Commission shall have the power to prosecute all violations of any order, rule, or regulation of the Commission or of a wetlands board, or violation of any provision of this chapter. Wetlands boards shall have the authority to investigate all projects whether proposed or ongoing which alter wetlands located within the city, town or county establishing such wetlands board. Wetlands boards shall have the power to prosecute all violations of any order of such boards, or any violation of any provision of the wetlands zoning ordinance contained in § 62.1-13.5. (1972, c. 711; 1975, c. 467.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

§ 62.1-13.16:1. Reporting, site inspections and notice to comply; Commission or Wetlands Board to issue stop work order or restoration order. - A. With respect to permits required pursuant to this chapter, Chapter 1 (§ 62.1-1 et seq.) or Chapter 2.2 (§ 62.1-13.21 et seq.) of this title, the Commissioner or Board Chairman may require of the person responsible for carrying out the provisions of the permit such monitoring and reports as they may reasonably deem necessary. With respect to any reported activity not authorized by the aforementioned chapters or with respect to the violation of any permit issued pursuant thereto, they may direct such on-site inspections as are deemed reasonably necessary to determine whether the measures required by the permit are being properly performed, or whether the provisions of the aforementioned chapters are being violated. Prior to conducting such inspections, notice shall be provided to the resident owner, occupier or operator.

Such resident owner, occupier or operator shall be given an opportunity to accompany the site inspector. If it is determined that there is a failure to comply with the permit, the Commissioner or Board Chairman shall serve notice upon the person who is responsible for carrying out the provisions of the permit at the address specified by him in his application or by delivery at the site of the permitted activities to the person supervising such activities and designated in the permit to receive such notice. Such notice shall set forth the measures needed for compliance and the time within which such measures shall be completed. Upon failure of such person to comply within the specified period, he may be deemed to be in violation of this section and upon conviction shall be subject to the penalties provided in this chapter.

B. Upon receipt of a sworn complaint of a substantial violation of this chapter, Chapter 1 (§ 62.1-1 et seq.) or Chapter 2.2 (§ 62.1-13.21 et seq.) of this title from the designated enforcement officer, the Commissioner or Board Chairman may, in conjunction with or subsequent to a notice to comply as specified in subsection A of this section, issue an order requiring all or part of the activities on the site to be stopped until the specified corrective measures have been taken. In the case of an activity not authorized by the aforementioned chapters or where the alleged permit noncompliance is causing, or is in imminent danger of causing, significant harm to the subaqueous bottoms, wetlands or the coastal primary sand dunes protected by the aforementioned chapters, such an order may be issued without regard to whether the person has been issued a notice to comply as specified in subsection A of this section. Otherwise, such an order may be issued only after the permittee has failed to comply with such a notice to comply. The order shall be served in the same manner as a notice to comply, and shall remain in effect for a period of seven days from the date of service pending application by the enforcing authority, permit holder or the resident owner, occupier or operator for appropriate relief to the circuit court of the jurisdiction wherein the violation was alleged to have occurred. Upon completion of corrective action, the order shall immediately be lifted. Nothing in this section shall prevent the Commissioner or Board Chairman from taking any other action specified in § 62.1-13.16.

C. Upon receipt of a sworn complaint of a substantial violation of this chapter, Chapter 1 (§ 62.1-1 et seq.) or Chapter 2.2 (§ 62.1-13.23 et seq.) of this title from a designated enforcement officer, the Commission or a wetlands board may order that the affected site be restored to predevelopment conditions if the Commission or board deems restoration necessary to recover lost resources or to prevent further damage to resources. Such an order shall specify the restoration necessary and establish a reasonable time for its completion. Such orders shall be issued only after a hearing with at least thirty days notice to the affected person of the time, place and purpose thereof, and they shall become effective immediately upon issuance by the Commission or board. The Commission or board shall require such scientific monitoring plans as it deems necessary to ensure that such projects result in the successful reestablishment of wetlands, subaqueous bottoms or coastal primary sand dunes protected by the aforementioned chapters and may require that a prepaid contract acceptable to the Commission or board be in effect for the purposes of carrying out the scientific monitoring plan. In addition, the Commission or board may require a reasonable bond or letter of credit in an amount and with surety and conditions satisfactory to it securing to the Commonwealth compliance with the conditions set forth in the restoration order. The appropriate court, upon petition by the Commission or board, shall have authority to enforce any such restoration order by injunction, mandamus or other appropriate remedy. Failure to complete the required restoration shall constitute a violation of this chapter.

D. The duties of the Commissioner or the Board Chairman prescribed in this section may be delegated to their respective designees; however, such respective designees shall not be those persons who are also designated as enforcement officers. (1987;- c:, 436; 1990, c. 81 1.)

The **1990 amendment** deleted the former heading of subsection A which read: "Reporting, site inspections and notice to comply," deleted the former heading of subsection B which read: "Issuance of stop work order," added present subsection C, and redesignated former-subsection C as present subsection D.

§ 62.1-13.17. Commission may receive gifts, etc. - The Commission may receive gifts, grants, bequests, and devises of wetlands and of money which shall be taken and held for the uses prescribed by the donor, grantor, or testator and in accord with the purposes of this chapter. The Commission shall manage such wetlands in such a way as to maximize their ecological value and in accord with the purposes of this chapter. (1972, c. 711.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

§ 62.1-13.18. Violation of orders, rules and regulations. - Any person who knowingly, intentionally, negligently or continually violates any order, rule or regulation of the Commission or of a wetlands board established pursuant to this chapter or violates any provision of this chapter or of a wetlands zoning ordinance enacted pursuant to this chapter or any provision of a permit granted by a wetlands board or the Commission pursuant to this chapter shall be guilty of a misdemeanor. Following a conviction, every day the violation continues shall be deemed a separate offense. (1972, c. 711.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

§ 62.1-13.18:1. Injunctions. - In addition to and notwithstanding the provisions of § 62.1-13.18, upon petition of the Commission or a wetlands board to the court of record having jurisdiction in the city or county wherein any act is done or is threatened to be done which is unlawful under the provisions of this chapter, the court may enjoin such unlawful act and may order the person so acting unlawfully to take such steps as are necessary to restore, protect and preserve the wetlands involved. (1973, c. 65.)

§ 62.1-13.18:2. Penalties. - A. Without limiting the remedies which may be obtained in this chapter, any person who violates any provision of this chapter or who violates or fails, neglects or refuses to obey any Commission or wetlands board notice, order, rule, regulation or permit condition authorized by this chapter shall, upon such finding by an appropriate circuit court, be assessed a civil penalty not to exceed $25,000 for each day of violation. Such civil penalties may, at the discretion of the court assessing them, be directed to be paid into the treasury of the county, city, or town in which the violation occurred for the purpose of abating environmental damage to, or the restoration of wetlands therein, in such a manner as the court may, by order, direct, except that where the violator is the county, city, or town itself, or its agent, the court shall direct the penalty to be paid into the state treasury.

B. Without limiting the remedies which may be obtained in this chapter, and with the consent of any person who has violated any provision of this chapter or who has violated or failed, neglected or refused to obey any Commission or wetlands board order, rule, regulation, or permit condition authorized by this chapter, the Commission or wetlands board may provide, in an order issued by the Commission or wetlands board against such person, for the one-time payment of civil charges for each violation in specific sums, not to exceed $10,000 for each violation. Civil charges shall be in lieu of any appropriate civil penalty which could be imposed under subsection A of this section. Civil charges may be in addition to the cost of any restoration ordered by the Commission or a wetlands board. (1990, c. 811.)

§ 62.1-13.19. Jurisdiction of Commission not affected. - Nothing in this chapter shall affect the Commission's sole jurisdiction over areas and activities as defined by Title 28.1 or § 62.1-3 of this Code. (1972, c. 711.)

Editor's note. - This section was amended by Acts 1973, c. 471. The 1973 act, which was made effective July 1, 1974, and provided that it should expire at midnight on that date unless earlier reenacted, was repealed by Acts 1974, c. 96, effective March 22, 1974, and therefore never went into effect.

§ 62.1-13.20. Exemptions. - Nothing in this chapter shall affect (1) any project in vegetated wetlands commenced prior to July 1, 1972, or any project in nonvegetated wetlands commenced prior to January 4, 1983; however, this section shall not be deemed to exclude from regulation under this chapter any activity which expands or enlarges upon a project already in existence or under construction at the time of such date, except for those activities exempted under § 62..1-13.5 (3) (h); (2) any project or development in vegetated wetlands for which, prior to July 1, 1972, or in nonvegetated wetlands for which, prior to January 1, 1983, a plan or plan of development thereof has been filed pursuant to ordinance or other lawful enactment with either an agency of the federal or state government, or with either the planning commission, board of supervisors, or city council of the jurisdiction in which the project or development is located; (3) any project or development in vegetated wetlands, whether commenced prior to July 1, 1972, and in nonvegetated wetlands whether commenced prior to January 1, 1983, if located or to be located in whole or in part on ground or in an area an interest in which was authorized by the General Assembly to be conveyed prior to July 1, 1972, for vegetated wetlands and July 1, 1982, for nonvegetated wetlands; and (4) for the North Landing River and its tributaries exemptions (1) and (2) above shall take effect July 1, 1975, for vegetated wetlands, and January 1, 1983, for nonvegetated wetlands.

For exemptions (1) and (2) herein to be effective, the project or development must be certified as exempt by the Commission or appropriate local wetlands board. The request for certification must be filed prior to January 1, 1984. Projects or developments which have been determined by the Commission or the appropriate local wetlands board prior to July 1, 1982, to be exempt from the provisions of this chapter shall be considered to be certified. If the request for certification is not granted or denied within 120 days from receipt of request by the Commission or a local wetlands board, the certification will be conclusively presumed to have been granted. The time limitations and public hearing requirements imposed by § 62.1-13.5 shall not apply to the certification process. Upon request by any person holding a certification issued by the Commission or a local wetlands board, the clerk of the circuit court having jurisdiction over the property on which the certified project is located shall record such certification in the appropriate deed book of the circuit court. (1972, c. 711; 1975, c. 268; 1982, cc. 300, 468.)

Law Review. - For survey of Virginia law on administrative law for the year 1971-1972, see 58 Va. L. Rev. 1159 (1972). For article, "Virginia Natural Resources Law and the New Virginia Wetlands Act," see 30 Wash. & Lee L. Rev. 19 (1973).

Chapter 2.2. Coastal Primary Sand Dune Protection Act.

§ 62.1-13.21. Legislative declaration; sand dunes and beaches protected. - A. The Commonwealth of Virginia hereby recognizes the importance of coastal primary sand dunes with their unique physiographic features which, in their natural state, serve as protective barriers from the effects of flooding and erosion caused by coastal storms, thereby protecting life and property; that such dunes provide an essential source of natural sand replenishment for beaches and an important natural habitat for coastal fauna; and are important to the overall scenic and recreational attractiveness of Virginia's coastal area.

Inappropriate development on coastal primary sand dunes and beaches can destroy vegetation which stabilizes such features, alter the natural contour of these sand dunes and beaches, impede their natural formation and migration and interrupt wind and water currents which replenish the sand supply of beaches. Such alterations to coastal primary sand dunes and beaches may lead to increased shoreline erosion, coastal flooding, damage to fixed structures near the shore, loss of public and private open space, loss of wildlife habitat and increased expenditure of public funds.

Therefore, in order to reasonably protect the public interest, promote public health, safety, the general welfare of the Commonwealth, protect private and public property from erosion and flooding and protect wildlife and the natural environment, it is declared to be the public policy of the Commonwealth whenever reasonably necessary to preserve and protect coastal primary sand dunes and beaches and to prevent their despoliation and destruction and whenever practical to accommodate necessary economic development in a manner consistent with the protection of such features.

B. The provisions of this chapter shall apply to the protection of coastal primary sand dunes and beaches. Whenever coastal primary sand dunes are referred to in this chapter such references shall also include beaches. (1980, c. 660; 1984, c. 556; 1989, c. 342.)

The numbers of §§ 62.1-13.21 through 62.1-13.28 were assigned by the Virginia Code Commission, the numbers in the 1980 act having been 62.1-13.20:1 through 62.1-13.20:8.

The 1989 amendment designated the first paragraph as subsection A, substituted "beaches" for "reaches" in the second and third paragraphs, and added subsection B.

§ 62.1-13.22. Definitions. - For the purposes of this chapter, the following words shall have the meanings respectively ascribed to them:

"Beach" means (i) the shoreline zone comprised of unconsolidated sandy material upon which there is a mutual interaction of the forces of erosion, sediment transport and deposition that extends from the low water line landward to where there is a marked change in either material composition or physiographic form such as a dune, bluff or marsh, or (ii) where no such change can be identified, to the line of woody vegetation (usually the effective limit of stormwaves), or the nearest impermeable man-made structure, such as a bulkhead, revetment or paved road.

"Commission" means the Virginia Marine Resources Commission.

"Commissioner" means the Commissioner of the Virginia Marine Resources Commission.

"County or city" means the governing body of such county or city.

"Coastal primary sand dune" means a mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent, and upon any part of which is growing as of July 1, 1980, or grows thereon subsequent thereto, any one or more of the following: American beach grass (*Ammophilla breviligulata*); beach heather (*Huisonia tometosa*); dune bean (*Strophostylis umbellata* var, paludigena); dusty miller (*Artemisia stelleriana*); saltmeadow hay (*Spartina patens*); seabeach-handwort (*Arenaria peptoides*); sea oats (*Uniola paniculata*); sea rocket (*Cakile edentula*); seaside goldenrod (*Solidago sempervirens*); and short dune grass (*Panicum ararum*). For purposes of this chapter, "coastal primary sand dune" shall not include any mound of sand, sandy soil or dredge soil which has been deposited by man for the purpose of the temporary storage of such material for later use.

"Coastal primary sand dune zoning ordinance" means that ordinance set forth in § 62.1-13.25.

"Governmental activity" means any or all of the services provided by the Commonwealth or a county or city to its citizens for the purpose of maintaining public facilities and shall include but not be limited to such services as constructing, repairing and maintaining roads, sewage facilities, supplying and treating water, street lights and constructing public buildings. (1980, c. 660; 1984, c. 556; 1985, c. 589; 1987, c. 499; 1989, c. 342.)

Cross references. - As to the erecting and maintenance of protective bulkheads by certain property owners in the Sandbridge Beach subdivision, see SS 62.1-13.28 B.

The 1989 amendment added the paragraph defining "Beach," deleted the designations of subsections A through F, and deleted former subsection G which defined "Reach."

§ 62.1-13.23. Standards for use of coastal primary sand dunes. - No permanent alteration of or construction upon any coastal primary sand dune shall take place which would: (i) impair the natural functions of the dune as described herein; (ii) physically alter the contour of the dune; (iii) destroy vegetation growing thereon as defined herein unless the wetlands board, or in its absence the Commission, determines that there will be no significant adverse ecological impact, or that the granting of a permit hereunder is clearly necessary and consistent with the public interest considering all material factors. (1980, c. 660.)

§ 62.1-13.24. Guidelines. - In order to implement the policy set forth in SS 62.1-13.21 and to assist cities and counties in the regulation of coastal primary sand dunes, the Commission shall, with advice and assistance from the Virginia Institute of Marine Science, promulgate guidelines which set forth the consequences of the use of these dunes. In developing these guidelines, the Commission shall consult with any affected state governmental agency. (1980, c. 660.)

§ 62.1-13.25. Certain counties and cities authorized to adopt coastal primary sand dune ordinance. - Any of the following counties or cities which adopt a wetlands ordinance pursuant to § 62.1-13.5 may adopt the ordinance contained herein: the Counties of Accomack, Lancaster, Mathews, Northampton and Northumberland and the Cities of Hampton, Norfolk, and Virginia Beach. In the event that a locality has not adopted a wetlands ordinance pursuant to Chapter 2.1 (§ 62.1-13.1 et seq.) of Title 62.1, such locality may adopt the ordinance contained herein; however, such locality shall appoint a wetlands board following the procedure specified in § 62.1-13.6. Any county or city which has adopted the Coastal Primary Sand Dune Zoning Ordinance prior to July 1, 1989, shall amend such ordinance to conform it to the ordinance contained herein by

December 1, 1989. Until such county or city has made such amendment, the ordinance shall be read as if it conformed with the ordinance contained herein.

Coastal Primary Sand Dune Zoning Ordinance

§ 1. The governing body of ...., acting pursuant to Chapter 2.2 (§ 62.1-13.21 et seq.) of Title 62.1 of the Code of Virginia, for the purposes of fulfilling the policy and standards set forth in such chapter, adopts this ordinance regulating the use and development of coastal primary sand dunes. Whenever coastal primary sand dunes are referred to in this ordinance, such references shall also include beaches.

§ 2. Definitions. For the purpose of this ordinance:

"Beach" means (i) the shoreline zone comprised of unconsolidated sandy material upon which there is a mutual interaction of the forces of erosion, sediment transport and deposition that extends from the low water line landward to where there is a marked change in either material composition or physiographic form such as a dune, bluff or marsh, or (ii) where no such change can be identified, to the line of woody vegetation (usually the effective limit of stormwaves), or the nearest impermeable man-made structure, such as a bulkhead, revetment or paved road.

"Commission" shall mean the Virginia Marine Resources Commission.

"Commissioner" shall mean the Commissioner of the Virginia Marine Resources Commission.

"County or city" shall mean the governing, body of such county or city.

"Coastal primary sand dune" hereinafter referred to as "dune," shall mean a mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent, and upon any part of which is growing on July 1, 1980, or grows thereon subsequent thereto, any one or more of the following: American beach grass (*Ammophilla breviligulata*); beach heather (*Hudsonia tometosa*); dune bean (*Strophostylis umbellata* var, paludigena); dusty miller (*Artemisia stelleriana*); saltmeadow hay (*Spartina patens*); seabeach sandwort (*Arenaria peploides*); sea oats (*Uniola paniculata*); sea rocket (*Cakile edentula*); seaside goldenrod (*Solidago sempervirens*); and short dune grass (*Panicum amarum*). For purposes of this ordinance, "coastal primary sand dune" shall not include any mound of sand, sandy soil or dredge soil which has been deposited by man for the purpose of the temporary storage of such material for later use.

"Governmental activity" shall mean any or all of the services provided by the Commonwealth or a county or city to its citizens for the purpose of maintaining public facilities and shall include but not be limited to such services as constructing, repairing and maintaining roads, sewage facilities, supplying and treating water, street lights and constructing public buildings.

"Wetlands board" or "board" means the board created as provided for in § 62.1-13.6 of the Code of Virginia.

§ 3. The following uses of and activities on dunes are permitted if otherwise permitted by law:

A. The construction and maintenance of noncommercial walkways which do not alter the contour of the coastal primary sand dune;

B. The construction and maintenance of observation platforms which are not an integral part of any dwelling and which do not alter the contour of the coastal primary sand dune;

C. The planting of beach grasses or other vegetation for the purpose of stabilizing coastal primary sand dunes;

D. The placement of sand fences or other material on or adjacent to coastal primary sand dunes for the purpose of stabilizing such features, except that this provision shall not be interpreted to authorize the placement of any material which presents a public health or safety hazard;

E. Sand replenishment activities of any private or public concern provided no sand shall be removed from any coastal primary sand dune unless authorized by lawful permit;

F. The normal maintenance of any groin, jetty, riprap, bulkhead or other structure designed to control beach erosion which may abut a coastal primary sand dune;

G. The normal maintenance or repair of presently existing roads, highways, railroad beds and facilities of the United States, this Commonwealth, or any of its counties or cities, or those of any person, firm, corporation, or utility, provided no coastal primary sand dunes are altered;

H. Outdoor recreational activities, provided that such activities do not alter the natural contour of the coastal primary sand dune or destroy its vegetation;

I. The conservation and research activities of the Virginia Marine Resources Commission, Virginia Institute of Marine Science, Department of Game and Inland Fisheries and other related conservation agencies;

J. The construction and maintenance of aids to navigation which are authorized by governmental authority;

K. Activities pursuant to any emergency declaration by the governing body of any local government or the Governor of the Commonwealth or any public health officer for the purposes of protecting the public health or safety; and

L. Governmental activity on coastal primary sand dunes owned or leased by the Commonwealth of Virginia or a political subdivision thereof.

§ 4. Any person who desires to use or alter any coastal primary sand dune within this .... (county or city), other than for those activities specified in § 3 herein, shall first file an application with the wetlands board in accordance with § 4 of § 62.1-13.5 of the Code of Virginia. The wetlands board may establish a processing fee in accordance with § 4 of § 62.1-13.5 of the Code of Virginia. No person shall be required to file two separate applications for permits if the project to be undertaken would require that a permit be filed in accordance with § 62.1-13.5 as well as this ordinance. Under such circumstances the fee accompanying the application required by § 62.1-13.5 shall also be the fee for the purpose of this ordinance.

§ 5. All applications and maps and documents relating thereto shall be open for public inspection at the office of the recording officer of this .... (county or city).

§ 6. Not later than sixty days after receipt of such application, the wetlands board shall hold a public hearing on such application. The applicant, the local governing body, the Commissioner, the owner of record of any land adjacent to the coastal primary sand dunes in question, known claimants of water rights in or adjacent to the coastal primary sand dunes in question, the Virginia Institute of Marine Science, the Department of Game and Inland Fisheries, the Water Control Board, the Department of Transportation and governmental agencies expressing an interest therein shall be notified by the board of the hearing by mail not less than twenty days prior to the date set for the hearing. The wetlands board shall also cause notice of such hearing to be published at least once a week for two weeks prior to such hearing in the newspaper having a general circulation in this .... (county or city). The costs of such publication shall be paid by the applicant.

§ 7. In acting on any application for a permit, the board shall grant the application upon the concurring vote of three members of a five-member board or four members of a seven-member board. The chairman of the board, or in his absence the acting chairman, may administer oaths and compel the attendance of witnesses. Any person may appear and be heard at the public hearing. Each witness at the hearing may submit a concise written statement of his testimony. The board shall make a record of the proceeding, which shall include the application, any written statements of witnesses, a summary of statements of all witnesses, the findings and decision of the board, and the rationale for the decision. The board shall make its determination within thirty days from the hearing. If the board fails to act within such time, the application shall be deemed approved. Within forty-eight hours of its determination, the board shall notify the applicant and the Commissioner of such determination and if the board has not made a determination, it shall notify the applicant and the Commission that thirty days has passed and that the application is deemed approved.

The board shall transmit a copy of the permit to the Commissioner. If the application is reviewed or appealed, then the board shall transmit the record of its hearing to the Commissioner. Upon a final determination by the Commission, the record shall be returned to the board. The record shall be open for public inspection at the office of the recording officer of this .... (county or city).

§ 8. The board may require a reasonable bond or letter of credit in an amount and with surety and conditions satisfactory to it securing to the Commonwealth compliance with the conditions and limitations set forth in the permit. The board may, after hearing as provided herein, suspend or revoke a permit if the board finds that the applicant has failed to comply with any of the conditions or limitations set forth in the permit or has exceeded the scope of the work as set forth in the application. The board after hearing may suspend a permit if the applicant fails to comply with the terms and conditions set forth in the application.

§ 9. A. In making its decision whether to grant, to grant in modified form, or to deny an application for a permit, the board shall base its decision on the following factors:

1. Such matters raised through the testimony of any person in support of or in rebuttal to the permit application.

2. Impact of the development on the public health and welfare as expressed by the policy and standards of Chapter 2.2 (§ 62.1-13.21 et seq.) of Title 62.1 of the Code of Virginia and any guidelines which may have been promulgated thereunder by the Commission.

B. If the board, in applying the standards above, finds that the anticipated public and private benefit of the proposed activity exceeds the anticipated public and private detriment and that the proposed activity would not violate the purposes and intent of Chapter 2.2 of Title 62.1 of the Code of Virginia and of this ordinance, the board shall grant the permit, subject to any reasonable condition or modification designed to minimize the impact of the activity on the ability of this .... (county or city), to provide governmental services and on the rights of any other person and to carry out the public policy set forth in Chapter 2.2 of Title 62.1 of the Code of Virginia and in this ordinance. Nothing in this section shall be construed as affecting the right of any person to seek compensation for any injury in fact incurred by him because of the proposed activity. If the board finds that the anticipated public and private benefit from the proposed activity is exceeded by the anticipated public and private detriment or that the proposed activity would violate the purposes and intent of Chapter 2.2 of Title 62.1 of the Code of Virginia and of this ordinance, the board shall deny the permit application with leave to the applicant to resubmit the application in modified form.

§ 10. The permit shall be in writing, signed by the chairman of the board and notarized.

§ 11. No permit shall be granted without an expiration date, and the board, in the exercise of its discretion, shall designate an expiration date for completion of such work specified in the permit from the date the board granted such permit. The board, however, may, upon proper application therefor, grant extensions. (1980, c. 660; 1984, c. 556; 1989, c. 342.)

The 1989 amendment added the last two sentences of the first paragraph, added the last sentence in § 1, and in § 2 added the paragraph defining "Beach," deleted the designations of subdivisions A through F, and deleted former subdivision El, which defined "Reach."

§ 62.1-13.25:1: Not set out.

Editor's note. - This section, relating to emergency sand grading activities on sand dunes located on the Atlantic Shoreline of Virginia Beach, was enacted by Acts 1984, c. 518. In furtherance of the general policy of the Virginia Code Commission to include in the Code only provisions having general and permanent application, this section, which is limited in its purpose and scope, is not set out here, but attention is called to it by this reference.

§ 62.1-13.26. Permits required for certain activities; issuance of permits by Commission. - No person shall conduct any activity which would require a permit under a coastal primary sand dune ordinance unless he has a permit therefor. Until such time as the county or city in which a person proposes to conduct an activity which would require a permit under such ordinance adopts such ordinance, such person shall apply for a permit directly to the Commission. (1980, c. 660.)

§ 62.1-13.27. Administration; appeals; enforcement. - In administering the provisions of this chapter and in order to provide for appellate review and enforcement, the Commission, Commissioner or wetlands board as appropriate shall, as to the Coastal Primary Sand Dune Protection Act or an ordinance adopted pursuant thereto, bear all those duties and responsibilities and follow those procedures specified in §§ 62.1-13.7 through 62.1-13.19 of the Code of Virginia in the same manner and on the same basis as they administer and enforce the Wetlands Act or an ordinance adopted pursuant thereto. (1980, c. 660.)

§ 62.1-13.27:1. Penalties. - A. Without limiting the remedies which may be obtained in this chapter, any person who violates any provision of this chapter or who violates or fails, neglects or refuses to obey any Commission or wetlands board notice, order, rule, regulation or permit condition authorized by this chapter shall, upon such finding by an appropriate circuit court, be assessed a civil penalty not to exceed $25,000 for each day of violation. Such civil penalties may, at the discretion of the court assessing them, be directed to be paid into the treasury of the county, city, or town in which the violation occurred for the purpose of abating environmental damage to, or the restoration of wetlands therein, in such a manner as the court may, by order, direct, except that where the violator is the county, city, or town itself, or its agent, the court shall direct the penalty to be paid into the state treasury.

B. Without limiting the remedies which may be obtained in this chapter, and with the consent of any person who has violated any provision of this chapter or who has violated or failed, neglected or refused to obey any Commission or wetlands board order, rule, regulation, or permit condition authorized by this chapter, the Commission or wetlands board may provide, in an order issued by the Commission or wetlands board against such person, for the one-time payment of civil charges for each violation in specific sums, not to exceed $10,000 for each violation. Civil charges shall be in lieu of any appropriate civil penalty which could be imposed under subsection A of this section. Civil charges may be in addition to the cost of any restoration ordered by the Commission or a wetlands board. (1990, c. 811.)

§ 62.1-13.28. Exemptions. - A. Nothing in this chapter shall affect any project or development (i) for which a valid building permit or final site plan approval has been issued prior to July 1, 1980; or (ii) which, if no building permit is required for such project including a locally approved mining operation, has been otherwise commenced prior to July 1, 1980, and certified as exempt by the Commission or appropriate wetlands board; or (iii) approved by the governing body of any county or city pursuant to any local ordinance whose principal purpose is to review development in coastal primary sand dunes prior to July 1, 1980. Nothing in this section shall be deemed to exclude from regulation any activity which expands or enlarges upon a project already in existence or under construction.

B. The Virginia Beach Wetlands Board shall make an ongoing determination in the Sandbridge Beach subdivision of the area bounded on the north by Dam Neck Naval Base, on the west by Sandfiddler Road, and on the south by White Cap Lane, to determine which structures or properties are in clear and imminent danger from erosion and storm damage due to severe wave action or storm surge. The owners of structures or properties so defined shall not be prohibited from erecting and maintaining protective bulkheads or other equivalent structural improvements of a type, size and configuration approved by the Virginia Beach Wetlands Board. The Virginia Beach Wetlands Board shall not impose arbitrary or unreasonable conditions upon its approval of any such bulkhead or other structural improvement but shall maintain a continuing responsibility to ensure that each bulkhead or structural improvement constructed under the authority of this section is maintained in a condition which is safe, structurally sound, and otherwise in conformity with the reasonable conditions imposed by the Virginia Beach Wetlands Board. At the time the application is submitted, the applicant shall consent in writing to any subsequent construction which may occur whereby an adjacent property owner desires to tie in a bulkhead at no additional cost with that bulkhead proposed by the applicant. Such consent shall be considered a waiver of property line defenses relating to the bulkhead line. (1980, c. 660; 1987, c. 499; 1.988, c. 740.)

Editor's note. - Acts 1988, c. 740, which amends this section, provides in cl. 2 that the act shall expire on June 30, 1991.

The 1988 amendment deleted the fourth and fifth sentences, pertaining to written agreements of adjacent property owners.

Wetlands Guidelines

Prepared by

The Department of Wetlands Ecology
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and

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Pursuant to Section 62.1-13.4, and in Amplification of Section 62.1-3, Code of Virginia

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Section I

Introduction

Virginia's coastal zone is composed of many different but highly interrelated ecological systems. Below the low tide limits are found the vast areas of submerged bottomland which are vitally important as fish and shellfish feeding, spawning and nursery habitat. These areas not only help support Virginia's highly valuable commercial catch but also the myriad of species which the average Virginian never directly encounters but nevertheless are as important ecologically as the commercially sought organisms.

Between the high water line and the low water line are found the nonvegetated intertidal flats and beaches. These areas, though uncovered and seemingly devoid of life during a portion of each tidal cycle, provide important habitat for a host of different marine organisms, aquatic birds and many mammals.

Beginning approximately at the elevation we call mean sea level are found the various vegetated communities known as marshes. Best known for their high plant production on the order of tons per acre per year, marshes have other valuable functions. They are a buffer between the estuary and the upland; interacting with both.

With the passage of House Bill 400, which adds nonvegetated intertidal areas to the existing wetlands protection mechanism, the General Assembly has not only recognized the value of intertidal flats and beaches to the Commonwealth but also the interrelated and interdependent nature of the vegetated and nonvegetated wetlands systems. All wetland resources of the Commonwealth will now be managed under a single, unified program. Moving landward from mean low water (the Marine Resources Commission controls the bottomland seaward of mean low water) wetland jurisdiction now extends to mean high water where no emergent vegetation exists, and to 1.5 times the mean tide range where marsh is present. All intertidal areas are now called wetlands and can be managed holistically under a single permit system.

The purpose of this document is to revise the existing *Wetlands Guidelines,* which deal only with marshes, to include beaches, tidal flats and subaqueous lands as well. Although scientific research has yet to clearly define and quantify all aspects of wetlands function and importance within the estuary, there are few in the scientific community who would argue that these areas are not highly significant systems whose conservation is very important to the Commonwealth. The policy stated by the legislature when it passed the vegetated wetlands act in 1972 is as relevant today as it was then:

> "Therefore, in order to protect the public interest, promote the public health, safety and the economic and general welfare of the Commonwealth, and to protect public and private property, wildlife,

> marine fisheries and the natural environment, it is declared to be the public policy of this Commonwealth to preserve the wetlands, and to prevent their despoliation and destruction and to accommodate necessary economic development in a manner consistent with wetlands preservation."

In the pages that follow, the value of the wetlands to the Commonwealth and its citizens is described. This is followed by a brief description of each community type and then by an environmental value ranking system. In this section the community types are ranked relative to each other according to their environmental values. It should be noted that all wetlands are important but where management decisions must be made regarding necessary economic development in wetlands, this ranking system may help in guiding development into the lesser value wetland communities.

The ranking system is followed by the general and specific guidelines for wetland disturbing activities. These guidelines have been expanded to cover the nonvegetated area and to deal with issues that have arisen since the adoption of the original guidelines in 1974. it is intended that these guidelines aid wetland managers in preserving the wetlands while accommodating necessary economic development along Virginia's 5000 miles of shoreline.

Section II

Wetlands Types and Properties

Wetlands, as defined in Chapter 2.1 of the Code of Virginia, fall into two major groupings: vegetated (tidal marshes and swamps) and nonvegetated (intertidal flats, bars and beaches). Although seldom recognized by the general public except as exhibited in the desire to live on or near the water, wetlands have a variety of both tangible and intangible values which place them in a position of inestimable importance to the Commonwealth.

This section of this document first identifies the primary values of the wetlands, then describes the general wetland types found in "Tidewater" Virginia, and finally ranks these types relative to each other in terms of these primary values.

Each wetland type is evaluated in accordance with five general values.

These are:

1. **Production and detritus availability.** Marshes and tidal flats are major sites of primary production in the marine ecosystem. When this plant material dies and

begins to decay (detritus) it becomes the basis of a major marine food pathway. The productivity of all the major marsh community types is well documented and ranges from one to six tons per acre per year. Generally, the lower the elevation of the marsh, the greater its contribution of detritus and the greater its value to the aquatic environment.

Plant productivity on tidal flats is typically less than that of tidal marshes but higher than the bottom in deeper open water areas due to the greater supply of light and nutrients available. Plant productivity in intertidal areas is dominated by nonvascular plants (bottom-dwelling, one-celled micro- and macroalgae). Probably the most important function of the nonvegetated wetlands is that of mediating the breakdown of detritus produced on the vegetated marshes. Tidal flats located adjacent to extensive marsh areas may therefore be more biologically valuable than more isolated tidal flats. As mediators of detrital breakdown, nonvegetated wetlands are often the sites of large, diverse invertebrate populations and are often major feeding sites and spawning and nursery grounds for estuarine organisms of sport and commercial value to man.

2. **Waterfowl and Wildlife Utilization.** Long before wetlands were discovered to be detritus producers and feeding areas for marine organisms, they were known as rich habitats for various mammals, marine birds and migratory waterfowl. Some wetland types are more important than others in this regard but in many cases distinctions may not be clear-cut. A species, for example, may appear to be dependent on vegetated marsh for cover and breeding but without the adjacent tidal flats may not use a certain marsh at all. Wetlands offering a variety of habitats and plant types are generally the more valuable from a habitat perspective.

3. **Erosion Buffer.** Erosion is a common problem throughout coastal Virginia and is by no means limited to ocean beaches. Vegetated wetlands do erode but by virtue of their ability to establish dense root systems, trap and accumulate sediments, and baffle wave energy they are buffers against erosion and sea level rise. Among the vegetated wetlands the freshwater communities are less effective in this regard.

   Nonvegetated wetlands are also effective erosion buffers although they function in a different manner from the marshes. For example, a broad, gently sloping sand beach is an excellent wave energy dissipator and large intertidal bars and flats serve to "trip" waves as they move shoreward thus reducing their energy before they strike the shoreline. The disruption of nearshore intertidal areas may increase wave energy striking the adjacent shoreline thus accelerating erosion there.

4. **Water Quality Control.** The dense growth of some marshes acts as a filter, trapping upland sediment before it reaches waterways and thus protecting shellfish beds and navigation channels from siltation. Marshes can also filter out sediments that are already in the water column. The ability of marshes to filter sediments and maintain water clarity is of particular importance to the maintenance of clam and oyster

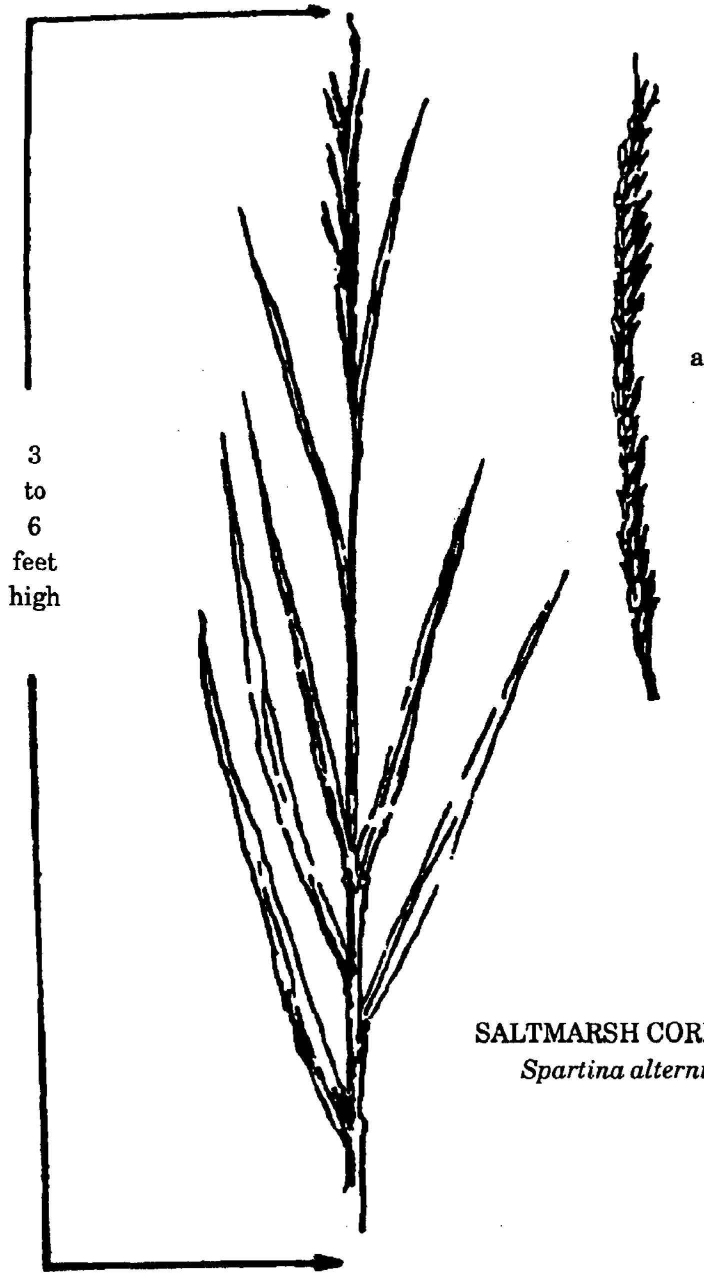
production. Some marshes have been shown to act as sinks or traps for other pollutants and marsh plants take up nutrients deposited in marsh soils. Excess nutrient levels in an estuary can be a problem but the exact role of marshes in nutrient removal is not yet fully understood.

Nonvegetated wetlands are also important in the cycling of nutrients in the estuary and the filter feeding organisms present, particularly on tidal flats, remove suspended solids from the water column in amounts that may significantly affect water clarity.

5. **Flood Buffer.** The peat substratum of some marshes acts as a giant sponge in receiving and releasing water. This characteristic is an effective buffer against coastal flooding, the effectiveness of which is a function of marsh type and size. The higher elevation marshes are the more effective flood buffers. Nonvegetated wetlands, because of their intertidal location have little value in this regard.

The following descriptions of wetland community types are identified and presented for management purposes. The first twelve of these are the vegetated wetlands and of these the first ten are characterized by a single dominant species of emergent vegetation. The term "dominant" is defined here to mean at least 50% of the vegetated surface of the marsh is covered by a single plant species. Types eleven and twelve are brackish and freshwater marshes which have no clearly dominant species of vegetation.

The five types of nonvegetated wetlands described here are identified mainly by physiographic position and sediment composition. No attempt is made to quantitatively separate the communities by particle size dominance since this is not necessary for value judgements on the level described in this publication.



SALTMARSH CORDGRASS
Spartina alterniflora

a. Branch of fruiting head.

Type I. Saltmarsh Cordgrass Community

Dominant vegetation: Saltmarsh cordgrass (*Spartina alterniflora* Loisel).

Associated vegetation: Saltmeadow hay, saltgrass, black needlerush, saltwort, sea lavender, marsh elder, groundsel tree, sea oxeye.

Growth habit: Stout, erect grass; long, smooth leaves, often with attached periwinkle snails; located at the waters edge. Tall form 4 to 6 feet along the water; short form 1 to 2 feet at or slightly higher than MHW.

Physiographic position: Ranges from mean sea level to approximately mean high water.

Average density: Usually 20 plants per square foot. Can range from 10 to 50 plants.

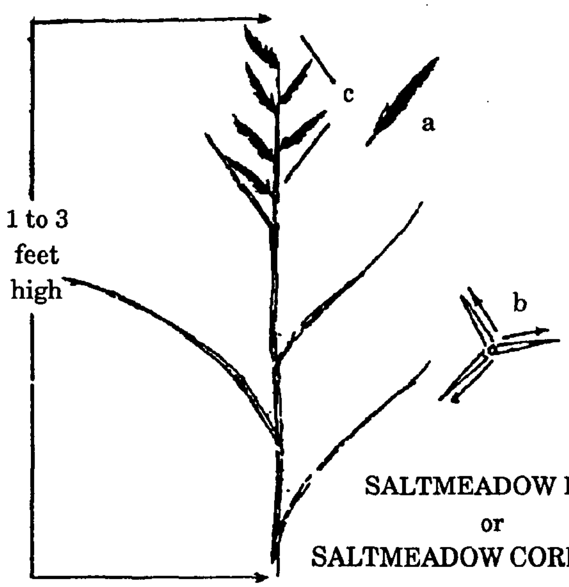
Annual production and detritus availability: Average yield is about 4 tons per acre per annum; optimum growth up to 10 tons per acre. Daily tides flux nearly throughout this community. Available detritus to the marine environment is optimum. This type of marsh is recognized as an important spawning and nursery ground for fish.

Waterfowl and wildlife utility: Roots and rhizomes eaten by waterfowl. Stems used in muskrat lodge construction. Nesting material for Forsters tern, clapper rail and willet.

Potential erosion buffer: Most saltmarshes and brackish water marshes are bordered by saltmarsh cordgrass along the waters edge. A marsh/water interface of this type is highly desirable as a deterrent to shoreline erosion. Underlying peat with a vast network of rhizomes and roots is very resistant to wave energy.

Water quality control and flood buffer: Marshes of this type can also serve as traps for sediment that originate from upland runoff. This also includes large debris that may accumulate on the marsh surface.

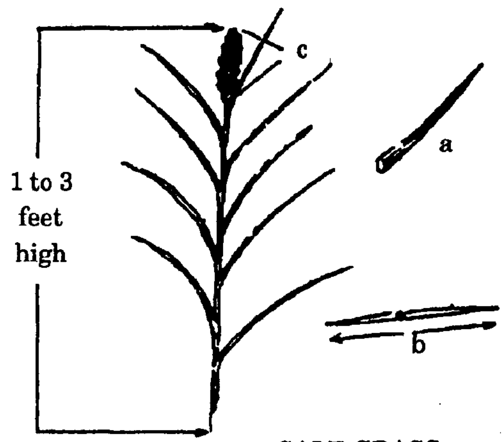
SUMMARY: Considering the many attributes of this type of marsh community, its conservation should be of highest priority.



SALTMEADOW HAY
or
SALTMEADOW CORDGRASS

Spartina patens

a. Branch with flowers.
b. Leaves arranged in 3 or more planes.
c. Flowering or fruiting head.



SALT GRASS

Distichlis spicata

a. Trough-shaped leaves (rolled inward).
b. Leaves arranged in one plane.
c. Flowering or fruiting head.

Type II. Saltmeadow Community

Dominant vegetation: Saltmeadow hay (*Spartina patens* (L.) Greene) Saltgrass (*Distichlis spicata* (L.) Greene).

Associated vegetation: Saltmarsh cordgrass, black needlerush, marsh elder, groundsel tree, saltwort, sea oxeye.

Growth habit: Matted meadow-like stands with swirls or "cowlicks", individual plants wiry in appearance; saltgrass 1-2 feet high.

Physiographic position: About mean high tide to the limit of spring tides; saltgrass at lower elevations, saltmeadow hay predominates at the higher end of the range.

Average density: Mixed populations; 50-150 stems per square foot.

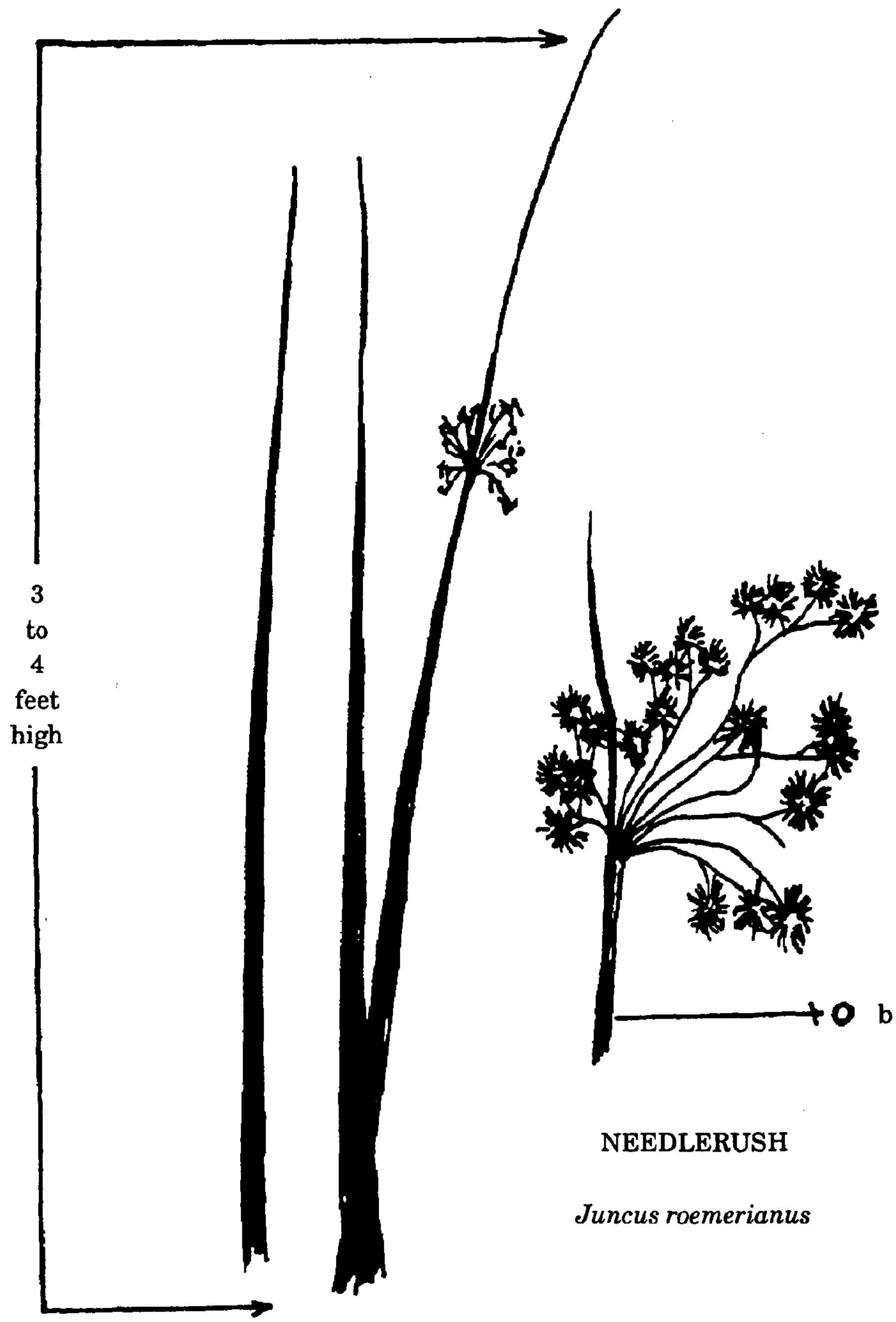
Annual production and detritus availability: Ranges from 1-3 tons per acre annum. Only small amounts of dead plant material are flushed out during storms and spring tides.

Waterfowl and wildlife utility: Seeds eaten by birds; provides nesting area. Habitat for a snail (*Melampus*) important as food for birds.

Potential erosion buffer: Effective erosion deterrent at higher elevations.

Water quality control and flood buffer: In many cases, this community represents the oldest part of a marsh system. Peat may accumulate to great depths, making this type of marsh act as a giant sponge when flood waters wash over it. Denseness of vegetation and deep peat filter sediments and waste material.

SUMMARY: This system is an excellent buffer, filtering out sediments and wastes and absorbing runoff water originating in the uplands. Production and detritus are less important to the marine environment than in Type I communities. Its contributions tend to favor the upland environment. Its values rank somewhat below Type I but, nevertheless, a Type II marsh should not be unnecessarily disturbed.



NEEDLERUSH

Juncus roemerianus

a. Fruiting head.
b. Stem round in cross section.

Type III. Black Needlerush Community

Dominant vegetation: Black needlerush (*Juncus roemerianus* Scheele.)

Associated vegetation: Usually pure stands with saltmarsh cordgrass, saltgrass and saltmeadow hay near the margin.

Growth habit: Dense monospecific stands; plant leafless, cylindrical hard stems tapering to a sharp pointed tip; brown to dark green in color, 3 to 5 feet high.

Physiographic position: About mean high water to somewhat below spring tide limit. Seems to prefer sandy substratum.

Average density: 30 to 50 stems per square foot.

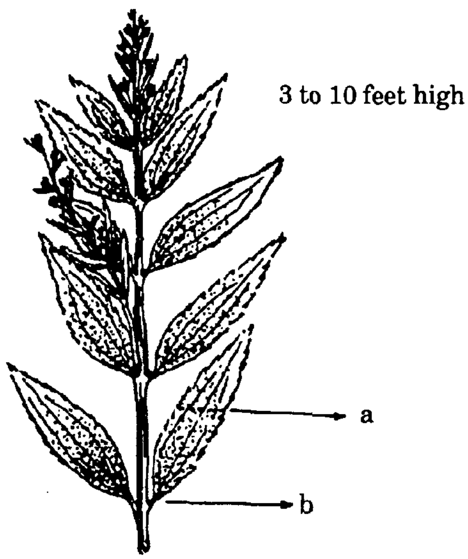
Annual production and detritus availability: 3 to 5 tons per acre per annum, decomposes more slowly than most of the marsh grasses. Not flushed daily by tides.

Waterfowl and wildlife utility: There is no evidence that waterfowl or wildlife utilize this type of plant directly as a food. Because of the dense, stiff stands, it has little wildlife value except for limited cover.

Potential erosion buffer: The dense system of rhizomes and roots of black needlerush are highly resistant to erosion. On sandy shores and low sand berms which support this community type, this characteristic is of high value.

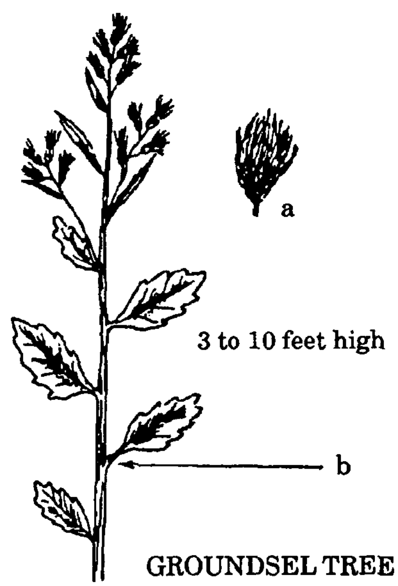
Water quality control and flood buffer: An effective trap for suspended sediments, but less effective than the densely matted saltmeadow community. Provides effective absorbent areas to buffer coastal flooding.

SUMMARY: As a single monospecific community this type would support less wildlife diversity than Type I and II. It functions well as a sediment trap and erosion deterrent but ranks lower than the preceeding types. The rhizomes of black needlerush are harder and tougher than the grasses that dominate Types I and II communities; therefore, needlerush is useful as an erosion deterrent. Overall, the values of this marsh type rank below Types I and II.



MARSH ELDER

Iva frutescens



GROUNDSEL TREE

Baccharis hamilifolia

a. Leaves thick and fleshy.
b. Leaves opposite each other on the stem.

a. Fruiting head.
b. Leaves alternate.

Type IV. Saltbush (Gallbush) Community

Dominant vegetation: Groundsel tree, highwater bush (*Baccharis halimifolia* L.), marsh elder saltwater bush (*Iva frutescens* L.)

Associated vegetation: Saltmeadow hay, saltgrass, wax myrtle, sea oxeye.

Growth habit: Shrubs 3 to 10 feet high along the margin of the marsh and upland plant communities.

Physiographic position: Lower limit is approximately the upper limit of marsh (marsh-upland ecotone).

Average density: May provide dense canopy over marsh. Individual shrub trunks usually spaced 3 to 10 feet apart.

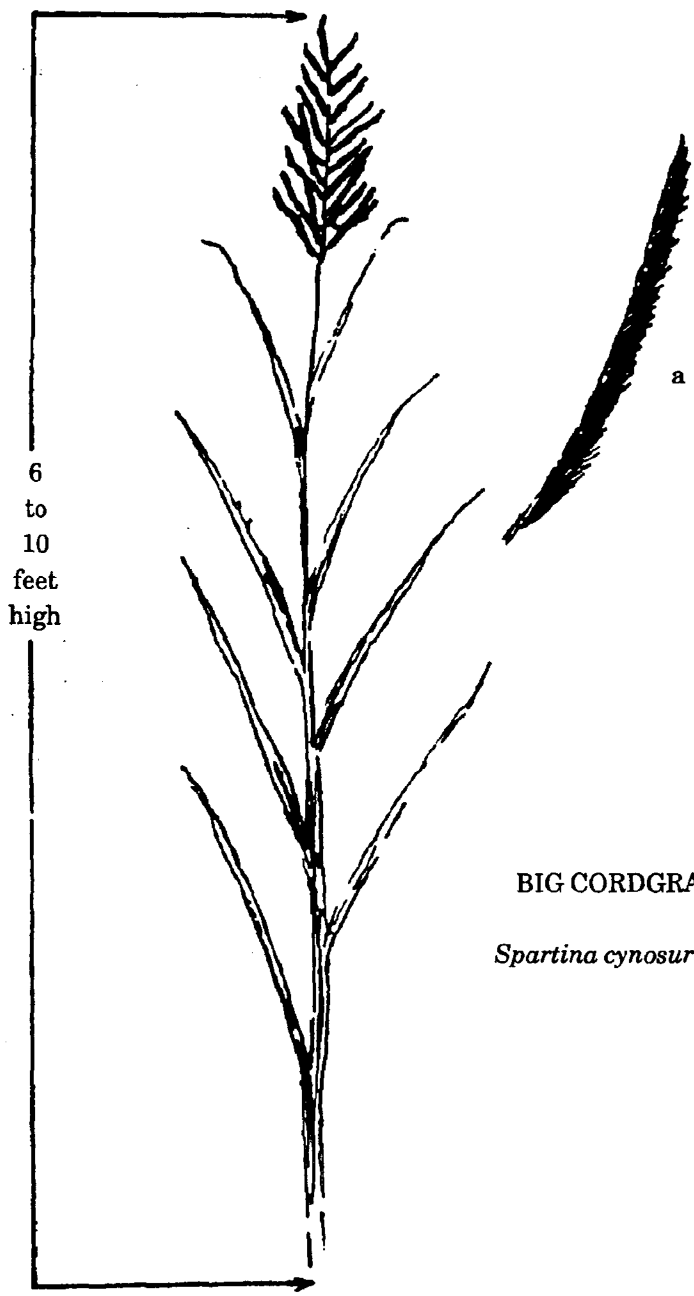
Annual production and detritus availability: Probably less than 2 tons per acre per annum. Detritus of little value.

Waterfowl and wildlife utility: Provides diversity for wildlife in general and especially as a nesting area for small birds. No significant food value.

Potential erosion buffer: Although not structurally suited as an assimilator of sediment and flood waters, it serves somewhat as a buffer to erosion on sand berms that often front small pocket marshes. Also functional as a trap for larger flotsam.

Water quality control and flood buffer: Of minor consequence, but does trap larger material. (See above).

SUMMARY: Useful as an indicator of upper limits of marshes as defined in the Wetlands Act. Values of this type rank below that of the preceding types. However, this community does add diversity to the marsh ecosystem.



BIG CORDGRASS

Spartina cynosuroides

a. Branch of fruiting head.

Type V. Big Cordgrass Community

Dominant vegetation: Big cordgrass (*Spartina cynosuroides* (L.) Roth.)

Associated vegetation: Usually pure stands.

Growth habit: Very tall (6-12 feet), heavily stemmed, leafy grass with distinct branched fruiting head in the fall.

Physiographic position: At or slightly above mean high water and extending to the upland margin. Most common in brackish or lower salinity marshes.

Average density: 10 to 15 stems per square foot.

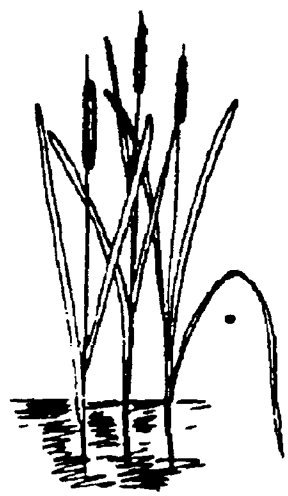
Annual production and detritus availability: 3 to 6 tons per acre per annum. Detritus accessible only on spring or wind tide, however is rivaled only by saltmarsh cordgrass, which gives big cordgrass a higher value in the context of production than other grasses found above mean high tide. Decomposes more slowly than saltmarsh cordgrass.

Waterfowl and wildlife utility: Utilized as a habitat by small animals, often used for muskrat lodges. Geese often eat its rhizomes.

Potential erosion buffer: The large, coarse rhizomes and intertwining roots stabilize peat along marsh edges.

Water quality control and flood buffer: Usually this community type occupies the older parts of a marsh system where peat may be deeper increasing its capacity as a flood water assimilator. It is also useful in trapping flotsam.

SUMMARY: Although the elevation occupied by this community type is similar to that of the saltmeadow community, big cordgrass has a much higher yield of organic matter which likely contributes to the marine food web. It is also relatively high in value as a wildlife food as well as a buffer to erosion.

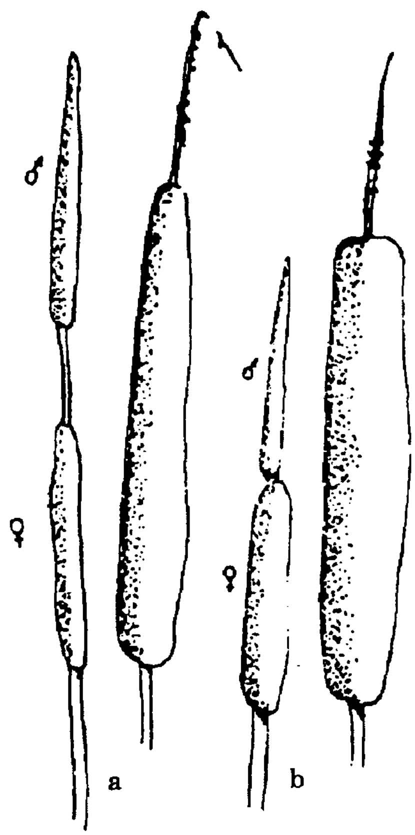


NARROW-LEAVED CATTAIL

Typha angustifolia

COMMON CATTAIL

Typha latifolia



a. Narrow-leaved cattail (Flower and fruiting head).
b. Common cattail (Flower and fruiting head).

Illustrations after Fassett, A Manual of Aquatic Plants.

Type VI. Cattail Community

Dominant vegetation: Narrowleaf cattail (*Typha angustifolia* L.)

Associated vegetation: Broadleaf cattail (*Typha latifolia* L.), sedges, bulrushes, arrow arum, pickerel weed, smartweed, other fresh or brackish water plants.

Growth habit: Characteristic "Wiener on a stick" fruiting heads, long strap-like leaves, somewhat blunted tips. 4 to 6 feet tall.

Physiographic position: Very wet sites, sometimes in standing water, often at the margin of marsh and uplands. Does well in seepage areas resulting from upland runoff.

Average density: 2 to 6 stalks per square foot.

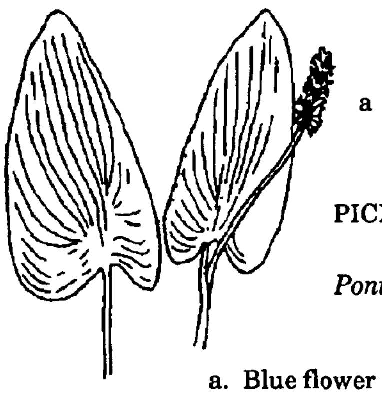
Annual production and detritus availability: 2 to 4 tons per acre. Detritus usually not readily accessible to the marine environment.

Waterfowl and wildlife utility: Provides habitat for certain birds; roots consumed by muskrats.

Potential erosion buffer: Because of its preferred habitat and its characteristic shallow root system, Type VI is only a minor buffer to erosion.

Water quality control and flood buffer: Its usual habitat along the upland margins in soft muddy areas ranks this marsh type high as a sediment trap despite its shallow rooted condition. Very few species will grow in these areas either because of the stagnant condition of the substratum or because they are inhibited by toxin release of the cattail roots or a combination of the two factors.

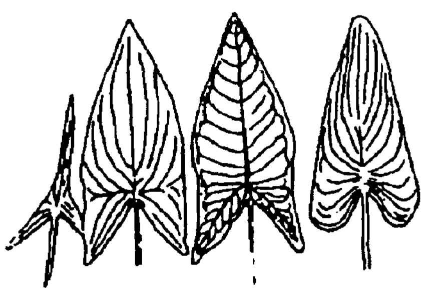
SUMMARY: Because of its value as a wildlife food and habitat, its function as a sediment trap, its relatively high production and the usual soft substratum, this type of marsh community should not be indiscriminately used as a development site. As far as overall value is concerned it compares with a saltmeadow marsh (Type II).



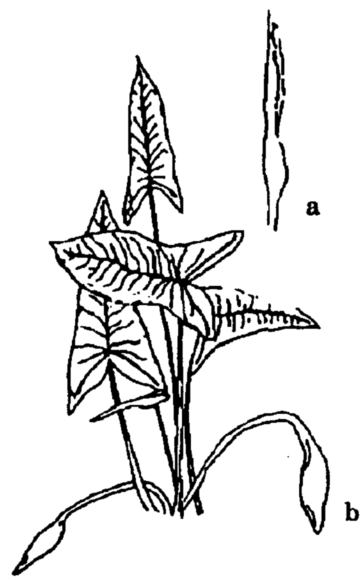
PICKEREL WEED

Pontederia cordata

a. Blue flower head.



Arrowhead | Arrow Arum | Pickerel Weed



ARROW ARUM

Peltandra virginica

a. Flower head.
b. Fruiting head.

Type VII. Arrow Arum-Pickerel Weed Community

Dominant vegetation: Arrow arum (*Peltandra virginica* (L.) Kunth.) Pickerel weed *Pontederia cordata* L.)

Associated vegetation: Sedges, smartweeds, bulrushes, ferns, cattails, pond lily.

Growth habit: Many broad leaved clumps growing from a thick, cylindrical rhizome; arrow or heart shaped leaves. Clumps 2 to 6 feet tall, average height 3 feet.

Physiographic position: On tidal mud flats from mean sea level to about mean high tide in low salinity or freshwater marshes.

Average density: 1 or 2 clumps per 10 square feet.

Annual production and detritus availability: 2 to 4 tons per acre. Detritus readily available to the marine food web because of daily tide fluxes. In the fall of the year these species decompose quite rapidly and completely except for the root stock.

Waterfowl and wildlife utility: Seeds and shoots of both species are eaten by ducks. Arrow arum seeds float after the pod decays and are readily available for wood ducks. Often associated with confirmed spawning and nursery areas for herring and shad.

Potential erosion buffer: Although this community type lacks the vast network of rhizomes, roots and peat substratum typical of a saltmarsh cordgrass community, this marsh/water interface vegetation is often the only vegetative buffer to shoreline erosion in freshwater areas. The substratum in a marsh such as this is typically often, unstable mud. After the vegetation has decayed in the winter time, the mud flats are highly susceptible to erosion due to winter rains.

Water quality control and flood buffer: Slows the flow of flood waters, causing some suspended sediment to settle out.

SUMMARY: Under natural conditions the marsh of this type is relatively stable but is highly sensitive to development and activities such as excessive boat traffic. Because of its many attributes this marsh ranks similar to that of Type 1.

REED GRASS

Phragmites australis

a. Stand in winter condition, without leaves.

Type VIII. Reed Grass Community

Dominant vegetation: Reed grass (*Phragmites australis*) formerly (*Phragmites communes* Trinius)

Associated species: Switch grass, saltbushes, a few others.

Growth habit: Tall stiff grass with short, wide leaves tapering abruptly to a point; soft plume-like seed head. 6 to 10 feet high.

Physiographic position: Usually above mean high tide, drier areas on disturbed sites.

Average density: 3 to 6 stems per square foot.

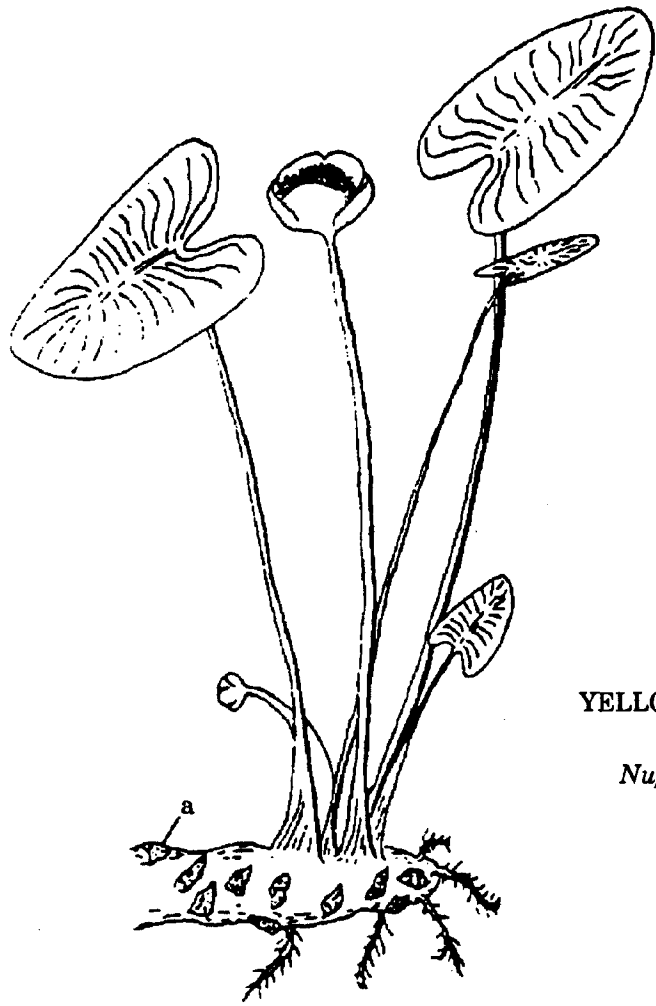
Annual production and detritus availability: 4 to 6 tons per acre, detritus seldom available except in storm conditions.

Waterfowl and wildlife utility: Little direct value to wildlife except as cover. May have a detrimental effect in that it can invade areas of a marsh and compete with desirable species. It appears to be replacing big cordgrass and other plants in freshwater marshes of the Pamunkey River.

Potential erosion buffer: Good erosion deterrent on disturbed sites, especially on spoil.

Water quality control and flood buffer: Valuable as a buffer to erosion. Potential as sediment trap and flood deterrent appears to be minimal.

SUMMARY: This plant is a relatively recent invader in Virginia but is spreading rapidly, often displacing more important marsh plants. It has little or no value to wildlife in general. Its only important value would be its function as a stabilizer on dredge spoil. This community type ranks below a Type III marsh, the black needlerush community.



YELLOW POND LILY

Nuphar advena

a. Leaf scar.

Type IX. Yellow Pond Lily Community

Dominant vegetation: Yellow pond lily, spatter-dock (*Nuphar luteum* (L. Sibthrop and Smith)

Associated vegetation: Pickerel weed, arrow arum.

Growth habit: Saucer shaped leaves with a narrow notch, floating on water; large, leathery yellow flower. 2 to 4 feet high from submerged root stalk.

Physiographic position: Submerged except for floating leaves at high tide. Found in freshwater areas.

Average density: One plant (cluster of leaves) for every 3 to 5 square feet.

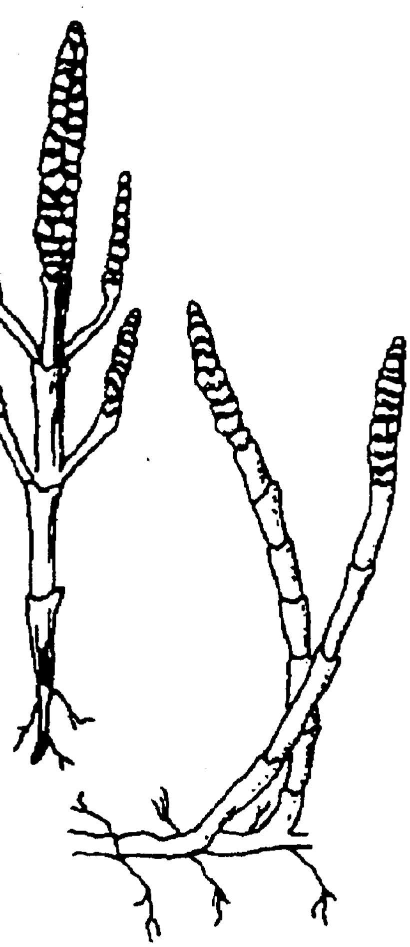
Annual production and detritus availability: To 1 ton per acre; detritus readily available but not a significant contributor to the food chain.

Waterfowl utility: Excellent cover and attachment site for aquatic animals and algae. Feeding territory for aquatic birds and fish.

Potential erosion buffer: While lacking the stiffness of grasses and sedges, these plants do reduce wave action from wind and boats. This has been noted in freshwater streams and boat channels.

Water quality control and flood buffer: Although not a direct assimilator of sediments and flood waters, the flow of flood water is slowed somewhat and sediments can settle out. This function is minimal because the community is submerged completely in flood conditions.

SUMMARY: Destruction of the community would result in a decrease in number and diversity of aquatic animal life in the immediate area. The greatest value the community has is its habitat for aquatic biota. This type should be ranked with or slightly higher than a Type III (black needlerush) marsh.



SALTWORT

Salicornia sp.

Type X. Saltwort Community

Dominant vegetation: Saltwort, glasswort (*Salicornia* sp.)

Associated vegetation: Saltmarsh cordgrass, saltgrass, sea lavender.

Growth habit: Leafless green fleshy-stemmed plant, red in color in fall; 8 inches to 1 feet tall.

Physiographic position: Above mean high tide in pannes or sparsely vegetated areas.

Average density: 10 to 15 stems per square foot.

Annual production and detritus availability: Less than 1/2 ton per acre. Exerts very little influence on the marine environment.

Wildlife and waterfowl utility: Some evidence that stems are eaten by ducks. May be a feeding area for other marsh birds.

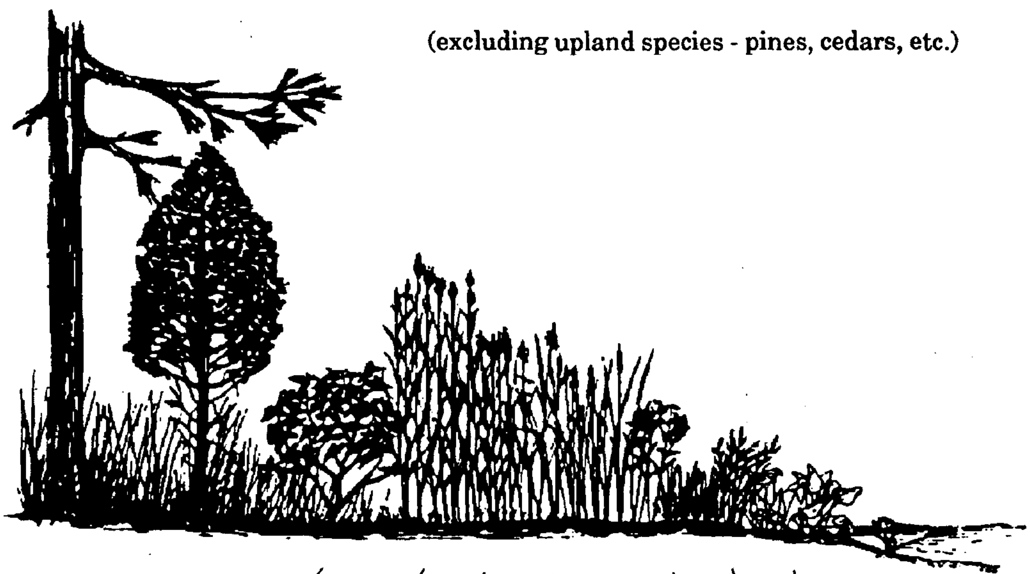
Potential erosion buffer: Has very little value as an erosion deterrent.

Water quality control and flood buffer: Because of the character of the stem, a shallow root system and the usual small sizes of the populations, these community types have little or no value in this category.

SUMMARY: This community is not high in value. It usually occupies small areas within larger more productive marshes and can be used as an indicator of higher marsh elevations.

FRESHWATER MIXED COMMUNITY TYPE XI

(excluding upland species - pines, cedars, etc.)



Type XI. Freshwater Mixed Community

Dominant vegetation: No single species covers more than 50% of the site.

Associated vegetation: Bulrushes, sedges, waterdock, smartweeds, ferns, pickerel weed, arrow arum, wildrice beggar's ticks, rice cutgrass.

Growth habit: Heterogeneous mixture of plants.

Physiographic position: From submerged to the upper limits of the wetlands.

Average density: Highly variable.

Annual production and detritus availability: 3 to 5 tons per acre. Detritus of species such as arrow arum, pickerel weed and yellow pond lily would be available in the intertidal zone.

Waterfowl and wildlife utility: A highly valuable marsh for a broad diversity in wildlife species. Plant species such as smartweeds, waterdock, wildrice and others are prime waterfowl and sora rail foods. Waters adjacent to these type marshes are also known as spawning and nursery grounds for striped bass, shad and river herring.

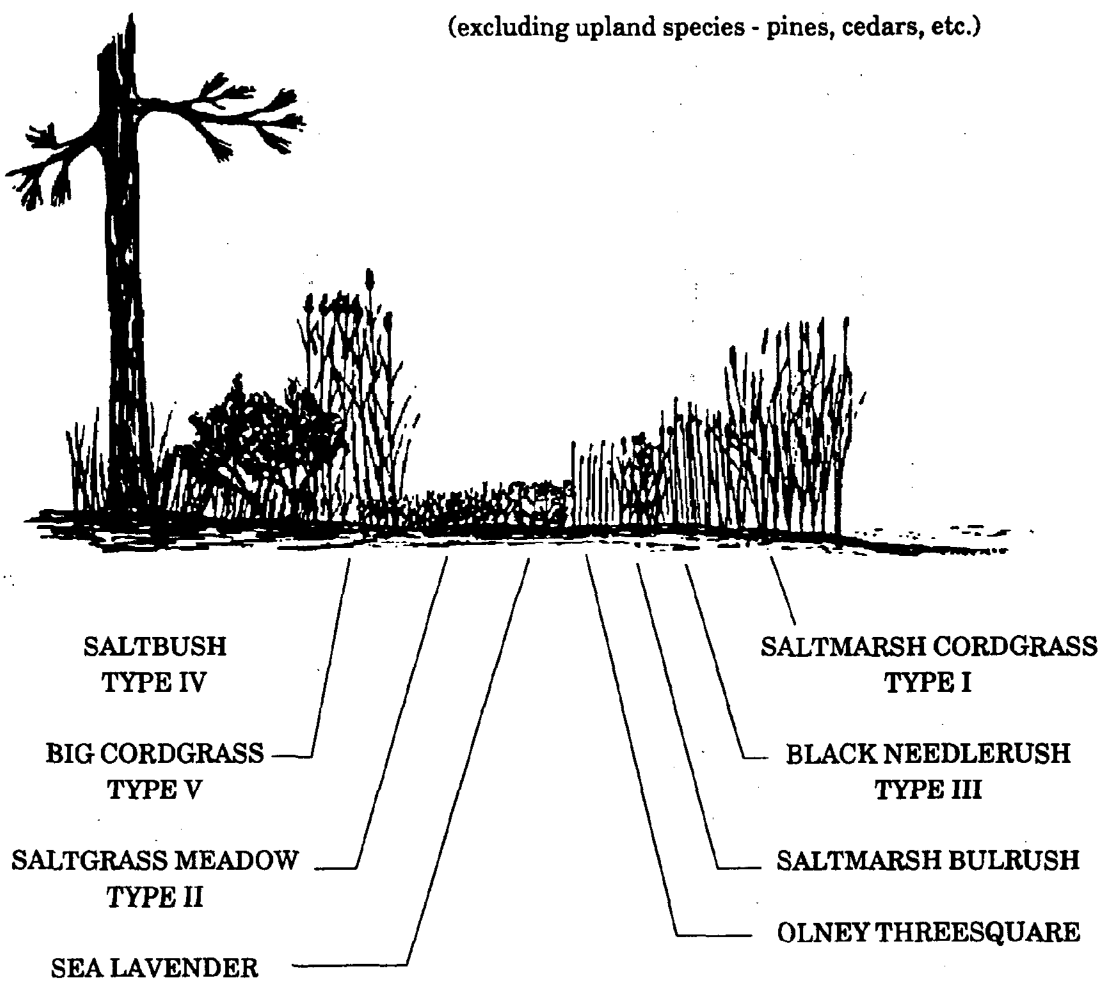
Potential erosion buffer: Shoreline erosion protection provided by this type of marsh is equivalent to Type VII, arrow arum - pickerel weed community.

Water quality control and flood buffer: This ranks somewhat higher as a sediment trap and flood deterrent than an arrow arum - pickerel weed community. The presence of the stiffer, more resilient grasses, sedges and rushes and peaty-type substratum increases the ability of this type of community over a Type VII marsh as an assimilator of sediments and flood waters.

SUMMARY: These are very valuable marshes and the aim should be to keep them in a natural state. This type of marsh would be ranked equivalent to a saltmarsh cordgrass marsh (Type I) and an arrow arum - pickerel weed (Type VII) marsh.

BRACKISH WATER MIXED COMMUNITY TYPE XII

(excluding upland species - pines, cedars, etc.)



Type XII. Brackish Water Mixed Community

Dominant vegetation: No single species covers more than 50% of the site.

Associated vegetation: Saltmarsh cordgrass, saltmeadow hay, saltgrass, black needlerush, saltbushes, threesquares, big cordgrass, cattails.

Growth habit: Heterogeneous mixture of plants in wet areas.

Physiographic position: Extending from about mean sea level to the upland margin.

Average density: Highly variable.

Annual productivity and detritus availability: 3 to 4 tons per acre, detritus readily available in the intertidal zone.

Waterfowl and wildlife utility: Wide diversity of vegetation provides a variety of wildlife food. Waterfowl foods are plentiful, such as the generous seed heads of saltmarsh bulrush.

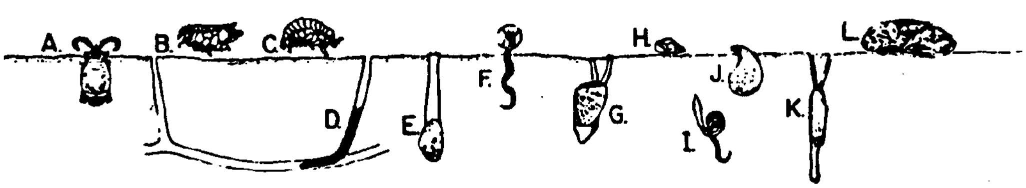
Potential erosion buffer: Shoreline erosion protection is the same as that of a Type I marsh (saltmarsh cordgrass). Most brackish water marshes are bordered by saltmarsh cordgrass.

Water quality control and flood buffer: Ranks high in this category, having similar attributes as a Type II marsh (saltmeadow).

SUMMARY: This marsh is a microcosm of all the communities found in saline waters. Brackish water marshes are known spawning and nursery grounds. This community type contains valuable food and habitat for a wide diversity of wildlife species. Ranks with a Type I (saltmarsh cordgrass) marsh.

DOMINANT BENTHIC SPECIES OF THE NON-VEGETATED WETLAND COMMUNITIES

	INTERTIDAL BEACH COMMUNITY	TIDAL FLAT COMMUNITY			INTERTIDAL OYSTER REEF COMMUNITY
SEDIMENT TYPE	SAND	SAND	SAND/MUD	MUD	SHELL
DOMINANT SPECIES	AMPHIPODS MOLE CRABS DONAX CLAMS	AMPHIPODS BLOODWORMS SOFT CLAMS RAZOR CLAMS SANDWORMS	MUD SNAILS SOFT CLAMS RAZOR CLAMS SPIONID WORMS HARD CLAMS	MUD SNAILS BLOODWORMS RAZOR CLAMS SPIONID WORMS	OYSTERS HARD CLAMS CURVED MUSSELS AMPHIPODS MUD CRABS



SPECIES INDEX

A. MOLE CRAB (*Emerita talpoida*)
B. HAUSTORID AMPHIPOD (*Parahaustorius*)
C. HAUSTORID AMPHIPOD (*Protohaustorius*)
D. SANDWORM (*Nereid polycheate*)
E. SOFT CLAM (*Mya arenaria*)
F. SPIONID WORM (*Polydora ligni*)
G. DONAX CLAM (*Donax variabilius*)
H. MUD SNAIL (*Ilyanassa obsoleta*)
I. BLOODWORM (*Glycera dibranchiata*)
J. CURVED MUSSEL (*Isochodium recurvus*)
K. RAZOR CLAM (*Tagelus plubeus*)
L. OYSTER (*Crassostrea virginica*)

Type XIII. Intertidal Beach Community

Dominant species: Ocean Beach - Mole crabs, Donax clam, Haustorid amphipods
Bay Beach - Haustorid amphipods, oligochaete worms, beach fleas

Associated species: Ghost crabs, polychaete worms, razor clams

Growth habit: Most organisms buried just below the sand surface. Constantly being uncovered by waves and burrowing back into sand. Most species are annuals.

Average density: Highly variable, animals move up and down beach with tide level. In warmer months densities can average 100 to 5000 individuals/m^2. Annual production is very high.

Primary production and nutrient cycling: Relatively low compared to marshes and tidal flats because of high wave energy.

Habitat value: Very important foraging area for many shorebirds areas above mean high water are used as nesting sites by terns and skimmers. Fish utilize area for feeding during high tide.

Erosion buffer: Beach is an ideal natural wave-energy dissipator. It interacts with nearshore sand bars and dunes. Its most important ecological function to man is to buffer the effects of storm waves.

SUMMARY: Beach systems deserve the highest order of protection particularly when associated with extensive dunes and nearshore sandbars.

Type XIV. Sand Flat Community

Dominant species: Sandworm, bloodworm, amphipods, soft clams, razor clams.

Associated species: Other polychaete worms, mollusks and phoronid worms.

Growth habit: Most of the inhabitants are surface and deep burrowing species; some are permanent tube builders. Most species are annuals or biannuals, several reproduce throughout the warm weather period. There is a fairly rapid turnover of individuals due to predation so the average size of organisms is small.

Average density: Highly variable with polychaete worms reaching higher densities than other groups. Densities of major invertebrate groups range from 330 to 3000 ind./m^2.

Primary production: Annual production ranges from 100 to 200 g C/m^2. This is lower than that of marshes but only slightly less than other tidal flats. The primary production of this community enters the estuarine food web directly via grazing. This is more efficient than the detrital food chain where decomposition in an intermediate step. The large particle size of sand and lower percentage of organics reduces the role of this community type in nutrient recycling.

Habitat value: Very important as nursery and feeding area for fishes and blue crabs. Important shorebird feeding area. May support high shellfish populations.

Erosion buffer: Important in reducing wave energy and thus erosion potential on adjacent shorelines.

SUMMARY: Overall, the ecological value of this community rates only slightly below beaches, oyster reefs and Group I marshes.

Type XV. Sand/Mud Mixed Flat Community

Dominant species: Hard clams, parchment worms, Spionid polychaetes, soft clams, razor clams and mud snails.

Associated species: Other polychaetes, molluscs, crustaceans, acorn worms, Phoronid worms.

Growth habit: This community is populated in general by many surface and deep burrowers, and permanent tube builders. Otherwise similar to sand flats.

Average density: Highly variable but overall higher than sand flats or mud flats. Densities range from 5300 to 8300 individuals/m^2.

Primary production and nutrient cycling: Primary production in this community is very similar to sand flats. Since the organic matter content of the sediments is higher than that of sand flats, secondary, microbial production may be higher and this augments the primary production. This community probably interacts with estuarine nutrient cycles to a greater extent than sand flats.

Habitat value: This community is a very important area for wading birds, shorebirds and other other migratory waterfowl. It is heavily used by important commercial and sports fishes for feeding and is important blue crab habitat. The habitat value may increase in importance when a marsh is adjacent due to higher organic content in the sediments and the habitat variety provided by the marsh.

Erosion buffer: Slows wave velocity and thus may reduce wave erosion impinging on adjacent shoreline.

SUMMARY: Overall this community has very high habitat values especially if associated with marshes. Ranks only slightly below beaches and intertidal oyster reefs.

Type XVI. Mud Flat Community

Dominant species: Spionid worms, mud snails, razor clams, bloodworms.

Associated species: Other polychaetes, molluscs and crustaceans.

Growth habit: Surface and shallow burrowing organisms predominate in this community type. Some permanent tube builders may be present. Problems with sediment stability limit species to mainly surface detrital feeders.

Average density: Highly variable; Generally densities are slightly lower than mixed flats but higher than sand/flats with a range of 50 to 5000 individuals/m^2.

Primary production and nutrient cycling: The areal extent of mud flats is probably equal to or greater than the total for marshes. Primary production is probably the highest of the nonvegetated communities. Mud flats interact significantly with adjacent vegetated areas in the cycling of nutrients. Where mudflats and marshes occur together they are mutually dependent. Ecologically, each is an extension of the other.

Habitat value: Highly important foraging area for waterfowl, sports and commercial fishes and many other species of food chain value in the marine ecosystem.

Erosion buffer: Since this community is generally only found in quiescent areas it has less value in this regard than sand or mixed flats.

SUMMARY: The overall ecological value of mud flats is comparable to sand flats and mixed flats. It is probably most important in nutrient cycling of the three.

Type XVII. Intertidal Oyster Reef Community

Dominant species: Oysters, hard clams, sand worms, amphipods, mud crabs.

Associated species: Other polychaetes, mud snails, curved mussels, barnacles, sponges, hydroids, razor clams, other molluscs and crustaceans.

Growth habit: Oyster shells provide increased diversity of habitats for a variety of estuarine species. This community is characterized by high diversity of attached and associated organisms.

Average density: Oysters dominate when area managed by man. Otherwise the reef is dominated by fouling organisms as listed above. Highly variable density but generally greater than other flats.

Primary productivity and nutrient cycling: Very little data are available concerning the primary production of oyster reefs. Given the high habitat and animal diversity however, it is probable that primary production is at least as high as other nonvegetated communities.

Habitat value: Very high; many important food chain organisms associated. This community is heavily utilized by blue crabs and fishes during high tides. Very high diversity and secondary productivity.

Erosion buffer: Shells cemented together may be important in dissipating waves and may resist shoreline erosive forces.

SUMMARY: Overall ecological value very high. This community is an excellent habitat with high diversity.

Section III

Evaluation of Wetlands Types

For management purposes, the twelve types of vegetated wetlands (marshes) and five types of nonvegetated wetlands (tidal flats and beaches) identified in Section II are grouped into five classifications based on the estimated total environmental value of an acre of each type. The reader is cautioned however that these groupings are based on average values and case-by-case analysis may yield differing results. One must also exercise restraint when comparing vegetated vs. non-vegetated communities.

Group One: **Vegetated communities**

Saltmarsh cordgrass (Type I)
Arrow arum-pickerel weed (Type VII)
Freshwater mixed (Type XI)
Brackish water mixed (Type XII)

Nonvegetated communities

Intertidal beaches (Type XIII)
Intertidal oyster reef (Type XVII)

The vegetated community types in Group One have the highest values in productivity and wildlife utility and are closely associated with fish spawning and nursery areas. They also have high values as erosion inhibitors, are important to shellfish populations and are important factors in nutrient cycling.

Intertidal beaches and sand bars have the highest relative values as buffers to shoreline erosion. In addition, they rank very high as marine habitat and in secondary productivity. Intertidal oyster reefs, which occur primarily on the seaside of the Eastern Shore, have their highest values in terms of productivity, habitat and commercial importance.

All of the communities in the Group One classification merit the highest order of protection.

Group Two: **Vegetated communities**

Big cordgrass (Type V)
Saltmeadow (Type II)
Cattail (Type VI)

Nonvegetated communities

Sand/flats (Type XIV)
Sand/mud mixed flats (Type XV)
Mud/flats (Type XVI)

The marshes in Group Two are only slightly less valuable than those in the Group One classification. The major differences being the reduced availability of detritus from the Group Two marshes due to physiographic factors. The detritus produced on the Group Two marshes is more likely to accumulate in the marsh and is less available to marine organisms. Group Two marshes have high values in maintaining water quality, buffering coastal flooding, and as habitat.

The Group Two nonvegetated communities have high general productivity values and play an essential role in nutrient cycling in the estuary. They are very important foraging areas for marine birds and many mobile marine organisms of commercial and recreational importance. They have less value than the Group One communities from an erosion and flood buffering standpoint.

Group Two wetlands communities rank only slightly below those of Group One in overall environmental importance. They deserve an order of protection only slightly below that of the Group One wetlands. Since there are many variables involved in any evaluation scheme, it is highly likely that some Group Two wetlands may on occasion outrank some Group One communities. This may be particularly true of the nonvegetated communities which exhibit a great deal more variability than the vegetated communities.

Group Three: Yellow pond lily (Type IX)
Black needlerush (Type III)

The two marshes in the Group Three category are quite dissimilar in properties. The yellow pond lily marsh is not a significant contributor to the food web but it does have high values to wildlife and waterfowl. Black needlerush has a high productivity factor but a low detritus availability value. Black needlerush has little wildlife value but it ranks high as an erosion and flood buffer. Group Three marshes are important, though their total values are less than Group One and Two marshes. If development in wetlands is considered necessary, it would be better to alter Group Three marshes than Group One or Two.

Group Four: Saltbush (Type IV)

The saltbush community is valued primarily for the diversity and bird nesting habitat it adds to the marsh ecosystem. To a lesser extent it also acts as an erosion buffer. Group Four marshes should not be unnecessarily disturbed but it would be better to concentrate necessary development in these marshes rather than disturb any of the marshes in the preceeding groups.

Group Five: Saltwort (Type X)
Reedgrass (Type VIII)

Based on present information Group Five marshes have only a few values of significance. While Group Five marshes should not be unreasonably disturbed, it is preferable to develop in these marshes than in any of the other types.

The ranking system above is only a partial tool for use in making decisions to alter wetlands for it measures only one wetland type against another. Other factors, involving a total view of the creek or river system involved, should be considered in the decision making process.

Acreage is obviously one important factor to consider when evaluating a specific wetland. A large wetland is inherently more valuable than a smaller wetland of the same type. Many creeks and rivers in Virginia however, contain vegetated and nonvegetated wetland areas which are quite small and/or fragmented. The cumulative value of these small areas may be as great or greater than that of a single wetland of the same type and acreage.

Any marsh which is 2 feet or more in average width is considered to have significant values as an erosion deterrent and in filtering sediments coming from the uplands. It may also have other values depending upon the total acreage of the marsh parcel. Any marsh which is greater than 1/10 of an acre in size may have, depending on type and viability, significant values in terms of productivity, detritus availability and wildlife habitat. Depending on its location, it may also have value as an erosion buffer.

In Virginia wetlands represent a little over 1% of the total acreage in the state yet they play a vital role in sustaining the important commercial and recreational fisheries which millions of east coast citizens enjoy. Population and development pressures in the tidal portion of Virginia pose a subtle but constant threat to these marine resources. Habitat losses are generally counted in small portions rather than catastrophic leaps. It is very important to note that although the large scale projects attract greater publicity, the total resource loss due to many small projects may be of equal or greater importance from an environmental viewpoint.

Because of the essential functions performed by wetlands in the marine environment and the limited extent of this resource, it is necessary to limit the activities which adversely affect wetlands to those considered highly essential. If the activity proposed can be accommodated while preserving all or most of the wetlands involved, a proper balance has been struck. In cases where development and preservation are mutually exclusive the necessity of the activity must be weighed against the value of the resource involved and the degree of adverse impact the activity will have on the wetland.

Section IV

Criteria for Evaluating Alterations of Wetlands

The legislature established a policy "to preserve the wetlands and to prevent their despoliation and destruction and to accommodate necessary economic development in a manner consistent with wetlands preservation". This section addresses the foregoing policy. Many proposed uses of the shoreline can be accommodated with little or no loss of wetlands if the following criteria are applied. There are times, of course, when these criteria may not apply in specific cases. The conscientious application of these criteria will, however, materially reduce adverse environmental impacts of man's activities on the shoreline.

The individual criteria contained in this section are supported by brief statements explaining the basic reasons behind adoption of the particular criterion. It is emphasized that these rationale are of necessity very brief and do not encompass all aspects of the given subject. Persons desiring further details should contact either the Virginia Marine Resources Commission, Environmental Division or the Virginia institute of Marine Science, Department of Wetlands Ecology.

General Criteria

A. Provided significant marine fisheries, wetlands and wildlife resources are not unreasonably detrimentally affected, alteration of the shoreline or construction of shoreline facilities may be justified in order to:

1. Gain access to navigable waters by:

    a. Commercial, industrial, and recreational interests for which it has been clearly demonstrated that waterfront facilities are required.

    b. Owners of land adjacent to waters of navigable depth or waters which can be made navigable with only minimal adverse impact on the environment.

2. Protect property from significant damage or loss due to erosion or other natural causes.

B. Alteration of the shoreline is ordinarily **not** justified:

1. For purposes or activities which can be conducted on existing fastlands and which have no inherent requirement for access to water resources.

2. For purposes of creating waterfront property from lots and subdivisions which are not naturally contiguous to waters of navigable depth or waters which can only be made navigable by substantial alteration or destruction of marine resources.

3. When damage to properties owned by others is a likely result of the proposed activity.

4. When the alteration will result in discharge of effluents which impair wetlands, water quality or other marine resources.

5. When there are viable alternatives which can achieve the given purpose without adversely affecting marshes, oyster grounds or other natural resources.

Rationale: These criteria recognize riparian rights and reserve the shoreline for those uses or activities which require water access. These criteria also point out that activities such as dredging into the fastlands for housing developments often have a significant and long term adverse impact on the marine environment through such effects as changed upland hydrology, sedimentation, changes in water current patterns near the shoreline, and the introduction of pollutant discharges which frequently lead to closure of shellfish grounds. The dredging of channels into fastlands may also lead to deterioration of ground water by salt water intrusion into aquifers.

C. Utilization of open-pile type structures for gaining access to adequate water depths is generally preferred over the construction of solid structure, dredging or filling.

Rationale: The construction of solid structures, or the conduct of dredging and filling operations, often causes irretrievable loss of wetlands through their direct displacement or by indirect effects of sedimentation or altered water currents. Open-pile type structures permit continued tidal flow over existing wetlands and subtidal areas, avoid potential sedimentation problems, future maintenance dredging, and have less effect on existing water current patterns.

D. Channels, fills and structures should be designed to withstand the maximum stresses of the marine environment and also to minimize the frequency of future maintenance activities.

Rationale: Shoreline alterations often change currents, affect shoreline stability and cause biological damage. Unsuccessful structures or channels generate demands for remedial action which can compound initial adverse effects. Designs which minimize the dredging frequency in channels are particularly important. Dredging destroys or displaces bottom-dwelling organisms of value to the aquatic food web. Organisms can be expected to recolonize a dredged area after a period of time, however, too frequent dredging can inhibit recolonization.

E. High density development in or immediately adjacent to wetlands and/or other flood plains is discouraged.

Rationale: Development in low-lying areas and on high energy coastlines has historically created costly flood control and flood relief problems including claims for indemnification. Additionally, hydrological changes in surface run-off patterns are caused by the paving over of formerly absorbent soil. The usual effect is an increase in both the amount and the rate of surface water-flow, often contributing to shoreline erosion and other problems. Finally, high-density development leads to a concentration of contaminating constituents in urban surface water runoff which can severely stress receiving waters in the adjacent marine environment. There appears to be a direct relationship between population density in a watershed and increased bacterial levels in adjacent waters. This may lead to the imposition of long term restrictions on the direct marketing of shellfish.

Specific Criteria

The following specific criteria are established for use in the design, evaluation or modification of individual projects.

A. Shoreline Protection Strategies

1. Shoreline protection structures are justified only if there is active, detrimental shoreline erosion which cannot be otherwise controlled; if there is rapid sedimentation adversely affecting marine life or impairing navigation which cannot be corrected by upland modifications; or if there is a clear and definite need to accrete beaches.

Rationale: The design and placement of shoreline protection structures is a highly technical subject and often the precise or long-term effects of such structures on littoral processes cannot be predicted. A study of one county's shoreline shows that nearly 50% of the existing shoreline protection systems are ineffective or poor in performance. Shoreline protection structures disrupt natural forces and drive a shoreline away from a natural equilibrium state. In short, all protective structures have the potential to adversely affect marine resources directly or through indirect means. Needless shoreline modification is therefore discouraged.

2. For shorelines experiencing mild to moderate erosion, the planting of marsh grasses is a preferred means of stabilization. **Note:** The planting of marsh grasses is not appropriate on all shorelines and requires some technical expertise. Free advice is available from the Virginia Shoreline Advisory Service and the Virginia Institute of Marine Science.

Rationale: Fringing marshes buffer erosion through their dense root systems and ability to collect sand and sediments moving along the shoreline. When a fringe marsh is established, it not only provides food and habitat for marine birds and other organisms but also minimizes the adverse effects to adjacent shoreline properties which are often associated with other types of erosion control measures.

3. When an erosion control structure, such as a bulkhead or seawall, is deemed necessary, it should ordinarily be placed landward of any existing and productive marsh vegetation. A line of saltbushes, if existing, can usually indicate the seaward limit of the vertical structure. Along shorelines where no marsh vegetation exists, the retaining structure should ordinarily be placed far enough landward of mean high water so as to minimize exposure to wave action.

Rationale: A vertical retaining structure behind a marsh not only preserves the marsh for its biological productivity but also utilizes the marsh's capabilities of aiding water quality and deterring erosion.

Placing a vertical retaining structure landward of mean high water minimizes its exposure to wave action and reduces erosion or scour along the toe which could jeopardize the integrity of the structure. Landward placement also preserves intertidal bottom, maintaining habitat diversity and associated functions of this area within the marine ecosystem.

4. Sloped rock or riprap revetments and gabions are generally preferred over vertical structures.

Rationale: Vertical retaining structures tend to reflect wave energy and often transfer a problem to neighboring properties. Coastal waves, whether from natural causes or from boat wakes, are better absorbed or dissipated by riprap revetments or gabions. In addition, the slope and open spaces in riprap or gabion structures may provide suitable habitat for crabs and small fish. In some cases, sediment may be trapped in riprap or gabion structures and subsequently become vegetated with marsh species.

5. The placement of offshore breakwater or submerged, nearshore sills parallel to a portion of shoreline in order to attempt to elevate the height of a beach or damp-

en wave energy is generally acceptable only in areas with a good sand supply in the nearshore zone or where there is active detrimental erosion. Sill structures are usually constructed of properly filled sandbags, gabions or mortar filled bags. Although not a general rule, the sill is usually most effective when placed at or near the mean low water line. Both breakwaters and sills must be specifically designed for the shoreline segment in question.

Rationale: The placement of sill structures where there is an insufficient supply of sand to the beach may cause harmful effects to the shorelines of adjacent downdrift properties. Placing the sills at, or near the mean low water line will usually ensure sufficient backshore height. Placement of the sill structure too far offshore may result in insufficient filling and ultimately failure of the system. Sills may also not be suitable for high use beaches because of the potential hazard to swimmers.

6. The placement of a groin or series of groins on eroding shorelines in an effort to trap sand and build up a beach is justified only when there is sufficient sand in the littoral drift system or if properly functioning groins already exist in the section of shoreline in question.

Rationale: Groins are designed to trap sand and build beaches. When they function properly, they necessarily deprive downdrift shorelines of sand and thus may accelerate erosion to adjacent properties particularly if there is only a small amount of sand available in the system.

7. When groins are considered justified they should be low profile in design and only as long as is necessary to trap sand drifting in the littoral zone. Ideal groin length can be determined by examining the sand fillets in existing groins along the same shoreline reach or can be based on the width of the local beach.

Rationale: The low profile groin is designed to resemble the natural beach slope and allow sand to by-pass and thus nourish downstream properties once the groin has filled. Groins which are too long for the existing beach may shunt sand out to deeper water thus making it unavailable to downdrift properties.

8. The use of jetties at the entrance of a channel in order to maintain navigable depths or protect the entrance from wave attack is justified only when there is a clear and demonstrated need for such a structure and adjacent properties will not be significantly adversely affected.

Rationale: jetties attempt to prevent the littoral drift from entering the channel by trapping sediment moving along the shoreline. Sand tends to accumulate on the updrift side of a jetty and sediments are transported away from the jetty on the downdrift side. This can often result in accelerated erosion of the downdrift shoreline.

B. Filling and Dredged Material Disposal.

1. Filling in wetlands or subaqueous areas for the singular purpose of creating waterfront upland property is generally undesirable.

Rationale: Marine resources are finite, provide many valuable services and products and are delicately balanced in an intricate web of biological and physical interactions. Permanent loss of these resources and unnecessary alterations jeopardize this delicate ecological balance.

2. When filling along a shoreline is necessary, the activity should be confined to the area landward of any wetlands. If suitable non-wetland areas are not available and it is necessary to locate the fill further seaward, locations in Group 3-5 wetlands should be selected if possible (reed grass, saltwort, saltbush, black needlerush, yellow pond lily). Every reasonable effort should be made to preserve existing Group 1 and 2 wetlands communities. In nonvegetated wetlands, fill should be contained at or above the mean high water line. In cases where some encroachment beyond mean high water is justified (e.g. where an eroding bluff is being graded down to stop erosion), the encroachment channelward of mean high water should be limited to the minimum required to achieve the desired goal.

Rationale: The values of the more important wetland communities are preserved, thus somewhat lessening the undesirable impact of destroying marshes and in the case of nonvegetated areas, minimizing encroachment conserves these shallow areas to function as described in Section II of this document.

3. Fill material, whether on wetlands or nearby fastlands, should not contain contaminants which may leach into adjacent waters. Upland source material is generally preferable to dredged material for use as fill.

Rationale: Oil or other contaminants can leach off the surface of filled areas and travel to adjacent waters via surface runoff. In some instances, they may also leach downward into the water table. In either case, water quality is impaired. Most dredged material is composed of silts and clays which when dry and compacted do not allow the free flow of water and thus may cause hydraulic flow problems behind a bulkhead.

4. Where feasible, controlled disposal of dredged material on highland property is the preferred method.

Rationale: There are many difficulties inherent in controlling dredged material in the marine environment. Marine resources are finite and subject to significant disruption from such activities since the water column can act as a vector carrying sediments well beyond the immediate disposal point.

5. Dredged material disposal areas should meet the following criteria:

a. Disposal by the bucket or dragline method:

1. Build an earth-tight bulkhead along the perimeter of the disposal area sufficient to confine the dredge spoil. The bulkhead or dike (berm) should have a top elevation at least 3 feet above the average upper limit of spring tides.

2. Earthen dikes (berms) should be compacted as they are constructed, have side slopes no steeper than 1 horizontal to 3 vertical, a top width of at least 3 feet, and the toe of the slope should be at least 15 feet from existing marsh grasses. Spillway boxes or release pipes should be provided to prevent water from eroding or over-topping the dike. As soon as possible after completion of the project, the disposal area should be graded and vegetative cover established.

3. In some projects involving small volumes of generally sandy material, a double line of staked straw bales may provide suitable containment.

b. Disposal by hydraulic methods:

Earthen dikes should be constructed by dragline or land fill methods to the specifications as described in 3 (1) above. The volume of the disposal area lying below the elevation of the spillway crest should, at all times during the dredging, be sufficient to provide a retention time long enough to clarify the discharge water to meet applicable water quality standards. The spillway should be placed as far as possible from the discharge end of dredging pipes.

2. The dredge pipeline should have tight joints to prevent leaks. Grading and vegetative cover should be accomplished as soon as possible. (It is recognized that hydraulically filled areas may take many months to dry sufficiently for people or equipment to move across them. Seeding may have to be delayed for periods possibly as long as a year. The spillway should therefore be maintained until the area is permanently seeded and vegetation is well established and providing adequate ground cover to retain the soil).

Rationale: Control of sedimentation is accomplished if the above criteria is maintained during the entire dredging period.

6. Dredged material should not ordinarily be deposited in adjacent marsh as a convenience. if it becomes necessary to place spoil on a marsh, consideration should be given to placing it on those portions of lower value or to scattering the material in

a thin layer rather than containing it behind a berm. Berms in marshes should be used to contain fill only when absolutely necessary and when they will not impair tidal flow to other wetlands areas.

Rationale: A continuous berm often cuts off water supply to a marsh. Selective piling allows continued water supply to uncovered portions of a marsh and may enhance habitat for wildfowl and animals. Scattering of dredged material in a thin layer can sometimes maintain basic marsh values though it may ultimately lead to changes in vegetative species if the marsh surface is significantly raised in elevation. The depth of the soil layer must be evaluated in each case.

7. Whenever feasible, displaced marsh vegetation and peat should be used to reconstitute marsh in the vicinity of the activity site and particularly along the banks of newly cut canals. The practice of compensating for marsh loss in one area by building marsh in another is theoretically viable but because of significant technical difficulties is not always recommended.

Rationale: This procedure, when successful, aids in maintaining marsh inventory and will deter shoreline erosion and enhance water quality conditions.

8. When under specific case by case analysis it is determined that marsh creation is an acceptable means of compensating for an unavoidable marsh loss, one marine habitat (e.g. tidal flats) should ordinarily not be sacrificed to create another (marsh). Resource compensation through marsh creation is not a panacea and should be limited to cases where the loss of existing marsh is unavoidable and significant and there is a high probability of success.

Rationale: There is at present no conclusive evidence that the trading of one marine habitat for another results in a net gain for the environment. The creation of marsh from upland or other habitat is technically feasible in many cases. It is however a complex activity that generally cannot be successfully accomplished without technical knowledge and expertise.

9. Overboard disposal of dredged material is generally undesirable unless the deposits are basically clean sand, the disposal area is devoid of commercially important bottom organisms, and the deposits will have a beneficial effect on shoreline erosion problems. There may be occasions when overboard disposal of silty spoil can be used to create marsh. This will probably also entail the planting or seeding of marsh vegetation under closely controlled conditions.

Rationale: Silty soils tend to stay in the water column longer than the heavier sands and may therefore drift to other areas resulting in damage to bottom organisms outside the selected spoil area. Pollutants may likewise drift with the currents. In some cases, good quality sand can be beneficial in nourishing starved or eroding beaches and this possibility should be considered.

10. Whenever overboard disposal is permitted, the operation should be located and conducted so as to minimize impacts on commercially important bottom dwelling (benthic) organisms such as clams and oysters, submerged aquatic vegetation, and other unique or highly productive habitats.

Rationale: Because water is the link which ties all different marine habitats together and can transport pollutants over large areas, care must be taken to localize the impacts of overboard disposal to the maximum extent practical.

11. The overboard disposal of good quality sand in order to replenish beaches is generally acceptable so long as the beach sand and dredged sand are size-compatible.

Rationale: The placement of material of smaller particle size than that found on the natural beach will only serve to increase turbidity since it will be resuspended by wave action and carried away very quickly resulting in little benefit for the sand-starved beach.

C. Dredging

1. When possible, open pile piers should be lengthened to reach necessary water depths in order to minimize the amount of dredging required.

Rationale: Open pile piers have a minimal adverse impact on the marine environment. Dredging is a significant, though temporary, disruption which must be repeated in order to maintain water depths. Every dredging project, whether new dredging or maintenance requires an approved disposal area and this can be a major problem particularly in developed areas.

2. Dredging for the singular purpose of obtaining fill is ordinarily not justified.

Rationale: Although dredged areas are repopulated to a degree by organisms after cessation of dredging, they generally never return to their predredge productivity levels if water depths are greatly increased. The result is a chronic degradation of habitat quality and reduction in system productivity.

3. For relatively small projects (2000 c.y. or less), dredging by dragline or bucket method is generally preferred.

Rationale: Control of sedimentation is much simpler with the bucket dredge in that there is a higher ratio of soil to water as the dredged material is transferred from the dredging area. Dredged material disposal is less complicated and more easily subject to productive use. Hydraulic dredging is preferred for large dredging projects particularly when the dredged material is to be placed in an area remote from the dredged site.

4. The practice of "double handling" dredged material in a waterway is generally undesirable.

Rationale: This activity, which involves the interim placement of dredged material in the waterway effectively doubles the adverse effects of bottom disruption and turbidity associated with dredging activities.

5. Dredging in shellfish areas, beds of subaquatic vegetation and other areas of singularly high productivity should be avoided if possible.

Rationale: These areas generally have very high values to both commercial and sport fisheries and to the organisms that support them. In addition their recovery period from dredging is measured in years rather than months as is the case for other bottom types. In many cases the new depth involved after dredging may preclude any recovery of these particular biotic communities.

6. In oyster and clam growing areas (brackish and saline water) dredging should be avoided during the months of July, August, September, December, January and February, whenever possible. This is particularly important when the dredging is to be performed within 500 yards of, or overboard disposal is within one mile of, productive public or privately leased oyster ground. In anadromous fish spawning and nursery areas (i.e. freshwater), dredging and overboard disposal operations should be avoided, when possible, during the period of mid-March through October. Particularly critical is the actual spawning period, mid-March through June. Concern is heightened when overboard disposal is involved.

Rationale: The majority of oyster spawning and spatfall occurs during the months of July, August and September in most areas of Virginia. Higher than normal suspended solids levels, which can occur in proximity to large dredging and disposal activities, can interfere with the development and survival of oyster larvae. Resultant sedimentation can also adversely affect the setting of oyster larvae by covering clean hard substrates thus making them unavailable to the larvae. During the coldest months of the year, oysters are more susceptible to siltation because their pumping activity is reduced and they are less able to clear away rapidly accumulating silt. During the spring spawning run (mid-March through June) anadromous fish eggs and larvae can be adversely affected by higher than normal levels of suspended sediments. Adult migrations can be impeded especially in narrow streams and rivers where turbidity may reach from bank to bank. The period July through October is the nursery period when the larvae develop into juveniles before beginning their migration back to the ocean. **Note:** This guideline is not subject to blanket application in the salinity regimes where it is applicable. Careful case-by-case analysis is required.

7. In relatively large water bodies, overdredging to reduce the frequency of maintenance dredging, should not exceed an additional two feet and this should be

based on the anticipated sedimentation rate. In narrow canals and other water bodies subject to poor flushing, the dredged depth should not exceed one foot below that of the connecting waters.

Rationale: This guideline balances the benefits of reduced maintenance frequency and thus environmental disturbance with the creation of stagnant or "dead" water which can occur when artificially deep holes are created.

Specialized Structures and Activities

D. Channeling into Fastland or Marshes

1. Where feasible, community piers and launching facilities are preferable to channeling into fastlands or marshes for water access in conjunction with urban development.

Rationale: Studies have shown that such channeling leads to water quality problems. Poor water circulation and flushing, combined with contaminating constituents and high nutrient loads from adjacent development often leads to reduced dissolved oxygen levels, noxious odors, uncontrolled algal growth and fish kills.

2. While environmentally objectionable, there may be times when channels into marshes or uplands are permitted. When this is the case, the following criteria should be applied in order to reduce adverse effects:

a. Channels should be short in length and preferably no longer than twice the width.

b. Channels should not be dredged more than I foot deeper than the depth of the waterway to which they are to be connected.

c. Channels should not be box-cut but should be dredged with slopes that approximate the natural angle of repose of soils of the area, usually on the order of 3 feet horizontal for every 1 foot vertical.

d. The top banks of channels should be graded to a slight incline anywhere between mean sea level and mean high tide for an inland distance of at least 10 feet. This area should then be planted with marsh vegetation appropriate to the soils and the salinity of waters in the area.

e. Channels should be significantly shallower at their heads than at their mouths in order to promote better exchange with the natural waterway.

f. Channel curves and angles should be avoided.

Rationale: The foregoing criteria reduce the potential adverse impacts of channelization by providing for better water circulation and bank stability. The marsh vegetation aids in preventing upland spoils and contaminants from lowering water quality.

E. Dams and Impoundments

1. Dams and impoundments should ordinarily not be located in tidal wetland areas. If some encroachment into such areas is deemed necessary every effort should be made to limit the encroachment as much as possible and restrict marsh loss to Group 3-5 marshes.

Rationale: Impounding an upland area generally involves a tradeoff of one set of upland habitat values (e.g. hardwood forest) for another set (lake or pond). When tidal wetlands are lost to this same type of development, the loss to the marine environment can be severe and is generally irreplaceable.

2. When a dam or impoundment is constructed in, or adjacent to, a tidal stream, provisions should be incorporated into the design to maintain a flow of freshwater into the estuary.

Rationale: Maintaining a flow will minimize the upstream movement of salt water in the stream and thus reduce large scale aquatic habitat changes due to salinity shift.

3. Dams should incorporate the use of fish ladders in order to minimize the loss of upstream spawning and nursery grounds for marine species.

Rationale: Many commercial and sports fishes are spawned and develop to adult stages above the tidal estuary. These areas are critical to the maintenance of population levels in these species.

4. Techniques which will minimize the possibility of mudwave creation adjacent to the dam site should be implemented when wetlands are present.

Rationale: This guideline limits wetland losses due to impoundments to that immediately in and upstream of the dam site. A mudwave effectively destroys wetlands in its path by raising the substrate elevation above the range of tide.

5. Whenever possible, impoundments should be designed to incorporate shallow water areas capable of supporting emergent vegetation and water tolerant timber.

Rationale: Shallow water habitat within the impoundment can help offset the loss of tidal wetland habitat due to dam construction.

F. Marinas

1. Dry storage type facilities are encouraged in preference to wet slip complexes.

Rationale: Such facilities minimize adverse impacts to the marine environment and do not occupy space in the water which could be used for recreation by all citizens of the Commonwealth.

2. When siting and designing a marina facility in a coastal waterway, the following should be considered:

a. All structures should be open-pile or floating with any permanent loss of aquatic habitat limited to that which is absolutely necessary.

b. If sited in a small tributary or other poorly circulating body of water, the marina should be situated near the mouth rather than the headwaters.

c. The structures should encroach no more than one third the distance across the waterway except in unusual channel configurations.

d. Marinas should be sited away from productive or actively worked oyster and clam grounds.

e. Consideration should be given to the size and depth of the existing waterway and to the number of boats already housed in the vicinity.

f. Slips for deep draft vessels should be located in the naturally deeper waters of the marina.

g. If the site involves a marsh, all structures except those needed for access (ramps, railways, etc.) should be located landward of or channelward of marsh vegetation.

h. Design of any necessary breakwaters should permit adequate water circulation within the facility to help prevent an accumulation of pollutants. Floating tire or other non-permanent type breakwaters should be considered.

Rationale: The foregoing criteria reduce the potential adverse impacts of marinas by providing for better water circulation, minimizing marine habitat loss, and reducing initial and maintenance dredging requirements.

G. Drainage and mosquito ditches

1. Drainage and mosquito ditches should be designed according to a master plan which will maximize their effectiveness while minimizing their extent as much as possible.

2. Ditches designed along conventional grid patterns are discouraged in favor of ditches which link identified mosquito producing areas within the marsh with tidal waters. Drainage ditches should also be designed to connect to specifically identified areas of poor drainage.

3. Depths should be limited to no more than 1 foot deeper than the connecting waters.

4. Depending on the size of the ditch, dredging should be accomplished "in the dry" (landside to seaward).

5. If dredge spoil must be placed in the marsh, it should be spread or broadcast as thinly as possible over a broad area with no effective elevation change on the marsh surface. If this is not possible, the dredged material should be placed in small widely separated mounds creating plant diversity and allowing water to circulate over the remaining marsh.

6. Where maintenance dredging is to be accomplished, the dredged material should be placed, to the maximum extent possible, on the old spoil area. If this is in the form of a continuous berm paralleling the ditch, the berm should be breached periodically to promote inundation of the remaining marsh.

7. Rotary ditchers are the preferred means of constructing mosquito ditches and small drainage ditches.

Rationale: Adherence to the above procedures will maximize the effectiveness of the ditches while minimizing adverse impacts to the wetlands.

H. Submarine pipeline crossings

1. Whenever feasible, pipelines should be placed on piles or attached to existing structure.

2. When a pipeline must be buried in the river bottom, the stockpiling of excavated material adjacent to the trench should be avoided.

3. When a pipeline must be buried in a marsh, material may be temporarily placed along side the trench if upon completion all excess material is removed from the marsh, the original elevation is restored, and all denuded areas are sprigged with appropriate vegetation.

Rationale: These guidelines minimize construction impacts to the wetlands and allow for the fastest possible recovery of the natural system after the disturbance.

Glossary

ALGAE - Simple marine or freshwater photosynthetic plants. May be single or multi-celled.

ANNUALS - Invertebrates which generally spawn once a year and live about a year.

BENTHIC - Pertaining to any plant or animal living in or on the bottom sediment of a river, ocean, lake or other aquatic system.

BERM - A wall or mound built around a low-lying area to contain a spoil material.

BIANNUALS - Invertebrates which generally spawn twice a year and live less than a year.

BRACKISH - Pertaining to the waters of bays and estuaries, salty but of lower salinity than seawater.

BULKHEAD - A structure or partition, usually running parallel to the shoreline, for the purpose of protecting fastlands from wave action or protecting channels from upland sedimentation.

COMMUNITY - Ecological term for any naturally occurring group of different organisms inhabiting a common environment, interfacing with each other relatively independent of other groups. Communities may vary in size and larger communities may contain smaller ones.

DETRITUS - Organic matter (primarily marsh plants) which while decaying in the aquatic system forms the basis of major marine food web. The organic matter and its rich growth of microbes are fed on by many estuarine species.

DOMINANT - For purposes of classifying marshes in this report, any organism which makes up at least 50% by volume of the organisms present in a given area.

DRAGLINE - The method of dredging employing a crane and large metal bucket to remove accumulated sediment.

DREDGING IN THE DRY - A technique of dredging used where new channels or canals are being cut. The canal is dredged from the landward end toward the seaward end and the last step is to open the new canal to the existing waterway.

DIKE - A wall or mound built around a low-lying area to prevent flooding.

ECOLOGY - The overall relationships between organisms and their environment.

FASTLANDS - The zone extending from the landward limits of wetlands to at least 400 feet inland.

FRESH WATER - Waters containing no appreciable salt, usually less than .5 parts per thousand.

FOOD WEB - The complex interactions of organisms in a natural community involving organisms feeding on one another to obtain energy.

GABION - A container filled with stone, brick, shells or other material to give it a heavy weight suitable for use in constructing bulkheads or groins. In the marine environment, usually made of galvanized steel wire mesh with a PVC (polyvinyl chloride) coating over the galvanizing.

GROIN - A shore protection structure built (usually perpendicular to the shoreline) to trap sand and other material moving along the shoreline and thus retard erosion of the shore.

HETEROGENEOUS - Being composed of many different forms of something. Specifically, a heterogeneous marsh is one composed of many different species without any one being dominant.

HYDROLOGICAL - Pertaining to water, its properties and distribution especially with reference to water on the surface of the land, in the soil and underlying rock.

INTERTIDAL - Area on a shoreline between mean high water and mean low water.

JETTY - On open seacoast, a structure extending into a body of water designed to prevent shoaling of a channel by sand or other materials. Usually placed along side channels at entrances.

LINE OF SALTBUSHES - Refers to the characteristic growth of saltmarshes at the upper limit of the highest high tides. When present in a line along the inland side of a marsh it often indicates the upper limits of wetlands as defined in the Virginia Wetlands Act.

LITTORAL PROCESSES - Those physical features and characteristics of the intertidal area which determine the type of shoreline present.

MICROCOSM - A small community regarded as having all the characteristics of the biosphere or the world.

MONOSPECIFIC - Being composed entirely of one species or one type of organism. In this case a marsh vegetated by one type of grass.

MEAN HIGH WATER - The average height of high waters over a nineteen year period.

Coastal Primary Sand Dunes/ Beaches Guidelines

Guidelines for the Permitting of Activities Which Encroach into Coastal Primary Sand Dunes/Beaches

Issued by the
Virginia Marine Resources Commission
2401 West Avenue
Newport News, Virginia 23607

Developed Pursuant to Chapter 2.2 of Title 62.1, Code of Virginia, These Guidelines were approved on August 26, 1980 and became effective September 26, 1980

Revised August 1986

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Section I

Introduction

During its 1980 session, the Virginia General Assembly took an important step in reducing the potential for the loss of lives and property as well as the expenditure of public assistance funds in coastal hazard areas by adopting the first State-supervised program in Virginia for controlling development in coastal primary sand dunes. In adopting the legislation, the Commonwealth recognized the importance of coastal primary sand dunes as features which, in their natural state, serve as protective buffers to the effects of flooding and erosion caused by coastal storms; thereby, protecting life and property, and further recognized the value of these features to the replenishment of sand on beaches, their importance as habitat for coastal fauna and their role in the overall scenic and recreational attractiveness of Virginia's coastal environment.

At the same time, the General Assembly expressed its concern over the fact that activities which do not take into account the essentially dynamic nature of coastal dunes and which compromise their special values may lead to increased shoreline erosion, coastal flooding damage to fixed structures and increased expenditure of public funds for disaster assistance and beach replenishment. Therefore, the General Assembly established the policy of preserving and protecting, whenever necessary and practical, coastal primary sand dunes in a manner which accommodates necessary economic development. Building upon the successful structure of the Virginia Wetlands Act, the General Assembly has chosen to offer selected localities having coastal primary sand dunes the opportunity to adopt a specified ordinance to control development in these dunes through local wetlands boards already in existence or created in order to carry out this Act. In order to simplify the task of these boards as well as the Marine Resources Commission, the legislators have wisely chosen to standardize procedures for the Wetlands and Dunes Statutes. Therefore, as with the Wetlands Statute, the Marine Resources Commission will review, on appeal, local permit decisions on dunes, and where the locality has not adopted the specified ordinance, administer the permit system itself.

In order to provide guidance to the public, and to local wetlands boards as well as to insure uniformity of decisionmaking criteria, the General Assembly directed the Marine Resources Commission, with the assistance of the Virginia Institute of Marine Science, to develop and publish guidelines. These guidelines were approved by the Commission August 26, 1980 following four public hearings which were held in conformance with the Administrative Processes Act. They are promulgated to supplement the policy and standards of the Coastal Primary Sand Dune Protection Act with the hope that they will assist project proponents and decision-makers alike in shaping shorefront development in a manner that preserves and protects the values of coastal primary sand dunes articulated in the Act.

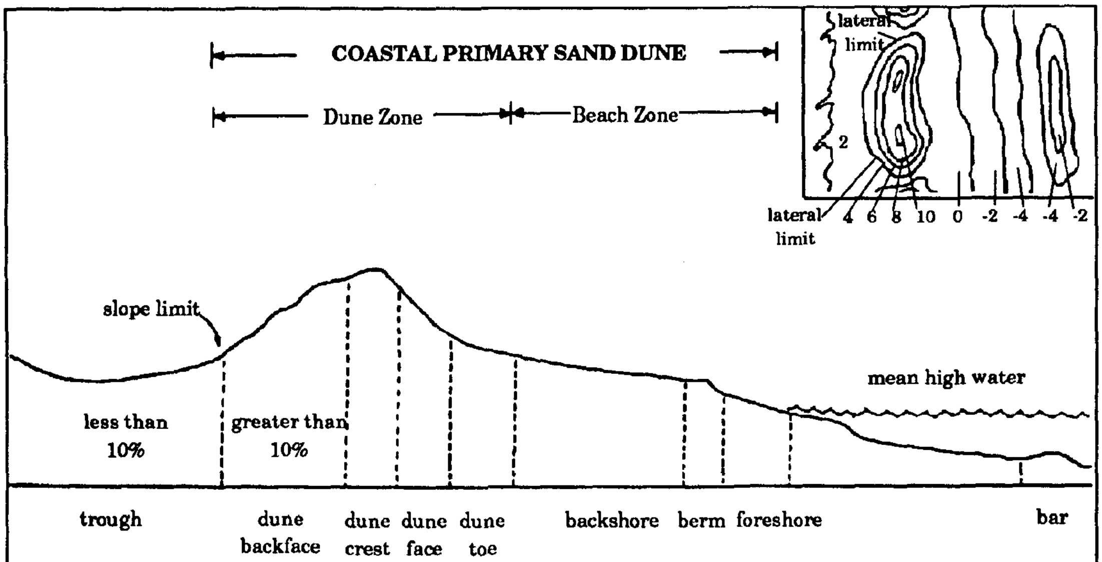
In 1989, the General Assembly modified the Coastal Primary Sand Dune Protection Act to bring "beaches" in certain counties, cities and towns fronting on Chesapeake Bay under the same regulatory process as that required of dunes. The intent is to regulate the use or development of sandy beaches and to prevent their alteration even if no coastal primary sand dune can be identified or where contiguity with a dune system or former dune system has been interrupted by a manmade structure such as a road, bulkhead or building.

Section II

Description of Coastal Primary Sand Dunes and Their Values

A. Dune Characterization. The Coastal Primary Sand Dune Protection Act defines a dune as a mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent and upon any part of which is growing as of July one, nineteen hundred eighty, or grows thereon subsequent thereto, any one or more of ten plant species associated with dunes. Under this definition, chosen to recognize the dynamic nature of the system, coastal primary sand dunes include both the mound of sand comprising the dune zone as well as the foreshore comprising the beach zone. Together, these two zones form the coastal primary sand dune system which commences at mean high water and proceeds landward to the backside of the dunes where the slope drops below ten percent. (See Figure 1).

The primary dune system is a component of the active shore system as well as a transition zone between the intertidal area and secondary rows of dunes or fastland property. Coastal primary sand dunes represent an accumulation of sand, often supporting rooted vegetation, formed by the interaction of wind and wave action on the sandy material along the shore. Sand moved on the beach during periods of relatively low wave energy is moved landward by the action of onshore winds. Vegetation along the dune line acts as a baffle, slowing wind speed and causing wind-borne sand to settle and be trapped in the vegetation resulting in the growth or accretion of the dune. The size and location of a primary dune are therefore determined by the amount of sand available and the ability of wind and waves to move the sand as well as the degree to which any existing vegetation can act to trap it. Thus, just as the intensity, direction and duration of winds and waves constantly change through the seasons, so, too, do coastal dunes remain in a state of flux. During high energy conditions, such as the northeast storms which frequent the Eastern Seaboard, primary dunes may be subject to attack by wind driven waves aided by storm surges, and the dune is eroded away, with the sand settling in an offshore bar. Thus, during normal weather conditions, dunes act as a reservoir of sand which can, through erosion, buffer inland areas from the effects of storm waves and in the process act as natural levees against the effects of coastal flooding.



COASTAL PRIMARY SAND DUNE
Dune Zone
Beach Zone
lateral limit
2
lateral limit
4 6 8 10 0 -2 -4 -4 -2
slope limit
mean high water
less than 10%
greater than 10%
trough
dune backface
dune crest
dune face
dune toe
backshore
berm
foreshore
bar

Figure 1

B. Dune Values. In adopting legislation governing coastal primary sand dunes, the General Assembly recognized that these features, "...in their natural state serve as protective barriers from the effects of coastal flooding and erosion caused by coastal storms...provide an essential source of natural sand replenishment for beaches and an important natural habitat for coastal fauna; and are important to the overall scenic and recreational attractiveness of Virginia's coastal area." Every primary sand dune provides some measure of each of these four recognized benefits, depending upon the size, location and setting of the dune as well as the quality and vigor of the vegetation.

1. Flood and Erosion Protection. Primary sand dunes provide a buffer against coastal flooding and erosion by virtue of both their location and composition. Primary dunes develop at an elevation above the normal reach of tidal waters. During storm surges, however, the dune, as noted above, serves as a levee protecting the land behind from the force of waves and flood waters. The sand itself absorbs much of the wave energy as it is moved about by storm waves. Thus, the energy each wave expends eroding the dune is subsequently unavailable to act on fastland and structures behind the dune. The ability of the dune to provide this protection is obviously dependent on its height and breadth. The continuity of the dune line is also a major factor in the ability of the dune to provide protection. Solitary dunes or dune lines which are subject to being breached or flanked cannot afford the protection provided by a continuous line of uniformly high dunes.

The composition of the dune, in terms of its sediments and vegetation, also affects its ability to provide protection for coastal areas. As noted above, dune vegetation acts as a baffle to trap sand where the root system of the vegetation as well as dead vegetation bind the sediments together. Thus, the type and vigor of vegetation present on dunes help to determine the degree to which the dune will absorb wave energy.

2. Sand Replenishment. Coastal primary sand dunes are basically onshore sand bars, or as noted above, reservoirs of sand. Sand is constantly being moved by wind and waves between offshore sand bars, beaches, dunes and during storm events, even inland. Sand eroded from dunes during high energy conditions often finds its final resting place on beaches or offshore bars. These offshore bars then act as sources of sand for the beach during periods of lower energy when wave action tends to deposit material in the beach zone. Thus after each storm, the sand originally eroded from the dune returns to the beach zone during the rebuilding process.

3. Habitat. Coastal primary sand dunes, in their natural state, serve as a habitat for a wide variety of plants. Dune vegetation is characterized by its ability to withstand extremes in the natural environment and by its inability to withstand man-made disturbances. The dune is a very rigorous environment for a plant. Each plant must be able to survive with very limited amounts of fresh water, tolerate constant salt spray and endure extreme variations in temperature. That such vegetation hardy enough to survive all of these stresses should be so intolerant to any additional disturbance such as trampling by people and/or vehicles is explained by the fact that these plants are living close to their limit of tolerance and even minor disturbances to root systems can cause such plants to die.

Vigorous vegetation both on the dune crest and the leeward side of the dune can provide attractive habitats for some shore-dwelling animals. The most visible inhabitants of dunes other than plants are various shore birds which utilize the area for roosts and nesting. Dunes also support a variety of insects and occasionally some small mammals and reptiles.

4. Aesthetics. Perhaps the most widely accepted but least quantifiable value of the coastal primary sand dune is the contribution it makes to the attractiveness of the coastal area. Aesthetic evaluations are a personal prerogative and therefore difficult to utilize as the basis for management decisions. Nevertheless, the General Assembly has taken note of the contribution dunes make to the enhancement of the shore experience. It is therefore, appropriate for development adjacent to dune areas to be considerate of that contribution.

Section III

Consequences of Altering Coastal Primary Sand Dunes

Simply stated, the consequences of altering coastal primary sand dunes are a loss of or diminution of the values discussed above. Unfortunately, there is very little information enabling quantitative assessments of the loss or degradation of these values from any proposed development in the dunes area. In the absence of such information decisions regarding such development must be based on experience and reasoned judgements with each decision being made on a case-by-case basis. It is, however, possible to rank the consequences of alteration in terms of the scale of alteration:

1. Leveling dunes. The leveling of a dune is certainly the most extreme alteration of that feature which can be undertaken. In such instances, the buffering capability provided by the natural levee of the dune and its source of sand are obliterated. This exposes adjacent and neighboring properties to substantially greater risk of flooding and causes a reduction in available sand for the adjacent beach zone as well as destabilization of the flanks of adjacent dunes.

2. Displacement of the dune. The natural position of a dune is the result of a balance of natural forces at any given time. Generally dunes are found in areas where they are attacked by waves only during storm events and then only after the backshore has been eroded by wave action. Displacement of a dune to a more seaward location exposes it to wave energy more often thereby accelerating erosion of the dune. Structures built on or behind the dune may then be exposed to wave action or inundated with sand as the dune migrates to a position in which it is again in equilibrium with wind and wave forces. Equally important, however, is the breach that such relocation causes in the dune line and the hazard such a breach poses for both the property located behind the relocated dune and adjacent properties as well. Displacement of a dune to a more landward location for whatever reasons would create the same type of breaching problem as well as affording no buffering capability for any property located seaward of it. Such displacement also causes a loss of sand for natural beach replenishment.

3. Building on the beach backshore. Building on the beach backshore, seaward of the dune can lead to adverse consequences in three ways:

a. During construction, the dune may be reduced in elevation for access to the building site. Should a storm occur during this period, the dune may be breached with the impacts discussed above.

b. After construction, the structure itself may interfere with wind patterns over the dune crest causing deflation or wind scouring.

c. Pedestrian traffic over the dune can cause the loss of vegetation anchoring the dune unless a dune overwalk, following the natural contour of the dune, is provided.

4. Pedestrian and vehicular traffic across the dune. The principal consequence of cross dune traffic is that, after the vegetation has been killed, wind transport of sand can very quickly excavate a crossdune blowout resulting in a localized weakness.

5. Building on the crest or foreface of the dune. Building on the foreface of the dune is very likely to result in alteration of the dune contours during construction, sand removal from channelization of wind around the structure and an increase of pedestrian traffic over the dune. During construction, wind blown sand may become a nuisance to other nearby properties.

6. Building on the dune backface. Since the dune backface is the natural zone of deposition in the dune system, construction in this zone is less deleterious to the functions of the dunes so long as significant amounts of material are not excavated. The presence of the structure will modify the wind flow but to the extent the structure is in the lee of the dune this may be minimized.

The preceding comments are directed principally toward destructive alterations of coastal primary sand dunes. It is possible to enhance dunes. Basically, these alterations are efforts to create more extensive, better stabilized dunes. Encouraging the natural development of a dune is not an exact science, but there is information available about the efficacy of a variety of methods. Just as with the construction of any other structure, seeking advice from a professional is advisable. The benefits accrue in terms of lessening costs associated with coastal storms.

The consequences of altering existing natural dunes are, in some respects, dependent on where the dune is located. This is particularly true of the dune's role as a protection and beach replenishment device. Within Virginia, coastal dunes are found in three broad geographic areas: the oceanside of the Eastern Shore, the Atlantic beaches south of the Bay entrance, and the shoreline of the Bay proper.

Eastern Shore - Oceanside

The oceanside of the Eastern Shore contains by far the largest complement of dunes in Virginia. Accomack and Northampton Counties have a total of about 85.3 miles of coastal dunes associated almost exclusively with the barrier islands. Barrier islands are among the most dynamic of coastal features.

As the Barrier Islands absorb the storm induced wave energy, they are frequently breached or overtopped and the sand is spread over the lee-side marshes. With the onset of normal weather, the dunes rebuild. As the Barrier Islands erode, the entire ensemble, beach-dune-washover, also retreats. Thus, the complete beach morphology is preserved. For the most part, the dunes are of low elevation and susceptible to even moderate storm activity. Given the many inlets in the system, the dunes do not have a primary function of flood control. They do, however, help control the washover processes. Given the low-lying elevations, any development on the Barrier Islands may result in inordinately high private or public costs. (See Section VII).

Virginia Beach

The second general area includes the Atlantic coast beaches south of the entrance to Chesapeake Bay. These beaches lie almost entirely within the City of Virginia Beach. The city contains about 38.5 miles of dunes. In contrast to the Barrier Island dunes, the Virginia Beach sand dunes include some under the most intense developmental pressure anywhere in Virginia.

Because of the tremendous development along the coastline, it is in this area that primary sand dunes have their greatest potential for protecting life and property. In order for the dunes to offer the maximum flood and erosion protection, they must be maintained as a relatively uniform, uninterrupted dune line. Each time a dune elevation is lowered or a portion of the dune line is completely removed, the protective capabilities of the dune are compromised not only at that site, but for adjacent areas as well.

The challenge is to accommodate the property owner's desire for access to the beach while retaining the integrity of the dune system. Repeated experience has established that construction on the dune is undesirable. Even open-pile structures lead to changes in wind and sand deposition patterns in the area. Frequently, this results in a local deflation of the dune. In the Virginia Beach area, loss of the primary dune line integrity could have its most significant consequences in terms of loss of life and property.

A second consequence of modifying dunes in the Virginia Beach area is the loss of the natural sand replenishment dunes provide to beaches. In an area whose principal resources include an attractive beach, the value of a viable dune system can easily be appreciated. The costly and continuous efforts of artificial beach nourishment are a partial result of sand dunes having been previously destroyed.

Chesapeake Bay Shores

There are scattered dune areas throughout much of the Virginia Bay shoreline. They can be found in: Norfolk, Hampton, Virginia Beach, Mathews County, Lancaster County, Northumberland County, and Northampton and Accomack Counties on the Eastern Shore. The Chesapeake Bay shoreline in Virginia Beach, Norfolk's Ocean View section and some of Hampton's shoreline possess the same development pressures as the Atlantic shoreline of Virginia Beach. The consequences of dune alteration are therefore identical in those areas. The other localities differ in the type and location of dunes generally found there. Typically, the dunes are part of a less extensive beach system and frequently occur in areas with much less developmental pressure than the more urban settings. In these areas, loss of a dune's protective capabilities can have consequences for both life and property similar to that in Virginia Beach, and can impact other natural resources as in the Barrier Islands.

Section IV

Recommended Guidelines When Altering Coastal Primary Sand Dunes

In adopting the Coastal Primary Sand Dune Act, the General Assembly established the following standards for construction on sand dunes:

"No permanent alteration or construction upon any coastal primary sand dune shall take place which would:

(a) impair the natural functions of the dune as described by the Act

(b) physically alter the contour of the dune

(c) destroy vegetation growing on the dune

Activities contrary to these standards will be permitted only if the wetlands board or Commission finds that there will be no significant adverse ecological impact from the proposal, or that granting a permit for the proposal is clearly necessary and consistent with the public interest."

It is apparent from a reading of the policy and standards of the Act that the General Assembly did not intend a prohibition on all activity in the dunes area. Instead, the legislators sought a careful balancing of the public and private benefits and detriments of each proposal. Some proposed development in the dunes area can be accommodated by utilizing proper location and design methods. Each proposal will likely be unique with respect to the necessity for the project and its probable effects on the beneficial value of dunes; therefore, criteria must be applied on a case-by-case basis. The objective of these criteria is to provide guidance which will direct development into an accommodation with the ecology of the coastal primary sand dune.

Guidelines

A. Provided the beneficial attributes of coastal primary sand dunes as discussed above are not significantly disturbed, alteration of dunes may be justified in order to:

1. Construct water access dependent facilities which must pass over the coastal primary sand dune for such access.

Such construction as might be allowed in item 1 above must be constructed in a manner which will minimize alteration of the dune slope during and after construction. Encroachment on the backside of a primary dune should be limited to the minimum necessary. In addition to other requirements that may apply for construction, only structures with open pile foundations should be constructed.

Rationale: The requirement that any construction on the dune backside must utilize an open pile foundation design is based upon consideration of the dynamics of dune movement, the compatibility of housing within the dune system, and the need to protect life and property within the fastland fringing the beach zone.

During times of severe storms, the entire primary dune system may yield to excavation by elevated water levels accompanied by high waves. Structures on slab foundations or designs other than open piling may be expected to exhibit structural failure. Such slab foundations also generally require the excavation of the dune backface for placement and do not allow for the natural migration of the dune. During periods of normal weather and sea state, and during poststorm periods of natural dune rebuilding, the backside of the dune is a zone of sand deposition. Structures elevated on open piling foundations will be less susceptible to burial by encroachment and deposition.

Bridging the dunes to gain access for certain water dependent activities may be permitted when those activities are deemed necessary. In such cases, elevated open piling foundations will minimize disturbance of natural dune building processes.

It should be noted that a requirement for open pile foundations is consistent with existing requirements of the National Flood Insurance Act.

B. Alteration of coastal primary sand dunes is ordinarily not justified:

1. for purposes of activities which can be accommodated without encroachment into the dune area.

Rationale: It is clearly the intent of the legislature to protect the primary sand dunes from unnecessary despoliation. Therefore, activities which have no inherent need to be immediately adjacent to the shore or for which there is sufficient room landward of the coastal primary sand dune may not require modification of the dune.

2. where the construction is proposed on the dune crest or seaward of the dune crest.

Rationale: The beach backshore is the primary sand supply for the primary dune and the foreface and crest of the deposit are the most active transport zones in the dune system. Construction on the backshore, frontal face and crest is thus likely to disrupt the transport system. In particular, construction on the crest and/or frontal face will cause local deflation of the sand elevations causing local weaknesses in the integrity of the dune system.

3. where the dune location must be modified in order to accommodate the proposed construction activity.

Rationale: The natural location of the primary dune is the result of all beach processes. The natural dune position is just beyond the reach of normal beach modulations. Relocation of the dune by artificial means to a more seaward or landward location is likely to result in a loss of the sand stored in the dune. This will reduce the integrity of the dune line and compromise the ability of the dune to protect against storm flooding and erosion.

4. where alteration of the dune would likely result in damage to neighboring property owners.

Rationale: Construction within a primary coastal dune may lead to weaknesses in the protective attributes of the system. Under severe storm attack, the weakness may lead to failure causing that site to become the focus of wave overwash activity. The breach in the system can reasonably be expected to widen to neighboring properties and cause otherwise avoidable damage.

In addition, during the periods of dune regrowth, the new sand deposits may encroach upon the developed zone of the neighboring lots.

Section V

Considerations for Construction and Mitigation Activities in the Area of Coastal Primary Sand Dunes

Due to the constantly changing nature of dunes and the possible wind, wave and scour action they may be subjected to, the design, location selection, and construction of structures in dune areas should be done by qualified professionals. As a recommended minimum, all elements of beach front structures, including the foundation and non-structural fastenings and components, should be designed to withstand the wind and wave forces of a 100 year storm. The first habitable floor of a building should be elevated on a piling foundation to a height above the crest of the 100 year design wave. Any construction in the space below the first floor should incorporate breakaway walls intended to collapse under stress without jeopardizing the structural support of the building. The piling foundation should safely transmit to the ground the full vertical and horizontal loads imposed on the superstructure by 100 year design storms. It should present as slender a profile as possible while being durable enough to resist storm loads, which may include the impact of floating debris. Pilings should be spaced such that no one row of piles is subject to significant wave forces at any one time and the spacing should provide for unhindered movement of water and debris between piles. Pilings should be of a circumference which minimizes induced concentration of wave force and consequent erosion and scour at the base, yet they should penetrate deeply enough (5 to 20 feet below mean sea level) and have sufficient strength to safely support the superstructure when the surrounding material is eroded down to the lowest predictable level. The foundation should be of a material which will resist deterioration in a corrosive marine environment. Structures with large areas in contact with the ground, such as swimming pools, decks, and slab foundations, should be discouraged. The ground below the first habitable floor should not be paved or altered, however, shell or marl are suitable when used to stabilize driveways. Telephone and electric lines should be located underground in water proof conduits laid in protected areas not subject to erosion. Water and sewage facilities should also be located in protected areas not subject to erosion.

Vegetation is the most effective protection for the land against the sea in establishing and maintaining a coastal position, and for that reason, during permitted construction, all precautions should be taken to retain as much natural vegetation as possible on the dunes and upper beaches. When walkways and platforms are located over a dune system, they should be elevated sufficiently to provide for the continued healthy growth of the vegetation below (3 feet minimum). Restoration of destroyed dunes can be accomplished by creating fills using slat or brush fencing or by moving upper beach sand by machine. Both procedures should be followed by long-term plantings of vegetation to replace that which was destroyed and to stabilize the dune. For the restoration of a long foredune, the fence should be aligned parallel to primary dunes in the vicinity and somewhat parallel to the drift line berm of the upper beach. The fence should be far enough back to allow the wind to move an adequate supply of sand against it, and placed so as not to bury existing vegetation. To build fills and help reform dune topography in smaller areas, fences should be built across the direction of prevailing winds. The newly created fill material should then be stabilized with plantings.

Section VI

Beaches

A. Definition. In the 1989 change to the Coastal Sand Dune Protection Act, the term beach is defined and added in place of reach. All references to reaches were dropped. Beach is defined as:

> 1. the shoreline zone comprised of unconsolidated sandy material upon which there is a mutual interaction of the forces of erosion, sediment transport and deposition that extends from the low water line landward to where there is a marked change in either material composition or physiographic form such as a dune, bluff or marsh, or
>
> 2. where no such change can be identified, to the line of woody vegetation (usually the effective limit of storm waves), or the nearest impermeable man-made structure, such as a bulkhead, revetment or paved road.

Beaches have therefore been added to the legislative declaration of policy as an area to preserve and protect in the same fashion as Coastal Primary Sand Dunes.

B. Applicability. Under the foregoing definition, all coastal and bay beaches in Virginia would be included since they all are composed of unconsolidated sandy soil and experience the "... mutual interaction of erosion, sediment transport and deposition...".

Identifying the landward limit of a beach should present minimal problems. In most cases a dune, bulkhead or other solid man-made structure will mark the upper limit of the beach. Where none of these are found, the landward limit will be marked by woody vegetation such as wild black cherry (*Prunus serotina*) Ehrhart, live oak (*Quercus virginiana*) Miller, red cedar (*Juniperus virginiana*) L., wax myrtle (*Myrica cerifera*) L., loblolly pine (*Pinus taeda*) L., bayberry (*Myrica pensylvanicum*) Loisel, poison ivy (*Rhus radicans*) L., and highbush blueberry (*Vaccinium corymbosum*) L.

In evaluating an application to use or develop property which meets the "beach" definition, Sections IV and V of these Guidelines contain information which can be utilized in arriving at the appropriate decision.

C. Decision Process. The wetlands and dunes protection programs have been successful largely because of the conscientious adherence of local boards and VMRC to established policy standards and guidelines. Similar careful adherence to a rule of reasonableness in administering "beaches" will assure the development of a decision record which can successfully sustain an appeal should one result.

Section VII

Virginia Marine Resources Commission Barrier Island Policy

(Rev. October 25, 1990)

A. Introduction

1. Definitions. For the purpose of this regulation, the definitions contained within Section 62.1-13.22 of the code of Virginia apply. In addition, the following words and terms when used in these regulations, shall have the following meaning unless the context clearly indicates otherwise:

Barrier Islands - means elongated narrow landforms consisting largely of unconsolidated and shifting sand, fronted on one side by the ocean and on the other by a bay or marshland which separates them from the mainland.

Dune Crest - means the highest elevation of the coastal primary sand dune on the lot as determined in consultation with the Virginia Institute of Marine Science.

Local 100-year long-term recession rate - means calculating the average shoreline recession over fixed one-mile intervals averaged over the period between surveys of 100 years or more.

2. Background. Barrier islands are transient landforms. Their dynamic and unstable nature poses significant risk to life and property located there. Scientific evidence placed before the Marine Resources Commission supports a finding that some of Virginia's barrier islands, including Cedar Island, are more fragile, more unstable, and pose even greater risk to life and property than many other coastal barriers due to their sand-deficient character. In addition, barrier islands are themselves significant natural resources that contain a number of specific features (coastal primary sand dunes, wetlands, and vast stretches of state-owned sandy beaches) including natural heritage resources and threatened or endangered species that are recognized by the General Assembly for their natural value and are protected by law. This policy applies to the barrier island systems on the seaside of the Virginia portion of the southern Delmarva peninsula, and is not intended to cover military activities essential to national security, or the construction, operation, maintenance or rehabilitation of Coast Guard facilities or access thereto. This exclusion does not obviate compliance with other applicable provisions of the Coastal Primary Sand Dune Protection Act.

Survival of these barrier islands often depends on the ability of sand to wash across the island naturally in concert with the local wind and wave climate. The sand is then protected from loss offshore and provides a means of perpetuating the island, albeit in a more landward location. Activities which adversely affect this interaction can have an extremely detrimental impact on the island as well as the structure, form and function of its dune system. The artificial accumulation of sand along the oceanside of an island can make it more susceptible to loss offshore during a storm. Once such a loss occurs, the sand then becomes unavailable for washover and for the continued landward migration of the island. Houses, sand fences and similar structures can also alter wind patterns; this alteration impedes the wind transport of sand across the island. Accumulations adjacent to these impediments can be lost offshore as the shoreline continues to recede, leading to an increased rate of recession and a narrowing of the island. In addition, many of the Commonwealth's rarest species depend on the continuation of natural processes that currently exist on barrier islands. Consequently, they are threatened by any interference with those processes. The implementation of the policies and guidelines set forth in this document will support a fuller achievement of the purposes of the Virginia Natural Area Preserves Act (Section 101.1-209 et. seq. of the Code of Virginia), the Virginia Endangered Species Act (Section 29.1-563 et. seq. of the Code of Virginia) and the Virginia Endangered Plant and Insect Species Act (Section 3.1-1020 et. seq. of the Code of Virginia).

Two of the main natural features of barrier islands are natural dunes and washover areas, both of which are included in the statutory definition of a coastal primary sand dune as a "mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent, and upon any part of which is growing" certain designated plants as listed in Section 62.1-13.22 of the Code of Virginia. Given the particular combination of risks to both natural values and life and property posed by development on barrier islands, the Commission finds it necessary and appropriate to establish a policy and supplemental guidelines to assist landowners and decision makers alike in shaping barrier island uses in a manner that preserves and protects the values of Coastal Primary Sand Dunes as set forth by the General Assembly.

B. Permits Required

1. Applications for New Development

a. No construction or any other activity which has the potential for encroaching on or otherwise damaging coastal primary sand dunes or state-owned beaches shall occur without review and approval by the Marine Resources Commission (Commission) or a local wetland board, or both. Consequently, a permit application must be submitted for any such construction or other activity. Each application shall include:

(1) A certified survey of the site which is representative of current conditions showing:

(i) One-foot contours relative to local mean high water, commencing at that line and proceeding through the site to the first wetlands vegetation,

(ii) Specific location for all proposed structures including septic system and drainfields,

(iii) Size, configuration and design of access points,

(iv) Location of any other activity which may affect coastal primary sand dunes or State-owned shore, and

(v) A dune crest, determined in consultation with the Virginia Institute of Marine Science, which identifies the highest elevation of the coastal primary sand dune on the lot.

(2) A copy of both a valid building permit and septic or other wastewater handling or disposal system permit.

b. All lot pins and proposed construction locations, drainfield sites and access points shall be staked and tied to suitable reference points.

c. In its review of the application, the Commission (or a local wetlands board) will determine the correctness of the dune crest and will establish a minimum setback necessary to prevent encroachment in or damage to the dune or interference with the natural processes of dune growth.

2. Loss of Structures and Applications for Redevelopment. When a structure is destroyed or damaged by natural events such that the structure is condemned by health officials or local building officials, reconstruction in that location may not be authorized. Submission of a new application and evaluation as if no structure were present will be required. In the event a structure is damaged beyond repair and is no longer habitable, or damaged and not restored to a usable state within one year, the owner of record shall be responsible for the complete removal of all vestiges of the structure and materials resulting therefrom, including the septic tank, distribution box and drainfields in their entirety, or as directed by the State or local Department of Health. The owner of the lot shall restore the area to as natural a state as possible.

C. Supplemental Guidelines

1. Structures

a. No permanent structure, other than those already specifically allowed by law or provided for in Section C.2.b below for purposes of permanent access, will be permitted seaward of the crest of the coastal primary sand dune. No permanent alteration of the coastal primary sand dune will be permitted, except in accordance with the standards set forth in the Coastal Primary Sand Dunes Act.

b. Since it is well established that the coastal primary sand dunes and the islands themselves recede continually westward at a reasonably predictable rate, and that excessive vehicular and pedestrian use will increase the fragility of coastal primary sand dunes or impact upon significant natural resources, development must be limited to no more than low density single family use on each platted parcel. Uses other than single family dwellings can clearly be characterized as "unnecessary and inconsistent with the public interest considering all material factors."

c. The density of structures and the percent of the shoreline frontage occupied by those structures are critical to minimizing the impact they have on sand migration across the island. Data concerning the development on barrier islands indicates that adverse impacts may be minimized when no more than 25% of the islands' linear shoreline is occupied by structures. This factor shall be considered in evaluating the individual and cumulative impacts of each permit application. In considering permit applications, the following guidelines shall be followed:

(1) There shall be adequate area within the lot that is neither sand dune (including beach and overwash areas) nor wetlands to accommodate the proposed dwelling and any appurtenant structures, including attendant sanitary facilities.

(2) Minimum frontage for a lot on the ocean capable of supporting a single-family vacation cottage shall be 100 feet.

(3) Minimum side yard requirements shall be 30 feet.

(4) The setback from the dune crest for all structures including septic systems shall be 20 times the local 100 year long-term annual shoreline recession rate. The dune crest shall be defined as the location of the highest elevation of the coastal primary sand dune, beach or washover located on the lot.

(5) The maximum allowable square footage for the first floor of a single family dwelling on a 100 foot lot shall be 900 square feet and for a 200 foot lot, 1800 square feet, including porches, decks, and other appurtenances. Houses with first floors larger than these will not be considered necessary economic development.

(6) The maximum height of a dwelling shall be 25 feet measured from the base of the first floor to the peak of the roof.

(7) All dwellings shall be constructed on elevated open pilings a minimum of ten feet above grade. No enclosures will be permitted below the first floor.

(8) An appropriate identification number shall be affixed to all septic tanks made of nonbiodegradable plastic materials to aid in their identification.

(9) Exceptions to these requirements may be authorized in individual cases. No such exception shall be authorized unless the Commission finds:

> (i) That the strict application of the requirement would produce undue hardship, and
>
> (ii) That the authorization of such exception will not result in significant detriment to barrier islands, their natural resources, or adjacent property.

d. Evidence of cumulative environmental impacts of existing and proposed structures, as well as the secondary impacts resulting from their use, shall be considered in passing upon any application for a permit.

2. Access

a. No cuts through the dune will be permitted. Temporary vehicular access for purposes of construction will be permitted only by open-pile or "corduroy" ramps. Permits for temporary vehicular access will be limited as necessary to protect significant natural resources. At expiration of the authorized term all structures, except as noted in subdivision b below, must be removed and the dune restored to its pre-construction contours and revegetated. All plans for temporary construction access must be specified in the application for any construction permit.

b. Permanent vehicular access across the dune will be permitted only by "corduroy" or open-pile vehicular ramps which allow the natural process of dune growth and migration to occur. An open-pile or "corduroy" ramp developed for purposes of construction access may remain in place for permanent access if it meets the above criteria and is specifically approved. All plans for permanent access must be specified in the application for any construction permit.

c. Each dwelling will be limited to a maximum of one vehicle for access to and from the island's landings. All vehicles shall be subject to the following conditions:

(1) Each vehicle shall have a no-cost annually renewable permit to travel on the beach. The owner shall attest at the time of renewal the vehicle's status and condition.

(2) The permit number for each vehicle shall be displayed in two foot high letters on the roof and sides of the vehicle.

(3) When a vehicle for a particular dwelling is no longer functional, it must be removed from the island. Evidence of its removal must be provided prior to the issuance of a permit for a new vehicle.

(4) All driving will be limited to the intertidal zone and between there and approved dune crossovers. Vehicular use of the beach at periods greater than four hours either side of low water shall be considered a violation of this section.

(5) All bird nesting areas posted by the Virginia Department of Game and Inland Fisheries, U.S. Fish and Wildlife Service, or Department of Conservation and Recreation shall be off limits to all vehicles.

(6) No all terrain vehicles (ATVs) will be permitted on barrier islands.

(7) Evidence of vehicular use in areas other than those authorized shall be cause for revocation of the permit and a requirement that the vehicle be removed from the island.

Any person having his or her permit revoked shall be precluded from reapplication for a one-year period.

3. Roads. No roads or trails will be permitted on or across any coastal primary sand dune or in any wetland.

4. Sand Movement. No artificial relocation of sand will be permitted.

5. Shore Hardening. Structures normally associated with or used for shoreline protection or erosion control, including but not limited to bulkheads, riprap, revetments, gabion baskets, sand bags, groins and jetties, or any other hardening of the shoreline will not be permitted under any circumstances.

6. Point Source Discharges. No point source discharge pipe, structures or other devices will be permitted.

7. Bond Requirement. A reasonable bond or letter of credit will be required prior to granting any permit to assure restoration of any temporary alteration of the coastal primary sand dune including, but not limited to, regrading to the original elevation, resprigging with appropriate vegetation and removal of any and all construction debris.

8. Sand Fence. The use of sand fencing or other artificial barriers is discouraged because of its interference with the natural sand transport and migration on barrier islands.

9. Solid Waste. All solid waste generated on barrier islands must be removed and disposed of appropriately on the mainland.

10. Pets. In order to prevent unrestricted roaming which may result in the disturbance of, or depredation to wildlife, domestic pets must (a) be restrained or under the control of their owner at all times; (b) shall not be allowed off of the owner's property except under leash; and (c) shall not be abandoned on a barrier island.

11. Endangered Species. Encroachment upon the nesting sites of threatened and endangered species identified by the Virginia Department of Game and Inland Fisheries or Department of Conservation and Recreation is prohibited. Evidence of impact or potential impact on threatened and endangered species shall be considered in passing upon any application for a permit.

12. Landscaping. The planting of exotic species or introduction of non-native fauna are impermissible. Broadcast spraying of pesticides or herbicides are impermissible except when necessary to protect the public health or safety as decreed by the appropriate public health official.

D. Public Hearings

The public hearing required by § 6 of the model ordinance may be held in Newport News, Virginia. Such hearing will not be scheduled until the Commission staff has determined that it is in receipt of a complete application.

E. Comments/Advisory Notes

1. Risks. While future events and their impacts on human activity cannot be forecast with any degree of precision, experience in other coastal areas suggest a proclivity to seek public assistance when catastrophic events occur or when services are needed beyond the ability of private resources to provide. The Commission believes that any development on barrier islands should be undertaken only with the full acceptance by the owners of the risks involved.

a. No Public Protection of Private Property. Authorization of structures should in no way serve as justification for the future expenditure of public resources to protect such structures.

b. Services. Any services which may be provided by local government to promote public health, safety and general welfare must be installed, maintained and operated in a manner consistent with the policy, standards and guidelines of both the Wetlands and Dunes Protection Acts.

c. Relocation of Structures. Once local mean high water approaches a structure to within 10 times the average recession rate, a plan for its movement/relocation must be submitted for review. No movement or relocation will be permitted without the written permission of the Commission.

2. Interference With Natural Processes. The serious sand deficiency which currently exists on Virginia's barrier islands is exacerbated by any artificial manipulation, including sand fences, which might render the supply more vulnerable to export offshore or interfere with the natural movement onshore in washover areas during storm events. Private property owners have even more at stake than the public-at-large in assuring that natural processes are not interfered with to any discernible degree.

3. Value of Dune Preservation. Special emphasis is placed on the legislative declaration of public policy that coastal primary sand dunes "in their natural state serve as protective barriers from the effects of flooding and erosion caused by coastal storms, thereby protecting life and property."

a. Accordingly, every reasonable precaution to avoid permanent alteration is expected to be exercised by all users in gaining temporary access to private property for construction or for continued access to authorized structures.

b. All construction, including septic systems, shall be set back from mean high water a distance at the site to assure reasonable survival duration. Setbacks from the dune crest were specified in Section C.1.c(4) of this policy.

4. Water Quality. While the Commission believes that properly functioning septic systems in the limited density anticipated will have no measurable effect, failing systems or greater numbers than now forecast could impact important public shellfish growing areas. Therefore, staff will request at least biannually from the State Health Department an assessment of the cumulative impact and/or catastrophic failure of septic systems they have authorized.

F. Policy with Regard to Private Restrictive Agreements

In addition to the above guidelines and advisory comments and as an additional means to reasonably "preserve and protect coastal primary sand dunes and beaches and to prevent their despoliation and destruction," and to help achieve the other purposes set forth by the General Assembly in the Coastal Primary Sand Dune Protection Act, the Commission endorses and looks favorably upon restrictive private covenants which "accommodate necessary economic development in a manner consistent with the protection of (coastal primary sand dunes)." For example, the Commission encourages restrictive private covenants which:

1. Protect the "natural habitat for coastal fauna", "wildlife habitat," and "vegetation which stabilizes (Coastal Primary Sand Dunes)."

2. Prohibit special exemptions or attempts to obtain such exemptions from the application of controlling statutes.

3. Enhance the "scenic and recreational attractiveness of Virginia's coastal area," protect the "important natural habitat for coastal fauna," and protect the "vegetation which stabilizes such features."

4. Require cooperation with the state and federal conservation agencies to protect the ecologically significant natural resources including granting permission to post critical bird nesting sites.

Section VIII

Coastal Dune Vegetation

The following dune plants commonly occupy coastal primary dunes and related habitats in Virginia and adjacent states. These plants are important to the dune environment in that they reduce the effects of the wind erosion and in some cases actually aid in dune development. They are an integral part of coastal dune habitat and play an important role in the ecological integrity of this system. Several dune species, such as American Beach Grass and Sea Oats are often planted for dune stabilization or dune creation projects. These two grasses have the capacity of not only surviving but stabilizing accreting sand. When buried by sand, these grasses produce fast growing vertical rhizomes (underground stems) that eventually produce a shock of leaves at the top of the dune. Therefore, if a sand supply is available, a dune can grow and become stabilized through the help of these grasses.

Most dune plants are necessarily very hardy. They must be able to withstand intense heat, reflected light, saltspray, nearly sterile substrate, and strong winds. Many of these species have developed specialized morphological features that have helped them adapt to these adverse conditions. Despite these outstanding features, these plants are highly susceptible to trampling, off-road vehicles and the like.

The dune plants illustrated* and described* in this section are protected by the Coastal Primary Sand Dune Protection Act, Virginia Code Chapter 2.2 of Title 62.1.

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Sea Oats

Uniola paniculata L.

This tall, stately grass is one of the most important primary dune plants on the Southeast Coast. Sea Oats ranges from Virginia to the Gulf Coast. It's robust seed head (a panicle of numerous wafer-like spikelets) is easily distinguished from Beach Grass which has a rather narrow, dense spike of flowers.

In late summer or early fall the seed head turns a bronze-yellow color whereas the spike of Beach Grass matures to a dull gray. Both grasses are highly adaptive to accreting sand, salt spray, wind and dry conditions. They are very important natural resources in a dune field and should not be disturbed.

American Beach Grass

Ammophila breviligulata Fern.

This grass is the most common plant that grows on primary dunes from New England to North Carolina. It has a very dense narrow flowering spike which distinguishes it from other dune grasses. The spike is surrounded by a dense tuft of long, narrow and pointed leaves. Beach Grass has excellent sand binding capabilities and can tolerate, and even thrives to some degree, on being buried by shifting sand. Seedlings of Beach Grass are often planted in dune restoration projects. only one other beach plant can withstand such conditions, and that is Sea Oats *Uniola paniculata* which has a more southern range.

Short Dune Grass

Running Beach Grass

Panicum ararum Ell.

The grass is often found on dunes from the New England area to the Gulf Coast. Compared to *Ammophila* and *Uniola*, the leaves of Short Dune Grass have blue green color that is quite distinguishing. The seed head is a rather sparse, narrow panicle of small ellipsoid seeds. Unlike the other two species, this grass is not as highly adapted to accretinq sand. Whereas the specialized growth system of *Ammophila* and *Uniola* can keep up with sand build up, *Panicum* will eventually become buried by large amounts of shifting sands. Where there are optimal growing conditions (reduced sand accretion and salt spray), this grass often forms relatively dense mats of vegetation originating from underground rhizomes.

Seaside Goldenrod

***Solidago sempervirens* L.**

Seaside Goldenrod is one of the most striking plants in the coastal zone during late summer or early fall. This tall, leafy perennial produces a spray of bright yellow blooms that is typical of interior goldenrods. The leaves are dark green and fleshy and are produced in profusion along the entire length of the stem which may be as much as 6 feet long. It is typically found on the more stable part of the dune, on low secondary dunes or along the edges of salt marshes.

Dusty Miller

Artemisia stelleriana Besser.

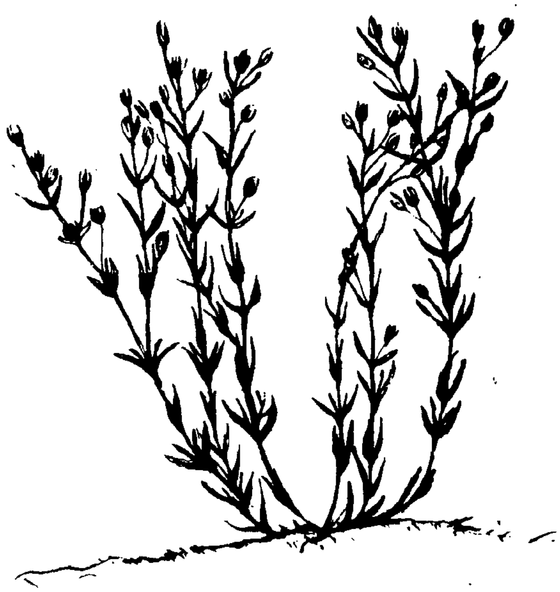
Dusty Miller is an introduced plant that over the years has invaded and adapted well to coastal dunes from Quebec to Virginia. It is commonly used as a border plant because of its unusual and attractive foliage. The lobed leaves have dense whitish hairs on both sides that gives the foliage a velvety appearance. As are many dune species, this plant is a perennial and spreads by creeping underground stems called rhizomes. Although the foliage is mostly low or creeping in posture, the plant produces a flowering stem at the peak of the growing season that may be over two feet tall. This reproductive stem may have a large number of flower heads. Each head bears many tiny, nearly inconspicuous flowers. This characteristic is typical of the composite or Aster family to which this plant belongs.

Dune Bean

Beach Bean

Strophyostyles helvola (L.) Ell.

Dune Bean is an annual, trailing and twining vine which occupies various habitats in the dune/beach system. It has a characteristic bean or legume flower which is usually rose or purplish when mature. It also produces a typical "bean pod". The leaves are divided into three separate leaflets. The combination of these three features (flower, pod and leaf) will distinguish this vine from many other plants that live in the beach/dune habitat. This plant is not strictly a dune species but can also be found in maritime forests, and other interior, open woodland habitats.



Seabeach Sandwort

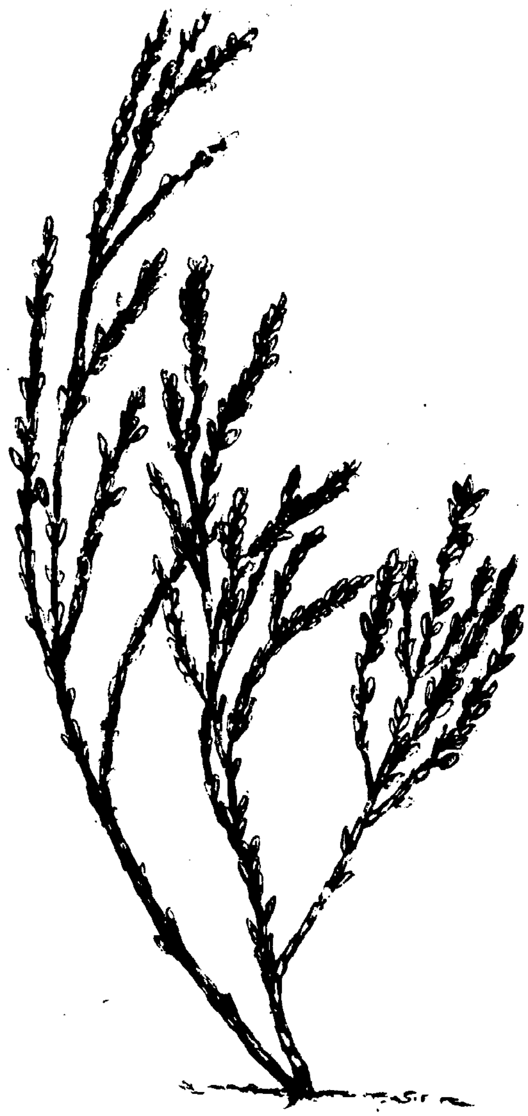
Arenaria lanuginosa (Michaux) Rohrback

This small plant is usually found on the margin of swales between or behind the primary dunes. Sandwort appears to be too delicate for the rigorous coastal environment and in fact, the plants appear to be more vigorous where they are somewhat protected from salt spray, excessive sand accretion and wind. The leaves are small and narrow and the flowers not very conspicuous. It is found only sparingly in Virginia as this area is the northern extent of its range which continues as far south as South America.

Sea Rocket

Cakile edentulata (Bigelow) Hooker

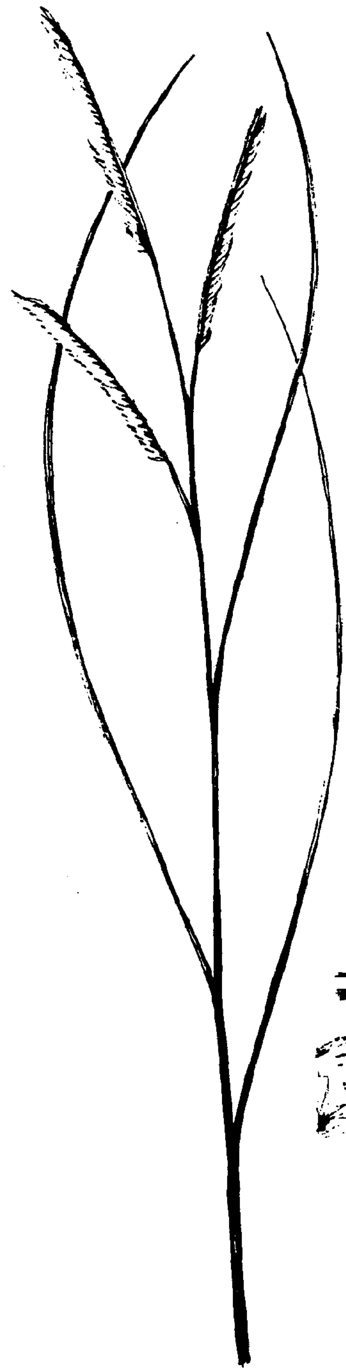
Sea Rocket usually occupies the zone between the toe of the primary dune and wrack line on the beach. *Cakile* is a succulent plant with fleshy stems and leaves. The small flowers are usually lavender or light blue or occasionally white. Thick, fleshy fruits develop late in the growing season. Although Sea Rocket does not have the sand binding qualities of the beach grasses, it is indicative of this dynamic zone between dune and mean high water.



Beach Heather

Hudsonia tometosa Nuttall

Beach Heather is a low, spreading shrubby plant that rarely grows over a foot tall. The leaves are scale-like, somewhat resembling those of a cedar tree and are covered with very short, dense hairs. The whitish hairs give these little shrubs a "mildewy" appearance. At the peak of the growing season, tiny yellow flowers are evident. Beach Heather generally grows on somewhat moist, compacted sand which is typical around the edge of swales between dunes. *Hudsonia tometosa* is more common in the New England area but ranges as far south as North Carolina where it is found infrequently.



Saltmeadow Hay

Spartina patens (Aiton) Muhl.

Saltmeadow Hay is short (seldom over knee high) wirey grass that grows in dense clumps on the backside (landward) of primary dunes. It is also found, sometimes profusely, on lower secondary dunes, swales and higher portions of a saltmarsh where it often forms dense meadows. Compared to Beach Grass and Sea Oats, it has a relatively sparse, branching seed head. Its leaves are long, very narrow and are often rolled inward (somewhat trough-like) so that they appear to be round. This mechanism helps reduce water loss (excessive transpiration) in the plant. Most dune plants have adaptive characteristics that help them withstand the rigorous environment of the coastal ecosystem.

Glossary

ACCRETION - growth by accumulation of new material.

BARRIER ISLAND - a low island which, usually in conjunction with other islands, shelters an open area of water or marsh between itself and the mainland.

BACKSHORE - an area in the beach zone between mean high water and the toe of the dune system.

BERM - that part of the beach at the upper limit of the wave wash formed by the deposit of material by wave action.

COASTAL PRIMARY SAND DUNE - mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten per centum or greater to less than ten per centum, and upon any part of which is growing as of July one, nineteen hundred eighty, or grows thereon subsequent thereto, any one or more of the following: American beach grass (*Ammophilla breviligulata*); beach heather (*Hudsonia tometosa*); dune bean (*Strophostylis umbellata* var, *paludigena*); dusty miller (*Artemisia stelleriana*); saltmeadow hay (*Spartina patens*); seabeach sandwort (*Arenaria peploides*); sea oats (*Uniola paniculata*); sea rocket (*Cakile edentula*); seaside goldenrod (*Solidago sempervirens*); and short dune grass (*Panicum ararum*). For purposes of this chapter, "Coastal Primary Sand Dune" shall not include any mound of sand, sandy soil or dredge spoil which has been deposited by man for the purpose of the temporary storage of such material for later use.

CONTIGUOUS - bordering or adjoining, next to.

DEFLATION - the removal of loose material from a beach or dune by wind action.

DUNE BACKFACE - the zone from the crest of the dune to the point at which the dune grade drops below ten percent.

DUNE CREST - a line connecting the highest points of a dune along its long axis.

DUNE LINE - the line established by several dunes positioned next to one another.

DUNE TOE - a zone on the seaward face of the dune marked by a significant change in grade.

FASTLAND - the comparatively stable upland area adjacent to the shoreline.

FORESHORE - that part of the shore lying between the upper limit of wave wash at high tide and the ordinary low water mark.

GRADE - as used in the Sand Dune Act, the term refers to the rate of change in elevation progressing across a dune; grade is determined by dividing the absolute increase or decrease in the vertical distance occurring over any measured horizontal distance as long as both measures are in the same units.

LANDWARD LIMIT - in the Act, the onshore boundary of the dune.

LATERAL LIMIT - in the Act, the ends of the dune usually found lying perpendicular to the shoreline or the dune boundaries normal to the long axis of the dune.

MEAN HIGH WATER - the average height of high waters over the previous nineteen year period.

MORPHOLOGY - the form and structure of a dune or dune vegetation.

OFFSHORE BAR - one (or more) sand bar(s) running roughly parallel to the shoreline.

ONE HUNDRED YEAR STORM - that storm event which, on the average, may be expected to occur once in one hundred years.

OPEN PILE FOUNDATION - a foundation composed entirely of large poles driven into the ground which support a structure above ground level.

STORM SURGE - the additional depth of water above mean high water which accompanies coastal storms.

TRANSITION ZONE - that area in which physical and/or biological features characteristic of two adjacent areas (e.g., beach and uplands) can both be found.

UNCONSOLIDATED - in the Sand Dune Act, sediments which do not bind together.

WASHOVER DEPOSIT - the material deposited by the passing of water over the beach onto the fastland.

Wetlands
Mitigation-Compensation
Policy

Virginia Marine Resources Commission

VR 450-01-0051

Section 1. Definitions

The following words, when used in these guidelines, shall have the following meaning unless the context clearly indicates otherwise:

"Compensation" means actions taken which have the effect of substituting some form of wetland resource for those lost or significantly disturbed due to a permitted development activity; generally habitat creation or restoration. Compensation is a form of mitigation.

"Mitigation" means all actions, both taken and not taken, which eliminate or materially reduce the adverse effects of a proposed activity on the living and nonliving components of a wetland system or their ability to interact.

Section 2. Policy

In spite of the passage of the Virginia Wetlands Act and the Federal Water Pollution Control Act in 1972, the pressures to develop lands, including wetlands along Virginia's shoreline, have continued to accelerate as evidenced by the increasing number of permit applications being submitted. At the same time scientific research has demonstrated that certain wetlands can be established or reestablished in areas where wetlands are not found at present. This has led to an increasing number of proposals calling for the destruction of wetlands in one area in order to accommodate development, and the creation of wetlands in another area in order to offset the loss of the natural wetland resource.

Although compensating for the loss of a wetland by establishing another of equal or greater area sounds very attractive in theory and has been regarded as successful in a few specific cases, in general, this form of mitigation has proven difficult to successfully implement. Many questions regarding the ecological soundness and feasibility of substituting one habitat for another remain to be answered. In addition, a number of studies have demonstrated that for various reasons the created habitats either never attain the level of productivity or diversity of the natural systems they replace or simply are not capable of performing the ecological functions of the undisturbed habitat.

Although California and Oregon now require compensation for lost wetlands on all projects, states such as North Carolina and New Jersey have taken a much more limited approach to the mitigation-compensation question. In general, these latter two states rely on wetland compensation only as a last resort to replace wetlands whose loss is highly justified and unavoidable. Virginia to this point has also taken a very conservative tack with regard to the use of wetland compensation as a management tool.

The Commission, and these guidelines, do not require that all wetlands losses be compensated. They do recommend, however, that compensation be required on a limited basis to replace unavoidable wetlands losses. There are three main reasons for this recommendation.

First, a literature survey and experience with implementing compensation on a day-to-day basis reveal a number of significant problems with the concept itself that remain to be resolved.

Second, there are general philosophical and technical questions regarding compensation which have not been answered by the scientific community to this point in time.

Third, and most important, a reading of the Wetlands Act clearly indicates that the General Assembly intended for the Commonwealth's wetland resources to be preserved in their "natural state," and emphasized through its declaration of policy, the importance of an overall ecological approach to wetlands management.

> "The Commonwealth of Virginia hereby recognizes the unique character of the wetlands, an irreplaceable natural resource which, in its *natural state,* is essential to the ecological systems of the tidal rivers, bays and estuaries of the Commonwealth." (Emphasis added)

The General Assembly also stated that where economic development in the wetlands is clearly necessary and justified it will be accommodated while preserving the wetlands resource.

> ".... it is declared to be the public policy of this Commonwealth to preserve the wetlands and to prevent their despoliation and destruction and to accommodate *necessary* economic development in a manner consistent with *wetlands preservation.*" (Emphasis added)

In Section 62.1-13.3 of the Code of Virginia the General Assembly mandated the preservation of the ecological systems within wetlands of primary ecological significance and then stated:

> "Development in Tidewater, Virginia, to the maximum extent possible, shall be concentrated in wetlands of lesser ecological significance, in wetlands which have been irreversibly disturbed before July one, nineteen hundred seventy-two, and in areas of Tidewater, Virginia, apart from the wetlands."

The General Assembly has spelled out clearly that "necessary economic development" is to be accommodated in Tidewater, Virginia, but that the emphasis is on wetlands preservation in their natural state.

Section 3. General Criteria

It shall remain the policy of the Commonwealth to mitigate or minimize the loss of wetlands and the adverse ecological effects of all permitted activities through the implementation of the principles set forth in these Wetlands Guidelines which were promulgated in 1974 and revised in 1982. To determine whether compensation is warranted and permissible on a case-by-case basis, however, a two-tiered mechanism will be implemented. This dual approach will consist first of an evaluation of necessity for the proposed wetlands loss (See Section 4). If the proposal passes this evaluation, compensation will be required and implemented as set forth in the second phase, the Supplemental Guidelines.

The primary thrust of combining the existing Wetlands Guidelines with the two-tiered compensation guidelines is to preserve the wetlands as much as possible in their natural state and to consider appropriate requirements for compensation only after it has been proven that the loss of the natural resource is unavoidable and that the project will have the highest public and private benefit. Commitments to preserve other existing wetlands shall not ordinarily be an acceptable form of compensation.

Section 4. Specific Criteria

In order for a proposal to be authorized to destroy wetlands and compensate for same in some prescribed manner, the three criteria listed below must be met. If the proposal cannot meet one or more of these criteria, the activity shall be denied, or must occur in areas apart from the wetlands. Should it satisfy all three criteria, however, compensation for the wetlands lost is required.

1. All reasonable mitigative actions, including alternate siting, which would eliminate or minimize wetlands loss or disturbance must be incorporated in the proposal.

2. The proposal must clearly be water-dependent in nature.

3. The proposal must demonstrate clearly its need to be in the wetlands and its overwhelming public and private benefits.

Section 5. Supplemental Guidelines

If compensation is required, then the following guidelines should be given due consideration and, if appropriate, may be included as conditions of the permit:

1. A detailed plan, including a scaled plan view drawing, shall be submitted describing the objectives of the wetland compensation, the type of wetland to be created, the mean tide range at the site, the proposed elevations relative to a tidal datum, the exact location, the areal extent, the method of marsh establishment and the exact time frame from initial work to completion.

2. Once the grading is completed at the planting site, it should be inspected by a competent authority to insure that the elevations are appropriate for the vegetation to be planted and that the surface drainage is effective.

3. The compensation plan and its implementation must be accomplished by experienced professionals knowledgeable of the general and site-specific requirements for wetland establishment and long-term survival.

4. A performance bond or letter of credit is required and shall remain in force until the new wetland is successfully established; a minimum of two growing seasons.

5. The compensation marsh should be designed to replace as nearly as possible, the functional values of the lost resource on an equal or greater basis. In general this means creating a marsh of similar plant structure to that being lost. This may not be the case where a lesser value marsh is involved (i.e. Group 4 or 5 wetlands). A minimum 1:1 areal exchange is required in any case.

6. The compensation should be accomplished prior to, or concurrently with, the construction of the proposed project. Before any activity under the permit may begin, the permittee must own all interests in the mitigation site which are needed to carry out the mitigation.

7. All reasonable steps must be taken to avoid or minimize any adverse environmental effects associated with the compensation activities themselves.

8. On-site compensation is the preferred location alternative with off-site in the same watershed as a consideration when on-site is not possible. Locating a compensation site outside the river basin of the project is not acceptable unless it is done as part of a state-coordinated program of ecological enhancement.

9. In selecting a compensation site, one aquatic community should not be sacrificed to "create" another. In cases where dredged material must be placed overboard, the area may be used to create marsh, oyster rock or improve the resource value of the bottom.

10. The type of plant community proposed as compensation must have a demonstrated history of successful establishment in order to be acceptable.

11. The proposed activity should stand on its own merits in the permit review. Compensation should not be used to justify permit issuance.

12. Manipulating the plant species composition of an existing marsh community, as a form of compensation, is unacceptable.

13. Nonvegetated wetlands should be treated on an equal basis with vegetated wetlands with regard to compensation and mitigation, unless site-specific information indicates one is more valuable than the other.

14. Both short- and long-term monitoring of compensation sites should be considered on a case-by-case basis. For unproven types of compensation the applicant will be responsible for funding such monitoring as is deemed necessary.

15. Where on-site replacement for noncommercial projects is not feasible, compensation for small wetland losses (less than 1,000 sq. ft.) should be avoided in favor of eliminating loss of the natural marsh to the maximum extent possible.

16. Conservation or other easements to be held in perpetuity should be required for the compensation marsh. Easements accepted by the Commission will be processed in accordance with the provisions of Section 62.1-13.17 of the Code of Virginia.

17. All commercial projects which involve unavoidable wetland losses should be compensated. ◆

Criteria for the Siting of Marinas or Community Facilities for Boat Mooring

Virginia Marine Resources Commission

VR 450-01-0047

Section I

Objective

As a result of increasingly intensive development through the subdivision of lands adjacent to waters of the Commonwealth, the Commission finds it necessary to develop more detailed criteria for the siting of facilities to serve the needs of boaters in order to protect, conserve and manage properly the natural resources of the Commonwealth for the reasonable and beneficial use of all its citizens.

Section II

Goals

The goals of the Commission are to:

1. Insure that its decisions concerning use of the Commonwealth's natural resources are consistent with the Constitution and laws of Virginia.

2. Develop and administer siting criteria consistent vith the Chesapeake Bay Initiatives and the Governor's Commitments contained in the 1987 Chesapeake Bay Agreement.

3. Maintain all fisheries resources, and where possible, enhance production on both public and private currently productive or potentially productive shellfish grounds.

4. Discourage the acquisition of private shellfish leases for any purpose other than the propagation of shellfish.

5. Accommodate, wherever possible, all reasonable and permissible uses of State waters and State-owned bottomlands.

6. Promote navigational safety.

7. Protect private riparian rights while facilitating public access to, and use of State waters to the maximum practicable extent.

8. Promote best management practices which protect and, where possible, enhance water quality.

Section III

Background

The pressures to develop shoreline property and State-owned subaqueous lands are increasing at an unprecedented rate. Boat mooring facilities have become an attractive and effective mechanism to enhance the marketing of subdivided lots in proximity to State waters.

In the process of providing mooring facilities to serve such developments, private benefits are realized but public detriments are often increased. Automatic shellfish closure may result; water quality can deteriorate; habitat values can be irrevocably affected and the character of the water body can be permanently changed.

The Commonwealth is historically a key shellfish producing state. Unfortunately, current shellfish leasing practices encourage the acquisition of shellfish leases by developers in order to eliminate or reduce opposition to seasonal shellfish closures which may result from the siting of mooring facilities.

In order to protect public health, the Bureau of Shellfish Sanitation of the State Health Department has established a policy which requires the establishment of buffer zones around boat mooring facilities within which shellfish cannot be harvested for direct marketing during the months of April through October. These buffer zones are as follows:

0-50 slips - 1/8 mile in all directions

51-100 slips - 1/4 mile in all directions

over 100 slips - 1/2 mile in all directions

As a result of this policy, the State Water Control Board, also as a matter of policy, considers it a violation of water quality standards if a proposed facility will result in a seasonal shellfish closure. The Commission is required by law to give due consideration to water quality standards established by the Water Control Board and to enforce the shellfish closures established by the Health Department.

Section IV

Policy

A comprehensive siting review process for boat mooring facilities requiring permits from the Commission is necessary to insure that permit decisions comply with statutory requirements and the legislative mandate that our natural resources be maintained and conserved for present and future generations. All public and private interests will be carefully considered in this review. As the size, density, complexity and range of services offered by a proposed facility increase, so must the detail in design and implementation of best management practices in its siting, construction and operation. Minimizing adverse environmental impacts must be the ultimate goal in all phases of planning, siting construction and operation. Furthermore, the acquisition of shellfish leases which may be affected by a seasonal shellfish closure around a proposed facility will be given no weight and absent mitigating circumstances will be viewed as a negative factor by the Commission in its evaluation of the facility.

Section V

Definitions

For the purposes of standardization, the definitions contained in Article 1 of Part 1 of the Department of Health Regulation, VR 355-17-01; Sanitary Regulations for Marinas and Boat Moorings; will pertain. For reference purposes, the following two definitions are reproduced herein:

> "Marina means any installation operating under public or private ownership, which provides dockage or moorage for boats (exclusive of paddle or row boats) and provides, through sale, rental or fee basis, any equipment, supply or service (fuel, electricity or water) for the convenience of the public or its lessee, renters or users of its facilities."

> "Other places where boats are moored means any installation operating under public or private ownership which provides dockage, moorage or mooring for boats (exclusive of paddle or row boats) either on a free rental or fee basis or for the convenience of the public."

For purposes of this document, "other place where boats are moored" and "community facility for boat mooring" are interchangeable.

Additionally, since community facilities increase significantly the value of the upland property they are intended to serve, the Commission has a long standing policy that such facilities are classified as commercial in nature. Accordingly, only non-commercial, private piers placed by individual owners of riparian lands in the waters opposite such riparian lands are considered statutorily exempt from public interest review.

Section VI

General Siting Criteria

In addition to the criteria contained on Pages 8 and 9 of the current *Subaqueous Guidelines* promulgated by the Commission in 1979 and revised in 1986, the following should be considered by the applicant in planning and will be considered by the Commission during the public interest review of each application for recreational boat mooring facilities.

1. The physical dimensions and characteristics of the water body should be compatible with the size of the marina and the type of vessels it will house. For example, a shallow cove or basin is not an appropriate site for a deep draft sailboat marina.

2. Marinas must have sufficient upland area to provide all necessary parking, stormwater management BMP's, fuel, and sanitary facilities without filling wetlands or subaqueous bottom.

3. All marinas should be located in areas with good natural flushing to minimize the build-up of organic material and other pollutants on the bottom.

4. Marinas should not be sited close to areas of very high natural resource value such as shellfish beds, seagrass communities and areas frequented by endangered species.

5. The transfer of control of shellfish leases in order to accommodate marina development is generally unacceptable.

6. Projects that by their cumulative impact will result in dense concentrations of boats in one area will be critically evaluated as to their impacts on natural resources; however, in densely populated areas, concentration of slips in a single facility may be justified to prevent disturbance at undeveloped shorelines.

Specific Siting Guidelines

1. For community piers and marina facilities which are appurtenances to residential developments, the number of slips will not necessarily be predicated by the number of units on the property.

2. The dredging of access channels should be limited to the minimum dimensions necessary for navigation and should avoid sensitive areas such as wetlands, shellfish grounds and seagrass beds.

3. Dredged material disposal areas for initial as well as future disposal needs should be clearly defined and designated.

4. Dredged areas should be no more than one foot deeper than controlling depths in the waterway and should be connected to natural channels of similar depth.

5. Piers and wharves crossing vegetated wetland and seagrass areas should be limited to the minimum necessary for water access.

6. Where vegetated areas are crossed, the height of the pier above the substrate should be equal to one foot less than its width with a three foot minimum required.

7. Site specific stormwater management BMP's are required (such as buffer strips, grassed swales, wet detention ponds and permeable parking surfaces.)

8. A solid waste disposal and recovery plan with facilitated marina user access must accompany marina development plans.

9. Sanitary facilities and pumpout facilities convenient to marina users should accompany development plans.

10. All fuel facilities must incorporate automatic shutoff valves and must have spill contingency plans.

11. Methods of insuring against the discharge of wastes, gray water, fuels, bilge wastes and the use of TBT paints shall be provided.

12. Facilities incorporating boat maintenance operations shall include plans for the efficient collection and removal of sand blasting material, paint chips and other by-products of maintenance operations.

Section VII

Best Management Practices (BMP's)

In order to reduce discharge of non-point source pollutants into State waters, the Commission will require the applicant to demonstrate how appropriate BMP's will be incorporated into both the upland development plan associated with the facility as well as the Erosion and Sediment (E&S) Control Plan required by local government.

The Commission may require, as a condition of any permit issued, that BMP structures be completed before any slips can be occupied and that the permittee cooperate fully with local governmental agencies in complying with the E&S Plan, including maintenance of any required BMP structures. An appropriate surety bond or letter of credit may be required to ensure proper installation, stabilization and maintenance of any vegetative or structural measures.

Section VIII

Siting Criteria Check List

The following criteria will be considered by the Commission in determining whether, and upon what condition to issue any permit for a boat mooring facility. In addition, the Commission may consider other factors relevant to a specific project or application.

Criteria	Undesirable	Desirable
Water depth	Less than 3 ft. mlw.	Greater than 3 ft. mlw
Salinity	Suitable for shellfish growth	Unsuitable for shellfish growth
Water Quality	Approved, conditionally approved or seasonally approved for shellfish harvesting	Closed for direct marketing of shellfish. Little or no potential for future productivity.
Designated Shellfish Grounds	Private leases or public oyster ground in proximity	No private leases or public ground within affected area. No potential for future productivity
Maximum Wave Height	Greater than 1 ft.	Less than 1 ft.

Criteria	Undesirable	Desirable
Current	Greater than 1 knot	Less than 1 knot
Dredging	Requires frequent dredging	Does not require frequent maintenance
	No suitable site for dredged material	Suitable site for all dredged material
Flushing Rate (Tidal Exchange)	Inadequate to maintain water quality	Adequate to maintain water quality
Proximity to Natural or Improved Channel	Greater than 50 ft. to navigable water depths	Less than 50 ft. to navigable channel
Threatened or Endangered Species	Present as defined in existing regulations, or project has potential to affect habitat	Absent; project will not affect
Adjacent Wetlands	Cannot maintain suitable buffer	Suitable buffer to be maintained
Navigation and Safety	Water body difficult to navigate or presently overcrowded conditions exist	Navigation not impeded
Existing Use of Site	Presently used for skiing, crabbing, fishing, swimming or other potentially conflicting uses	Not presently used for skiing, fishing, swimming or other recreational use
Submerged Aquatic Vegetation	Present	Absent
Shoreline Stabilization	Bulkheading required	Shoreline protected by natural or planted vegetation or riprap
Erosion Control Structures	Groins and/or jetties necessary	No artificial structures needed
Finfish Habitat Usage	Important spawning and nursery area	Unimportant area for spawning or nursery for any commercially or recreationally valuable species

VIMS WETLANDS PROGRAM
TECHNICAL REPORTS

Contents

Wetlands Program

June 1990 No. 90-1

Technical Report

College of William and Mary
Virginia Institute of Marine Science
School of Marine Science
Wetlands Program
Gloucester Point, Virginia 23062

Dr. Carl Hershner, Program Director

Commonwealth's Declared Policy:

"to preserve the wetlands and to prevent their despoliation and destruction. . ."

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

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Animals of the Intertidal Sand and Mud Flats

(a glance)

Kirk J. Havens

In 1982, recognizing the value of intertidal sand and mud flats, the Virginia General Assembly amended the Wetlands Act of 1972 to include these nonvegetated wetlands and incorporated them into the Commonwealth's Declared Policy "to preserve the wetlands and to prevent their despoliation and destruction and to accommodate necessary economic development in a manner consistent with wetlands preservation." The Commonwealth's Wetlands Guidelines classify intertidal sand and mud flats as Group Two wetlands types that warrant a high order of protection.

While a casual observer might dismiss intertidal sand and mud flat areas as unimportant and lifeless, a close examination will reveal a myriad of creatures and activities on and just below the sediment surface. As many as 300 different species of invertebrates can be found burrowing or scurrying about the mud and sand grains.

In an area roughly the size of an average desk top, there can be as many as 8,300 animals.

These animals range from microscopic organisms to worms almost four feet long. Some tunnel through the sediments ingesting mud and stripping the grains of attached organic matter, while others build burrows from which they venture to capture prey or filter out microscopic plants called plankton. Still others wander over the surface feeding on algae or burrow deep within the substrate searching for prey.

As they retreat into their burrows, the animals themselves may remain hidden, however signs of their presence are evident everywhere to one who knows what to look for. Burrow holes and mounds of fecal pellets are easily observed as the tide recedes and faint tracks across the surface can be seen by those unafraid to get their hands and knees muddy.

The Lugworm, *Arenicola cristata*, lives deep below the surface and feeds by ingesting muds and digesting any organic matter found among the grains. The lugworm tills marine soils much like an earthworm tills garden soils. A telltale sign of the lugworm is a hole surrounded by a soft coil of sand and, a short distance off, a funnel-shaped depression.

(continued)

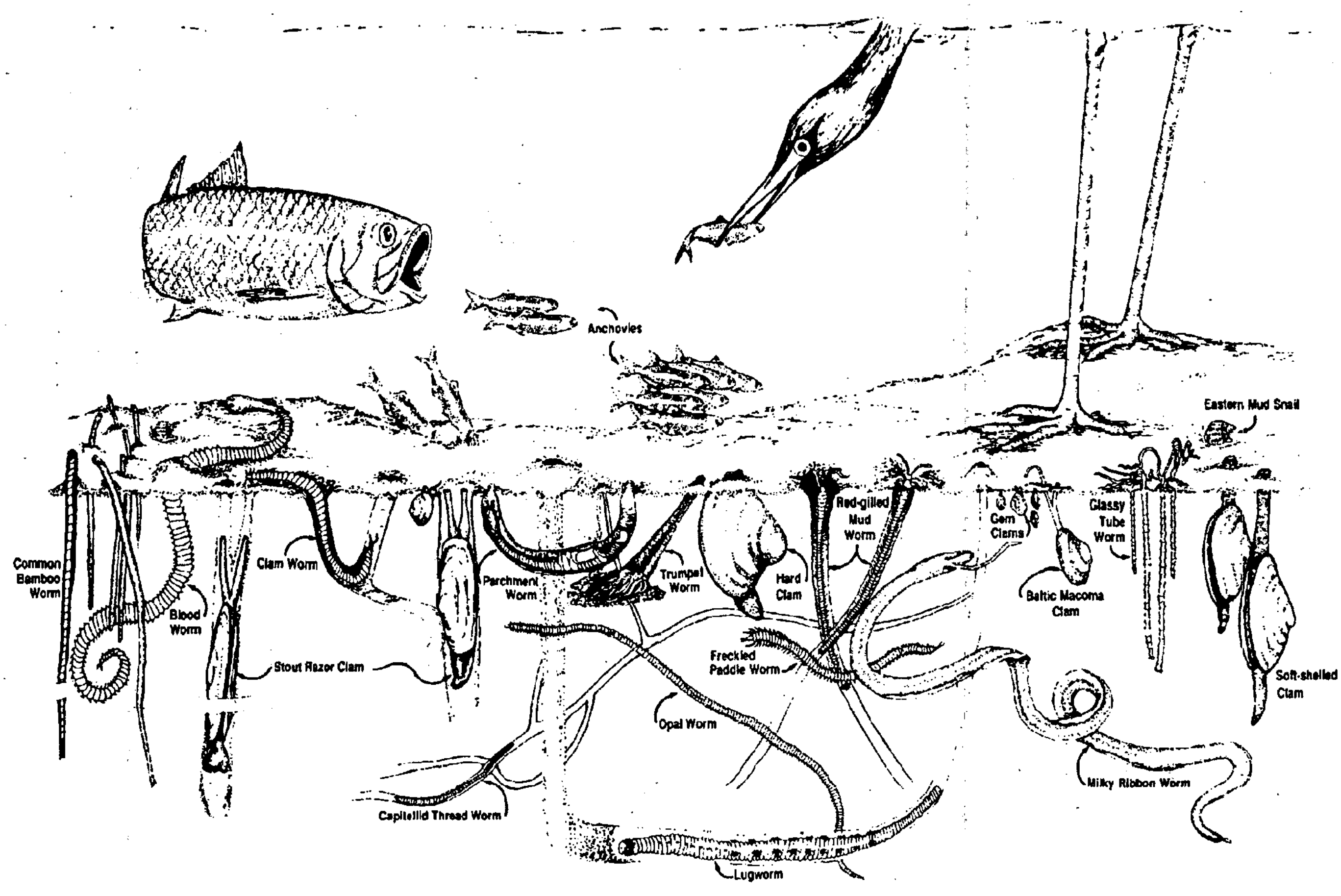
The Parchment Worm, *Chaetopterus variopedatus*, grows to about 10 inches and lives in a U-shaped tube, usually with a couple of small crabs as permanent tube guests. The parchment worm feeds by pumping water through it's tube and trapping plankton and other suspended organic matter on a net of mucus. It is strangely bioluminescent which is somewhat surprising for an animal that is blind and lives buried in the bottom. Yet, when the tube opening is disturbed, a blue luminous cloud of mucus is released and the worm retreats to the opposite end of its tube. This is possibly a mechanism to avoid being eaten by startling a potential predator.

The Milky Ribbon Worm, *Cerebratulus lacteus*, is a white to yellow-pink worm that reaches lengths of about three to four feet, though some specimens have been reported to reach 20 feet. The milky ribbon worm roams the flats in search of prey, generally clams and polychaetes. Upon locating a clam, the ribbon worm will attack the clam's foot to prevent the bivalve from retreating into it's burrow. It burrows by generating waves along its body and swims by flattening its body and writhing like an eel. During the spring and summer breeding season, the milky ribbon worm turns a dark-reddish color.

The Clamworm, *Nereis succinea*, is one of the most abundant worms in the Chesapeake Bay. It grows to about six inches, but is generally much smaller. The anterior of the clamworm is brown and a slightly different shape from the reddish posterior. There is also a blood streak down the middle of the back. The clamworm is an aggressive predator that will also feed on dead fish and algae.

These are just a sample of some of the worms found in the sand and mud flats. There are many, many more with diverse feeding behaviors such as the Common Bamboo Worm, Trumpet Worm, Freckled Paddle Worm, Barred-gilled Mud Worm, Red-gilled Mud Worm, Opal Worm, Bloodworm, Capitellid Thread Worm, Fringed-gilled Mud Worm, Glassy Tube Worm, Red-lined Worm, Chevron Worm, Plumed Worm, Ornate Worm and all are an important source of food for other marine organisms, especially bottom feeding fishes.

The Eastern Mud Snail, *Ilyanassa obsoleta*, is a common forager over mud flats and can sometimes be found in aggregations of



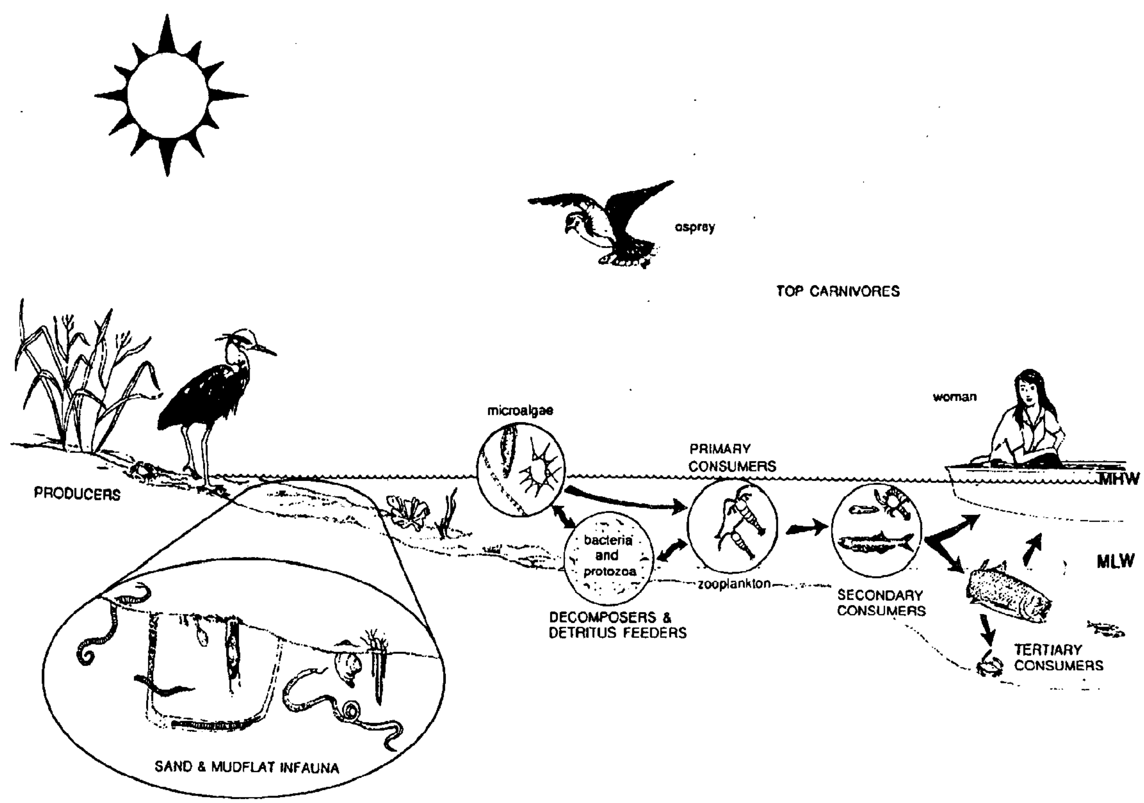
thousands of individuals. These snails feed primarily on algae on the sediment surface but will also feed on dead crabs, clams, or fish. As the snail travels across the mud surface, it leaves a mucus trail that other mud snails recognize and follow. However, if an individual is injured, a substance is released that causes other snails to quickly (for a snail) evacuate the area. An interesting aside is that the Eastern Mud Snail is the intermediate host of the parasite *Austrobilharzia variglandis* which, in the adult stage, is a blood fluke of shorebirds. The parasite's larvae are released into the water from the snails where they penetrate the skin of birds, enter the blood, and mature. The larvae will also penetrate the skin of swimming humans but, since they cannot enter the blood, will remain only briefly in the skin and result in an irritation we know fondly as "swimmers itch".

A number of clams inhabit the flats, from the tiny 1/8 inch Gem Clam, *Gemma gemma*, to the 10 inch Common Jackknife Clam, *Ensis directus*. These bivalves can be found literally packed side by side under the sediment surface. They feed by extending a pair of siphons above the bottom surface muds. One siphon draws in water from which plankton and detrital food is obtained along with dissolved oxygen. The other siphon expels waste. These bivalves serve to filter the water as they constantly pump water in and out. It has been estimated that prior to the 1870's there were so many bivalves in the bay that the entire water volume of the Chesapeake Bay was filtered through them every three to six days. Today, due to the significant reduction in bivalve populations (especially oysters), the water volume turnover estimate is every three hundred and twenty five days.

Amphipods are very small (5-8 mm) shrimplike crustaceans found throughout the bay. There are as many as 5,500 species of amphipods, however the two most common in the Chesapeake Bay's intertidal sand and mud flats are the Saltmarsh Flea, *Orchestia grillus*, and the Spine-backed Scud, *Gammarus mucronatus*. Amphipods graze algae from the bottom sediments and are a favorite food of many fish.

The Fiddler Crab, *Uca* sp., is easily recognized by the one large claw of the male. Fiddlers dig burrows along the upper reaches of the intertidal flats and emerge at low tide to feed on detritus and microalgae. As the tide rises, the fiddler retreats to its burrow and plugs it, sealing itself inside. Interestly, while the fiddler emerges from its burrow at low tide, it is not the absence of water that triggers its emergence from the burrow. Researchers have shown that the fiddler's biorhythm is tied to the lunar cycle and not the presence or absence of water over its burrow. If fiddlers are taken inland far from water, they still become active when low tide normally would have occurred.

The Blue Crab, *Callinectes sapidus*, is a frequent visitor to the intertidal flats. As the tide



rises, the blue crab will venture into the shallows to scavenge for food. Juvenile blue crabs will move into the shallow water of the sand and mud flats to escape predation. Blue crabs, as with all crustaceans, must shed their shell in order to grow. Immediately after shedding and before the blue crab's new shell has hardened, the animal is very vulnerable to predation. One avenue of protection that the blue crab utilizes is to move into shallow water to shed in an attempt to escape large predatory fish. What looks like numerous small dead blue crabs littering the waters edge, are actually the discarded exoskeletons of crabs that have recently shed their shells.

Some of the fish that forage in the intertidal area when the tide is high are juvenile Striped Bass, *Morone saxatilis*, juvenile Spot, *Leiostomus xanthurus*, juvenile White Perch, *Morone americana*, juvenile Menhaden, *Brevoortia tyrannus*, Anchovies, *Anchoa mitchilli*, Silversides, *Menidia* sp., Killifishes, *Fundulus* sp., American Eel, *Anguilla rostrata*, and many others. These fish forage in the shallows feeding on worms, amphipods, clams, and snails.

While fish are moving in from the water to forage in the intertidal flats, birds are scouting them from the air. The Great Blue Heron, *Ardea herodias*, can be seen standing in the shallows patiently waiting to capture a meal. The great blue heron will feed on just about anything it can swallow including fish, insects, frogs, crabs, snakes, turtles, mice and rats. The Northern Shoveler, *Anas clypeata*, uses its spoon-like bill to sift through the mud for worms and other small aquatic animals. The Oyster Catcher, *Hoematopus palliatus palliatus*, pries open oyster shells with its beak but will also eat shrimp, mussels, crabs and barnacles. The Clapper Rail, *Rallus longirostris*, moves in and out of the marsh vegetation to snatch fiddler crabs from the intertidal flats and will also feed on insects, small fish, and clamworms.

Upon close examination of the sand and mud surface another forager of the intertidal flats can be recognized. The Raccoon, *Procyon lotor*, is a frequent visitor who leaves distinctive footprints. The raccoon generally forages at night in search of anything it can find that is even slightly edible. In its evening raids to the flats, the raccoon may come across another predator cruising the shallows for fish, the Northern Water Snake, *Nerodia sipedon*.

All the animals in the intertidal flats form important strands in the food web. The smaller invertebrates feed on the primary producers, detritus, bacteria and microalgae, and in turn are fed upon by the larger animals. In this way the energy produced by the primary producers is transported out of the sand and mud flats to the upland via mammals, birds, snakes, etc., or out to the deeper waters via crustaceans and fish.

It is well worth the effort to scoop up and sift through a handful of mud or sand. The numerous different types of animals that inhabit this seemingly lifeless, constantly wet, land is overwhelming. The adventurous person who straps on a knapsack, grabs a field guide, struggles into hip boots and boldly strides forth into the mud flat will be amply rewarded with new and interesting discoveries (one of which is to have a friend along to give you a hand out of the mud.)

Suggested Reading

Lippson, Robert. 1984. *Life in the Chesapeake Bay*. The John Hopkins University Press, Baltimore and London.

Niering, William A. 1988. *The Audubon Society Nature Guide - Wetlands*. Alfred A. Knopf, Inc., New York, New York.

Teal, John and Mildred. 1969. *Life and Death of the Salt Marsh*. Ballantine Books, Inc., New York, New York.

Wetlands Program **Technical Report**

College of William and Mary
Virginia Institute of Marine Science
School of Marine Science
Gloucester Point, Virginia 23062

Wetlands Program

August 1990 No. 90-3

Technical Report

College of William and Mary
Virginia Institute of Marine Science
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Dr. Carl Hershner, Program Director

Commonwealth's Declared Policy:

"to preserve the wetlands and to prevent their despoliation and destruction. . ."

This report was funded, in part, by the Virginia Council on the Environment's Coastal Resources Management Program through grant # NA89AA-D-CZ134 of the National Oceanic and Atmospheric Administration under the Coastal Zone Management Act of 1972 as amended.

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CUMULATIVE IMPACTS OF SHORELINE CONSTRUCTION ACTIVITY ON TIDAL WETLANDS IN VIRGINIA

by

Walter I. Priest, III, Kirk J. Havens, Thomas A. Barnard, Jr., Julie G. Bradshaw and Maryann Wohlgemuth

Wetlands have been protected in Virginia since the passage of the Wetlands Act in 1972 which requires a permit for the use or development of tidal wetlands. These were defined as that land contiguous to mean low water extending up to an elevation of one and one-half times the local mean tide range and upon which is growing any of a number of wetland plant species listed in the Act. The Wetlands Act was amended in 1982 to include all non-vegetated areas between mean low water and mean high water.

This legislation applies to approximately 5,242 miles of shoreline in Tidewater Virginia and approximately 213,686 acres of vegetated tidal wetlands.

Management of these wetland resources has always been hampered by the lack of knowledge regarding the rates of wetlands loss from permitted activities. These statistics have usually been the most intractable data to acquire because of the numerous agencies involved in the permitting process, the frequent modifications of permit applications and the difficulties involved with ensuring the inclusion of all projects proposed. The development of a database documenting the permitted wetland resource losses in Virginia will provide a number of new perspectives on the management process. First, it can help determine the effectiveness of management efforts by documenting the permitted losses of wetlands. Secondly, it will allow an assessment of the cumulative impact of incremental wetland losses on the resource as a whole. Thirdly, the data are a critical baseline element necessary to assess the Commonwealth's relationship to the goal of "no net loss" of wetlands, a current management priority. Lastly, interpretation of these data may illuminate trends in construction activity or impacts requiring special management attention.

This report summarizes a pilot program utilizing information from the database on the type and extent of shoreline modifications authorized by 1988 wetland permit actions. It was undertaken to test the effectiveness and further develop the permit database developed by the Wetlands Advisory Program at the Virginia Institute of Marine Science (VIMS). The software program, "Info Text", was selected and modified by VIMS Computer Center personnel to provide an integrated database which could accommodate the different aspects of the tidal wetlands management program in Virginia.

A record is created for each permit application reviewed. This record contains a number of data fields which can be divided into four major groups:

- Applicant - name, application number, agent, purpose and cost
- Location - locality (county, city or town), waterway and watershed
- Project description - dimensions of bulkhead, riprap, fill, etc.
- Impacts - type and extent of wetlands and subtidal bottom impacted.

The database is designed to be able to sort the data according to almost any combination of these fields. They are also organized according to a standard set of watersheds to simplify geographical interpretation (Figure 1.).

The impacts reported for the 1988 data include both habitat lost to filling and habitat impacted but not lost to the system, such as the conversion of intertidal mudflat to subtidal bottom by dredging or conversion of a sand beach to intertidal riprap. Impacts to vegetated wetlands usually result in the loss of the vegetation. The impacts estimated in the database are based on those activities actually permitted by the local wetlands boards and the Virginia Marine Resources Commission.

The database has several limitations which should be taken into account when analyzing or interpreting the data. These permitted losses must be viewed in the context of natural changes from erosion and accretion as well as unpermitted activities which could involve larger or smaller areas than the losses reported here but are currently unquantified. In most instances, permitted projects are eventually constructed, however there may be occasions where the projects are never constructed and the impacts never accrue to the environment.

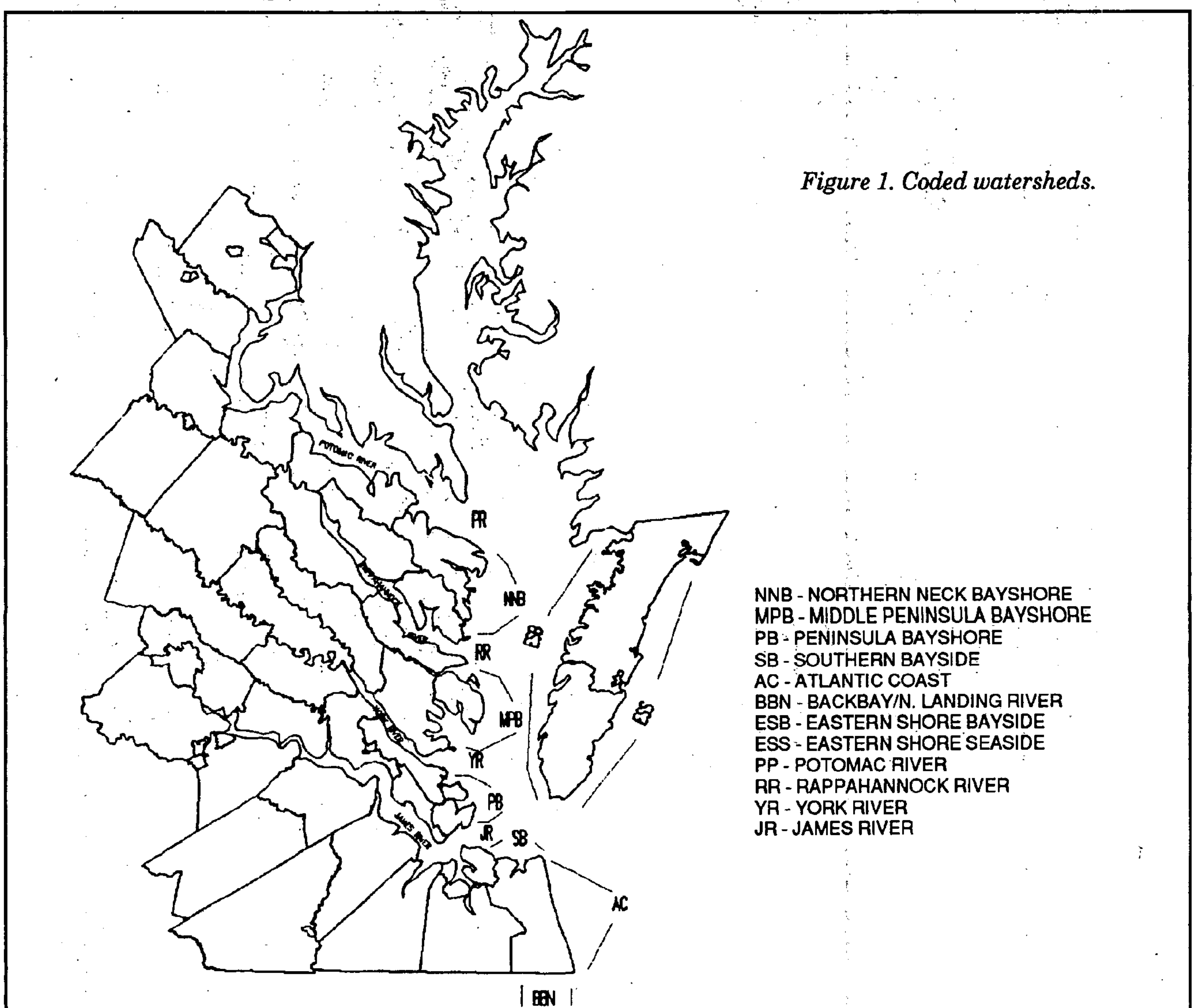

Figure 1. Coded watersheds.

Additionally, the 1988 database does not exclude projects approved by a locality or the state that may have been subsequently denied by the Corps of Engineers. It also does not account for any compensation which may have been required.

Results

The tidal wetlands permitted to be impacted in 1988 totalled 21.0 acres (914,704 square feet). The vegetated area, 4.44 acres (193,574 square feet), and the non-vegetated area, 16.56 acres (721,130 square feet), impacted are summarized by watershed in Figure 2. The data are presented on a county-by-county basis by wetland type in Table 1. The permit activities of each board as a per cent of the state totals are summarized in Table 2. the vegetated and non-vegetated impacts are reviewed by watershed in Table 3.

In 1988 a total of 19.11 miles (100,879 linear feet) of shoreline alterations were authorized (Figure 3.). Bulkheading comprised 8.33 miles (43,958 linear feet) and riprap 10.78 miles (56,921 linear feet). Currently, the database does not allow distinction between newly and previously hardened shorelines. Consequently, these figures include new structures as well as the repair and replacement of existing structures. These data are depicted on a watershed basis in Figure 3 and on a county-by county basis in Table 4.

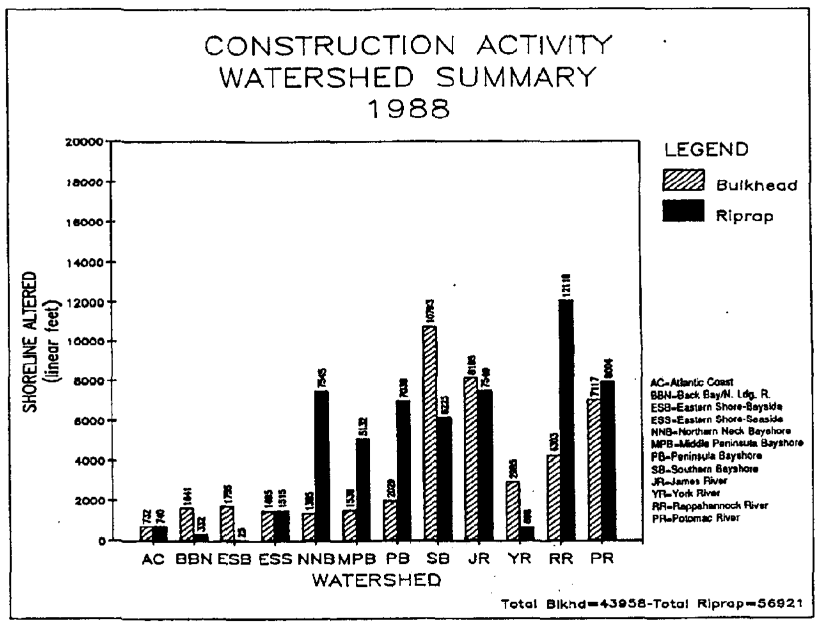

Figure 2. Construction activity by watershed.

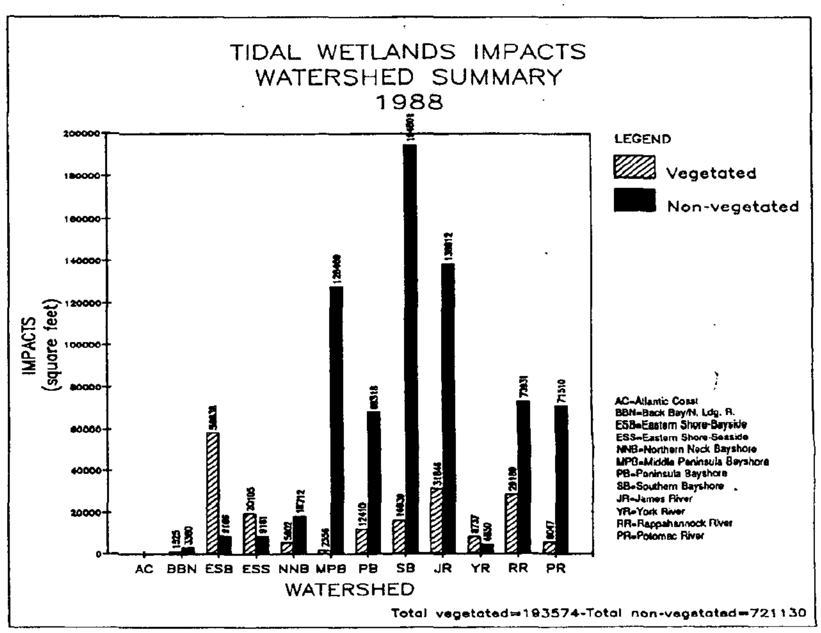

Figure 3. Tidal wetlands impacts by watershed.

Table 1. Tidal wetlands impacts permitted in 1988 by county and wetlands type.

COUNTY	TP1	TP2	TP3	TP4	TP5	TP8	TP11	TP12	TOTVEG	TP13	TP14	TP15	TP16	TOTNV
ACM	1000	675	0	1200	0	480	0	61678	65033	1440	4740	4066	3061	13307
ALEX	0	0	0	0	0	0	0	0	0	0	3000	2000	0	5000
CAROL	0	0	0	0	0	0	0	0	0	0	60	10	0	70
C.CTY	0	0	0	0	0	0	1100	0	1100	1900	0	0	0	1900
CHES	426	0	0	5300	0	1350	0	5085	12161	41900	12000	11620	2344	67864
CHEST	0	0	0	0	0	0	0	0	0	0	1000	0	0	1000
ESSEX	0	1375	0	0	0	0	10000	4356	15731	0	20365	2540	0	22905
FAIRF	0	0	0	0	0	0	0	0	0	0	0	10	0	10
GLOU	412	179	0	0	0	0	0	0	591	0	3393	1546	1564	6503
HAMP	530	75	2300	1225	0	2550	0	3000	9680	30000	0	0	1000	31000
HOPEW	0	0	0	0	0	0	0	0	0	21780	0	14000	0	35780
ISL.W	0	0	0	0	1000	0	0	0	1000	0	0	800	0	800
JAMES	0	0	0	0	0	0	0	120	120	0	0	1500	3410	4910
K&Q	0	0	0	0	0	0	0	0	0	0	0	360	0	360
K.GEO	0	0	0	0	0	0	0	0	0	0	240	0	0	240
K.WIL	0	0	0	0	0	0	0	0	0	0	0	0	672	672
LAN	1879	129	8056	10	0	0	0	445	10519	0	7648	32619	63	40330
MATH	157	1520	0	120	0	0	0	0	1797	0	96648	8184	2500	107332
MSEX	639	173	0	212	100	0	0	96	1220	3819	20327	4077	115	28338
N.KNT	0	0	0	0	0	0	0	50	50	0	430	400	0	830
N.NEW	0	0	0	0	0	0	0	0	0	1250	10	0	300	1560
NOR	7087	0	0	1423	0	1025	75	630	10240	0	10411	5650	9272	25333
NH	13265	765	0	0	0	0	0	0	14030	2630	2280	250	0	5160
NUB	6860	415	80	256	60	0	0	1836	9507	0	1250	29306	0	30556
POQ	675	0	0	575	0	0	0	1000	2250	0	0	3263	2960	6223
PORT	200	0	0	1900	0	0	0	1816	3916	0	1000	0	1200	2200
PR.WL	0	0	0	0	0	0	0	0	0	0	0	15252	0	15252
RCITY	0	885	0	0	0	0	0	0	885	0	15	440	0	455
RCOUN	0	0	0	0	0	0	0	0	0	0	0	540	0	540
STAFF	0	0	10	0	0	0	50	0	60	0	0	5634	0	5634
SUFF	0	0	0	0	0	0	0	2228	2228	0	100	0	0	100
SURRY	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VB	5840	5945	0	5020	30	10	0	1800	18645	0	18395	25361	154885	198641
WPT	300	0	0	0	0	0	0	0	300	0	0	0	0	0
WESM	244	15	0	0	0	1300	0	1732	3291	0	3010	29730	0	32740
WBURG	0	0	0	0	0	0	0	550	550	0	0	0	400	400
YORK	460	10	0	100	8100	0	0	0	8670	150	160	23700	3175	27185
TOTAL									193574					721130

TP1 = SALTMARSH CORDGRASS COMMUNITY = 39,974 sq. ft.
TP2 = SALTMEADOW HAY COMMUNITY = 12,161 sq. ft.
TP3 = BLACK NEEDLERUSH COMMUNITY = 10,446 sq. ft.
TP4 = SALTBUSH COMMUNITY = 17,341 sq. ft.
TP5 = BIG CORDGRASS COMMUNITY = 9,290 sq. ft.
TP8 = REED GRASS COMMUNITY = 6,715 sq. ft.
TP11 = FRESHWATER MIXED VEGETATION COMMUNITY = 11,225 sq. ft.
TP12 = BRACKISH WATER MIXED VEGETATION COMMUNITY = 86,422 sq. ft.
TP13 = INTERTIDAL BEACH COMMUNITY = 104,869 sq. ft.
TP14 = SAND FLAT COMMUNITY = 206,482 sq. ft.
TP15 = SAND/MUD MIXED FLAT COMMUNITY = 222,858 sq. ft.
TP16 = MUD FLAT COMMUNITY = 186,921 sq. ft.

Table 2. Summary of locality permit activity in 1988 and tidal wetlands impacted.

COUNTY	TOTAL WETLANDS IMPACTED(SQ.FT.)	APPLICATIONS REVIEWED(%)	TOT NVEG IMPACT%	TOT VEG IMPACT%	TOT WETL IMPACT%
Accomack	78340	6.20%	1.85%	33.59%	8.56%
Alexandria	5000	.33%	.70%	0.00%	.55%
Caroline Co.	70	.33%	.01%	0.00%	.00%
Charles City	3000	.33%	.26%	.57%	.33%
Chesapeake	80025	2.12%	9.41%	6.28%	8.75%
Chesterfield	1000	.16%	.14%	0.00%	.11%
Essex	38636	2.45%	3.18%	8.13%	4.22%
Fairfax	10	.65%	0.00%	0.00%	0.00%
Gloucester	7094	3.59%	.90%	.30%	.78%
Hampton	40680	1.96%	4.30%	5.00%	4.45%
Hopewell	35780	.33%	4.46%	0.00%	3.91%
Isle of Wight	1800	.33%	.11%	.52%	.20%
James City	5030	1.31%	.68%	.06%	.55%
King & Queen	360	.16%	.05%	0.00%	.04%
King George	240	.33%	.03%	0.00%	.03%
King William	672	.33%	.09%	0.00%	.07%
Lancaster	50849	9.62%	5.59%	5.43%	5.56%
Mathews	109129	5.71%	14.88%	.93%	11.93%
Middlesex	29558	8.81%	3.93%	.63%	3.23%
New Kent	880	.49%	.12%	.03%	.01%
Newport News	1560	.98%	.22%	0.00%	.17%
Norfolk	35573	7.67%	3.51%	5.29%	3.89%
Northampton	19190	1.79%	.72%	7.25%	2.10%
Northumberland	40063	12.56%	4.24%	4.91%	4.38%
Poquoson	8473	2.28%	.86%	1.16%	.93%
Portsmouth	6116	1.30%	.30%	2.02%	.67%
Prince William	15252	.16%	2.12%	0.00%	1.67%
Richmond City	1340	.33%	.06%	.46%	.15%
Richmond County	540	.16%	.07%	0.00%	.06%
Stafford	5694	2.45%	.78%	.03%	.62%
Suffolk	2328	.49%	.01%	1.15%	.25%
Surry	0	.16%	0.00%	0.00%	0.00%
Virginia Beach	217286	15.50%	27.55%	9.63%	23.75%
West Point	300	.16%	0.00%	.15%	.03%
Westmoreland	36031	5.06%	4.54%	1.70%	3.94%
Williamsburg	950	.49%	.06%	.28%	.10%
York	35855	2.94%	3.77%	4.48%	3.92%
TOTAL	**914704**	**100.02%**	**99.50%**	**99.98%**	**99.91%**

Table 3. Tidal wetlands impacts permitted in 1988 by watershed.

Vegetated Wetlands

WS	TP1	TP2	TP3	TP4	TP5	TP8	TP11	TP12	TOTAL	%
AC	0	0	0	0	0	0	0	0	**0**	0.00%
BBN	0	625	0	50	0	0	0	850	**1525**	.79%
ESB	735	675	0	0	0	0	0	57428	**58838**	30.40%
ESS	13530	765	0	1200	0	360	0	4250	**20105**	10.39%
JR	8227	0	0	8560	1030	2375	1175	10479	**31846**	16.45%
MPB	389	1717	0	250	0	0	0	0	**2356**	1.22%
NNB	4920	246	0	150	0	0	0	586	**5902**	3.05%
PB	1585	75	2300	1900	0	2550	0	4000	**12410**	6.41%
PR	1324	205	10	116	60	1300	50	2982	**6047**	3.12%
RR	3378	2456	8136	82	100	120	10000	4897	**29169**	15.07%
SB	5326	5320	0	5033	0	10	0	950	**16639**	8.60%
YR	560	77	0	0	8100	0	0	0	**8737**	4.51%

Non-vegetated Wetlands

WS	TP13	TP14	TP15	TP16	TOTAL	%
AC	0	0	0	0	**0**	0.00%
BBN	0	530	1350	1500	**3380**	.47%
ESB	2630	1520	3916	1120	**9186**	1.27%
ESS	1440	5500	400	1821	**9161**	1.27%
JR	66830	20326	33830	17826	**138812**	19.25%
MPB	0	112715	11690	4064	**128469**	17.81%
NNB	0	2120	16592	0	**18712**	2.59%
PB	30150	4325	26963	6880	**68318**	9.47%
PR	0	6900	64610	0	**71510**	9.92%
RR	3819	31228	38586	298	**73931**	10.25%
SB	0	18165	24151	152485	**194801**	27.01%
YR	0	3153	770	927	**4850**	.67%

WATERSHED

AC = Atlantic Coast - Virginia Beach
BBN = Back Bay North Landing River
ESB = Eastern Shore Bayside
ESS = Eastern Shore Seaside
JR = James River Basin
MPB = Middle Peninsula Bayshore
NNB = Northern Neck Bayshore
PB = Peninsula Bayshore
PR = Potomac River Basin
RR = Rappahannock River Basin
SB = Southern Bayshore
YR = York River Basin

Table 4. Shoreline alterations permitted during 1988 in tidal Virginia by county.

COUNTY	BULKHEAD (linear ft.)	RIPRAP (linear ft.)	TOTAL
Accomack	2674	625	3299
Alexandria	254	202	456
Caroline Co.	200	0	0
Charles City	200	145	345
Chesapeake	990	2245	3235
Chesterfield	0	0	0
Essex	846	910	1756
Fairfax	378	760	1138
Gloucester	2644	920	3564
Hampton	323	4125	4448
Hopewell	115	1500	1615
Isle of Wight	0	0	0
James City	943	0	943
King & Queen	80	0	80
King George	84	0	84
King William	200	0	0
Lancaster	768	9711	10479
Mathews	1032	3023	4055
Middlesex	1643	4213	5856
New Kent	311	0	0
Newport News	300	438	738
Norfolk	4204	3217	7421
Northam pton	636	765	1401
Northumberland	3850	9639	13489
Poquoson	559	1328	1887
Portsmouth	836	314	1150
Prince William	1060	0	1060
Richmond City	145	0	145
Richmond County	0	120	.120
Stafford	1463	323	1786
Suffolk	90	194	284
Surry	0	0	0
Virginia Beach	12987	7268	20255
West Point	330	0	0
Westmoreland	2079	3626	5705
Williamsburg	375	0	375
York	1359	1310	2669
TOTAL	**43958**	**56921**	**100879**

Discussion

The majority of the tidal wetlands authorized to be impacted in 1988 were non-vegetated. However, of the vegetated impacts authorized, the majority was in the Group I marshes, Saltmarsh Cordgrass Community (Type I), Freshwater Mixed Vegetation Community (Type XI) and Brackish Water Mixed Vegetation Community (Type XII). These types are normally to be afforded the highest order of protection but appear to be accruing most of the impacts, perhaps because of their wide occurence as fringe marshes.

Vegetated tidal wetlands permitted to be impacted were greatest on the Eastern Shore where losses on the Bayside were higher than the Seaside. This was primarily due to a single project impacting over one acre.

The data appear to indicate a certain affinity for particular types of structures in the four watersheds showing the greatest amount of shoreline alterations permitted, Potomac River (PR), Rappahannock (RR), James River (JR) and Southern Bayshore (SB). The predominantly rural areas, PR and RR, permitted more riprap, 20,122 LF, than bulkheading, 11,420 LF. The opposite was true in the more urban areas, JR and SB, where more bulkheading, 18,977 LF, than riprap, 13,774 LF, was permitted. It is unknown whether this is a true preference or rather something dictated by local circumstances such as the nature of adjacent shoreline structures, economics or engineering considerations.

Summary

The Pilot Program reported here has demonstrated that the database can be an effective tool in compiling data on the cumulative impact of permitted wetlands losses. Future efforts will be directed at modifications to improve the versatility of the database and its value to the wetlands management process. Those already proposed include expanding the types of construction activities covered, creating a fill category that will indicate the actual area of habitat permitted to be lost and providing a summary of required compensation.

Wetlands Program Technical Report

College of William and Mary
Virginia Institute of Marine Science
School of Marine Science
Gloucester Point, Virginia 23062

Wetlands Program

August 1990 No. 90-A

Technical Report

Special Edition

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

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Monitoring of Compliance With Permits Granted By Local Wetlands Boards

Julie G. Bradshaw

Introduction

Activities in Virginia's tidal wetlands are regulated at the State and local level by the Virginia Wetlands Protection Act of 1972. For localities (i.e., counties, towns and cities) which elect to regulate their own wetlands, the Act requires adoption of a prescribed ordinance and formation of a volunteer citizen board of 5 or 7 members. The Virginia Marine Resources Commission (VMRC), the Commonwealth's marine resource management agency, retains an oversight and appellate role over these wetlands boards. For localities which choose not to adopt the wetlands ordinance, VMRC assumes primary regulatory authority over tidal wetlands within that locality. Of 48 localities eligible to regulate tidal wetlands within their borders, 33 have adopted local wetlands ordinances and formed wetlands boards.

The wetlands boards and/or VMRC have the ability to grant or deny permits for the use or development of wetlands within their jurisdictions. Parties wishing to use or develop wetlands must first submit a permit application which includes a statement of purpose and detailed drawings and descriptions of the proposed activity. The types of activities for which parties request permits include shoreline stabilization structures such as bulkheads and riprap revetments, and water access structures and activities such as boat ramps, community or commercial piers, and dredging. The role of the Virginia Institute of Marine Science (VIMS) in the permitting process has been to estimate the impacts of projects on the marine environment and to recommend alternatives to minimize those impacts where possible. Quite often these recommendations involve realignment of shoreline structures to lessen the areal extent of wetlands impacted.

The wetlands boards (or VMRC for those localities without wetlands boards) hold a public hearing for each permit application. All interested citizens, regulatory and advisory agencies are given the opportunity to comment on proposed activities in writing and at the public hearing. Based on a consideration of public and private benefits and detriments expected from the proposed activities, the wetlands boards decide whether to deny permits or to grant them as proposed or with conditions.

(continued)

Once permits are granted, there is no requirement or suggestion in the Wetlands Act or in guidelines promulgated by VMRC that the permits be monitored for compliance. VIMS has not undertaken a formal study of individual projects to determine the extent of noncompliance with permits. However, we are aware of many projects which were not constructed as permitted. The noncompliance in many of these cases involved construction of bulkheads or riprap revetments at alignments up to several feet channelward of the permitted alignments. In other cases, permittees did not dispose of dredged material in the permitted location or manner, or constructed boat ramps in locations other than those permitted.

The potential significance of noncompliance is evident when the magnitudes of permitted projects and impacts are examined. For example, in 1988, approximately 44,000 linear feet of shoreline were permitted to be bulkheaded in tidewater Virginia. Preliminary analysis indicates that the average permitted bulkhead encroachment on wetlands was approximately 2.3 feet per linear foot of bulkhead, resulting in a projected total loss of approximately 100,000 square feet of wetlands due to bulkhead construction and backfilling. If each of those bulkheads was constructed only one foot channelward of its permitted alignment, the additional wetland loss would be approximately 44 percent greater. While encroachment into wetlands of several feet more than permitted may be relatively easy to detect by watchful neighbors or during a casual follow-up inspection, a one foot difference in permitted versus actual alignment would be more difficult to detect without a structured monitoring program, and may seem punitive to correct once a project is completed. Both individually and cumulatively, wetland losses due to permit noncompliance are potentially significant. Because of their great and unique values as an ecological component of the marine environment and as a physical buffer for erosion, flooding and water quality control, continuing unnecessary losses of wetland resources should be avoided.

A prudent wetland management program should therefore include some method of determining compliance with permits granted. A survey was conducted in order to determine how, and to what extent, the wetlands boards monitor for permit compliance.

Methods

Most localities provide the wetlands boards with some degree of staffing which ranges from strictly administrative or clerical assistance to varying levels of professional technical assistance. Telephone and personal interviews with wetlands board staff were conducted during November 1989. Interviewees were questioned about five aspects of their compliance monitoring programs:

a.) whether shoreline structures required building permits in addition to the wetlands permits required by the Wetlands Act,

b.) whether the applicant is required to provide ***benchmarks*** in the application (i.e., distances of proposed structures from more than one fixed reference point)

c.) whether the alignment permitted by the wetlands board is staked by the staff or wetlands board prior to construction,

d.) whether the permittee is required to notify staff prior to beginning or after completing the permitted activity,

e.) whether staff or wetlands board members undertake site inspections after the permit is granted.

Of the 33 existing wetlands boards, staff from 24 wetlands boards were interviewed. Wetlands boards which heard fewer than four permit applications in 1988 were excluded from this survey. The results reported are based on responses to the November 1989 survey and do not reflect program changes which may have occurred since that time.

Survey responses were weighted by the number of permits granted in 1988 by each wetlands board as reported by the wetlands boards in their annual reports to VMRC, and collated by R.C. Neikirk of VMRC.

Responses by rural and urban boards were compared. For the purpose of this survey, rural localities were defined as those with a population density less than 140 per square mile; urban localities were defined as those with a population density greater than 140 per square mile, using population data from the 1980 census by the U.S. Department of Commerce (Univ.

of Virginia, 1987). By this definition, the least populous urban counties were James City and Stafford; the most populous rural locality was Suffolk.

Results and Discussion

Wetlands board staff responses to questions about aspects of their permit compliance monitoring programs are summarized in Table 1.

Table 1. Responses of wetlands board staff to questions about aspects of their permit compliance monitoring programs (from 24 wetlands boards except where indicated).

Permit Compliance Program Components:	Number of wetlands boards	
Building permits (of 22 Boards)		
—required for all structures	7	(32%)
—required for wooden structures only	12	(54%)
—not required	3	(14%)
Benchmarks required	4	(17%)
Staking of permitted alignments		
—all projects staked	4	(17%)
—5 to 40% of projects staked	7	(29%)
—no projects staked	13	(54%)
Notification required	12	(50%)
Inspections		
—all projects inspected	6	(25%)
—60-95% of projects inspected	4	(17%)
—20-40% of projects inspected	6	(25%)
—no projects inspected	8	(33%)

Building permits

Of 22 localities which responded to this question, 7 (32%) require building permits for all structures (including riprap revetments), 12 (54%) require building permits only for wooden structures, and 3 (14%) do not require building permits.

Benchmarks

Four of 24 (17%) wetlands boards require the use of benchmarks in the project drawings. Three of these wetlands boards require the applicant to provide this information; one locality's staff generates these benchmarks themselves for inclusion in the permits. Benchmarks are not required by 20 of 24 (83%) wetlands boards.

Staking

Eleven of 24 (46%) localities stake the permitted alignments for bulkheads and riprap revetments. Of these eleven, four localities stake all alignments, and the other seven stake 5 to 40 percent of the alignments. Those which stake only some of the alignments stated that they stake only projects with complex alignments, those with the potential to impact significant wetland resources, or those involving contractors with whom they had previously had trouble.

Notification

Twelve of 24 (50%) localities require the permittee to notify staff prior to beginning work on a permitted activity, usually at least 24 hours before beginning work. One of these 12 has required such notification of only 15% of permittees, generally if the application was complex, controversial, or had the potential to impact significant wetlands resources. Of those localities which do not require prior notification, one has required permittees to notify staff after completion of the permitted activity for 25% of permits, usually when the project involved restoration of wetlands or stabilization of a steep slope.

Inspections

Sixteen of 24 (67%) localities conduct inspections of permitted activities. Six of 24 (25%) inspect all projects; 10 of 24 (42%) inspect at least half of the projects. Inspection programs are of four general types:

a.) designated inspections based on the progress of the project; requires notification of staff by permittee (e.g., prior to backfilling a bulkhead, after completion of the project) (5 of 16 localities which conduct inspections utilize this method)

b.) periodic (e.g., monthly) inspections of all pending projects (2 of 16 utilize this method)

c.) unstructured inspections (i.e., made "whenever they get around to it") (6 of 16). Also in this category were inspections prompted by complaint calls from neighbors of permittees or other members of the general public. In fact, many localities stated that surveillance by neighbors was their primary form of permit compliance monitoring.

d.) chance inspections; unplanned; projects seen only if staff happens to be in the vicinity (3 of 16).

Determination of compliance

Staff members described a variety of methods which they used for determining permit compliance during inspections. Some determinations of compliance were based on staff recollection of the permit requirements and how the shoreline looked prior to the permitted activity. Others involved comparison of completed activities with photographs taken at prior site visits. Often these photographs depicted stakes or flagging which indicated the proposed or permitted alignment. Other localities evaluated the completed activity by comparing it with the drawings submitted in the application.

There are problems inherent in all of these approaches. Shorelines are often drastically altered by permitted activities such as construction of bulkheading and riprap. In many cases, the adjacent upland may also be altered significantly during the time which elapses between permit issuance and the accomplishment of the permitted activities. The new landscape may not be easily recognizable and comparison of the site with recollections or with photographs, subjective approaches at best, may not yield the desired results. Drawings included with the permit application are often inadequate to determine the exact positioning or alignment of a proposed structure or activity because they are not drawn to scale or fail to include reference points such as existing structures and tidal references (i.e., mean low water and mean high water). Inspections for some of the localities which also require building permits for shoreline structures are conducted by building inspectors who may not be familiar with wetlands, the wetland permit application, the wetland permitting process, or permit conditions.

Localities which require scale drawings or reference points to be included in the application have an objective standard by which compliance may be determined by anyone with a tape measure and drawings of the permitted activity. The use of benchmarks (i.e., distances of proposed structures from more than one fixed reference point) is a simple method by which inspectors (even those unfamiliar with particular sites, wetlands identification, or the wetland permitting process) may evaluate permit compliance.

Program structure

The localities' responses to questions about the five aspects of permit compliance monitoring programs investigated ranged from all negative responses (i.e., none of the five activities was required or accomplished) to all affirmative responses (i.e., the localities used all five components in their compliance monitoring programs).

At a minimum, a program to monitor for compliance with wetlands permits should include:

a.) a follow-up inspection of the permitted project, and

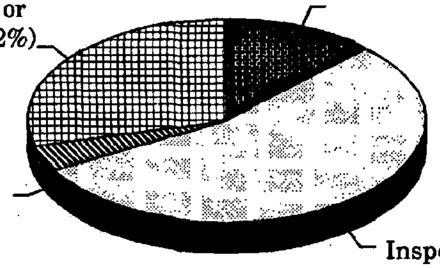
b.) standards (e.g., benchmarks) by which the inspector may judge whether the permit conditions have been satisfied.

The other aspects of permit compliance monitoring programs which were investigated (i.e., requirement for building permits, notification requirement, and staking of permitted alignments) are strategies which could make such a program easier to accomplish, although they are not absolutely essential for successful monitoring of permit compliance.

Based on the criteria of inspections and benchmarks, the wetlands boards' programs for monitoring permit compliance were categorized by structure. Results are summarized in Figure 1.

Of the 24 wetland boards interviewed, the majority (13, or 54%) inspected at least some of the permitted projects but did not use benchmarks as a standard by which to determine compliance. Three of the 24 localities required benchmarks in the applications and conducted inspections of at least some permitted projects. One locality required benchmarks in

Figure 1. Permit compliance monitoring program structure (% of boards).



permit applications but did not conduct inspections of permitted projects. The remaining seven wetland boards (29%) neither required benchmarks nor inspected permitted projects for compliance.

Permits granted in 1988

The wetlands boards surveyed granted 835 permits in 1988. Although 67 percent of the wetlands boards inspect at least some projects after they are permitted, when applied to the number of permits granted by those localities in 1988, only 47 percent of these projects would have been inspected.

Comparisons of other monitoring components are shown in Figure 2. Although 46 percent of the boards required staking of permitted alignments, those boards only granted 38 percent of the 1988 permits. Conversely, although only 17 percent of the wetlands boards require benchmarks in permit applications, those boards granted 34 percent of the 1988 permits. For the other aspects of monitoring programs (i.e., the notification and building permit requirements) the proportion of boards using these components was similar to the proportion of permits granted by those boards in 1988.

Comparison of rural and urban boards

Of the 24 wetlands boards surveyed, 13 were classified as rural and 11 as urban. Boards from urban localities granted 48 percent of the 1988 permits. The structures of permit compliance monitoring programs of rural and urban localities are compared in Table 2. The proportion of rural and urban wetlands boards within each of the four program structures was similar. However, when the responses were weighted by the number of permits granted by each board in 1988, the proportion of permits granted by rural and urban boards within each of the four program structures was significantly different. Examination of Table 2 reveals where these differences occur. The majority (59%) of permits granted by urban boards in 1988 were granted by boards which require both inspections and benchmarks. Only 6 percent of permits granted by rural boards fall into this category. The majority of permits granted by rural boards were split between boards which have some type of inspection program but do not require benchmarks (44%) and boards which neither inspect projects nor have a benchmark requirement (49%). When staff responses about the proportion of projects inspected for compliance are applied to the numbers of permits granted in 1988 by each locality, it is revealed that 70% of activities permitted in urban localities are inspected for compliance, while only 27% of those in rural areas are inspected.

Some of the differences between the permit compliance monitoring programs of rural and urban localities may be attributable to differences in the amount of staff support available to the boards. In general, urban wetlands boards have a greater level of staff support than do rural boards (Hershner et al., 1985). Many of the rural staff members interviewed stated that monitoring of permit compliance could not be accomplished at current staffing levels.

Figure 2. Percent of localities requiring permit compliance monitoring program components.

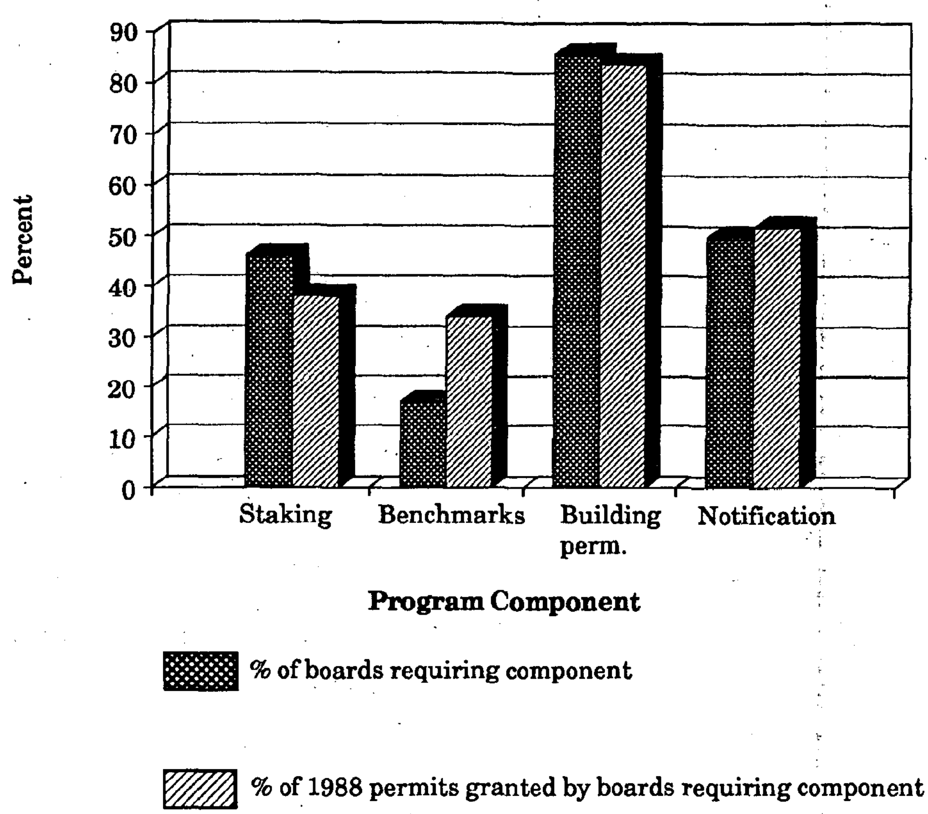


Table 2. Comparison of urban and rural wetlands board programs to monitor for permit compliance.

			Some or all projects inspected: Benchmarks Required		Some or all projects inspected: Benchmarks Not required		No projects inspected: Benchmarks Required		No projects inspected: Benchmarks Not required	
Number of wetlands boards	rural	13	1	(8%)	7	(54%)	0	(0%)	5	(38%)
	urban	11	2	(18%)	6	(54%)	1	(9%)	2	(18%)
Number of permits granted in 1988	rural	433	28	(6%)	193	(44%)	0	(0%)	212	(49%)
	urban	402	239	(59%)	101	(25%)	13	(3%)	49	(12%)

A model permit compliance monitoring program

A model program for permit compliance monitoring could include:

1. ***Benchmarks.*** Benchmarks or tie-downs are distances from the most channelward extent and all corners or turns of the proposed structure or activity to more than one permanent fixed reference point (e.g., the corners of an existing house). If permanent fixed reference points do not exist in the vicinity of the project, they should be established (e.g., using steel rods) and maintained until the project is complete and has been inspected by all regulatory agencies involved. Benchmarks should be included in the permit application drawings and can be used by regulatory personnel prior to permit approval to determine proposed project locations, and after permit approval to determine compliance. Some magnitude of allowable deviation from the permitted benchmark distances should be established by the locality.

2. ***Alignment staking.*** Ideally, the applicant would stake a proposed project upon submitting the application and using the benchmarks in the application. If permitted alignment was different from that proposed, the permitted alignment would be staked by the locality, or staked by the applicant and confirmed by the locality.

3. ***Notification.*** Ideally, permittees should notify localities one or two days prior to beginning a permitted activity. Notification would allow scheduling of inspections by the locality.

4. ***Inspection.*** Inspection could be based on the progress of the project; for example, a locality could require inspection of a bulkhead prior to installation of sheeting or prior to backfilling. Noncompliance could be easier to correct at this point than after backfilling. If the locality requires the applicant to stake the permitted alignment, the notification and inspection procedure could be used to confirm that the applicant's stakes are at the permitted alignment. Inspections could also be independent of the progress of individual projects; for example, a locality could visit a particular creek system periodically and inspect any projects underway. Most localities which currently use this approach also survey for unpermitted activities concurrently with inspection of permitted projects. Using this method of inspection, however, noncompliance may not be discovered until after project completion, when it may be more difficult to correct.

5. ***Building permits.*** Most localities currently require that building permits be obtained for shoreline construction projects in addition to permits granted by the wetlands boards. If an established building permit inspection program exists, it could be used in conjunction with a wetlands permit compliance monitoring program, particularly if the monitoring program includes other suggested components (i.e., benchmarks, staking, and notification).

Conclusion

Virginia's Tidal Wetlands Protection Act and its guidelines allow the use or development of wetlands where justified and unavoidable. Unnecessary loss of Virginia's tidal wetlands is a course which the Commonwealth must avoid if it is to retain the essential ecological and physical services of these unique resources. Potential increased "natural" loss of wetlands due to rising sea level will make preservation of existing wetlands even more critical in the years to come. Until public pressure on coastal resources is alleviated, the burden is on regulatory agencies, such as the wetlands boards, to prevent wetland despoliation. An essential aspect of this wetland stewardship role is the monitoring of permit compliance. A program which grants permits without monitoring them for compliance has the potential to undermine the regulatory process by allowing unnecessary wetland losses. Such a program may give citizens a false impression of the degree to which its wetland resources are being protected. If Virginia is to be a leader in the preservation and restoration of the Chesapeake Bay, it must continue to focus attention on tidal wetlands, the critical interface between the land and the Bay.

References

Hershner, Carl, Thomas A. Barnard, Jr., and N. Bartlett Theberge. 1985. Analysis of Virginia's local wetlands boards. Pgs. 537-543 *in* Magoon, Orville T., Hugh Converse, Dallas Miner, Delores Clark and L. Thomas Tobin, eds. Coastal Zone '85. Proceedings of the Fourth Symposium on Coastal and Ocean Management. American Society of Civil Engineers. New York. 2672 pp.

University of Virginia, Center for Public Service. 1987. Virginia Statistical Abstract. Center for Public Service, University of Virginia. Charlottesville, VA.

Wetlands Program

Technical
Report
Special
Edition

College of William and Mary
Virginia Institute of Marine Science
School of Marine Science
Gloucester Point, Virginia 23062

Wetlands Program

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Technical Report

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Wetlands Program
Gloucester Point, Virginia 23062

Dr. Carl Hershner
Program Director

Commonwealth's Declared Policy:

"to preserve the wetlands and to prevent their despoliation and destruction. . ."

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TIDAL WETLAND VALUES

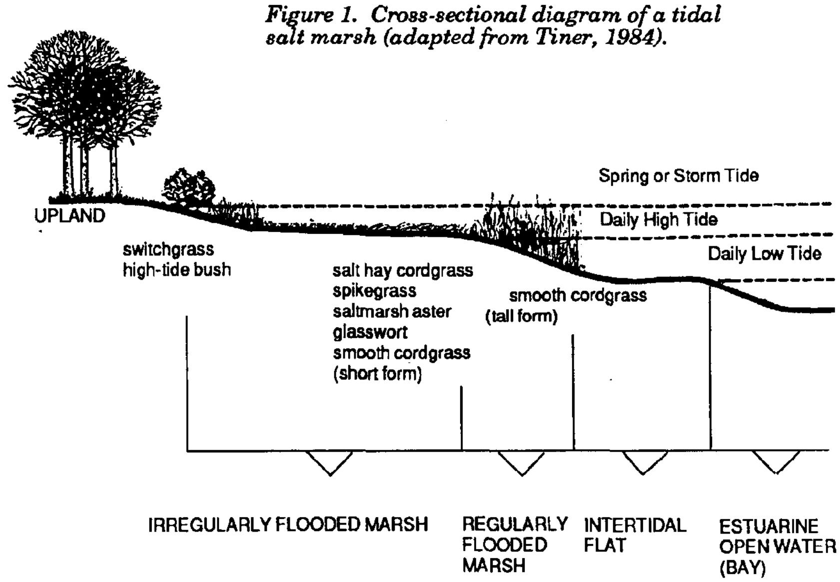
Maryann Wohlgemuth

Throughout the state of Virginia there is a variety of wetland types which range from tidal marshes and swamps near the coast, to nontidal wetlands found anywhere from the coastal plain to the mountains. Wetlands are found in topographic depressions or along rivers, lakes, and coastal waters.

Wetlands, in general, are areas that are wet or have wet soils during some part of the growing season.

Tidal wetlands are found along the coastline where they are influenced by daily tidal fluctuations and include vegetated marshes and swamps or nonvegetated mud and sand flats (Figure 1).

Figure 1. Cross-sectional diagram of a tidal salt marsh (adapted from Tiner, 1984).



Wetlands were historically considered wastelands that harbored bothersome snakes and disease-carrying insects. They were considered useless for most farming or building because of the unstable, wet substrate. These lands were often drained or filled for farming, housing, and urban development. However, this negative view of wetlands was not shared by the fishermen, hunters, and trappers who benefited from the productive and diverse supply of mammals, fish, and waterfowl found in wetlands.

Wetland Values

Tidal wetlands provide many ecological and socio-economic benefits including: water quality improvement, aquatic productivity, fish and wildlife habitat, shoreline erosion control, stormwater treatment, flood protection, potable water supplies, economically valuable resources, and recreation. The level of these values varies with the type, setting, size, and hydrology of the particular wetland. The health of the Chesapeake Bay and its fisheries are closely linked to the existence of wetlands.

Water Quality Improvement

Due to their strategic position between uplands and the aquatic environment, tidal wetlands can filter and trap sediments and pollutants from upland runoff before they reach an adjacent waterway. Water pollution problems can be reduced when urban and agricultural runoff pass through a wetland buffer before reaching the aquatic environment. The research of Cerco and Kuo (1979) concluded that a tidal marsh creek that received effluent from a poultry processing plant significantly reduced levels of nutrients and increased levels of dissolved oxygen.

As wetland plants grow, they utilize and recycle nutrients, which otherwise may contribute to decreased water clarity by stimulating algal blooms. There is a seasonal uptake and release of nutrients in wetlands. During the growing season nitrogen and phosphorous are assimilated by plants. After death of the aboveground portions of plants, nutrients may be released by decomposition. Mitsch and Gosselink (1986) point out that the uptake during the growing season may be beneficial to water quality because it coincides with the periods when serious algal blooms occur.

It has been shown that some wetlands are successful at reducing nutrients, heavy metals, and bacteria from sewage effluent and other waters (Grant and Patrick, 1970; Sloey et al., 1978; Kadlec and Kadlec, 1979). In Monterey, a town in western Virginia, a bulrush wetland was the most economical alternative for accomplishing secondary wastewater treatment. (Virginia Natural Resources Newsletter, 1989). Wetland vegetation and the associated root mass act to slow water flow, which results in settlement and deposition of suspended sediments, and the associated pollutants, and nutrients (Boto and Patrick, 1979). Benefits are realized by increased water clarity and reduced siltation in downdrift oyster beds, fish spawning and nursery areas, seagrass beds, and navigation channels (Anderson et al., 1978).

For erosion control on tidal banks where water quality improvement is a consideration, the Commonwealth's manual: Best Management Practices for Agriculture (VSWCB, 1979) suggests planting vegetation. It is especially important to maintain fringe wetlands adjacent to development sites and agricultural lands to filter upland sediments, nutrients, and pollutants before they enter the marine environment. Trees are good stabilizers of river banks and subsequently reduce shoreline erosion. Their roots bind the soil, while their trunks and branches slow the flow of flooding waters and dampen wave height (Tiner, 1984; Burke et al., 1988). Marshes have a significant effect on water quality in estuaries with large marsh areas, small water volume, and small point sources of nutrients, as shown in Sweeney's (1980) calculations for the York and James rivers.

Aquatic Productivity

Some wetlands produce more plant material per area than the most productive farmlands (Figure 2). Wetlands along the East

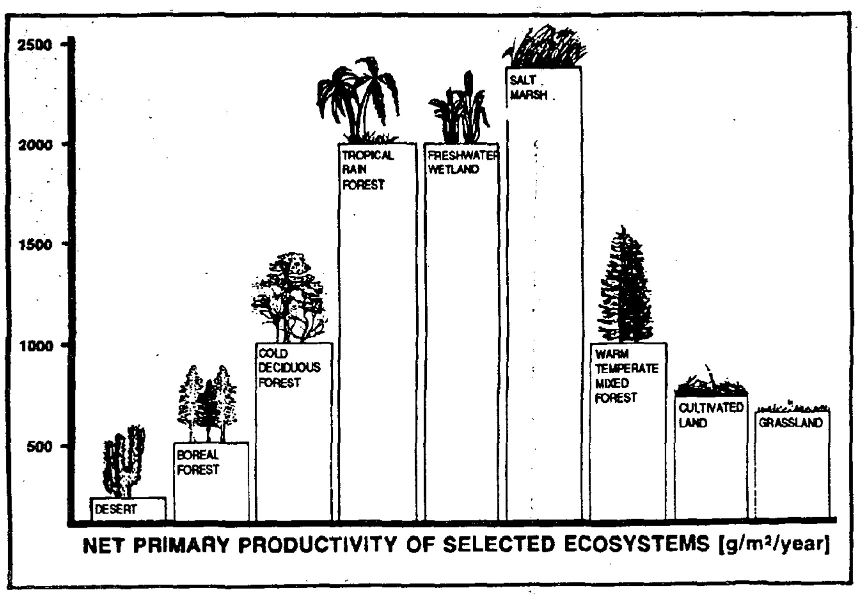


Figure 2. Relative productivity of wetland ecosystems in relation to others (adapted from Tiner, 1984).

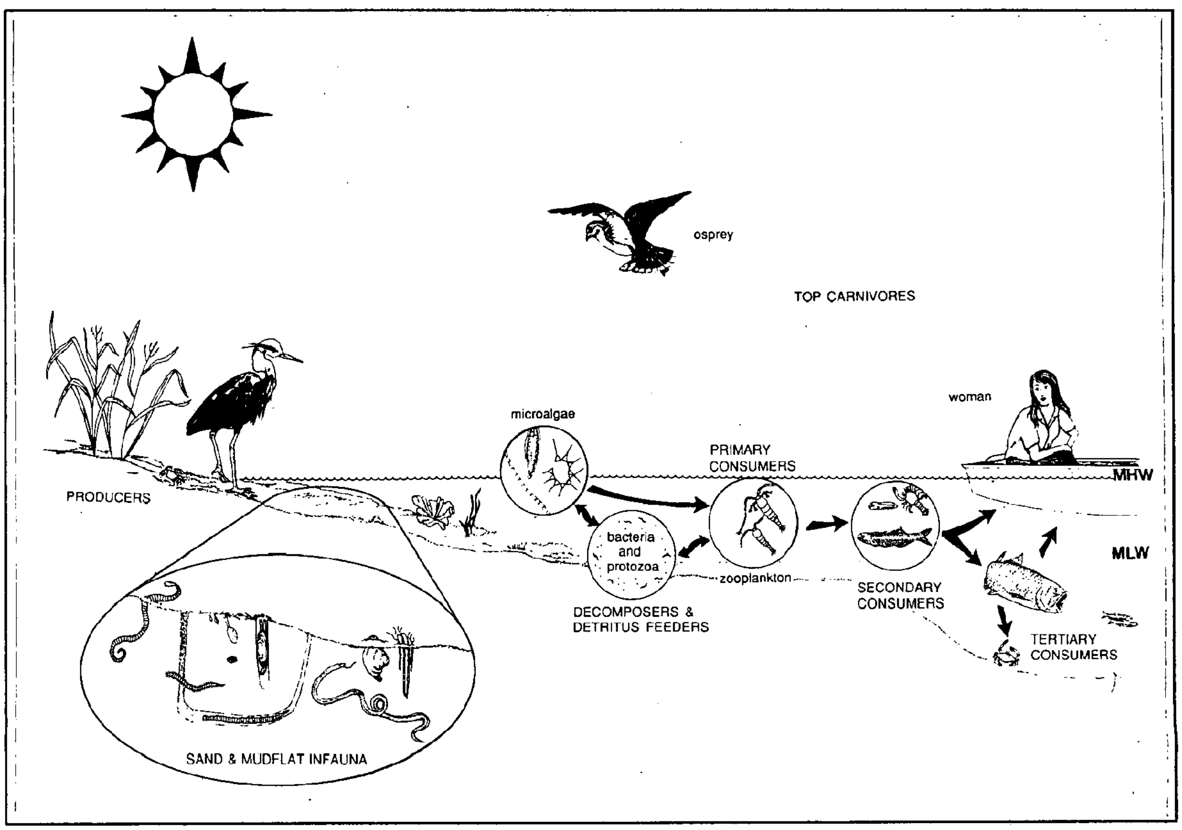
Coast produce 5-10 tons of organic matter per acre annually, while agricultural fields produce 0.3 to 5 tons per acre annually (Teal, 1969). This large amount of productivity provides a food source for fish, birds, invertebrates, and furbearers. The plant material can be utilized directly by marine grazers or used in a decaying form called detritus. Detritus is consumed by many small invertebrates, juvenile fish, and oysters, which in turn are eaten by larger fish, birds, and crabs (Anderson et al., 1978). This pattern of feeding is called a food web and is essential to the viability of the Chesapeake Bay and for providing fish for human consumption (Figure 3).

Fish and Wildlife Habitat

Tidal wetlands are used by a large variety of birds, fish, mammals, and invertebrates for food, shelter, and spawning and nesting sites. Approximately two-thirds of the fish and shellfish species that are harvested commercially are associated with wetlands (Mitsch and Gosselink, 1986). These species include: blue crab, oyster, clam, shrimp, striped bass, menhaden, bluefish, flounder, sea trout, spot, and croaker. Rozas and Hackney (1984) found 29 species of fish in a tidal marsh and suggested that shallow marsh areas are a preferred habitat because of reduced competition, slow currents, scarcity of predators and an abundant food supply.

In 1967-1968, 95% of Virginia's annual fish harvest was shown to be at least partially dependent on wetlands (Wass and Wright, 1969). Blue crabs use tidal marsh creeks as shelter from predators during molting (Hines et al., 1987). Juvenile blue crabs and 14 species of fish were more abundant on flooded salt marsh surfaces than in non-vegetated subtidal areas (Zimmerman and Minello, 1984a). Some species, such as mummichogs (minnows) and fiddler crabs, utilize wetlands throughout their lifespan. Other species, such as striped bass, spawn in waters adjacent to tidal freshwater marshes similar to those along the Pamunkey River (McGovern and Olney, 1988). Many coastal fish, including spot, menhaden, and mullet, use wetlands as nursery areas for their juvenile stage (Weinstein, 1979). The diet of menhaden has been shown to consist of 30% marsh derived detritus and 70% plankton (Deegan et al., 1990).

Figure 3. Food Web.



Of the nation's endangered and threatened species, 50% of the animals and 28% of the plants are dependent on wetlands for their survival (Niering, 1988).

Migratory waterfowl are dependent on wetlands for feeding during their seasonal stopovers. Metzgar et al., (1973) estimated that the Bay's wintering population of waterfowl has been more than one million. Various shore and wading birds use wetlands as a food source and a location for nest sites. Atlantic coast salt marshes are used for nesting by birds such as laughing gulls, Forster's terns, clapper rails, willets, and marsh hawks (Tiner, 1984). Coastal wetlands are also used as foraging and nest sites for wading birds such as the herons and egrets (Tiner, 1984).

Shoreline Erosion Control

Tidal wetlands provide a buffer against shoreline erosion by reducing wave energy and current velocity. Wetlands dissipate the full force of waves before they reach upland areas. Vegetated wetlands can reduce shoreline erosion by four mechanisms: increased stability of the sediment-root matrix, wave damping as the waves propogate through a stand of grass, reduction in current velocity from additional friction forces as it flows through grasses, and storage of sand in dunes (Dean, 1979). Wetlands have a complex root and rhizome system that binds shoreline sediments together which helps reduce the loss of uplands to coastal erosion.

As wave action and current speed are reduced by the wetland, sediments in the water settle to the bottom, resulting in improved water quality and the build-up of the marsh surface. Knutson et al., (1982) found that more than 50% of the energy associated with waves passing through a fringe marsh was dissipated within the first eight feet of the marsh. A planted salt marsh fringe may be an effective, inexpensive, and ecologically-preferred alternative to a bulkhead or a revetment (Hardaway et al., 1984). Boon (1975) demonstrated that the configuration of meandering marsh creeks and broad tidal flats can cause diversion and retention of peak tidal current flows. Wave height and current speed are also reduced by non-vegetated wetlands, such as beaches and mudflats by causing waves to spread out as they pass over the flat (Theberge and Boesch, 1978). This reduces the final impact on the upland, thereby reducing erosion of upland areas.

Flood Protection

Wetlands adjacent to watercourses slow surface water flow and may temporarily store flood waters. This effect is particularly evident in riverine systems. Estuarine wetlands adjacent to tidal rivers provide a temporary storage of flood water, but their storage effect may be either increased or reduced by the tidal stage during flooding (Carter et al., 1979). The ability of wetland vegetation to slow flood waters depends on the type and density of vegetation and the depth of the water (Carter et al., 1979). These processes desynchronize peak flows by temporarily slowing and storing water, which results in a non-simultaneous gradual release of peak waters minimizing flow downstream (Figure 4) (Zacherle, 1984). Flood control has become increasingly important in

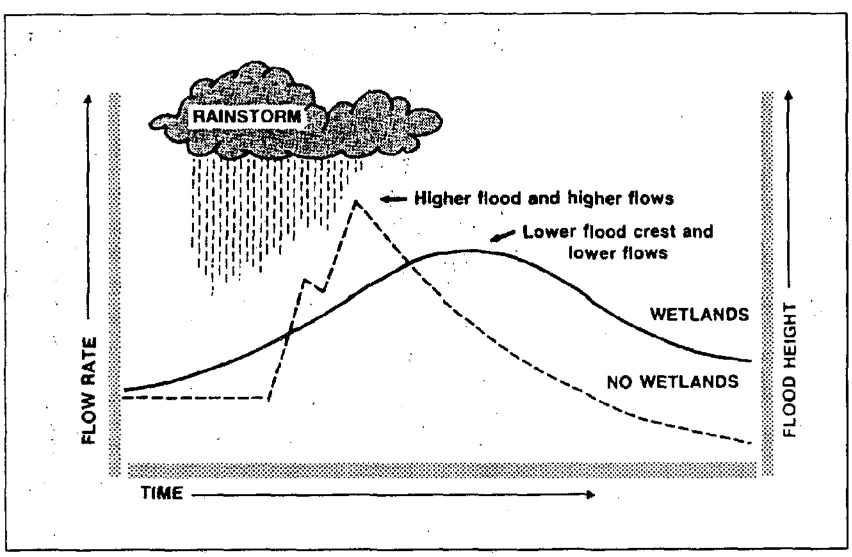


Figure 4. Wetland value in reducing flood crests and flow rates after rainstorms (adapted from Tiner, 1984)

urban areas where the rate and volume of stormwater runoff have increased with non-porous surfaces, such as roads, parking lots, and buildings. Mangrove swamps are so effective at reducing flood levels and buffering storm water damage that the Federal Flood Insurance program requires coastal communities to probibit mangrove destruction if they wish to remain eligible for insurance (Tiner, 1984).

Water Supply

Most wetlands are areas of groundwater discharge. In Massachusetts at least 60 municipalities have public wells in or near wetlands (Motts and Heeley, 1973). Some wetlands may recharge groundwater aquifers, but most do not. Recharge potential varies according to wetland type, geographic location, season, soil type, water table location and precipitation (Tiner, 1984). Most estuarine intertidal wetlands are discharge rather that recharge areas (Carter et al., 1979). In coastal areas large groundwater withdrawls for urban and industrial use have caused saltwater intrusion into the drinking water aquifers.

Economic and Recreational Values

The economic benefits of wetlands are realized in natural products, shoreline erosion control, stormwater treatment, flood protection, water supply, livestock grazing, and recreation. Natural products include timber, fish, shellfish, waterfowl, furbearers, peat, and wild rice. Commercially important species such as striped bass, menhaden, bluefish, flounder, spot, blue crabs, oysters, and clams are partially dependent on coastal wetlands during some part of their life history. Wetland grasses are also used for livestock grazing or harvested for hay. Recreational activities in wetlands include boating, swimming, fishing, hunting, and nature study. All of these activities and products derived from wetlands bring direct and indirect economic benefits to the adjacent communities.

Economic benefits from hunting and fishing are significant: in 1980 furs from muskrats yielded approximately $74 million; in 1980 5.3 million people spent $638 million on hunting waterfowl and other migratory birds; and in 1975 sport fishermen spent $13.1 billion to catch wetland dependent fishes in the U.S. (Burke et al., 1988). In 1980, 47 percent of Americans spent $10 billion observing and photographing waterfowl and other wetland birds (Burke et al., 1988).

The ablity of wetlands to control flood waters reduces property damage from flooding, and reduces costs for flood control structures. Property damage from floods for 1975 in the U.S. was estimated to be $3.4 billion (U.S. Water Resources Council, 1978). The U.S. Army Corps of Engineers found that buying wetlands adjacent to the Charles River in Massachusetts was the most inexpensive solution to flooding problems in the Charles River Basin (Tiner, 1984). Wetlands provide perpetual values, (Table 1) whereas economic benefits from wetland destruction are finite (Mitsch and Gossilink, 1986).

Table 1. Tidal Wetland Values.

ECOLOGICAL VALUES

Water Quality Improvement
- Pollutant removal
- Sediment trapping
- Nutrient recycling
- Wastewater treatment

Aquatic Productivity

Fish And Wildlife Habitat
- Spawning and nesting sites
- Nursery areas for young
- Shelter from predators

SOCIO-ECONOMIC VALUES
- Shoreline Erosion Control
- Flood protection
- Groundwater recharge and discharge
- Natural products (timber,fish,waterflowl)
- Recreation (boating, fishing, hunting)

Wetland Losses

Human threats to wetlands include drainage, pollution, dredging, filling, shoreline structures, groundwater withdrawal, and impoundments. Between 1956 and 1977, coastal wetland loss in Virginia was approximately 6.3 thousand acres (Tiner, 1987). Of those losses, urban development accounted for 43 percent, and coastal waters (from impoundments) accounted for 36 percent (Tiner, 1987). The natural inland migration of wetlands is slowed or stopped where bulkheads or riprap are placed along shorelines for erosion control. As sea level rises, wetlands in front of hardened shorelines will eventually be drowned. Wave reflection from shoreline defense structures may accelerate erosion on adjacent or channelward wetlands. Natural events that may cause wetland loss include rising sea level, natural succession, the hydrologic cycle, sedimentation, erosion, beaver dam constuction, and fire (Tiner, 1984). As wetlands are lost so are their associated benefits.

Regulation of Tidal Wetlands

In 1972 Virginia enacted a law with the intent to protect tidal wetlands while accommodating necessary economic development. The Virginia Marine Resources Commission (VMRC) was given the responsibility of lead state agency. Under the Act's local option alternative most localities have adopted the model ordinance and administer their programs through local wetlands boards and ordinances. Federal wetland regulation under the Clean Water Act is administered by the U.S. Army Corps of Engineers (COE) and overseen by the U.S. Environmental Protection Agency (EPA). The Corps and the VMRC have developed a joint permit application that is used by the local, state, and the federal regulatory authorities to streamline the permit process. The Commonwealth has compiled a set of Wetland Guidelines which describe tidal wetland types, their values, and methods of coastal construction that minimize wetland impacts. These guidelines can be used to assist applicants when filling out the joint permit application. Other state and federal agencies that may comment on wetland applications during the joint permit review include: the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, Council on the Environment, the State Department of Health, State Water Control Board, Shoreline Erosion Advisory Service, Virginia Institute of Marine Science (VIMS), and Game and Inland Fisheries.

Concerned citizens can assist in wetland protection through various activities by: attending Wetlands Board public hearings, locating and monitoring wetlands in their area, supporting wetland legislation, informing neighbors and developers of the values of wetlands, and encouraging them to minimize their impact on wetlands.

"In the beginning, wetlands were considered valueless. Only when most of the native waterfowl vanished was it determined that wetlands might ensure the survival of many endangered plants and animals. Only after billions of dollars were spent on structural flood control that resulted in further flooding were wetlands recognized for reducing flood peaks. Only after additional billions were spent to purify streams was it realized wetlands naturally filter pollutants for free." (Illinois Institute of Natural Resources)

Bibliography

Anderson, G., J. Brokaw, T. Lassen, G. Mapp, and L. D. Theberge. 1978. In: E. L. Shea and N. B. Theberge, eds. Wetland Evaluation and Management in Virginia. SRAMSOE No. 211, Virginia Institute of Marine Science, Gloucester Point, Virginia. 116 pp.

Boon, J.D. 1975. Tidal discharge asymmetry in a saltmarsh drainage system. Limnology and Ocean. 20(1):71-80.

Boto, K. G. and W. H. Patrick, Jr. 1979. Role of wetlands in the removal of suspended sediments. In: P. E. Greeson, et. al. Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 479-489.

Burke, D. G., E. J. Meyers, R. W. Tiner Jr., and H. Groman. 1988. Protecting nontidal wetlands. American Planning Association. Washington D.C.

Carter, V., M. S. Bedinger, R. P. Novitski and W. O. Wilen. 1979. In: P. E. Greeson, et al. Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 344-376.

Cerco, C. F. and A. Y. Kuo. 1979. Water quality in a small tidal creek: Parker Creek, Virginia. SRAMSOE No. 231 Virginia Institute of Marine Science, Gloucester Point, Va. 112 pp.

Dean, R. G. 1979. Effects of vegetation on shoreline erosional processes. In: P. E. Greeson, et al. Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 415-426.

Deegan, L. A., B. J. Peterson, and R. Portier. 1990. Stable isotopes and cellulase activity as evidence for detritus as a food source for juvenile Gulf menhaden. Estuaries 13:14-19.

Grant, R. R., Jr. and R. Patrick. 1970. Tinicum Marsh as a water purifier. In: Two Studies of Tinicum Marsh. The Conservation Foundation. pp. 105-123.

Hardaway, C. S., G. R. Thomas, A. W. Azcherle, and B. K. Fowler. 1984. Vegetative erosion control project: Final report 1984. Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, Virginia.

Hines, A. H., R. N. Lipcius and A. M. Haddon. 1987. Population dynamics and habitat partitioning by size, sex, and molt stage of blue crabs *Callinectes sapidus* in a subestuary of central Chesapeake Bay. Mar. Ecol. Prog. Ser. 36: 55-64.

Illinois Institute of Natural Resources, Illinois Wetlands, p. ix. Quoted in Zinn, J. A. and Copeland, C. 1982. Wetland Management. Congressional Research Service The Library of Congress, Washington D.C.

Kadlec, R. G. and J. A. Kadlec. 1979. Wetlands and water quality. In: P. E. Greeson, et al. Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 436-456.

Knutson, P. L., R. A. Brochu, W. N. Seelin, and M. Inskeep. 1982. Wave damping in *Spartina alterniflora* marshes. Wetlands 2: 87-104.

McGovern, J. C. and J. E. Onley. 1988. Potential Predation by Fish and Invertebrates on Early Life History Stages of Striped Bass in the Pamunkey River, Virginia. Transactions of the American Fisheries Society 117:152-161.

Metzgar, R. G. 1973. Wetlands in Maryland. Maryland Dept. of State Planning, Baltimore, Md.

Mitsch, W. J. and J. G. Gosselink. 1986. Wetlands. Van Nostrand Reinhold Co., New York, NY.

Motts, W. S. and R. W. Heeley. 1973. Wetlands and groundwater. In: J. S. Larson, ed. A Guide to Important Characteristics and Values of Freshwater Wetlands in the Northeast. University of Massachusetts, Water Resources Research Center. Pub. No. 31, pp. 5-8.

Niering, W. A. 1988. Endangered, threatened and rare wetland plants and animals of the continental United States. In: D. D. Hook and others, eds. The Ecology and Management of Wetlands, Vol. 1 Ecology of Wetlands. Timber Press, Portland, Oregon. p.227-238.

Rozas, L. P. and C. T. Hackney. 1984. Use of oligohaline marshes by fishes and macrofaunal crustaceans in North Carolina. Estuaries 7: 213-224.

Sloey, W. E., F. L. Spangler, and C. W. Fetter, Jr. 1978. Management of freshwater wetlands for nutrient assimilation. In: R. E. Good, et al. Freshwater Wetlands. Ecological Processes and Management Potential. Academic Press, New York. pp. 321-340.

Sweeney, J. T. 1980. Measurement and analysis of tidal marsh fluxes of oxygen demanding materials. College of William and Mary, Virginia Institute of Marine Science Master's Thesis. 122 pp.

Teal, J. and M. 1969. Life and Death of a Salt Marsh. Boston. Little, Brown, and Co. 274 pp.

Theberge, L. and D. F. Boesch. 1978. Values and management strategies for non-vegetated tidal wetlands. Special Scientific Report No. 90, Virginia Institute of Marine Science, Gloucester Point, Virginia. 55 pp.

Tiner, R. W., Jr. 1984. Wetlands of the United States: Current Status and Recent Trends. Washington, D.C.: U.S. Fish and Wildlife Service.

Tiner, R. W., Jr. 1987. Mid-Atlantic Wetlands a Disappearing Natural Treasure. Washington, D. C.: U.S. Fish and Wildlife Service.

U. S. Water Resources Council. 1978. Estimated flood damages. Appendix B., Nationwide Analysis Report. Washington, D. C.

Virginia Natural Resources Newsletter. 1989. Vol. 3.

Virginia State Water Control Board. 1979. Best Management Practices Handbook Agriculture. Planning Bulletin 316.

Wass, M. L., and T. D. Wright. 1969. Coastal wetlands of Virginia. Special Report No. 10 in Applied Marine Science and Ocean Engineering, Virginia Institute of Marine Science, Gloucester Point, Virginia.

Weinstein, M. P. 1979. Shallow marsh habitats as primary nurseries for fishes and shellfish, Cape Fear River, North Carolina. Fish. Bull. 77: 339-357.

Zacherle. A. W. 1984. A method for evaluating the long-term, cumulative impacts of tidal marsh alterations: the York River system - a case study. College of William and Mary, Virginia Institute of Marine Science Master's Thesis. 197 pp.

Zimmerman, R. J. and T. J. Minello. 1984. Densities of *Penaeus aztecus*, *Penaeus setiferus*, and other natant macrofauna in a Texas salt marsh. Estuaries 7: 421-433.

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Wetlands Program

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Technical Report

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Gloucester Point, Virginia 23062

Dr. Carl Hershner
Program Director

Commonwealth's Declared Policy:

"to preserve the wetlands and to prevent their despoliation and destruction. . ."

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Compensatory Mitigation Within the Tidal Wetlands of Virginia

Thomas A. Barnard, Jr.
and Pamela Anne Mason

Introduction

As the population in the coastal zone continues its rapid expansion, pressures increase to develop wetlands and other sensitive natural areas. One third of the nation's wetlands have been lost in the past 200 years, and presently more than 300,000 acres are lost annually (Hamon and McConnell 1983, Tiner 1984). While much of the loss of wetlands occurs naturally due to subsidence or erosion, the majority of the loss is caused by man's activities in channelization, flood control, agricultural land conversion, and dredging (Farnell 1981, Wakefield 1982). Even though it is generally recognized that wetlands have high ecological value and provide natural services such as water quality maintenance, development pressures continue due to economic factors. In Virginia the number of wetlands permit applications reviewed by the Wetlands Advisory Program, Virginia Institute of Marine Science (VIMS) has increased from 372 in 1980 to 935 in 1989.

During this same time period, both the regulatory and development communities have been looking for methods by which the adverse impacts of wetland development might be mitigated. One method which has seen increased use is that of compensatory mitigation. Generally this is the term used for the practice of constructing a new, similar wetland as compensation for one which is filled or otherwise disturbed by development activities. In theory the new wetland would serve to offset the losses incurred by the environment due to destruction of the natural wetland.

Although the theoretical value of wetlands compensation makes it very appealing and the practice has become increasingly common, it is generally the subject of controversy due to studies indicating less than successful implementation of the concept in application. Many of these studies are controversial in themselves due to the difficulty inherent in defining what constitutes a "successful" created wetland. Habitat creation is predicated on the theory that man-made systems can function on a par with natural systems. Major difficulties are encountered in determining when created wetlands reach ecological parity with the natural systems they theoretically replace. How does one measure and then compare the function and value of systems which at best are only poorly understood to begin with? Man-made wetlands are particularly poorly understood because the concept is relatively new and very little scientific information is available at present (Shisler and

(continued)

Charette 1984, Race 1985). Many plant species are slow colonizers and may take very long periods of time to attain natural densities and rates of production. In addition, the substrate changes over time as sediments and peat accumulate and different plant species invade the new wetland. During the development period, both plant production and habitat value are generally low (Thayer, *et al.* 1986). Also, many different types of wetland plant communities, many of which have no history of successful establishment, are being used as compensation with no predictable probability of long-term establishment. As a result, the validity of wetlands creation as a management tool has been questioned (Race and Christie 1982, Knutz 1987).

The appeal of compensation to developers, other landowners and the regulatory community is understandable. It can be looked upon as a form of having your cake and eating it too. If compensation works, development can occur, permits can be issued and at the same time resource loss is prevented. Some states have adopted mandatory compensation for all wetlands losses. Others have refused to rely on wetlands creation except in rare circumstances. With the adoption by many federal and state programs of the "no net loss" goal for wetlands resources, pressures will very likely increase to employ compensation as one method of achieving the objective. The overall question remains, however, as to how well created marshes restore the functional values of the resources they theoretically replace and how well the compensation concept is implemented on a day-to-day basis.

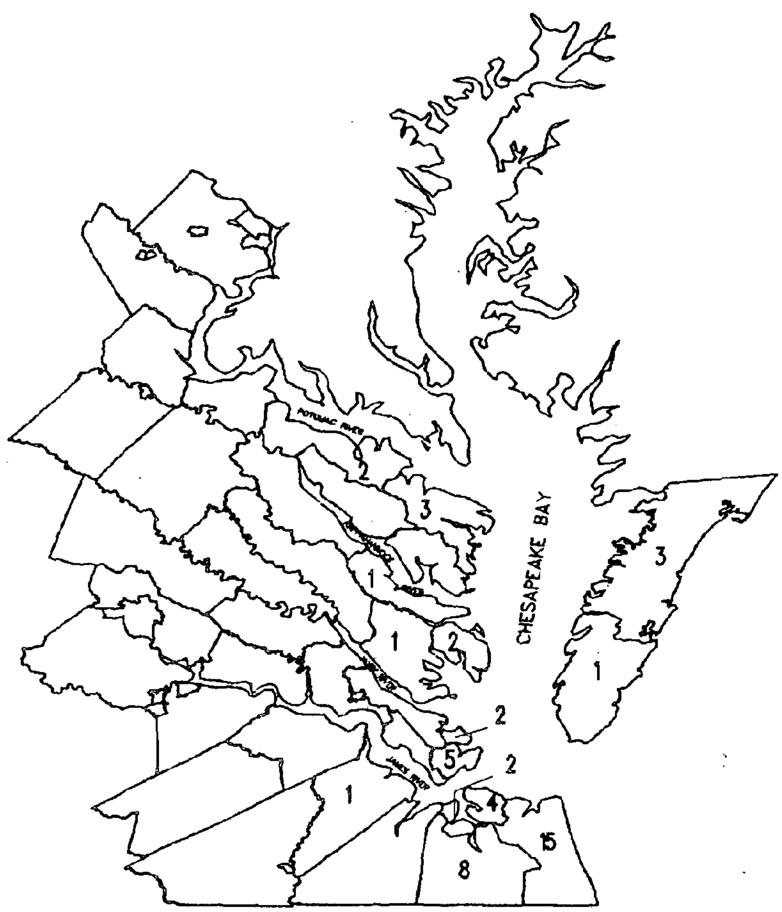
The study described herein has as its primary purpose an examination of how compensatory mitigation has worked as a wetlands management tool to date in Virginia (i.e., how well theory has been put into practice). Our approach was to look at the overall use of compensation in coastal Virginia based on regulatory records and to examine as many existing created wetlands as possible within the tidal area of the state to determine how closely these projects have come, both singly and collectively, to fulfilling the compensatory goal of wetland replacement.

Methodology and Limitations

This study is a survey of wetland compensation sites created through requirements of the permit process in Virginia. Wetlands are regulated in Virginia by a cadre of 31 local wetlands boards whose activities are overseen by the Virginia Marine Resources Commission, a state agency. The Corps of Engineers manages these same wetlands from the federal perspective. Because there is no centralized listing of marsh creation sites or agency which tracks projects as they are permitted in Virginia, each regulatory body in the state was petitioned and a list of compensation projects was generated from the responses of the 31 extant wetlands boards, the staff of the Virginia Marine Resources Commission (VMRC), personnel of the Regulatory Functions Branch of the Norfolk District of the Army Corps of Engineers (COE), and the staff of the Wetlands Advisory Program of the Virginia Institute of Marine Science, College of William and Mary.

The resulting list of potential compensation survey sites has 51 entries (Figure 1). This in-

Figure 1. Distribution of Permitted Tidal Wetland Compensation Sites in the Coastal Plain of Virginia in 1989.



clusive list was examined to determine which of the potential sites were suitable to be surveyed as part of this study. Sites eliminated were those which were too recently permitted or had had less than two years of growth. Also eliminated from sampling due to time constraints and their minimal size were 11 sites under 1,000 square feet in total area. Logistic problems, the inability to locate the site or gain access, removed 5 sites from the list. Because there is no agency tracking of compensation projects, many problems were encountered in trying to evaluate project objectives versus the outcome based on permit file data. Evaluation of a number of projects had to be eliminated or cut short for these reasons. The result was 32 sites visited.

Percent cover estimates were made at each of the compensation sites and where possible at adjacent natural sites. In highly developed areas, the compensation sites were often isolated and lacked any contiguous natural wetlands. A few sites were adjacent to natural wetlands of totally different vegetative community character. In these cases, no cover estimate was determined for a natural site. Qualitative observations were made at each site where such factors as bird use, invasion by the opportunist (*Phragmites australis*), faunal associations, etc. supplemented the cover survey information.

Results and Discussion

A total of 51 compensatory mitigation projects were identified as a result of this survey. The earliest permitted wetland compensation projects identified in our survey were two which were authorized in 1981. Although somewhat variable, the number of permits issued involving wetland compensation increased generally on an annual basis between 1981 and 1989 (Figure 2). It is not possible, given the data available, to determine whether the increase in compensation projects reflects an increase in popularity of the practice among the regulatory community or whether it is accounted for simply by the increase in the total volume of permits which also climbed steadily during the same time frame. Ten compensation permits were issued in 1988, the most for any year in our survey. The permit data for 1989, the year of the survey, were incomplete. The average number of compensation projects permitted annually since 1981 was 6.3.

Figure 2

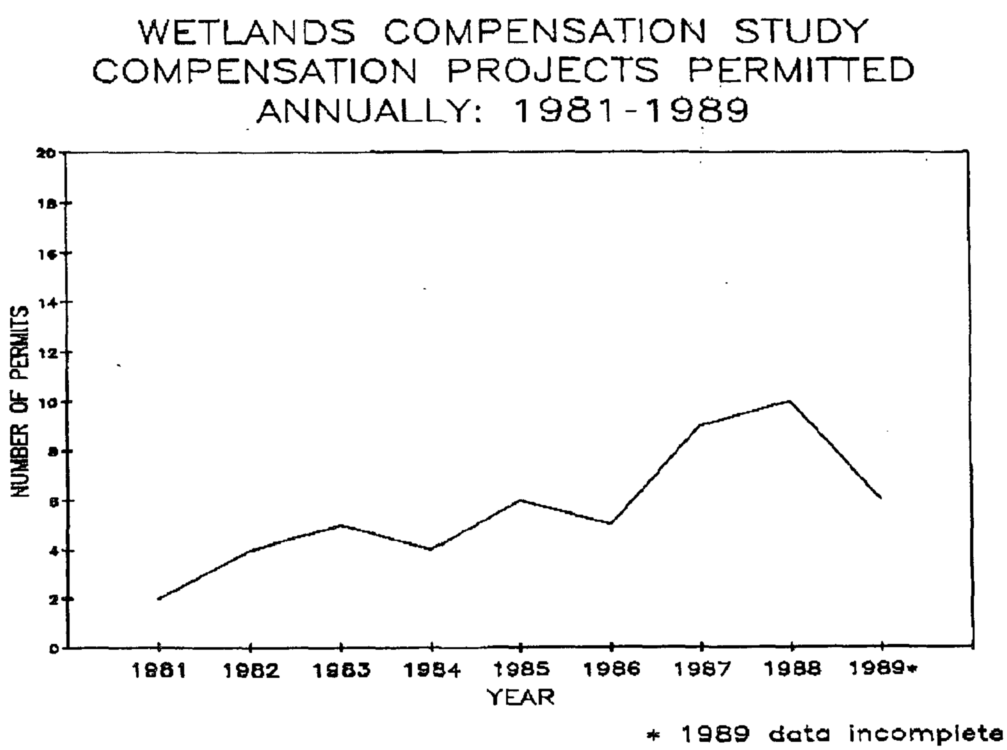
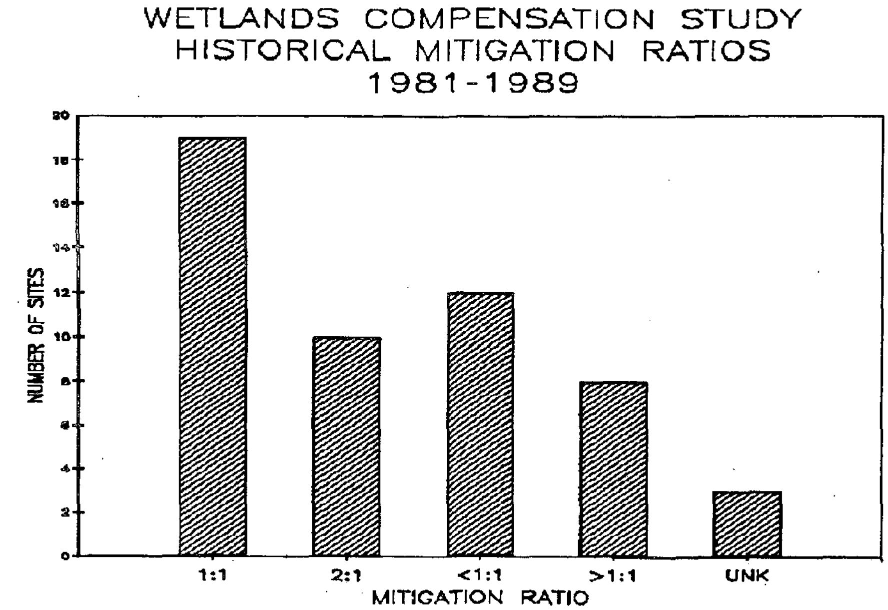


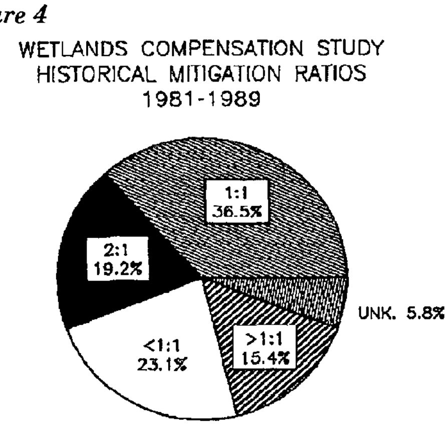
Figure 3



Since wetland compensation was first permitted for use in Virginia in 1981, a total of 32.3 acres of man-made wetlands has been ordered as compensation for projects impacting a total of 31.3 acres of aquatic habitat. The average size mitigation area permitted was 0.68 acres. If, however, the seven projects over one acre in size are deleted, the average man-made wetlands is 0.12 acres. The latter average is more indicative of the size projects generally constructed in Virginia since a total of 43 compensation projects are below one acre in size and 9 are below 1,000 square feet. The seven large projects mentioned above account for 79% of the 32.3 acre wetland compensation total.

The theoretical acreage figures for man-made vs. natural marsh, presented in the foregoing paragraph, demonstrate an overall mitigation ratio of slightly greater than 1:1. The actual numbers from permit files are shown in Figures 3 and 4. These data demonstrate that

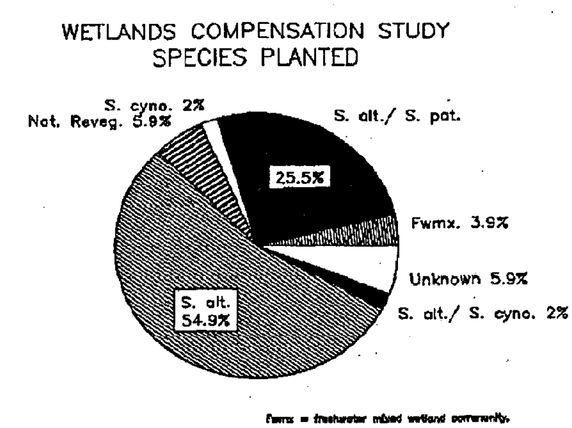
Figure 4



ratios of 1:1 or less than 1:1 were the rule and were permitted 60 percent of the time. If all projects were constructed successfully, these figures would indicate a slight gain in wetland acreage.

Smooth cordgrass, *Spartina alterniflora*, was the vegetation planted or seeded in 83 per cent of the projects permitted (Figure 5). Areas

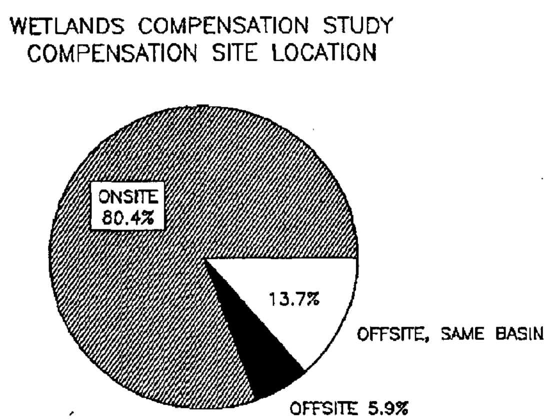
Figure 5



were permitted to naturally revegetate in only 6 percent of the permits. Since this survey only covers tidal areas and in general smooth cordgrass has the highest historical planting success rate, these figures are not surprising. The use of smooth cordgrass would also be expected since it is a vigorous plant that spreads rapidly via rhizome growth. It can be established via plugging or seeding.

Eighty percent of the permits issued requiring wetland compensation were issued for construction "onsite". "Offsite, same basin" and "offsite" accounted for the remaining twenty percent (Figure 6). If implemented as permitted,

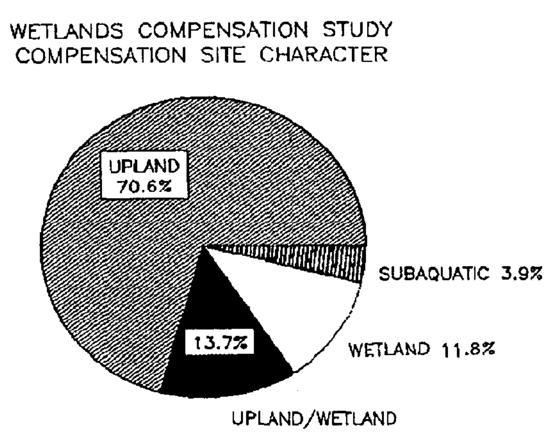
Figure 6



these figures indicate the generally accepted prioritization for these three choices of location are being followed in the tidal areas of Virginia.

Data on the general site character of areas permitted to be used for compensation are presented in Figure 7. Seventy percent of the permits issued required the grading down of uplands, while thirty percent involved the use of both upland and wetland, wetland only or the use of subaquatic habitat. These data indicate that if all projects are constructed as proposed, something less than thirty percent of the projects will involve the construction of wetlands on some type of existing marine habitat. To the extent that this occurs, it negates the compensatory aspects of these projects. The permit record data regarding site characteristics were often quite incomplete. Some of the permit files seemed to indicate that projects may have involved restoration of disturbed areas in some cases rather than purely wetland for wetland. In other cases it was clear that one marine habitat such as subaquatic bottom or higher elevation marsh was used to create a different marsh community for compensatory mitigation purposes.

Figure 7

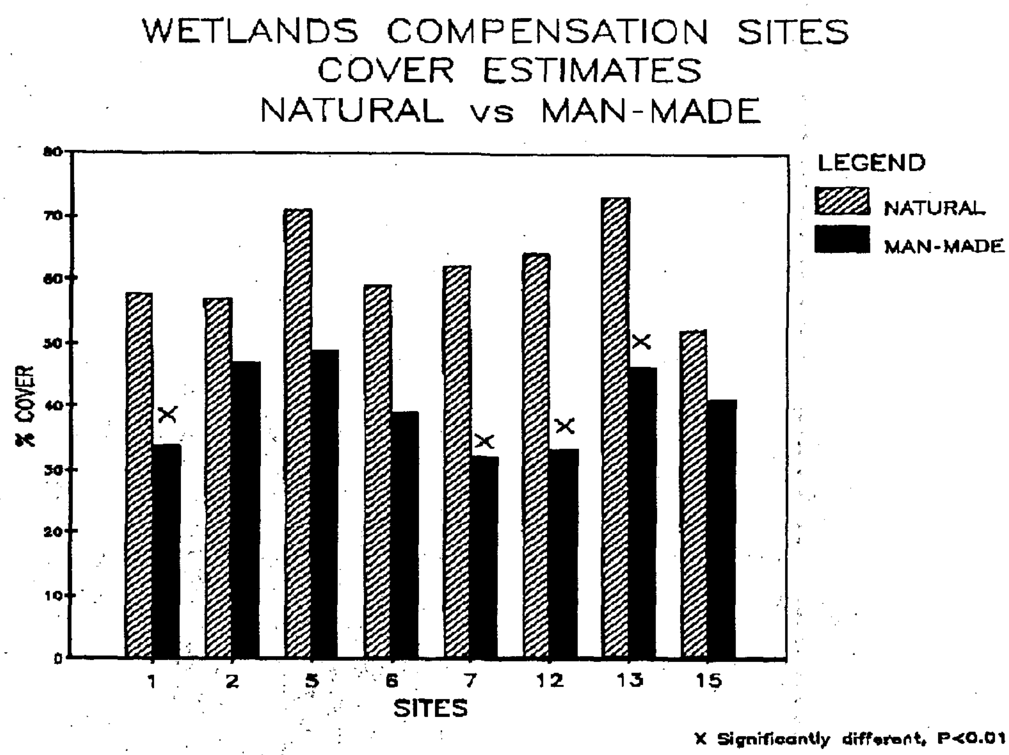


Cover estimates were made at eighteen of the compensation marshes visited. The investigators were able to sample similar adjacent marshes at eight of these sites. A total of four of the eight compensation marshes sampled had significantly lower cover than their respective adjacent natural systems (Figure 8). Slope runoff and perhaps tidal communication appeared to be the problem at two of the sites. Tidal communication and substrate elevation appeared to have adversely affected vegetation at the two other sites.

The cover data for all eighteen sites were also pooled to examine the overall differences between the man-made and natural wetlands. A significant difference was found at the 99 percent confidence level for the pooled data. The mean cover for all man-made marshes was 41 percent and that for the natural systems was 63 percent. The cover estimates noted above are an important indicator of how successful a marsh is at that particular point in time. This one parameter, however, is one indicator and not conclusive evidence of success or lack thereof. In order to say any more about the success of wetland community establishment in the man-made versus the natural marshes of this survey, destructive sampling techniques such as peak standing crop, stem density and below-ground biomass are necessary. This approach was not considered feasible for a survey of this type, dealing with many small, privately-owned marshes.

In order to further examine wetland compensation in Virginia, the authors looked at the acreages proposed to be constructed and that which was found at the sites. Two of the large compensation sites could not be accurately measured and so are not included in these numbers. For the sites visited in this survey, 709,358 sq. ft. of wetland was to be constructed. Our observations indicate that 68,792 sq. ft. either was never constructed or was generally devoid of marsh vegetation at the time of our site review. This amounts to approximately 10 percent of the total extent of the compensation

Figure 8



sites examined. If this ratio holds for all compensation within Virginia, it would mean that approximately 3.1 acres of compensation marsh is non-functional or non-existent. In addition to this factor, our survey indicates that although the exact acreages are not known, approximately 12 percent of the mitigation sites permitted in Virginia to date were on sites which were already wetlands. The compensatory value of these "wetland to wetland" areas would have to be in question.

A number of other factors were observed to be affecting the quality of some of the compensation sites examined in this survey. Several marshes were being adversely affected by sedimentation which came from unstabilized, adjacent land. Several were adversely affected by the activities which were occurring in their immediate vicinity and from which they were not buffered. In addition, 65 percent of the "new" marshes were already being invaded by the less desirable opportunist, *Phragmites australis*. The quality of the marsh as compensation for that lost to development may be diminished to the extent that this species is able to displace the wetlands species planted. This is not a measurable factor at present, however.

Conclusions and Recommendations

In overview, our survey results support the continued use of wetland compensation by the regulatory community, but only on a highly limited basis (i.e., generally as a last resort). The study documents problems with implementation of the concept in both wetland establishment success and regulatory decision-making. Our cover data and historical decision characterization indicate that adverse impacts (i.e., the net loss of wetland habitat) are probable on a local scale. If wetland compensation continues to see increasing use, these relatively small local effects could have cumulative significance. Increased planning, monitoring and research are recommended in order to effectively deal with such an eventuality. The pressures of growth in the coastal zone, and the adoption of "No Net Loss" policies almost ensure more pressure for compensatory mitigation in the future. These recommendations along with the newly promulgated "Wetland Compensation Guidelines" should address the concerns brought out by this study.

Wetland compensation has had a relatively limited role in tidal Virginia to date. Based on the results of our survey, 32.3 acres of tidal wetlands have been proposed for creation since 1981 (the earliest application year identified). This eight-year acreage total is dwarfed by the 215,000 acre total for tidal wetlands in Virginia and is a relatively small proportion of permitted wetland losses of approximately twenty acres annually (VIMS' Wetlands Advisory Program, unpublished data). Our data indicate a slowly increasing use of compensation as a management tool. In terms of project numbers, wetland compensation in Virginia is dominated by small projects. In terms of wetland acreage, however, seven projects over one acre in size compose 79 percent of the 32.3 acre wetland compensation total.

Our research indicates that 10 percent of this total was not constructed or has been adversely affected by other external factors to the point that it is not viable wetland. Additionally, the man-made compensation marshes exhibited significantly lower vegetative cover than the natural wetlands sampled. These results indicate that even though the planned overall mitigation ratio within Virginia is slightly greater than 1:1, the effective ratio in terms of successful marsh establishment may be significantly less than that envisioned by the permitting agencies. If in practice anthropogenic wetlands are significantly less productive and in some cases never establish as planned, we may be in a sense mortgaging our wetland future.

Our study indicates that, in general, state regulators are using compensation on a conservative basis. Record keeping is highly variable and much of the permit information available is maintained at different locations within the regulatory community. There is much information that is apparently not available due to the fact that there are no standard record-keeping practices for compensation projects. In addition, there is some indication that monitoring and follow-up are being employed on a limited basis, although this effort appears to have little consistency. Most of the follow-up which does occur appears to be at the behest of the federal regulatory authority.

If wetland compensation continues to be used as a management tool or sees increasing use, as our survey indicates is happening, steps should be taken to ensure that the compensation wetlands are constructed in a manner which will ensure that they mature, in both structural and functional aspects, into wetlands similar to existing natural systems. Based on our survey of permit records, our ten years of field experience, and the field surveys conducted as part of this study, we offer the following recommendations:

- Record-keeping for compensatory mitigation projects should be improved through consolidation and standardization. A centralized record repository is needed.

- All projects should have post-construction inspections and selected projects should be monitored for viability and ecological function. The monitoring should include similar, adjacent natural systems where possible.

- Regulatory agencies should give greater consideration to the siting and buffering of wetland compensation areas during permit review. The aim should be to minimize the impacts to the wetland from adjacent physical features (i.e., sediment erosion and deposition), and from adjacent activities such as farming and development.

- More attention should also be directed to other planning aspects such as tidal hydrology and substrate elevation. Slow-spreading species such as *Spartina cynosuroides* should generally not be planted or should be mixed with faster growing species such as *Scirpus robustus* and *Spartina alterniflora*.

- *Phragmites australis* should be studied to determine its impact on created marshes and how best to naturally control it if this is deemed necessary.

- Wetland compensation should take into consideration regional wetland management needs through the use of comprehensive shoreline inventories or other information systems.

- Basic research aimed at increasing our knowledge of the values, structure and function of both anthropogenic and natural wetland systems should be continued.

- Long-term monitoring of man-made wetlands should be initiated in order to establish what the realistic time tables are for these systems to reach ecological parity with similar natural communities. These efforts should involve multiparameter investigations as well as structurally diverse wetland types.

Literature Cited

Farnell, S. 1981. Legal options for wetland management, p. 237-248. In: Proceedings of the Seventh Annual Conference of the Coastal Society. October 11-14, 1981. Galveston, Texas.

Hamon, K. W. and C. A. McConnell. 1983. The politics of wetlands conservation: a wildlife view. *J. Soil and Water Cons.* 2:93-95.

Knutz, G. 1987. Offsite habitat mitigation banking: the Port of Long Beach experience, pp. 2530-2543. In: O. T. Magoon, H. Converse, D. Miner, L. T. Tobin, D. Clark and G. Domurat (eds.), *Coastal Zone '87* Proceedings of the fifth symposium on coastal and ocean management. May 26-29. Seattle, Washington.

Race, M. S. 1985. Critique of present wetlands mitigation policies in the United States based on an analysis of past restoration projects in San Francisco Bay. *Environ. Manage.* 9(1):71-82.

Race, M. S. and D. R. Christie. 1982. Coastal zone development: mitigation, marsh creation and decision-making. *Environ. Manage.* 6(4):317-328.

Shisler, J. K. and D. J. Charette. 1984. Evaluation of artificial salt marshes in New Jersey. New Jersey Agricultural Experiment Station Publication No. P-40502-01-84. 169 p. Rutgers University, New Brunswick, N.J.

Thayer, G. W., M. S. Fonseca and W. J. Kenworthy. 1986. Wetland mitigation and restoration in the Southeast United States and two lessons from seagrass mitigation, pp. 95-117. In: *The Estuarine Management Practice Symposium.* Nov. 12-13, 1985. Baton Rouge, Louisiana.

Tiner, R. W., Jr. 1984. Wetlands of the United States: current status and recent trends. U.S. Fish and Wildlife Service, Washington, D.C. 59 p.

Wakefield, P. 1982. Reducing the federal role in wetlands protection. *Environment* 24:6-13, 30-33.

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Dr. Carl Hershner, Program Director
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Dianne Bowers, Artwork

Commonwealth's Declared Policy:

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Primary Producers and Decomposers of Intertidal Flats

Maryann Wohlgemuth

Intertidal flats are those coastal wetlands characterized by unconsolidated sediments located between mean high water and mean low water. The sediments may be composed of sand, mud, organic substrates, gravel, or shell. Mud and sand flats are often perceived as unproductive and unimportant areas adjacent to vegetated marshes. These areas may appear to be nonvegetated because of the absence of the more conspicuous marsh grasses or other emergent plants. However, tidal flats are vegetated with numerous species of algae, both large (macroalgae) and small (microalgae). Intertidal mudflats may be recognized at low tide as those mucky areas, difficult to walk through and smelling like rotten eggs. Sandflats are generally easier to walk across, and may be good areas to collect clams, oysters, crabs, or worms for fishing.

The organisms and processes that occur on intertidal flats provide an essential component in the balance of the estuarine ecosystem. The next few pages present a sketch of some of the complex processes and fascinating organisms that occur on intertidal flats.

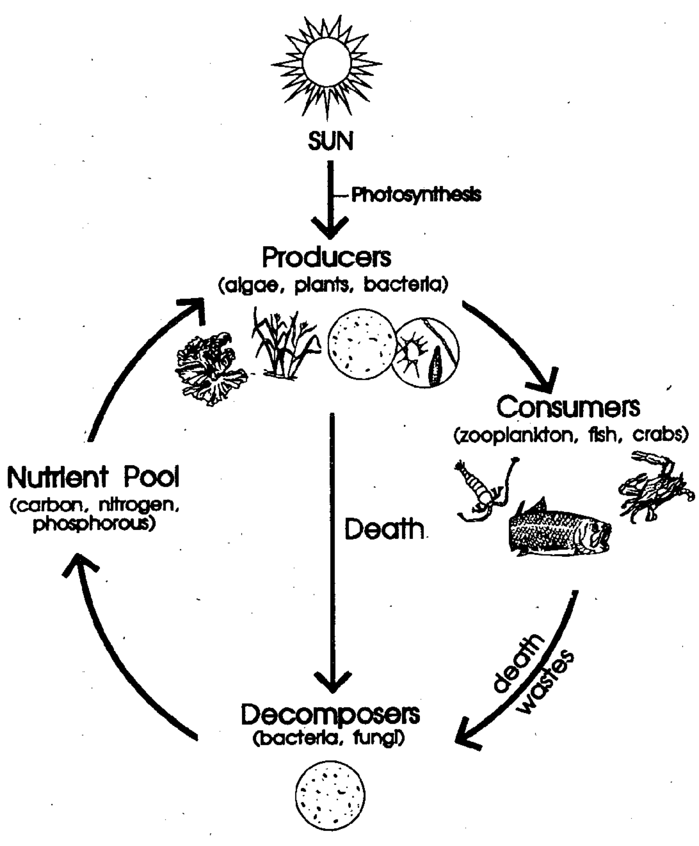
General Ecological Concepts

Energy from the sun provides the initial power source that fuels ecosystem growth processes. Through the process of photosynthesis, plants utilize the sun's energy to convert atmospheric carbon dioxide and water to oxygen and organic matter in the form of plant tissue. As a result of this process, plants such as algae, grass, and trees are recognized as the primary producers of ecosystems. They produce the initial form of edible organic material upon which all living things depend. Many types of bacteria are also primary producers. Some are photosynthetic, using the energy from the sun to make organic matter, while others are chemosynthetic, using energy from chemical compounds.

(continued)

Basic food and energy processes cycle nutrients and energy through producers, consumers and decomposers. Primary consumers (herbivores), such as crabs or fish consume the producers (plants). Secondary consumers, including larger fish, birds, or people feed upon the primary consumers. Decomposers, the bacteria and fungi, obtain their nutrition from degrading dead plant and animal biomass. As they break down organic matter they remineralize constituent nutrients including, carbon, nitrogen, and phosphorous. Remineralization is the process of breaking up the organic biomass into the components from which it was synthesized, the simple minerals (inorganic). These become the raw materials or nutrient pool available to green plants for reuse in primary production of food. Decomposers are therefore an essential link in the recycling of nutrients in all ecosystems (Figure 1). "Life on earth would die out far faster if bacteria became extinct than if the animals, plants, and fungi disappeared" (Margulis, 1982).

Figure 1. Food and energy cycling in an ecosystem.



Primary Producers of Intertidal Flats

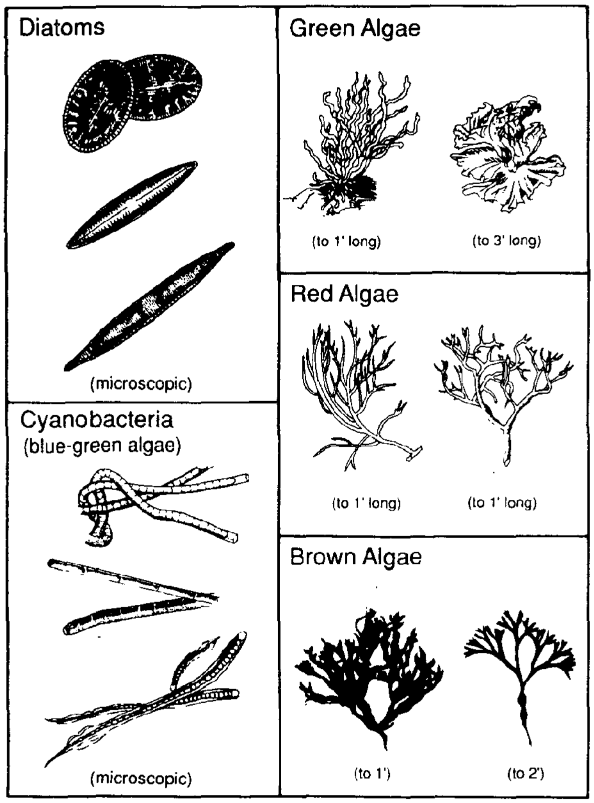
The primary producers on the mud and sand flats include: microalgae such as diatoms, cyanobacteria (blue-green algae), bacteria, and macroalgae (Figure 2). Algae found living on mud and sand flats are referred to as benthic algae to describe their mode of living on the bottom. Though these plants may not be as conspicuous as the easily observed marsh grasses, they are important to the aquatic system for several reasons. They produce an invaluable food source, play an essential role in nutrient cycling, and provide oxygen to the water column.

The organic material produced by benthic algae remains within the aquatic system where it can be utilized as a food source. Similarly, the oxygen produced by benthic algae stays within the aquatic environment. Whereas emergent marsh plants may be utilized as a food source in terrestrial systems; and the oxygen they produce is released to the atmosphere. The organic material produced by algae supplies food for many animals including snails, crabs, clams, and a variety of fish (Figure 3). Microalgae and cyanobacteria are especially important in nutrient cycling because of their fast turnover rate and because they are productive throughout the year. Annual turnover rate is the number of times an organism replaces or reproduces itself in a year.

Microalgae

The microalgae community of intertidal flats is generally dominated by diatoms. Diatoms are single cell organisms that are often observed in dense colonies. Other microalgae observed seasonally include single cell phytoplankton (free-floating plants), such as green algae, dinoflagellates,

Figure 2. Primary producers of intertidal flats.



and other planktonic flagellates (Lippson et al., 1979; Pomeroy, 1959).

Microalgae range from unicellular forms to larger colonial or filamentous forms. Diatoms may be found as solitary cells or attached together in dense colonies. Diatom densities may be up to 40 million per square centimeter (about the size of a postage stamp) (Valiela, 1984). At low tide, microalgae communities growing on tidal flats appear as a discoloration on the sediment surface. Diatoms may appear as a brownish film or gelatinous skin.

Microalgae are valuable to the estuarine ecosystem because they have a high annual productivity, fast turnover, provide a readily utilizable food source and oxygenate the water column (Diaz et al., 1982). Annual productivity of microalgae in a Delaware salt marsh was reported to be approximately a third of the salt marsh production (Gallagher and Daiber, 1974). Unlike emergent marsh plants, microalgae grow in winter as well as summer providing an important winter food source when other plants are dormant.

Diatoms have optimal reproduction rates in the range of 0.5 to 6 doublings per day (Eppley, 1977) resulting in annual turnovers of 182 - 2190 times. Optimal rates may occur when nutrients, light, temperature or other environmental parameters are not limiting. These reproduction rates are appreciable considering that vascular marsh plants, like saltmarsh cordgrass, may only turn over 1 - 2 times per year. This high turnover rate contributes to the high production rate of microalgae. Even though microalgae are small, their annual production may be significant because they reproduce many times during the year. To estimate annual production, biomass from each turnover is summed. The rapid turnover rate of algae also utilizes and recycles nutrients at a high rate.

Microalgae are composed of relatively simple structural materials which provide a readily utilizable food source. Unlike most marsh plants that die and decay before being consumed, microalgae can be consumed directly. Algae are also valued in their ability to oxygenate the water column. Photosynthesis by benthic algae releases oxygen directly into the overlying water, which can result in a significant contribution to dissolved oxygen concentrations. Patrick (1976) reports that unicellular algae are much more efficient oxygenators of water than the more complex emergent marsh plants.

Cyanobacteria

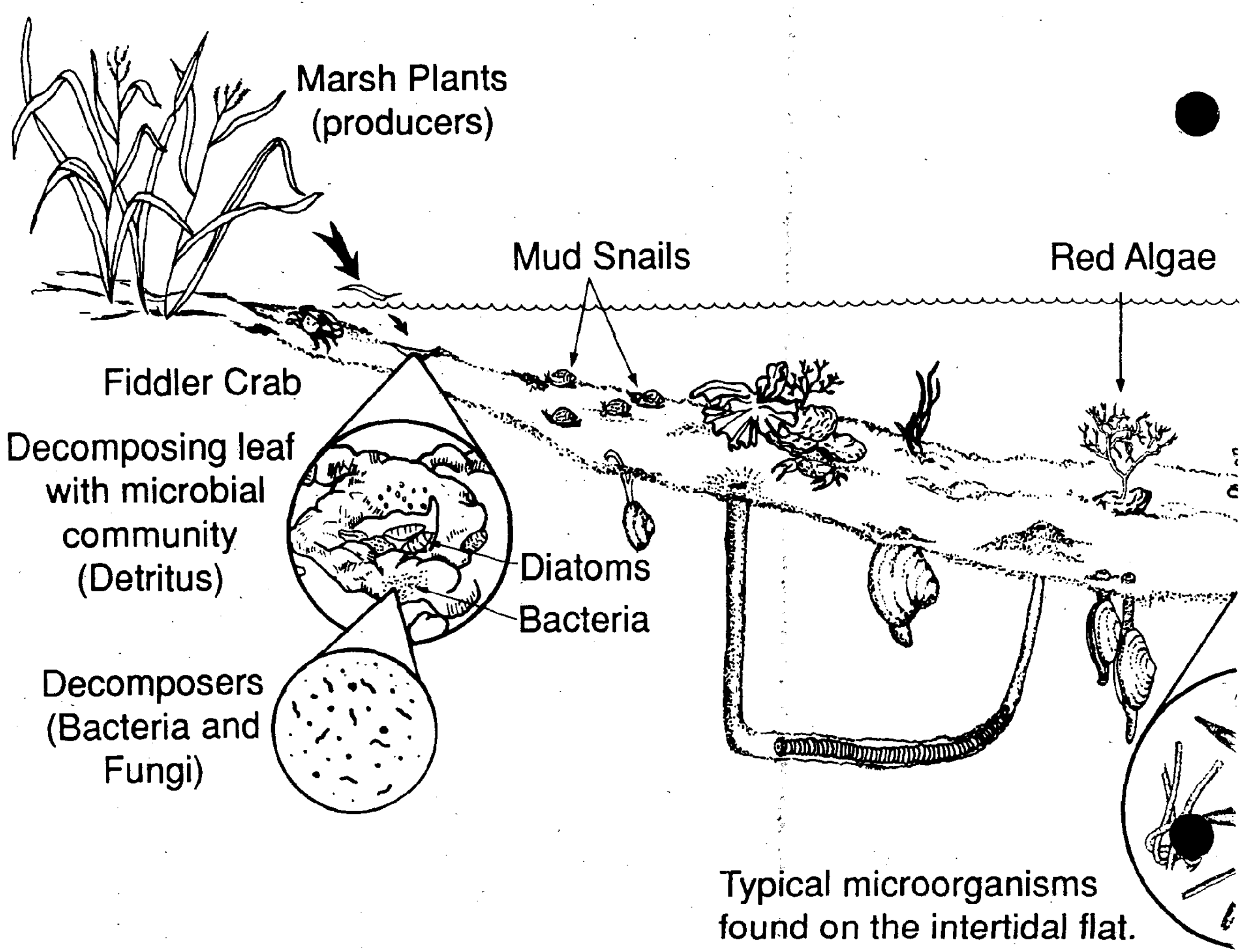
The resemblance of blue-green algae to photosynthetic bacteria resulted in the name change to cyanobacteria (Margulis, 1982). Similar to the microalgae, cyanobacteria are valued for their high annual productivity, rapid turnover rate, readily utilizable food source, and oxygen production. The structure of cyanobacteria is typically a filament or chain of cells. Dense assemblages of filaments appear on intertidal flats as a greenish tinge or thick gelatinous mass. Margulis (1982) reports that cyanobacteria are credited with providing primordial earth with the necessary oxygen concentrations for the evolution of animals and plants. Approximately two billion years ago cyanobacteria increased the atmospheric oxygen concentration from less than 1 percent to about 20 percent (Margulis, 1982).

Macroalgae

Common benthic macroalgae found in Virginia include the green algae (Chlorophyta), red algae (Rhodophyta), and brown algae (Phaeophyta) (Humm, 1979). Macroalgae are commonly referred to as seaweed, and may be found washed up on sandy beaches. A common green algae is sea lettuce which looks similar to the leaves of lettuce. Other examples of structural forms are shown in Figure 2. Macroalgae are most common on intertidal sand flats or attached to rocks, shell, or logs on sand or mud flats. Macroalgae can be distinguished from submerged aquatic plants or other plants by the absence of vascular tissue. Vascular tissue is the circulatory system of plants, transporting water, food, and wastes.

Bacteria

Chemosynthetic and photosynthetic bacteria are also primary producers, using chemical energy or the suns energy to produce organic material. These bacteria are very important in anaerobic (without oxygen) environments such as mudflats. High rates of production by chemosynthetic and photosynthetic bacteria occur in the anoxic zone of the sediment in the intertidal flats (Valiela, 1984). Here they recycle the energy and nutrients that are tied up in organic matter buried in sediments. Margulis (1982) states that bacterial photosynthesis and



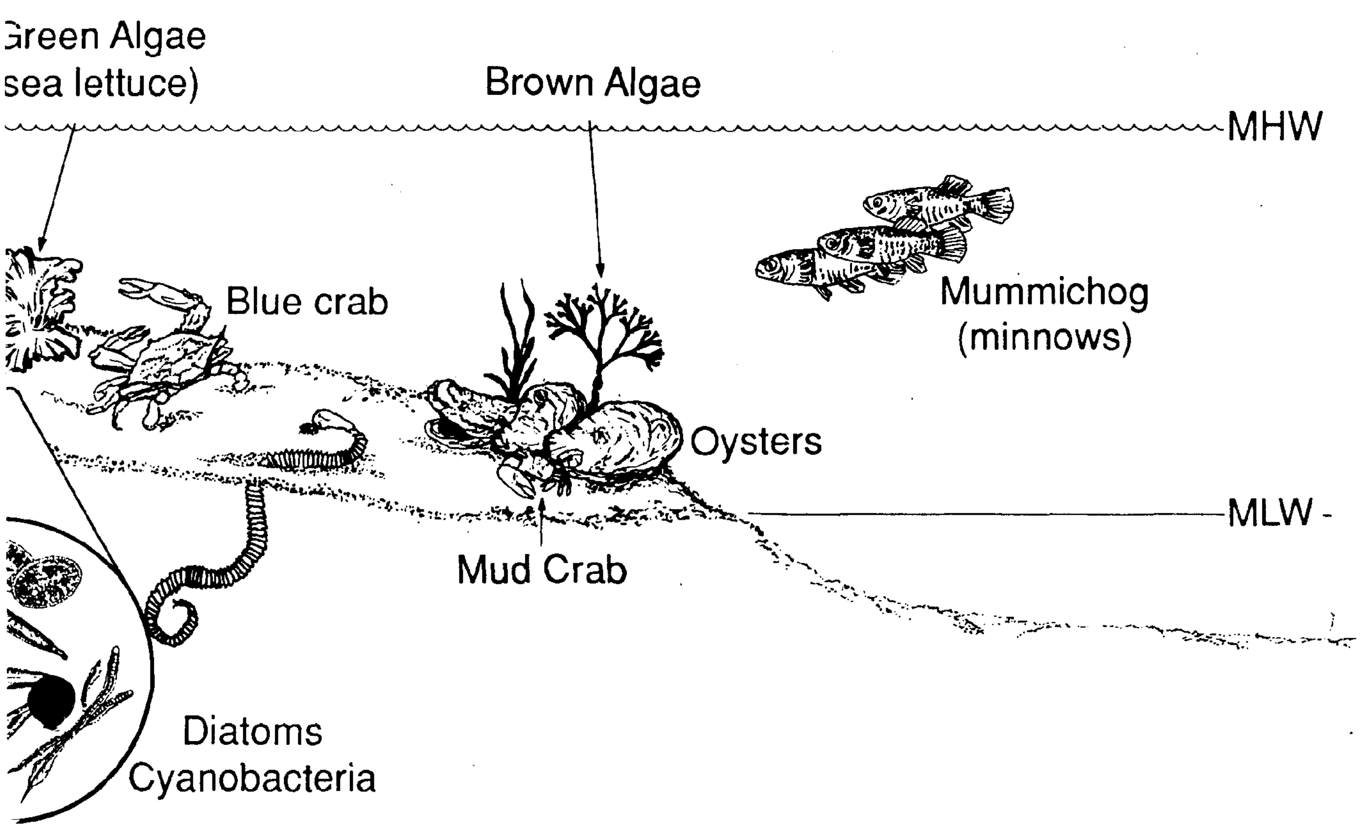
chemosynthesis are essential for cycling the elements and compounds which are fundamental to the survival of the entire biosphere and ourselves. Bacteria are fed upon by microscopic animals which are fed upon by larger animals, thus providing the base of a food web. Larger animals also feed on bacteria by straining them out of the water column or scraping them from sediment or detrital particles.

Decomposers

Tidal flat sediments are important sites for converting complex plant and animal tissue into more utilizable food sources and for remineralizing nutrients. The organisms responsible for decomposition are the bacteria and fungi. The density of bacterial cells is often so great they may form a bacterial film which can be observed as a green or purple tinge on the sediment surface. Decomposers obtain their nutrition by breaking down dead plant and animal matter. Plant and animal tissues in various stages of decay are referred to as detritus, which is a valuable food source for many marine organisms.

Vegetated wetlands, such as the familiar saltmarsh cordgrass wetlands, would be of far less value without the action of decomposers. Only minimal amounts of marsh vegetation are directly grazed upon by herbivores. The majority, 95 percent, of the organic material produced in marshes is consumed as detritus (Patrick, 1976). The action of decomposers allows the large amounts of organic tissue produced in marshes to be degraded into a usable food source which would otherwise be useless to the aquatic food web. Furthermore, the nutrients bound in organic matter would be lost

Figure 3. *Mudflat composed of detritus and fine sediments covered with a film of diatoms and bacteria, supports detrital food web.*



from the ecosystem and not recycled without bacterial decomposition (Theberge and Boesch, 1978).

Intertidal flats provide an environment for decomposers to degrade organic material produced in adjacent vegetated wetlands into detritus. The microbial community on the intertidal flats play an important role in transferring the plant material produced in vegetated wetlands to a variety of estuarine consumers. As the microbes break down organic matter into detritus and colonize it, they provide a food web base for the estuarine ecosystem. The food source and nutrients made available by the decomposers provide a stable and constant supply throughout the year, which may be especially important when plants are dormant and nutrient levels low.

Remineralization of nutrients by bacteria is a critical pathway in recycling nutrients in all ecosystems. As organic tissues are degraded, remineralized nutrients such as carbon, nitrogen, phosphorous, and sulphur are released. Bacterial decomposition releases sulphur as hydrogen sulphide gas which gives off the rotten egg smell in salt marshes. The benthic microbial community decomposes the available organic matter resulting in a continuous recycling of nutrients between the bottom and the overlying water. The cycling of elements within detritus, sediments and the water column are due largely to the metabolic activities of bacteria (Parsons et al., 1984). Nutrient fluxes across the sediment water interface are important to the primary producers in summer when water column nutrients are low (Nixon et al., 1976).

Bacterial cells have a fast turnover rate similar to the microalgae. They may undergo cell division every 20 minutes under the most optimum conditions and their biomass may increase 5 - 6 times in 24 hours (Zhukova, 1963). Some bacteria are adapted to live below the surface of the sediments where oxygen is absent. Much of the decomposition, production, and nutrient recycling by bacteria is accomplished in the oxygen poor environment below surface sediments.

Detritus

Detritus is a simple word for a complex of decaying organic material and a dense community of microscopic organisms. One gram of detritus may contain up to 5 billion cells of bacteria (Zhukova, 1963). As plant or animal tissue is broken down by bacteria the fragmented parts are readily colonized by microorganisms such as diatoms, bacteria, fungi, ciliates, and flagellates. These organisms are single cell or colonial in structure and provide a protein rich food source for detrital feeding organisms (detritivores) (Bott, 1976). The ciliates and flagellates graze on the bacteria and fungi while this entire microbial community is grazed upon by larger animals. These feeding pathways are part of the detrital food web. The detritivores actually feed on the microorganisms skimmed from the nonliving organic debris (Levinton, 1982). The term 'gardening' has been used to describe this feeding process (Parsons et al., 1984). As the detrital particles pass through the gut of a detritus feeder, microbes are digested while the majority of the plant tissues pass through the gut without being assimilated. The microbe-rich organic matter passing through the gut is further fragmented. The higher surface area to volume ratio of the fragmented particles can then support a larger microbial community. Detrital particles can be seen as a reusable carrier of food as well as a food source.

Detritivores may be either deposit feeders or filter feeders. Deposit feeders ingest sedimentary deposits and assimilate the microbes, composed of bacteria, microalgae, and fungi. Filter feeders consume particles suspended in the water column using a variety of sievelike devices. Examples of filter feeders are clams and barnacles; while worms, fish, and crabs that consume benthic detritus are considered deposit feeders.

In summary, decomposers unlock the organic food source found in dead plants and animals by breaking them down into detritus, a readily utilizable food source. By colonizing the dead material they also provide an additional highly nutritious food source. Microbes create detritus and provide an integral detrital food component as well. They further provide a critical link in nutrient cycling through remineralization of organic material.

Regulation of Intertidal Flats

In 1982 the Virginia General Assembly amended the Wetlands Act of 1972 to include regulation of the intertidal mud and sand flats, or nonvegetated wetlands. These areas are defined as those coastal environments that occur between mean low water and mean high water. The Virginia Marine Resources Commission (VMRC) was given the responsibility as lead state agency. Under the Act's local option alternative most localities have adopted the model ordinance and administer wetlands management through local wetlands boards and ordinances. Federal wetland regulation under the Clean Water Act is administered by the U.S. Army Corps of Engineers (Corps) and overseen by the U.S. Environmental Protection Agency (EPA). The Corps and the VMRC have developed a joint permit application that is used by the local, state, and federal regulatory authorities to streamline the permit process. The Commonwealth has compiled a set of Wetland Guidelines which describe tidal wetland types, their values, and methods of coastal construction that minimize wetland impacts. These guidelines can be used to assist applicants when filling out the joint permit application. Other state and federal agencies that may comment on tidal wetland applications during the joint permit review include: the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, Council on the Environment, the State Department of Health, State Water Control Board, Shoreline Erosion Advisory Service, and Virginia Department of Game and Inland Fisheries.

Intertidal flats are still being lost at a significant rate. The majority of tidal wetlands permitted to be impacted in Virginia have been intertidal flats; 79 percent in 1988 and 73 percent in 1989 (Havens, personal communication).

Concerned citizens can assist in wetland protection through various activities by: attending Wetlands Board public hearings, locating and monitoring wetlands in their area, supporting wetland legislation, informing neighbors and developers of the values of intertidal flats, and encouraging them to minimize their impact on wetlands.

Suggested Reading

For a description of the types of animals that feed on the algae and bacteria of intertidal mud and sand flats see the Wetlands Program Technical Report No. 90-1.

The *Marine Algae of Virginia*, by H. J. Humm, presents a description of the cyanobacteria and the macroalgae identified in Virginia.

Literature Cited

Bott, T. L. 1976. Nutrient Cycles in Natural Systems: Microbial Involvement. In: Biological Control of Water Pollution. J. Tourbier and R.W. Pierson, Jr. (eds.) Univ. of Pennsylvania Press. pp. 41-52.

Diaz, R.J. (ed.), R.J. Orth, G. Markwith, W. Rizzo, R. Wetzel, and K. Storey. 1982. Examination of Tidal Flats: Vol. 2, A Review of Identified Values. U.S. Department of Transportation, 47 pp.

Eppley, R.W. 1977. The growth and culture of diatoms. In: The Biology of Diatoms, D. Werner (ed.), Oxford, U.K.: Blackwell Scientific Publications. pp. 24-64.

Gallagher, J.L. and F.C. Daiber. 1974. Primary production of edaphic algal communities in a Delaware salt marsh. Limnol. Oceanogr. 19: 310-395.

Humm, H. J. 1979. The Marine Algae of Virginia. The University Press of Virginia, 263 pp.

Levinton, Jeffrey S. 1982. Marine Ecology. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 526 pp.

Lippson, A. J., M.S. Haire, A.F. Holland, F. Jacobs, J. Jensen, R.L. Moran-Johnson, T.T. Polgar, and W.A. Richkus. 1979. Phytoplankton and Other Algae. In: Environmental Atlas of the Potomac Estuary.

Cambridge University, New York, NY, pp. 74-83.

Margulis, L., and K.V. Schwartz. 1982. Five Kingdoms: An Illustrated Guide to the Phyla of Life on Earth. W.H. Freeman and Company, San Francisco.

Nixon, S.W., C.W. Oviatt, and S.S. Hale. 1976. Nitrogen regeneration and the metabolism of coastal marine bottom communities. In: The Role of Terrestrial and Aquatic Organisms in Decomposition Processes, J.M. Anderson and A. MacFadyen (eds.), Oxford, U.K.: Blackwell Scientific Publications. pp. 269-283.

Parsons, T.R., M. Takahashi, and B. Hargrove. 1984. Biological Oceanographic Processes, Third Edition. Pergamon Press, New York, NY, 330 pp.

Patrick, R. 1976. The Role of Aquatic Plants in Aquatic Ecosystems. In: Biological Control of Water Pollution. J. Tourbier and R.W. Pierson, Jr. (eds.) University of Pennsylvania Press. pp. 53-59.

Pomeroy, L.R. 1959. Algal productivity in salt marshes of Georgia. Limnol. Oceanogr. 4: 386-397.

Theberge, L., and D.F. Boesch. 1978. Values And Management Strategies For Non-vegetated Tidal Wetlands. 55 pp.

Valiela, I. 1984. Marine Ecological Processes. Springer-Verlag, New York, NY, 546 pp.

Zhukova, A.I. 1963. On the quantitative significance of microorganisms in nutrition of aquatic invertebrates. In: Marine microbiology. C.H. Oppenheimer (ed.). C.C. Thomas Publisher, Illinois. pp. 699-710.

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Nontidal Wetland Functions And Values

Maryann Wohlgemuth

Introduction

Approximately 750,000 acres or 85% of Virginia's wetlands are nontidal (Odum, 1988). Nontidal wetlands include marshes, swamps, bogs, and low-lying areas along the margins of rivers, streams and lakes. They can also be found in isolated upland depressions or areas where the water table stays near the land surface (Figure 1). They are characterized by wet soils and by plants that are adapted to grow in the wet conditions. Vegetation found in nontidal wetlands may include grasses, herbaceous plants (non-woody), shrubs, and trees. They are not influenced by daily tides like tidal wetlands. Nontidal and tidal wetlands share many of the same values and both are important in maintaining the health of the Chesapeake Bay and its living resources.

Nontidal Wetland Types

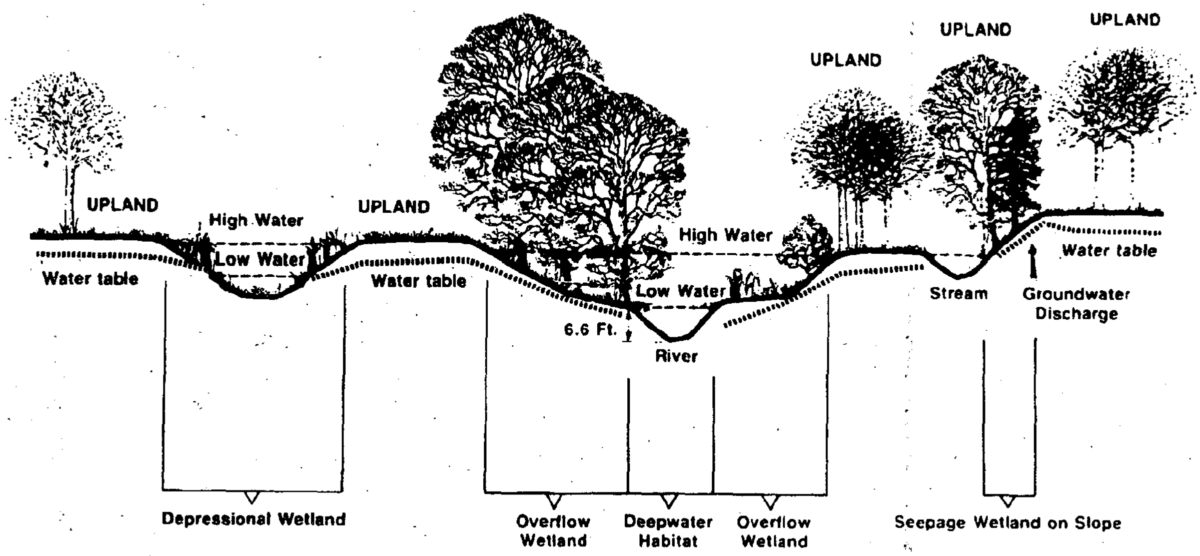
Forested, palustrine emergent, and lacustrine are the most prevalent types of nontidal wetlands in Virginia (Odum, 1988). Forested wetlands are the most extensive including bottomland hardwood forests, riparian wetlands, and bottomland hardwood swamps. Forested wetlands can occur as broad flood plains along rivers, as fringes along streams, or in upland depressions. Trees common to forested wetlands in Virginia include red maple, green ash, black gum, sweet gum, American elm, river birch, black willow, loblolly pine and alder (Odum, 1988). Palustrine emergent wetlands occupy depressions, ditches or stream banks and are characterized by emergent herbaceous plants such as sedges, rushes, and grasses. Cattails are a familiar plant found in these wetlands. Lacustrine wetlands are found along shorelines of lakes and are identified by grasses, sedges, rushes, shrubs, and trees. Other nontidal wetlands in Virginia include scrub-shrub wetlands, bogs, fens, and interdune swale wetlands (Odum, 1988).

Wetland Values

Ecological processes are usually described by function, such as wildlife habitat support. The further classification of a function by its value connotes usefulness to humans. The location of the wetland, the human population pressures on it, or the extent of the wetland may indicate the value of a functional ecologic process (Mitsch and Gosselink, 1986). For example, wildlife habitat may be important to humans because it provides wildlife for hunting, or

(continued)

Figure 1. Schematic diagram showing wetlands, deepwater habitats, and uplands on landscape. Note differences in wetlands due to hydrology and topographic location (adapted from Tiner, 1984).



nature study. Wetlands provide many ecological and socio-economic benefits including water quality improvement, stormwater treatment, food sources, fish and wildlife habitat, shoreline erosion control, flood protection, potable water supplies, economic resources such as timber, and recreation. Wetlands have traditionally been considered unproductive wastelands, which has lead to their elimination by artificial draining or filling. This view has changed significantly as the connection between wetlands, wildlife, water quality, and other ecological and economic values have been studied. Hunters, fishermen, trappers, and loggers have always benefited from the abundant supply of mammals, fish, waterfowl, and lumber.

Nontidal Wetland Values to the Chesapeake Bay

In considering the values of nontidal wetlands, it is important to understand the coupling of wetlands with adjacent ecosystems, such as streams, rivers, lakes, bays, uplands, and floodplains. Of particular concern is the function Virginia's nontidal wetlands may play in protecting the water quality of the Chesapeake Bay. The entire Bay watershed should be considered in evaluating the cumulative function of nontidal wetlands (Figure 2). A ***watershed*** can be defined as all the area that drains by surface or subsurface flow into the water body being considered (Figure 3). The Chesapeake Bay watershed extends north through parts of New York State and west to the Appalachian mountains covering approximately 64,000 square miles (Chesapeake Bay Program, 1983). Any substance that is added to the land or the waters within this area has the potential to impact the water quality and ecology of the Bay system. For example, agricultural or lawn fertilizers applied in western Virginia or New York have the potential to impact the Bay either through surface flow or groundwater flow (Figure 3). Nontidal wetlands throughout this watershed have the potential to improve or maintain many ecological values in waters flowing toward the Bay, especially water quality.

Nontidal wetlands are diverse and cover a wide range of habitats. Because they do not all provide the same values or functions, generally it is difficult to determine the functions a wetland provides without site specific analysis. Variables to consider in assessing the functional values of a wetland may include: wetland type, soil characteristics, hydrology, size, and surrounding upland land use. This report gives an overview of nontidal wetland functions and values.

Water Quality

Located at the interface between terrestrial and aquatic systems, wetlands often intercept pollutants and nutrients in upland runoff before they reach an adjacent waterway (Figure 4). Substances that can affect water quality include nutrients, dissolved gases, heavy metals, pesticides, pathogens, and industrial wastes. The nutrients of most importance in wetland and aquatic systems are nitrogen and phosphorous. In excessive quantities, they can cause nuisance algal blooms and subsequent low oxygen levels; however, they are essential for growth of wetland plants. Dissolved oxygen is produced by plants and is necessary for aquatic animals to survive. The processes occurring in wetland systems that impact water quality are plant uptake and cycling, filtering, sedimentation, reduction in shoreline erosion, soil adsorption, and soil microbial activity.

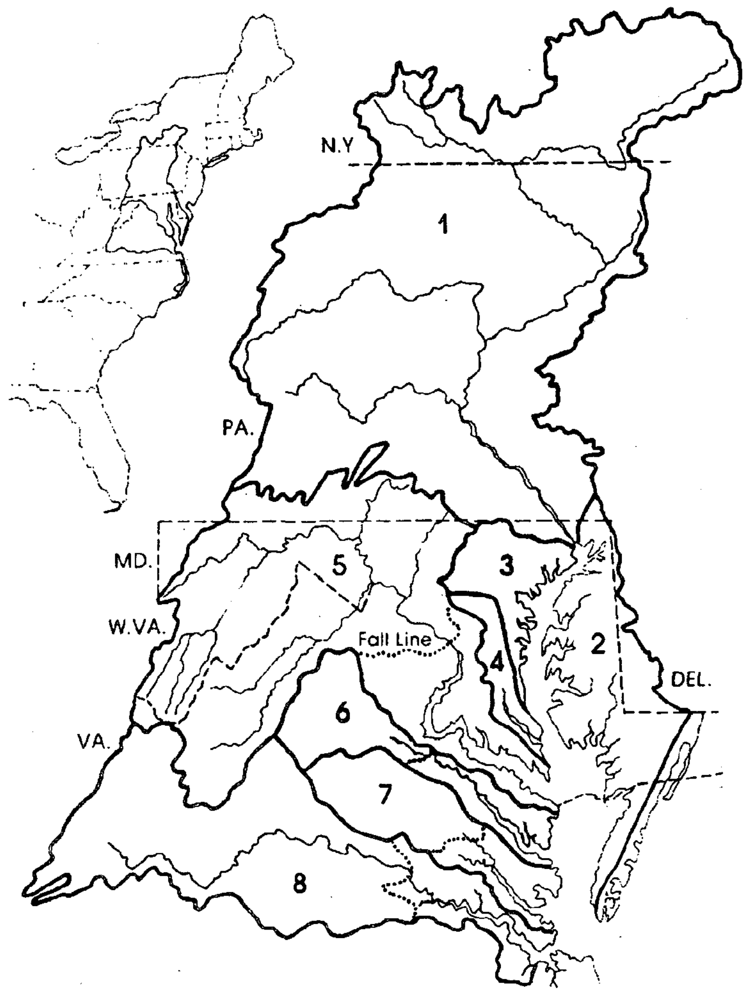
Nutrient Uptake and Cycling

As wetland plants grow and die, they take up ***inorganic*** nutrients (nitrogen, phosphorous) and release ***organic*** or ***detrital*** forms (decaying plant material) of nutrients. The result is a valuable cycling and transformation of nutrients in the ecosystem. The transformation from inorganic to organic forms of nutrients reduces potential problems from excessive nutrient loadings, while providing organic forms of nutrients that are more useful to aquatic animals (Figure 5). Excessive nutrients may come from septic system leakage, sewage effluent, runoff from fertilized lawns and farms, and stormwater outflows. The organic forms of nutrients provide the base of the detrital food web, which may support many commercially important fish, crabs, and shellfish (Elder, 1985). A ***food web*** is the set of complex feeding interactions that occur in an ecosystem.

Some wetlands function as nutrient sinks in which the net output of nutrients is less than the net input. Most wetlands are at least seasonal sinks for nutrients, taking them up during the growing season. A review by Van der Valk et al. (1979) of 17 studies showed that freshwater wetlands trapped nutrients during the growing season. This wetland function can be very important in managing urban and agricultural runoff with high concentrations of nutrients which may degrade downstream water quality. Even a slight increase in the amount of wetlands in an agricultural watershed reduced the amount of nitrogen leaving the watershed (Jones et al., 1976).

Plants may also take up heavy metals, and other chemical pollutants and incorporate them into their leaves, roots, and stems (Kadlec and

Figure 2. Chesapeake Bay watershed and major drainage basins (adapted from Chesapeake Bay Program, 1983).



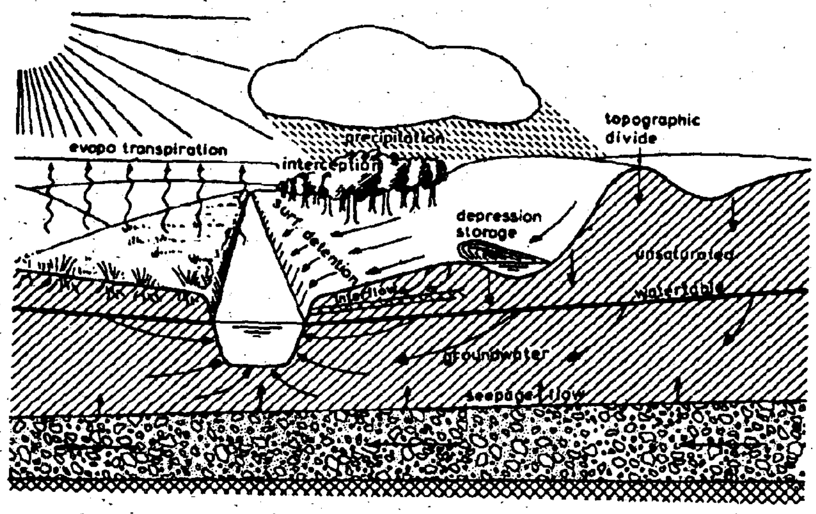


Figure 3. The riverine hydrologic cycle, note the subsurface flows (adapted from Clark, 1983).

Kadlec, 1979; Boto and Patrick, 1979). As the plant dies, the pollutants may be buried and removed from the system or returned to the water column. If the plant is consumed by an animal the pollutants may be passed up the food web.

Wetland Soil Processes

Wetland soils have been shown to be more important at removing nutrients from the overlying water than plant uptake. Sather et al. (1990) states that chemical adsorption by detritus and precipitation appear to remove more phosphorus than plant uptake. Bacteria at the water sediment interface remove significant amounts of nitrogen from the water column (Sather et al., 1990). Soil microbes such as bacteria are also important in degrading pesticides, resulting in reduced potential risk even if the soils are disturbed (Boto and Patrick, 1979).

Filtering and Sedimentation

Wetlands are sites of increased sedimentation, which improves water quality by reducing suspended solids and increases bank stabilization through the accumulation of sediment. As overlying waters pass across wetlands, water velocities are slowed by the increased friction between the water and the sediment interface and the presence of vegetation. As the water is slowed, suspended particles fall out, reducing turbidity and improving water quality. Riparian areas have been shown to retain 80 percent of sediment runoff from adjacent agricultural lands (Richardson, 1989). Wetlands located in depressions may retain all the sediment entering them (Novitzki, 1979). This is valuable in reducing siltation in downstream areas such as fish spawning areas and ship channels.

As sediments are removed from the water column, so are attached nutrients, heavy metals, and other toxins. Mitsch et al. (1979) found that large amounts of phosphorous were deposited

Nontidal *Wetland Values*

ENVIRONMENTAL QUALITY VALUES

Water Quality Improvement

- Pollutant removal (heavy metals, pathogens)
- Sediment trapping
- Nutrient uptake and recycling
- Oxygen production
- Wastewater treatment
- Stormwater treatment

Aquatic and Terrestrial Productivity

Fish and Wildlife Habitat

- Spawning and nesting sites
- Nursery areas for young
- Shelter from predators
- Foraging areas

SOCIO-ECONOMIC VALUES

- Shoreline Erosion Control
- Flood Protection
- Groundwater recharge and discharge
- Natural products (timber, fish, waterfowl)
- Recreation (boating, fishing, hunting)
- Aesthetics

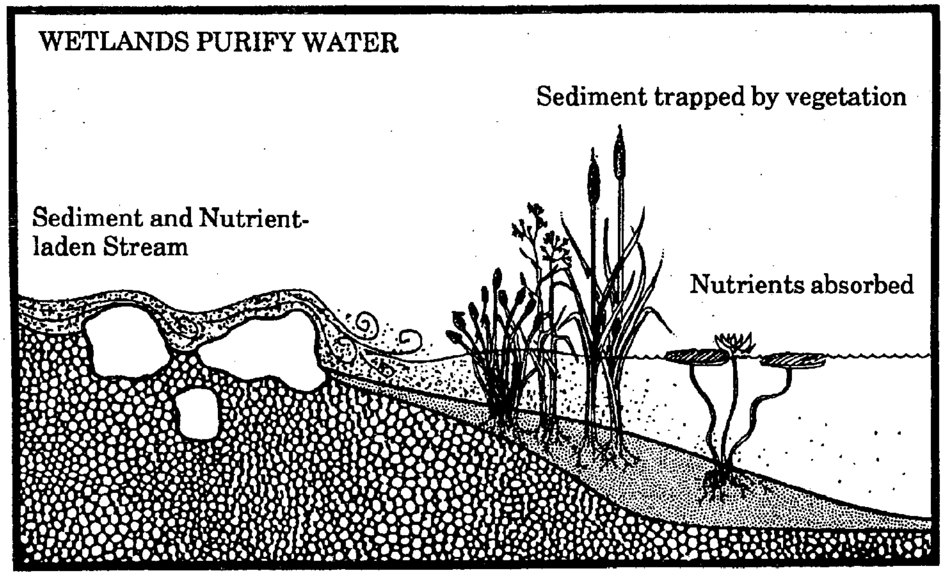


Figure 4. Wetlands help purify water by filtering out nutrients, wastes, and sediment from runoff and floods (adapted from Kusler, 1983).

with river sediments during river flooding in a swamp. Most wetland sediments accumulate faster than they are removed. This accumulation rate allows the wetland to retain a significant portion of the nutrients and other pollutants buried in the soil (Sather et al., 1990). Heavy metals and other toxic substances attached to sediment particles will become immobile through burial in sediments until they become disturbed through dredging or lowering of the water table (Boto and Patrick, 1979).

Wastewater Treatment

Some wetlands are so successful at removing nutrients that they have been utilized in treating wastewater. Freshwater wetlands filter 60 - 90 percent of the suspended solids from wastewater addition studies (Richardson, 1989). Boyt et al. (1976) studied a hardwood swamp that had been receiving sewage effluent for 20 years and reported a 98 percent reduction in phosphorous and 90 percent reduction in nitrogen in the outflow waters. Coliform bacteria may also show significant reductions in sewage effluent after passing through a wetland (Spangler et al., 1976). ***Coliforms*** are an indicator of human fecal matter which may contain pathogens. However, some studies have questioned the ability of a wetland to remove pathogenic microorganisms (Bender and Correll, 1974) and have shown that some wastewater heavy metals that are incorporated in plant tissue can be passed up the food web (Windom, 1976; Roman, 1981).

Stormwater Management

Stormwater runoff is becoming widely recognized as a significant contributor to water pollution problems. Stormwater runoff may contain many pollutants, among them are fuel and chemical spillage, lawn fertilizers and herbicides, vehicle drippings (oil, gas, antifreeze), sediment from erosion or construction activities, and sewage from failing systems. Urban areas are beginning to implement natural methods of reducing these pollutant loads, including vegetated drainage ways and detention basins with their associated wetland border. The Commonwealth's Best Management Practices (BMP) Manual for urban areas suggests using wetlands for natural biological treatment of stormwater (Virginia State Water Control Board, 1979b). Directing stormwater runoff through a wetland can be considered a filtering process analogous to running dirty water through a coffee filter. The filtering process is accompanied by complex biological and chemical reactions that occur in the wetland, resulting in significant reductions in total pollutants.

In summary, establishment or maintenance of wetland buffer zones may significantly improve water quality in the adjacent and downstream water bodies. Wetlands can improve water quality by five mechanisms: 1) plant nutrient uptake and cycling, 2) chemical adsorption and precipitation, 3) bacterial processes, 4) sedimentation, 5) reduction in shoreline erosion (discussed later in this paper).

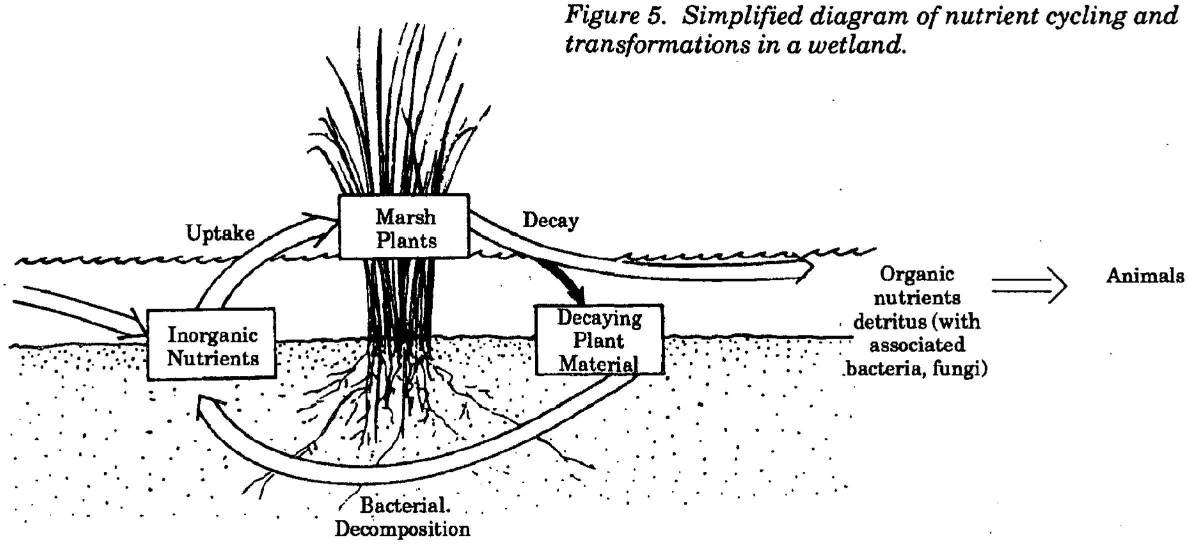


Figure 5. Simplified diagram of nutrient cycling and transformations in a wetland.

Primary Production

Wetland productivity provides the source of many wetland functions, including nutrient recycling, fish and wildlife food and habitat, and food web support. All life is ultimately dependent on the photosynthetic production of plant material by primary producers. ***Primary producers*** include grasses, shrubs, trees, macro-algae, and floating microscopic plants (phytoplankton). ***Photosynthetic production*** of organic matter converts the sun's energy into a form which can be used by living organisms. In this process, nutrients and carbon dioxide are taken up and oxygen is released. Wetland plants produce more plant material than some of our most productive cultivated farm fields (Figure 6). Numerous wetland plant adaptations allow for maximum growth rates that are less common or impossible for terrestrial plants, which may be water or nutrient limited (Wetzel, 1989). Watersheds which drain wetland regions export more organic material than do watersheds that do not have wetlands (Mitsch and Gosselink, 1986). Wetzel (1989) compared the productivity rates across a wetland gradient beginning on the uplands and moving into the open water. He reported that the photosynthetic production of organic matter was greatest in the wetland area. The upland forest and plants produced less than half the amount of organic matter that the wetland produced. A portion of this production in wetlands is directly consumed by mammals, birds, and insects. The most significant portion is consumed as ***detritus*** which is decaying plant material that is colonized by microorganisms (bacteria, protozoa, and fungi). The attached microbes increase the nutritional content of the plant material, resulting in a highly nutritious and readily available food source for many aquatic organisms including fish, crabs, shellfish, and zooplankton (microscopic animals). The fungi and bacteria in swamps produce vitamin B12, which is necessary for aquatic invertebrates and fish growth (Burkholder, 1956). Floodplain swamp forests are among the most productive ecosystems due to periodic flooding that supplies organic matter, water, nutrients, and clay (Bates, 1989).

Fish and Wildlife Habitat

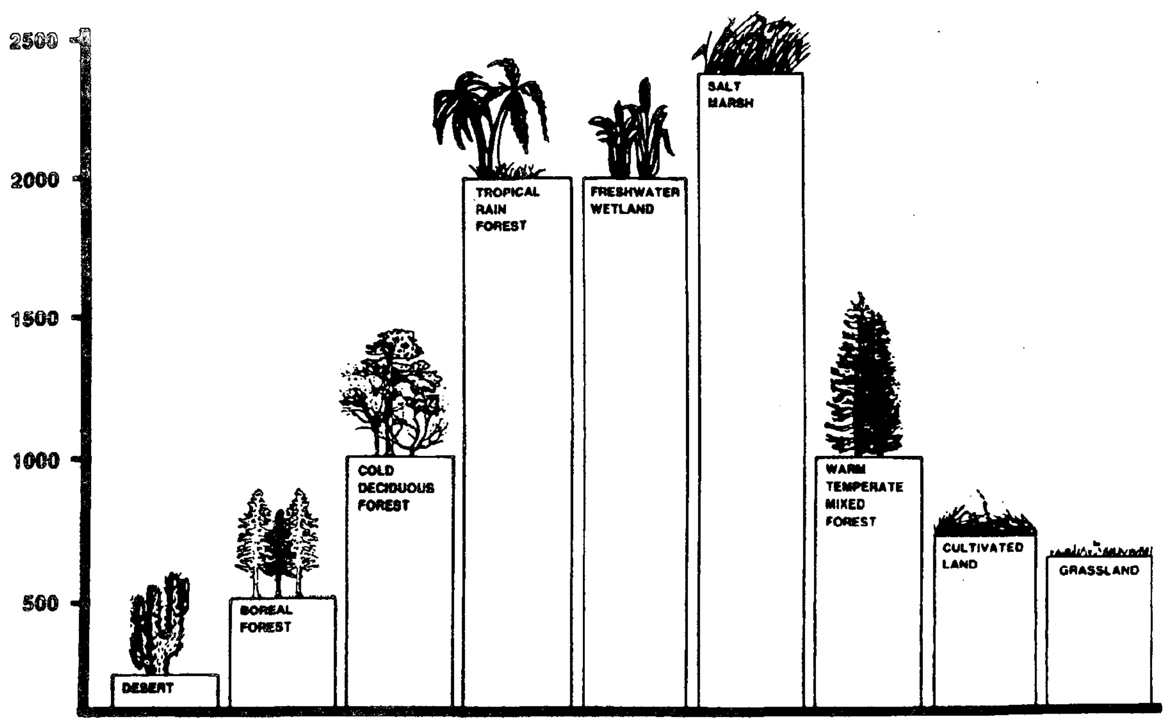
Nontidal wetlands provide food and habitat for many terrestrial and aquatic animals including fish, birds, mammals, and invertebrates (Figure 7). Among the most valued food items in wetlands are plant leaves, detritus, tubers, seeds, snails, clams, worms, frogs, and insects. Mitsch and Gosselink (1986) reported that virtually all of the freshwater fish and shellfish are partially dependent on wetlands. Freshwater fish depend on wetlands for food, nursery grounds, and spawning. Almost all recreational fishes spawn in the aquatic portions of wetlands, often spawning in marshes bordering lakes or in riparian forests during flooding (Peters et al., 1979, Mitsch and Gosselink, 1986). Common fish that utilize freshwater wetlands include pickerel, sunfishes, bass, crappies, bullheads, carp, herring, white perch and American shad. Several anadromous fish (those which migrate from saltwater to freshwater to spawn) spawn in wetlands of the freshwater portions of rivers. For example, the blueback herring spawns on the hardwood forest floor during flooding (Adams, 1970), and the American shad spawns in freshwater streams (Tiner, 1985). Bottomland hardwoods of the southeastern U.S. are important to fish that use them for spawning, feeding, and hiding (Sather et al., 1990). Estuarine and marine fish and crabs have been reported to migrate into freshwater wetlands for food, spawning, and nursery areas (Conner and Day, 1982).

Wetlands provide a critical habitat for many birds including waterfowl, migratory songbirds, and shorebirds. Some species may utilize wetlands year round while others use them seasonally for breeding, feeding, resting, or overwintering. Wetland nesting birds include redwinged blackbirds, green herons, least bitterns, mallards, black ducks, wood ducks, and Virginia rails (Tiner, 1985). Other birds utilizing nontidal wetlands may include towhees, chickadees, titmouses, warblers, tanagers, vireos, flycatchers, and sparrows (Tiner, 1985). Predaceous birds such as hawks, bald eagles, ospreys, and owls also feed and nest in wetlands. Wetland seeds and tubers provide essential winter food for ducks and geese (Weller, 1979).

Bottomland forested wetlands are primary wintering grounds for waterfowl, as well as important breeding areas for wood ducks, herons, egrets, and wild turkeys (Tiner, 1984).

Muskrats, beavers, rabbits, river otters, raccoons, mice, and white-tailed deer are among the furbearers utilizing nontidal wetlands. Muskrats may feed on plant parts including belowground tubers; they may also feed on invertebrates found in wetlands such as clams and mussels. Muskrat lodges are often made of tall robust plants such as cattails. White-tailed deer depend on wetlands for winter shelter, food, cover and breeding (Tiner, 1985).

Figure 6. Net primary productivity of selected ecosystems (g/m^2/year) (adapted from Lieth, 1975 and Teal and Teal, 1969).



Another major component in wetland wildlife populations are the reptiles (turtles, snakes) and amphibians (frogs, salamanders). Almost all amphibians depend on wetlands for breeding. They lay eggs in water where their larvae develop and feed on algae as well as other foods (Weller, 1979). Frogs often found in wetlands include green, bull, and leopard frogs, and spring peepers (Tiner, 1985). Amphibians are numerous in some wetlands; 1,600 salamanders and 3,800 frogs and toads were found in a gum tree pond less than 100 feet wide in Georgia

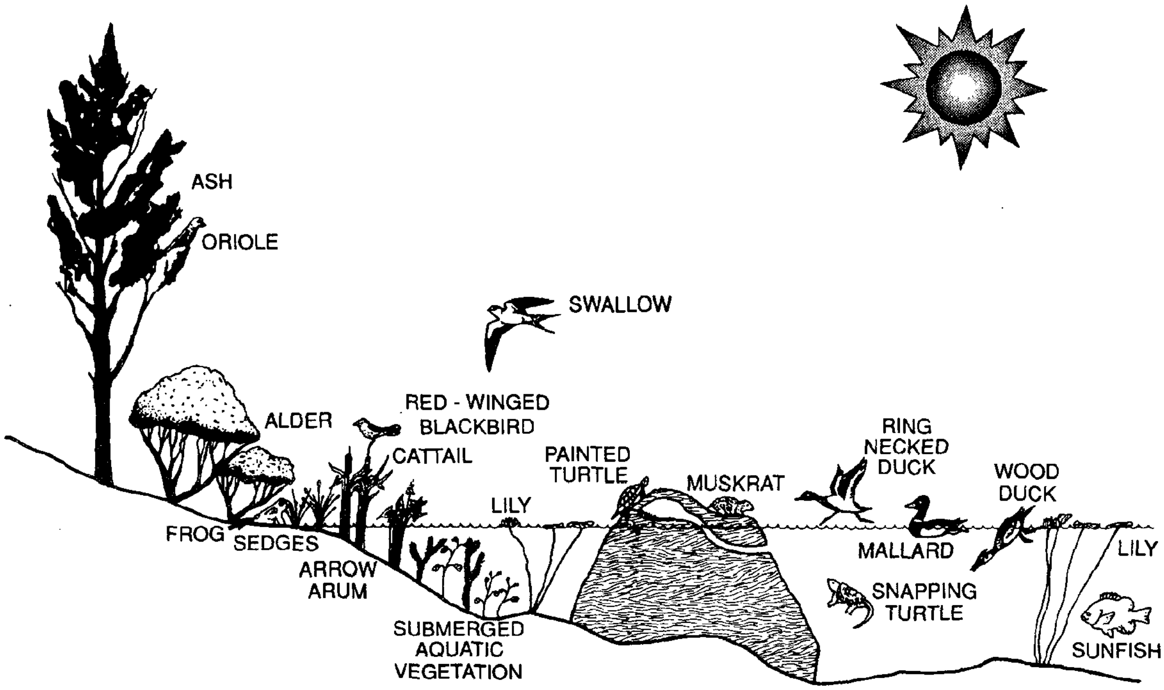


Figure 7. Simplified diagram of the plants and animals of a nontidal wetland and adjacent aquatic habitat.

(Wharton, 1978). Amphibians are a prime food source for larger animals such as raccoons, herons, mink, bitterns, and fish (Weller, 1981). Turtles and snakes use freshwater wetlands for food and cover and move to drier land to deposit eggs. Turtles are most common in freshwater marshes and ponds, the most common being box, snapping, painted, pond, and mud turtles (Clark, 1979). Water snakes are the most abundant snake in wetlands, though cottonmouths, garter, and mud snakes are also found.

Wetlands are also important in maintaining species diversity which is critical to ecosystem balance. Diversity is a measure of the variety of species present in an ecosystem. High species diversity provides resilience to potentially catastrophic events such as disease or environmental disturbance. Of the nation's endangered and threatened species, 50 percent of the animals and 28 percent of the plants are dependent on wetlands for their survival (Niering, 1988). Preservation of wetland plants is also important for maintaining direct potential benefits in the fields of agriculture and medicine (Niering, 1988). As Ehrlich and Ehrlich (1981, in Niering, 1988) state:

> "The natural ecological systems of Earth, which supply these vital services, are analogous to the parts of an aeroplane that make it a suitable vehicle for human beings. But ecosystems are much more complex than wings or engines. Ecosystems, like well-made aeroplanes, tend to have redundant subsystems and other 'design' features that permit them to continue functioning after absorbing a certain amount of abuse. A dozen rivets, or a dozen species, might never be missed. On the other hand, a thirteenth rivet popped from a wing flap, or the extinction of a key species involved in the cycling of nitrogen, could lead to a serious accident".

For the survival of many fish and wildlife, it is critical to preserve not only the wetland habitat in which the species is most common, but also a portion of the adjacent areas. Maximum wildlife usage may be dependent on preservation of upland buffer areas adjacent to wetlands (Adamus, 1990). Certain species are dependent on adjacent upland or aquatic areas for some part of their life history such as breeding, feeding, protection, or raising young. For example, trees and shrubs along a wetland edge make valuable nesting sites, song perches, and cover for birds. The upland adjacent to a wetland may be favored by wildlife for feeding, denning, nesting, cover, roosting, or breeding (Porter, 1981). Upland buffers in urban areas may provide the necessary shield and concealment from human activities to allow for wildlife usage (Porter, 1981). The combination of the wetland and upland fringe provides an abundance of food close to good cover.

Shoreline Erosion Control

Wetlands located at the interface between upland and aquatic habitats have the potential to reduce upland erosion. As water moves across the reduced slope of shallow waters and wetlands, the energy dissipates. As friction or drag from the bottom increases the erosive force declines. This action occurs in nonvegetated as well as vegetated wetlands. Vegetated wetlands can reduce shoreline erosion by several mechanisms. The complex root system binds and stabilizes the sediment; as a wave propagates through vegetation additional frictional drag reduces wave energy and current velocity (Dean, 1979). Wetland vegetation also increases deposition of sediment which helps build the shoreline channelward of the uplands. Bulrushes and reed grass have been reported as the most successful herbaceous vegetation in erosion abatement (Seibert, 1968; Kadlec and Wentz, 1974). Trees stabilize banks of streams and rivers with their deep penetrating roots (Siebert, 1968; Virginia State Water Control Board, 1979a). Shoreline erosion control with vegetation has its limitations depending on many factors such as: potential wave energies, current velocities, flood magnitude, vegetation type, soil type, and slope.

Flood Storage

Wetlands within drainage basins attenuate flood peaks and total stream flows by temporarily storing surface water in slope wetlands or retaining them in depressional wetlands (Carter et al., 1979; Novitzki, 1979). These processes desynchronize peak flows by temporarily slowing and storing water, which results in a non-simultaneous, gradual release of peak waters, minimizing flow downstream (Figure 8) (Zacherle, 1984). Flood flows in watersheds with wetlands may be 80 percent lower than in basins without wetlands (Novitzki, 1979). The U.S. Army Corps of Engineers found that protection of natural wetland systems along the Charles River basin in Massachusetts was the most cost-effective solution to controlling flood waters (U.S. Army Corps, 1972; Carter et al., 1979). Wetlands are able to store or remove water through several mechanisms, which include: maximum water storage resulting from soil properties specific to wetlands, plant uptake and evapotranspiration, and open water surface evaporation (Carter et al., 1979). The predominantly organic soils of wetlands have better water retention capabilities than mineral soils (Novitzki, 1979). Plant evapotranspiration is the loss of water vapor by plant parts. Flood storage may be reduced when soils are already saturated or in winter when plant uptake is lower (Carter et al., 1979). The increased friction caused by contact with wetland vegetation and roughness of the ground reduce flood current velocities. Mitsch et al., (1979) observed floodwaters being slowly returned to the river from a swamp months after maximum runoff occurred. This action results in reduced flood water heights because water levels have subsided in the river channel as these floodwaters are slowly released. Flood control has become increasingly important in urban areas where the rate and volume of stormwater runoff have increased with nonporous surfaces, such as roads, parking lots, and buildings.

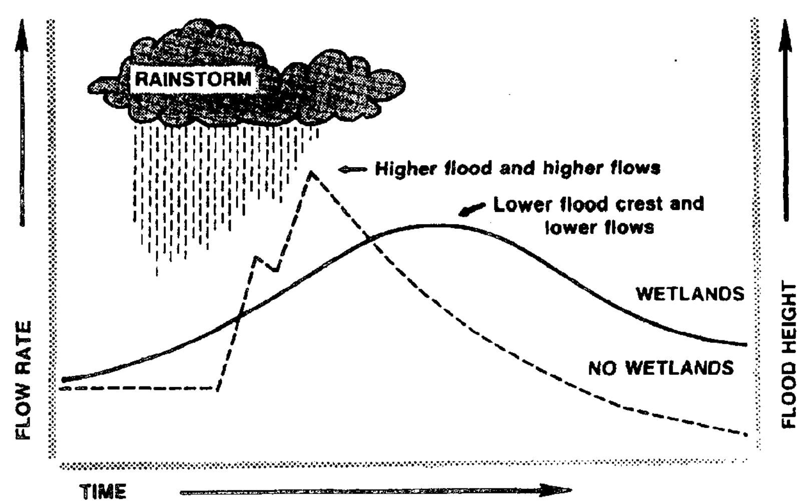


Figure 8. Wetland value in reducing flood crests and flow rates after rainstorms (adapted from Kusler, 1983).

Groundwater Discharge and Recharge

Some wetlands have been shown to be sites for groundwater recharge while most have been identified as areas of groundwater discharge. ***Groundwater recharge*** is the movement of water into a potential drinking water supply or aquifer. Wetlands located at sites of ***groundwater discharge*** occur where the groundwater table meets the surface of the land and discharges as springs or seeps. Most wetlands are discharge areas and may be used to supply drinking water. At least 60 municipalities in Massachusetts have public wells in or near wetlands (Motts and Heeley, 1973). In riverine wetlands, groundwater aquifers are recharged during floodplain inundation (Ward, 1989). Recharge potential varies according to wetland type, geographic location, season, soil type, water table location and precipitation (Tiner, 1984). May (1989) observed that the freshwater wetlands on Hilton Head Island, South Carolina are important recharge reservoirs for the aquifer that supplies potable water. Nontidal wetlands have the potential to impact the quantity and quality of potable water supplies as recharge or discharge areas.

Economic and Recreational Values

The economic benefits of wetlands are realized in natural products, shoreline erosion control, stormwater treatment, flood protection, water supply, livestock grazing, and recreation. Natural products include timber, fish, shellfish, waterfowl, furbearers, peat, and wild rice. Wetland grasses are also used for livestock grazing or are harvested for hay. Recreational activities in wetlands include boating, swimming, fishing, hunting, and nature study. All of these activities and products derived from wetlands bring direct and indirect economic benefits to the adjacent communities.

Economic benefits from hunting and fishing are significant. In 1980 furs from muskrats yielded approximately $74 million; in 1980 5.3 million people spent $638 million on hunting waterfowl and other migratory birds; and in 1975 sport fishermen spent $13.1 billion to catch wetland dependent fishes in the U.S. (Burke et al., 1988). In 1980, 47 percent of Americans spent $10 billion observing and photographing waterfowl and other wetland birds (Burke et al., 1988).

The ability of wetlands to control flood waters reduces property damage from flooding, and reduces costs for flood control structures. Property damage from floods for 1975 in the U.S. was estimated to be $3.4 billion (U.S. Water Resources Council, 1978). Wetlands provide perpetual values, whereas economic benefits from wetland destruction are finite (Mitsch and Gosselink, 1986).

Wetland Losses

Human threats to wetlands include drainage, dredging, filling, construction of shoreline structures, groundwater withdrawal, and impoundments. Wave reflection from shoreline defense structures may erode an adjacent wetland. As wetlands are lost so are their associated benefits. The short term economic gains acquired through wetlands destruction are relatively easy to measure and therefore have received a great deal of emphasis in the past. However, the long term economic and environmental costs of wetland destruction may well outweigh the short term gains.

Regulation of Nontidal Wetlands

Presently Virginia does not have a state nontidal regulatory program. The Commmonwealth's Chesapeake Bay Preservation Act includes nontidal wetlands that are connected by surface flow and are contiguous to tidal wetlands or tributary streams as part of Resource Protection Areas. These areas and an upland buffer bordering the wetland will be subject to land disturbance restrictions. The land management practices will be implemented by local governments. The intent of the Act is to protect water quality in the Chesapeake Bay, through managing lands that have the potential to impact water quality in the Bay and its tributaries.

The U.S. Army Corps of Engineers is the lead federal agency responsible for regulation of wetlands as described under Section 404 of the Clean Water Act. The Corps' decisions are overseen by the U.S. Environmental Protection Agency. Concerned citizens can assist in wetland protection through various activities including: attending Wetlands Board public hearings, locating and monitoring wetlands in their area, supporting wetland legislation, informing neighbors and developers of the values of wetlands, and encouraging them to minimize their impact on wetlands. It is important for citizens to consider that any substances such as fertilizers, auto fluids, and pesticides that are distributed or disposed of within the Bay watershed (Figure 2) may potentially impact the waters of the Chesapeake Bay and drinking water supplies.

Economic development and wetland protection are not mutually exclusive. Many commercial activities and economic growth depend on the productivity and aesthetic values of the Chesapeake Bay. Without wetlands and their attendent values, expensive alternative methods would be required to prevent flooding, control erosion, improve water quality, and provide fish and wildlife habitat and recreational opportunities. Our wetlands resource, if properly managed, will provide these services far into the future. We risk much more than just the wetlands if we allow their loss in favor of short term economic gain.

Literature Cited

Adams, J.G. 1970. Clupeids in the Altamaha River, Georgia. Coastal Fisheries office, Georgia Game and Fish Commission, Contribution Series No. 20. Brunswick, GA.

Adamus, P. R., R. D. Smith, and T. Muir. 1990. manual for assessment of bottomland hardwood functions. EPA 600/3-90/053. Prepared by U.S. Army Engineer Waterways Experiment Station. Vicksburg, MS.

Bates, R.D. 1989. Biomass and primary productivity on an early successional flood plain forest site. In: R.R. Sharitz and J.W. Gibbons (eds.) Freshwater wetlands and wildlife. Proceedings of a Symposium Held at Charleston, South Carolina, March 24-27, 1986. U.S. Department of Energy. Available from NTIS, Springfield, VA as DE90005384.

Bender, M.E. and D.L. Correll. 1974. The use of wetlands as nutrient removal systems. Chesapeake Research Consortium, No. 29, VIMS Contribution No. 624. Gloucester Point, VA. 12pp.

Boto, K.G. and W.H. Patrick, Jr. 1979. Role of wetlands in the removal of suspended sediments. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 479-489.

Boyt, F.L., S.E. Bayley, and J. Zoltek, Jr. 1976. Removal of Nutrients From Treated Municipal Wastewater by Wetland Vegetations. J. Water Poll. Cont. Fed. 49: 789-799.

Burke, D.G., E.J. Meyers, R.W. Tiner, Jr., and H. Groman. 1988. Protecting nontidal wetlands. American Planning Association. Washington D.C. 76 pp.

Burkholder, P.R. and L.M. 1956. Vitamin B12 in Suspended Solids and Marsh Muds Collected Along the Coast of Georgia, Limnol. & Oceanogr. 1 : 202-8.

Carter, V., M.S. Bedinger, R.P. Novitzki and W.O. Wilen. 1979. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.). Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 334-376.

Chesapeake Bay Program. 1983. Chesapeake Bay Program: Findings and Recommendations, U.S. Environmental Protection Agency, Philadelphia, PA. 48 pp.

Clark, J.E. 1979. Fresh water wetlands: habitats for aquatic invertebrates, amphibians, reptiles, and fish. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 330-343.

Clark, J.R. 1983. Coastal Ecosystem Management, A technical manual for the conservation of coastal zone resources, Robert E. Krieger Publishing Company, Malabar, Florida.

Conner, W.H. and J.W. Day, Jr. 1982. The ecology of forested wetlands in the southeastern United States. In: B. Gopal, R.E. Turner, R.G. Wetzel, and D.F. Whigham (eds.) Wetlands Ecology and Management. National Institute of Ecology and International Scientific Publications. UNESCO, Paris and Dept. of Science and Technology, New Delhi. pp. 69-87.

Dean, R.G. 1979. Effects of vegetation on shoreline erosional processes. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 415-426.

Ehrlich, P. and Ehrlich A. 1981. Extinction: the causes and consequences of the disappearance of species. Random House, New York. Quoted in Neiring, W.A. Endangered, threatened and rare wetland plants and animals of the continental United States.

Elder, J.F. 1985. Nitrogen and Phosphorus Speciation and Flux in a Large Florida River-Wetland System, Water Resources Research, 21: 724-732.

Jones, J.R., B.P. Borofka, and R.W. Bachmann. 1976. Factors Affecting Nutrient Loads in Some Iowa Streams. Water Research 10: 117-122.

Kadlec, J.A. and W.A. Wentz. 1974. State-of-the-art Survey and Evaluation of Marsh Plant Establishment Techniques: Induced and Natural. Vol. I: Report of Research, Contract Report D-74-9, U.S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Mississippi.

Kadlec, R.G. and J.A. Kadlec. 1979. Wetlands and water quality. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 436-456.

Kusler, J.A. 1983. Our National Wetland Heritage. A Protection Guidebook. Environmental Law Institute, Washington, D.C. 167 pp.

May, J.P. 1989. Groundwater recharge potential of freshwater wetlands on Hilton Head Island, South Carolina. In: R.R. Sharitz and J.W. Gibbons (eds.) Freshwater wetlands and wildlife. Proceedings of a symposium held at Charleston, South Carolina, March 24-27, 1986. U.S. Department of Energy. Available from NTIS, Springfield, VA as DE90005384.

Mitsch, W.J., C.L. Dorge, and J.R. Wiemhoff. 1979. Ecosystem dynamics and a phosphorus budget of an alluvial cypress swamp in southern Illinois, Ecology 60: 1116-1124.

Mitsch, W.J. and J.G. Gosselink. 1986. Wetlands. Van Nostrand Reinhold Co., New York, NY. 329 pp.

Motts, W.S. and R.W. Heeley. 1973. Wetlands and groundwater. In: J.S. Larson, ed. A Guide to Important Characteristics and Values of Freshwater Wetlands in the Northeast. University of Massachusetts, Water Resources Research Center. Pub. No. 31, pp. 5-8.

Niering, W.A. 1988. Endangered, threatened and rare wetland plants and animals of the continental United States. In: D.D. Hook and others, eds. The Ecology and Management of Wetlands, Vol. 1 Ecology of Wetlands. Timber Press, Portland, Oregon. p. 227-238.

Novitzki, R.P. 1979. Hydrologic characteristics of Wisconsin's wetlands and their influence on floods, stream flow, and sediment. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 377-388.

Odum, W.E. 1988. Nontidal freshwater wetlands in Virginia. Virginia Journal of Natural Resources Law 7: 421-434.

Peters, D.S., D.W. Ahrenholz, and T.R. Rice. 1979. Harvest and value of wetland associated fish and shellfish. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 606-617.

Porter, B.W. 1981. The wetland edge as a community and its value to wildlife. In: Richardson, B. ed. Selected Proceedings of the Midwest Conference on Wetland Values and Management. Navarre, Minnesota: Freshwater Society; pp. 15-26.

Richardson, C.J. 1989. Freshwater wetlands: transformers, filters, or sinks? In: R.R. Sharitz and J.W. Gibbons (eds.) Freshwater wetlands and wildlife. Proceedings of a symposium held at Charleston, South Carolina, March 24-27, 1986. U.S. Department of Energy. Available from NTIS as DE90005384. pp. 25-46.

Roman, C.T. 1981. Detrital exchange processes of a Delaware salt marsh. Ph.D. dissertation, University of Delaware. 144 pp.

Sather, J. H., R. D. Smith, and J. S. Larson. 1990. Natural values of wetlands. In: Wetlands and shallow continental water bodies, Vol. 1. Natural and human relationships, B. C. Patten (ed.). SPB Academic publishing. pp. 373-388.

Seibert, P. 1968. Importance of natural vegetation for the protection of the banks of streams, rivers, and canals. In: Nature and Environment Series (Vol. Freshwater). Council of Europe, pp. 35-67.

Spangler, F., W. Sloey, and C.W. Fetter. 1976. Experimental use of emergent vegetation for the biological treatment of municipal wastewater in Wiconsin. In: Biological Control of Water Pollution, J. Tourbier and R. Pierson, Jr. (eds.) Univ. Penn. Press, Philadelphia, Pennsylvania, pp. 161-172.

Tiner, R.W., Jr. 1984. Wetlands of the United States: Current Status and Recent Trends. Washington, D.C.: U.S. Fish and Wildlife Service.

Tiner, R.W., Jr. 1985. Wetlands of New Jersey. U.S. Fish and Wildlife Service, Washington D.C., pp. 117.

U.S. Army Corps of Engineers. 1972. Charles River Watershed, Massachusetts. New England Division, U.S. Army Corps of Engrs., Waltham, Massachusetts, 65 pp.

U.S. Water Resources Council. 1978. The nation's water resources, 1975-2000. vol. 1. Washington, D.C.: U.S. Water Resources Council.

Van der Valk, A.G., C.B. Davis, J.L. Baker, and C.E. Beer. 1979. Natural freshwater wetlands as nitrogen and phosphorus traps for land runoff. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding, American Water Resources Assoc., Minneapolis, Minn., pp. 457-467.

Virginia State Water Control Board. 1979a. Best Management Practices Handbook, Agriculture. Planning Bulletin 316 pp.

Virginia State Water Control Board. 1979b. Best Management Practices Handbook, Urban. Planning Bulletin 321 pp.

Ward, J. V. 1989 Riverine-wetland interactions. In: R.R. Sharitz and J.W. Gibbons (eds.) Freshwater wetlands and wildlife. Proceedings of a symposium held at Charleston, South Carolina, March 24-27, 1986. U.S. Department of Energy. Available from NTIS as DE90005384. pp. 385-400.

Weller, M.W. 1981. Freshwater marshes. University of Minnesota Press, Minneapolis. 146 pp.

Weller, M.W. 1979. Wetland habitats. In: P.E. Greeson, J.R. Clark, and J.E. Clark (eds.) Wetland Functions and Values: The State of Our Understanding. Amer. Water Resources Assoc. pp. 210-234.

Wetzel, R.G. 1989. Wetland and littoral interfaces of lakes: productivity and nutrient regulation in the Lawrence Lake ecosystem. In: Proceedings of a Symposium Held at Charleston, South Carolina, March 24-27, 1986. U.S. Department of Energy. Available from NTIS, Springfield, VA as DE90005384. pp. 283-302.

Wharton, C.H. 1978. The Natural Environments of Georgia. Georgia Dept. of Nat. Res., Atlanta. 227 pp.

Windom, H.L. 1976. Geochemical interactions of heavy metals. In: Southeastern salt marsh environmentals, Ecol. Res. Ser. EPA-600/376-023, Washington, D.C. 36 pp.

Zacherle, A.W. 1984. A method for evaluating the long-term, cumulative impacts of tidal marsh alterations: the York River system-a case study. College of William and Mary, Virginia Institute of Marine Science Master's Thesis. 197 pp.

Wetlands Program

Technical Report Special Edition

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MEAN LOW WATER - The average height of low waters over a nineteen year period.

PERENNIAL - A plant which produces new growth year after year according to the seasons. In the case of nonwoody plants the aerial portion dies each winter and is replaced each spring.

PHYSIOGRAPHIC - A description of nature or natural phenomena in general.

POPULATION - All of the members of one species within a community.

PRIMARY PRODUCTION - Biomass produced directly from sunlight by plants.

PRODUCTIVITY - The rate of energy storage of an ecosystem or community in the form of organic substances which can be used as food materials.

RHIZOMES - Underground stems capable of producing new aerial shoots.

RIPRAP - Refers to a bulkhead or groin constructed of selected rock or concrete forms carefully placed so as to dissipate wave energy (bulkhead) or collect sand (groin) along a shoreline.

SECONDARY PRODUCTION - Biomass produced by animals grazing on plants or other organic matter.

SHORE DEFENSE STRUCTURES - A bulkhead or groin intended to deter erosion of the shoreline.

SPECIES DIVERSITY - Pertaining to the numbers of different species inhabiting a given area, i.e. high species diversity would mean many different species in one area.

SPOIL - The material removed from a channel bottom or other body of water during a dredging operation.

SPRING TIDES - Higher high tides which occur twice monthly due to astronomical conditions.

WRACK LINE - A line of debris, above the mean high tide line, which has been deposited by previous higher than normal tides.

VIMS WETLANDS PROGRAM
PLANT SERIES

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No. 90-2 / July 1990

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Spartina alterniflora Loisel.

Growth Habit and Diagnostic Characteristics

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. The tall form produces a long, narrow flowering head (inflorescence) in August and produces seeds in September. The reproductive inflorescence is made up of a series of closely appressed branchlets that are whitish-green in flower and straw colored in seed. The short form rarely becomes reproductive. Although the more robust form of this grass produces seeds, its primary means of propagation is by a massive rhizome system that produces many new sprigs. *Spartina alterniflora* is quite successful in spreading into previously unvegetated areas rather rapidly.

Density and Production

Stem density is quite variable but usually averages about 200 culms per square meter (20 stems per foot^2) but can range as high as 500 culms per m^2. Annual production in this region ranges from 500 to 1300 grams of dry weight per meter^2, with an average rate of about 900 grams per meter square (4 to 6 tons per acre per year). *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.

Distribution

Spartina alterniflora is a common and often dominant plant of salt and brackish marshes along the Atlantic Coast from the Canadian Maritime Provinces to Florida and the Gulf of Mexico. Mangroves become dominant in the intertidal habitat along the southern Atlantic and Gulf shorelines of Florida and other Gulf states. The most extensive stands of cordgrass are found in the great barrier island marshes of South Carolina and Georgia. Production estimates vary throughout the distribution range because of latitude and associated season length. In Nova Scotia, for example, production rates average 600 gms/m^2, whereas in Georgia, which has a longer growing season, production rates are 1500 gms/m^2 or more.

Habitat

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.

Ecological Values/Benefits

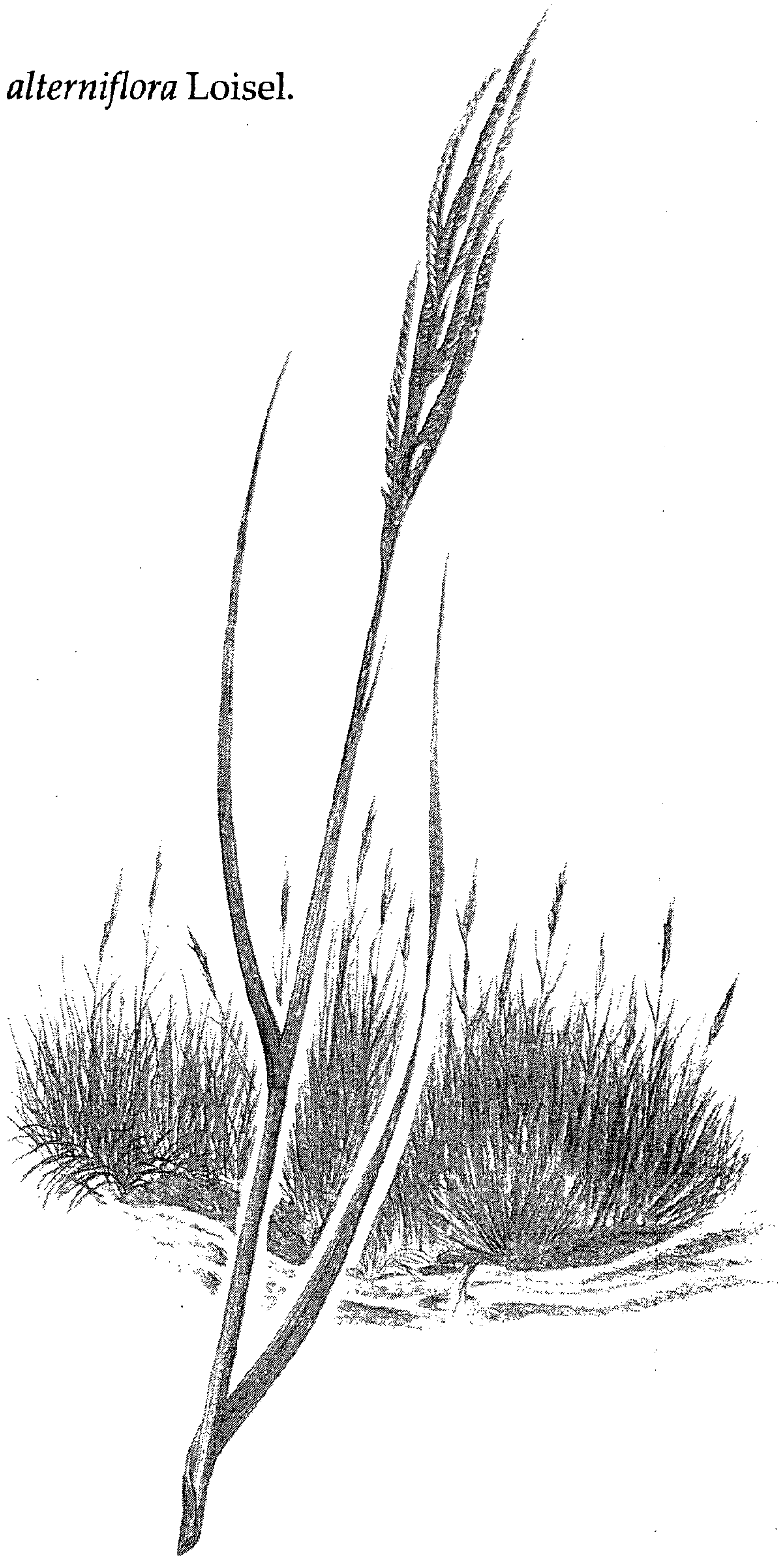
Cordgrass is one of the most productive species of tidal wetlands. Because it grows in intertidal areas, detritus is flushed into receiving waters were it becomes a major component of the estuarine/marine food web. This community is also an important habitat for an array of fauna, including the juvenile stages of the blue crab, as well as a nursery and spawning area for commerically important finfish.

Dense stands are effective in buffering shoreline erosion. The culms are incredibly flexible because of high cellulose tissue and, consequently, they are effective in dampening wave energy. Dense stands also produce an equally dense mass of rhizomes and roots up to 30 cm deep which with the characteristic texture of marsh peat, creates a formidable barrier to erosion.

Hydrophytic Factor/Federal Delineation

According to the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* and the *National List of Plant Species that Occur in Wetlands: Virginia* (1988), *Spartina alterniflora* is classified as an **obligate wetland plant (OBL)**. OBLs are plants that almost always occur in wetlands (>99% probability).

Spartina alterniflora Loisel.



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Wetlands Program

Technical Report

Wetland Flora

No. 90-4 / September 1990

Gene M. Silberhorn

Saltmeadow Hay

Spartina patens (Aiton) Muhl.

Growth Habit and Diagnostic Characteristics

This fine, wiry grass usually appears collectively as a densely matted meadow in the higher areas of salt and brackish marshes. It also grows on low dunes and sand flats along the coast, however, in this habitat the growth form appears taller and clustered in distinct tuffs. The somewhat lax plants of the marshes are from 30 to 60 cm long (1 to 2 feet), whereas dune plants are more erect and average 40 to 120 cm tall (1.5 to 4.0 feet). The long tapering leaves are often rolled inward and appear as a cylinder. The longest leaves are nearly one-half to two-thirds the length of the stem. The lower part of the stem is rather weak and has a tendency to bend when stressed by winds or spring tides and/or storm surges. During these events, individual stems (culms) intertwine, producing the overall effect of swirls or 'cowlicks' that often occur in large, open saltmarsh meadows. Sparingly branched, the inflorescence (flowering head) appears reddish-brown when in flower and dull brown in seed.

Density and Production

Spartina patens often grows with another meadow plant, salt grass (*Distichlis spicata*). Populations seldom occur as pure stands. Culms of mixed samples of saltmeadow hay and salt grass range from 500 to 1600 stems per m^2 or 50 to 150 stems/ft^2. Most of the detritus produced remains in the higher parts of the marsh, its usual habitat zone. Organic material accumulates within matted living material, very little of it washed out on spring tides or storm surges. Standing crop estimates of this community for this region range from 1 to 3 tons of dry weight per acre per year.

Distribution

Saltmeadow hay is found in the higher areas of salt and brackish marshes along the coast from the Maritime Provinces of Canada to Florida and along the Gulf Coast to Texas. As the name implies, it is harvested for hay as cattle feed, although this practice is on the wane. In certain areas, large areas of saltmarsh were diked in order to block tidal communication. Diked areas essentially created high marsh conditions, thereby sustaining meadow communities so they could be harvested for fodder. During colonial times, it was common practice to graze cattle on high marshes in New England maritime states. Even in this century, hay stacks in these marshes were a common sight.

Habitat

Spartina patens is often associated with *Distichlis spicata*, especially near the limits of mean high water or where ponding of saline water occurs during spring tides or storm surges. Saltmeadow hay is also commonly found near the marsh/upland ecotone, usually associated with woody species such as marsh elder (*Iva frutescens*), groundsel tree (*Baccharis halimifolia*) and wax myrtle (*Myrica cerifera*).

In addition to tidal marsh habitats, *S. patens* also grows on low dunes and sand flats. *Spartina patens* is one of the pioneer species that invades overwash fans that form during storm events.

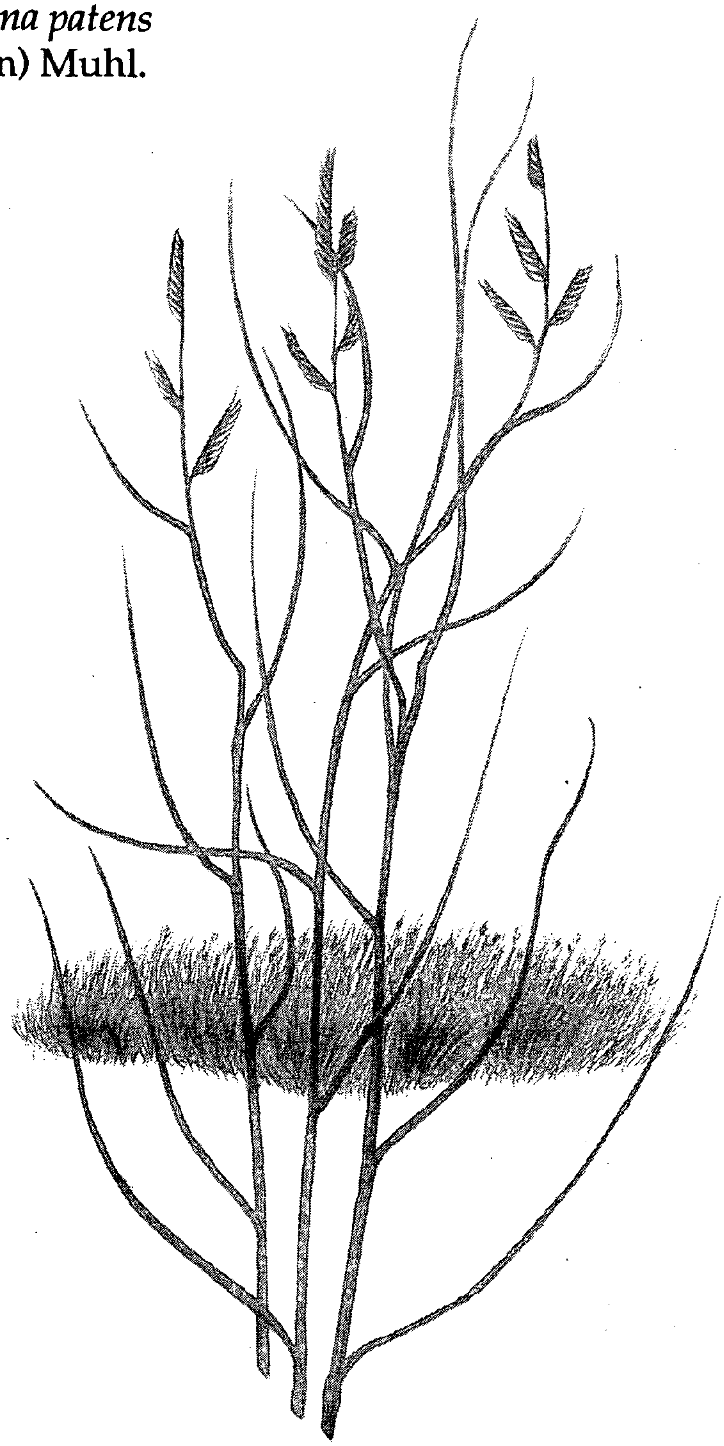
Ecological Values/Benefits

The meadow community is an excellent buffer, filtering sediments and other wastes during periods of runoff. Production and available detritus are somewhat less important to the estuarine environment than intertidal plant communties such as saltmarsh cordgrass. Salt and brackish meadows function as staging and feeding areas for aquatic and land mammals such as muskrats and raccoons and nesting places for rails and other birds. This community is also the primary habitat for the marsh snail (*Melampus bidentatus*), an important food for several species of birds.

Hydrophytic Factor/Federal Delineation

According to the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* and the *National List of Plant species that Occur in Wetlands: Virginia* (1988), *Spartina patens* is classified as a **facultative plus wetland plant (FACW+)**. FACW+ plants usually occur in wetlands (67-99% probability), but are occasionally found in nonwetlands (coastal dunes and sand flats).

Spartina patens
(Aiton) Muhl.



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Wetlands Program

Technical Report

Wetland Flora

No. 90-6 / November 1990 Gene M. Silberhorn

Arrow Arum
Duck Corn

Peltandra virginica (L.) Kunth

Growth Habit and Diagnostic Characteristics

Peltandra virginica is a robust, emergent, fleshy perennial found in the intertidal zone of freshwater marshes and swamps. The most dominant and striking characteristic of this plant is the large, triangular or arrowhead-like leaf blade (20 to 50 cm long and 15 to 30 cm wide – 8 to 20 by 6 to 12 in). The basal lobes may be half as long as the blade. The characteristic venation of the leaf – a prominent midrib and paired downward trending veins into the basal lobes – makes identification easy in absence of flowers or fruit.

In late May or June, an elongated, leaf-like, reproductive structure develops from the rhizome. The unique appendage resembles a pointed, rolled leaf (spathe), which surrounds, in clasping fashion, a fleshy, cylindrical inflorescence (spadix). These are characteristic features of the Araceae family to which this plant belongs. As fruits develop, the tip of the spathe decomposes, leaving a drooping, pod-like fruiting head.

Peltandra may be confused with two associated species that often occur in the intertidal zone, namely pickerelweed (*Pontederia cordata*) and arrowhead (*Sagittaria latifolia*). The three can be easily differentiated; pickerelweed has a spike of blue flowers and heartshaped leaves and arrowhead has white flowers and arrowhead-like leaves, but without the three predominant veins as arrow arum. Arrow arum grows in dense clumps with leaf stalks (originating from large horizontal rhizomes) that attain heights of 0.5 to 2 m (2 to over 6 ft).

Density and Production

Arrow arum is a major component of the total production of tidal freshwater wetlands. Production estimates range from about 100 to over 1200 g (dry weight)/m^2 or up to 5 tons/acre/annum. These estimates do not consider the belowground biomass of the massive and dense rhizome. The highly foliated stems range from 10 to 20 per m^2. *Peltandra* is known to undergo rapid decompositon at the end of growing season.

Distribution

Not necessarily a coastal plant, arrow arum is found in wetland areas throughout 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.

Habitat

In coastal wetlands, *Peltandra* usually grows in the soft sediments of the intertidal zone (between mean sea level and mean high water) in riverine freshwater marshes and swamps. It cannot tolerate salinities much above 0.5 ppt, hence it is almost always an indicator of freshwater conditions. Although arrow arum is often found in monospecific stands, it also co-dominates with pickerelweed, and is less commonly associated with arrowhead, bultongue (*Sagittaria falcata*), giant bulrush (*Scirpus validus*) and wild rice (*Zizania aquatica*).

Ecological Values/Benefits

In a holistic sense, the intertidal freshwater estuarine community, of which *Peltandra* is a major component, as well as the entire scope of tidal freshwater wetlands in general, are collectively very important as spawning areas for anadromous fishes. These systems, as well as contiguous nontidal wetlands, function as sinks for upland runoff which often is contaminated with excessive nutrients and other pollutants.

Specifically, the fleshy seeds of *Peltandra* are food for wood ducks and black ducks, hence one of the common names, duck corn. The dark green to black seeds are buoyant and are commonly found along shorelines many miles from the place of origin... even out to sea.

Hydrophytic Factor/Federal Delineation

According to the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* and the *National List of Plant Species that Occur in Wetlands: Virginia* (1988), *Peltandra virginica* is classified as an **obligate wetland plant (OBL)**. OBLs are plants that almost always occur in wetlands (<99% probability).

Peltandra virginica
(L.) Kunth

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Wetlands Program

Technical Report

Wetland Flora

No. 91-1 / January 1991
Gene M. Silberhorn

Reed Grass
Phragmites

Phragmites australis (Cav.) Trin. ex. Steud.

Growth Habit And Diagnostic Characteristics

Reed Grass is a tall, coarse grass with a terminal, feathery seed head that is all too often an invader of disturbed wetlands, especially marshes. The broad, acutely tapering leaves, 1 to 5 centimeters (cm) wide (0.5 to 2 inches) and up to 50 cm long (up to 20 inches), the characteristic seed head, and the very long, exposed rhizomes are typical features of this giant grass. It usually grows rapidly to heights of 2 to 4 meters (m) or more (6 to 12 feet).

The dense, but somewhat delicate reproductive panicle (flowering head), is approximately 15 to 35 cm long (6 to 13 inches), brownish-purple in flower (late June to August), fading to a pale straw color later in the season. It grows in dense monospecific stands, usually outcompeting other species exclusively. Characteristically, the leaves are deciduous by late fall or winter, but the naked stems and head remain until spring. The rhizomes, which are actually horizontal stems, produce new sprigs every several inches along their length. Rhizomes often grow above ground and can be up to 13 meters long (over 40 feet). The aggressive nature of this plant is attributed to the rapid growth of these modified stems. Rhizomes originate from mature plants and can each produce as many as 20 new sprigs (clones).

Density and Production

Stem density ranges from 30 to 65 stems per meter^2. Annual productivity ranges from 4 to 6 tons per acre per annum.

Distribution

Reed Grass is a cosmopolitan plant found nearly throughout the world, especially in the northern hemisphere. It appears mainly in tidal and non-tidal freshwater wetlands. In Eastern Europe, fibers from its tough, thick stems are used for paper making. In Great Britian, *Phragmites* marshes are the prime habitat for the marsh hawk. In its European habitats, Reed Grass is held in check by natural biological controls, and is considered a valuable plant. On this side of the Atlantic, most wetland managers consider it an unwanted weedy invader.

Reed Grass was first recorded in New England during colonial times. Its distribution has since expanded south and west. Along the lower Hudson River, the great New Jersey 'meadowlands' (a term still used today) were once dominated by Saltmeadow Hay (*Spartina patens*), hence the placename. The original meadows were disturbed long ago by solid waste and fill from various sources, and that which has not been developed (a football stadium, interstate highways and the like), is now overgrown with *Phragmites*.

Reed Grass was little noticed in Virginia until approximately the last 30-40 years. It is now definitely gaining ground in the Commonwealth. Managers are concerned about the species because of its ability to outcompete more desirable species such as Big Cordgrass (*Spartina cynosuroides*), Wild Rice (*Zizania aquatica*), *Spartina patens*, and other native wetland plants.

Habitat

Phragmites is usually not found in undisturbed high salinity marshes. It is prevalent, however, where such areas have been diked to contain dredged material, restricting tidal communication. This practice is no longer permitted of course. Chronic marsh fires may also disturb natural marshes sufficiently to allow *Phragmites* to invade and take over as a dominant plant.

Ecological Values/Benefits

Although it is not desired, *Phragmites* is able to propagate in dredged spoil areas, thereby reducing sheet erosion and enhancing aeration to the surface sediments.

Hydrophytic Factor/Federal Delineation

According to the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* and the *National List of Plant Species that Occur in Wetlands: Virginia* (1988), ***Phragmites australis* is classified as a facultative plus wetland plant (FACW+)**. FACW+ plants usually occur in wetlands (67-99% estimated probability), but are occasionally found in nonwetlands.

Phragmites australis
(Cav.) Trin. ex. Steud.

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Rita Llanso

Wetlands Program

Technical Report

Wetland Flora

No. 91-3 / March 1991 Gene M. Silberhorn

Arrowhead
Duck Potato

Sagittaria latifolia Willd.

Growth Habit and Diagnostic Characteristics

Sagittaria latifolia is frequently found in tidal freshwater marshes and swamps, particularly in the intertidal zone. It is often associated with arrow arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*) and to a lesser extent, bultonge (*Sagitteria falcata*), but it is seldom as abundant as arrow arum and pickerelweed. Arrowhead is a fleshy emergent, growing from 45 to 90 cm (1.5 to 3.0 ft) high. A variable species, the leaf blades range from broad (as illustrated) to very slender and strap-like. Blades usually have the characteristic arrowhead shape, whether broad (up to 35 cm) or narrow (8 cm or less). The leaf petiole and flower stalk (scape) come up from rhizomes beneath the substrate. The scape usually occurs associated with leaf clusters, but is independent of them. Rhizomes also produce underground tubers that are produced at the ends of rhizomes, hence the common name duck potato. The tubers are a prime waterfowl food. They are also quite good for human consumption; however, they are difficult to find in the mud and are seldom larger than a golf ball.

The flowers are showy white with bright yellow centers (stamens or pistils) with the male or staminate flowers near the terminus of the scape. The reproductive structure of this plant is very similar to bultongue (*S. falcata*), however, bultongue has lance-shaped leaves without the downward trending lobes. Both species produce dry fruits called achenes that are sometimes eaten by waterfowl. Unlike arrowhead, bultongue does not produce tubers.

A similar plant, arrow arum (*Peltandra virginica*), has a triangular-shaped leaf that may be confused with this species, however, *Peltandra* does not have white flowers and the leaf veination is different. Arrow arum has three major veins, whereas arrowhead has narrower veins that parallel the general shape of the blade.

Density and Production

Annual production for *S. latifolia* ranges from 200 to over 1000 grams of dry weight per meter^2 (1-4 tons/acre). There is no information in the literature regarding stem count or density.

Distribution

Arrowhead is widely distributed in wetland areas throughout the eastern two thirds of the United States.

Habitat

S. latifolia usually grows in the soft, muddy sediments of the intertidal zone of freshwater marshes and swamps. Arrowhead is often associated with arrow arum and pickerelweed (*Pontederia cordata*), although it does not appear as abundant as the other two species. A related species, bultongue (*S. falcata*), can also be found in the same habitat. Arrowhead also grows in non-tidal wetlands.

Ecological Values/Benefits

In addition to the waterfowl food value of this species (tubers), the entire ecosystem is considered a primary spawning and nursery area for anadromous fishes. Holistically, organic matter produced by vascular plants, phytoplankton, and benthic algae in these systems serves as an energy source for a large array of organisms, a number of which are commercially important.

Hydrophytic Factor/Federal Delineation

According to the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* and the *National List of Plant Species that Occur in Wetlands: Virginia* (1988), *Sagittaria latifolia* is classified as an **obligate wetland plant (OBL)**. OBLs are plants that almost always occur in wetlands (>99% probability).

Sagittaria latifolia Willd.

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Wetlands Program

Technical Report

Wetland Flora

No. 91-5 / May 1991

Gene M. Silberhorn

Pickerelweed
Tuckahoe

Pontederia cordata L.

Growth Habit and Diagnositic Characteristics

Pickerelweed is a striking, fleshy perennial appearing in tidal freshwater, riverine wetlands in the intertidal zone, between mean sea level and mean high water. At peak season, the plant's two prominent features are its rich green, heart-shaped (cordate) leaves and attractive spike of violet-blue flowers. The leaves, 20 to 40 cm long (8 to 10 in) and 10 to 20 cm wide (4 to 8 in), have an array of delicate veins that parallel one another and the characteristic shape of the leaf. Although the dense foliage and height (60 to 120 cm - 2 to ft) are prominent habit features, the spike of blue flowers (May to September) may be its most asthetic asset. A marsh dominated by this plant will have a definite blue hue during the blooming season because of the mulitiude of flowering spikes. Subtending the flower spike is a leaf-like bract, very similar to the vegetative leaves. *Pontederia* often grows in association with arrow arum (*Peltandra virginica*). Although both species are somewhat similar, they can be easily differentiated. Pickerelweed has heartshaped leaves and blue flowers and arrow arum has an enclosed (spathe) spike (spadix) and triangular shaped leaves with three prominent veins.

Density and Production

Production estimates of *Pontederia* are often combined with *Peltandra* in the scientific literature largely because both species usually occur as the arrow arum/pickerelweed community in the intertidal zone. In the Mid-Atlantic region, peak standing crop estimates for this community range from 450 to over 1200 g (dry wt)/m^2, averaging over 660 or up to 5 tons per acre per year. These figures are comparable to the very productive saltmarsh cordgrass (*Spartina alterniflora*). Stem density is not well documented, but estimated to be from 10 to 20 per m^2. Fleshy aquatic plants, such as *Pontederia*, rapidly decompose at the end of the growing season. The familiar vegetated shores are mainly bare mud by October.

Distribution

Pickerelweed ranges throughout the eastern North America from Canada to South Carolina and Texas. In nontidal areas, *Pontederia* often occupies the shoreline of lakes and ponds.

Habitat

In the coastal plain riverine wetlands of our area, *Pontederia* commonly grows in soft, muddy sediments between mean sea level and mean high water (intertidal zone). It often functions as a pioneer species in this habitat, invading mud flats in advance of its usual companion counterpart, *Peltandra virginica*. Pickerelweed is seldom found in marshes where salinities average above 0.7 ppt. Arrow head (*Sagittaria latifolia*), bultongue (*Sagittaria falcata*), giant bulrush (*Scirpus validus*) and wild rice (*Zizania aquatica*) are frequent or occasional associate species.

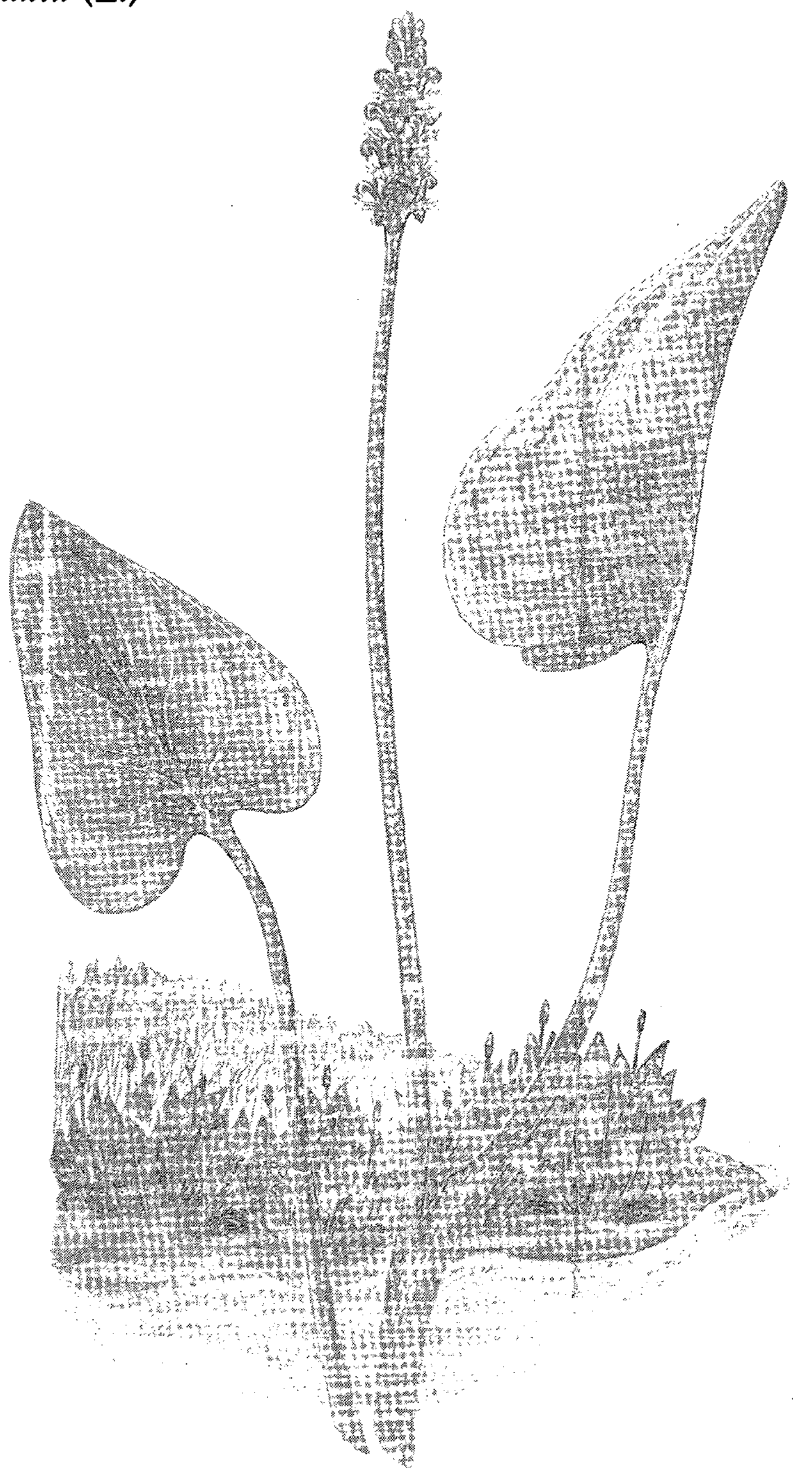
Ecological Values/Benefits

Oligohaline and freshwater tidal riverine wetlands of the Chesapeake Bay watershed are important spawning and nursery areas for anadromous fishes, such as herring and shad. The reddish, bladder-like seeds of pickerelweed have limited value as waterfowl food.

Hydrophytic Factor/Federal Delineation

According to the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* and the *National List of Plant Species that Occur in Wetlands: Virginia* (1988), *Pontederia cordata* is classified as an **obligate wetland plant (OBL)**. OBLs are plants that almost always occur in wetlands (>99% probability).

Pontederia cordata (L.)



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Rita Llanso

Wetlands Program

Technical Report

Wetland Flora

No. 91-7 / July 1991

Gene M. Silberhorn

Red Maple

Acer rubrum L.

Growth Habit and Diagnostic Characteristics

An immature red maple tree has relatively smooth, gray bark similar to American beech (*Fagus grandifolia*), which retains even gray bark throughout life. In contrast, as red maple ages, the bark darkens, longitudinal farrows form and often breaks off in strap-like fashion. The leaves are arranged oppositely on the stem and are fan-lobed, exhibiting the familiar 'maple leaf shape'.

The twigs and buds are reddish, especially in the spring, hence the name red maple. The underneath side of the leaves is whitish in color. This characteristic is particularly evident in a breeze.

The winged fruit (samara) occurs in pairs and is reddish in the spring, turning straw-brown as it matures.

A similar species, silver maple (*Acer saccharinum*), may also be found in wet woods, but it can be distinguished from red maple by the deeper notches between the leaf lobes. Red maple is much more common in bottomland hardwood forests or swamps of coastal Virginia than silver maple.

Another tree species that may be confused with red maple is sweet gum, (*Liquidambar styraciflua*), because it has similarily shaped five-lobed leaves. This tree may also be a component of certain wet woods, but it has *alternate* leaves, green on the underneath side, and large, spherical, bur-like fruits, often referred to as 'gum balls'.

Distribution

Red maple is found throughout most of the eastern two thirds of the United States in both uplands and wooded wetlands.

Habitat

Acer rubrum occurs in a very wide range of habitats, from hillsides to swamps, which may have standing water three to six weeks or more of the year. It is usually a common community component of winter wet woods, otherwise known as PFO1A (Palustrine, Forested, Broad-leaved Deciduous, Temporarily Flooded) wetlands according to federal terminology/classification. In this wetland type, it often occurs with sweet gum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), green ash (*Fraxinus pennsylvatica*) and American hornbeam (*Carpinus caroliniana*). Red maple is a very opportunistic tree, often one the chief invaders or pioneer species that proliferates cutover woodlands or even abandoned fields.

This tree is also found in a wide variety of other freshwater wetland types. Red maple is a common subordinate species in the tidal swamps in the Pamunkey River Watershed of Virginia, occupying sites with two dominant species, green ash and black gum (*Nyssa sylvactica* var. *biflora*). *Acer rubrum* is also very common in the Great Dismal Swamp in Virginia and North Carolina, especially in areas that were timbered within the last 50 years.

Ecological Values/Benefits

Since red maple is found in several different wetland types, both tidal and nontidal, the broad range of ecological values attributable to forested wetlands in general may be applied to this species as a common component of these habitats.

Nontidal wetlands function as natural filters of high nutrient loads which often originate from croplands as well as sediment runoff, pesticide and herbicide residues and other potential toxins. They also serve as habitat for wildlife.

Specifically, red maple often produces abundant seeds, a food source for birds and squirrels. As a pioneer species, *A. rubrum* is known to rapidly invade cutover woodlands, eventually providing cover and shade, browse for deer, adding organic matter to the soil and other modifying contributions.

Hydrophytic Factor/Federal Delineation

According to the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (1989) and the *National List of Plant Species that Occur in Wetlands: Virginia* (1988), *Acer rubrum* is classified as a **facultative plant** (FAC). FACs are plants that are "equally likely to occur in wetlands or nonwetlands (estimated probability 34%-66%)".

Acer rubrum L.

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THE PERMIT PROCESS

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February 1991 No. 91-2

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College of William and Mary
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Dr. Carl Hershner, Program Director
Kirk J. Havens, Editor
Harold Burrell, Artwork

Commonwealth's Declared Policy:

"to preserve the wetlands and to prevent their despoliation and destruction. . ."

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Coastal Resources and the Permit Process: Definitions and Jurisdictions

Julie G. Bradshaw

This paper reviews the jurisdictions of the various regulatory agencies and the definitions of terms relating to wetlands and other coastal resources in Virginia. The procedure for processing of permits for activities involving coastal resources is outlined.

Regulatory Authority

Activities on Virginia's shoreline are controlled by a number of federal and state laws. The laws create overlapping jurisdictions for the various regulatory agencies.

State/local

Pertinent laws of the Commonwealth of Virginia include the Tidal Wetlands Act (Title 62.1, Chapter 2.1) and the Coastal Primary Sand Dune Protection Act (Title 62.1, Chapter 2.2). The Commonwealth's ownership of subaqueous land is established in Title 62.1, Chapter 1 of the Virginia Code. The Virginia Marine Resources Commission (VMRC) is the regulating authority for the coastal resources included in these laws. Localities (i.e., counties, cities, and towns) which desire to regulate their own tidal wetlands or sand dunes have the option of adopting prescribed zoning ordinances and forming citizen Wetlands Boards. VMRC retains an oversight and appellate role for localities which have adopted these coastal resource ordinances.

Federal

Federal laws include Section 404 of the Clean Water Act of 1977 (33 U.S.C. 1251) which addresses dredge and fill operations in wetlands and Section 10 of the Rivers and Harbors Appropriation Act of 1899 (33 U.S.C. 403) which addresses activities affecting navigation. The U.S. Army Corps of Engineers is assigned as the primary federal agency with regulatory authority for these laws. The Corps jurisdiction established by these laws includes waters of the U.S. and their adjacent wetlands.

(continued)

Tidal datums

mean low water (MLW)—the average elevation of low water observed over a specific 19 year period

mean high water (MHW)—the average elevation of high water observed over a specific 19 year period

mean tide range—the difference in elevation between MLW and MHW

mean sea level—the average of hourly water elevations observed over a specific 19 year period

Notes: The National Oceanic and Atmospheric Administration's National Ocean Service keeps tidal datum records at a network of gage stations along the coast. The specific 19 year period used for calculating MLW and MHW, called the Metonic cycle or the National Tidal Datum Epoch, incorporates a number of the astronomical cycles which cause variations in tide levels.

The ***National Geodetic Vertical Datum (NGVD)*** is a fixed reference based on the earth's shape and the distance between the earth's surface and the center of the earth. NGVD is the datum for land elevations on USGS topographic maps. NGVD was formerly known as the Sea Level Datum of 1929. The name was changed because of confusion with the tidal datum Mean Sea Level (defined above). Relationships between NGVD and local tidal datums are variable and are published in conjunction with the tidal bench mark data by the National Ocean Service.

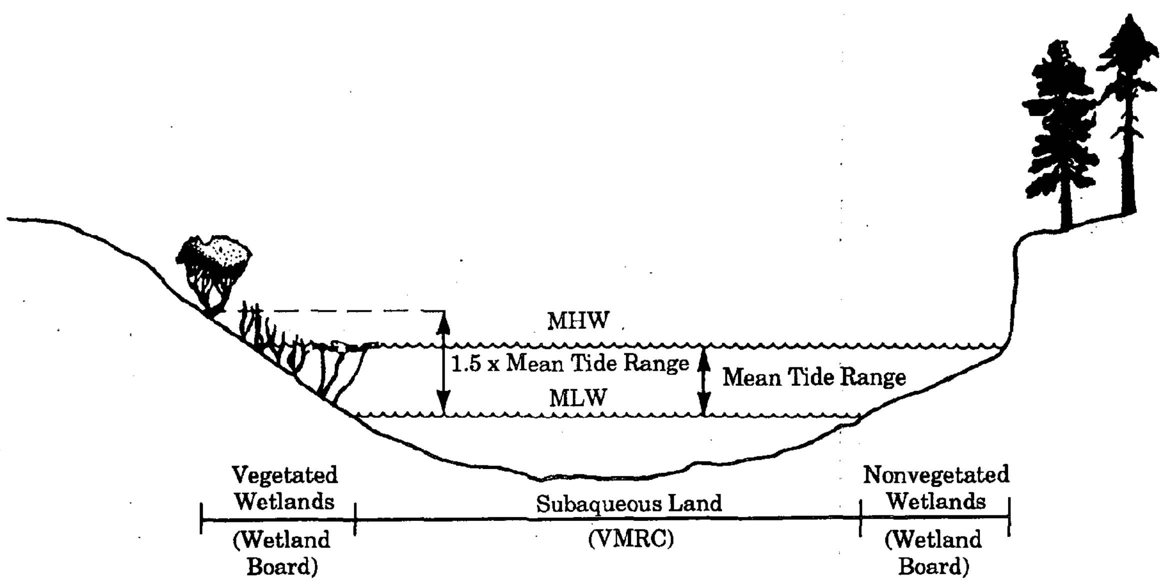
State/local definitions

vegetated wetlands are those lands which satisfy these criteria:

- between MLW and an elevation above MLW equal to 1.5 times the mean tide range
- contiguous to MLW
- vegetated with any of the listed wetland plant species (Appendix A)

nonvegetated wetlands are those lands which satisfy these criteria:

- between MLW and MHW
- contiguous to MLW
- not otherwise considered vegetated wetlands



Subtidal land or ***subtidal bottom*** refers to the area channelward or seaward of MLW, without regard to political subdivision or land ownership.

Subaqueous land or ***subaqueous beds*** refer to ungranted beds of the bays, rivers, creeks and shores of the sea which are owned by the Commonwealth. This includes the beds of tidal and nontidal water bodies. Because property ownership in Virginia extends channelward to MLW in tidal areas, subaqueous land is the land channelward of MLW, with some exceptions:

Potomac River

The Potomac River is owned by the State of Maryland and the District of Columbia. The boundary between Maryland and Virginia is generally at MLW on the Virginia side of the river, except where embayments, creeks and inlets occur, at which the boundary line is from headland-to-headland. Therefore, VMRC often may not have jurisdiction over subtidal land on the Potomac River.

Manmade canals

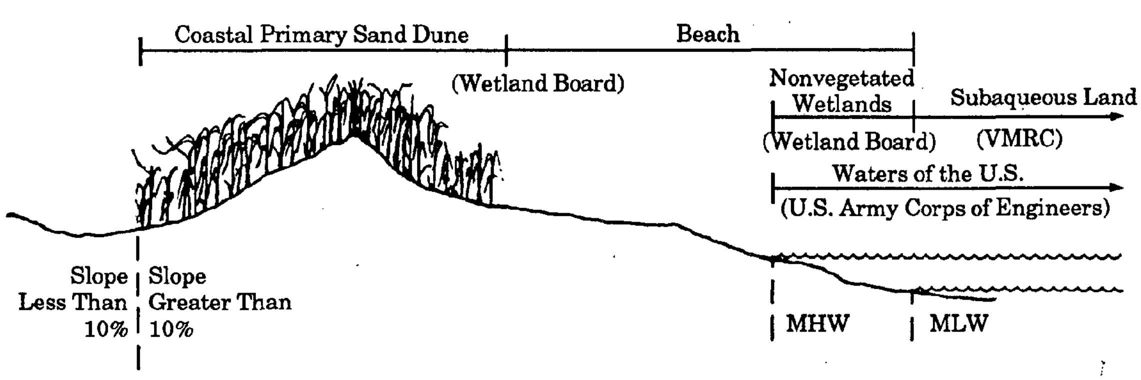
VMRC does not currently exert jurisdiction over subtidal land in manmade canals. However, the Commonwealth's Tidal Wetlands Act does apply to vegetated and nonvegetated wetlands within manmade canals.

coastal primary sand dunes are those lands which have the following characteristics:

- mound of unconsolidated sandy soil
- contiguous to MHW
- landward and lateral limits marked by a change in grade from 10% or greater to less than 10%
- vegetated with any of the listed dune plant species (Appendix B)
- applies only to Counties of Accomack, Lancaster, Mathews, Northampton, Northumberland, and Cities of Hampton, Norfolk, and Virginia Beach.

beaches are those lands which meet the following criteria:

- the shoreline zone of unconsolidated sandy material
- extends from MLW landward to a marked change in material composition or in physiographic form (e.g., dune, bluff, marsh)
- if no such marked change occurs, then the landward limit of the beach is defined by a line of woody vegetation or the nearest impermeable manmade structure.

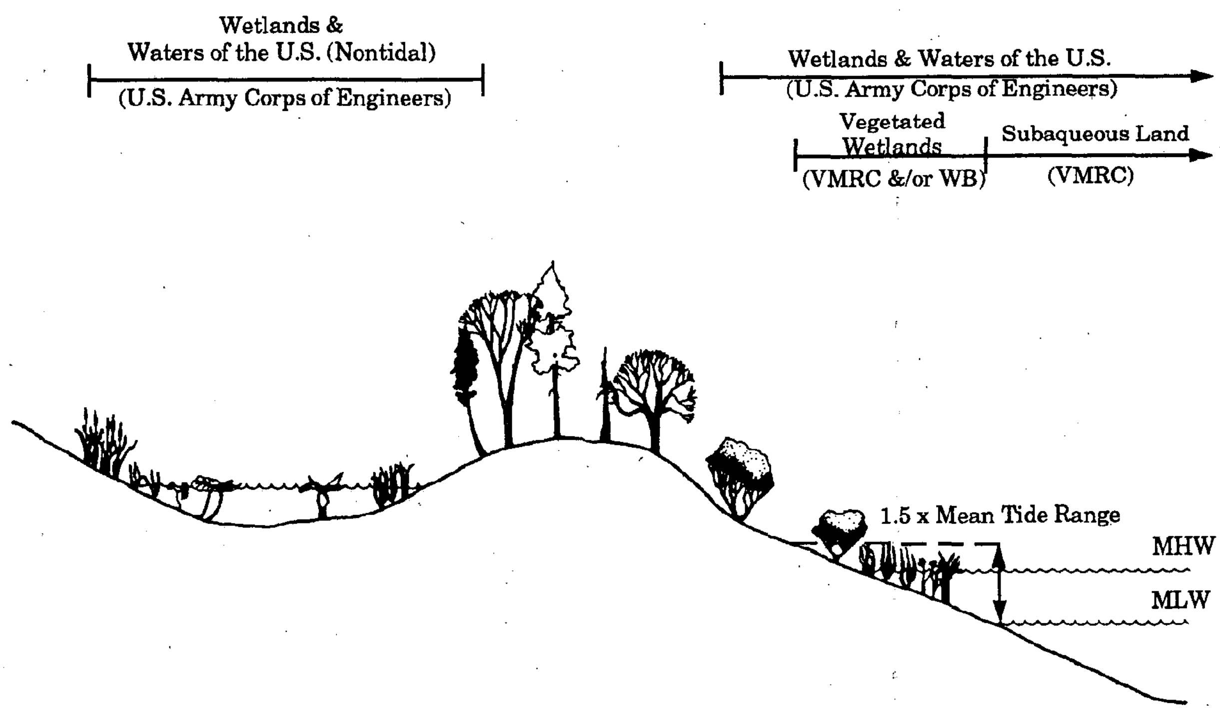


Federal definitions

The federal definition of **wetlands** is based on three parameters: soil, hydrology, and vegetation. Specifically, wetlands are: "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

The federal definition includes both tidal and nontidal wetlands.

In tidal areas, wetlands under federal jurisdiction may encompass a broader area than the state/local jurisdiction (i.e., federal wetlands may extend to elevations greater than 1.5 times the mean tide range above MLW).

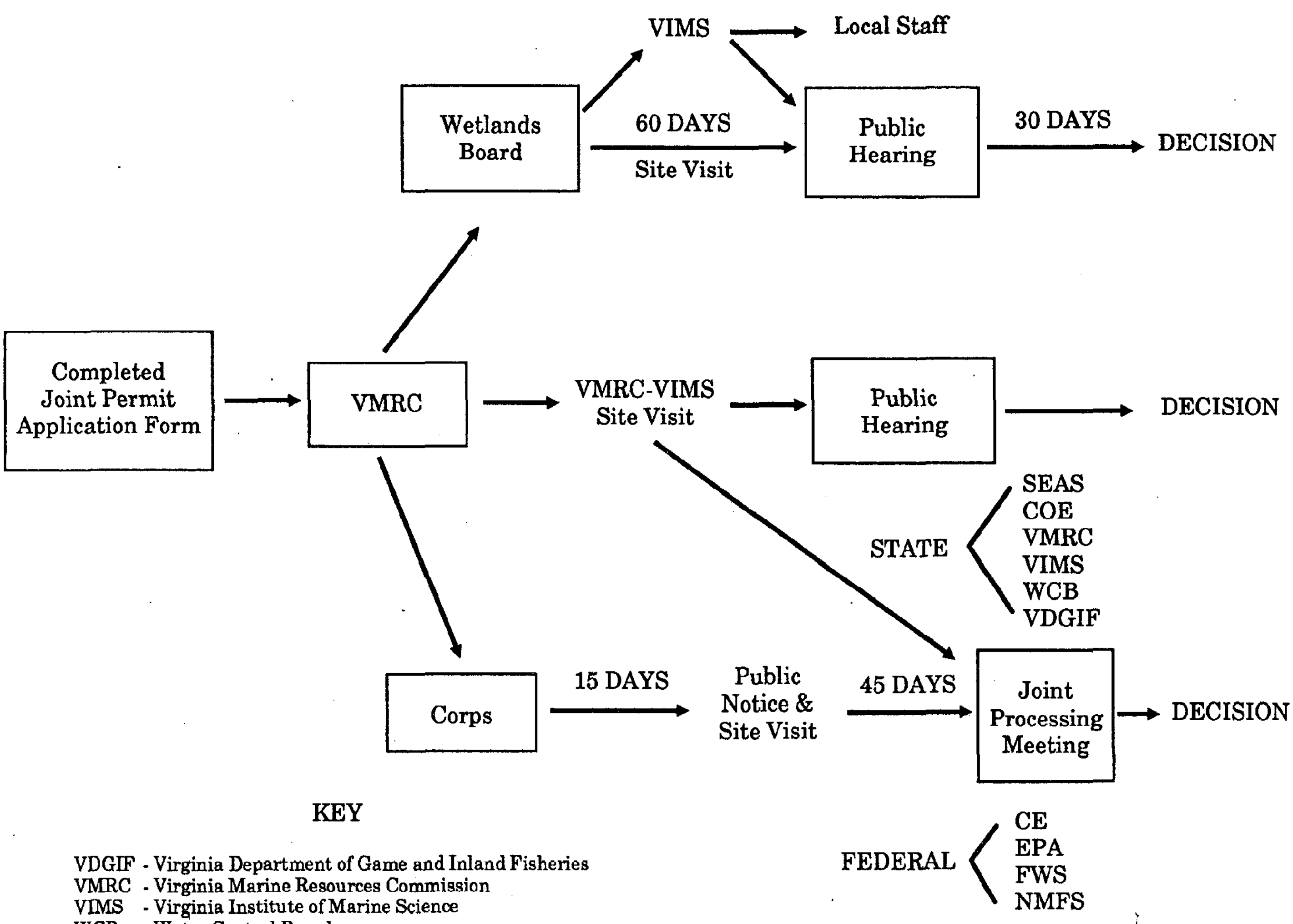


Permit Process

U.S. Army Corps of Engineers, Virginia Marine Resources Commission, and/or local wetlands board permits may be required for activities in Virginia's wetlands, subaqueous beds, sand dunes, and beaches. Activities which may require permits include, but are not limited to, dredging, filling, and construction of bulkheads, riprap revetments, groins, jetties, boat ramps, and piers. Submission of the Joint Permit Application initiates the permit process. Applications are processed independently by each agency.

The VIMS involvement in the permit process is strictly advisory. VIMS provides technical and scientific advice to the Commonwealth's regulatory agencies. Advice generally involves estimation of marine environmental impacts and recommendation of alternatives or modifications to minimize these impacts.

Virginia's Shoreline Permit Process



KEY

VDGIF - Virginia Department of Game and Inland Fisheries
VMRC - Virginia Marine Resources Commission
VIMS - Virginia Institute of Marine Science
WCB - Water Control Board
SEAS - Shoreline Erosion Advisory Service
COE - Council on the Environment
EPA - Environmental Protection Agency
FWS - Fish and Wildlife Service
NMFS - Narional Marine Fisheries Service
CE - Corps of Engineers

Appendix A

List of wetlands plant species in Virginia's Tidal Wetlands Act

saltmarsh cordgrass	(*Spartina alterniflora*)
saltmeadow hay	(*Spartina patens*)
saltgrass	(*Distichlis spicata*)
black needlerush	(*Juncus roemerianus*)
saltwort	(*Salicornia* sp.)
sea lavender	(*Limonium* sp.)
marsh elder	(*Iva frutescens*)
groundsel bush	(*Baccharis halimifolia*)
wax myrtle	(*Myrica* sp.)
sea oxeye	(*Borrichia frutescens*)
arrow arum	(*Peltandra virginica*)
pickerelweed	(*Pontederia cordata*)
big cordgrass	(*Spartina cynosuroides*)
rice cutgrass	(*Leersia oryzoides*)
wildrice	(*Zizania aquatica*)
bulrush	(*Scirpus validus*)
spikerush	(*Eleocharis* sp.)
sea rocket	(*Cakile edentula*)
southern wildrice	(*Zizaniopsis miliacea*)
cattails	(*Typha* spp.)
three-squares	(*Scirpus* spp.)
buttonbush	(*Cephalanthus occidentalis*)
bald cypress	(*Taxodium distichum*)
black gum	(*Nyssa sylvatica*)
tupelo	(*Nyssa aquatica*)
dock	(*Rumex* sp.)
yellow pond lily	(*Nuphar* sp.)
marsh fleabane	(*Pluchea purpurascens*)
royal fern	(*Osmunda regalis*)
marsh hibiscus	(*Hibiscus moscheutos*)
beggar's tick	(*Bidens* sp.)
smartweed	(*Polygonum* sp.)
arrowhead	(*Sagittaria* spp.)
sweet flag	(*Acorus calamus*)
water hemp	(*Amaranthus cannabinus*)
reed grass	(*Phragmites communis*, now called *P. australis*)
switch grass	(*Panicum virgatum*)

Appendix B

List of dune plant species in Virginia's Coastal Primary Sand Dune Protection Act

American beach grass	(*Ammophila breviligulata*)
beach heather	(*Hudsonia tomentosa*)
dune bean	(*Strophostyles umbellata* var *paludigena*)
dusty miller	(*Artemisia stelleriana*)
saltmeadow hay	(*Spartina patens*)
seabeach sandwort	(*Arenaria peploides*)
sea oats	(*Uniola paniculata*)
sea rocket	(*Cakile edentula*)
seaside goldenrod	(*Solidago sempervirens*)
short dune grass	(*Panicum amarum*)

Contacts

U.S. Army Corps of Engineers	
Norfolk District	(804) 441-7656
Northern Neck field office (Lively)	(804) 462-7891
Northern Virginia field office (Dumfries)	(703) 221-6967
U.S. Fish and Wildlife Service, Gloucester field office	(804) 693-6694
Virginia Marine Resources Commission (Newport News)	(804) 247-2252
Shoreline Erosion Advisory Service (Gloucester Point) (a program of the Dept. of Conservation and Recreation, Division of Soil and Water Conservation, Shoreline Programs Bureau)	(804) 642-7121
Virginia Council on the Environment (Richmond)	(804) 786-4500
Virginia Water Control Board (Richmond)	(804) 367-9763
Virginia Dept. of Game and Inland Fisheries (Richmond)	(804) 367-1000
Virginia Dept. of Health (Richmond)	(804) 786-7937
Virginia Institute of Marine Science (Gloucester Point)	(804) 642-7380

Wetlands Program Technical Report

College of William and Mary
Virginia Institute of Marine Science
School of Marine Science
Gloucester Point, Virginia 23062 U.S.A.

The Role of VIMS in the Permit Process

The Virginia Institute of Marine Science/School of Marine Science of the College of William and Mary is, as its name would indicate, unique in its blend of activities stemming from Title 28, Chapter 9 of the Code of Virginia. Sometimes called Virginia's Oceanographic Law, this section of the Code mandates three principal areas of responsibility to VIMS:

- Applied and fundamental research on the resources and environment of the tidal waters of the Commonwealth.

- Advice and assistance for the public and private managers and users of these environments and resources.

- Educational programs at all interest levels fostering marine science scholarship, informed decision-making in resource management and an enlightened public.

The linkage of these three areas of responsibility is a major strength and allows VIMS to provide necessary technical input to the shoreline permit process.

The Virginia Wetlands Act stipulates that VIMS will evaluate wetlands by type and maintain a continuing inventory of vegetated wetlands. VIMS is also charged with advising and assisting the VMRC with producing guidelines which scientifically evaluate wetlands by type and set forth the consequences of use of each type. These activities have been completed, and in the case of the guidelines completely revised in 1984. VIMS also assisted in the preparation of the Coastal Primary Sand Dune Guidelines adopted in 1980.

VIMS' educational and advisory mandates dictate several other activities in which the Institute is involved with the state shoreline permit system. Wetlands workshops and field trips are offered for board members, staff persons and other resource managers on the state and federal levels. Subjects covered include the types and values of wetlands, wetland delineation, impacts of man's activities, etc. VIMS prepared a detailed wetland curriculum during 1991 which serves as the basis for its education efforts on behalf of local resource managers, planners and staff. The Wetlands Program at VIMS also publishes *The Virginia Wetlands Report*, a quarterly bulletin which features news and articles of interest to Virginia resource managers. In addition, a technical report series presents detailed background information on wetlands and other resources in the coastal zone. A series of publications describing the common and not so common plants found in wetland habitats is also produced bi-monthly and distributed to managers and other interested persons throughout the Commonwealth.

VIMS' technical advisory role in the process consists of preparing environmental assessments for each application considered by a wetlands board or the VMRC. After visiting the site, a report is prepared outlining the resource impacts involved and describing alternatives and mitigating measures which would materially reduce the adverse effects of the proposal. This report serves as the principal environmental input to the wetlands public interest review and thus is an integral part of the decision-making process.

The Wetlands Program at VIMS is involved in ongoing research which contributes to the management effort overall. Studies involving the identification of the values and functions of wetlands, the impacts of man's activities in wetlands, the monitoring of created marshes, the effects of fire and the use of wetlands by estuarine organisms, as well as birds and other wildlife contribute to informed decision-making. VIMS scientists are available as needed to answer questions regarding wetlands and the marine environment generally.

Virginia Marine Resources Commission Role

The regulation of Virginia's tidal wetlands and coastal primary sand dunes is a joint responsibility of the Virginia Marine Resources Commission (Commission) and individual wetlands boards. In addition to assisting the local wetlands boards where possible, the role of the Commission involves the review of wetlands board decisions, the review of appeals filed by applicants or freeholders and the original consideration of applications for use or development of state-owned wetlands as well as wetlands and dunes in localities without boards. The Commission also acts as the "clearing house" for the Joint Permit Application which must be submitted for all wetlands projects (a separate application must be submitted for projects involving primary dunes which should be filed at the local level). The Commission is responsible for assigning a joint permit processing number to each wetlands application and distributing the application to the local wetlands boards. These duties and functions are carried out by the Commission's Habitat Management Division.

As required by Code, the Commission must review each board decision for projects involving both wetlands and coastal primary sand dunes. Commission staff must evaluate whether or not the local board properly considered and applied the policy, standards and guidelines of the wetlands and dunes act. If the Commissioner concludes that the decision of the board does not comply with the policy, standard or guidelines, the board chairman will be notified and the decision will be reviewed by the full Commission within 45 days.

A decision of a local board may also be appealed by an applicant or 25 freeholders in the county, city or town. All appeals must be filed within 10 days of the wetlands board decision. Upon receipt of an appeal or decision for review, the Commissioner will require that the record of the board proceedings (transcript of testimony, application, exhibits, photos, etc.) be forwarded to the Commission.

In order to develop an efficient working relationship with the various wetlands boards, each environmental engineer on staff within the Habitat Management Division is assigned a geographic area of responsibility. The engineer in each political jurisdiction is responsible for tracking the progress of each application and providing assistance to the local government. The engineer visits each project site and generally attends each wetlands board meeting. While the engineer can provide assistance regarding procedures and the processing of applications, they cannot make recommendations to the board as this would prejudice the Commission's required review of each board decision. The engineers are also available for consultation regarding violations of the wetlands or dunes ordinances.

ATTORNEY GENERAL AND VMRC ADVICE

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Official Attorney General Opinions

On Matters Related To

Wetlands And Dunes Issues

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Wetlands Act. Public Notice and Hearing Required When Permittee Seeks Modification in Conditions and Limitations of Permit.

June 20, 1979

The Honorable James E. Douglas, Jr., Commissioner
Marine Resources Commission

You ask whether a local wetlands board followed lawful procedure when it modified a permit at an "administrative" meeting. The permit had been granted over a year earlier after a public hearing held pursuant to §§ 6 and 7 of the Wetlands Zoning Ordinance prescribed by § 62.1-13.5 of the Code of Virginia (1950), as amended.

You have advised me that the board follows the practice of holding an administrative meeting on the first Tuesday of each month. These meetings are scheduled on the annual calendar of the local government as to date and location, and are open to the public. There is no compliance, however, with § 6 of the Ordinance, as no agenda items are advertised for these meetings. The board also holds a public hearing or meeting on the third Tuesday of each month. Agenda items for these meetings are advertised in compliance with § 6 of the Ordinance.

The permit in question had been granted over a year earlier, but changed circumstances now prevent the permittees from complying with the conditions and limitations of the permit. At two recent administrative meetings, the permittees requested modifications in spoil sites and bond requirements. There was to be no change in the encroachment on the wetlands. At the first administrative meeting, the board decided to set the matter for public hearing. At the second administrative meeting, the board reconsidered and granted the modification. Appeal has been taken to the commission by 25 or more freeholders pursuant to § 62.1-13.11(3), alleging the modification was made upon unlawful procedure. *See* § 62.1-13.13(2)(c). I am advised that these appellants were not at the second administrative meeting, and did not know the modification was then under consideration.

Section 8 of the Ordinance provides that if a permittee fails to comply with the conditions and limitations in an issued permit, the permittee is entitled to a hearing before the permit can be suspended or revoked. Also, under § 9(a) of the Ordinance, the board may grant applications in modified form, but in so doing the board shall base its decision on matters raised through testimony of any person in support of or in rebuttal to the permit application. *See* Ordinance § 9(a)(1). Without notice pursuant to § 6 of the Ordinance, there may be no opportunity for rebuttal testimony.

Accordingly, I find that the decision of the board was made upon unlawful procedure. The commission should modify or reverse the decision of the board if the commission finds that the substantial rights of appellants have been prejudiced because of the unlawful procedure. *See* § 62.1-13.13(2).

Wetlands Act. Counties, Cities and Towns. Ordinances. Authority to Repeal Standard Wetlands Zoning Ordinance Once Adopted.

February 9, 1981

The Honorable Daniel M. Stuck
County Attorney for New Kent County

You ask whether a county, city or town is authorized to repeal the standard Wetlands Zoning ordinance provided for in § 62.1-13.5 of the Code of Virginia (1950), as amended, once the governing body has adopted the ordinance.

Section 62.1-13.5 provides that any county, city or town may adopt a standard Wetlands Zoning Ordinance, as set out in the statute. I find no specific provision in the wetlands law (Ch. 2.1 of Title 62.1) that authorizes repeal, but at the same time, I find no specific provision that prohibits repeal.

The adoption of ordinances is a legislative act, and ordinarily the legislative power of a local governing body is not limited or exhausted by one exercise, and an ordinance once adopted may be amended or repealed.[1]

Accordingly, in the absence of any express statutory prohibition against repeal, I find that a county, city or town is authorized to repeal the standard Wetlands Zoning Ordinance provided for in § 62.1-13.5.[2]

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[1] *See* Opinion to the Honorable Stephen C. Harris, Commonwealth's Attorney for Louisa County, dated March 24, 1976, found in Report of the Attorney General (1975-1976) at 26; Opinion to the Honorable J. Richmond Low, Jr., Commonwealth's Attorney for King George County, dated July 14, 1980 (copy enclosed).

[2] Section 62.1-13.9 provides that when a county, city or town has not adopted the standard ordinance, applications for permits shall be made directly to the Marine Resources Commission, and the Commission shall process such applications in accordance with the standard ordinance. In the event a county, city or town repeals the standard ordinance, applications for permits shall again be made directly to the Commission under § 62.1-13.9.

Wetlands Act. Subdivision Plat is Not a Plan as Contemplated By Exemption Provision of Wetlands Act Unless it is a Monument to Developer's Intention Diligently Pursued and it Represents Substantial Expenditure.

September 1, 1982

The Honorable James E. Douglas, Jr., Commissioner
Marine Resources Commission

You have asked that I reconsider a previous Opinion of this Office, found in the 1972-1973 Report of the Attorney General at 513, which discussed the meaning of the term "plan or plan of development" as used in the Wetlands Act.[1] Section 62.1-13.20 of the Code of Virginia provides, in pertinent part, that

> "[n]othing in this chapter shall affect...(2) any project or development...for which, prior to July 1, 1972... a plan or plan of development thereof has been filed pursuant to ordinance or other lawful enactment...."

The 1973 Opinion stated that "a subdivision plat which clearly indicates lot lines and streets, the confines of which are identifiable, would constitute a plan or plan of development..." required for the exemption. You point out that a recent decision of the Circuit Court of Virginia Beach, in a case styled *City of Virginia Beach v. Virginia Marine Resources Commission, et al.* (C81-Z366-A), found a subdivision plat not to be a plan or plan of development for purposes of the above-quoted exemption from the provisions of the Wetlands Act.

The circuit court, in its Memorandum opinion issued May 19, 1982, interpreted "plan or plan of development" to mean either a "plan of development" submitted under a zoning ordinance adopted pursuant to § 15.1-491,[2] or a plan which would be equivalent to a plan of development, such as a site plan which had been filed and diligently pursued.

---

[1]The Wetlands Act, § 62.1-13.1, *et seq*., provides generally that all development of wetlands shall require prior permit from either a local wetlands board or the Marine Resources Commission.

[2]When the plat which was the subject of that case was recorded, State law did not require localities to enact subdivision ordinances, and Princess Anne County, which is now a part of the City of Virginia Beach, did not enact such an ordinance until December 22, 1952.

See Fairfax County v. Medical Structures, Inc., 213 Va. 355, 357-358, 192 S.E.2d 799, 801 (1972). The court reserved decision on whether a subdivision plat meeting the necessary criteria would be regarded as a "plan" for purposes of § 62.1-13.20.

The court's test for equivalency to a plan of development was a document filed pursuant to law, diligently pursued, which represented (1) a monument to the developer's intention (that is, his intended use of the property), and (2) a substantial good faith expense. The court determined the plat in the Virginia Beach case was only a schematic representation of land divided and had no purposes other than to facilitate the transfer of ownership of land within the plat. The developer was free to vacate the plat, resubdivide the property, or convey all or part of the parcels identified on it. The court further noted that the plat in that case did not dedicate property or serve to meet any of the other commitments required of developers recording subdivision plats under modern subdivision ordinances. Hence, it did not satisfy either the requirement of showing what the developer intended to build, or the requirement of a substantial expense. Accordingly, it was not exempt from the provisions of the wetlands ordinance.

The court's opinion limits the exemption from regulation to those projects for which developers have filed plans which represent a monument to the developer's intention diligently pursued and for which the developer has expended a substantial sum. This construction is sufficiently restrictive to accomplish the protection of undisturbed wetlands intended by the Wetlands Act. It also provides the protection intended by § 62.1-13.20(2) for those who have not yet begun construction but have so altered their position that in fairness they should be permitted to construct their project.

I am, therefore, of the opinion that a subdivision plat, standing alone, is not a plan or plan of development for purposes of the exemption provided in § 62.1-13.20(2), unless it is a monument to the developer's intention which has been diligently pursued and it represents a substantial good faith expense. This Opinion supersedes the Opinion found in the 1972-1973 Report of the Attorney General at 513 to the extent that the two Opinions are inconsistent.

Wetlands Act. Marine Resources Commission and Local Wetlands Boards Have No Authority to Regulate Federal Activities Affecting Federally Owned Wetlands.

September 1, 1982

The Honorable James E. Douglas, Jr., Commissioner
Marine Resources Commission

You have asked for my opinion as to whether, under the Wetlands Act and the Coastal Primary Sand Dune Protection Act, §§ 62.1-13.1, *et seq.*, and 62.1-13.21, *et seq.*, of the Code of Virginia, respectively,[1] local wetlands boards or the Marine Resources Commission can exercise jurisdiction over vegetated and non-vegetated wetlands and coastal primary sand dunes on lands owned by the federal government.

Article VI of the United States Constitution provides that federal law is the supreme law of the land. Thus, states cannot regulate or control the functioning of the federal government within their boundaries in any manner to impede the execution of constitutionally granted federal power, except where the federal government has voluntarily subjected itself to state regulatory processes. 1978-1979 Report of the Attorney General at 174. As pointed out in that Opinion, the 1977 Clean Water Act amended § 404 of the Federal Water Pollution Control Act, 33 U.S.C. § 1344(t), to expressly require that federal agencies comply with all substantive and procedural state requirements concerning the discharge of dredged or fill material. Therefore, to the extent that any project involves the discharge of dredged or fill material in any portion of the navigable waters within Virginia's jurisdiction, that activity is subject to regulation by State law.

The Coastal Zone Management Act of 1972, 16 U.S.C. § 1451, et seq., does not waive federal immunity from state requirements, but § 1456(c)(2) directs federal agencies to ensure that any development project in the coastal zone is consistent, to the maximum extent practicable, with *approved* state coastal zone management programs. The requirements or approval are found in 16 U.S.C. § 1455(c). Because Virginia elected not to have an approved coastal zone management program, this provision is not applicable.*

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[1]Both acts require permits for use or development of "wetlands" and "coastal primary sand dunes" from either the Virginia Marine Resources Commission, or a wetlands board created pursuant to § 62.1-13.6. *See* §§ 62.1-13.5 §4(a) and 62.1-13.26.

*Virginia now has an "approved" coastal zone management plan and thus the directive to be consistent with state plans now applies in Virginia.—*Editor*

I am unaware of any federal laws which specifically waive federal immunity from state regulations for wetlands and primary sand dunes, as was done in the Clean Water Act of 1977. I am, therefore, of the opinion that the Marine Resources Commission and the local wetlands boards have no jurisdiction to regulate federal activities on federally owned wetlands and primary sand dunes unless (1) such activities involve the discharge of dredged or fill materials in any portion of the navigable waters within Virginia's jurisdiction or (2) federal immunity from state environmental requirements has been specifically waived in the legislation authorizing the project in question.

Fees. Local Wetlands Board May Charge Second Fee for Processing Modified Permit Application Where Justified By Cost of Processing Such Modified Application.

September 28, 1982

The Honorable Glenn B. McClanan
Member, House of Delegates

You have asked two questions concerning the processing of an application before a local wetlands board. You first ask whether an applicant for a permit from a local wetlands board must pay a second application fee for processing a modified application following the local board's denial of the first permit application, which denial was with leave to resubmit in modified form. The applicant appealed the ruling to the Marine Resources Commission, which, in turn, remanded the application to the local board for a review on the merits of the modified application.

The Wetlands Act, § 62.1-13.1, *et seq.*, of the Code of Virginia, provides generally that all non-exempt development of wetlands requires a prior permit from either a local wetlands board or the Marine Resources Commission. Section 62.1-13.5 provides the only form of Wetlands Zoning Ordinance allowed. Section 4(c) of that form deals with fees as follows:

> "A nonrefundable processing fee to cover the cost of processing the application, set by the applicable governing body with due regard for the services to be rendered, including the time, skill, and administrator's expense involved, shall accompany each application."

Section 9(b) provides that if the local board denies the application, it shall do so "with leave to the applicant to resubmit the application in modified form."

The statute authorizes the applicable governing body to set a fee to cover the cost of processing the application including the time, skill and administrator's expense involved. I am of the opinion that, if the amended application is equivalent to a new application which must be processed, the local wetlands board can determine that the cost involved in processing such amended application justifies the imposition of an additional fee.

You also ask whether consideration of the modified proposal must be readvertised. Sections 6 and 7 of the Wetlands Zoning Ordinance, as provided in § 62.1-13.5, require a hearing on each application after newspaper publication and mailed notification to certain designated persons. Any person may be heard at the hearing. This provision is clearly intended to allow anyone interested to be heard, and to provide them with notice of their opportunity to be heard.

Because the modified application in the case referred to in your letter proposes to use pilings rather than fill, I assume that it is equivalent to a new application for purposes of advertising the hearing. The public has not had the statutorily required opportunity to be heard on the new proposal. *See* 1978-1979 Report of the Attorney General at 326. I am, therefore, of the opinion that a hearing on a modified application, which substantially differs from the original, must be advertised as required by the Wetlands Zoning Ordinance, as provided in § 62.1-13.5 (§ 6).

Wetlands Act. Members of Local Wetlands Board May Appear and Testify Before Marine Resources Commission Where Such Commission, in its Discretion, Decides to Hear Such Evidence.

December 16, 1982

The Honorable Glenn B. McClanan
Member, House of Delegates

You have asked whether it is appropriate for members of a local wetlands board to (1) appear and (2) testify before the Marine Resources Commission (the "Commission") in connection with a hearing of an appeal from a denial of an application by such local board where the local board members appearing and testifying previously participated in the vote to deny the application.

Decisions of a local wetlands board are subject to review by the Commission under the circumstances enumerated in § 62.1-13.11 of the Code of Virginia. The Commission is empowered by § 62.1-13.13 to modify, remand or reverse the decision of the wetlands board.[1]

If the review by the Commission could be equated with appeals from lower courts, or limited to the record prepared by the board, I would be inclined to view as improper an appearance by a board member before the Commission. However, appeals from the board are not so limited. The procedure for review by the Commission is provided in § 62.1-13.12, which provides in pertinent part as follows:

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[1]Section 62.1-13.13 provides: "The Commission shall modify, remand or reverse the decision of the wetlands board:

(1) If the decision of the wetlands board will not adequately achieve the policy and standards of this chapter or will not reasonably accommodate any guidelines which may have been promulgated by the Commission hereunder; or

(2) If the substantial rights of the appellant or the applicant have been prejudiced because the findings, conclusions or decisions are

(a) In violation of constitutional provisions; or

(b) In excess of statutory authority or jurisdiction of the wetlands board; or

(c) Made upon unlawful procedure; or

(d) Affected by other error of law; or

(e) Unsupported by the evidence on the record considered as a whole; or

(f) Arbitrary, capricious, or an abuse of discretion."

> "The Commission shall hear the appeal or conduct the review on the record transmitted by the board...and such additional evidence as may be necessary to resolve any controversy as to the correctness of the record. And the Commission, in its discretion, may receive such other evidence as the ends of justice require."

This section gives the Commission full discretion to receive any evidence which the ends of justice require. If the Commission decides that testimony of members of the local wetlands board which adopted the position being challenged on appeal would be helpful, the Commission has the discretion to receive it. As long as the appellant has an opportunity to be present to hear and to rebut any adverse evidence presented, he will not be improperly prejudiced by such testimony.

I am, therefore, of the opinion that it is not inappropriate for members of a local wetlands board who participated in a vote denying an application to appear and testify in the appeal of such application before the Commission, provided the Commission, in its discretion, determines that such evidence is appropriate to permit it to render a proper decision.

Wetlands Act. Wetlands Permit Required for Setting of Pilings, for Construction of Residence on Pilings, for Construction on Pilings of Adjoining Open Wooden Deck.

January 10, 1983

The Honorable Owen B. Pickett
Member, House of Delegates

You have inquired whether the Wetlands Act (§ 62.1-13.1, *et seq.*, of the Code of Virginia) requires that a permit be obtained from the local wetlands board under the following fact situation: An owner of a parcel of wetlands proposes to improve his parcel by constructing a two-story frame residence on pilings with an adjoining open wooden deck on pilings. No fill dirt will be placed in the wetlands, and the pilings will permit the reasonably unobstructed flow of the tide and preserve the natural contour of the wetlands. The Army Corps of Engineers has advised that no Department of Army permit will be required.

You ask the following three questions. (1) Is a permit required for setting the pilings? (2) Is a permit required for construction of the dwelling on pilings? (3) Is a permit required for construction on pilings of the open wooden deck adjoining the dwelling?

Section 62.1-13.9 of the Wetlands Act requires a permit for any activity in wetlands if the local wetlands zoning ordinance contained in § 62.1-13.5 requires a permit for such activity. Section 4(a) of the local wetlands zoning ordinance requires a permit for "[a]ny person who desires to *use or develop* any wetland...other than for those activities specified in § 3 above...." (Emphasis added.) Section 3 sets forth the uses and activities on wetlands which are permitted without a permit. The pertinent portion of § 3 is subsection (a) which exempts:

"The construction and maintenance of non-commercial catwalks, piers, boathouses, boat shelters, fences, duckblinds, wildlife management shelters, footbridges, observation decks and shelters and other similar structures; provided that such structures are so constructed on pilings as to permit the reasonably unobstructed flow of the tide and preserve the natural contour of the wetlands[.]"

I will address your first and second questions together, inasmuch as the pilings are to be set as part of the construction of a residence. The setting of pilings for a residence, and the construction of the house built on pilings, would clearly be a use or development of wetlands. Because no exemption is provided for such use or development, I am of the opinion that setting pilings and building a house on pilings over wetlands would require a permit from the local wetlands board.

The last question is whether the construction on pilings of an open wooden deck adjoining the dwelling would be exempted. Section 3(a) permits the construction of observation decks and similar structures as long as they are built on pilings so as to permit the flow of the tide and preserve the contour of the wetlands. The exemptions listed describe small, isolated structures which are used intermittently and which would have minimal effect on the wetlands. The exemptions are not applicable to decks constructed in conjunction with residential development, where the effects of the pilings and the covering of wetlands by the deck would have to be added to the effects resulting from the construction of the dwelling house. I am, therefore, of the opinion that a permit must be obtained for the construction of an open wooden deck adjoining a residence.

Wetlands Act. Political Subdivision's Ownership of Easement or Right-of-Way Over Wetlands Exempts Its Governmental Activity Therein from Requirement to Get Wetlands Permit.

January 18, 1983

The Honorable William T. Parker
Member, Senate of Virginia

You have asked if a political subdivision undertaking governmental activities in wetlands through which it has an easement or right-of-way is exempt from the permit requirements of the Wetlands Act, § 62.1-13.1, *et seq.*, of the Code of Virginia.

Section 3(i) of the local wetlands zoning ordinance contained in § 62.1-13.5 reads as follows:

> "§ 3. The following uses of and activities on wetlands are permitted, if otherwise permitted by law:
>
> * * *
>
> (i) Governmental activity on wetlands owned or leased by the Commonwealth of Virginia, or a political subdivision thereof...."

The question is whether wetlands subject to a political subdivision's easement or right-of-way are wetlands "owned or leased" by a political subdivision for the purpose of being permitted by this section. While your letter did not describe the easement or right-of-way, I will assume that such easement or right-of-way has been obtained by properly recorded deed or condemnation proceedings. I further assume that the proposed activity falls within the permissible limits of the terms of the deed.

An easement or right-of-way is a different estate from that which an "owner" is normally thought to have. Possession of an easement or right-of-way is, however, ownership of some of the rights to the land. The owner of an easement or right-of-way is the "dominant" tenant and has a right to use the land, thus making the record owner a servient tenant. In tax cases, the word "owner" has covered various types of ownership.

> "The word 'owner' includes any person who has the usufruct, control or occupation of the land, whether his interest in it is an absolute fee, or an estate less than a fee," *Stark v. City of Norfolk*, 183 Va. 282, 289, 32 S.E.2d 59 (1944), quoting from *Powers v. Richmond*, 122 Va. 328, 335, 94 S.E.803 (1918).

Interpreting "owned or leased by...a political subdivision" to include the ownership of an easement or right-of-way will not subvert the legislative purpose expressed in § 62.1-13.1, because the Commonwealth's political subdivisions will necessarily be guided by the wetlands policy established by the General Assembly.

For the foregoing reasons, I am of the opinion that local governmental activity on wetlands over which the local government has an easement or right-of-way is authorized by § 3(i) of the local wetlands zoning ordinance contained in § 62.1-13.5.[1]

[1]As previously stated, this conclusion is based upon an assumption that the activity falls within the permissible limits and terms of a properly recorded deed or condemnation proceeding.

Parliamentary Procedure. local Wetlands Board May Adopt Procedures Not Inconsistent With Local Ordinances or State Law.

February 27, 1984

The Honorable Owen B. Pickett
Member, House of Delegates

You have requested my opinion on the Virginia Beach Wetlands Board's proposed procedure for acting on permit applications under Chapter 2.1 (§ 62.1-13.1 *et seq.*) of Title 62.1 of the Code of Virginia (the "Wetlands Act").

Virginia Beach has adopted the wetlands ordinance found in § 62.1-13.5 and has recently expanded its wetlands board to seven members as authorized by § 62.1-13.6. Section 62.1-13.5(4)(a) provides that anyone wishing to use or develop wetlands for purposes not otherwise permitted must file an application for a permit with the local wetlands board. Section 62.1-13.5(6) requires the wetlands board to hold a public hearing within 60 days of receipt of the application. Section 62.1-13.7 provides that a quorum of four members of a seven-member board is required for conducting a hearing or "taking of any action." Section 62.1-13.5(7) provides that:

> "In *acting* on any application for a permit, the board shall grant the application upon the concurring vote of...four members of a seven-member board.... The board shall *make its determination* within thirty days from the hearing. If the board *fails* to *act* within such time, the application shall be deemed approved." (Emphasis added.)

Before considering the proposed procedure, it is helpful to consider the legislature's policy in the Wetlands Act. Section 62.1-13.1 sets forth this policy as one of preserving an irreplaceable resource and accommodating necessary development in a manner consistent with such preservation. To ensure this protection, the legislature required a majority vote of the whole board rather than just a majority vote of a quorum, for permits to alter wetlands. At the same time, the legislature wished to protect wetlands owners from indefinite procedural delays, by providing in § 62.1-13.5(7) for the automatic approval of applications not acted on within thirty days after the hearing. With the legislative intent in mind, I turn to the proposal.

As I understand the proposed procedure enclosed with your request, the chairman of the Virginia Beach Wetlands Board will call for a vote on an application after all persons have been heard and all deliberations completed. If four members of the seven-member board vote favorably, the application is approved, and the permit will issue. If less than four members vote favorably, even if there should be a 3-2 or a 3-1 majority for approval, or a 3-3 or 2-2 tie, the application will be deemed to be denied because of the lack of the statutorily required four concurring votes.

The taking of a vote on the application will be considered "acting" on the application, and the resulting approval or non-approval will be considered the "determination" of the board. If the application receives less than four concurring votes, this will be considered a board determination to deny the permit, and the board will so notify the applicant within forty-eight hours of its determination as required by SS 62.113.5(7). The vote on the application must, of course, be taken when there is a quorum present and must be taken within the applicable time limits.

Section 62.1-13.7 provides in part that "the board may make, alter and rescind rules and forms for its procedures, consistent with ordinances of the county, city or town and general laws of the Commonwealth, including this chapter." Inasmuch as this section specifies that wetlands boards may make their own rules, the procedures selected by the Virginia Beach Wetlands Board will comply with statutory requirements if they are consistent with local ordinances, general laws of the Commonwealth and Chapter 2.1 of Title 62.1. The procedures are not inconsistent with any requirements of local ordinances or general law of which I am familiar. They are also consistent with the requirements of the Wetlands Act.

The procedures meet the requirement of § 62.1-13.5(7) that the board grant the application upon the concurring votes of four members of the seven-member board. Even if there is no such concurring vote, the procedures are sufficient to comply with the § 62.1-13.5(7) requirement of taking action or making a determination within thirty days of the public hearing. The "action" is the board's vote. The "determination" required by that section is the action of granting or denying the application.

Section 62.1-13.5(7) contains no language expressly referring to the denial of an application. Nevertheless, I think it is clear that an application which is not approved by at least four concurring votes is necessarily denied. There is a third possibility, however, and that is when the board does not bring an application to a vote with a quorum present within the time limit. In that case the board has not taken any action, and the application is deemed approved 30 days after the hearing.

I am, therefore, of the opinion that the procedure proposed by the Virginia Beach Wetlands Board is consistent with its authority to form its own procedures and complies with the general laws of the Commonwealth including the Wetlands Act.

Wetlands. Local Wetlands Board May Consider Effects on Wetlands of Portions of Project Beyond Jurisdiction.

October 31, 1984

The Honorable William A. Pruitt
Commissioner, Marine Resources Commission

You have requested my opinion regarding the authority of a local wetlands board to regulate the length of structures known as groins (structures built out from a shore to prevent erosion) and other similar structures constructed as part of a single project extending beyond the wetlands in both the intertidal zone and below mean low water.

The Wetlands Act, § 62.1-13.1 *et seq.* of the Code of Virginia, provides for local wetlands boards and gives them authority to regulate wetlands which are contiguous to and above mean low water, including the intertidal zone.

The lands below mean low water, unless previously conveyed away, are owned by the Commonwealth. *See* § 62.1-1. Section 62.1-3 allows certain uses of these lands and gives the Marine Resources Commission (the "Commission") authority to permit other uses. *See* 1981-1982 Report of the Attorney General at 242.

The Wetlands Act prohibits any use or development of wetlands without a wetlands permit issued by a wetlands board. *See* §§ 62.1-13.9 and 62.1-13.5(4)(a). A wetlands board must base its decision to issue or deny a permit on the impact the use or development will have on the public health and welfare as expressed by the Act's policy of preserving wetlands. Sections 62.1-13.5(9) and 62.1-13.1. The Commission is empowered by § 62.1-13.13 to modify, remand or reverse the decision of the wetlands board. *See* 1982-1983 Report of the Attorney General at 761.

In granting or denying any permit for the use of State-owned bottom lands, the Commission must consider the effect of the project "upon the wetlands of the Commonwealth, except when its effect upon said wetlands has been or will be determined under the provisions of Chapter 2.1 (§ 62.1-13.1 *et seq.*) [The Wetlands Act]...." Section 62.1-3, ¶ 6.

By reading a wetlands board's authority to carry out the Commonwealth's strong policy favoring wetlands preservation, together with the deference to Wetlands Act decisions contained in § 62.1-3, I conclude that a local wetlands board should consider the impact on wetlands from the total project, including that portion of the project resting on subaqueous lands beyond the wetland. Although not expressly authorized to do so by statute, regulation of the length of a structure is vital to exercising the authority to regulate the use of wetlands. Whether such consideration will require imposition of a limitation on the length of structures located below mean low water is a factual determination which must be made on a case-by-case basis. That decision is subject to review by the Commission. If the wetlands board does not consider the wetlands impact of the total project, the Commission must consider, pursuant to § 62.1-3, the effect of such a subaqueous project on wetlands, when it determines whether or not to grant a permit to use subaqueous lands.

I am, therefore, of the opinion that a local wetlands board is authorized to regulate the length of a structure which is constructed through both the intertidal zone and channelward of mean low water, subject to superior jurisdiction of the Commission to modify or reverse the decision.

Wetlands. Repair or Replacement of Bulkheads Exempt from Permit Requirements as Long as No Additional Wetlands Covered.

December 19, 1984

The Honorable John H. Foote
County Attorney for Prince William County

This letter is in response to your request for an interpretation of the Wetlands Act, § 62.1-13.1 *et seq.* of the Code of Virginia, as it pertains to bulkheads and their repair. Your inquiries are motivated by a proposal to completely remove an existing wooden bulkhead and replace it with new metal materials. Such operation will disturb non-vegetated wetlands. You did not indicate if additional wetlands will be covered by the construction.

Section 62.1-13.5 authorizes counties, cities and towns to adopt a wetlands zoning ordinance. The provisions are specified in the statute. Section 3 of the ordinance exempts certain uses of wetlands from the necessity of obtaining a wetlands permit. It reads, in pertinent part, as follows:

> "The following uses of and activities on wetlands are permitted, if otherwise permitted by law:
>
> * * *
>
> (h) The *normal maintenance, or addition* to presently existing roads, highways, railroad beds, or the facilities of any person, firm, corporation, utility, federal, State, county, city or town abutting on or crossing wetlands, *provided* that no waterway is altered and *no additional wetlands are covered....*" (Emphasis added.)

Your first inquiry is whether bulkheads are "facilities," as described in SS 3(h) of an ordinance authorized in § 62.1-13.5. When reading a statute, the general rule is that its words should be given their usual, commonly understood meaning. *See The Covington Virginian v. Woods,* 182 Va. 538, 29 S.E.2d 406 (1944); 1980-1981 Report of the Attorney General at 58. The commonly understood meaning of "facility" is "something...that is built...installed, or established to perform some particular function...." *Webster's Third New International Dictionary* 812 (1968). The same publication defines "bulkhead" as a device designed to resist pressure or shut off water, especially "the retaining wall along a waterfront." A bulkhead is commonly used to perform a particular function: to prevent the erosion of the bank of a waterway or to contain fill material; accordingly, a bulkhead comes within the broad definition of "facility." I am, therefore, of the opinion that bulkheads are included within the word "facilities" in § 3(h), and that the normal maintenance, repair or additions to a bulkhead would be permitted under that section if no further wetlands were covered.

Your second question is whether the phrase "normal maintenance, repair or addition to" in § 3(h) would include the complete replacement or reconstruction of a bulkhead in the same location. It is my understanding that such replacement may disturb existing non-vegetated wetlands, but you did not state whether it will result in the *covering of any additional wetlands*. The answer to your inquiry hinges upon that fact.

The exemption contained in § 3(h) applies not only to maintenance and repair but also to an "addition to" a facility, the key condition being that "no additional wetlands are covered." I am advised that when a bulkhead begins to suffer serious deterioration, a common practice is to completely replace it. The replacement may occupy the exact location or it may be constructed seaward of the existing bulkhead. If not built on the same location, it would necessarily mean that additional wetlands will be covered by the facility.

I am, therefore, of the opinion that replacement of a bulkhead is within the contemplation of "normal maintenance, repair or addition to presently existing...facilities...." If, however, any additional wetlands will be covered, such replacement will require a wetlands permit inasmuch as it would not then be exempted as provided in § 3(h) of the wetlands ordinance.

Counties, Cities and Towns. Zoning. Restrictions on Private, Noncommercial Piers Constructed By Riparian Landowners. Permissible Exercise of Zoning Power.

October 22, 1985

The Honorable W. Tayloe Murphy, Jr.
Member, House of Delegates

You inquire as to a local governing body's authority to regulate, by zoning ordinance, private, noncommercial piers constructed by riparian landowners beyond the mean low water line of their properties into State waters. You also inquire as to other sources of regulation affecting riparian landowners who wish to construct private, noncommercial piers.

There are three possible sources of regulation at the State and local level, including the local governing body, the Virginia Marine Resources Commission ("VMRC"), and the local Wetlands Board.[1]

Comprehensive zoning powers have been delegated by statute to counties and municipalities. *See* Art. 8, Ch. 11, Title 15.1 of the Code of Virginia, § 15.1-486 *et seq.* Section 15.1-486 authorizes local governing bodies to restrict and otherwise regulate:

> "(a) The use of land, buildings, structures and other premises for agricultural, business, industrial, residential, flood plain and other specific uses;
>
> (b) The size, height, area, bulk, location, erection, construction, reconstruction, alteration, repair, maintenance, razing, or removal of structures;
>
> (c) *The areas and dimensions of land, water, and air space to be occupied by buildings, structures and uses....*" (Emphasis added.)

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[1]A riparian landowner must also comply with the general permit requirements of the United States Army Corps of Engineers.

The purpose of zoning ordinances is to promote the health, safety or general welfare of the public. Among the purposes to be considered by such ordinances are:

> "(1) to provide for adequate light, air, convenience of access, and safety from fire, flood and other damages;
>
> * * *
>
> (3) to facilitate the creation of a convenient, attractive and harmonious community;
>
> * * *
>
> (6) to protect against one or more of the following: overcrowding of land, undue density of population in relation to the community facilities existing or available, obstruction of light and air, danger and congestion in travel and transportation, or loss of life, health, or property from fire, flood, panic or other dangers...."

Section 15.1-489.

A prior Opinion of this Office addressed the similar question of whether a local government may enact a zoning ordinance restricting the erection of structures on the beaches and shores of the locality. The Opinion concludes that such a restriction is permissible and consistent with the purposes for which a zoning ordinance may be enacted. *See* 1977-1978 Report of the Attorney General at 518.[2] In my opinion, a local government may, by ordinance, *reasonably* regulate the construction of private, noncommercial piers, consistent with the purposes for which zoning ordinances may be enacted.[3]

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[2]Compare 1983-1984 Report of the Attorney General at 475 (flood plain regulations in local zoning ordinances which restrict property development not facially invalid).

[3]As described in the concluding paragraph of this Opinion, the locality's zoning regulations must be reasonable. They may not be arbitrary. If a landowner believes the zoning ordinance to be arbitrary, he may seek judicial review in an appropriate proceeding.

Accord People v. Anton, 431 N.Y.S.2d 807, 105 Misc.2d 124 (1980); *Harbor Island, Etc. v. Bd. of Cty. Com'rs*, 407 A.2d 738 (Md. 1979); *Itasca County v. Rodenz*, 268 N.W.2d 423 (Minn. 1978); *Town of Islip v. Powell*, 358 N.Y.S.2d 985, 78 Misc.2d 1007 (1974); *Brady v. Board of Appeals of Westport*, 204 N.E.2d 513 (Mass. 1965).[4]

The General Assembly also has enacted in Title 62.1 a comprehensive statutory scheme concerning the uses of watercourses and wetlands, and the Commonwealth's policies concerning such uses. Certain of the materials which were provided to you suggest that a local governing body has no authority to regulate private, noncommercial piers because such structures are statutorily authorized and exempted from regulation by any local wetlands board. *See* § 62.1-13.5. I do not share that conclusion.

A riparian landowner has a common law right to construct a pier or wharf opposite his riparian lands, subject to reasonable regulation by the State. *See Grinels v. Daniel*, 110 Va. 874, 877, 67 S.E. 534 (1910); *Taylor v. Commonwealth*, 102 Va. 759, 771, 47 S.E. 875 (1904); 1975-1976 Report of the Attorney General at 215. This common law right has been codified in § 62.1-164 as the right to erect a private, noncommercial pier or wharf in a watercourse opposite the land, subject to the conditions that navigation not be obstructed nor the private rights of any person injured. The existence of a riparian landowner's right to "wharf out" is not absolute under the common law or under § 62.1-164. Where the legislature has delegated to localities the authority to regulate the rights of riparian landowners, such regulation is not inconsistent with § 62.1-164.

Section 62.1-3(10) provides statutory authorization for "the placement of private piers for noncommercial purposes by owners of the riparian lands in the waters opposite such riparian lands, *provided such private shall not extend beyond the navigation line or lawful private pier lines established by proper authority*." (Emphasis added.) This authority operates to exempt private piers from the permit requirements of VMRC for encroachments on subaqueous beds which are the property of the Commonwealth.

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[4]Section 15.1-1031 provides that the boundary of every county, city or town bordering on the Chesapeake Bay and its tidal tributaries or the Atlantic Ocean shall embrace all wharves, piers and docks. *See also* § 15.1-11.3, which authorizes counties, cities and towns to adopt ordinances requiring the removal, repair or securing of wharves and piers which might constitute an obstruction or hazard.

Section 62.1-13.5 sets out a "Wetlands Zoning Ordinance" which may be adopted by a local governing body. Section 3 of the Wetlands Zoning Ordinance provides, in pertinent part, as follows:

> "The following uses of and activities on wetlands are permitted, *if otherwise permitted by law*:
>
> (a) The construction and maintenance of noncommercial catwalks, piers, boathouses, boat shelters, fences, duckblinds, wildlife management shelters, footbridges, observation decks and shelters and other similar structures; provided that such structures are so constructed on pilings as to permit the reasonably unobstructed flow of the tide and preserve the natural contour of the wetlands...." (Emphasis added.)

Those uses permitted by § 3 of the Wetlands Zoning Ordinance are exempted from the application and permit process set out in § 4. The exemption of private piers from the permit requirements of VMRC and the permit process under a local Wetlands Zoning Ordinance is based on the legislative determination that piers and other structures built on pilings permit the continued flow of the tide and preserve the contour of the wetlands. Also, such structures are generally small, isolated structures which are used intermittently and which would have minimal effect on the wetlands. *See* 1982-1983 Report of the Attorney General at 765. Finally, they must be otherwise permitted by law.

To summarize, in enacting § 62.1-164, the General Assembly intended to preserve the common law right of riparian landowners to erect private, noncommercial piers and wharves, subject to reasonable State regulation. Private piers are exempted by § 62.1-3(10) from VMRC permit requirements which restrict most uses which encroach on subaqueous beds owned by the Commonwealth. Under a Wetlands Zoning Ordinance adopted by a locality, a private pier is a use of right and, therefore, is exempt from the application and permit procedure of that particular ordinance. *See* § 62.1-13.5 (§§ 3 and 4). In § 15.1-486(c), however, the General Assembly has delegated to localities the authority through zoning ordinances to regulate water space to be occupied by structures and uses.

It is a basic rule of statutory construction that when construing statutes on the same subject matter *in pari materia*, the statutes should be hormonized if possible. *See, e.g.,* 1982-1983 Report of the Attorney General at 484. Construing the above statutes together in accordance with this basic rule, I am of the opinion that the regulation of private, noncommercial piers and wharves is a permissible exercise of a locality's zoning power, subject to the same requirements as to reasonableness and constitutional limitations as are other zoning restrictions.[5] *See generally* 1983-1984 Report of the Attorney General, *supra* note 2. In the event a riparian landowner is subject to arbitrary or unreasonable action by zoning officers or subject to an arbitrary or unreasonable provision of a zoning ordinance, he may apply for judicial review. *See City of Richmond v. County Board,* 199 Va. 679, 687, 101 S.E.2d 641 (1958).

[5]A related question is whether local limitations on a riparian landowner's right to construct private, noncommercial piers are inconsistent with the principle that the property of the Commonwealth is not subject to local zoning restrictions. *See* Reports of the Attorney General: 1981-1982 at 467; 1971-1972 at 103. As noted above, the subaqueous beds of the bays, rivers, creeks and shores of the sea are the property of the Commonwealth unless conveyed by special grant. *See* § 62.1-1. Riparian landowners, however, have substantial property rights derived from their status. These rights include the right to "wharf out," discussed above, and to sever and alienate riparian rights as a separate property interest. *See Marine Resources* Commission *v. Forbes,* 214 Va. 109, 197 S.E.2d 195 (1973); *Thurston v. City of Portsmouth,* 205 Va. 909, 140 S.E.2d 678 (1965). The character of an area could not be preserved if a riparian landowner were to be permitted to use property rights derived from his status to circumvent other validly enacted limitations on his property rights. *Compare Harbor Island, Etc.,* 407 A.2d at 747. In other words, the State's use of State-owned bottom is not subject to local regulation, but the exercise of a riparian landowner's property rights which encroach on State-owned bottom is validly subject to local regulation.

Waters, Ports And Harbors: Wetlands - Coastal Primary Sand Dune Protection Act.

No conflict exists between compliance with time requirements to hold hearing and make decision on application under Wetlands Act and concurrent prosecution of violations; issuance of permit and decision to prosecute separate issues.

August 5, 1988

The Honorable Robert Tata
Member, House of Delegates

You ask two questions concerning how the Virginia Beach Wetlands Board (the "Board") should administer the Wetlands Act, §§ 62.1-13.1 through 62.1-13.20 of the Code of Virginia, and the Coastal Primary Sand Dune Protection Act, §§ 62.1-13.21 through 62.1-13.28, in light of the time requirements established in these Acts and the need to take enforcement action against persons who are in violation of either Act.

1. Applicable Statutes

The Wetlands Act and the Sand Dune Protection Act are similar in structure, and § 62.1-13.27 provides for enforcement of the Sand Dune Protection Act under Wetlands Act provisions.

Section 62.1-13.9 of the Wetlands Act prohibits any person from conducting "any activity which would require a permit under a wetlands zoning ordinance unless he has a permit therefor." Section 4(a) of the Wetlands Zoning Ordinance in § 62.1-13.5 (the "Ordinance") provides that "[a]ny person who desires to use or develop any wetland ... other than for those activities specified in § 3 ... shall first file an application for a permit with the wetlands board." The activities specified in § 3 of the Ordinance are exempted from the permit requirement. Section 6 of the Ordinance requires the Board to hold a public hearing not later than sixty days after receipt of the application. Section 7 requires the Board to make its decision within thirty days of the hearing. If the Board fails to act in thirty days, the application is deemed approved.

Section 62.1-13.18 provides for the enforcement of certain violations of the Wetlands Act.

> Any person who knowingly, intentionally, negligently or continually violates. . .any provision of this chapter or of a wetlands zoning ordinance enacted pursuant to this chapter or any provision of a permit granted by a wetlands board or the [Vir-

ginia Marine Resources] Commission pursuant to this chapter shall be guilty of a misdemeanor. Following a conviction, every day the violation continues shall be deemed a separate offense.

II. No Conflict Exists Between Compliance with Time Requirements to Hold Hearing and Make Decision on Application Under Wetlands Act and Concurrent Prosecution of Violations

You first ask whether the Board is required to hear applications within the time limits in §§ 6 and 7 of the Ordinance if the application is for a nonexempt use or development of a wetland which has already been completed or begun without a permit.

It is important to separate the regulatory provisions of the Wetlands Act from its enforcement provision. The regulatory provisions require in evaluation of the project, as described in the application, under the standards in the Wetlands Act. Nonexempt construction without a permit is a violation of this Act. *See* § 62.1-13.18. The enforcement provision authorizes criminal punishment for such a violation, to encourage compliance with the Wetlands Act and to vindicate and maintain the authority of the wetlands program.

Except in § 4(a) of the Ordinance, which specifies that an application shall "first" be filed, the Wetlands Act provides for applications without referring to whether the application is filed before or after any nonexempt use or development is begun. Nevertheless, this Act clearly requires that an application be filed and a permit issued before any nonexempt use or development of a wetland is begun. *See* § 62.1-13.9. It is my opinion, however, that nothing in the Wetlands Act requires that the Board treat a particular application differently because it was untimely filed. It is further my opinion, therefore, that when an application is filed after any nonexempt use or development of a wetland is begun, the Board must consider that application under the time schedules set forth in §§ 6 and 7 of the Ordinance, but that such consideration does not prevent and should not delay any prosecution of the nonexempt use or development under § 62.1-13.18.[1]

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[1] I am aware that the United States Army Corps of Engineers does not accept applications for such an after-the-fact permit where legal action is deemed appropriate until such legal action has been completed. *See* 33 C.F.R. § 326.3(e)(1)(ii) (1987). A similar policy by the Board, in my opinion, would serve to delay a final resolution of the application and would be contrary to the intent of the Wetlands Act that decisions are to be made within the times specified.

You next ask whether the Board is required to hear an application to amend a permit where the permittee is alleged to have violated the permit and court action is pending. As discussed above, there is nothing in the Wetlands Act to exempt this type of application from the time limits placed on applications in general. It is my opinion, therefore, that acting on the application within the time limits specified in §§ 6 and 7 of the Ordinance should have no effect on the court action, since court action concerns a violation which is alleged to have occurred previously.

III. Issuance of Permit and Decision to Prosecute Are Separate Issues

In summary, the failure to secure the necessary permits in the facts you present is a violation of the Wetlands Act which may be referred for prosecution pursuant to § 62.1-13.18. Whether a permit should issue is a separate question which should be determined in the most efficient manner possible as provided in the Wetlands Act. If the application is denied, and the violation i s not corrected, a suit may be brought pursuant to SS 62.1-13.18:1 to enjoin the violation.[2]

---

[2] I also note that § 8 of the Ordinance grants the Board, after a hearing, the authority to suspend or revoke a permit if the permittee has not complied with its terms and conditions. *See* 1978-1979 Att'y Gen. Ann. Rep. 326, 327.

A Review of Current Enforcement Procedures in Light of Recent Changes to Title 62.1 of the Code of Virginia

Introduction

Recent changes in legislation regarding enforcement authority under Title 62.1 present an excellent opportunity for a review of our current enforcement procedures as well as a chance to highlight the changes that result from additions to the law. This review is designed to be used as an enforcement guide and should not take the place of advice from knowledgeable counsel.

All of the amendments and additions included in Chapter 811 Acts of Assembly 1990 (Senate Bill 183) as found in Attachment A, are contained in Title 62. 1 of the Code of Virginia and affect the regulation of subaqueous lands, tidal wetlands and coastal primary sand dunes, Chapters 1, 2.1 and 2.2, respectively. Specifically, those amendments provide the Commission with the authority to adopt regulations, and the Commission or local wetlands board with the authority to issue restoration orders and assess civil charges for violations of the applicable statutes.

In the past, violations of the aforementioned Code sections usually resulted in either voluntary restoration or more frequently, submittal of an after-the-fact application for a permit. Violators were usually asked to appear before the Commission or wetlands board and reprimanded for their actions with the intent of producing a lasting impression through public admonishment. The prospect of prosecution within the judicial system was previously and remains a viable option. Unfortunately, the inherent problems associated with preparing a case to go to Circuit Court remain unchanged. The difference now is that once in Circuit Court, a judge can levy a civil penalty up to $25,000 for each day of a violation. This hopefully will serve as a strong deterrent to violating the law and a powerful incentive to resolve the matter at an administrative level. In that regard, Section 62.1-13.18:2 grants the Commission and wetlands boards the authority to assess civil charges of up to $10,000 per violation. Civil charges are to be paid in lieu of any appropriate civil penalty and can be assessed only with the consent of the person in violation.

The obvious intent of both civil penalties and charges is to provide financial disincentives against violating the law while at the same time providing the impetus to resolve these issues at an administrative level. A $10,000 civil charge may seem extreme but when compared to perhaps a $100,000 civil penalty ($25,000 X each day in the violation, four days in this example) the more cost-effective solution remains at the administrative level. It should be noted that civil charges may be in addition to the cost of any restoration ordered under Section 62.1-13.16:1(C).

The adoption of financial disincentives not only commands the attention of those parties involved in coastal development but also those responsible for administering Virginia's coastal law. Enforcement procedures within Virginia's 32 wetland boards has in the past reflected the varying degrees of complexity found in each local government. Unifying these procedures to conform to rigid standards is perhaps not desirable but a review of the basic enforcement components does provide a basis from which localities can refine an enforcement mechanism which is legally complete and reflects the unique character of each locality.

Enforcement

Figure 1 - Enforcement Procedures, represents a generalized flowchart outlining the enforcement components incorporated into Title 62.1 of the Code. Because different Code sections embody different enforcement components, this unified approach is intended to be a guide and is not a substitute for a more comprehensive review and understanding of the applicable Code sections. A discussion of each of these components combined with relevant reporting requirements will hopefully solidify the enforcement procedure within the context of your individual needs.

Report of a violation, either through citizen response or staff awareness, immediately calls into question the test of imminent danger and significant harm. If the potential violation appears to involve substantial impact to natural resources and further delay could lead to increased despoliation, it may be necessary to forgo standard notification requirements and serve a Stop Work Order as specified in Section 62.1-13.16:1(B). Otherwise, standard operating procedures dictate that prior to inspection, notice shall be provided to the resident owner, occupier, or operator. If notice is given verbally, it should be followed with written correspondence. The individual(s) involved should be given an opportunity to accompany the site inspector during their inspection.

If it is determined that there is failure to comply with a permit or that unauthorized activities have transpired, a Sworn Complaint (Attachment B) from the designated enforcement officer should be completed and presented to the board chairman. Upon receipt of a Sworn Complaint, the board chairman issues a Notice to Comply (Attachment C), indicating the measures needed for compliance and a specified time within which such measures shall be completed. Care should also be taken at this time to completely document the violation. The violation worksheet (Attachment D) contains pertinent questions which should be answered and may be helpful to ensure that all necessary information is obtained.

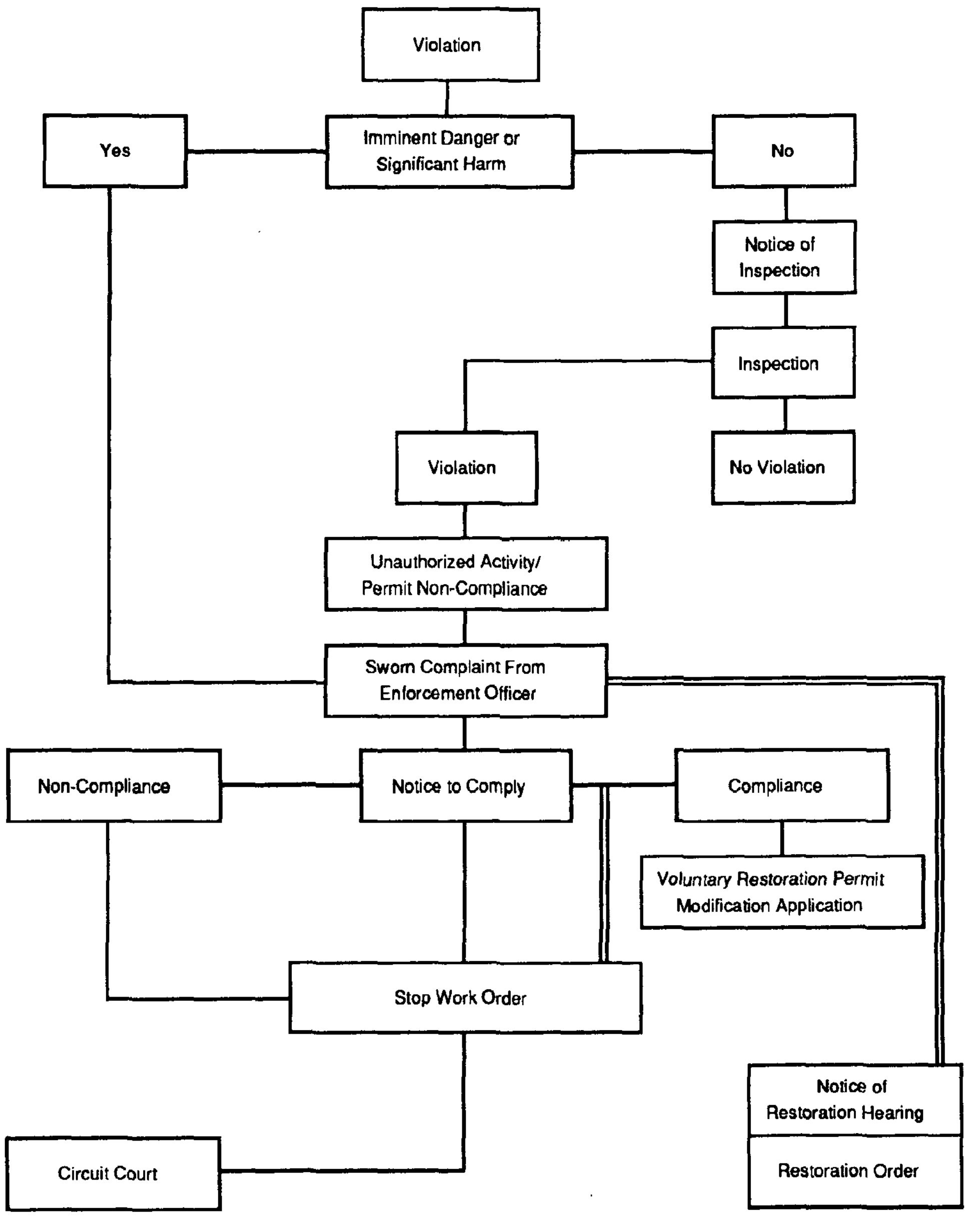
Compliance in most cases involves one of three potential approaches:

A. Voluntary Restoration

B. Request for Permit Modification

C. Application for After-the-Fact Permit

Figure 1 - Enforcement Procedures



Non-compliance will result in the issuance of a Stop Work Order (Attachment E) from the board chairman. The affect of a Stop Work Order is directly related to the desired outcome of any given situation. A Stop Work Order is usually viewed administratively as an "attention getter" designed to reinforce the need for compliance with the law. As such, Stop Work Orders can be issued in conjunction with the Notice to Comply. In the absence of compliance, the Stop Work serves as the precursor to application for appropriate relief to a Circuit Court in the jurisdiction wherein the violation was alleged to have occurred.

The Sworn Compliant is an important component of the violation procedure. While not required under Section 62.1-13.16:1(A), the Sworn Complaint is an integral part of the enforcement proceeding under Sections 62.1-13.16:1(B), and (C). In fact, the Sworn Complaint is required as a precursor to the issuance of a Stop Work Order or a Restoration Order.

Section 62.1-13.16:1(C) provides the boards with additional remedies under the law in the form of a Restoration Order. The general format of this order is contained in Attachment F. The Restoration Order, while it falls near the bottom of the flowchart, should not be considered a position of last resort. In cases where restoration is a desirable outcome, a Notice to Comply with voluntary restoration may preclude a formal restoration hearing and the issuance of a Restoration Order.

A restoration hearing is appropriate in instances where substantial damage to resources, beyond that which normally have been permitted, has occurred. Even in instances where voluntary restoration is deemed a viable alternative, the Restoration Order may be useful in specifying the details necessary to ensure an effective restoration effort.

A Restoration Order can only result from the issuance of a Sworn Complaint along with the appropriate 30 day notice to the affected party including the time, place and purpose of the restoration hearing. Such an order shall require the submission of a monitoring plan to ensure successful re-establishment of the affected resources (see monitoring plan requirements, Attachment G) . While the general format and conditions of a monitoring plan are under development, each plan may have to be tailored to individual circumstances and site constraints. It may also require a prepaid contract acceptable to the board be in affect for the purpose of carrying out the Monitoring Plan. In addition, the board **may** require a reasonable bond or letter of credit in an amount and with surety and conditions satisfactory to securing compliance with the conditions set forth in the Restoration Order. Failure to complete the required restoration constitutes a separate violation.

Compliance Monitoring

The adoption of financial disincentives places a burden not only on developers but also on individual wetlands boards. As briefly touched on earlier, many of the problems previously associated with enforcement efforts remain today. While it may prove relatively easy to determine that a bulkhead was constructed without authorization, it is somewhat harder to determine the extent of encroachment beyond that which was authorized by a particular permit. The basis for such determinations ultimately hinges on the permit drawings that were made a part of the permit document.

As such, it may be in the best interest of each local board to adopt a more demanding stance in determining adequacy of application drawings. Effective enforcement of permit noncompliance can only be achieved with more rigorous standards. To this end, The Wetlands Advisory Program at VIMS has produced a paper titled "Monitoring of Compliance with Permits Granted by Local Wetlands Boards" (Attachment H). The intent is to provide insight into the nuts and bolts of compliance monitoring while providing technical formats for application drawings. Incorporating these mechanisms into application requirements will greatly assist boards in resolving questions of non-compliance.

Civil Penalties and Charges

The major thrust of SB183 was the addition of teeth into what many perceived was an exercise in administrative futility. The provision of penalties and charges, however, does nothing to ease the burden of identifying and legally documenting the existence of a violation. As discussed above, application drawings become the only reliable standard by which permit compliance can be determined.

The enforcement flowchart identifies the two available paths for invoking civil penalties or charges. Both paths involve identifying the presence of a violation. once a violation has been determined and documented sufficiently, a Sworn Compliant is issued, followed by a Notice to Comply. In cases where restoration is a desirable conclusion, the individual has the option of restoring an area to preexisting conditions. (Voluntary restoration in this manner may still benefit from a restoration hearing to establish the formal conditions for restoration. A minimum 30 day notice of a restoration hearing applies.) Otherwise, application for a permit modification or after-the-fact approval is necessary.

Any violation, whether voluntarily restored or not, should be considered an agenda item and fully discussed during a regularly scheduled meeting of the wetlands board. Standard notification procedures apply. The party involved should be contacted and informed that the violation in question will be discussed at the following board meeting and that their presence is requested.

In the absence of complete and satisfactory restoration, anyone found in violation of these Code sections is subject to either a civil penalty (Circuit Court) or to a civil charge (local wetlands board). These are the only options available under this Code section. The ramifications of each needs to be clearly explained to the individual(s) in violation. only with the individual's concurrence can the board assess a civil charge.

Section 62.1-13.18:2 indicates that a board may order a one-time payment of civil charges for each violation not to exceed $10,000. **Table 1 - Civil Charge Determination,** has been developed to ensure continuity between all of the boards as they arrive at an actual dollar amount representative of the violation in question. This assessment is designed to contain the flexibility necessary for each individual board to arrive at a conclusion based on the specific terms of each individual violation. These amounts are by no means absolute and are intended to be used as a guide rather than a template.

Table 1 - Civil Charge Determination

Environmental Impact	Significant	$5,000	$7,500	$10,000
	Moderate	$1,500	$3,000	$4,500
	Minimal	$500	$1,000	$1,500
		Minor	Moderate	Major
		Relative Degree of Deviation or Non-compliance		

Environmental Impact in this table refers less to the actual square footage of area impacted and more to the relative environmental value of the resource lost. The values for each wetland type are found on Page 38 of the *Wetlands Guidelines*. For example, 100 square feet of impact to two stands of vegetated wetlands may be viewed differently depending on the dominant plant species. A Group One wetland ranks higher in value than a Group Five wetland and therefore would tend to be a more significant loss even though on an areal basis the impacts might at first appear relatively equal.

Relative Degree of Deviation or Non-compliance refers to the extent of a violation. This could include not only the magnitude of the area of impact but other mitigating factors such as:

- Good Faith
- Degree of Willfulness
- History of Non-compliance
- Cooperation

(Ignorance of the law should **not** be considered a mitigating factor.)

Conclusion

While it is appealing to believe that successful implementation of these Code changes will solve all your problems with respect to wetland violations and after-the-fact applications, such a situation is unlikely. As long as individuals choose to live along the shores, development activities within this coastal fringe will continue to exert tremendous pressure on Virginia's tidal wetlands.

The success or failure of these Code changes will be directly related to each of Virginia's local wetlands boards. Enforcement needs to be accomplished in as uniform and consistent a manner as possible. At a minimum, each board should thoroughly review its present enforcement procedures and determine how the current changes need to be incorporated within their existing administrative infrastructure.

This expanded wetlands board power should not be considered as the ultimate answer. A great deal of the problem with enforcement and permit compliance rests in a lack of attention to detail and crossed communication. Remember, "as close to the bank as possible" may be viewed in a variety of ways. It may mean within three feet to the wetlands board, but it could mean "as far as I care to go" for someone building the structure.

ATTACHMENTS

ATTACHMENT A

1990 SESSION

VIRGINIA ACTS OF ASSEMBLY - CHAPTER 811

An Act to amend and reenact §§ 62.1-13.4 and 62.1-13.16.1 of the Code of Virginia and to amend the Code of Virginia by adding in Chapter 1 of Title 62.1 a section numbered 62.1-9.1, and sections numbered 62.1-13.18.-2 and 62.1-13.27.1. relating to the restoration of habitat; penalties.

Approved April 9, 1990

Be It enacted by the General Assembly of Virginia:

1. That §§ 62.1-13.4 and 62.1-13.16:1 of the Code of Virginia are amended and reenacted and that the Code of Virginia is amended by adding in Chapter 1 of Title 62.1 a section numbered 62.1-9.1, and sections numbered 62.1-13.18:2 and 62.1-13.27:1 as follows:

§ 62.1-9.1. Penalties.—A. Without limiting the remedies which may be obtained in this chapter, any person who violates any provision of this chapter or who violates or fails, neglects or refuses to obey any Commission notice, order, rule, regulation or permit condition authorized by this chapter shall, upon such finding by an appropriate circuit court, be assessed a civil penalty not to exceed $25,000 for each day of violation. Such civil penalties may, at the discretion of the court assessing them, be directed to be paid into the treasury of the county, city or town in which the violation occurred for the purpose of abating environmental damage to, or the restoration of wetlands therein, in such a manner as the court may, by order, direct, except that where the violator is the county, city, or town itself, or its agent, the court shall direct the penalty to be paid into the state treasury.

B. Without limiting the remedies which may be obtained in this chapter, and with the consent of any person who has violated any provision of this chapter or who has violated or failed, neglected or refused to obey any Commission order, rule, regulation or permit condition authorized by this chapter, the Commission may provide, in an order issued by the Commission against such person, for the one-time payment of civil charges for each violation in specific sums, not to exceed $10,000 for each violation. Civil charges shall be in lieu of any appropriate civil penalty which could be imposed under subsection A of this section. Civil charges may be in addition to the cost of any restoration ordered by the Commission or a wetlands board.

§ 62.1-13.4. Marine Resources Commission to develop guidelines.-In order to implement the policy set forth in § 62.1-13.1 and to assist counties, cities or towns in regulation of vegetated and nonvegetated wetlands, the Commission shall with the advice and assistance of the Virginia Institute of Marine Science, which will evaluate wetlands by type and maintain a continuing inventory of vegetated wetlands, from time to time promulgate in accordance with the Administrative Process Act (§ 9-6.14:1 et seq.) guidelines which scientifically evaluate vegetated and nonvegetated wetlands by type and which set forth the consequences of use of these wetlands types. *In addition, the Commission may promulgate regulations in accordance with the Administrative Process Act (§ 9-6.14.,1 et seq.) which are necessary to carry out its powers and duties under the provisions of this title. In developing guidelines or regulations,* the Commission shall consult with any affected state governmental agency.

§ 62.1-13.16:1. Reporting, site inspections and notice to comply; Commission or Wetlands Board to issue stop work order or restoration order.—A.—With respect to permits required pursuant to this Chapter, Chapter 1 (§ 62.1-1 et. seq.) or Chapter 2.2 (§ 62.1-13.21 et seq.) of this title, the Commissioner or Board Chairman may require of the person responsible for carrying out the provisions of the permit such monitoring and reports as they may reasonably deem necessary. With respect to any reported activity not authorized by the aforementioned chapters or with respect to the violation of any permit issued pursuant thereto, they may direct such on-site inspections as are deemed reasonably necessary to determine whether the measures required by the permit are being properly performed, or whether the provisions of the aforementioned chapters are being violated. Prior to conducting such inspections, notice shall be provided to the resident owner, occupier or operator.

Such resident owner, occupier or operator shall be given an opportunity to accompany the site inspector. If it is determined that there is a failure to comply with the permit, the Commissioner or Board Chairman shall serve notice upon the person who is responsible for carrying out the provisions of the permit at the address specified by him in his application or by delivery at the site of the permitted activities to the person supervising such activities and designated in the permit to receive such notice. Such notice shall set forth the measures needed for compliance and the time within which such measures shall be completed. Upon failure of such person to comply within the specified period, he may be deemed to be in violation of this section and upon conviction shall be subject to the penalties provided in this chapter.

B.—Upon receipt of a sworn complaint of a substantial violation of this chapter, Chapter 1 (§ 62.1-1 et seq.) or Chapter 2.2 (§ 62.1-13.21 et seq.) of this title from the designated enforcement officer, the Commissioner or Board Chairman may, in conjunction with or subsequent to a notice to comply as specified in subsection A of this section, issue an order requiring all or part of the activities on the site to be stopped until the specified corrective measures have been taken. In the case of an activity not authorized by the aforementioned chapters or where the alleged permit noncompliance is causing, or is in imminent danger of causing, significant harm to the subaqueous bottoms, wetlands or the coastal primary sand dunes protected by the aforementioned chapters, such an order may be issued without regard to whether the person has been issued a notice to comply as specified in subsection A of this section. Otherwise, such an order may be issued only after the permittee has failed to comply with such a notice to comply. The order shall be served in the same manner as a notice to comply, and shall remain in effect for a period of seven days from the date of service pending application by the enforcing authority, permit holder or the resident owner, occupier or operator for appropriate relief to the circuit court of the jurisdiction wherein the violation was alleged to have occurred. Upon completion of corrective action, the order shall immediately be lifted. Nothing in this section shall prevent the Commissioner or Board Chairman from taking any other action specified in § 62.1-13.16.

C. Upon receipt of a sworn complaint of a substantial violation of this chapter, Chapter 1 (§ 62.1-1 et seq.) or Chapter 2.2 (§ 62.1-13.23 et seq.) of this title from a designated enforcement officer, the Commission or a wetlands board may order that the affected site be restored to predevelopment conditions if the Commission or board deems restoration necessary to recover lost resources or to prevent further damage to resources. Such an order shall specify the restoration necessary and establish a reasonable time for its completion. Such orders shall be issued only after hearing with at least thirty days notice to the affected person of the time, place and purpose thereof, and they shall become effective immediately upon issuance by the Commission or board. The Commission or board shall require such scientific monitoring plans as it deems necessary to ensure that such projects result in the successful reestablishment of wetlands, subaqueous bottoms or coastal primary sand dunes protected by the aforementioned chapters and may require that a prepaid contract acceptable to the Commission or board be in effect for the purposes of carrying out the scientific monitoring plan. In addition, the Commission or board may require a reasonable bond or letter of credit in an amount and with surety and conditions satisfactory to it securing to the Commonwealth compliance with the conditions set forth in the restoration order. The appropriate court, upon petition by the Commission or board, shall have authority to enforce any such restoration order by injunction, mandamus or other appropriate remedy. Failure to complete the required restoration shall constitute a violation of this chapter.

D. The duties of the Commissioner or the Board Chairman prescribed in this section may be delegated to their respective designees; however, such respective designees shall not be those persons who are also designated as enforcement officers.

§ 62.1-13.18:2. Penalties.—A. Without limiting the remedies which may be obtained in this chapter, any person who violates any provision of this chapter or who violates or fails, neglects or refuses to obey any Commission or wetlands board notice, order, rule, regulation or permit condition authorized by this chapter shall, upon such finding by an appropriate circuit court, be assessed a civil penalty not to exceed $25,000 for each day of violation. Such civil penalities may, at the discretion of the court assessing them, be directed to be paid into the treasury of the county, city or town in which the violation occurred for the purpose of abating environmental damage to, or the restoration of wet-

lands therein, in such a manner as the court may, by order, direct, except that where the violator is the county, city, or town itself, or its agent, the court shall direct the penalty to be paid into the state treasury.

B. Without limiting the remedies which may be obtained in this chapter, and with the consent of any person who has violated any provision of this chapter or who has violated or failed, neglected or refused to obey any Commission or wetlands board order, rule, regulation, or permit condition authorized by this chapter, the Commission or wetlands board may provide, in an order issued by the Commission or wetlands board against such person, for the one-time payment of civil charges for each violation in specific sums, not to exceed $10,000 for each violation. Civil charges shall be in lieu of any appropriate civil penalty which could be imposed under subsection A of this section. Civil charges may be in addition to the cost of any restoration ordered by the Commission or a wetlands board.

§ 62.1-13.27.:1. Penalties.—A. Without limiting the remedies which may be obtained in this chapter, any person who violates any provision of this chapter or who violates or fails, neglects or refuses to obey any Commission or wetlands board notice, order, rule, regulation or permit condition authorized by this chapter shall, upon such finding by an appropriate circuit court, be assessed a civil penalty not to exceed $25,000 for each day of violation. Such civil penalties may, at the discretion of the court assessing them, be directed to be paid into the treasury of the county, city or town in which the violation occurred for the purpose of abating environmental damage to, or the restoration of wetlands therein, in such a manner as the court may, by order, direct, except that where the violator is the county, city, or town itself, or its agent, the court shalt direct the penalty to be paid into the state treasury.

B. Without limiting the remedies which may be obtained in this chapter, and with the consent of any person who has violated any provision of this chapter or who has violated or failed, neglected or refused to obey any Commission or wetlands board order, rule, regulation, or permit condition authorized by this chapter, the Commission or wetlands board may provide, in an order issued by the Commission or wetlands board against such person, for the one-time payment of civil charges for each violation in specific sums, not to exceed $10,000 for each violation. Civil charges shall be in lieu of any appropriate civil penalty which could be imposed under subsection A of this section. Civil charges may be in addition to the cost of any restoration ordered by the Commission or a wetlands board.

ATTACHMENT B

SWORN COMPLAINT

No.____________________

Date____________________

Pursuant to Section 62.1-13.16:1 of the Code of Virginia, I hereby certify that a substantial violation of Chapter 2.1 of the Code has occurred at ________________________

____*(Location)*.

I have personally inspected the site and noted the following unauthorized activity:

____

____

____

____.

____________________, 19____ ________________________________
(Designated Enforcement Officer)

. . . .

Appropriate Wetlands Board

I, ________________________________, a Notary Public within and for

__________________________, hereby certify that ________________________,

a designated Enforcement Officer whose name is signed to the foregoing, has

acknowledged the same before me.

Given under my hand this ________ day of ____________________, 19____.

My Commission expires: ________________________________.

____
Notary Public

ATTACHMENT C

NOTICE TO COMPLY

No.____________________

Date____________________

Pursuant to Section 62.1-13.16:1 of the Code of Virginia, my field staff inspected your construction site at ____
(Address or Location)

on ________________________, at ________, having provided notice of such
(Date) *(Time)*

inspection to ________________________ on ________________________.

The following discrepancies were noted: ______________________________.

The following corrective measures are needed to bring you into compliance:

____

____

____

____

These measures are to be completed by ________________________.
(Date)

Notice ordered by ____.
(Wetlands Board Chairman)

on ____________________, 19____.

Notice served to ____.
(Signature of Person Notified)

on ____________________, 19____.

____
(Signature of Enforcement Officer)

ATTACHMENT D

VIOLATION WORKSHEET

Time:______________________________

Enforcement Officer:____________________

Date/Time:__________________________

Others Present:______________________

Photos: YES or NO

1. Location: ____

   ____

2. When did violation occur (if known): ______________________________

3. Description of violation: ____

   ____

   ____.

4. Dimensions of impact area: ______________________________________

   ____

   ____.

5. Environmental setting: ____

   ____

   ____.

6. Wetland type(s) impacted:

   Type: ____________________ Approx. Area:__________________

   Type: ____________________ Approx. Area:__________________

   Type: ____________________ Approx. Area:__________________

   Type: ____________________ Approx. Area:__________________

7. Reason for violation: ____

   ____

   ____.

ATTACHMENT E

STOP WORK ORDER

No.________________________

Date________________________

Pursuant to Section 62.1-13.16:1 of the Code of Virginia, having issued Notice to Comply No. ______________ on __________________________________ (copy attached), and having received a Sworn Complaint from my designated Enforcement Officer (copy attached), that a substantial violation of Chapter 2.1 of Title 62.1 of the Code exists as noted on the attached, you are hereby notified that further work at ____ (site location), must be **IMMEDIATELY DISCONTINUED.**

Work may be resumed under the following conditions:

____

____

____

____

Ordered by ____.
(Wetlands Board Chairman)

on ________________________, 19_____.

Notice served to ____.
(Signature of Person Notified)

on ________________________, 19_____.

____
(Signature of Enforcement Officer)

ATTACHMENT F

RESTORATION ORDER

Restoration Order Forthcoming

ATTACHMENT G

MONITORING PLAN REQUIREMENTS

Monitoring Plan Requirements Forthcoming

General Permit VGP #2

Commonwealth of Virginia

Virginia Marine Resources Commission

VMRC general permit for groin projects designed to control shoreline erosion, which conform to certain criteria and are undertaken by riparian owners in, on or over state-owned subaqueous lands in waters of the Commonwealth.

1. Authority - Effective Date:

(a) This General Permit is promulgated pursuant to the authority contained in Sections 28.1-23 and 62.1-3 of the Code of Virginia, as amended.

(b) This General Permit conforms with current Commission policy in its establishment of general permits for projects which meet certain restrictive criteria.

(c) This General Permit is consistent with the official opinion of the Attorney General issued on October 31, 1984 and attached hereto.

(d) The effective date of this General Permit is July 1, 1985.

2. Discussion:

(a) A principal objective of the permit streamlining efforts of this agency is the achievement of a single permit wherever possible for minor projects with minimal cumulative impacts.

(b) The Norfolk District U.S. Army Corps of Engineers has approved a general permit for groin projects in Virginia waters which are authorized by a local wetlands board and/or VMRC (83 GP-19).

(c) Local wetlands boards now process applications and issue permits for groins under the 1982 amendments to the Wetlands Act which placed the non-vegetated intertidal area of the "Tidewater Virginia" shoreline under their jurisdiction.

(d) The Virginia Institute of Marine Science reviews all applications for groins in tidal waters and submits a written evaluation to local boards for their use in the decision process.

(e) All local wetlands board decisions are made at public hearings which are public noticed in accordance with Section 62.1-13.5 of the Code of Virginia.

(f) The Commissioner reviews all decisions of local wetlands boards in compliance with Section 62.1-13.10.

(g) Any applicant, or 25 or more freeholders of property within the locality, aggrieved by a final decision of the local board, whether such decision is affirmative or negative in form, may appeal that decision to the Commission which will then review the local record in accordance with Sections 62.1-13.11, 13.12, and 13.13.

(h) The Commission has promulgated guidelines to assist local boards in determining the appropriateness and suitability of proposed groin structures.

3. Procedures:

The Chief, Habitat Management Division will administer the General Permit and assure:

(a) That the approved Local-State-Federal Joint Permit application form is completed and filed in accordance with the instructions contained therein.

(b) That applications are processed in accordance with the procedures established in Section 62.1-13.5 of the Wetlands Act and the local ordinance adopted thereunder.

(c) That groin projects authorized by this permit achieve the policy and standards implicit in Title 62.1 of the Code of Virginia, reasonably accommodate guidelines promulgated by the Commission and are consistent with the attached opinion of the Attorney General.

(d) That groins authorized by local boards meet the following criteria: (1) are of "low profile" design, (2) do not extend more than 48 feet channelward of mean high water, (3) if constructed of riprap or stone material do not exceed 6 feet in base width, and (4) any spur associated with an approved groin must be properly designed and located.

Projects which do not meet the criteria in (a) through (d) above will be processed for an individual VMRC permit with appropriate fees and royalties.

4. Authorization/Conditions:

All proposals for groin structures to encroach in, on or over State-owned subaqueous land which meet the criteria in paragraph 3 (a) through (d) above are hereby permitted subject to the following standard conditions:

(1) This permit grants no authority to the Permittee to encroach upon property rights, including riparian rights, of others.

(2) The duly authorized agents of the Commission shall have the right to enter upon the premises at reasonable times, for the purposes of inspecting the work being done pursuant to this permit.

(3) The Permittee shall comply with the water quality standards as established by the State Water Control Board and all other applicable laws, ordinances, rules and regulations affecting the conduct of the project. The granting of this permit shall not relieve the Permittee of the responsibility of obtaining any and all other permits or authority for the project.

(4) This permit shall not affect or interfere with the right vouchsafed to the people of Virginia concerning fowling and the catching of and taking of oysters and other shellfish in and from the bottom of areas and waters not included within the terms of this permit.

(5) The Permittee shall, to the greatest extent practicable, minimize the adverse effects of the project upon adjacent properties and wetlands and upon the natural resources of the Commonwealth.

(6) This permit may be revoked at any time by the Commission upon the failure of the Permittee to comply with any of the terms and conditions hereof or at the will of the General Assembly of Virginia.

(7) There is expressly excluded from this permit any portion of the waters within the boundaries of the Baylor Survey (Public Oyster Ground).

(8) This permit is subject to any lease of oyster planting ground in effect on the date of this permit. Nothing in this permit shall be construed as allowing the Permittee to encroach on any lease without the consent of the leaseholder. The Permittee shall be liable for any damages to such lease.

(9) The issuance of this permit does not confer upon the Permittee any interest or title to the beds of the waters.

(10) All structures authorized by this permit which are not maintained in good repair shall be completely removed from State-owned bottom within three (3) months after notification by the Commission.

(11) The Permittee agrees to indemnify and save harmless the Commonwealth of Virginia from any liability arising from the establishment operation or maintenance of said project.

(12) This permit authorizes no claim to archaeological artifacts which may be encountered during the course of construction. If, however, archaeological remains are encountered, the Permittee agrees to notify the Commission, who will, in turn,

notify the Virginia Historic Landmarks Commission. The Permittee further agrees to cooperate with agencies of the Commonwealth in the recovery of archaeological remains if deemed necessary.

5. This General Permit should be retained by the Permittee for the life of his project as evidence of authorization.

Criteria for the Placement of Sandy Dredged Material Along Beaches in the Commonwealth

Virginia Marine Resources Commission

VR 450-01-0052

Section 1

Objective and Goals

A. The objective is to assure that all suitable dredged material is utilized on eroding beach shorelines to the maximum extent practicable.

B. In considering dredging permit applications, the Commission will endeavor to:

1. Support Section 10.1-704 of the Code of Virginia which provides that the beaches of the Commonwealth be given priority consideration as sites for the disposal of that portion of dredged material determined to be suitable for beach nourishment.

2. Coordinate and cooperate with the appropriate state and federal agencies to the extent that VMRC regulatory actions can support those agencies in administering House Joint Resolution No. 223, 1987 session, regarding the use of dredged material for beach nourishment.

3. Resolve or minimize legal, environmental and engineering problems which can result from inadequate planning of dredged material placement.

Section 2

Purpose

The purpose of this is to develop manageable criteria and threshold levels for use by Commission staff in determining which projects justify a requirement for the expenditure of funds by an applicant for sediment tests as well as investigation of legal, environmental and engineering implications inherent in every dredged material placement proposal.

Section 3

Policy

The Commission will strive to achieve maximum beneficial uses of suitable dredged material for those projects which qualify under criteria established herein while protecting the interests of the Commonwealth in the land and the resources lying channelward of the mean low water shoreline which land and resources are owned by the Commonwealth and are to be held as a common for use by all its citizens.

Section 4

General Criteria

Increasing interest in the beneficial uses of dredged material dictates a more structured approach to the processing of dredging permit applications. Parameters to be considered in attempting to utilize suitable material for beach nourishment are frequently economic, legal, political, or technical, as well as environmental, and most often a combination of all these factors.

Because of the complexity of interests involved, certain threshold levels are needed to more readily define projects which justify the time and expense of determining whether beach nourishment is a reasonable alternative.

The following general criteria should be used to determine candidate projects suitable for detailed evaluation:

1. More than 7,500 cubic yards of material are to be removed and, based on previous experience, there is a reasonable expectation that usable quantities of suitable beach nourishment material free from toxic compounds is present in the material to be dredged.

2. Beaches with a demonstrated need for and capability of accepting all or a part of the available material are within proximity of the dredging site.

3. The political subdivision within which the potential placement site is located has expressed an interest in obtaining beach nourishment material.

4. The applicant understands that he will be required to undertake the research necessary to locate private property owners willing to accept the material if no publicly owned shoreline is in reasonable proximity.

5. When beach nourishment is incorporated into a dredging project, a more comprehensive subsurface investigation plan is required than if dredging is the only consideration.

Section 5

Specific Criteria

1. Sufficient borings must be made and analyzed to develop a clear picture of the vertical and horizontal limit of sand deposits in the dredging area. Such borings are the responsibility of the dredging applicant.

2. Shoreline investigations at the nourishment site must determine the characteristics of the native material, the location of utilities, structures, outfall pipes, property lines along shore transport, and other basic engineering considerations.

3. Engineering information must be analyzed to determine acceptable grain size range of fill material, design berm height, width and length, probable fate of the material, expected loss rates and the resulting maintenance requirements.

4. Legal easements and public rights-of-way must be obtained from property owners which preserve public use and State ownership of all State-owned submerged land existing channelward of mean low water shoreline prior to the placement of any material. These legal documents are the responsibility of the dredging applicant or property owners, or both.

5. The project should be engineered in a manner which results in the least environmental impact while providing an efficient and cost effective construction plan. Consideration will be given, but not limited to, the project's potential impacts on existing natural resources and habitats. These include, *inter alia*, existing finfish, shellfish, turtle and avian species and their critical time periods for spawning, nesting and nursery functions in areas of submerged aquatic vegetation, wetlands and submerged or intertidal and beach habitat.

Memorandum of Agreement between the U.S. Army Corps of Engineers, Norfolk District and the Virginia Marine Resources Commission for the implementation of a Certificate of Compliance with Norfolk District's Regional Permit 90-17

I. Purpose

The United States Army Corps of Engineers, Norfolk District (COE) and the Virginia Marine Resources Commission (VMRC) hereby establish cooperative procedures for the implementation of a Certificate of Compliance with Norfolk District's Regional Permit (RP) 90-17. Regional Permit 90-17 regulates the construction, maintenance, and repair of private, non-commercial piers and mooring piles in certain navigable waters of the United States within the Commonwealth of Virginia.

II. Procedures

Applicants will complete, sign, and submit a copy of the Certificate of Compliance along with their permit application to the VMRC. Applications which have a completed certificate of compliance attached when received at VMRC will be processed without copies of the applications or related correspondence being furnished to the COE.

The Certificate of Compliance may be reproduced locally and is approved by the COE for immediate use. The responsibility for certifying compliance with the conditions outlined in the permit rests with either the applicant or the agent. This certification will constitute legal documentation from the COE that a project meets the conditions of RP 90-17. No additional COE documentation will be provided.

ADDITIONAL READING

Contents

Additional Reading

Anonymous. 1988. Population Growth and Development in the Chesapeake Bay Watershed to the Year 2020. The report of the 2020 panel to the Chesapeake Executive Council. 52 pp. [Available at many public libraries, Virginia Council on the Environment and the Chesapeake Bay Commission, 60 West Street, Annapolis, MD 21401.]

Badger, Curtis. 1978-79. Saltmarsh Ecology, Parts I-IV. *Virginia Wildlife* 39:(9) and 40:(1,4,8). [Available at many libraries.]

Conservation Foundation. 1988. Protecting America's Wetlands: An Action Agenda. The Final Report of the National Wetlands Policy Forum. 69 pp. [Available from the Conservation Foundation, 1250 24th Street, N.W., Washington, D.C. 20037.]

Dahl, T. E. 1990. Wetland Losses in the United States 1780's to 1980's. U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C. 21 pp. [Available from U.S. Fish and Wildlife Service, National Wetlands Inventory, St. Petersburg, FL.]

Daiber, Franklin C. 1986. *Conservation of Tidal Marshes*. Van Nostrand Reinhold Company. NY, NY. 341 pp. [Available in many larger libraries and college libraries.]

Hardin, Garrett. 1968. The Tragedy of the Commons. *Science* 162:1243-1248. [Available at most larger libraries.]

Horton, Tom. 1991. *Turning the Tide—Saving the Chesapeake Bay*. Island Press. Washington, D.C. 327 pp. [Available from Island Press and many bookstores.]

Leopold, Aldo. 1966. *A Sand County Almanac: With Essays on Conservation from Round River*. Ballantine Books. NY, NY. 295 pp. [Available in many bookstores and libraries.]

Mitsch, William J. and James G. Gosselink. 1986. *Wetlands*. Van Nostrand Reinhold Company. NY, NY. 537 pp. [Available at college bookstores.]

Niering, William A. 1985. *The Audubon Society Nature Guides: Wetlands*. Alfred A. Knopf, Inc. NY, NY. 638 pp. [Available at most bookstores.]

Settle, Fairfax H. 1969. Survey and analysis of changes effected by man on tidal marshes of Virginia, 1955-1969. Unpublished Master's Thesis. VPI&SU. Blacksburg. 47 pp. [Available on interlibrary loan from VPI&SU.]

Silberhorn, G. M. 1982. *Common Plants of the Mid-Atlantic Coast: A Field Guide*. The Johns Hopkins University Press. Baltimore. 256 pp. [Available from VIMS Sea Grant Office and William and Mary Bookstore.]

Siry, Joseph V. 1984. *Marshes of the Ocean Shore, Development of an Ecological Ethic.* Texas A&M University Press. 216 pp. [Available at VIMS library.]

Southeastern Virginia Planning District Commission. 1988. The Value of Wetlands: A Guide for Citizens. Southeastern Virginia Planning District Commission. Chesapeake, Virginia. 30 pp. [Available at Southeastern Virginia Planning District Commission, 723 Woodlake Drive, Chesapeake, VA 23320.]

Steinhart, P., T. Williams, J. Stuller, et al. 1990. The Last Wetlands. *Audubon Magazine.* July 1990. 132 pp. [Special issue available at most libraries.]

Teal, John M. and Mildred. 1969. *Life and Death of the Salt Marsh.* Ballatine Books. NY, NY. 274 pp. [Available in paperback in many bookstores.]

Tiner, Ralph W., Jr. 1984. Wetlands of the United States: Current Status and Trends. U.S. Fish and Wildlife Service. National Wetlands Inventory. Washington, D.C. 46 pp. [Available from U.S. Government Printing Office, Washington, D.C. 20402.]

Tiner, Ralph W., Jr. 1987. Mid-Atlantic Wetlands: A Disappearing Natural Resource. U.S. Fish and Wildlife Service. National Wetlands Inventory Program. Newton Corner, Massachusetts. 28 pp. [Available from U.S. Fish and Wildlife Service, National Wetlands Inventory, Newton Corner, Massachusetts 02158.]

Udall, Stuart L. 1988. *The Quiet Crisis II.* Henry Holt and Company. NY, NY. 298 pp. [Available in many bookstores.]

U.S. E.P.A. Chesapeake Bay Program. 1982. Chesapeake Bay: Introduction to an Ecosystem. 33 pp. [Available from Chesapeake Bay Program, 401 Severn Avenue, Annapolis, MD 21403.]

U.S. E.P.A. 1988. America's wetlands: our vital link between land and water. U.S. E.P.A., Office of Wetlands Protection. Washington, D.C. 9 pp. [Available from Office of Wetlands Protection, Washington, D.C. 20460.]

Virginia Sea Grant College Program. 1989. Virginia Marine Resource Bulletin. Vol. 21:(1). 21 pp. [Tidal freshwater wetlands issue available from VIMS Sea Grant Office.]

White, Christopher P. 1989. *Chesapeake Bay: Nature of the Estuary, A Field Guide.* Tidewater Publishers, Centreville, Maryland. 212 pp. [Available at many bookstores.]

Virginia Wetlands
Historical Summary

Background

1966	Legislature established a special Marine Resources Study Commission.
1967	Study Commission recommended a special study on marsh and wetlands.
1968	Legislature directed VIMS to conduct the wetlands study.
1969	VIMS report (*Coastal Wetlands of Virginia, Interim Report*, Wass and Wright, Dec. 1969).
1970-72	Public hearings, drafting of Wetlands Act and research (Marcellus, Boon, Lynch) to determine wetlands definitions and upper limits of wetlands.
1972	Published *Tidal Datum Planes and Tidal Boundaries and Their Use as Legal Boundaries*, Boon and Lynch, 1972.
1972	Wetlands Act enacted, to become effective 1 July 1972. Publication of *Coastal Wetlands of Virginia, Interim Report No. 2*, Marcellus, July 1972. First local wetlands boards established and VIMS commences training workshops for boards. VIMS also commences wetlands inventory.
1973	Published management manual for wetlands boards (*Local Management of Wetlands—Environmental Considerations*, Marcellus, Dawes, Silberhorn, June, 1973). First county inventory published (*Lancaster County Tidal Marsh Inventory*, Silberhorn, December, 1973).
1974	Published wetlands guidelines (*Coastal Wetlands of Virginia, Interim Report No. 3, Guidelines for Activities Affecting Virginia Wetlands*, Silberhorn, Dawes, Barnard, June 1974). Published two county inventories (Mathews, York; both Silberhorn). Wetlands Guidelines promulgated by VMRC.
1974	Wetlands of Back Bay and the North Landing River and its Tributaries added by amendment.
1982	Nonvegetated wetlands added by amendment. Boards expanded from 5 to 7 members (optional). Grandfather Sunset Clause.
1983	Wetlands Guidelines revised to include nonvegetated areas.

(over)

1987 Wetlands Act amended to allow reporting, site inspections, notice to comply and stop work orders.

1989 Wetlands Mitigation-Compensation Policy adopted.

1990 Wetlands Act amended to allow court ordered civil penalties not to exceed $25,000 for each day of violation. In lieu of any civil penalty, civil charges of up to $10,000 for each violation may be ordered by the Marine Resources Commission or Wetlands Board. Restoration hearings were also authorized.

1991 Tidal Marsh Inventory for City of Chesapeake completed and published (last of original series). Wetlands inventories to be maintained and updated using computer-based Geographical Information System (GIS).

1991 VIMS Wetlands Program produces "Virginia Wetlands Management Handbook" and Wetlands Educational Curriculum.

Informal Suggestions for Conducting A Public Hearing

Contents

Just Prior to Meeting Staff Should:

1. Telephone reminder to Board Members

2. Confirm availability of meeting chamber

3. Check lights and speakers

4. Set out name plates, pads, and pencils

5. Bring appropriate area maps

6. Bring state and local laws

7. Bring photographs of site

8. Post agendas for public

Holding Public Hearing

1. Meeting called to order

2. Attendance recorded, quorum confirmed

3. Chair explains purpose of meeting, reads opening statement*

4. Chair states where agendas are posted

5. Chair calls for comments, questions, corrections on minutes

6. Chair inquires about old business

*Many boards choose to read the policy statement at the beginning of the Wetlands Act.

Hearing Items

1. Chair may shift hearing order, administer oaths, limit presentations and discussions
2. Chair or staff state case number and presents brief description of proposed project
3. Chair or staff read VIMS report into record
4. Applicant or representative speaks
5. Others speak
6. Chair closes hearing to public

Board Discussion

1. Chair asks for comments from Board members

2. Record should display a consideration of:

    A. Social concerns

    B. Economic concerns

    C. Physical concerns

    D. Environmental concerns

3. Chair asks for staff evaluation/recommendation

4. Chair asks if any additional comments from VIMS

5. Chair entertains motion

*A benefits vs. detriments format is recommended

Motions may include:

1. **Approval as submitted**
2. **Approval in modified form**
3. **Approval with bonding or letter of credit required**
4. **Denial**
5. **Denial without prejudice**
6. **Direct applicant to provide more information**
7. **Defer decision for up to 30 days**

After Board Decision

1. **Chair informs applicant and audience of appeal process**
2. **Time limit on permit**

Helpful Hints

1. Require speaker from public to approach Board, state name/address, speak, return to audience

2. Limit speakers to issues germane to Wetlands Board

3. Allow everyone an opportunity to speak

4. Direct all public comment or questions to Board

5. Discourage interaction between audience and speaker

6. State decision rationale in benefit vs. detriment format