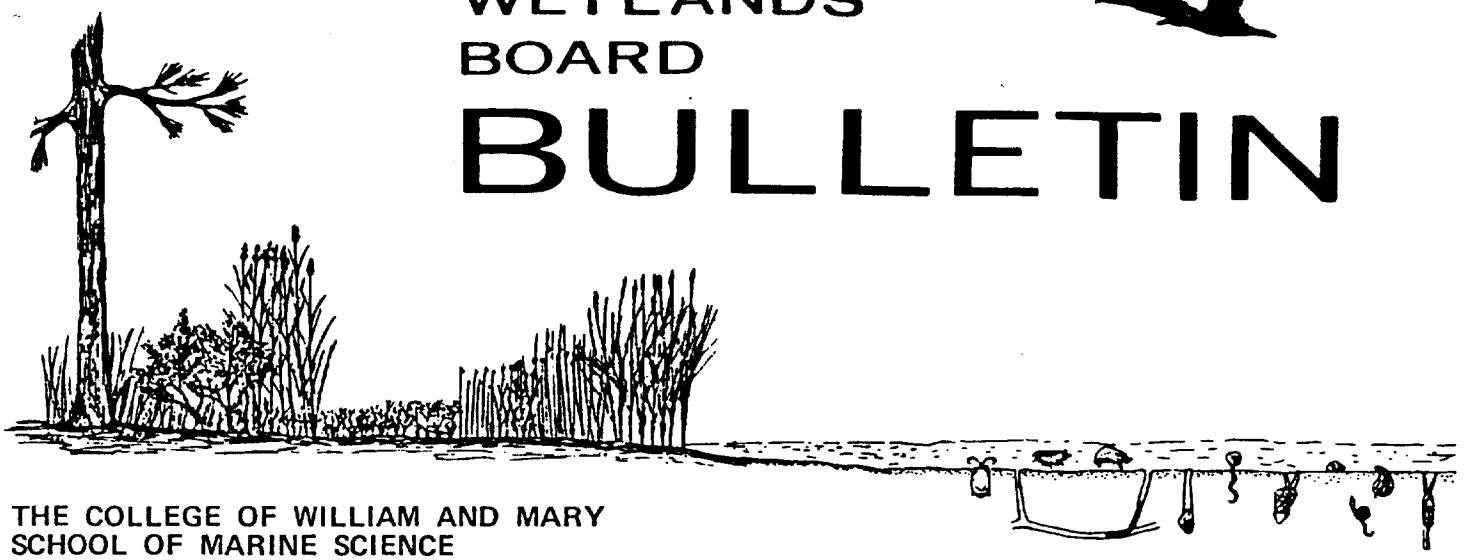
WETLANDS BOARD BULLETIN



THE COLLEGE OF WILLIAM AND MARY
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VIRGINIA INSTITUTE OF MARINE SCIENCE

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PLANTING WETLANDS AND DUNES IN VIRGINIA, PART 2: ON-SITE MONITORING

James E. Perry, III and Walter I. Priest, III

INTRODUCTION

This is the second part of a three part series designed to aid local wetland boards and regulatory agencies in interpreting the the art of wetland compensation and restoration. The first article in this series presented information on critically reviewing compensation and restoration projects (Wetlands Board Bulletin, Vol.1 No.3). This article will cover constuction techniques and potential on-site problems. The last article of the series will discuss planting times and procedures.

When coastal resource managers determine that it is necessary to impact a coastal dune or wetland system, several tools exist to help lessen the damage to the environmental system. As stated in the first article, one of these tools is the process of compensation and restoration of wetlands. Again, we must state that we do not intend to condemn nor condone compensation and/or restoration as mitigation tools and will restrict our comments to the practical aspect of interpretation and on-site monitoring of dune and wetland establishment projects.

Whatever the rationale, whether it is the restoration of construction impacts or compensation for unavoidable habitat loss, the success of the project depends, to a high degree, on proper construction. Since attention to details such as elevation, placement of plant species, field determination of soil types and mud wave potential can mean the difference between the success or failure of a compensation project, monitoring of the construction phase by the wetland boards and/or their staff becomes very important. With appropriate supervision, on-site changes can be made to cope with most situations. The presence of regulatory managers on-site during project construction not only helps to ensure that the size and location specifications are met, but can, with the help of their knowledge and common sense, keep a compensation project, particularly one based on good design techniques, from falling on its face.

WETLAND CONSTRUCTION MONITORING

ELEVATIONS: Please rememember that it is easier to plot a proposed elevation on a piece of paper than it is to actually do the work in the field. The most critical aspect of successful wetland establishment is the elevation of the planting site relative to the tides. The important datums, i.e. mean sea level (MSL), mean high water (MHW) and upper limit of the wetlands (ULW) may not always follow the "paper" criteria established via the permit proposal, but may vary from site to site. Although the planting range may be determined by either topographic survey or by observation of tide heights as compared to the tide tables, the best approximation of planting zones can be obtained by using the average upper and lower elevations of existing marshes in

close proximity to the project site. For a typical Spartina alterniflora (smooth cordgrass) marsh planting, it is essential that the planting area is inundated by the tides twice daily. Once an area has been graded, it is best, if possible, to stake the high and low tide levels on several consecutive tides to assure the proper elevations. If the elevations are too low, the plants will be covered by water too often and will not survive. In cases where elevations are too high terrestrial species can and often do invade the planting site changing the nature of the marsh from wetland to upland, nullifying the goal of the compensation project. CHECK THOSE ELEVATIONS!

SITE PREPARATION: Site preparation, including slope grading, is another important factor. One must determine the type of equipment to be used and the soil characteristics of the site. On small projects (1,000 to 10,000 square foot) a small tractor and/or backhoe is all that is needed. However, on large projects (over 10,000 square feet) heavy equipment (dredges or graders) is generally necessary. The soil at these sites must be able to support the heavier equipment. In cases where it cannot, the machinery will have to work from mats.

Usually small sites will be excavated under wet conditions. To avoid rutting of the excavated area by the machine treads and tires, work should begin at the waterward edge and move landward. If reworking of the grade becomes necessary, it should be done at times of low tides when the surface is exposed. Reworking grades during high tides is not recommended for two reasons: 1) the potential of environmental damage due to increased turbidity and 2) the lack of visibility, i.e. the contractor will not be able to visually judge the grading process.

DREDGED MATERIAL and MUDWAVES: When a large amount of material is dredged, care must be taken to store the spoil in a place away from wetland areas. When placed too close to wetlands, the surcharge (the added weight load of the spoil) will often cause uplift in the adjacent wetland area (mudwave formation). Uplift can be handled in two ways: 1) remove the material causing the surcharge or 2) grade the uplift down to the original elevation. The latter must be done repeatedly until the surcharge has reached an "equilibrium" point and may take months of repeated regrading and delay of planting (or forced replanting when the grading work removes the vegetation). Furthermore, the grading equipment may be required to work under "wet" conditions, (soils that will not support weight) and mats will usually be necessary. Therefore, removal of the material causing the surcharge is the best option since it is generally the less expensive, least environmentally damaging alternative.

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Riprap for Shoreline Erosion Control

By Lee Hill

Waterfront property owners experiencing shoreline erosion are selecting structural measures to protect their property. One measure receiving increased attention is the riprap (large rock) structure. The riprap structure can be used throughout the tidal region to control erosion. The popularity of the structure generates questions concerning its design and construction.

The design of the riprap structure is site specific. the following should be considered when designing a riprap structure:

1. The riprap structure is generally constructed using two sizes of rock. The inner layers are composed of bedding or core stone. The outer layers are constructed of armor rock.

   The armor rock is large rock which protects the structural integrity of the measure. The size (weight) of the armor rock is proportional to the design wave (the largest wave that may occur at the site). Depending on the property location, the size of the armor rock may vary from 30 pounds to several hundred pounds. For example, we recommend a minimum 30 pound armor rock for a protected creek and a minimum 200 pound armor rock for properties on the bay.

   The core or bedding stone is placed under the armor rock. The size of the core stone can vary and is generally much smaller than the armor rock. Therefore, rock which is not suitable for armor can be used as bedding.

2. To protect the structure from scour (erosion of the beach or bottom in front of the structure), a buried toe (foundation) is required. The depth of the buried toe is based upon the height of the design wave. In addition, the mean low water elevation is the datum for the toe. For example, a design wave of 2 feet would require a buried toe with a minimum depth of 2 feet below the mean low water elevation.

   In areas where the buried toe is not feasible (such as unsuitable soil conditions, buried cables, ease of construction, etc.), the riprap apron is an alternative. The riprap apron consists of 2 layers of armor rock extending along the bottom. The length of the apron is twice the depth of the buried toe. For example, a buried toe of 2 feet would require a riprap apron of 4 feet.

3. The slope on which the riprap structure is placed is also very important. Although the rock could be properly sized, placement on an unsuitable slope could mean structural failure. We generally recommend a 2:1 (horizontal/vertical) slope. However, steeper or flatter slopes can be used provided this factor is used in the design of the structure.

4. A layer of filter cloth should be used under and behind the riprap structure. The purpose of the filter cloth is to prevent sediment loss through the rock layers. The loss of sediment could result in structural failure.

   Filter cloth is manufactured in many styles. We recommend using a woven filter cloth. As many styles are available, the filter cloth should be selected to meet the soil and water conditions of the site.

As seen from the above design considerations, a riprap structure is not just a pile of rocks placed on the bank. In fact, the structure should be a properly designed and constructed protective measure. For more information concerning the design of a riprap structure, please contact:

Shoreline Erosion Advisory Service
P.O. Box 1024
Gloucester Point, Virginia 23062
804/642-7121

Lee Hill is Chief Engineer for the Shoreline Erosion Advisory Service

SLOPE and DRAINAGE: The slope of the planting site should be gentle and smooth. On steep slopes the intertidal planting area and wave energy dissipation zone become smaller and the erosion potential of the slope higher. If possible, planting slopes should be no steeper than 10 to 1; a one foot rise (vertical distance) for every 10 feet of run (horizontal distance). The actual on-site slope can be determined by surveyor levels, but inexpensive hand-held optical levels do an adequate job. The latter are available through most engineering or forestry suppliers and cost between $20-$100. If a level is not available, the slope can be estimated by noting the time it takes for the graded area to be covered by a rising tide. For example, if a tide rises three feet in six hours (therefore 1 foot in two hours) and the proposed slope is 10 to 1, it should take two hours for the tide to travel 10 feet landward on the graded slope (therefore rising one foot vertically). The actual tide range and differences between tides can be obtained from the NOAA Tide Tables. However, since the rate of rising tides is non-linear, without extensive computation this method provides only an estimate. Do not expect to calculate the exact slope, but with care you can come within plus or minus 3 feet on the vertical portion of the slope formula (i.e. 13:1 or 7:1). To minimize errors, several readings can be taken simultaneously.

Drainage, as mentioned above, is important in assuring the survival of intertidal planting. Drainage must be complete at normal low water, i.e. no standing water should remain on the site. Tire trenches and rough grading will leave pockets of water that can significantly decrease the emergent plant productivity of the compensation/restoration site.

MONITORING DUNE CONSTRUCTION

Proper sand dune construction depends on five elements: 1) proper alignment, 2) using sand of the proper grain size, 3) the construction height of the new dunes, 4) the placement of the sand fences, and 5) planting the right species at the right time. The last of these, choosing plant species and the correct time and procedures for planting, will be covered in the next article. The first, alignment, is simple: align all dunes parallel to the shore. The main function of a dune, at least from the point of view of property protection, is to abate wave energy and, therefore, minimize property damage. Any alignment other than parallel would not serve any protective function.

GRAIN SIZE: Grain size is important when erosion is a problem. Sand that is smaller in size than the naturally occuring sand on-site will be prone to more rapid erosion.

(cont. pg 4)

THE VMRC CONNECTION
BY
Norman E. Larson

As you know, we have over the past several years promulgated a Wetlands Newsletter from time-to-time as the need arose. Because of the press of other responsibilities, the newsletter generally assumed a low priority and often didn't get drafted until there was an urgent need to communicate information to the local boards.

I was therefore particularly pleased to learn that VIMS was producing a quarterly publication that can very capably fill our need to promulgate information from time-to-time. Accordingly, I have discontinued any future newsletters and will instead take advantage of the opportunity to join with our partners at VIMS in contributing to their quarterly publication. I hope we can find the time to fill a small space in every issue.

I know I don't need to comment to Board members how much we rely on the Wetlands Program staff at VIMS to assist us in our day-to-day permitting responsibilities. This VMRC/VIMS partnership traces its origin to the modest beginning in the late 1940's of the development of the Virginia Fisheries Laboratory to support the Virginia Fisheries Commission with technical and scientific information needed to properly manage the fishery. The addition of the Habitat Management responsibilities in 1962 was a logical extension of that partnership and has served to strengthen it markedly, particularly since passage of the Wetlands Act in 1972. I feel certain that this quarterly bulletin will prove to be an important vehicle to share information and help fill continuing communication needs.

Norm Larsen is chief of VMRC's Habitat Management Division

SIXTH ANNUAL WETLANDS SYMPOSIUM

Saturday, February 7, 1987 will be the date for this years conference which will again be held at Hampton University. As usual, 10:00 a.m. to 4:00 p.m. will be set aside for the program with registration, coffee and pastries scheduled for about 9:30. Attendance has been increasing each year and we hope this year will see a continuation of that trend. Be sure to mark your calendar and plan to attend. A detailed agenda and registration form will be mailed before the holidays.

Norman E. Larsen

Editors Note

A number of persons have expressed interest in organizing a Virginia Wetlands and Shorelines Association. Such a group would help bring together all wetlands board members and others who have a responsibility or interest in preserving, protecting and managing the wetlands, dunes, beaches and shorelines in the Commonwealth. The Association could help to provide a focus for the exchange of information, help promote more uniformity in wetlands board actions, help foster better interagency cooperation and understanding and also help provide a means for better informing the general public on the values of and problems facing Virginia's wetlands and shoreline resources.

Those who desire to be involved in helping to organize the Association, may write or call:

Clay Barnick
Environmental Planner
Virginia Beach Planning Department
115 Operations Building
Virginia Beach, Virginia 23456
(804) 427-4621

The smaller the particle, the more easily it is moved by natural forces such as wind, waves, and currents. Sand that is larger in size is generally not a problem. Without microscopic equipment for comparing the source vs. natural grains or the use of rather complex laboratory procedures, it is generally difficult to judge whether an adequate grain size is being used. However, comparisons are possible. Check the texture of the two. A coarse texture implies a larger grained sand. Another technique is to weigh a known volume of dry sand from both the source and the site. Sand that is of a smaller grain size will have less air spaces and, therefore, weigh more than sand of a larger grain size.

HEIGHT: As a general rule, new dunes should not be constructed with a height elevation of over four feet. The four foot limit is one of practical means: the major force in dune stabilization is the inherent relationship between the entwining root mat of the vegetation and the water table level of the dunes. The water table level of a dune (the "aquifer") is a function of several factors, most importantly, the height of the dune. Through capillary action, water is drawn into the empty spaces ("pore" spaces) between the sand grains. The higher the dunes, the higher the water table in that dune (to a limit, of course). When dunes are built over the height limit and planted with vegetation, the root mats, when formed, will not penetrate to the bottom of the dune, but to the level of the water table. Therefore, the relationship between the vegetation and a constructed dune that exceeds the recommended height is one of a vegetated "cap" over a pile of sand, not one that simulates natural dune formation and, therefore, would be one that would not provide the wanted protection.

Dune construction height on-site can be determined by the use of a surveyors level or hand held optical level. However, one can optically determine the height of a constructed dune by placing 4 foot tall measuring poles perpendicular to the dune. One simply sights, with your eye at the four foot mark, to the other stake. If your line of vision is above the farther stake, the height is above four feet. Please note that not all the dune must be at four feet, use the four foot mark as an average goal.

SAND FENCING: Sand fences (a.k.a. snow fences) should be placed with two purposes in mind: 1) to hold the existing sand in place and 2) to catch wind-blown sand. Research has shown that rows of fences should be placed 7 to 10 feet apart. The first fence should be placed at the foot of, or two to three feet waterward of, the seaside toe of the dune. Furthermore, a row should be placed at the seaward crest of the dune.

Jim Perry is a noted botanist/wetland ecologist and a doctoral student at the Virginia Institute of Marine Science.

Walter Priest is a marine scientist and member of the faculty and staff at the Virginia Institute of Marine Science.

Erosion policy lacking, panel says

By BRUCE REID
Staff Writer

RICHMOND — State officials and legislators agreed Monday that Virginia does not have a shoreline erosion policy governing coastal development and that establishing one will be a big job.

A legislative subcommittee studying that issue, which met in Richmond for the third time, has begun a closer examination of controversial developments that have caused bitter disputes over the state's powers to balance private and public interests in the use of shorelines.

Opponents of a vacation-home development on Accomack County's Cedar Island claim that the public interests in protecting the mainland from flooding and guarding against destruction of wildlife habitat have been slighted.

On Cedar Island, allowing erosion — or more correctly a gradual westward movement of the barrier island — to continue would be sound state policy, some officials say. Without that freedom of movement, the island could be destroyed, they say.

On the other hand, residents of Virginia Beach's Sandbridge community contend that the state has a substantial interest in protecting private properties from impending erosion. Stopping erosion and protecting a tax base and a tourist industry would also be good policy, the residents say.

"This is a bit of a quagmire because it's so broad and complex," said Del. V Thomas Forehand, D-Chesapeake, who chairs the House-Senate subcommittee. "The overall lesson is that the same solutions don't apply across the state."

Forehand said the panel has begun examining erosion policies in other states, many of which are more restrictive than Virginia's laws or regulations.

Some states, such as Florida and North Carolina, have minimum setback provisions prohibiting new development expected to be subject to flooding years in the future.

Although the subcommittee is not close to proposing new laws, some of its members are considering ways to strengthen the state's control over use of the coastline.

Testimony from a variety of officials Monday pointed to several problems:

- Some officials and legislators think the state should exercise the power to prohibit coastal housing that when taken individually might not be harmful but collectively might pose risks to sensitive sand dunes, wetlands, seafood resources or other interests. The question: Does the state have that power?
- Norman Larsen, a top official with the Virginia Marine Resources Commission, acknowledged that that members of his agency's governing board have little or no experience in land-use management. In recent years, the commission has become the principal regulator of coastal development.

One of the slots on the seven-member commission, which Hampton resident John Mallory Phillips has said he is vacating, might be filled by someone with land-use expertise, top state officials have indicated.

- Despite a doctrine of common, or public, ownership of some shoreline property in existence since the early 1600s, the state has no idea how much beachfront property it owns or where it is. Determining the extent of ownership would have a bearing on the degree of the public's interest in protecting access to beaches and give the state more leverage in controlling development.

Despite the political strife of managing coastal development, one longtime Eastern Shore resident presented a more simplified view of the problem to the subcommittee.

"They way I see it," he said, "erosion is like aging. You either deal with it gracefully or you try to fight it and make a mess of it."

Editor's Note

The following is a copy of the Wetlands and Coastal Primary Sand Dune Violation Procedures for the City of Norfolk Wetlands Board. Other wetlands boards may find this useful in their cities or counties.

City of Norfolk
Wetlands Board

Wetlands and Coastal Primary Sand Dune
Violation Procedures

I. Violation observed or referral by Citizen or Governmental Agency

II. Initial Site Inspection

- A. Refer to city aerial photographs and topographic maps
- B. Obtain measurements from ground reference points
- C. Photograph violation

III. Reinspection with VIMS Advisor

IV. Action: No Violation Found

- A. Notify property owner if fill material or equipment is adjacent to marsh or dune
- B. Notify referral party or agency

V. Action: Violation Found

- A. Staff (Environmental Services) issues a notice to cease work
  1. Certified letter to property owner of record with return receipt. Remail certified letter if unclaimed.
  2. Include interim protective measures as recommended by VIMS Advisor (ex., straw bale barrier, sand fence).
  3. Direct violator to contact Environmental Services within seven (7) days to arrange a meeting on site.
- B. Failure to comply, with notice to cease work
  1. Staff (Environmental Services) shall advise Chairman of the Wetlands Board. Special board meeting may be called as directed by Chairman.
  2. Board's attorney may immediately seek injunctive relief.

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VI. Site Meeting with Violator

- A. Invite Corps, VMRC & VIMS representatives, as necessary
- B. Determine the project purpose
- C. Past filling or grading dates
- D. Names of any contractors involved (notify them of notice to cease work)
- E. Inform violator of permit requirements and regulations

VII. Staff Investigation of Violation

- A. Conduct a title search to verify ownership of property since 1972 (Wetlands) and 1980 (Dunes)
- B. Determine approximate square footage of wetlands or dunes disturbed or displaced
  1. Refer to City aerials and topographic maps (1974), U. S. Army Corps of Engineers aerials (1979 and 1982) and VIMS shoreline assessment photographs.
  2. Perform soil borings, as necessary, with assistance from Board's Technical Advisor from VIMS.
- C. Mail certified letter with return receipt to property owner
  1. Detail the extent of the violation
  2. Request property owner to appear before Board to show cause why they should not be held in violation of Wetlands/Dunes Ordinance

VIII. Bring Matter Before Board at Next Scheduled Meeting

- A. Staff presentation of violation
- B. Staff recommendation:
  1. Require violator to submit an after-the-fact application.
  2. Direct restoration with Board ordering what corrective action is to be taken with a thirty (30) day time limit for compliance.

IX. After-the-Fact Application

- A. Follow prescribed notice and public hearing procedures

X. Restoration Order

- A. Board directs staff to prepare restoration order and forward to violator (certified mail-return receipt)
- B. Non-compliance may result in appropriate legal action by Board's Staff Attorney

XI. Reinspection of Site as Necessary

This issues quote

"The creeks overflow; a thousand rivulets run
'Twixt the roots of the sod; the blades of the marsh grass stir;
Passeth a hurrying sound of wings that westward whirr;
Passeth, and all is still; and the currents cease to run;
And the sea and the marsh are one.

How still the plains of the waters be!
The tide is in his ecstasy.
The tide is at his highest height-
And it is night.

And now from the Vast of the Lord will the waters of sleep
roll in on the souls of men,
But who will reveal to our waking ken
The forms that swim and the shapes that creep
Under the waters of sleep?
And I would I could know what swimmeth below when the tide comes in
On the length and the breadth of the marvelous marshes of Glynn."

(Sidney Lanier, excerpts from *"The Marshes of Glynn"*, 1878)