



Study Offers Options For Protection of Secondary Dunes

Most of you reading this newsletter are familiar with the term “primary dune” and probably somewhat familiar with the Coastal Primary Sand Dune Protection Act in Virginia. You may have even heard of “secondary” dunes also. Secondary dunes are in general those that occur landward of the primary dune. The likelihood of your having extensive knowledge of secondary dunes however, is quite low given that until recently the secondary dunes found around the Chesapeake Bay had never been inventoried and studies were almost nonexistent.

Dune systems (primary and secondary together) are important in protecting against tidal flooding due to storm surge, in serving as a sand reservoir and replenishing beaches. They also provide unique habitat among the various coastal biotic communities found around the Bay. The dynamic combination of drifting sand and highly adapted vegetation not only makes the foregoing functions possible but also gives

dunes the attributes that make them an invaluable contributor to the aesthetic and recreational attractiveness that is coastal Virginia. Given these valuable natural functions, the Commonwealth implemented in 1980 legal protection for primary dunes. Secondary dunes however, have not been considered on a statewide basis until recently.

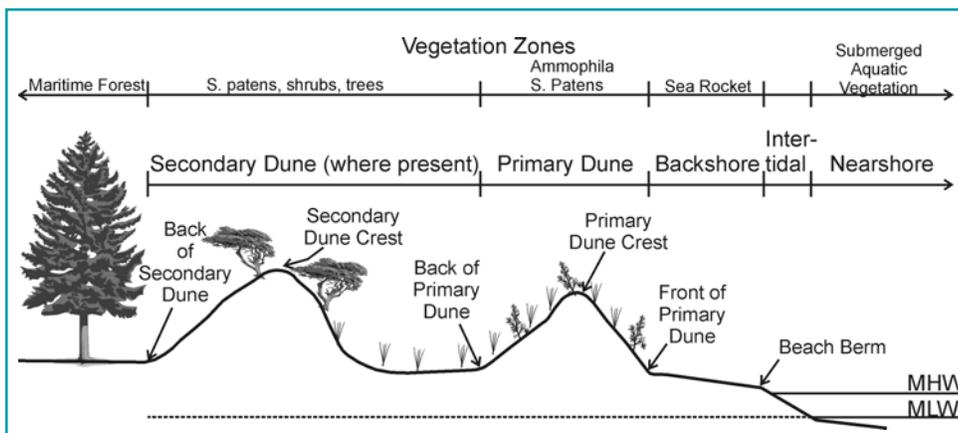
Two researchers, Lyle Varnell and Scott Hardaway, at the Virginia Institute of Marine Science, have recently released their report entitled, *An Analysis of Shoreline Development risk for Secondary Dune Systems in Tidewater Virginia with Associated Management Recommendations*. This study was conducted in response to concerns by environmental resource managers related to the potential adverse impacts to Virginia’s remaining secondary dune ecosystems. Virginia’s environmental regulatory programs have little decision-making authority over the use of secondary dunes as these areas are not included in the Coastal Primary Sand

Dune Act (the Dunes Act). The research effort was funded by the Coastal Resources Management Program of the Virginia Department of Environmental Quality through a grant of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended.

Secondary dunes have been identified, characterized, and classified through a related project (Hardaway et al. 2001a). The lack of a legal or science-based definition for estuarine secondary dunes made them somewhat of a moving target for the scientists; however, working definitions and delineation criteria were developed through the previous project and formed the basis of their analyses.

The criteria for determining the need for protection of individual secondary dune areas were based on the investigators’ analyses of the area’s character, location, potential for development (based in part on accessibility and local development), uniqueness, size, probable habitat value, probable sustainability (based on local sand resources and erosion rates), landscape setting, and degree of current impact.

The study disclosed that there are 99,423 linear feet (18.83 miles) of shoreline containing secondary dunes. This constitutes approximately 47.9% of the total dune shoreline length in Virginia’s Chesapeake Bay. These dunes are found within the counties of



Typical Chesapeake Bay Dune Profile

Mathews, Lancaster, Northumberland, Northampton and Accomack and the cities of Norfolk, Hampton and Virginia Beach. Total estimated secondary dune acreage from the study was 310.

The study reported that historical coastal plain demographics (1980-1999) support the projected growth trends (U.S. Dept. of Commerce 2002). Populations in dune-containing localities generally has increased significantly during the time series. Building permits issued in Virginia coastal localities increased from 19,682 in 1990 to 25,214 in 1999 (an increase of 22%), although the number of building permits per year has generally declined. In general, the

The Virginia Wetlands Report is a quarterly publication of the Wetlands Program at the Virginia Institute of Marine Science of the College of William and Mary. Subscriptions are available without charge upon written request to: Wetlands Program, Virginia Institute of Marine Science, P.O. Box 1346, Gloucester Pt, VA 23062 USA. Address corrections requested.

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This report was funded, in part, by the Virginia Institute of Marine Science and by the Virginia Coastal Resources Management Program of the Department of Environmental Quality through Grant #NA97OZ0181-01 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resources Management, under the Coastal Zone Management Act, as amended.



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higher the income, the more money is put into the local economy and the greater the economic vitality of the region. Per capita income is seen as the proxy for the overall economic health of a region or community, which can indicate the underlying potential for growth.

The researchers reported that population growth in Northampton County, for example, may exceed projections due to recent improvements to the Chesapeake Bay Bridge-Tunnel and significant new toll reductions. Northampton County contains the largest dune resource in the lower Chesapeake Bay. The study further details the information documenting the potential risk to Virginia's secondary dunes due to population growth and calls the risk significant.

The investigators found that approximately 55.1% of secondary dune shoreline length is privately owned (54,789 feet). The remainder is owned by the Commonwealth of Virginia (21.9%), federal entities (9.1%), local government (9.5%), and non-governmental organizations (NGO's) (4.4%). Additionally, 28.9% (28,893 linear feet) of the secondary dune shoreline length is zoned for residential development; 24.3% (24,274 linear feet) is zoned agriculture/forestry; 10.5% (10,480) is zoned conservation; and 36.3% (36,356 linear feet) is zoned for other categories.

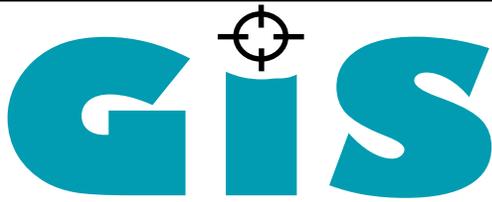
At least 33,342 linear feet of secondary dune shoreline (33.3% of total secondary dune shoreline) has been developed (dwellings/structures are located on the lot(s)), with varying degrees of adverse impact. Structures contribute to the overall economic value of the land, and the total assessed secondary dune land value (including structure values) is at least \$61,868,737.

Approximately 49.5% of secondary dune acreage and 36.8% of the total dune shoreline length are classified as "protected" due to government or NGO ownership. An additional 20.0% of the acreage and 16.9% of the dune shoreline length are classified as "protected" due to low potential risk from development). These areas are generally remote and/or inaccessible by road. A minor percentage (1.0% of the acreage and 1.8% of the dune shoreline length) is contained in relatively small units and/or units with associated use resulting in questionable value from an ecological and management perspective.

The study did not recommend protection strategies for areas where impacts to the secondary dunes (and frequently the primary dune) were already significant and therefore, areas meeting this criterion were excluded from consideration. The study noted that the amount of secondary dunes impacted from development to the point that function is significantly impaired



Cape Charles-- Extensive primary and secondary dune feature.



Geographic Information System

GIS Assists in Dune Management Project

Marcia R. Berman

Historic changes in shoreline position can be determined by mapping relative shoreline position from historic aerial photographs, and performing time series comparisons. This was accomplished by applying photo interpretation techniques to vertical photographs captured for selected regions in the Chesapeake Bay with active dune fields. Working with historic photographs is a challenge as each one must be geo-referenced and ortho-rectified to be converted to digital images. Known ground control is used to rectify photographs that have been digitally scanned.

Photo interpretation combines GIS and best professional judgement re-

garding the location of the land-water interface. This is a relative position which is not corrected for a tidal datum. Nevertheless, positions calculated from different imagery captured over different years can be compared using GIS to determine relative changes in shoreline position.

Recession and accretion rates of shoreline lend important information to the potential dynamics of dune systems over time. Important management questions are now being evaluated. Preliminary steps are underway to quantify the dynamics of natural shorelines versus anthropogenically altered shorelines. We need to know how

shoreline management decisions, particularly those regarding shoreline stabilization might be affecting the health and fate of natural dunes. Do artificially stabilized shorelines reduce sand supply available to dunes? Are well established dune systems more frequently associated with natural shorelines? Does shoreline mobility affect stability of natural dune systems? Conclusions drawn from this body of research will lend important information to answer these questions, thus supporting dune management decisions in the Commonwealth. Studies have begun in the counties of Northumberland and Northampton.

was 15.2% of the total acreage and 31.8% of dune shoreline length in Chesapeake Bay. Due to the degree of development at most of the significantly impaired sites, it is probable that little additional development will occur. Coupled with the relatively minor additional adverse environmental impacts that would result from further development, the need for environmental review was deemed minor by the researchers.

The study concludes that when the areas of secondary dune that are not threatened due to protection afforded by existing ownership, severely limited access or other factors are subtracted from the total dune inventory, the secondary dune systems in need of additional management protection amount to approximately 14.3% of the total acreage (44.4 acres) of secondary dunes or 12.7% of the dune shoreline (2.4 miles). These sites are Mosquito Point in Lancaster County, Bluff Point in Northumberland County, and sites in Northampton County consisting of

Savage Neck, Cape Charles and Pond Drain. These are areas of generally high ecological value (expansive systems with high plant community diversity) that are considered vulnerable to development and/or alteration based on ownership, zoning, landscape situation, and ease of access.

Mosquito Point is located near the mouth of the Rappahannock River in Lancaster County. This 3.4 acre dune feature covers approximately 850 linear feet of shoreline. Mosquito Point is classified as a natural and relatively stable salient dune field with a broad beach (greater than 60 feet from primary dune crest to mean low water (MLW)) and a variable width nearshore gradient. The primary dune crest elevation ranges from 3.7 feet to 5.3 feet above MLW.

Bluff Point dune field is the result of the migration of a barrier spit that became trapped between eroding headlands. The dunes support a diverse herb community that includes sea rocket (*Cakile edentula*), saltmeadow

hay (*Spartina patens*), running dune grass (*Panicum amarum*), switchgrass (*Panicum virgatum*), common reed (*Phragmites australis*), Russian thistle (*Salsola kali*), and others. This dune system is part of a mixture of diverse estuarine edge habitats. The surrounding land use is forest with some adjacent agriculture. Nontidal wetlands exist between the back of the secondary dune field and the forested upland.

Savage Neck is a northwest/west facing natural open-Bay, linear dune field covering 2,680 linear feet of shoreline in Northampton County. Secondary dune acreage is relatively small, about 2.46 acres. The Commonwealth of Virginia owns a small portion of this dune field, with the remainder held privately. The area is zoned for agriculture. Due to the projected growth of Northampton County and the market potential of beachfront property, the fate of this area is uncertain.

The Cape Charles dune field is located south of the Town of Cape

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Varied & Versatile Wetlands

Beach Plum: *Prunus maritima*

Pam Mason

The beach plum is a shrub native to the mid-Atlantic coast. While more common from Maine to New Jersey, a naturally occurring plant has been recently documented in Virginia. Beach plums grow in the swales between dunes and in maritime forests with open canopies. Beach plum is often found



growing with other woody species including bay berry, shad bush, salt bushes and poison ivy (Silberhorn 1982).

Beach plum shrubs are 3 to 7 feet tall. Flowers are white and occur in May later than most other stone fruit. The plums ripen in late summer and at one half to one inch diameter are smaller than commercially produced Asian or European plum varieties. Ripe plums vary in color from the occasional golden yellow to dark red to purple. The perfectly ripe plums are sweet enough to be eaten fresh, but the primary use of the tart fruits is in preserves.

Beach plums have historically been, and continue to be, harvested from the wild. During a peak in popularity in the 1940s and 50s, efforts to domesticate and produce beach plums commercially failed. Despite the fact that the plants

survive a notably nutrient poor, and climatologically harsh climate, there has been little success in cultivation and the guarantee of a steady crop. The production of fruit is highly susceptible to the effects of weather on pollination. Several factors have come together to spur renewed interest in beach plum

cultivation; beach plum products are in high demand, cranberry growers are looking for alternative crops and research in sustainable agriculture is increasing (Karp 2003). Aside from any direct interest in growing beach plums for harvest, the “thorny” structure of the shrubs and ability to withstand salt spray make beach plums a good choice for erosion control and

hedge plantings. And they are an obvious choice for wildlife, being popular with birds and small mammals.

As to be expected, it takes a great many fruits to make beach plum preserves. Purists insist that jelly made without the addition of pectin has the best taste. The amount of pectin in the fruit lessens as it ripens, so making jelly without additional pectin means using green plums as well as ripe fruit.



Beach Plum Jelly

1 cup green Beach Plums
4 cups red Beach Plums
sugar

Wash plums, remove stems, and put fruit in an enamel pot. Cover with water, bring to a boil, drain, and discard water. Return plums to the pot, add enough BOILING water to barely cover, and cook until the fruit is soft, mashing them once or twice with a wooden spoon. Turn the fruit and juice into a jelly bag made of several thicknesses of cheesecloth, suspended over a large bowl. Allow it to drain until no more juice drips though (overnight). DO NOT SQUEEZE bag or jelly will be clouded. For each cup of juice add 1 cup of sugar. Boil on medium high heat until the juice “sheets” that is, it will not run from a spoon but will drip in two drops that run together and fall from the spoon in a sheet. Stop cooking immediately. Skim jelly. Pour into sterile jelly jars. Seal with two layers of melted paraffin and the lids. Store in a cool dark place.

(The Wildflower Inn, Falmouth, Massachusetts)

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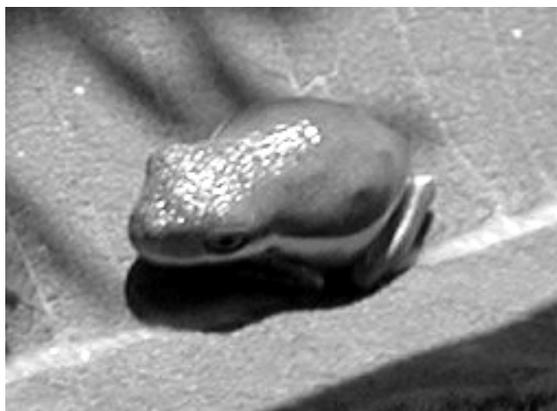
Wetland Denizens

Green Tree Frog

By Walter I. Priest, III

You may have seen them clinging to a cattail leaf in a marsh or crawling among the vegetation along the edge of a pond, their green and white bodies making them all but invisible. You may have also seen them hanging around your porch light on warm humid evenings seeking insects attracted to the light. They are the same animal, the green tree frog, *Hyla cinerea*. This diminutive amphibian has made a niche for itself almost anywhere it can stay moist and find a convenient meal.

The green tree frog belongs to the family Hylidae which is characterized by a reduced amount of webbing between the toes and suction discs on the end of their fingers and toes. Green tree frogs vary in color from bright green to a greenish gray usually with a prominent white stripe along its sides although this can be reduced or absent in some populations. Their backs are marked with very small yellow dots, and their bellies are white. Their skin is smooth and glandular. They range in size from 1.25 to 2.5 inches with the females being larger than the males.



Green tree frogs are primarily a coastal plain species, which ranges from the Chesapeake Bay region, the



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Carolinas, Florida, the lower Mississippi Valley and eastern Texas. It is typically a freshwater species but does tolerate brackish conditions. They are most commonly found amongst herbaceous wetland vegetation in marshes, along streams and pond and lake margins. It is one of the few amphibians whose moist skin can withstand the drying out caused by brackish conditions. More reptiles with scales to protect their skin have been able to adapt to marine and estuarine conditions than amphibians.

Breeding usually occurs during May, June and July in a variety of open water habitats such as temporary and permanent bodies of water including marshes, swamps, ditches, lakes, springs and rivers. The males call to attract females to these habitats. The call is variously described as a ringing *queenk*, *queenk*,

queenk sound that is repeated 60-75 times per minute. The eggs are fertilized as they are laid amongst vegetation in the water. Egg masses can contain as many as 400 eggs. The eggs hatch into tadpoles within a few days. The tadpoles feed on algae and transform into froglets after about two months. They over-winter in a dormant state in leaf litter, the bark of logs or below ground.

Tree frogs feed on insects, spiders and other small invertebrates. They, in turn, provide food for a wide range of invertebrates and vertebrates. Eggs are eaten by a number of invertebrates, tadpoles are preyed on by predaceous insects and fishes, and the adults provide food for fishes, snakes, snapping turtles, birds and mammals.

The green tree frog is a prime example of a wetland-dependent species that contributes to the diversity of wetlands while providing an important link in the wetland food chain that helps support an array of other wildlife that depend on wetlands for habitat.

Calendar of Upcoming Events

Nov. 20-23, 2003	National Symposium: Wetlands 2003. Landscape Scale Wetlands Assessment and Management. Nashua, New Hampshire. Sponsored by the National Association of State Wetlands Managers. http://www.aswm.org
May 15-19, 2004	Spring Specialty Conference. GIS and Water Resources III. Nashville, TN. Contact: http://www.awra.org
June 28-30, 2004	Riparian Ecosystems and Buffers: Multi-scale Structure, Function and Management. Olympic Valley, CA. Contact: http://www.awra.org/meetings/olympic2004/summer2004.doc

Secondary Dunes continued from page 3

Charles in Northampton County. This 7.7 acre natural open-Bay, linear dune field covers approximately 3,486 linear feet of shoreline below Cape Charles harbor. The Cape Charles dune field is characterized by high-elevation primary dune crests (ranging from 9.3 feet to 11.8 feet above MLW) fronted by a broad beach (greater than 120 feet from primary dune crest to MLW) and a broad shallow nearshore gradient. There are significant SAV resources immediately offshore of the beach.

The two tracts that include the secondary dunes are zoned municipal and thus are likely targeted for future development. The area landward of these parcels is a retirement/resort community and golf course complex. The fate of this area is highly uncertain due to zoning and adjacent land use.

Pond Drain is a natural open-Bay, linear dune field in Northampton

County. This is the largest dune complex in the lower Chesapeake Bay and extends over 4,900 linear feet of shoreline and contains approximately 27.8 acres of secondary dune. This area is characterized by broad beaches (approximately 100 feet from the primary dune crest to MLW) and high primary dunes (10.3 feet to 14.5 feet above MLW). There are local beds of SAV to the north.

The Commonwealth of Virginia owns a portion of the Pond Drain dune field. The remainder is privately owned and zoned for agriculture. Due to the projected growth of Northampton County and the market potential of beachfront property the fate of this area is uncertain.

Policy Recommendations

Virginia's Coastal Policy Team has previously recommended modifications to the Coastal Primary Dune Protection Act that would extend its coverage to additional localities that have primary

dunes but are not enabled by the present Act to manage them. Refinements to the plant list in the Act have also been recommended. These changes await legislative action.

According to the authors, the manage-

ment options currently available for secondary dunes include no action, modification of the Chesapeake Bay Preservation Act (Bay Act), modifying the present Dunes Act, establishing conservation easements, procuring development rights, land acquisition, or combinations of these.

The no action option is not recommended if greater oversight of secondary dune use is warranted. Modification of the Bay Act would place approximately 50% of the secondary dunes under regulatory review and thus would have limited effectiveness. Modification of the present Dunes Act was termed impractical by the researchers, given that such an option would face significant political and financial hurdles that might render it unworkable.

The report concludes that the use of conservation easements and/or fee simple purchase would require less financial commitment, be more effective and be implemented more rapidly than the development of new regulatory programs or the other options considered.

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Pond Drain-- The largest single secondary dune feature on the Chesapeake Bay.