The Virginia Wetlands Report

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Wetlands Program

Wetlands and Regional Watershed Management

A Call for a Holistic Management Strategy for Virginia's Watersheds

Katharine Hopkins

"Conservation is getting nowhere because it is incompatible with our Abrahamic concept of land. We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may be able to use it with love and respect."—Aldo Leopold, 4 March, 1948

The late 1960's ushered in a new era of environmental protection. The publication of Rachel Carson's *Silent Spring*, and the influence of environmentalists such as Aldo Leopold, awakened the United States public to the on-going degradation of the environment. The environmental movement gave rise to an environmental ethic and produced calls for better governmental stewardship. In the 1960's and 1970's, government began a more active role in the conservation of our environment. A new precedent was established with the National Environmental Policy Act (NEPA)of 1969: *"The purposes of this act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the nation; and to establish the Council on Environmental Quality"*

In addition to NEPA, Congress passed the first version of Clean Water Act (CWA) in 1972 (33 U.S.C.A. §§1251 - 1376). The act was designed to reduce point source pollution in waters under federal jurisdiction. Section 404 of the CWA expanded federal authority to cover all activities which affect the nations waters, including all dredge and fill activities in the nation's wetlands.

The General Assembly of Virginia, also awakened to the ecological and economic value of the state's natural resources, passed the Virginia Coastal Wetlands Act in 1972. The Wetlands Act was based on the premise that coastal wetlands constitute "...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" (Virginia Wetlands Act 1973). Concerns regarding the rapid rate of wetland loss, particularly in the coastal urban areas, helped to pass the Wetlands Act. In fact, the act was passed subsequent to the publication of a report by the Virginia Institute of Marine Science which found that wetlands were vital to the ecosystem and that they were being lost at an alarming rate (Wass & Wright, 1969). The Virginia Coastal Wetlands Act of 1972 reflected these findings in its general statement of policy that the purpose of the act is *"to preserve the wetlands and to prevent their despoliation and destruction and to accommodate necessary economic development in a manner consistent with wetlands preservation."*

Unfortunately, despite the good intentions of the Wetlands Act and §404 of the Clean Water Act, the mid 1950's to the late 1970's saw 11,500 acres of coastal and 54,600 acres of inland wetlands lost in the Chesapeake Bay watershed. Annual Chesapeake Bay region losses averaged 2,800 acres and national losses averaged 300,000 acres per year (Tiner, 1984,1987 and 1994). The implementation of §404 of the CWA and the Virginia Wetlands Act has significantly reduced the rate of loss of wetlands; however, wetlands continue to be developed.

If we persist in allowing wetland impacts and we have a policy of "no net loss," then we should try to minimize all impacts and compensate for all unavoidable losses (Hopkins, 1995). There is a need, therefore, for a regional watershed management strategy. The 1987 Chesapeake Bay Agreement, which established a Chesapeake Bay Wetlands Policy, is one example. The policy's goal is: "*...to achieve a net resource gain in wetland acreage and function over present conditions by: (1) protecting existing wetlands; and (2) rehabilitating degraded wetlands, restoring former wetlands, and creating artificial wetlands"* (Chesapeake Bay Executive Council, 1988). This same policy goal was endorsed by the Clinton Administration in 1993 through the White House Office on Environmental Policy.

The repairing and restoring of Virginia's wetlands is extremely important and should be given the same priority as water quality restoration, particularly since the two are so thoroughly intertwined. An ad hoc, case by case approach to wetland restoration may not adequately meet the goals of watershed and water quality restoration efforts. Current methods of wetland mitigation and restoration have been left to casual secondary mechanisms. Frequently, wetland mitigation projects are poorly organized and isolated, done in exchange for development permits, and are not based on any regional plan or long term goals. Given that urban wetlands are not random, single, isolated units, but rather cells in the body of the ecosystem, a holistic approach must be taken to repair and restore the urban wetlands and their associated watersheds.

Current mitigation efforts are usually decided in response to individual permit applications on the basis of the "No Net Loss" concept. Mitigative efforts are usually based on a one-to-one acreage ratio, and are frequently not in the same waterfront area, sometimes not even in the same watershed. These efforts may not be the best approach. Rather, wetland mitigation and compensation should be based on policies to achieve positive net cumulative gains, or a "Net Gain" concept. Such a policy would address the wetlands as part of an ecosystem, not a single entity but part of a whole. The policy would recognize that the valued functions of wetlands, water recharge, and purification/filtration, must by definition, interact with the watershed; therefore, mitigative and restorative efforts should be aimed at watershed/ ecosystem improvement.

To develop a "Net Gain" policy, Virginia should consider a regional watershed management strategy. That strategy would begin with general goals that consider the policies of the relevant agencies as well as both public and private interests. Secondly, the strategy should identify its objectives, and give guidelines to meet those objectives, and lastly the strategy should address some criteria for evaluating the effectiveness of the strategy (Clark, 1990).

The Elizabeth River project, an independent, non-profit organization designed to utilize community involvement in restoring the Elizabeth River, provides a fine example of a local regional strategy. The project mission is:

"To form a partnership *among the communities and all who earn their living from the river, to* raise appreciation *of its economic, ecological and recreational importance, and to* restore the Elizabeth River *to the highest practical level of environmental quality"* (Elizabeth River Project Mission Statement, 1993).

The project received a grant in 1993 from the EPA to begin a two year "comparative risk" assessment of the river. A "comparative risk" study is the EPA's tool for making policy decisions based on both science and public values. The comparative risk structure developed by the EPA "allowed many competing interests—business, military, civic, residential, recreational, regulatory, and research—to examine data together; to hear each other, and in the doing, to find that common voice without which a community does not move forward into lasting change (Elizabeth River Project, 1995)." The premise behind this process could serve as a format for the development of regional strategies for Virginia's watersheds.

The Elizabeth River Project is significant not just because of its findings and decisions thus far, but also because of its process. The project is headed by three Comparative Risk Committees: citizens/ industry, government/agencies, and science/ technical. The project's committees agreed on four areas of concern posing high risk to human health, the ecosystem, and quality of life in the watershed: sediment contamination, loss of habitat and aquatic life, non-point source pollution, and point source pollution. The project's action teams then identified eighteen critical areas deserving the most resources and attention at this time. The committees' and action teams' assessments and ranking have formed the basis for the next step in the regional management plan, developing strategies for addressing high risk problems and critical areas, again considering the range of river interests (Elizabeth River Project, 1996).

The development of goals and mitigation targets of regional strategy plans can be greatly assisted by the development of a Geographic Information Systems (GIS) database containing the historical and present geographical, ecological, and developmental conditions of the watersheds. A study of

Continued on page 3

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GIS Geographic Information System

Geographic Information Systems Support Tributary Strategy Planning in Virginia

Marcia R. Berman

Environmental agencies and interests groups within Virginia are now banding together to develop a nutrient reduction plan for each of the major tributaries to the Chesapeake Bay. Under leadership appointed by the Secretary of Natural Resources, a team will guide the development of a tributary strategy plan for each major watershed: Rappahannock, York, and James River watersheds. A draft plan for the Potomac has already been submitted. The teams will be assisted by technical advisors, local grassroots organizations, and local governments, among others. While the process is still evolving one thing is certain; geographic information systems (GIS) will play an important role.

Those who follow this section regularly are well aware of the capabilities of GIS for efficiently collecting and managing large amounts of spatial data. As a problem solver, GIS has some very advanced analytical capabilities as well. Regarding tributary strategy planning, this process will ultimately use water quality models which have been developed by the Chesapeake Bay Program to identify nutrient reduction goals for each tributary. The data which will support these models can be stored, manipulated, and retrieved through a GIS.

Presently the Comprehensive Coastal Inventory Program (CCI) at VIMS is using GIS to provide technical support to several principal players in the tributary strategy process. The ongoing work in the York River Watershed will provide a strong database of geographic information which are all important components of effective planning. These coverages include but are not limited to: land use and land cover, water quality, critical habitat, non-point source pollution ratings, monitoring stations, and the distribution of environmentally sensitive resources like tidal and non-tidal wetlands. Additions to this database proposed for the coming months include the identification of sites for implementation of nutrient management, farm management, and best management plans. The work is supported in part by the Natural Resource Conservation Service and the VA Association of Soil and Water Conservation Districts. Similar initiatives have recently started for the James River and the smaller Piankatank River watershed.

While CCI does not necessarily create these data independently, their role is to collect and disseminate data from various state and federal agencies; building an archive designed specifically to enhance the tributary strategy process. In the end, the database has multiple uses. Some data layers can be used directly to caliper the water quality models. Other data layers are used to map current and future conditions within the watershed which pertain to land usage and proposed development. Still other data are being collated to provide educational tools to inform local governments and citizens about the benefits and needs for effective watershed planning.

The concept of tributary strategies for Virginia's waterways is a relatively new one. Citizens of the Bay can expect to hear more about it in the near future, and are encouraged to become an active participant. By the year 1999 strategies will be in place. The need for effective watershed planning will continue however into the 21st century and beyond.

Wetlands and Regional Watershed Management
continued from page 2

historical and present conditions of the Elizabeth River watershed has shown a 48% loss of wetlands since 1944, and has identified the sites of these losses (Priest and Hopkins, 1996). This information will be used in the first stages of targeting habitat restoration sites.

Understanding and targeting areas of historical losses could be used to direct preservation and restoration projects to the most ecologically valuable wetland areas. Areas of less ecological significance could also be detected. Using a broad GIS database could increase the flexibility of the regulatory permit program by allowing areas of less ecological significance to be developed while directing restorative efforts to the more valuable areas. This could prevent further losses of wetlands in highly developed areas that have already suffered significant wetland losses and could direct development to areas of less ecological significance where the societal benefits of development may outweigh the ecological costs.

A regional strategy should be designed to address the negative cumulative impacts to the watershed system. It should attempt to offset those impacts

Continued on page 6

Feathers & Fins

Great Blue Heron

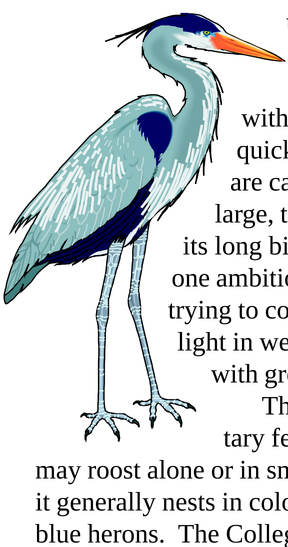
(Ardea herodias)

Julie Bradshaw

If a universal symbol for wetlands exists, it is probably the great blue heron. At 4 feet tall, the great blue heron is the largest heron occurring in the United States, and it is often the only animal visible to casual observers of the marsh. The great blue heron can be found throughout the U.S. and in a variety of habitats, including salt marshes, freshwater ponds, inland rivers, and even in agricultural fields.

The predominantly bluish-gray colored great blue heron is distinguishable from other dark herons found in the U.S. by its larger size. The reddish egret, found in Florida and along the Gulf Coast, is approximately 2.5 feet tall. Night-herons, little blue herons, and tricolored (Louisiana) herons are approximately 2 feet tall. The only other large heron found in our area is the great egret, a white bird approximately 3 feet tall. There is an all-white subspecies or color morph of the great blue heron called the great white heron, found in southern Florida.

The great blue heron's primary food source is fish, but it also preys on crayfish, crabs, frogs, salamanders, insects, and small mammals. Its feeding strategy is typically to stand very still in shallow water, with neck folded in an S-shape, and wait for prey to come within striking distance. It strikes by quickly thrusting its head forward. Fish are caught and swallowed whole, or if large, the bird may catch by spearing with its long bill. Terres (1980) relays a report of one ambitious "great blue" which died while trying to consume a 2 foot long shad. Although light in weight (5-8 pounds), the bird can strike with great force.



The great blue heron is usually a solitary feeder. During most of the year, it may roost alone or in small groups. During breeding season, it generally nests in colonies of a few to hundreds of great blue herons. The College of William and Mary's Center for Conservation Biology (1995) has documented the locations of 164 breeding colonies in Virginia containing over 9,000 pairs of great blue herons. Breeding colonies in our area are located in forests and swamps isolated from human disturbance. Nests of twigs are built in the tree canopy with the birds adding new material to the nest each year . Unless the birds are harassed or colonies are disturbed, the breeding

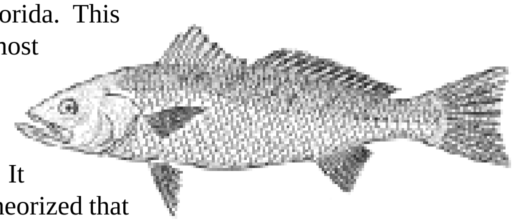
Continued on page 5

Weakfish

(Cynoscion regalis)

Lyle Varnell

The weakfish, also known by the common names gray trout and squeteague, is historically one of the most important commercial and recreational finfish in the Chesapeake Bay. It also plays an important role in the ecology of the Bay. The Chesapeake Bay is near the geographic center of the weakfish's range. Although documented as far north as Nova Scotia, sizeable populations occur from Massachusetts to northern Florida. This species is most abundant from North Carolina to New York. It was once theorized that three genetically separate stocks with overlapping ranges inhabited the western Atlantic Ocean. Recent DNA analysis has proven, however, that only one stock exists. The weakfish is a member of the drum family, Sciaenidae. Other members of this family include spot, croaker, spotted seatrout, red drum and black drum.



Distinguishing morphological features of the weakfish include a continuous lateral line which extends to the tip of the rounded caudal fin, and a protruding lower jaw with no barbels. The weakfish most closely resembles the spotted seatrout, but is dark olive to bluish above with many small dark spots which are not well defined. The common name "weakfish" is derived from the ease of which fishing hooks tear away from the mouth; a result of the thin, weak skin layer which make up the jaws.

Weakfish enter the Chesapeake Bay in the spring (generally during April) after migrating from their overwintering grounds off of Cape Hatteras, North Carolina. Spawning occurs near the Bay mouth; in the lower Bay and nearshore oceanic waters. Spawning occurs from approximately May to September; however, most spawning is complete before July. Fecundity is estimated to be from about 350,000 to 2.3 million eggs per female. Eggs are round, small (1 mm diameter), transparent and buoyant. After hatching, larvae and juveniles are carried by deepwater currents upstream to brackish water nursery areas. Development generally occurs below 30 parts per thousand salinity and between 53^{o}-75^{o}F. Young-of-year weakfish are euryhaline, moving from high to low salinity waters throughout the summer. They are most abundant in deeper water from August through December.

Continued on page 7

Wondering about Wetlands

William Roberts

Q What is a groin and how does it work?

A A groin is a linear structure constructed at a right angle to the shoreline which extends channelward from the upland, across the intertidal zone, into the subaqueous or subtidal zone. Groins can be constructed of numerous materials but are generally of pressure treated lumber or granite rock, commonly referred to as riprap.

A jetty is also a linear structure extending channelward from the shore and is often confused with the "groin." A jetty, however, is designed to protect an existing channel from shoaling and therefore is always constructed adjacent and parallel to the channel it is helping to stabilize. The elevation of a jetty is generally above the level of mean high water throughout its length.

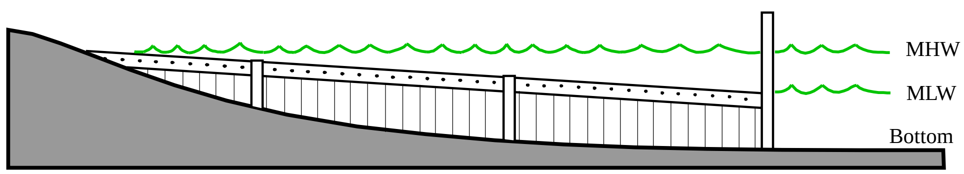
Groins are employed to interrupt alongshore sand movement for the purpose of accumulating a sand beach or retarding the loss of sand from the shore. By design, groins will function properly only if there is sand moving in the nearshore littoral system. In the process of capturing and accreting alongshore sand on the updrift side of the groin, adjacent downdrift areas, which depend upon alongshore sand transport to maintain their supply of sand, may be robbed of sufficient sand so as to adversely impact the area. Generally as the distance from the nearest groin to the area of potential impact increases the influence of the groin diminishes.

Spurs are shoreline parallel features which have been used effectively to minimize down drift erosion associated with groins by redirecting the incoming waves and promoting the accumulation of sand to help prevent flanking. Spurs are installed parallel to the shoreline near the low water level, on the downdrift side of the groin.

When designing a groin, whether of treated lumber or riprap, the groin should be of a low profile design where the top elevation of the channelward end is approximately equal to the level of mean low water. This design will allow sand moving in the nearshore littoral system to continue moving toward downdrift shorelines once the area between the groins is filled with sand.

Often a series of groins can function to: 1) retain sand along a shoreline reach that has been nourished by the addition of clean fill sand or 2) minimize the transport of sand away from an eroding beach allowing a more stable angle of repose to form, thereby reducing the rate of localized erosion. It is, in fact, the beach that offers the protection to adjacent upland banks not the groins themselves.

Because groins can have an adverse impact on adjacent downdrift shorelines, their use as erosion control devices is usually acceptable along shorelines with previously existing groins or those where sufficient sand is moving in the nearshore zone for the structures to be effective.



***Low Profile Groin** — Height of channelward end approximately equal to that of mean low water.*

Great Blue Heron
continued from page 4

colonies may be reused for many years. Butler (1992) reports that a breeding colony in British Columbia has been in use for 71 years.

Males and females share nest-building, incubation, brooding, and feeding duties. Great blue heron eggs are incubated for approximately 4 weeks, and the young birds leave the nest 2-3 months after hatching. After fledging, the herons disperse and migrate. However, great blue herons may be seen throughout the year in Virginia.

Potential threats to great blue heron populations include availability of nesting habitat and loss of feeding grounds. Butler (1992) postulates that the species has suffered more from wetland loss than from other adverse impacts such as eggshell thinning or hunting. He suggests that the most im-

Continued on page 8

Regional Watershed / Wetland Management
continued from page 3

and begin a trend of positive cumulative impacts for the regional system. The strategy planners should "determine a baseline condition, or threshold level, for attainment by examining historical trends of resource losses for the ecosystem. Future restorative mitigation would have an overall target to return the system, via positive cumulative impacts, to an earlier designated level of productivity (e.g., for the Chesapeake Bay, return to the status of the year 1950 seems to be favored) (Clark, 1990)."

Currently, the Commonwealth of Virginia has no regional plan, goal, or set of guidelines for wetlands mitigation or restoration. If restoration of urban wetland systems is to be successful, there needs to be an explicit method for regional consensus on mitigation priorities. A formal set of goals and guidelines would provide developers and consultants in advance with the information needed to plan mitigation and restoration as part of their projects. This could streamline the permit approval process significantly. It could potentially do away with months or years of negotiations between developers and regulators, as developers would know in advance what sort of compensation was expected of them, and what the cost of that compensation would be.

In addition, a regional strategy would shift mitigative and restorative processes from a reactive to a strategic approach. In other words, rather than having a proposed project be approved and subsequently require some form of mitigation as compensation, mitigative and restorative goals would already be set, and any project proposed that may diminish the function of the ecosystem must compensate by enhancing the preset ecological goals.

The goals of the strategy should change restorative and mitigative efforts from a case by case basis to an ecosystem or watershed basis. Given that wetlands are not isolated systems but part of a whole, and that the valued functions of a wetland involve the whole system, a regional plan should focus on the whole system.

The regional plan needs to identify areas of concern, and decide an "optimum balance" between different aspects of the ecosystem, such as high wetlands, low wetlands, intertidal areas, and waterways. The identification of the areas of concern and goals regarding an optimum balance should be used when deciding which or what restorative projects should be recommended. The strategy planners must decide regional priorities based on which areas provide the most environmental and socioeconomic benefits. Environmental professionals can then convert these priorities into functional criteria, which developers and engineers can use in designing development and construction (Clark, 1990).

There are currently several state and federal agencies and organizations which could be responsible for designing regional priority strategies. Virginia could use the power vested to it by the Coastal Zone Management Act to do regional Special Area Management Plans (SAMP's). "SAMP's can effectively establish regional strategies for aquatic habitat restoration, including restoration criteria, identification of mitigation sites, preparation of guidelines, and mechanisms for incorporating mitigation into a restoration master plan (Clark, 1990)."

Development and implementation of programs utilizing the preceding recommendations is clearly not an easy task. However, the Commonwealth of Virginia does have previously established federal and state legislative authority for the development of regional watershed management strategies, as well as an excellent model in the Elizabeth River Project. The project has successfully reemphasized the importance of restoring our resources and using the watershed approach. Virginia should consider developing regional watershed management strategies, based on historical and present conditions of the watersheds, considering both the economic and ecological goals and needs of the affected communities.

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Katharine Hopkins in currently conducting graduate studies within the Public Policy Program and the School of Marine Science of the College of William and Mary.

Cranberries

Pam Mason

Cranberries are a natural wetland product, historically collected in the wild, and now cultivated commercially. While it is still possible to collect cranberries in the wild, most are grown commercially. Two species of cranberries are commonly cultivated; the American cranberry, *Vaccinium macrocarpon* and the Dwarf cranberry, *Vaccinium oxycoccos*.

The cranberry is in the Heath (*Ericaceae*) family, along with commonly known ornamental shrubs such as azaleas and rhododendrons. Cranberries grow on prostrate, evergreen vines. Cranberries are native to North America, ranging throughout most of Canada and the northeastern United States but only as far south as the mountains of North Carolina. *V. macrocarpon* is rare in Virginia, occurring in only 6 Virginia localities, according to the Atlas of Virginia Flora (1992). Cranberries prefer wet, acidic environments. The American cranberry and the Dwarf cranberry are both listed as obligate wetland plants (occurs an estimated 99 percent of the time in wetlands) (Reed, 1988).

Cranberry plants can be tender to the cold. However, the plants are naturally protected by standing water in the native wetland habitats in which they occur. Initial efforts to cultivate cranberries involved planting cranberries in natural peat bogs allowing for commercial growers to mimic nature by flooding the cranberry in the winter to protect the plants.

The ability to manage water levels is important not only for winter protection, but also for harvesting. Cranberries may be harvested dry by hand-raking or by using machines which resemble rakes. However, most berries are harvested by flooding the beds. The berries are mechanically beaten from the vines with a brush similar to those in a car wash. The berries float to the surface and prevailing winds blow them to one end of the bed. A conveyor transports the berries to waiting trucks.

Historical accounts claim that Native Americans introduced colonists to the uses of the cranberry. The Native Americans consumed them fresh, cooked, and dried and used the skins of the berries for red dye. The berries keep and travel well, and the colonists shipped them long distances in barrels filled with water. Being high in vitamin C, it was quickly discovered the berries prevented scurvy, adding to their popularity. Commercial production began in the early nineteenth century. Massachusetts, Wisconsin and New Jersey are the major cranberry producing states. Cranberries are also grown in Washington and Oregon, as well as, Quebec, British Columbia and Nova Scotia, where cranberries are known as marsh apples.

Not unlike other agricultural products, the production of cranberries involves the establishment of a monoculture crop in place of a natural, diverse system. Peat bogs and other palustrine wetlands have been converted to cranberry culture. While conversion of wetland areas into cranberry bogs occur less frequently today than historically, on-going cranberry culture has the potential to impact adjacent palustrine wetlands. This may occur through the manipulation of local water supplies, but in the application of sand (a practice to encourage root development) and the use of biocides. Jorgensen and Nauman (1994) suggest careful design of cranberry beds to minimize the impacts of sand and biocides on adjacent wetlands.

Cranberries are a native wetland plant. While cranberry production does impact wetland habitats, it does not involve the conversion of the wetlands to uplands, and careful cultivation can minimize the impacts on adjacent wetlands.

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Weakfish
continued from page 4

Young weakfish grow rapidly. Maturity is reached approximately at the end of their first year of growth. At this time males are generally between 5 and 6 inches standard length. Females are slightly larger. When mature, weakfish undertake fall migrations to overwintering grounds. All migrating members of the species have generally left the estuary by December.

Small fish and crustaceans are the main components of this predator's diet. Although not primarily a bottom feeder, it has been known to eat mollusks and gastropods. Adult weakfish forage close to intertidal wetlands and seagrass meadows. These areas are nurseries for small prey fish. Juveniles and young-of-year also use wetlands and other shallow water estuarine and coastal areas as nursery grounds. Thus, the weakfish provides an important link in the estuarine and coastal ecosystem.

Calendar of Upcoming Events

Oct. 7-8. 1996	Seventh Annual Virginia GIS Conference. Wintergreen, Virginia. Contact: The Thomas Jefferson Planning District Commission at (804) 979-7310, fax: (804) 979-1597, email: tjpdc@avenue.gen.va.us. Also see: http://www.institute/virginia.edu/vapdc/gis.htm
Oct. 31 - Nov. 2	Second Annual Virginia Eastern Shore Natural Resources Symposium "Natural Resources Values and Vulnerabilities" Contact: The eastern Shore Institute (757) 442-5588.
Dec. 1-5, 1996	Third Marine and Estuarine Shallow Water Science and Management Conference. Atlantic City, NJ. Contact: Edward Ambrosio at (215) 597-3697 or email at ambrosio.edward@epamail.epa.gov
Dec. 11-12, 1996	Winter Botany Course (two days). Virginia Institute of Marine Science. Cost: $100. Contact Bill Roberts at (804) 642-7395.

Great Blue Heron
continued from page 5

portant efforts for management for great blue heron populations should include protection of existing breeding colony sites, feeding grounds, and winter habitats.

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"The law locks up both man and woman
That steals the goose from the common
But lets the greater felon loose
That steals the common from the goose."

–Old English quatrain