The Virginia Wetlands Report

Wetlands Program

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No. 93-8

Mid-Atlantic Wetland Compensatory Mitigation Workshop

Tom Barnard

The Mid-Atlantic Wetland Compensatory Mitigation Workshop was held in Annapolis, Maryland June 15, 16 and 17. More than 200 participants representing resource, regulatory, transportation and advisory agencies from federal, state and local governments attended.

The workshop brought together resource managers, scientists and compensatory mitigation experts to examine current and newly developed procedures and techniques for wetland compensatory mitigation. Attendees also had the opportunity to observe the "state-of-the-science" wetland creation and restoration. Attention also focused on identifying the components necessary to form an approvable compensatory mitigation proposal.

Keynote speaker, Dr. Dan Willard of the School of Public and Environmental Affairs of Indiana University, set the tone and direction of the workshop with his review of the Watershed-Ecosystem Approach for natural resources planning and management. In his view of the scientist-policy maker dichotomy, the scientist describes the interconnectedness and effects of one user on another throughout the watershed. Policymakers are faced with the often difficult task of developing policy within watersheds which are multijurisdictional with overlapping boundaries. Watershed bureaucracies are politically diverse and political boundaries do not correspond to natural resource areas. Therefore, costs may fall disproportionately on jurisdictions, without corresponding differentials in benefits. Each jurisdiction may have its own political perspective as well as philosophical approach to planning. Even though the complexity presents problems, Dr. Willard points out that many new administration appointees favor the more holistic approach to environmental decision making. A majority of the workshop participants appeared to favor evaluating compensatory mitigation within the larger landscape and watershed concepts.

The message from virtually all of the scientific community was the need to establish "reference wetlands" with long term monitoring.

Speakers Paul Shaffer of ManTech Environmental Technology, Inc. and Charles Rhodes of EPA reviewed national and regional mitigation trends. They agreed that while compensatory mitigation is not working at present, the "the jury is still out" on its ultimate success as a management tool.

Dr. Mark Brinson of East Carolina University discussed wetlands within a landscape context, pointing out that wetland properties need to be defined within a watershed or basin. He also introduced the concept of "reference wetlands," explaining that they are needed to compare various wetland classes; to serve as "classrooms" for those entering the wetlands compensatory mitigation field; and, to establish benchmarks and goals for wetland restoration and creation efforts.

In a major presentation, Bill Kruczynski of EPA Region IV told the group that at this time *compensatory mitigation is not working*. While there are numerous, diverse reasons for this failure, he cited poor working plans, the need to make decisions within a watershed context and the importance of moving away from the "in kind and in place" policy as major factors. He also emphasized the need to establish "reference wetlands."

Opening day activities concluded with panel discussions between agency personnel and scientists. In general, agency representatives were reluctant to recommend wetland compensation, citing problems such as management inconsistencies, poor track record for wetland creation projects, insufficient staff, and lack of enforcement. Scientists, on the other hand, were generally more optimistic. Reporting on more than 20 years experience in creating tidal wetlands on dredged material, Stephen Broome, of North Carolina State University, said his research demonstrated that the achievement of functional equivalence and the time required varied among parameters measured. Other panelists

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Workshop
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described how the wetland compensation process works and outlined ways in which researchers and the management community can work together to improve overall utility and effectiveness.

The following morning, scientists described current research on the wetland restoration-creation review process. James Brewer, Soil Conservation Service (SCS), described various characteristics of soils suitable for freshwater (nontidal) wetland creation. Dr. Karen Prestegaard of the University of Maryland pointed out that wetland hydrology can be highly variable and complex. She recommended determination of a water budget for potential nontidal compensation sites. In addition, she explained that many parameters are difficult to measure and that reference sites with long term monitoring are necessary. Dr. Norman Melvin of SCS gave an excellent presentation combining the Clementian and Gleasonian views of succession with the relevance to wetland creation summarized as follows:

1. Work with nature using existing land form.
2. Attempt to create a stable environment initially.
3. Don't expect to maintain the wetland community as planted, over time.

Dr. Mary Leck, Rider College, outlined results of her research showing significant variability in seed banks used for wetland creation and described the advantages and disadvantages to their use. Seed bank diversity and content vary seasonally and spacially. So, what you seed may not be what you get!

The afternoon of the second day involved presentations on case studies describing wetland restoration and creation. These presentations outlined many of the steps necessary in the wetland construction phases of a project. Other case studies highlighted risks and unknowns involved in some of the projects. Wildlife predation, weed invasion, vandalism, stochastic events and human error are but a few of the factors which may contribute to project failure or poor plant performance. A technical guidance document designed to minimize the effects of many of these factors will be published as a result of the workshop.

The final day of the conference included presentations by two panels representing agencies, consultants and the scientific perspective.

Overall, the conference highlighted the following issues and future trends in the area of wetland compensatory mitigation:

1. The majority of people working in the field feel that compensatory mitigation is still not working well and that avoiding and minimizing wetland loss remains the preferred alternative at present. Wetland restoration is more easily accomplished than wetland creation.
2. We need to examine and evaluate wetlands and actions regarding wetlands in the larger landscape context. This is the only way we will be able to accurately judge wetland function and value.
3. The message from virtually all of the scientific community was that we need to establish "reference wetlands" with long term monitoring. The results of this effort will form the basis for setting goals and benchmarks in our marsh creation and restoration programs.
4. We need to manage *aquatic systems*; not just wetlands or water quality or subaqueous bottom or lakes.
5. Our knowledge base continues to improve and as it does the compensatory mitigation track record should also improve. More long term monitoring of wetland construction and restoration sites is needed. These not only increase our knowledge base but serve also as reference sites.

Wetlands Program

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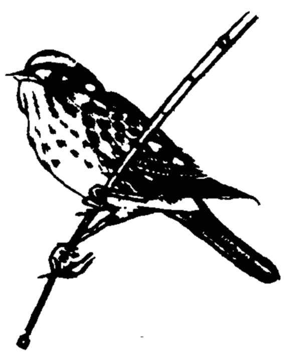
Swamp Sparrow

Melospiza georgiana

Julie Bradshaw

The swamp sparrow is dark with a rusty or chestnut crown, grayish face and sides of the neck, reddish brown wings, whitish throat, and gray breast. Its crown is generally more brown during the winter than it is the rest of the year.

From October to mid-May, the swamp sparrow is a common resident in Virginia's coastal plain. It is less commonly found in piedmont and mountain regions of the Commonwealth. This sparrow migrates to the northern United States and Canada to breed.



Its winter habitat is generally any wet or damp area which has some herbaceous cover present and some brushy cover nearby. This includes fresh and brackish marshes, the edges of marshes, streams, and ponds, wet fields, and hedgerows. The swamp sparrow forages on the ground or in marsh vegetation, gleaning insects and seeds from the water surface, marsh surface, or vegetation. It is somewhat difficult to observe the swamp sparrow during winter because of its preference for brushy habitat. However, if you travel north to its breeding grounds, you can more easily observe males as they sing their robust trill from perches in marshes.

Sturgeon

Atlantic or Long-nosed: *Acipenser oxyrhynchus*
Short-nosed: *Acipenser brevirostrum*

Lyle Varnell

Sturgeon, popular and plentiful in the Chesapeake Bay area during colonial times, have been seriously depleted by overfishing and the removal of historic spawning grounds by damming of tidal river headwaters. Early American fisherman destroyed sturgeon because they damaged nets. Later, the fish became prized for their high grade caviar and flesh. Today, it is illegal to take any sturgeon from Virginia waters.

Two species occur in the Chesapeake Bay area: the Atlantic or long-nosed sturgeon, and the short-nosed sturgeon. The short-nosed sturgeon is federally endangered. Both species are members of the order *Osteichthyes* (the bony fishes) and the family *Acipenseridae*. Sturgeon are primitive species with no close marine relatives. As a family they constitute the largest of the bony fishes: some weighing well over one ton. The species found in the Chesapeake Bay area are considerably smaller. While the short-nosed sturgeon reaches approximately 40 inches in length, the Atlantic sturgeon may grow to ten feet in length and weigh up to 500 pounds. In both species males are smaller than females. They are slow growing and it has been documented that some have lived over 100 years. Sturgeon characteristically have five rows of bony plates, or "scutes." The skin between the scutes is covered with smaller bony scales. The fish ranges in color from olive green, grayish or brownish purple on their dorsal sides to white on the underside. Their flattened snout contains four barbels in front of a protrusible inferior mouth.

"The main river [James] abounds with sturgeon very large and excellent good, having also at the mouth of every brook and in every creek both store and exceedingly good fish of drivers kinds." Captain Christopher Newport, 1607

Short-nosed sturgeon are primarily found in river mouths, estuaries, bays and occasionally in the open sea from New Brunswick, Canada to northeastern Florida. Adult Atlantic sturgeon primarily inhabit shallow continental shelf waters between Labrador and Florida. They are also found in the northeast Gulf of Mexico.

Both species are anadromous. Spawning migrations begin in April into the Chesapeake Bay region. Adults cease feeding and move up into the brackish water and freshwater reaches of tidal rivers to spawn. Females mature between 10 and 14 years of age and weigh at least 150 pounds. Males mature slightly sooner and are approximately six feet long and weigh at least 70 pounds. Spawning occurs primarily in the spring or early summer, but late summer spawns have been documented. Preferred spawning grounds are in running water up to 15 feet deep over

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Natural Places to Visit

Mason Neck National Wildlife Refuge

Pam Mason

Location: Fairfax County. Use Route 1 to Gunston Rd. (Follow signs for Gunston Hall). Turn on Gunston Rd. (Route 242). Travel 3.5 miles and bear right on Route 600. After 0.7 miles bear right onto High Point Road. Parking is on the left.

Details: The refuge, owned by the U.S. Fish and Wildlife Service, is open during daylight hours from April through November. Woodmarsh Trail is 3 miles round-trip, with two shorter loops, and is easy walking. Park naturalists conduct a number of programs. For information contact Mason Neck National Wildlife Reserve, 9502 Richmond Highway, Suite A, Lorton, Va. 22079, (703) 491-6255.

Pohick Bay Regional Park and Mason Neck State Park are both nearby. The state park is open year-round 8 am to dusk. The visitors center is open seasonally April through October with a $1 parking fee. The park includes a 1 mile round-trip trail with a wetlands boardwalk and offers educational programs. Camping, boating and swimming are available at Pohick Park.

The Woodmarsh Trail begins at the parking area and leads to the Great Marsh. Great Marsh is a pocket marsh, formed in a protected bend in the river by several streams carrying sediments from upland erosion to the marsh. Sediments are also carried onto the marsh at high tide. These sediments form the marsh substrate.

The vegetation is quite diverse: wild rice, cattails, rice cutgrass, softstem bulrush, arrow arum and pickerelweed. In the summer, several species of flowering plants add color to the marsh. Look for the large red-centered white blooms and the smaller pink blooms of two species of mallows as well as cardinal flower, wild rose and evening primrose. Much of the vegetation is favored as food by marsh animals or waterfowl.

The refuge is a great place for bird watching, particularly during the spring and fall migrations. Black duck, mallard, teals and other waterfowl come to the marsh to feed. The refuge is the site of the largest Great Blue Heron rookery in the state, and the birds are commonly seen fishing in the marsh creeks. There are also barred owls, screech owls, several species of hawks and wild turkeys. Bald eagles nest in the woods and the refuge was established in order to protect them.

There is a population of beavers at the refuge. Evidence of their logging operations may be visible from the trail. Beavers use grass, sticks, leaves and mud to create a dam. After construction of the dam, the beaver builds a lodge upstream in the ponded water. Beavers eat sedges, rushes and tree bark. Look for evidence of tree stumps the beavers have left behind. Beavers are nocturnal animals. Early in the morning is your best chance to see them. Red foxes, long-tailed weasels, and minks are also found in the refuge.

Sturgeon
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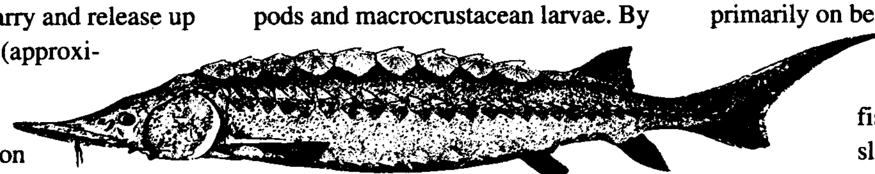
rubble or gravel. Water temperatures between 55 and 70° F induce spawning. Females can carry and release up to 2.5 million eggs (approximately one-third of the weight of an adult female sturgeon can be eggs). Eggs are encased in a sticky gelatinous envelope and adhere to vegetation, stones and each other. After spawning, adults quickly return to deeper water feeding grounds.

Eggs usually hatch in three to seven days. Larval sturgeon subsist on yolk. When the yolk sac supply is depleted, larvae begin feeding on planktonic crustaceans such a copepods and macrocrustacean larvae. By the time the young are approximately nine inches long they become bottom feeders. Young sturgeon spend the first few years (up to five) in the lower tidal reaches of the estuarine river of their birth prior to moving into estuaries and the open sea.



Adults have enormous appetites. They are bottom feeders which feed primarily on benthic marine worms, insect larvae, crustaceans, mollusks and fishes. They feed by slowing cruising over sandy or muddy stretches using their snout to disrupt the benthos and find food in a manner similar to a rooting pig.

Although the sturgeon does not rely directly on wetlands or submerged aquatic vegetation beds in its life history, many of its prey are intimately linked to such habitats.

VIMS Hosts Wetlands Functional Assessment Workshop

Dr. Carl Hershner

Trying to figure out how best to evaluate the functions and values of a wetland was the topic of a recent workshop hosted by the VIMS Wetlands Program. Scientists and agency personnel from Virginia and the surrounding mid-Atlantic region gathered for two days to evaluate existing wetland functional assessment methods and discuss ways to improve them. The workshop included field exercises and directed discussions on the assessment of functions in nontidal wetlands. Results of the workshop will likely lead to modification and refinement of methods being developed for Virginia by VIMS.

Assessment of wetland functions is becoming increasingly important as policy makers and managers try to develop rational strategies for preserving the benefits derived from natural wetland systems. Recognizing the role any particular wetland plays in the surrounding landscape is central to determining what can be altered and what must be preserved. There are numerous efforts to develop standardized methods for examining wetland systems to evaluate their role in water quality maintenance, habitat provision, sediment stabilization, and modification of hydrologic regimes. Developing a method which satisfies scientists, regulators and the regulated public has proven to be an elusive goal.

The VIMS Wetlands Program has been working to develop a functional assessment method for the nontidal wetlands found in the Commonwealth's coastal plain. Based on information from field work and literature reviews, current assessment methods have undergone extensive field testing. While the method has proven useful for research purposes, the utility for management purposes remains a concern. In an effort to identify further avenues for development of the method, VIMS scientists applied to the U.S. Environmental Protection Agency for funds to conduct a workshop on assessment methods.

There were three main objectives for the workshop. The first was to discuss the state of the art in wetlands assessment and to identify appropriate areas for additional research effort. The second was to evaluate means of incorporating "best professional judgement" into standardized assessment methods. The third was to evaluate options for developing very simple methods to provide guidance to wetland managers.

There is a need for an accurate and sophisticated assessment method to support long term management and policy development.

Workshop participants agreed there was still much work to be completed before a full understanding of the functions and values of all wetlands could be adequately assessed for management or research purposes. Water quality functions of wetlands are especially difficult to determine because a wetlands water quality functions are determined in part by the structure of the wetland and in part by the surrounding landscape. The result is that the same wetland in different settings will have differing water quality functions. There is a particular need for research on: (1) description of the water quality role played by different types of wetlands; and (2) identification of key indicators for determining what water quality functions a particular wetland may provide.

Numerous discussions focused on determining what constitutes "best professional judgement." While there is general agreement that the judgement of an experienced wetland scientist is invaluable in assessing the functions and values of a wetland, defining what makes up that judgement is very difficult. Participants tried to define the principal components of best professional judgement and to identify common elements in the approach used when applying their own best professional judgement. While much work remains to be done in this area, there was substantive progress which will be important to the continued development of rapid assessment methods by the VIMS Wetlands Program staff.

In reviewing existing functional assessment methods and evaluating the needs of managers, scientists and the regulated community, it is apparent that several goals should be included in future development of methods. There is a need for an accurate and sophisticated assessment method to support long term management and policy development. However, there is an even more pressing need for a rapid and robust assessment method to support current management efforts. The message from workshop participants was that while scientists must work to reduce the uncertainty that exists about the functions of wetlands, they must also work to help managers and the public deal with the existing technical uncertainty. Management efforts cannot wait for "all the answers."

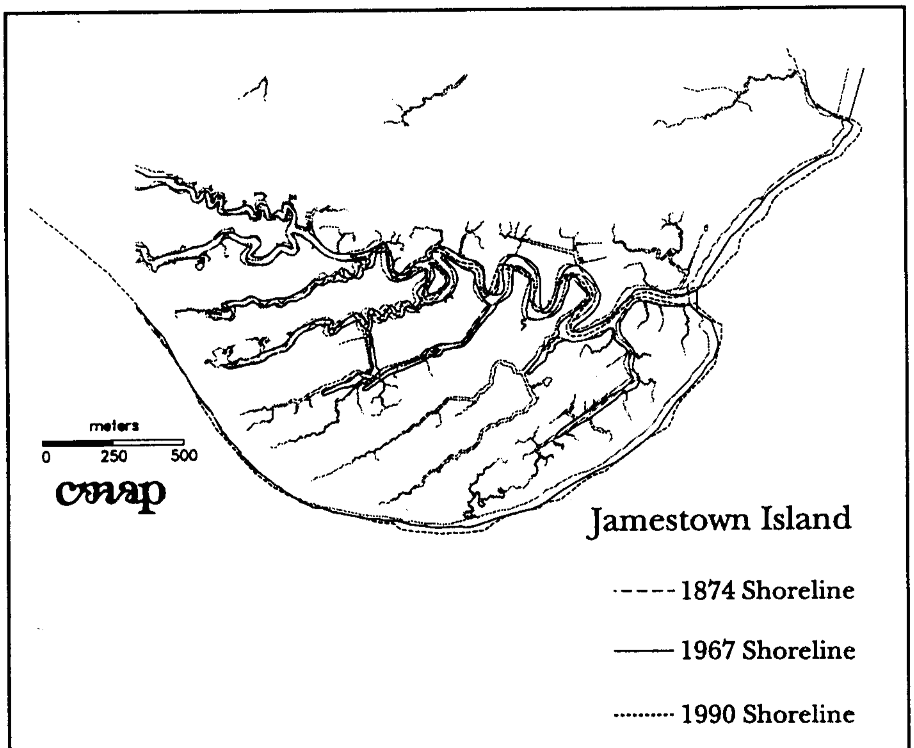
Geographic Information Systems

Mapping the Coastline

Marcia Berman

The coastline, as we know, is not static. It remains in a constant state of change. The dynamics of the shoreline, which defines the interface between the land and water, is the direct result of combined natural and anthropogenic pressures. Natural processes include: sediment supply, wave activity, daily fluctuations in water levels due to tides, local storm intensity and frequency, and sea level rise. Human intervention attempts to modify or halt natural processes; often with limited success.

The American population has been closing in on coastal areas for decades. Currently, 50 percent of the nations population lives within 75 kilometers of the coast. It is estimated that by the year 2010, this number will increase to 75 percent (Williams et al., 1991). The field of coastal management addresses the impending need to preserve and protect the coast as a resource, while striving to balance the pressures for coastal development.



The ability to manage effectively requires knowledge of the resource being managed. Understanding how the coastline has responded historically gives coastal managers a foundation to predict how the shoreline will respond in the future. With this knowledge, planners are better prepared to integrate coastal communities to a degree which minimizes impacts to the coastal zone. Coastal mapping has become an effective approach to this problem. In several areas of the Chesapeake Bay, the Center for Coastal Management and Policy is using the power of Geographic Information Systems (GIS) to map the patterns of shoreline change.

GIS software is designed to store digital cartographic information in a series of layers. Each layer represents a unique data element. An analysis of shoreline change conducted within the framework of a GIS environment is designed so each data layer represents a different shoreline measured; with each shoreline representing a different period of time. Sources which provide the information on shoreline position include historic charts, aerial photography, and topographic sheets.

Early shoreline maps can be acquired through the National Ocean Service, a division of the National Oceanic and Atmospheric Administration. These charts date back to the early 1800's. The United States Geological Survey (USGS) produces topographic maps which include the position of the mean high water shoreline. Current maps date from the mid-1900's to the present. Local agencies are also a valuable source of data. Several state and federal agencies regularly collect and maintain archives of aerial photography suitable for mapping applications. These agencies include: state highway departments and resource agencies, the National Aerial Photography Program (NAPP) at the USGS, the United States Army Corps of Engineers, and the National Aeronautics and Space Administration (NASA). As expected, the quality of imagery has improved over the years.

Once the sources are identified, each shoreline must be digitized to generate the digital coverage. Digitizing existing maps is fairly routine. Occasionally, historic maps

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Structurally Speaking....

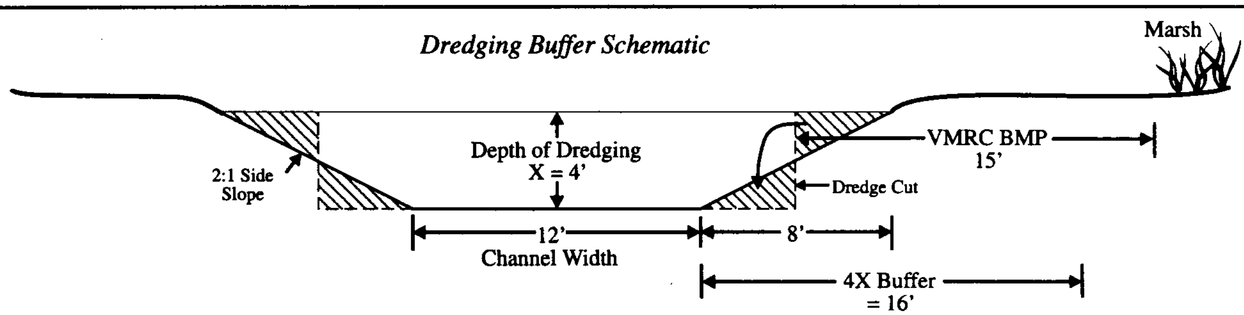
Dredging Buffers

Walter I. Priest, III

When in the course of human events, it becomes necessary to dredge channels adjacent to vegetated wetlands, it is usually prudent to provide buffers so that never the twain shall meet. The two major issues concern how wide the buffer needs to be and from where it should be measured.

The side slopes normally depicted in section drawings are representative of final grades and are not usually dredged as depicted. The channels are usually "box cut" (see figure), particularly the shallower channels. The sides of these cuts are designed to collapse and assume the nominally depicted side slopes while maintaining the design base width of the channel. This is generally accomplished by dredging the channel width plus half the horizontal dimension of the side slope on each side.

Dredging Buffer Schematic



There are basically to types of buffer models, fixed and variable. An example of the fixed buffer is that found in the VMRC BMP manual that stipulates a buffer of 15' from the top of the dredge cut to the edge of the vegetated wetlands. This provides a conservative buffer that works well with depths between 4 and 5 feet. At shallower depths it is probably more than is necessary and at depths of 6 feet and over is not enough. It can also be difficult to enforce because the dimensions of the "box cut" are very seldom identified and they are very difficult to reproduce after the dredging is finished.

A variable buffer is based on the depth of material to be removed from the channel because this is what inherently determines the nature of the side slopes. Based on this model, the buffer width that is normally recommended is four times the depth of material measured from the edge of the design channel. Half of this distance is used to constitute the side slopes of the channel, which experience has shown to be generally in the range of 2:1 (H:V). The other half of the distance is used to provide the buffer between the channel and any vegetated wetlands to help prevent undermining that would jeopardize the integrity of the marsh. This was arrived at by basically taking the distance thought necessary to provide normal side slopes of 2:1 and doubling it to provide a margin for error if the side slopes assumed by the channel sediments were greater than 2:1. This method has the advantage of being adjustable with the depth of material as well as providing a more well defined baseline for measuring compliance.

Mapping the Coastline
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which are often referenced to datums no longer used today, must be adjusted so they can be accurately compared with modern charts. Our ability to refine datum projections has been significantly enhanced with the development of Global Positioning Systems (GPS).

Before aerial imagery can be used for shoreline mapping the imagery must be geo-referenced to accurately place the image in geographic space. Several techniques can be used. The one frequently used by this program is a GPS survey. GPS receivers are positioned in the field at sites which can be easily identified on the image. After data collection and processing, the position of these sites is known to within 2 centimeters. This technology is unmatched in accuracy and precision. A minimum of four sites must be selected for each image. When the coordinate values for the sites are imported into the GIS the image is said to be rectified. The shoreline position on the photograph can then be digitized.

The wetted perimeter, a line which marks the location of the last high tide level, is followed with the digitizer's

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Mapping the Coastline
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cursor. It is identified by a change in coloration along the beachface. The ability to follow this line is controlled in part by the elevation of the tide when the image was photographed, as well as the general characteristics of the shoreline. Quality control guidelines become an important component of this exercise.

The figure illustrates results of the historic shoreline analysis conducted for Jamestown Island in cooperation with the National Park Service. Three levels of shoreline data were digitized. The oldest shoreline from 1874 was digitized from an NOS chart. The newest shoreline from 1990 was digitized from 1990 vertical photography from the photo archives at the Virginia Department of Transportation. GPS surveying equipment was used to geo-reference the photography for digitizing.

A general review of the history of shoreline change in this region suggests long-term recession of the shoreline (i.e. landward shift). This is characteristic of many regions within the Chesapeake Bay watershed. Since the morphology and general orientation of the island does not appear to have changed over the past 124 years, we can assume that the processes which influence shoreline change here have not been severely altered. A more detailed look at landuse practices, and the physical and geological environment will provide additional insight.

Reference:

Williams, S.J., K. Dodd., and K.K. Gohn, 1991. *Coasts in Crisis*, U.S. Geological Survey Circular 1075, Denver, CO., 32 pp.

Calendar
of Upcoming Events

September 18	Estuaries Day '93 York River State Park

Wetlands Program

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