The Virginia Wetlands Report

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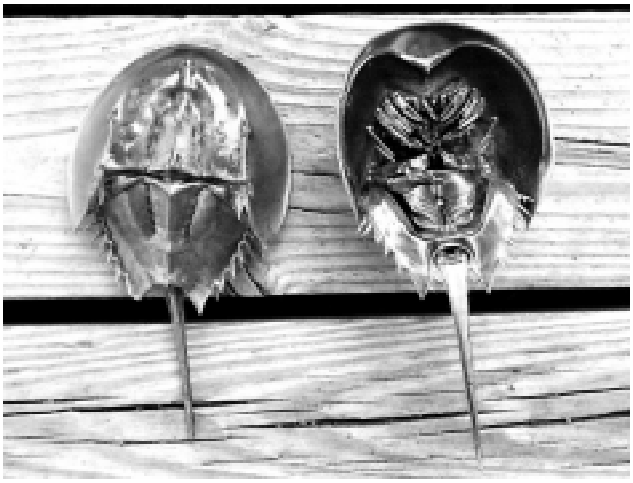
Wetlands Program

Horseshoes Anyone?

By Tom Barnard and Lyle Varnell

No, this article is not about the venerable old summertime game played at picnics and other large outdoor gatherings for hundreds of years. It is about a very familiar east and gulf coast marine organism known commonly as the horseshoe crab and more formally as *Limulus polyphemus.* The horseshoe crab is called such due to the horseshoe-like shape of its outer shell or carapace and the fact that it was once thought to be a true crustacean. If you know anything else at all about the horseshoe crab, it is probably that it is more closely related to spiders, ticks and scorpions (arachnids) than to crabs (crustaceans). In addition to the North American stocks, other large horseshoe crab populations are found along the coast of southeast Asia and associated islands such as Japan. Within the mid-Atlantic bight of the Atlantic coast of North America the largest spawning populations occur in Delaware Bay with a significant, yet smaller spawning population in Chesapeake Bay. The fact that this arthropod has significant economic, medical and ecological value in Virginia and may be experiencing a population decline has elicited concern from a variety of groups with highly divergent interests. These range from Audubon and wildlife groups to watermen to the biomedical community.

From an ecological perspective, *L. Polyphemus* adults and juveniles are an important component in the diet of juvenile loggerhead turtles which summer in and around the Chesapeake Bay. The eggs and larvae are significant seasonal food sources for commercially important finfish and shellfish as well as other marine food web components. Additionally, large numbers of shorebirds apparently time their spring migration to the Arctic to fuel up on horseshoe crab eggs and larvae before beginning the final leg of their journey to the northern nesting areas. These species include the red knots, turnstones and sanderlings and their Delaware Bay stop is said to be the only one they make between South America and the Arctic. The New Jersey Audubon Society sees protection of shorebirds on Delaware Bay as a hemispheric responsibility and the protection of the horseshoe crab as an integral part of this effort because of its importance as a food source for the birds.



Dorsal (top) and ventral (underside) views of the horseshoe crab.

There is also a major human health link with *L. Polyphemus.* In the late 1960's scientists from Johns Hopkins University found that horseshoe crab blood clots in the presence of certain toxins produced by specific bacteria. The crab clotting agent, Limulus Amoebocyte Lysate (LAL) has become a world wide standard for bacterial contamination screening, helping to insure the purity of laboratory produced fluids intended for human use. Since horseshoe crabs can not presently be cultured (they may take 10 to 12 years to mature), wild stocks are required for collection of the blood. Approximately 1/3 of each organism's blood is harmlessly removed and the animal is returned to the water.

In Virginia, *L. Polyphemus* is commercially exploited as bait for the conch and eel pot fisheries in Chesapeake Bay. Crabs are landed in Virginia from offshore and local waters and more recently are reported to have come from Delaware Bay also. Over 578,000 pounds (256,000 individuals) were landed in Virginia in 1998 according to the Virginia Marine Resources Commission (VMRC). At the present time, the Asian-Pacific and European markets for conch and eel are very strong and

also see http://www.audubon.org/campaign/horseshoe and http://www.beach-net.com/horseshoe/Bayhorsecrab.html

represent a healthy component of Virginia's fishing industry.

With all the competing uses outlined above, it should not surprise anyone that concerns have recently arisen regarding the status of mid-Atlantic horseshoe crab stocks and the impacts that a significant decline in the stocks might have on mid-Atlantic shorebird migration, fish and turtle populations, the conch and eel fisheries and the biomedical community.

Recognizing the cosmopolitan importance of the species, the Atlantic Marine Fisheries Commission (ASMFC) adopted in October, 1998 the Interstate Fishery Management Plan (IFMP) for horseshoe crabs. The plan calls for coastal states from Georgia to Massachusetts, and members of the biomedical industry to meet certain requirements for protecting the stock. In addition to various requirements addressing stock assessment, states are required by the end of 1999 to identify potential spawning and nursery habitat for the species. ***This last item is important because it could lead to regulatory bodies such as wetland boards and the VMRC being asked to place time of year restrictions on activities which would adversely affect identified spawning beaches.***

As a result of the implementation of the ASMFC, IFMP for horseshoe crabs, the Virginia Marine Resources Commission is currently considering regulatory action which would place restrictions on the Virginia horseshoe crab fishery. A public hearing was held in Newport News on February 23rd at which many of these issues were aired as they specifically apply to Virginia. Maryland, Delaware and New Jersey have already imposed quotas on the numbers of crabs that can be landed annually within their jurisdictions. VMRC Division of Fisheries Management staff recommended three actions for Commission consideration:

1) Mandatory reporting of catch by fishermen.
2) Prohibit the catching of horseshoe crabs within 1000 feet of mean low water during the organism's spawning season of May 1 - June 7.
3) Cap the annual landings in Virginia at 260,000 individuals.

There was a great deal of testimony at the public hearing as to the value of the horseshoe crab for shorebirds, to the general ecology of the Chesapeake Bay, to the biomedical community and of course, to the watermen that depend on them for at least part of their livelihood. There was little testimony, however, as to the present condition of the stock, whether the species is declining or not, etc. About the only thing that all the varying interests could agree on was that there is no reliable scientific data quantifying population levels in the bay. The anecdotal information available was in conflict with testimony regarding numbers being caught by fishermen at present.

At the end of the almost one and one-half hour public hearing, the commissioners voted to adopt the first two staff recommendations, listed above but refused to place any restriction on the number of horseshoe crabs that could be landed in Virginia. They also set up a study committee, made up of equal representation from the competing interests, which is to study the issue and report back as soon as possible. The formation of the committee, the requirements of the ASMFC management plan, the strong feelings of the competing interests and the lack of a credible stock assessment, all mean that this issue is far from settled and will remain a significant use-conflict for the foreseeable future.

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In this Issue:

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1999 VIMS Wetlands Education Course Schedule

May 11-14	Wetland ID/Delineation	4 days	$400.00
July 22	VIMS Tidal Wetland Seminar	1 day	$ 20.00
Sept. 15-17	Wetland Mitigation/Compensation	3 days	$300.00
Dec. 15-16	Winter Botany	2 days	$200.00

For more information about these courses, please contact Bill Roberts at (804) 684-7395.

GIS Geographic Information System

Shoreline Situation Reports: Revised, Revisited, and Updated

Marcia Berman

In the 1970s, passage of the Coastal Zone Management Act, and the newly established Chesapeake Research Consortium was a turning point for Virginia with regards to management of its coastline. The need for information to support decisions pertaining to development of coastal lands, and protection of coastal resources was overwhelming. These needs fueled the development of a series of reports which characterized the state of the shore lands in Virginia. This series, which came to be known as the Shoreline Situation Reports, was published on a county by county basis, for each of the Tidewater localities in Virginia. Geographically, the series addressed the primary tidal shorelines of the Commonwealth, excluding the ocean front. The reports describe the condition and "situation" of the shore lands through a combination of maps, tables, and text. They include data specific to land ownership, shoreline protection, shoreline stability, and general character. Distribution to local and state agencies was widespread in the 1970s. Requests for these reports, despite their age, are still routinely made.

With nearly 20 years passed since this series was published, the need for shore land information continues. In addition, development has moved into the upper reaches of the smaller tributaries, and data for these areas are not available. The Comprehensive Coastal Inventory Program recently started a long-term initiative to resurvey the shorelines of the Commonwealth, and update the Shoreline Situation Report series. This second phase will include both primary and secondary creeks and shoreline.

How will the revised series differ from the original? The first difference is how the data are collected. Early shoreline situation reports captured shoreline data from low altitude slide photography. The type of attribute mapped was limited to what could be observed from slides. CCI is collecting data for the revised series in the field. Hand-held Global Positioning System (GPS) units are logging the features observed from small shoal draft boats skirting the shoreline. This process, albeit time consuming, improves on the accuracy, and type of data which can be collected.

Second, the early inventories processed all data manually, and the final products were developed using graphic design skills. GPS software, and Geographic Information Systems (GIS) are used today for processing the data collected in the field, and generating reports. Digital files allow for rapid query and display of the information. Although the processing is very intensive, the development of the digital database is invaluable. Soon, more efficient collection techniques will be available to the program which will minimize a lot of the time-consuming lab processing presently required.

Finally, the type of data we can collect is enhanced because of the improved collection techniques. This coming series divides the shore land into three component parts: the adjacent upland, the bank, and the shoreline. No attention is given to the submerged nearshore. The adjacent upland is evaluated for its land use or land cover. Land use or cover is an indicator of how the shore may be managed. Six different alternatives are currently proposed: forest, scrub-shrub, grass, bare, residential, or commercial. From the boat, a continuous record of this changing attribute is surveyed by selecting one of these six choices using the hand-held GPS. The bank is evaluated for several properties, its height, its stability, and the presence or absence of natural buffers which afford the bank protection from high wave energy. Natural buffers are restricted to either beaches or marshes. Finally, the shoreline itself is evaluated primarily for human alterations. Since the bank evaluation discloses whether a beach or marsh is present, the shoreline itself is evaluated for the presence of shoreline structures. Three types of structures are considered, shoreline defense structures which protect the shore from erosion; offensive structures which attenuate wave energy or assist in trapping sediment; and recreational structures which enhance the enjoyment of, or access to the water. Land use, bank condition, and shoreline features collectively make-up the shoreline situation.

When can Virginia localities expect to see a revised Shoreline Situation Report? CCI is entering its second field season this spring. The program hopes to publish three inventories a year. Meeting this goal is dependent largely upon funds to support the initiative. CCI is actively seeking funds to expand this operation. Cost sharing between the program and the locality is a desirable alternative. Interested jurisdictions should contact Marcia Berman at (804) 684-7188 or email: marcia@vims.edu to discuss this possibility.

The Marsh Arabs of Southern Iraq

Pamela Mason

Throughout history people have been drawn to the waters edge, where they established towns, cities and civilizations. Life along the waterways provided access to the most critical elements; food, transportation and protection. While the co-existence of mankind and wetland ecosystems along the worlds' waterways has resulted in many varied uses of wetland resources by humans, one of the most unique uses of wetlands is for habitation. The Ma' dan people of southern Iraq, also known as "Marsh Arabs" not only live in the wetlands, they derive their entire existence from them.

The Marsh Arabs live in extensive marshlands in the vicinity of the confluence of the Tigris and Euphrates Rivers, an area commonly known as historic Mesopotamia. The largest wetland ecosystem in the Middle East, this area of permanent marsh and lakes occupied approximately 6,000 square miles in 1985 (North 1994). The freshwater marshes are dominated by common reed, *Phragmites*, sedges and rushes. The marshes serve as permanent residence, as well as migratory stopover, for many birds including, ducks, waders, ibises, cranes, eagles, and quail (Ochsenschlager).

Location of Tigris-Euphrates marsh complex.

It is thought that the Marsh Arabs have lived in the wetlands for over 5,000 years, and were some of the first peoples to develop techniques for irrigation and flood protection. The people construct houses, called sarifas, from reeds and set them on dry, stabilized substrate created from alternating layers of mud, quarried from the marsh bottom, with layers of reed mats. The main mode of transportation is by water in long, slender canoes built of reeds known as mashuf. Historically, and to date, the Ma'dan are generally agricultural people. Their primary crops are rice and millet. Not only do they harvest fish from the marshes, they also use the marshes for grazing cattle, water buffalo and sheep. There is some limited production of textiles used for trading. Not surprisingly, the textiles are made of reed, including baskets and mats (Marsh Arabs: http://gurukul.ucc.american.edu/TED/marsh.htm). There is also a limited amount of carpet weaving using locally produced wool which is spun and woven employing implements crafted from marsh reeds. This craft however, is disappearing as a result of competition from more efficient industrialized weaving centers (Ochsenschlager).

Recent events in the Middle East have brought attention to the plight of the Iraqi marshes and the people who make there home there. Indeed, as a result of massive channelization and draining projects, beyond the control of the marsh-dwelling people, the marshes are rapidly disappearing. Almost the entire flow of the Euphrates River has been diverted into a man-made riverbed, bypassing the most extensive and diverse wetland, Hammar Marsh. There have been an estimated 43 percent of the marshes converted to dry land since 1992 (North 1994). As the marshes disappear, so too do the people, their rich cultural and the natural history of the Iraqi marshes.

Citations

Marsh Arabs. Http://gurukul.ucc.american.edu/TED/marsh.htm.

North, Andrew. 1994. Iraq uses diversion tactics. Geographical Magazine v. 66, p.6.

Ochsenschlager, Edward. Carpets of the Beni Hassan village weavers in Southern Iraq. From Oriental Rug Review v. 15/5. Http://www.rugreview.com/155beni1.htm.

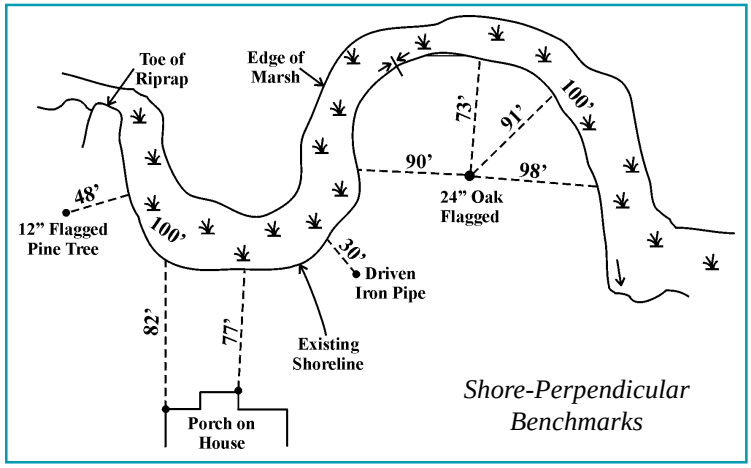
Wondering about Wetlands

William Roberts

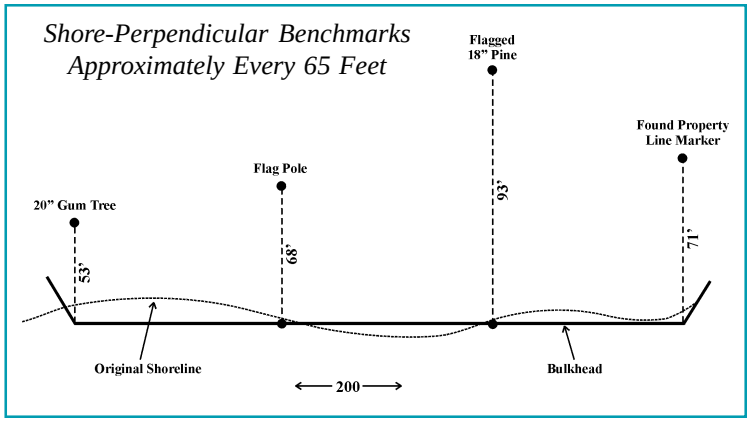
Q What are benchmarks and why are they important in my permit application drawings?

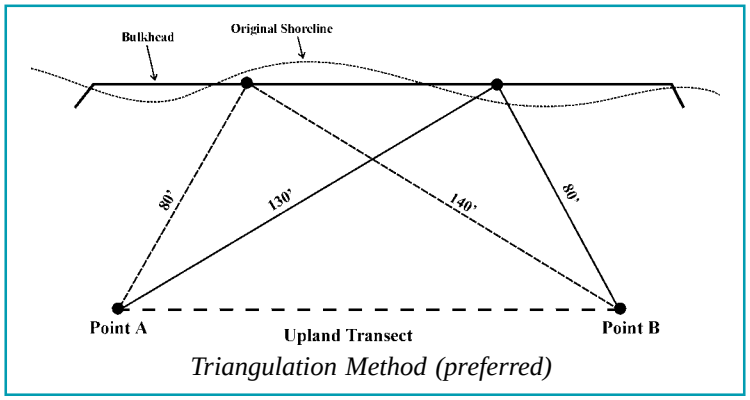
A In the process of filing the Local, State and Federal Joint Permit Application (JPA), aka the Basic Application Form, the applicant must select and complete the correct appendix that most accurately addresses his proposed project from among many appendices included in the application packet . An important requirement of these 18 appendices, A-R, is the inclusion of both a Plan View drawing and a Cross Section drawing. As an example, Appendix H - Riprap Revetment and Associated Backfill, page #23, contains a long checklist of required information and in bold capital letters states that "the drawings must contain the following information or they will be considered incomplete." One of the items required is "benchmarks showing distances to fixed points of reference."

First, let's explore the importance of a benchmark and its purpose on the application drawing. Each county's wetland board evaluates the information provided in the Joint Permit Application (JPA) before weighing the needs of the applicant against the potential impacts to the marine environment in rendering a decision on the proposed project. In most cases, the degree of potential impact to the marine environment plays a critical role in the decision making process. If the impacts are judged by the Board to be "excessive" or "unwarranted", the application may be denied or possibly modified to reduce these impacts. Whether approved, denied or modified, the proposed project is evaluated by comparing its benefits and impacts as appraised by the information supplied in the application and attached drawings. Any deviation from the approved alignment, footprint or location of a proposed bulkhead, revetment, breakwater or other shoreline erosion structure may significantly change the potential impacts to the marine environment. Therefore, it is extremely important that the on-site contractor be able to construct the proposed structure in the proper location using the application drawing submitted with the application and approved by the Wetland Board. A very effective method of transferring the approved alignment, which exists only on paper, to the actual site is through means of fixed reference points. These fixed reference points will clearly indicate where the proposed project is to be placed, that is, its exact alignment relative to the existing bank, mean high water, the intertidal zone and any wetland vegetation that may be on site. In this manner, the potential impacts to the marine environment can be more



Shore-Perpendicular Benchmarks





Triangulation Method (preferred)

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Wetlands Initiative Gains Momentum

Carl Hershner

In 1997, Virginia joined its partners in the Chesapeake Bay Program in committing to a net gain in wetland resources within the watershed. Each state agreed to develop a management strategy detailing how it would achieve a net gain in wetland resources. The states also committed to development of a restoration goal and implementation of a program for monitoring the status and trends of wetland resources in the watershed.

The development of a Virginia Wetlands Management Strategy has moved into high gear with the official appointment of both a Technical Advisory Committee and a Citizen Wetlands Advisory Committee. The work plan for the committees calls for development of a final draft strategy prior to the Chesapeake Bay Program Executive Council meeting at the end of 1999.

The Technical Advisory Committee is chaired by Michael Clower, Executive Director of the Chesapeake Bay Local Assistance Department. Each of the agencies within the Natural Resources Secretariat, as well as VIMS and the Department of Transportation, have representatives on the committee. This group has been charged with providing background and technical information necessary for development of the strategy.

The Citizen Wetlands Advisory Committee is composed of sixteen individuals representing a cross section of stakeholders in management of wetland resources. This group includes individuals from academia, development interests, local government, industry, and environmental interest groups. The committee is charged with reviewing existing regulatory and nonregulatory programs within the Commonwealth, and recommending new initiatives to the Governor.

The first meeting of the Citizen Wetlands Advisory Committee was held in Richmond on March 25. At that meeting the group was assured that the Governor is firmly committed to his pledge to achieve a net gain in Virginia's wetland resources during his term in office. The group has been challenged to be both comprehensive and imaginative in their consideration of ways Virginia could preserve and restore its wetlands.

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accurately estimated and then monitored within the limits permitted by the wetland board.

Now, let's try to define the term "benchmark". According to *Construction Measurements*, by B. Austin Barry, a benchmark (BM) is defined as "a permanent and recognizable point that lies at a known elevation." Unfortunately this definition really does not accurately apply to our need for a fixed reference point since benchmarks refer to fixed points of elevation, not linear distances. The surveying term "station" actually is used to denote a fixed, permanent point. Webster's Dictionary defines a benchmark the same way, however it also includes a common usage of the term which indicates a benchmark as "a point of reference from which measurements of any source may be made." Since the numerous agencies which review the Joint Permit Application (JPA) have deemed acceptable the use of the term benchmark to indicate a linear distance from a fixed point to a non-fixed point, it would seem acceptable to use this term in the same manner for our purposes. Simply stated then, a benchmark is "a fixed reference point that can be used to establish and verify the alignment or placement of a shoreline erosion control structure." The benchmark distance, shown on the application drawings, would then be the distance, in feet, from the upland fixed point to the channelward edge of the structure. The on-site contractor needs the information to accurately align the channelward edge of a shoreline erosion control structure, as shown on the approved application drawings. Benchmarks also provide the information needed for "as built" permit compliance checks.

Now that we have defined a benchmark, a discussion of how many, where and what kind of benchmarks may be employed in application drawings should help clarify their use in constructing shoreline erosion control structures. What objects can be used as a benchmark? Generally speaking, any fixed or permanent object within several hundred feet of the proposed structure would be acceptable. Any part of an existing house, the corner of a garage, a tree that will not be removed, a flagpole, an existing pier or even a flagged, 1/2 inch piece of re-bar driven flush with the ground will serve the purpose. Obviously, the closer the fixed point is to the proposed structure, the greater the accuracy and ease in measurement. A minimum amount of trees, shrubs and underbrush also will improve ease and accuracy of measurement.

The benchmark distance from a fixed upland point to the channelward edge of the erosion control structure can be measured using several methods. In surveying, triangulation is employed for utmost accuracy. In triangulation, a point along the channelward edge of the structure is measured from two different, fixed upland points, separated by a sufficient distance to permit the formation of a triangle (with angles of approximately 30-45 degrees along the upland base length). In most instances this degree of accuracy is not required in constructing a shoreline structure. The use

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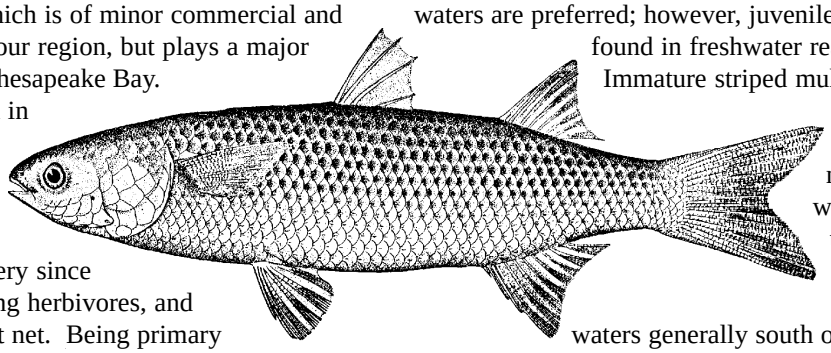
Fin Facts

Striped Mullet

Mugil cephalus

Lyle Varnell

The striped mullet may be commonly observed leaping above the water's surface in the Chesapeake Bay region during the spring and summer. This leaping behavior is the origin of their other common name of "jumping mullet." *M. cephalus* is a species which is of minor commercial and recreational importance in our region, but plays a major role in the ecology of the Chesapeake Bay. South of Cape Hatteras and in the Gulf of Mexico, the striped mullet is valued for its quality flesh and roe. They are primarily used for bait in the recreational fishery since the adults are bottom-feeding herbivores, and are generally caught by cast net. Being primary consumers they have an important place in the Bay's food chain dynamics, and are commonly consumed by predators such as bluefish, striped bass and spotted seatrout.



The striped mullet belongs to the family Mugilidae and includes its close relative *M. curema*, the white mullet. *M. cephalus* has a robust, slightly compressed body with longitudinal stripes on each scale row. The white mullet lacks these prominent stripes, which is the primary morphological characteristic distinguishing the two species. Generally, the striped mullet's body is bluish gray to greenish above, and silvery below. Adipose tissue covers most of the eye. Although this species can reach approximately 21 inches total length in the Chesapeake Bay region, most are commonly less than 12 inches total length. Found worldwide in temperate and tropical waters, the range of the striped mullet is generally limited to waters between Cape Cod and Brazil along the Western Atlantic.

Adults form large schools close to the shoreline in the Chesapeake Bay during summer and autumn. Higher salinity waters are preferred; however, juveniles and adults can be found in freshwater reaches of tidal waters. Immature striped mullet may overwinter in estuaries within its range, but adults migrate to oceanic waters to spawn. Along the Atlantic Coast, spawning occurs in offshore surface waters generally south of Cape Hatteras, primarily during November and December. Females may lay between 0.5 and 2 million eggs. Eggs float and hatch approximately 48 hours after fertilization. Juveniles enter the Chesapeake Bay and use the estuary as a nursery area. Most all of the striped mullet within a year-class have reached maturity by their third year.

Juveniles primarily feed on zooplankton within the water column. However, as striped mullet get older, their diet and feeding habits change to bottom feeding upon plant detritus and benthic algae.

Striped mullet are a valuable prey species in the Chesapeake Bay and other estuaries. They are responsible for the distribution of plant matter originating from intertidal marshes and submerged aquatic vegetation beds to higher level predators.

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of shore-perpendicular measurements is generally sufficient to insure the proper location of the structure within 6-12 inches of accuracy. At various points along the length of the structure, measurements perpendicular from the structure to fixed upland points will be sufficient to correctly locate and verify the approved alignment. The number of benchmark measurement points along the structure required is subjective and may vary with overall length of the structure and shoreline configuration. However, a measurement at the beginning and end of the structure, as well as one every 50 feet along the length of the structure will insure alignment accuracy.

In summation, a benchmark is a fixed upland point used to measure the distance to the channelward edge of a shoreline erosion control structure. A benchmark distance is the measured distance expressed in feet from the fixed point to the structure's channelward edge. Shore-perpendicular measurements from points along the structure to upland benchmarks is generally sufficient for alignment accuracy.

Calendar of Upcoming Events

June 6-12, 1999	**Society of Wetland Scientists Annual Meeting, Norfolk, Virginia** Contact: Harold Jones at (757) 441-7777 or email: harold.r.jones@usace.army.mil. Also see the SWS South Atlantic Chapter homepage: http://www.sws.org/regional/southatlantic/
July 24-30	**Coastal Zone 99, San Diego, CA.** Contact The Coastal Zone Secretariat at (617) 287-5577 or email: CZ99@gemini.cc.umb.edu
September 23-25	**International Conference of the Society for Ecological Restoration, San Francisco, CA.** Contact Deborah Amshoff at (805) 634-9228. Also see: www.sercal.org/ser99.htm
November 2-5	**Second Annual Wetlands Regulatory Workshop. Atlantic City, NJ.** Abstracts due by May 22. Contact: Ralph Spagnolo at (215) 814-2718. or Spagnolo.ralph@epamail.epa.gov

Compensatory Mitigation Issues:

Is the planting of nonvegetated wetlands with wetland plants an acceptable form of mitigation?

Kirk Havens

Wetland compensation is becoming more widely applied by wetland regulators to mitigate for the functions and values lost when a wetland is impacted. Before requiring this management tool however, it is important to understand the meaning of the terms *mitigation* and *compensation*. **Mitigation** is all actions that are taken (or not taken) to substantially lessen the overall impacts associated with a project. Mitigation may include avoidance of the wetlands, reduction of activity in the wetlands, restoration of degraded wetlands, creation of new wetlands, or preservation of existing wetlands and other actions that reduce the impacts of the project on wetlands. **Compensation** is actions taken to replace impacted wetlands with new wetlands and is a type of mitigation. This generally takes the form of grading a nonwetland area to an elevation that will support the establishment of a wetland.

Tidal wetlands provide a myriad of functions, with associated societal values, to the marine environment. The Commonwealth of Virginia holds nonvegetated wetlands equal in importance to vegetated wetlands. This is due to the fact that nonvegetated wetlands have functions that differ from vegetated wetlands, but which are equally important. For example, nonvegetated sand and mud flats harbor high populations of invertebrates (amphipods, clams, snails, worms) some of which only occur in nonvegetated areas. These mud and sand flat inhabitants are important food organisms for wading birds and commercially important fish, shellfish and crabs. Mud flats interact significantly with adjacent vegetated areas in the cycling of nutrients. While only certain types of vegetated wetlands are ranked as Group One or Two wetlands by the Commonwealth, **ALL** nonvegetated wetlands are so ranked and merit a high order of protection.

Sprigging a nonvegetated wetland with marsh vegetation is generally not an acceptable form of mitigation since it is simply changing one ecologically valuable wetland type into another type.

Sprigging a nonvegetated wetland with marsh vegetation is generally not an acceptable form of mitigation since it is simply changing one ecologically valuable wetland type into another type. Such action is contrary to the Commonwealth of Virginia's Wetlands Mitigation-Compensation Policy and is generally not recommended by the Virginia Institute of Marine Science. In addition, if an intertidal area does not presently support wetland vegetation there usually is a physical or geochemical reason, such as soil/sediment composition, wave exposure, shading, etc., that limits the presence of vegetation. If the impacts associated with a project warrant compensatory mitigation, then a nonwetland area should be graded to an intertidal elevation to provide for construction of wetlands.

For additional information on Virginia's Wetlands Mitigation-Compensation Policy look under the gold tab if you have access to a copy of the Virginia Wetlands Management Handbook, or contact the Virginia Marine Resources Commission for a copy of the guidelines.