

## GIS Technology and New York's Tidal Wetlands Trends Analysis

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The effectiveness of coastal wetland laws and policies is under greater scrutiny as coastal populations burgeon with increasing demand for community infrastructure and development. New York State recently undertook a review of its tidal wetlands protection policies by analyzing the change in wetland habitat since promulgation of the Tidal Wetlands Act in 1973. GIS (Geographical Information System) technology has been incorporated to conduct this trend analysis for New York tidal wetlands, which has shown that New York's wetlands regulations have been very effective.

### A Brief History of Tidal Wetland Regulation in NY

The Tidal Wetlands Act, Article 25 of the Environmental Conservation Law (ECL), became effective September 1, 1973. Prior to 1973 New York State twice promulgated legislation to protect wetlands. The New York State Long Islands Wetlands Act, section 11-2307, was added to the (ECL) in 1959. It established a program for cooperative agreements with local governments concerning lands dedicated to conservation purposes. This section was repealed effective September 1, 1973 and replaced by the Tidal Wetlands Act described below. Article 15, the Water Resources Law, of the ECL is still in effect and protects water resources through a variety of mechanisms. Section 15-0505 requires a permit for any excavation or fill in the navigable waters and adjacent marshes of New York State.

The New York State legislature recognized that "Tidal wetlands constitute one of the most vital and productive areas of our natural world, and that their protection and preservation are essential . . . vast acreage in the tidal wetlands in the state of New York has already been irreparably lost or despoiled as a

result of unregulated dredging, dumping, filling, excavating, polluting, and like activities; that the remaining tidal wetlands are in jeopardy of being lost or despoiled by these and other activities; that if the current rate of loss continues, most of the state's tidal wetlands will be entirely lost before the end of this century . . ." In order to "Preserve as much as possible of these remaining wetlands in their present natural state and to abate and remove the sources of their pollution," the Tidal Wetlands Act Article 25 of the ECL became effective September 1, 1973 (New York Codes Rules and Regulations Article 25 §25-0101).

The Tidal Wetlands Act provided for administration of wetland impacts directly by the state and provided for a moratorium on wetland impact permits pending the completion of an inventory of wetlands and development of the Tidal Wetlands Land Use Regulations. During the moratorium, an applicant, in addition to designing an acceptable plan, had to show hardship prior to the issuance of a permit. The moratorium was successful, and only 20 acres of wetlands were filled in the entire marine district as a result of approved activities. The extent of wetland loss to unapproved activities is not known. The moratorium ended on August 20, 1977, the effective date of the Tidal Wetlands Land Use Regulations (TWLUR).

The TWLUR (6 NYCRR, Part 661 issued pursuant to Article 25 of the ECL) utilized a complex classification system which categorized the compatibility of a proposed activity by reference to the type of activity itself and the nature of the geographic area (e.g., tidal wetlands cover type) in which the proposed activity was to take place. Wetlands were defined by a

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combination of tidal influence and vegetation (indicator species). Wetlands were divided into 3 vegetated categories—intertidal marsh (IM), high marsh (HM) and fresh marsh (FM)—and two non-vegetated categories—coastal bars and flats (SM) and littoral zone (LZ). The Inventory is based on aerial infrared photography taken in 1974 at 1 inch = 1000 feet from the Tappan Zee Bridge, south to the southern tip of Staten Island and east to Montauk Point. Photographic enlargements to 1 inch = 200 feet were made onto mylars. After photographic interpretation and field investigations, the mylars were annotated with lines indicating the 3 wetlands categories and 2 non-vegetated wetlands categories. The mylars were best fitted without ground control points to existing New York State Department of Transportation 7.5 minute planimetric maps.

The New York State Official Tidal Wetlands Inventory is maintained by the New York State Department of Environmental Conservation (NYSDEC), Division of Fish, Wildlife and Marine Resources, Bureau of Marine Resources, Geographic Information System Unit. This inventory serves as the basis for the trends analysis currently underway.

#### **Tidal Wetlands Trends Analysis Methodology**

In order to evaluate the effectiveness of the New York State's tidal wetlands program in protecting total acres of wetlands from 1974 to the present, a tidal wetlands trends analysis (TWTA) using GIS technology is being conducted for the tidal area in New York State south of the Tappan Zee Bridge.

GIS technology is the computerization of cartographic or mapping data. Once data are computerized, they can be managed, analyzed and displayed. GIS data can be displayed as points, polygons, and /or lines. An integral component of a GIS is to create a background layer called a raster layer. Aerial photos, nautical charts, U.S. Geological Service maps, or satellite imagery can be used to create rasters. Another important component of a GIS is to register the data to a coordinate system, that is, assign coordinates to the data. Examples of coordinate systems include latitude-longitude, state plane, and Universal Transverse Mercator.

ArcView<sup>1</sup>, ArcInfo<sup>1</sup> and Imagine<sup>1</sup> are the three types of GIS software that the NYSDEC's Tidal Wetlands GIS unit has been using to map the tidal wetlands (TW). ArcInfo and ArcView are registered trademarks of ESRI (Environmental Systems Research Institute Inc.) and are used to form the points, lines, and polygons

that represent the symbology in the GIS. Imagine is a registered trademark of ERDAS. Imagine is used to register and fit together (or mosaic is the term that is commonly used) aerial photographs as rasters for the GIS.

The TWTA utilizes aerial infrared photography taken in 1989 at 1 inch = 1000 feet. After photographic interpretation and field investigations, the wetland is delineated on the aerial photo. For one area, Shinnecock Bay, the 1989 aerial photographs were enlarged onto mylars at a scale of 1 inch = 200 feet and the wetland boundary was drawn, as was done for the 1974 photography. Currently all other mapping is being done using "heads up" digitizing (digitizing the wetlands boundary directly onto a

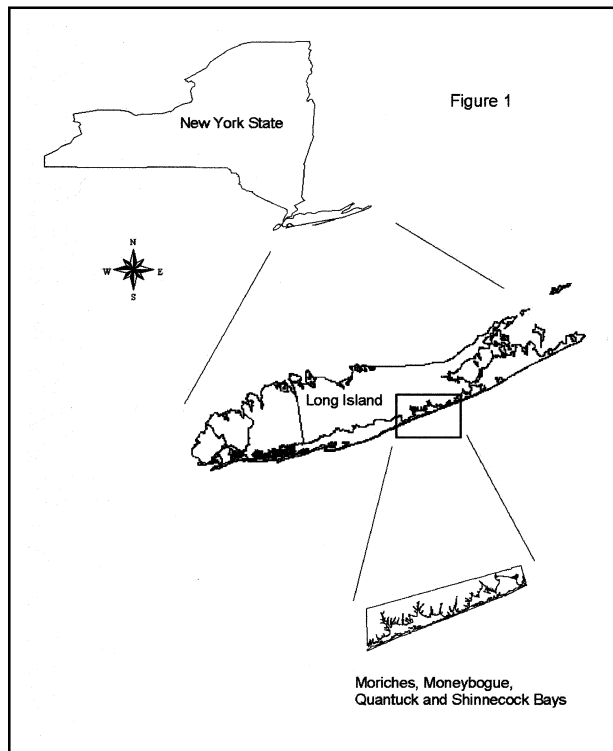
computer screen using GIS software with the aerial infrared photo in the background). The 1974 and the TWTA tidal wetlands lines were digitized in ARC/INFO to produce 2 seamless (edgematched and dissolved) vector coverages in New York Transverse Mercator (NYTM) coordinates. This coordinate system was also used for the 1974 inventory. A third vector coverage was produced from the original 2 coverages to enhance the changes in wetland boundaries and expedite coverage processing of the changes in wetland boundaries. The 1989 photography was digitized with an Eikonix 1412 full color scanner at a resolution of approximately 400 dpi (dots per inch). The resultant digital raster images were processed in ERDAS (registered trademark) to produce a seamless (mosaicked) raster coverage in NYTM coordinates.

Efforts were made to rectify the raster coverages to the vector coverages to within 10 meters relative accuracy.

#### **Results**

To date tidal wetlands in Shinnecock, Quantuck, Moneybogue and Moriches Bays have been mapped and analyzed. These bays are located on the southeast shore of Long Island in Suffolk County (see Figure 1). The first area studied, Shinnecock Bay, showed a gain of 161 acres of vegetated tidal wetlands as a result of a landward movement of the tidal wetlands boundary from 1974 to 1995. Twenty-one acres of tidal wetlands were destroyed by natural causes, of which 15 acres were tidal wetlands on islands. The second area of study, Moriches, Quantuck and Moneybogue bays, showed an increase of 137 acres of vegetated tidal wetlands. Approximately 1.5 acres were destroyed by natural causes. The losses due to permitted

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and unpermitted human activities were too small to be detected.

### Ongoing Analysis

Mapping is underway by NYSDEC staff for Great South Bay, and the east end (Oyster Pond to Napeague). Tidal wetland mapping of the upper (Troy Dam to Tappan Zee Bridge) and lower (Tappan Zee Bridge to NY Harbor). Hudson River is a contracted effort and part of Governor Pataki's Hudson River estuary management effort. The upper Hudson River tidal wetlands are being mapped for the first time. A tidal wetlands inventory was conducted on the lower Hudson in 1974. A trends analysis is now being conducted on the lower portion of the river. Both efforts are being overseen by NYSDEC GIS staff. Preliminary results conducted by GIS staff for Jamaica Bay, a south shore bay in Long Island, indicate a conversion of over 400 acres of mapped intertidal marsh to coastal shoals and littoral zone, and 10 acres to possible violations. Such a conversion is considered a loss because of the general category change. The wetland changes from a highly productive vegetative category (intertidal marsh) to a generally less productive unvegetated category (shoal or littoral zone). Vegetated tidal wetlands can produce over 3 tons of organic material per acre per year.

### Conclusions and Recommendations

1. Since 1974, New York's Tidal Wetlands Program has been successful in protecting tidal wetlands in the referenced areas.
2. Since 1974, the main cause of tidal wetland destruction in the referenced areas has shifted from human-caused factors, such as

filling, to natural factors, such as storms and naturally induced flow restrictions.

3. Tidal wetlands trends analysis utilizing GIS technology should continue every 5 years using aerial infrared photography at 1 inch = 1000 feet.
4. As the primary cause of wetlands loss is due to filling by overwash and water flow restriction, aerial color or black and white photography of target areas should be taken on a yearly basis for monitoring purposes utilizing GIS technology.
5. Efforts should be increased to manage wetlands areas in response to changes in tidal influence.
6. Areas of likely wetlands destruction due to overwashing should be identified and wetlands recovery contingency plans should be established including all needed permits.
7. Areas of likely wetlands destruction due to restricted flow should be identified and wetlands recovery contingency plans should be established including all needed permits.
8. Studies should be conducted to determine the causes of wetlands changes.
9. In the case of mitigation, areas of dredge spoil placement should be investigated; areas that are designated but are not being used for spoil, should be used as mitigation sites for projects that will cause wetland losses.

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## Canada Extends Oil and Gas Moratorium on Georges Bank

Canada joined the United States in extending its moratorium on oil and gas exploration on Georges Bank until 2012. Canada's original moratorium took effect in 1988 and was due to expire on January 1, 2000. On December 22, 1999, Nova Scotia Natural Resources Minister Gordon Balsar and other government officials, announced the decision to extend the moratorium for another 12 years. The decision came after the Georges Bank Review Panel submitted their report on this issue.

On June 30, 1999, the Georges Bank Review Panel, a Canadian joint government panel, recommended "that action be taken to have the moratorium on petroleum activities on Georges Bank remain in place." In the report, the panel did not specify a time period for the extension. They did identify Georges Bank as an area of exceptional ecological value, supporting important fisheries of great economic, social and cultural significance. The panel concluded that although information on the effects of seismic surveys is sparse, there is some credible evidence that this activity can affect fish catchability. In addition, fishing patterns would be disrupted during seismic and drilling operations and release of drilling muds and other discharges could pose some hazards to marine life and productivity.

The United States controls most of Georges Bank (five/

sixths of the 300 km area), however, Canada controls the northeast peak, the area containing some of the best fishing grounds and most attractive petroleum structures. Although, the fishing community and environmentalists are pleased with the decision, the oil and gas industry had hoped to begin exploration on the bank and claim that they can operate on the bank without harming fish stocks. Georges Bank's natural gas reserves are estimated at greater than five trillion cubic feet. The moratorium will be reviewed again in 2010 and the debate will likely begin again on whether to allow oil and gas exploration on Georges Bank.

The Georges Bank Panel Review report can be downloaded at: <http://www.gov.ns.ca/petro/index.htm> under "Georges Bank Review Panel Report" or obtained from: Nova Scotia Government Bookstore, Ground Floor, One Government Place, 1700 Granville St., P.O. Box 637, Halifax, Nova Scotia, B3J 2T3, Canada, phone: 902-424-7580, fax: 902-424-5599, email: [lynchcd@gov.ns.ca](mailto:lynchcd@gov.ns.ca).

**Sources:** *Georges Bank Ban Extended; Ecologically Sensitive Area Safe from Exploration for Another 12 Years* by Judy Myrden. The Chronicle-Herald. Thursday, December 23, 1999. p. A3.

*Georges Bank Review Panel Report*, Nova Scotia Petroleum Directorate, Nova Scotia, Canada, June 1999, 83 pp.

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## NMFS Disapproves South Atlantic Council's Sargassum FMP

In December 1998, the South Atlantic Fishery Management Council (Council) completed a fishery management plan (FMP) for the pelagic seaweed, *Sargassum*<sup>1</sup> (See story in January 1999 issue of *Habitat Hotline Atlantic*, pp. 1-2). The FMP proposed to phase out the harvest of this seaweed based on concern over *Sargassum* as important and essential fish habitat for several fish species managed by the Council. Limited harvest would have been allowed until January 1, 2001. After this date, harvest and/or possession would have been prohibited in federal waters (3-200 miles offshore).

In December 1999, the National Marine Fisheries Service (NMFS) disapproved the Council's *Sargassum* FMP<sup>2</sup> based on the failure of the FMP to specify a maximum sustainable yield (MSY) or to adequately justify the specified optimum yield (OY) of zero. Although it may seem strange to think of determining these values for a seaweed, the Magnuson-Stevens Fishery Conservation and Management Act requires that these values be determined for any fishery managed under an FMP.

The major difference between the Council FMP and the management actions suggested by NMFS in its disapproval notice stem from a disagreement about whether a total prohibition of harvest is necessary in order to protect, conserve, and enhance the abundance of this seaweed and its associated fauna. NMFS has suggested "several less restrictive management options that would allow the continued, but restricted, harvest of *Sargassum*, while ensuring minimal impacts to the habitat and the fauna associated with the *Sargassum* habitat, including the use of an on-board observer."<sup>3</sup> Since we first covered this story, the state of North Carolina has finalized its position as one of support for the prohibition on harvest or possession of *Sargassum* after January 1, 2001. The one current harvester of *Sargassum* in federal waters is from North Carolina.

In response to NMFS' disapproval, the Council plans to revisit the issue at their meeting scheduled for the week of March 9 at the Ocean Plaza Beach Resort in Tybee Island, Georgia. A public comment period has been scheduled as part of the Council's meeting on March 9. More information about the meeting is available from the council office 843-571-4366.

The EFH element makes this contentious issue even more interesting. EFH was designated by the Council approximately a year ago, but it is only now becoming integrated into fisheries regulation. This may indeed be considered its first test case for the South Atlantic region. Since *Sargassum* is a seaweed and not a marine animal, an additional challenge lies in applying assessment and management processes developed for fish. On top of this, consider that endangered sea turtles are involved, and the issue becomes even more complicated and contentious.

Numerous environmental and fishing groups are unhappy with NMFS' disapproval of the FMP. The National Coalition for Marine Conservation is lobbying for designation of the entire Sargasso Sea as a marine protected area, and has urged the U.S. government to take the lead internationally in working toward this goal. NCMC contends that allowing harvest in U.S. waters will make it difficult to get international agreement on prohibiting harvest in international waters<sup>3</sup>.

Controversy and contention are not new to fisheries management and seem to be part of the process when considering and trying to balance all interests (biological, ecological, and socio-economic). What is new is the element of EFH, and how it will be incorporated into the process and decision-making.

*Contacts: Roger Pugliese, South Atlantic Fishery Management Council, phone: 843-571-4366, Roger.Pugliese@noaa.gov and Steve Branstetter, NMFS, phone: 727-570-5305, steve.branstetter@noaa.gov.*

### Sources:

- 1 *FINAL Fishery Management Plan for Pelagic Sargassum Habitat of the South Atlantic Region*, South Atlantic Fishery Management Council, December 1998, 116 pp. (report available at <http://www.safmc.nmfs.gov/safmcweb/habitat/habitat.html>)
- 2 Notice of Agency Action, NMFS. Federal Register, December 15, 1999, vol. 64, no. 240, pp. 69989-69991. (notice available through [www.access.gpo.gov/su\\_docs/aces/aces140.html](http://www.access.gpo.gov/su_docs/aces/aces140.html))
- 3 *Ban on Sargassum Harvest Should Be Passed* by Ken Hinman, Salt Water Sportsman, February, 2000, pp. 40-44.

## Contaminated Sediments Report Available

Each year, six million dump truck loads of mud are dumped into America's oceans. Twice as much mud as was dredged to create the Panama Canal is dumped into the nation's rivers, lakes, estuaries, sounds and coastal waters. In all, 400 million tons of sediment scooped up from the bottom of ports and channels are dumped back into water that people drink from, swim in and eat fish from. And some of it is contaminated with toxics such as dioxin, DDT, PCBs, mercury, lead, arsenic and hydrocarbons, that are known to cause cancer, reproductive and developmental problems and immune system impairments in people.

These disturbing findings are included in a new book by Beth Millemann on contaminated sediments: *Muddy Waters - The Toxic Wasteland Below America's Oceans, Coasts, Rivers And Lakes*. The book may be purchased through the Coast Alliance. The book is listed at \$25, but national environmental groups can ask for a \$15 price, regional and state environmental groups can ask for a \$10 price, and individuals can ask for a \$5 price. Contact Coast Alliance at 202/546-9554 or by email at [jsavitz@coastalliance.org](mailto:jsavitz@coastalliance.org). For more information on contaminated sediments, contact Clean Ocean Action on 732/872-0111 or [milligan@monmouth.com](mailto:milligan@monmouth.com), or the Coast Alliance.

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# Back Issues of *Habitat Hotline Atlantic*

Back issues of *Habitat Hotline Atlantic* are available. Requests should be sent to Vanessa Jones at the Atlantic States Marine Fisheries Commission (202-289-6400; [vjones@asmfc.org](mailto:vjones@asmfc.org); ASMFC, 1444 Eye St., NW, Sixth Floor, Washington D.C., 20005). The lead story in each issue is listed below, as well as the contributing author/s. Please specify whether you want a copy of the entire issue (averages about 6 pages) or just the lead story.

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August 1999, Vol. VI, No. 3: **Lawsuit Charges Council FMP Essential Fish Habitat Provisions Inadequate** by Robin L. Peuser and Dianne Stephan (eds.).

April 1999, Vol. VI, No. 2: **Contamination of Sediments in Primary and Secondary Nursery Habitats in North Carolina Estuaries** by Courtney T. Hackney.

January 1999, Vol. VI, No. 1: **Fishery Management Council Prohibits *Sargassum* Seaweed Harvest** by Robin L. Peuser and Dianne Stephan (eds.).

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# NC Estuarine Trawling Reviewed

In July 1998, a petition was initiated to close inland waters to estuarine trawling in North Carolina's crab and shrimp fisheries. In August of that year, the Marine Fisheries Commission asked the NC Division of Marine Fisheries to prepare a report on the effects of estuarine trawling, including information on bycatch and the effects of bottom disturbance on habitat and estuarine productivity. A document entitled, "Shrimp and Crab Trawling in North Carolina Estuarine Waters<sup>1</sup>," was finalized in March 1999, and presented to the Marine Fisheries Commission in April. The report has since become available to the public and can be obtained from the NC Division of Marine Fisheries.

The report notes that while there are a number of studies that document the ecological effects of trawling on hard bottom surfaces, there are no studies that detail the effects on the bottom community in North Carolina waters, which consist primarily of sand and mud. For those studies that have been conducted, the effects of trawling on bottom communities are highly variable, ranging from no apparent impact, to the total elimination of some

species and simultaneous long-term changes to the benthos.

Since the release of the North Carolina report, a panel was convened to identify research proposals that would distinguish between the ecological impacts of trawling on the benthos from the ecological impacts of natural forms of disturbances. A research plan has been developed, but funding has not been available. Work is being conducted with the National Marine Fisheries Service to better understand the effects of trawling on soft bottom habitat. Until the effects of bottom trawling on soft bottom can be documented, neither the General Assembly nor the Marine Fisheries Commission has any plans for instituting a trawling ban in these fisheries. Currently, approximately 46% of the state's estuarine waters are closed to trawling for protection of seagrass, nursery areas, and oyster beds.

*<sup>1</sup>To obtain a copy of the report contact Georgia Mason with the NC Div. of Marine Fisheries, phone: 252-726-7021 or email: Georgia.Mason@ncmail.net.*

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