

Coastal Wetland Dieback: the Phenomenon of Marsh Browning & Marsh Dieback

By Leah Stetson, ASWM

Wetland scientists and riverkeepers have observed a distinct, disturbing change in the coastal marsh landscape since the 1990s—in the pan handle of Florida, and since 2000—in Louisiana, Georgia and Virginia, as the once green, intertidal smooth cord grass (*Spartina alterniflora*) turned unusually brown at a rapid rate, then died. The specific details of the dieback vary significantly from place to place. For example, in some cases, the original vegetation reestablished itself at the dieback sites, whereas in others, different vegetation supplanted the previously dominant species; yet in other marshes, vegetation remains absent.



Spartina alterniflora and *S. patens* both affected at a marsh dieback site on Cape Code. Photo by Dr. Stephen Smith, Plant Ecologist, Cape Cod National Seashore

Scientists in the South Call it ‘Marsh Browning’

Marsh browning and sudden wetland dieback affected over 100,000 acres of smooth cord grass in Louisiana salt marshes during the summer of 2000, which scientists and wetland professionals perceived as unusually extreme. Marsh browning does affect other salt marsh grasses besides cord grass, except—in some cases, salt grass and other salt-tolerant grasses, which do not appear affected by the phenomenon in Louisiana.

Salt marshes typically have small areas that are constantly changing, dying and regenerating. Most of the salt marshes in Louisiana, for example, have been eroding and subsiding for decades. What is new and significant about the brown marsh phenomenon is that the diebacks have occurred on a much larger scale over a period of several months.

What are *marsh browning* and *marsh dieback*?

Marsh browning is the rapid and unusual browning of intertidal plants. The dieback is the area where the grasses turn brown and die; this is said to be “natural” when the dieback is a small area. When marsh dieback is sudden and large-scale, there is a threat of large-scale habitat loss, among other factors. Dieback usually coincides with drought and occurs over several months. For further definitions and information about *marsh browning* and *marsh dieback* and its occurrence in Louisiana (2000-present), visit <http://www.brownmarsh.net/>. Further useful links can be found below.



Stephen Smith, NPS photos

Sudden Wetland Dieback in New England

More recently the marsh browning and dieback phenomenon has been observed along the coast of New England. There were reported wetland diebacks in Connecticut and Rhode Island in 1999; a few years later, Cape Cod observed marsh browning. The Wellfleet marshes on Cape Cod have been reported as showing the largest amounts of dieback observed in the region, with up to approximately 12% of the marsh area affected. Stephen Smith, Ph.D., Plant Ecologist at the Cape Cod National Seashore, is in the process of writing a report entitled, *Understanding salt marsh dieback on lower Cape Cod: monitoring, research, and the current state of our knowledge*, which was the subject of a recent discussion at a State of Wellfleet Harbor conference held in November 2006. For an abstract of Dr. Smith's upcoming report, along with his contact information, visit: http://www.aswm.org/member/wetlandnews/sm_dieback_abstract_nov2006.pdf

One of the most recent reports of sudden wetland dieback has come from the mid-Atlantic region. Delaware first observed wetland dieback in 2006. Studies are underway to explore the causes and extent of the dieback at the Center for the Inland Bays. For more information contact Chris Bason, chrisbason@inlandbays.org.

Literature, Studies & Projects

According to this year's USGS report on a project involving data from salt marsh browning and marsh dieback in Louisiana during 2000-2001, several possible causes of dieback were eliminated, including hypersalinity, while other causal factors remain in question. For example, one of the factors was lack of water but as some of the sites were flooded at the time of the surveys, drought could neither be ruled out nor determined as a cause. The study also revealed that the dieback sites held higher concentration of pyrite and acid-extractable aluminum and iron. Other factors, such as pre-existing stress conditions for acute dieback, were mentioned but the authors of the study stated that these stress conditions are yet unknown.

A major finding in the 2006 USGS report was that the effects of the marsh dieback in Louisiana were spatially related and affected different species, e.g. cord grass but not salt grass. Interior marsh areas were affected more severely than shoreline marsh areas. This spatial pattern of dieback and the differential susceptibility of marsh species were also observed in studies of New England marsh dieback sites. To view the entire USGS report, Salt Marsh Dieback in Coastal Louisiana: Survey of Plant and Soil Conditions in Barataria and Terrebonne Basins, June 2000-September 2001 by Karen L. McKee, Irving A. Mendelssohn, and Michael D. Materne, go to: <http://pubs.usgs.gov/of/2006/1167/>

Since its first appearance at Cape Cod National Seashore in 2003, wetland dieback has been a subject of study and monitoring. Researchers at Cape Cod National Seashore were in the process of monitoring dieback patches and determining possible causes of wetland dieback in 2004 and 2005. In addition to monitoring, the scientists at Cape Cod National Seashore have worked with the Atlantic Research Learning Center to draw further researchers interested in a more in-depth collaborative project that would study the extent, nature and causes of salt marsh dieback on the Cape. To learn more details about the monitoring of dieback patches and to read the Annual Administrative

Report and Work Plan for the Cape Cod National Seashore Prototype Monitoring Program for FY 2004- FY 2005, go to:

http://www.nature.nps.gov/im/units/caco/PDFs/CACO_FY0405_aarwp.pdf

If you are interested in doing research at Cape Cod National Seashore, this links directly to the contact page for the Atlantic Research Learning Center:

http://www.nps.gov/archive/caco/resources/CACO_LC/Contacts.htm

Is Marsh Dieback Caused by a Fungus?

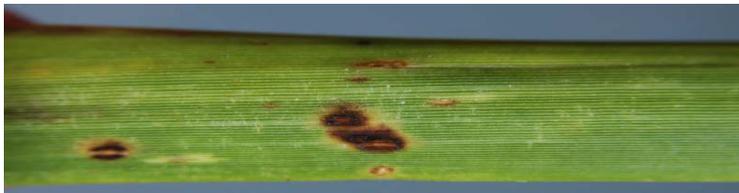
Scientists with the USGS have begun to test a relatively new hypothesis based on the effect of an African-born fungus on Caribbean coral reefs, which may have been a contributing factor in sea urchin die-offs. Now scientists need to figure out whether the fungus, tentatively classified as *Fusarium*, is a causal factor for salt marsh dieback. One plant pathologist, Dr. Wade Elmer, at the Connecticut Agricultural Experiment Station, is undertaking research on *Fusarium*'s effects on plants in New England wetlands. To see a list of his research publications on *Fusarium*, click on this link to his professional page:

<http://www.caes.state.ct.us/Biographies/ElmeWade.htm> For an abstract that was presented as a poster at the Oct 26-28 New England Estuarine Research Society (NEERS) meeting in New London, CT on *Fusarium Species Associated with Declining Spartina in Areas Affected by Sudden Wetland Dieback* by W. Elmer, C. Robertson, S. Useman, et. al., visit: http://www.aswm.org/member/wetlandnews/elmer_neer_1106.pdf

Dr. Elmer is willing to receive samples of *Spartina* from areas where dieback has occurred. For details on how data must be collected for this purpose, please go to: http://www.aswm.org/member/wetlandnews/sampling_protocol_for_sending_spartina_plants_1106.pdf

In addition to the research on *Fusarium* fungus in the northeast, Dr. Raymond Schneider at the Louisiana State University Agricultural Center has also argued that marsh dieback might be caused by *Fusarium*. During periods of stress, *Fusarium* causes vulnerable plants to die, according to Dr. Schneider. For a direct link to Raymond Schneider and Susan Useman's 2005 presentation on *The Possible Role of Plant Pathogens in Louisiana's Brown Marsh Syndrome*, visit:

http://www.csc.noaa.gov/cz/2005/CZ05_Proceedings_CD/pdf%20files/Schneider.pdf



Black leaf spot of *Spartina alterniflora* caused by the same strains of *Fusarium* sp. Associated with brown marsh syndrome. Photo by Dr. Raymond Schneider, Louisiana State University Agricultural Center

Recent Workshops on Marsh Dieback

In a collaborative effort to organize current research on sudden wetland dieback, the U.S. Fish & Wildlife Service, National Park Service – Cape Cod National Seashore, and the Connecticut Department of Environmental Protection – Office of Long Island Sound Programs organized a workshop series, which occurred over the past two years with added assistance from New England Estuarine Research Society. Topics ranged from salt

marsh vegetation loss at particular sites including Jamaica Bay and Cape Cod to possible causes of dieback to disease control—all with the shared objective of developing an integrated network of interested people, who want to explore this phenomenon.

To see the presentation materials from the 2006 workshop speakers, visit:
http://www.fws.gov/northeast/parkerriver/Workshop_Proceedings_2006_AppdxB.pdf

For a look at the prior workshop's proceedings, held in 2005, go to:
http://www.fws.gov/northeast/parkerriver/diebackworkshop_final.pdf

Useful Links for More Information on Marsh Dieback

Georgia Coastal Research Council -- <http://www.gcrc.uga.edu/index.htm>

Salt Marsh Dieback in Louisiana -- <http://brownmarsh.net>

Coastal Wetlands Planning, Protection & Restoration Act Task Force --
Breaux Act website or call the Louisiana Governor's Office of Coastal Activities
at 225-342-3968 -- www.LAcoast.gov/brownmarsh

Coastal Wetlands Planning, Protection and Restoration Act --
http://www.fws.gov/laws/laws_digest/COASWET.HTML

USGS National Wetlands Research Center – Coastal Marsh Dieback
<http://www.nwrc.usgs.gov/about/web/brwnmrsh.htm>

New England Sudden Wetland Dieback -- <http://wetland.neers.org/>
Updated by New England Estuarine Research Society -- <http://www.neers.org/>

Center for the Inland Bays – Projects and Research on Dieback in Delaware
http://www.inlandbays.org/cib_pm/saltmarsh-db-pages.php?id=165_0_42_0_C

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