Spatial and Temporal Distribution of Coastal Marsh Dieback in Louisiana, 2000 - 2002, as Determined from Aerial Surveys

Contact Name(s): Dr. Thomas C. Michot , Christopher J. Wells, R. Scott Kemmerer

Contact Affiliation/Info:

T. Michot (U.S.G.S.–National Wetlands Research Center, tommy_michot@usgs.gov, 337–266-8664)

C. Wells (U.S.G.S.–National Wetlands Research Center, chris_wells@usgs.gov 337–266–8651

S. Kemmerer (JCWS–National Wetlands Research Center, scott_kemmerer@usgs.gov, 337-266-8669)

Participating Investigators/Affiliation: U.S. Geological Survey: T. Michot, C. Wells

Study Initiated: October 2001 **Anticipated Completion Date**: August 2002

Funding Source: Louisiana Department of Natural Resources

Study Site Location(s): Coastal Louisiana

Keywords (highlight or circle):

Avicennia	*Juncus*	Restoration	Transplants
Climate	Mapping	Salinity	Water chemistry
Elevation	Microbes	*Spartina*	
Fauna	Monitoring	Photography	Other*: Aerial Surveys*
Greenhouse	Nutrients	Sediment	
Herbivory	Plant tissue analysis	Soil chemistry	
Hydrology	Remote sensing	Toxins	

Project Type:

Descriptive	Experimental	Restoration	Modeling
Other Monitoring			

Project Outline:

Specific Aims: Perform monthly aerial surveys to monitor and map the status and health of Louisiana coastal marshes and the extent of dieback impact.

Methodology:

Monthly or bimonthly aerial surveys were made over coastal Louisiana from June 2000 through August 2002 from a single-engine, fixed-winged amphibious aircraft (Cessna 185) owned and operated by the U.S. Department of the Interior (U.S. Geological Survey [USGS]). The aircraft was configured with a voice/global positioning system (GPS)/moving map system (Hodges 1999) that linked the aircraft's GPS, intercom system, and laptop computers so that each voice observation from the pilot or observer was assigned to a specific latitude, longitude, and time. The system also allowed geospatial points, the flight track of the aircraft, its present position, and the location of recent voice observations to be simultaneously displayed on a

1:250,000-scale digital map image in a computer monitor screen mounted on the aircraft's instrument panel in view of the pilot and observer.

The flight crew consisted of a pilot and an observer. Every five seconds, as determined from a digital elapsed-time indicator on the instrument panel, both the observer and the pilot assessed the general appearance and color of the marsh adjacent to the aircraft, directly beneath the wing, on their respective sides. The appearance/color of the marsh was assigned to one of five categories based on the estimated percent of brown (as opposed to green) vegetation that was visible on the patch of marsh (Table 1). For the initial flight (June 2000) we used only the four color categories (G, G/B, B/G, and B), but as the study progressed, we modified the classification system. We decided after the first flight that a given patch of marsh classified as "Brown" (i.e., 85 – 100% brown vegetation) may or may not have been completely dead because standing brown, or mostly brown, vegetation can still be viable. Therefore, we added a fifth category, "Dead," to describe a patch of vegetation that was grayish-brown or brownish-gray in color, and for which the plants appeared matted and/or degraded on the marsh surface, as opposed to standing brown vegetation that appeared to be still viable. By November 2000 we had added the term "Deadflat" to describe dead areas that had become completely devoid of vegetation. We could easily distinguish these areas from unvegetated tidal flats that existed prior to this dieback event because tidal flats were lower in elevation and had a well-developed marsh shoreline that separated them from the surrounding marsh. In contrast, the "Deadflats" appeared to be the same elevation as the surrounding marsh, without a well-developed shoreline, and often had a sparse covering of stubble or remnant sprigs from the vegetation that had previously covered them.

Additional modifiers were later developed to provide a more detailed description of the five basic categories. These included "Burned," "Mangrove," and "Sparse." Thus an area that would have been initially described as "Brown" may have been called "Brown-mangrove" in a later survey, thus retaining the original method and description but allowing new information to be incorporated within that framework. We also added color modifiers to deadflat areas, during the revegetation phase, to indicate the color of vegetation that was colonizing the open deadflats. We do not present data from the modifiers in this report, but those data area available upon request from the authors. For classification of patches we used the 30% rule (Cowardin et al. 1979), e.g., an area was classified as "Deadflat" if the open area was greater than 30%, but it was classified as normal marsh with one of the four color categories if vegetation coverage was at least 70%.

The aircraft was flown at an altitude of 50 m above ground level with airspeed maintained at approximately 90 knots (nautical miles per hour). The pilot and observer viewed the marsh from a continuous perspective defined by the window frame, pontoon, and wing strut. The viewing area of the marsh was about 100 meters in diameter. These observations were recorded using the "Record" program of the voice/GPS/moving map system (Hodges 1999).

Following each flight, the voice observations were transcribed by using the "Transcribe" program of the voice/GPS/moving map system (Hodges 1999) to digitize the voice observations and link them to GPS locations and time. Once transcribed, the biological, geographical and temporal information was imported into Excel™ spreadsheet files. We then imported all transcribed data into a geographical information systems (GIS) software package (ArcView 3.2a) to produce maps showing affected marsh distribution and to perform other spatial relationship functions. Marsh status observations were displayed on a LANDSAT Thematic Mapper satellite image of south Louisiana (Braud 2000) with coastal marsh salinity-

type data from Chabreck et al. (2001). We used GIS-generated habitat data to determine total affected acreage by parish by salinity type.

Results to Date

Dieback increased from June 2000 (35,000 acres) to March 2001 and peaked (126,891 acres), in which:

- 95% of the affected Deltaic Plain acreage was in saline marsh
- 90% of the affected marsh acreage was in Terrebonne and Lafourche Parishes

Observed a steady decrease of affected acreage to August 2002 (35,000 acres) and again to June 2003 (17,000 acres).

All coastal parishes and all marsh types were affected with the majority of the dieback acreage occurring in saline marsh, primarily in Terrebonne and Lafourche parishes.

As of late 2003, most of the saline marsh dieback sites have recovered.

Still a significant number of sites that have not completely revegetated.

In 2002 -2003 the Chenier Plain showed an increase in dieback area of non-saline marsh types.

Lessons Learned

Publications, reports, or web-accessible materials

Reports are being produced and finalized in house, and are not ready for publication.