

Aultiple scenes of Landsat Thematic Mapper (TM) satellite imagery were peppered by marsh balls and other debris, were present throughout the

inety percent of the new water area appearing after the hurri

ral-rich brackish and saline marshes appeared to have fared

by the lack of large new water areas in central Bretor

nities classified in 2001 (Chabreck and others,

canes in Breton Sound basin occurred within the 2001 fresh and intermec

Water Area Changes in Southeastern Louisiana After Hurricanes Katrina and Rita Detected with Landsat Thematic Mapper Satellite Imagery

of a mile or more in the North Shore marsh. The ober 2004, as observed when comparing the fall 2001 to the fall d others, 2003: Morton and others, 2005). Some images as obscured by clouds and cloud shadow. The classified data sets were rected for cloud coverage and mosaicked together to provide complet and-water coverage for each period. Areas west of the Mississippi River, with the exception of the areas east of Katrina's landfall, were impacted more by Rita than by Katrina, as observed guired on September 15, 2005, after ndfall. Areas of significant shoreline erosior d November 7, 2004, was used to rep upper Breton basin and ne basin to the Atchafala imarily occurred in fresh and intermediate marshe River. These although similar effects were observed in brackish marshes. ing aguatic vegetation were shifted or Rita's surge. Some of the new water and land area changes i and Isle, La., tide gauge (NOS #876172 pacts. Water level effects are also noticeable in the marshe ced by exposure of flats during low id-Oct. 2005) was acquir on the October, 25, 2005, image versus higher water water level co ons (Morton and others, 2005) evels on the November 7, 2004, imag ntification of land-water changes was based on comparison of the fall The combined impacts of Katrina and Rita (identified using TM imagery from 1983 to the present) exceeded impacts from other hurricanes in ricane Andrew). The largest TM-identified ili (Oct. 3, 2002) was 175 acres, althoug li or Tropical Storm Isido ity estimates. The land-water mosaics were masked was equivalent to 60 percent of the total increase in water area betwee rea (LCA) boundary to provide spatial col tency with prior 1956 and 2004. land-water change assessments (Barras and others, 2003). Data areas were summarized by major hydrologic basin as defined by the Coastal Wetlands References: Planning, Protection and Restoration Act (CWPPRA) (1993) and were Barras, J., Beville, S., Britsch, D., Hartley, S., Hawes, S., Johnston, J., Kemp, P., Kinler, masked to match the LCA area, excluding fastlands. Remnant hurricane Q., Martucci, A., Porthouse, J., Reed, D., Roy, K., Sapkota, S., and Suhayda, J., flooding located within leveed fastlands was not included in the land-water 2003, Historical and projected coastal Louisiana land changes: 1978area comparison. Total increase in water area within the 9,742-mi2 area, 2005, historical and projected coastal coustant and changes. 197 between fall 2004 and mid-October 2005 was 118 mi2. Coastal Wetlands, Planning, Protection and Restoration Act, 1993, New water areas appearing after the hurricanes were identified by spatially Reports: Louisiana coastal wetlands restoration plan: Lafayette, La., U.S comparing the classified land-water datasets to produce an output change Geological Survey, National Wetlands Research Center, http://www.lacoast.gov/reports/cwcrp/ dataset identifying new water and land areas occurring by mid-October 1993/index.htm, accessed 02/04/2006. 2005. The land-water change dataset was filtered to remove changes below 2.5 acres, to remove "noise," and to increase the confidence of the Morton, R., Bernier, J., Barras, J., and Fernia, N., 2005, Rapid subsidence and historical wetland loss in the Mississippi Delta Plain, likely causes and future implications: U.S. Geological Survey new-water area interpretation. Changes in water area that were identified by Landsat were verified by review of multi-date, multi-resolution imagery bracketing the hurricanes, Open-File Report 2005-1216, 42p. by small-plane overflight of TM-identified new water bodies on November 18 and December 9, 2005, and by limited field investigations. The imagery review indicated origin, variability, and duration of new water bodies. The small-plane overflight provided a quick and efficient way to verify the existence of new or expanded water bodies over southeastern Louisiana. Field investigations provided water depth information for selected new water bodies adjacent to Lake Leary, within the Breton Sound basin. According to the NOS Grand Isle gauge, daily average water levels during both verification flights were within 2.4 inches of the lower water levels shown on the October 25, 2005, Landsat image that covered the majority of the study area. The smallest new water body identified with TM imagery and verified by small-plane overflight was approximately 4 acres in the Bayou Biloxi marsh. The largest new lake was approximately 1,200 acres in the upper Breton Sound basin. Lake Verret The map depicts Katrina's and Rita's direct impacts to the coastal wetlands f southeastern Louisiana. New water bodies and expanded water bodies formed on the eastern side of the Mississippi River basin; the northwestern portion of the Breton Sound basin, from Delacroix to Caernarvon; the northern and eastern shorelines of Lake Borgne; and along the north shore of Lake Pontchartrain from Mandeville to the Mississippi border, including extensive impacts in the Pearl River basin. Many of the new water areas consist of shallow ponds where the marsh surface has been sheared or ripped to the root mat or to the underlying firm substrate of clay by storm surge. Remnant marsh balls and other debris, not large enough to be identified with TM imagery, litter some of the sheared areas, while other areas appear as large shallow ponds or lakes with large areas of exposed mud flats that vary depending on water level. Groups of small interconnected ponds have been expanded in some areas by the shearing of the intervening marsh. Areas of floating fresh marsh and some scrub/shrub ere completely removed in the northern Pearl River basin, while a series of shears was cut across the southern portion of the basin. The fresh marsh in northwestern Breton Sound basin was completely rearranged, displaying multiple NW-SE trending shears. Large deposits of wrack accumulated adjacent to and/or on top of spoil banks and natural distributary channels and often completely surrounded willows and shrubs. Shallow mudflats, Lake Palouro Atchafalaya Terrebonne Basin Basin Atchafalaya Bay Gulf of Mexico

Produced by: U.S. Department of the Interior U.S. Geological Survey National Wetlands Research Center **Coastal Restoration Field Station** Baton Rouge, Louisiana

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