



National Wetlands Research Center

Land Area Changes in Coastal Louisiana After the 2005 Hurricanes

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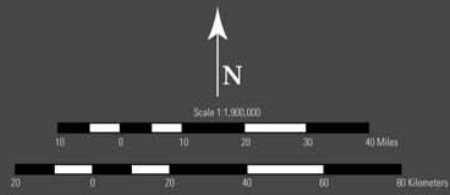
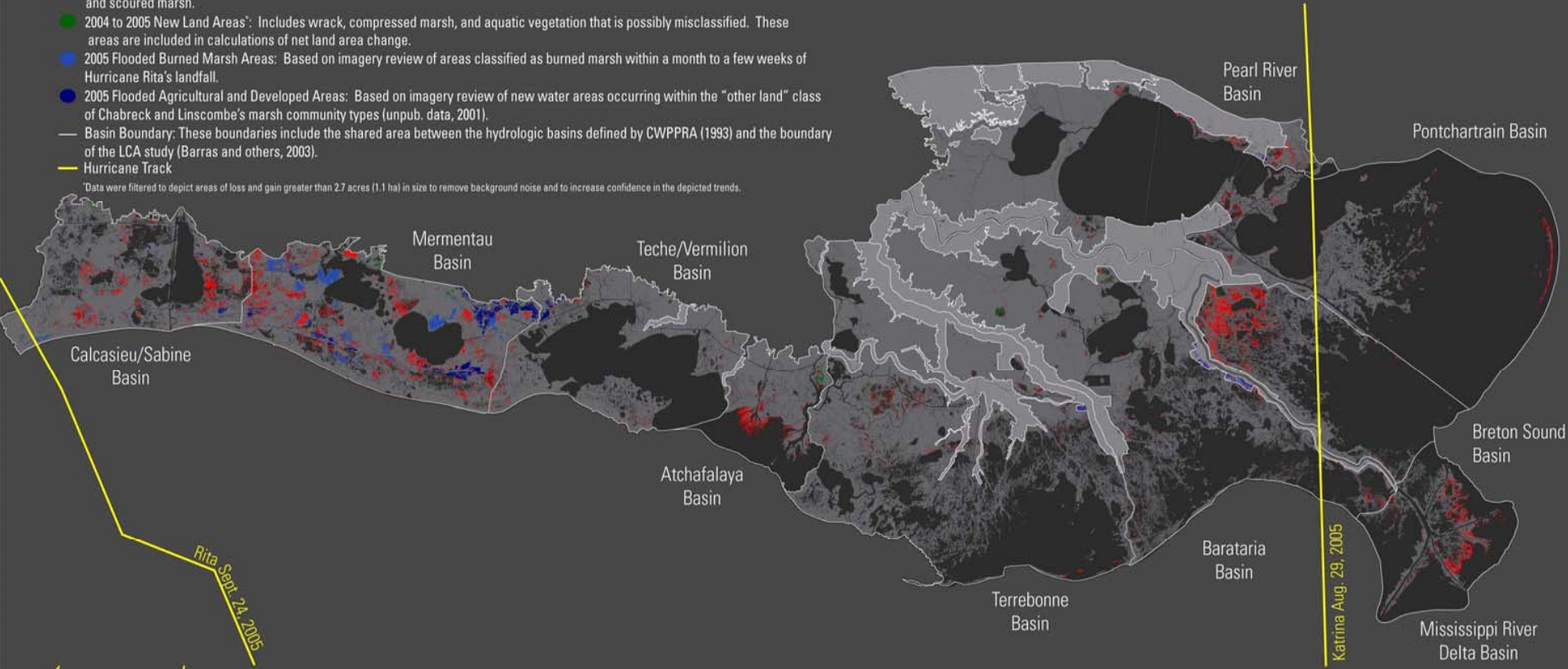
Regional Change Assessment

- Purpose
 - Provide preliminary information on land area changes shortly after Hurricanes Katrina and Rita.
 - Serve as a regional baseline for monitoring wetland recovery following the 2005 hurricane season.
- Estimation of permanent losses cannot be made until several growing seasons have passed and the transitory impacts of the hurricanes are minimized...
- Maps, methodology texts, area tables by basin, and charts are downloadable:
 - <http://pubs.usgs.gov/of/2006/1274/>

Land Area Change in Coastal Louisiana After the 2005 Hurricanes: Overview

- 2005 Land
- 2005 Water
- Fastlands: Agricultural, developed, and upland areas surrounded by levees that are generally considered non-wetlands (LOSR, 2002) and that are excluded from calculations of net land area change.
- 2004 to 2005 New Water Areas (Decreased Land Areas)*: Includes flooded marsh, sheared marsh, eroded marsh, and scoured marsh.
- 2004 to 2005 New Land Areas*: Includes wrack, compressed marsh, and aquatic vegetation that is possibly misclassified. These areas are included in calculations of net land area change.
- 2005 Flooded Burned Marsh Areas: Based on imagery review of areas classified as burned marsh within a month to a few weeks of Hurricane Rita's landfall.
- 2005 Flooded Agricultural and Developed Areas: Based on imagery review of new water areas occurring within the "other land" class of Chabreck and Linscombe's marsh community types (unpub. data, 2001).
- Basin Boundary: These boundaries include the shared area between the hydrologic basins defined by CWPPRA (1993) and the boundary of the LCA study (Barras and others, 2003).
- Hurricane Track

*Data were filtered to depict areas of loss and gain greater than 2.7 acres (1.1 ha) in size to remove background noise and to increase confidence in the depicted trends.



Regional Change

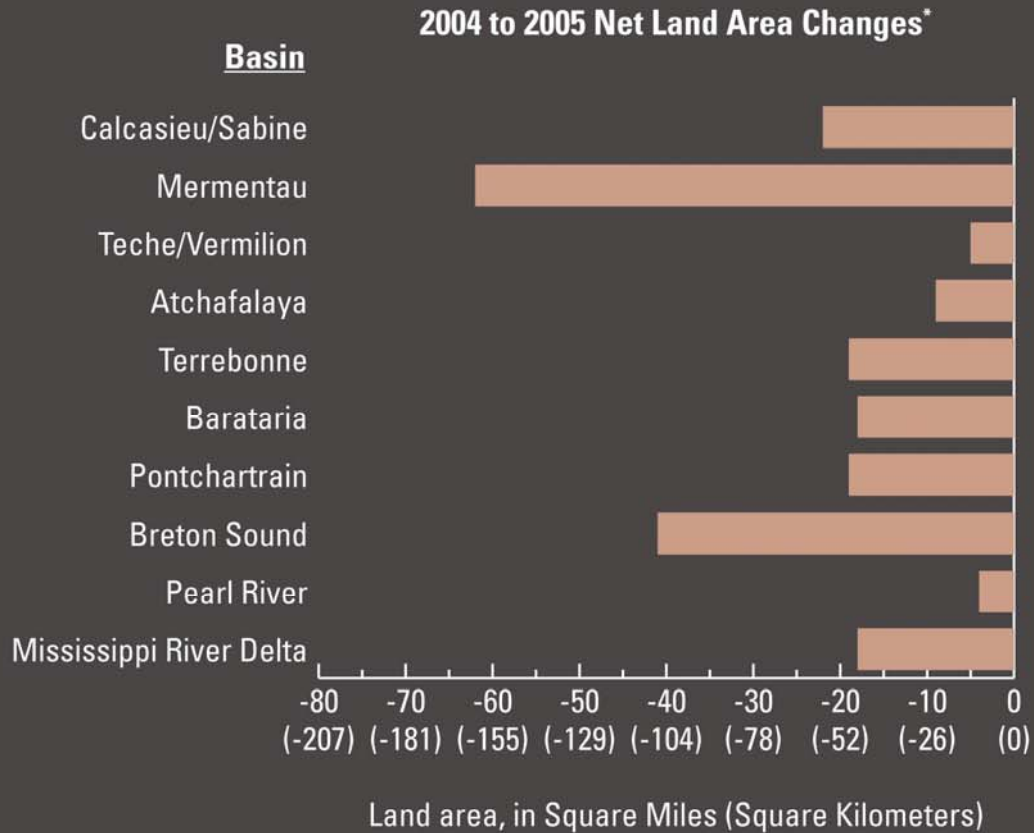
Land Area Changes October 2004 to October 2005	
Basin	Land area (mi²)
Calcasieu/Sabine	-22
Mermentau	-62
Teche/Vermilion	-5
Atchafalaya	-9
Terrebonne	-19
Barataria	-18
Mississippi River Delta	-18
Breton Sound	-41
Pontchartrain	-19
Pearl River	-4
Total	-217



Data Source:

Barras, John A., 2006, Land area change in coastal Louisiana after the 2005 hurricanes—a series of three maps: U.S. Geological Survey Open-File Report 06-1274

2004 to 2005 Net Land Area Changes Graph



*2004 to 2005 net land decrease: 217 mi² (562 km²)

Source: Open-File Report 2006-1274, Land Area Change in Coastal Louisiana After the 2005 Hurricanes: A Series of Three Maps

Land Area Change in Coastal Louisiana After the 2005 Hurricanes: Overview

Land Area Change in Coastal Louisiana After the 2005 Hurricanes: A Historical Perspective (from 1956)

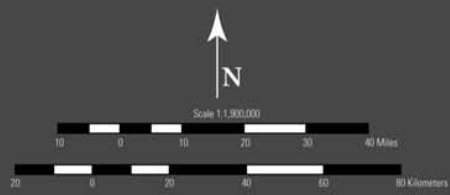
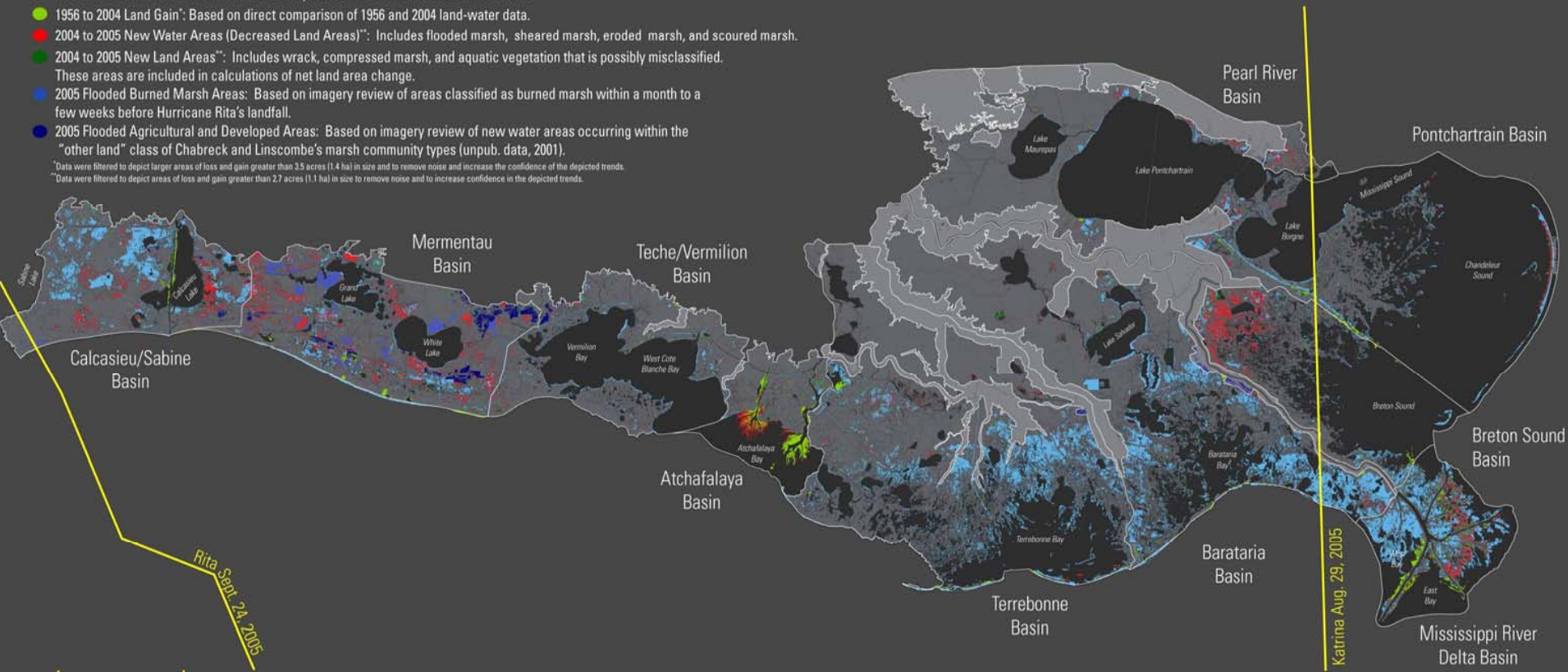
- 1956 Land
- 1956 Water
- Fastlands: Agricultural, developed, and upland areas surrounded by levees that are generally considered non-wetlands (LOSR, 2002) and that are excluded from calculations of net land area change.
- LCA Area Not Included in the 1956 Data Coverage
- 1956 to 2004 Land Loss¹: Based on direct comparison of 1956 and 2004 land-water data.
- 1956 to 2004 Land Gain²: Based on direct comparison of 1956 and 2004 land-water data.
- 2004 to 2005 New Water Areas (Decreased Land Areas)³: Includes flooded marsh, sheared marsh, eroded marsh, and scoured marsh.
- 2004 to 2005 New Land Areas⁴: Includes wrack, compressed marsh, and aquatic vegetation that is possibly misclassified. These areas are included in calculations of net land area change.
- 2005 Flooded Burned Marsh Areas: Based on imagery review of areas classified as burned marsh within a month to a few weeks before Hurricane Rita's landfall.
- 2005 Flooded Agricultural and Developed Areas: Based on imagery review of new water areas occurring within the "other land" class of Chabreck and Linscombe's marsh community types (unpub. data, 2001).

— Basin Boundary: These boundaries include the shared area between the hydrologic basins defined by CWPRA (1993) and the boundary of the LCA study (Barras and others, 2003).

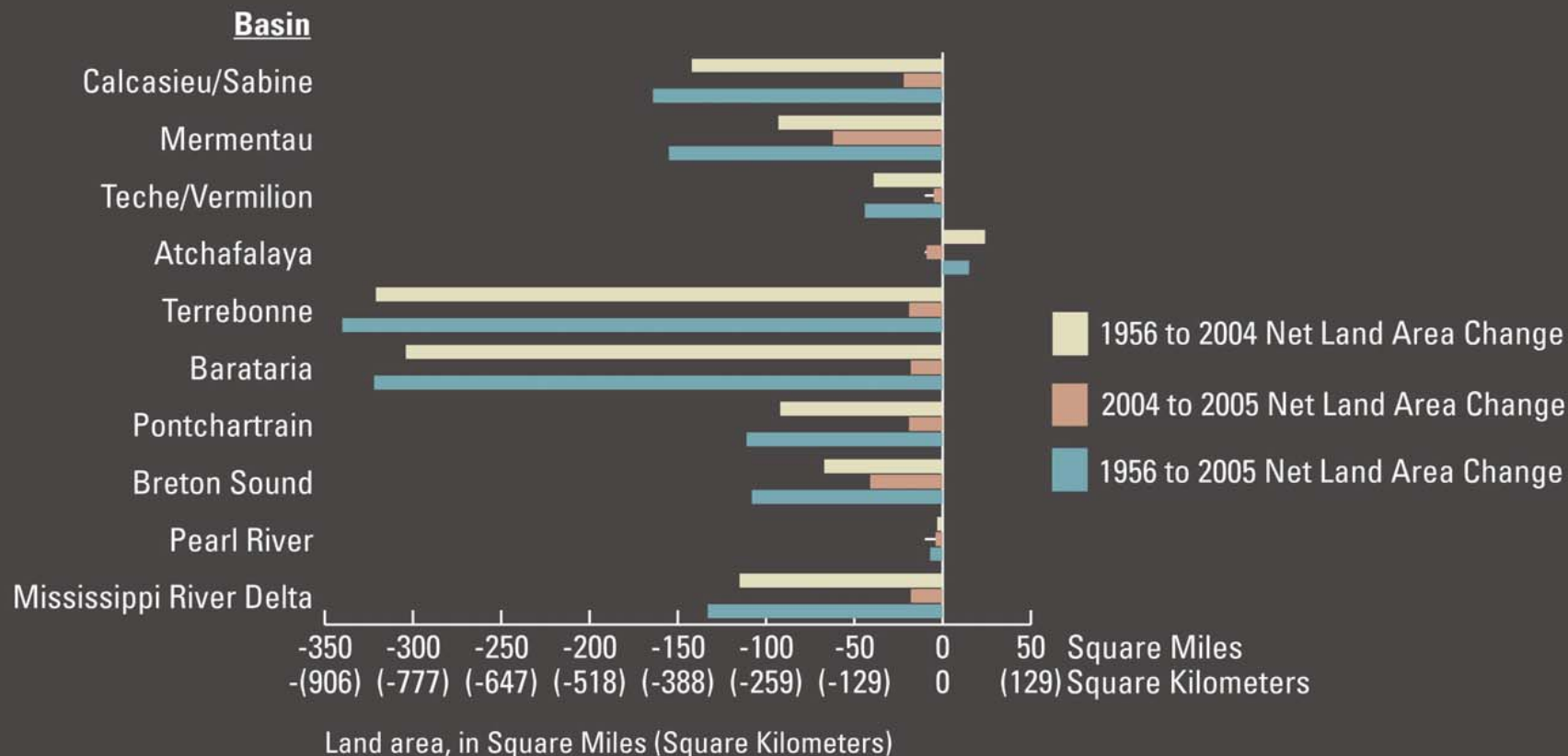
— Hurricane Track

¹Data were filtered to depict larger areas of loss and gain greater than 3.5 acres (1.4 ha) in size and to remove noise and increase the confidence of the depicted trends.

²Data were filtered to depict areas of loss and gain greater than 27 acres (1.1 ha) in size to remove noise and to increase confidence in the depicted trends.



1956 to 2004 and 2004 to 2005 Net Land Area Changes Graph*



*The 1956 to 2004 net land decrease is 1,149 mi² (2,975.91 km²). The 2004 to 2005 net land decrease is 218 mi² (564.62 km²), which slightly varies from the 217 mi² given elsewhere in this report. The variation results from matching the CZB (1956) and LCA (2004 to 2005) data sets, as discussed in this methodology.

Source: Open-File Report 2006-1274, Land Area Change in Coastal Louisiana After the 2005 Hurricanes: A Series of Three Maps

Land Area Change in Coastal Louisiana After the 2005 Hurricanes: A Historical Perspective (from 1956)

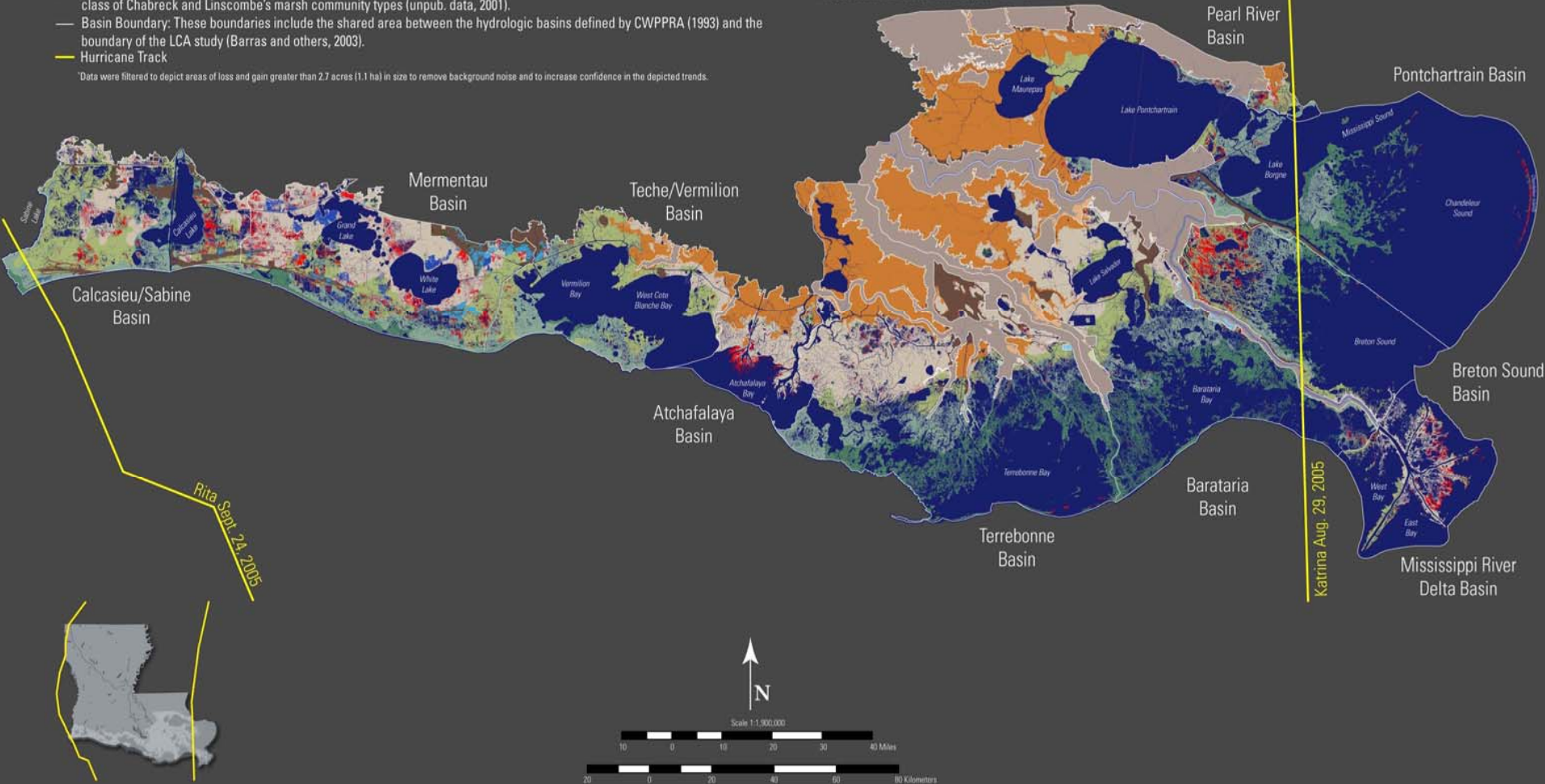
Land Area Change in Coastal Louisiana After the 2005 Hurricanes: Marsh Communities

- **Fastlands:** Agricultural, developed, and upland areas surrounded by levees that are generally considered non-wetlands (LOSR, 2002) and that are excluded from calculations of net land area change.
- **2004 to 2005 New Water Areas (Decreased Land Areas):** Includes flooded marsh, sheared marsh, eroded marsh, and scoured marsh.
- **2004 to 2005 New Land Areas:** Includes wrack, compressed marsh, and aquatic vegetation that is possibly misclassified. These areas are included in calculations of net land area change.
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- **2005 Flooded Agricultural and Developed Areas:** Based on imagery review of new water areas occurring within the "other land" class of Chabreck and Linscombe's marsh community types (unpub. data, 2001).
- **Basin Boundary:** These boundaries include the shared area between the hydrologic basins defined by CWPPRA (1993) and the boundary of the LCA study (Barras and others, 2003).
- **Hurricane Track**

- **Swamp****
- **Fresh Marsh****
- **Intermediate Marsh****
- **Brackish Marsh****
- **Saline Marsh****
- **Other Land**:** Includes agricultural areas, developed areas, and upland areas.
- **Fall 2005 Water**

**Incorporates 2005 land areas classified by 2001 marsh communities.

*Data were filtered to depict areas of loss and gain greater than 2.7 acres (1.1 ha) in size to remove background noise and to increase confidence in the depicted trends.



Regional Change by 2001 Marsh Communities

2001 Marsh Community Changes October 2004 to October 2005		
Community type	Land area (mi²)	% 2004 Land area change
Forested Wetlands	-1	-0.1%
Other Land	-26	-6.5%
Fresh Marsh	-122	-7.9%
Intermediate Marsh	-90	-8.3%
Brackish Marsh	-33	-3.8%
Saline Marsh	-28	-4.1%
Water*	300	4.3%

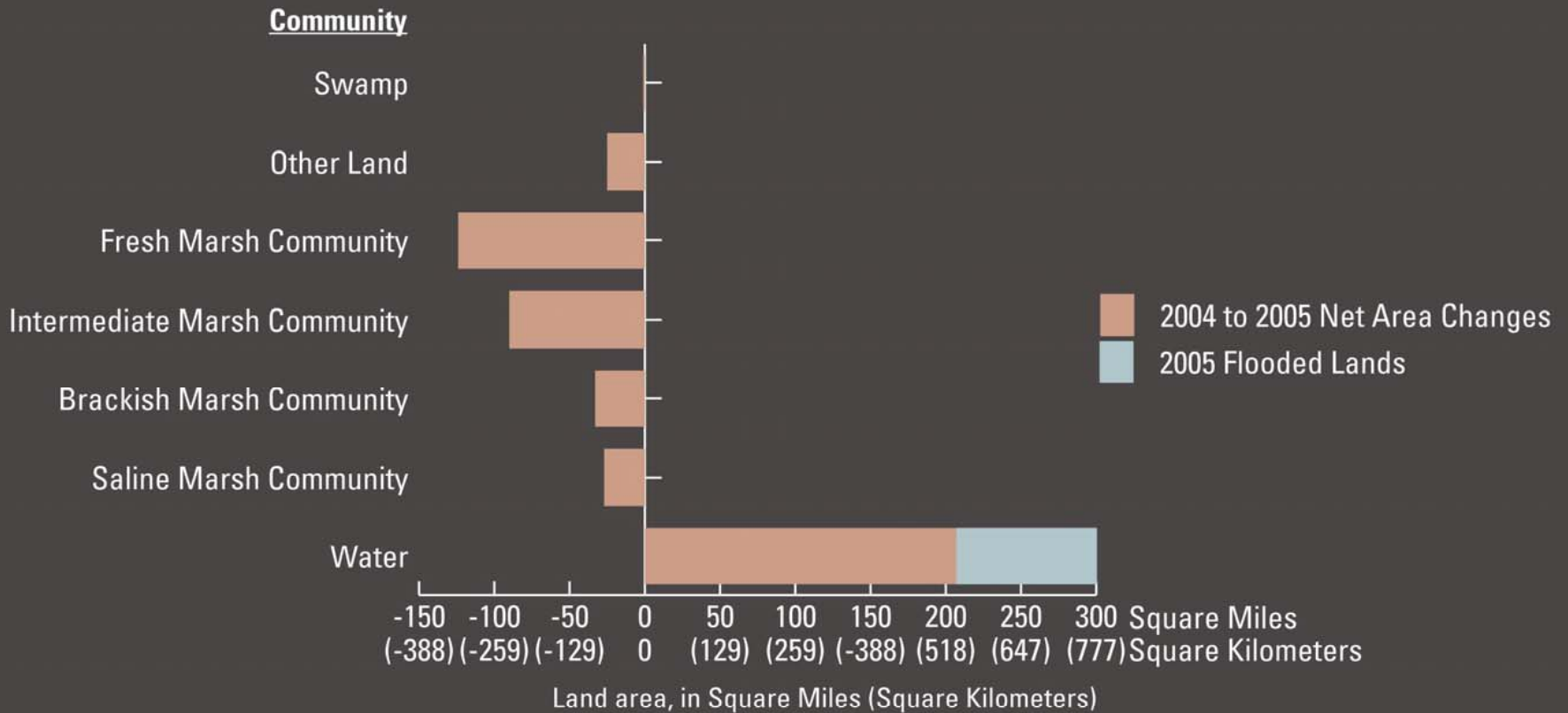
*Includes 83 Mi² of flooded lands. 2004 to 2005 net land decrease: 217 Mi².



Data Source:

Barras, John A., 2006, Land area change in coastal Louisiana after the 2005 hurricanes—a series of three maps: U.S. Geological Survey Open-File Report 06-1274

2004 to 2005 Net Land Area Changes by Marsh Community Graph*

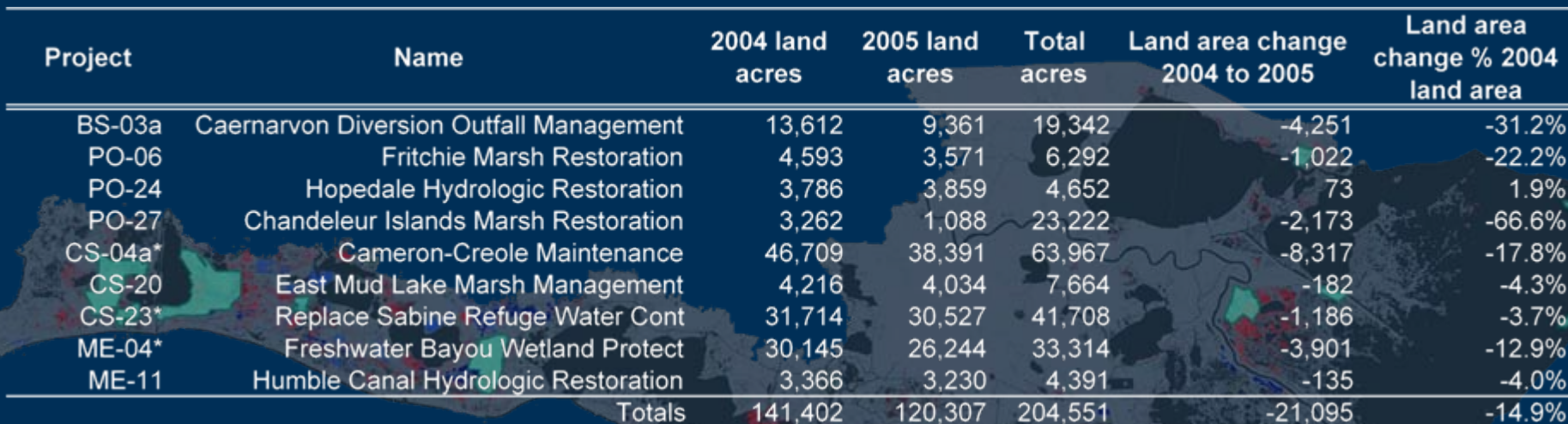


*2004 to 2005 net land decrease: 217 mi² (562 km²) after removing 83 mi² (214.97 km²) of flooded lands.

Source: Open-File Report 2006-1274, Land Area Change in Coastal Louisiana After the 2005 Hurricanes: A Series of Three Maps

Land Area Change in Coastal Louisiana After the 2005 Hurricanes: Marsh Communities

2004 to 2005 Land Area Change Selected Restoration Projects



Project	Name	2004 land acres	2005 land acres	Total acres	Land area change 2004 to 2005	Land area change % 2004 land area
BS-03a	Caernarvon Diversion Outfall Management	13,612	9,361	19,342	-4,251	-31.2%
PO-06	Fritchie Marsh Restoration	4,593	3,571	6,292	-1,022	-22.2%
PO-24	Hopedale Hydrologic Restoration	3,786	3,859	4,652	73	1.9%
PO-27	Chandeleur Islands Marsh Restoration	3,262	1,088	23,222	-2,173	-66.6%
CS-04a*	Cameron-Creole Maintenance	46,709	38,391	63,967	-8,317	-17.8%
CS-20	East Mud Lake Marsh Management	4,216	4,034	7,664	-182	-4.3%
CS-23*	Replace Sabine Refuge Water Cont	31,714	30,527	41,708	-1,186	-3.7%
ME-04*	Freshwater Bayou Wetland Protect	30,145	26,244	33,314	-3,901	-12.9%
ME-11	Humble Canal Hydrologic Restoration	3,366	3,230	4,391	-135	-4.0%
Totals		141,402	120,307	204,551	-21,095	-14.9%

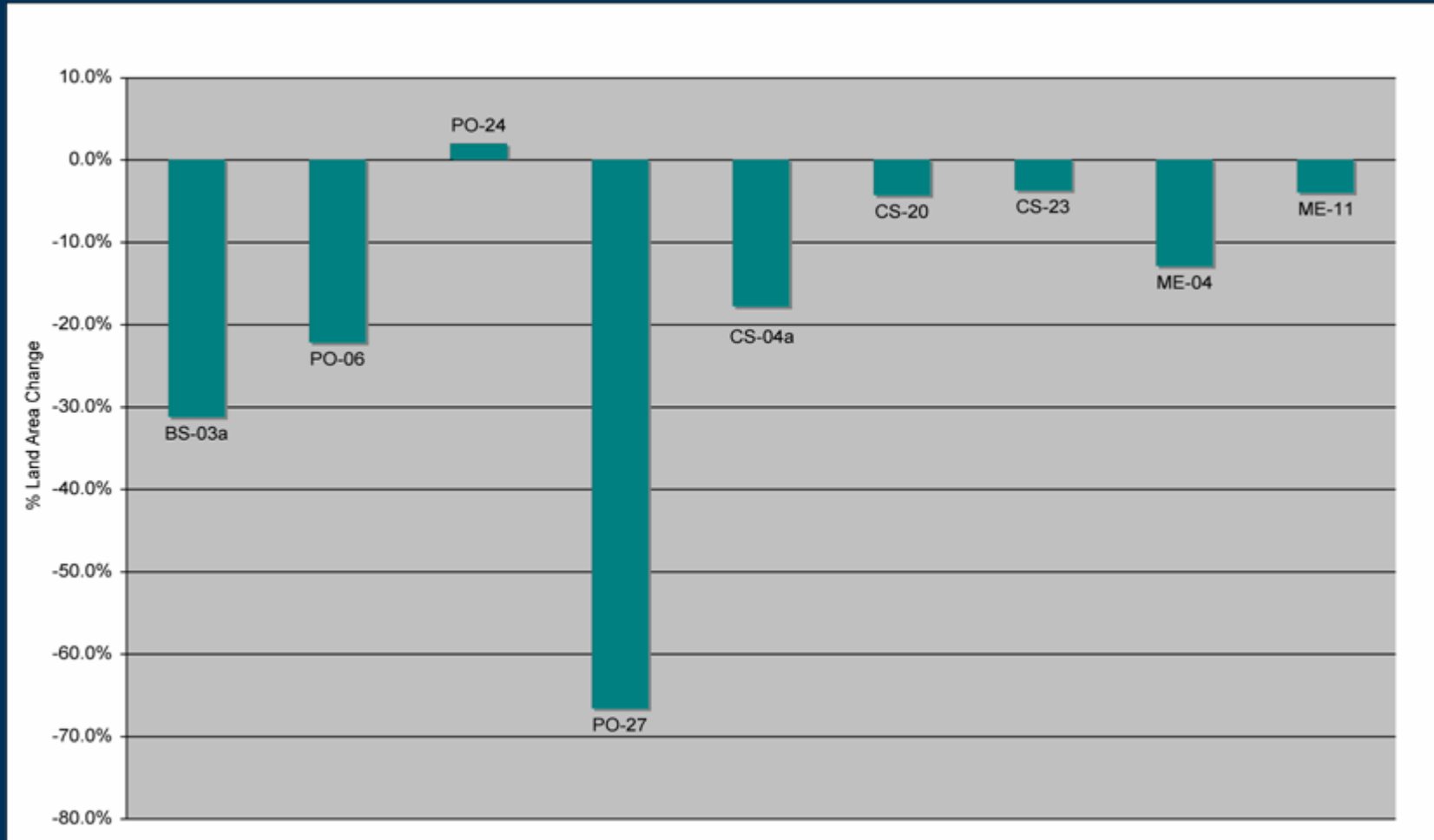
*The following projects contain flooded lands consisting of flooded burned marsh and flooded agricultural impoundments:

1. CS-04a, 734 acres
2. CS-23, 21 acres
3. ME-04, 317 acres

Data Source:
Barras, 2006

Land-water analysis based on classified Landsat Thematic Mapper satellite imagery.

Selected CWPPRA Projects 2004 to 2005 Percent Land Area Change

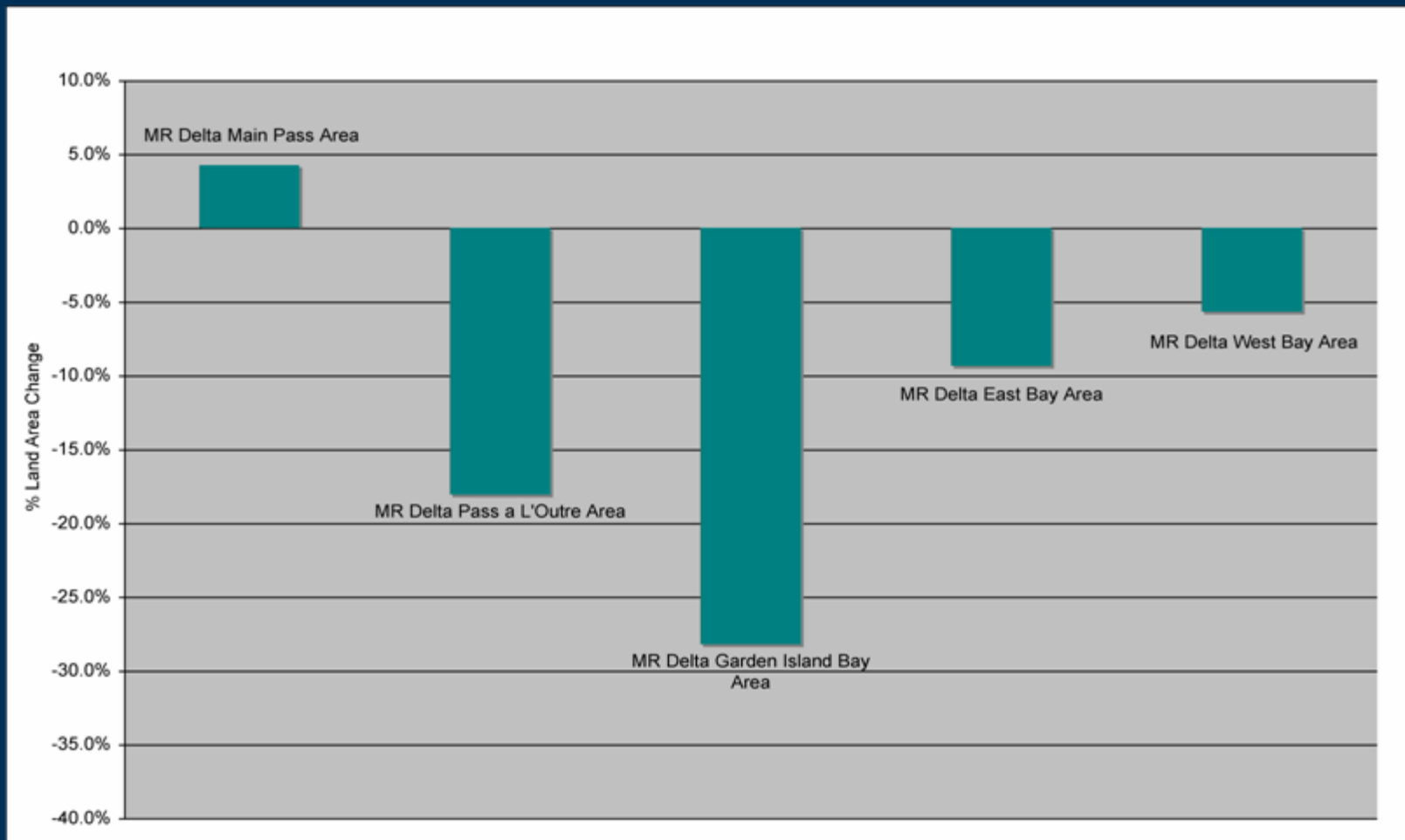


Data Source:
Barras, 2006

2004 to 2005 Land Area Change Mississippi River Delta

Project	Name	2004 land acres	2005 land acres	Total acres	Land area change 2004 to 2005	Land area change % 2004 land area
MR-Delta_1	MR Delta Main Pass Area	11,645	12,140	47,628	495	4.3%
MR-Delta_2	MR Delta Pass a L'Outre Area	20,277	16,613	70,147	-3,664	-18.1%
MR-Delta_3	MR Delta Garden Island Bay Area	22,242	15,966	94,093	-6,276	-28.2%
MR-Delta_4	MR Delta East Bay Area	10,344	9,377	80,995	-966	-9.3%
MR-Delta_5	MR Delta West Bay Area	18,089	17,064	101,682	-1,024	-5.7%
	Totals	82,597	71,161	394,543	-11,436	-13.8%

Mississippi River Delta 2004 to 2005 Percent Land Area Change



Data Source:
Barras, 2006

Upper Breton Sound Landsat 5 Thematic Mapper Satellite Imagery

Nov. 7, 2004

Oct. 25, 2005



Red = growing vegetation

Upper Breton Sound Landsat 5 Thematic Mapper Satellite Imagery

March 2, 2006

September 26, 2006

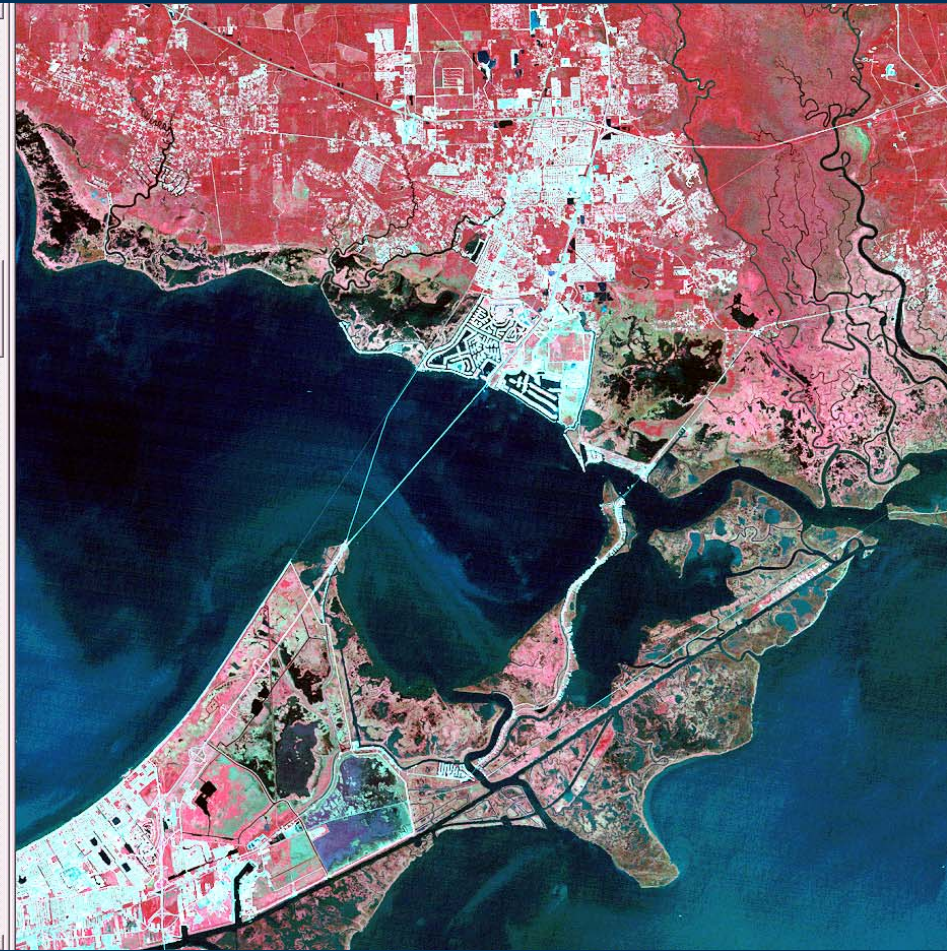


Red = growing vegetation

Eastern Lake Pontchartrain Landsat 5 Thematic Mapper Satellite Imagery

October 25, 2006

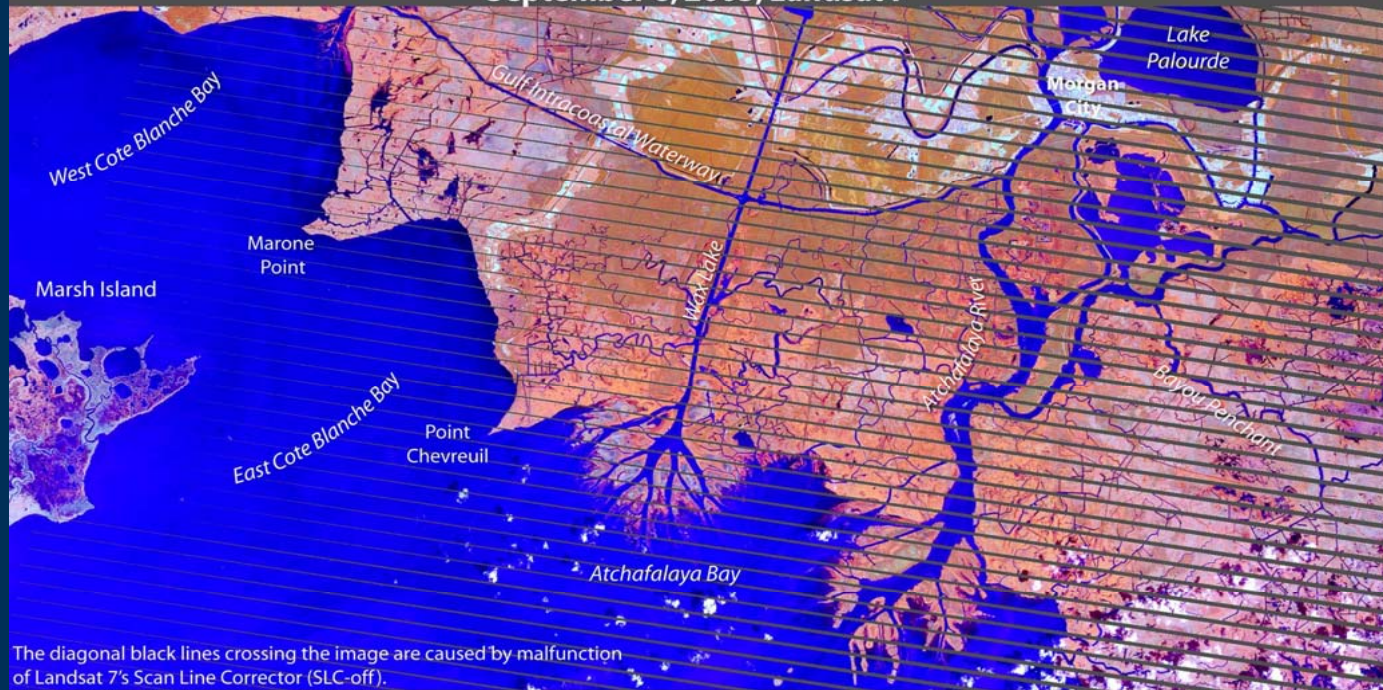
September 26, 2006



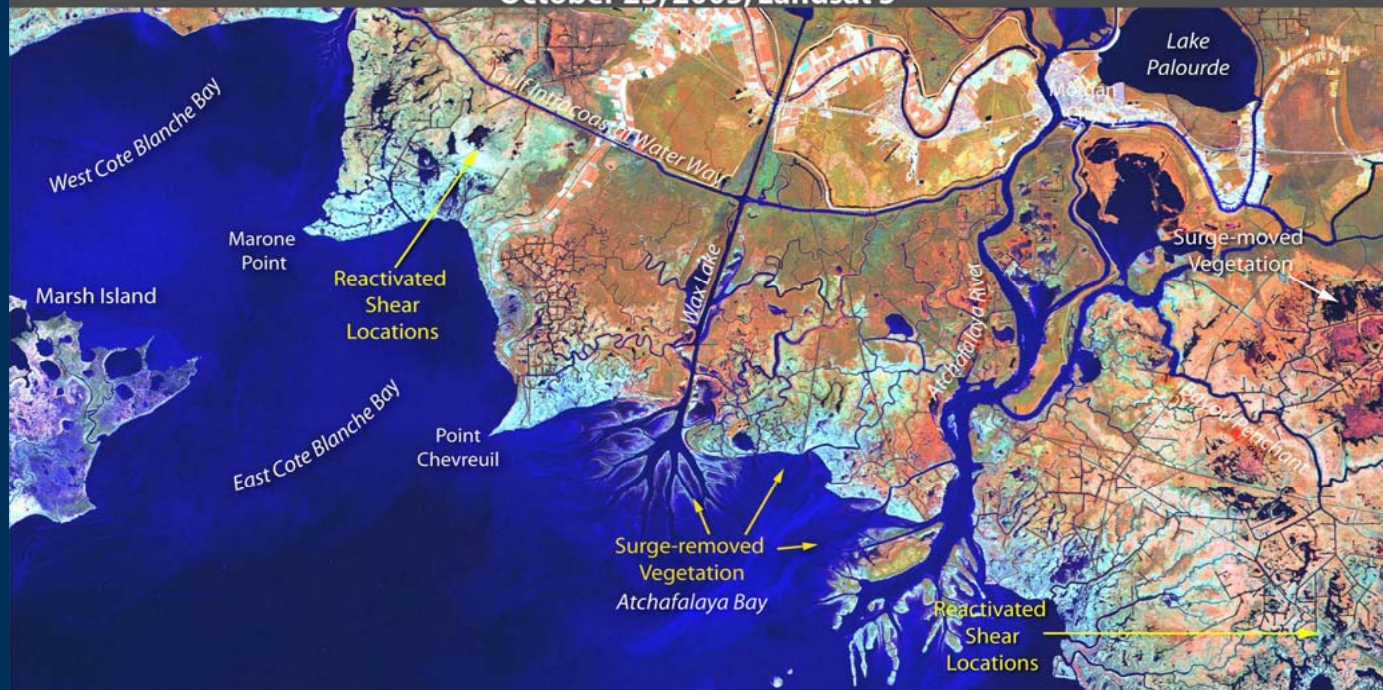
Red = growing vegetation

Atchafalaya River and Wax Lake Deltas Landsat 5 and 7 Thematic Mapper Satellite Imagery

September 6, 2005, Landsat 7



October 25, 2005, Landsat 5



Atchafalaya River and Wax Lake Deltas Landsat 5 Thematic Mapper Satellite Image November 17, 2005



Regional Analysis Updates

- **Multiple Landsat images already acquired for the coast since Oct. 2005.**
 - **Noncontemporaneous coast-wide coverage limited to individual scenes.**
- **Will acquire a Fall 2006 update, depending on imagery availability.**
- **Chenier Plain analysis problematic because of surge retention and flooding duration.**
- **Analysis and report generation will take time.**

Other Post-Hurricane Data Collection

- Coast-wide Reference Monitoring System (CRMS) and Louisiana Coastal Area (LCA) Science & Technology (S&T) Land Change Assessment: <http://pubs.usgs.gov/of/2006/1274/>
- CRMS Coast-wide Digital Photography: collected between Oct 15 – Dec 5, 2005; <http://www.lacoast.gov/maps/2005doqq>
- CRMS and Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Project-Specific Vegetation Assessments (Pre- vs Post-hurricane)
- LCA S&T Post-hurricane Assessment (Landscape change, vegetation, soils, salinity/sulfides, nutrients)
- USGS Science: Hurricane Supplemental
 - Marsh Change Projection by Marsh Type 2000 – 2050
 - Pre- vs Post-Hurricane Habitat Mapping (Selected Areas)
 - Elevation Monitoring and Vegetation Recovery

Citations

- Barras, J.A., 2006, Land area change in coastal Louisiana after the 2005 hurricanes-a series of three maps: U.S. Geological Survey Open-File Report 2006-1274, <http://pubs.usgs.gov/of/2006/1274/>, accessed October 18, 2006.
- Barras, J., Beville, S., Britsch, D., Hartley, S., Hawes, S., Johnston, J., Kemp, P., Kinler, Q., Martucci, A., Porthouse, J., Reed, D., Roy, K., Sapkota, S., and Suhayda, J., 2003, Historical and projected coastal Louisiana land changes 1978-2050, Appendix B of Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study: U.S. Geological Survey Open-File Report 2003-334, 39 p., <http://pubs.er.usgs.gov/usgspubs/ofr/ofr0334>, accessed September 16, 2006.
- Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), 1993, Reports: Louisiana coastal wetlands restoration plan: Lafayette, La., U.S. Geological Survey, National Wetlands Research Center, <http://www.lacoast.gov/reports/cwcrp/1993/index.htm>, accessed August 9, 2006.
- Louisiana Office of the State Registrar (LOSR), 2002, Title 43, Part I of the Titles of the Louisiana Administrative Code: Baton Rouge, La., <http://www.state.la.us/osr/lac/lactitle.htm>, accessed August 9, 2006.