

Land Area Change in Coastal Louisiana (1932 to 2010)

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U.S. Geological Survey
U.S. Department of the Interior

Louisiana coastal wetlands are *Critical* because they support:

- **20-25%** of domestic seafood production in the contiguous U.S.
- production and transportation of about **30%** of U.S. oil and gas
- **20%** of U.S. waterborne commerce
- more than **5 million migratory birds** that winter in Louisiana

Land Area Change in Coastal Louisiana

U.S. Department of the Interior
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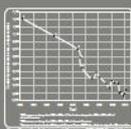
By Brady R. Conner, John A. Barco, Gregory D. Hayes, William Davis, Michelle Tucker, Holly Beck, Nadine Taylor, Brad Griffin, David Robinson

Introduction

The U.S. Geological Survey (USGS) Coastal Science Center is pleased to announce the release of the first set of maps for the 77 basins in coastal Louisiana. The maps show the land area change in coastal Louisiana from 1932 to 2010. The maps are the result of a multi-year effort by the USGS Coastal Science Center and the Louisiana State University (LSU) Center for Coastal Science and Technology (CCST). The maps are the result of a multi-year effort by the USGS Coastal Science Center and the Louisiana State University (LSU) Center for Coastal Science and Technology (CCST).

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Scientific Investigation Map 2010
Hydrologic Investigation Report

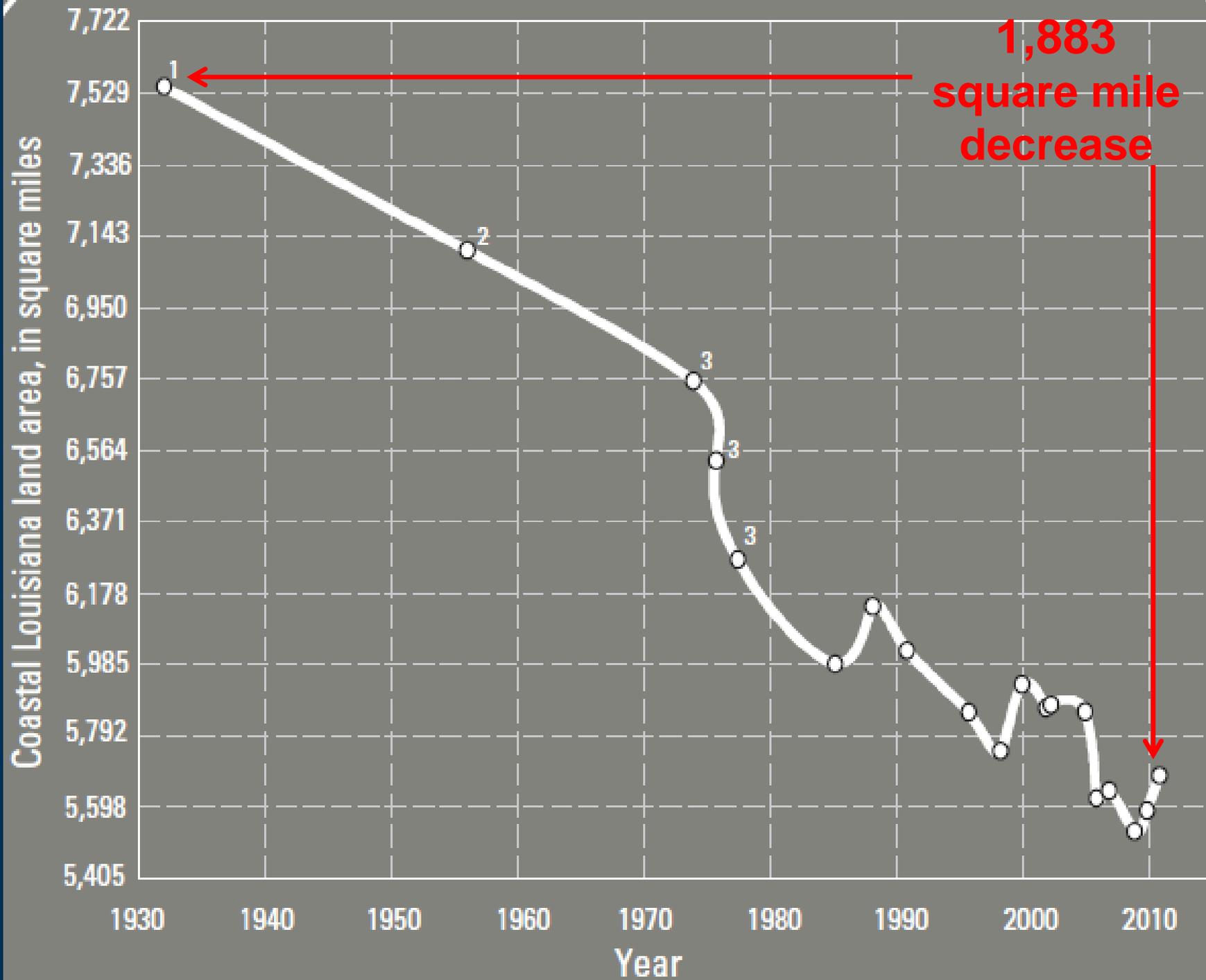


Basin	1932	1936	1940	1944	1948	1952	1956	1960	1964	1968	1972	1976	1980	1984	1988	1992	1996	2000	2004	2008	2010
Calcasieu-Sabine	1,200	1,150	1,100	1,050	1,000	950	900	850	800	750	700	650	600	550	500	450	400	350	300	250	200
Mermentau	1,500	1,450	1,400	1,350	1,300	1,250	1,200	1,150	1,100	1,050	1,000	950	900	850	800	750	700	650	600	550	500
Terrebonne	1,800	1,750	1,700	1,650	1,600	1,550	1,500	1,450	1,400	1,350	1,300	1,250	1,200	1,150	1,100	1,050	1,000	950	900	850	800
Atchafalaya	2,000	1,950	1,900	1,850	1,800	1,750	1,700	1,650	1,600	1,550	1,500	1,450	1,400	1,350	1,300	1,250	1,200	1,150	1,100	1,050	1,000
Touché-Vermilion	2,200	2,150	2,100	2,050	2,000	1,950	1,900	1,850	1,800	1,750	1,700	1,650	1,600	1,550	1,500	1,450	1,400	1,350	1,300	1,250	1,200
Barataria	2,500	2,450	2,400	2,350	2,300	2,250	2,200	2,150	2,100	2,050	2,000	1,950	1,900	1,850	1,800	1,750	1,700	1,650	1,600	1,550	1,500
De Cade	2,800	2,750	2,700	2,650	2,600	2,550	2,500	2,450	2,400	2,350	2,300	2,250	2,200	2,150	2,100	2,050	2,000	1,950	1,900	1,850	1,800
Grand Bayou	3,000	2,950	2,900	2,850	2,800	2,750	2,700	2,650	2,600	2,550	2,500	2,450	2,400	2,350	2,300	2,250	2,200	2,150	2,100	2,050	2,000
De Cade	3,200	3,150	3,100	3,050	3,000	2,950	2,900	2,850	2,800	2,750	2,700	2,650	2,600	2,550	2,500	2,450	2,400	2,350	2,300	2,250	2,200
De Cade	3,500	3,450	3,400	3,350	3,300	3,250	3,200	3,150	3,100	3,050	3,000	2,950	2,900	2,850	2,800	2,750	2,700	2,650	2,600	2,550	2,500
De Cade	3,800	3,750	3,700	3,650	3,600	3,550	3,500	3,450	3,400	3,350	3,300	3,250	3,200	3,150	3,100	3,050	3,000	2,950	2,900	2,850	2,800
De Cade	4,000	3,950	3,900	3,850	3,800	3,750	3,700	3,650	3,600	3,550	3,500	3,450	3,400	3,350	3,300	3,250	3,200	3,150	3,100	3,050	3,000
De Cade	4,200	4,150	4,100	4,050	4,000	3,950	3,900	3,850	3,800	3,750	3,700	3,650	3,600	3,550	3,500	3,450	3,400	3,350	3,300	3,250	3,200
De Cade	4,500	4,450	4,400	4,350	4,300	4,250	4,200	4,150	4,100	4,050	4,000	3,950	3,900	3,850	3,800	3,750	3,700	3,650	3,600	3,550	3,500
De Cade	4,800	4,750	4,700	4,650	4,600	4,550	4,500	4,450	4,400	4,350	4,300	4,250	4,200	4,150	4,100	4,050	4,000	3,950	3,900	3,850	3,800
De Cade	5,000	4,950	4,900	4,850	4,800	4,750	4,700	4,650	4,600	4,550	4,500	4,450	4,400	4,350	4,300	4,250	4,200	4,150	4,100	4,050	4,000
De Cade	5,200	5,150	5,100	5,050	5,000	4,950	4,900	4,850	4,800	4,750	4,700	4,650	4,600	4,550	4,500	4,450	4,400	4,350	4,300	4,250	4,200
De Cade	5,500	5,450	5,400	5,350	5,300	5,250	5,200	5,150	5,100	5,050	5,000	4,950	4,900	4,850	4,800	4,750	4,700	4,650	4,600	4,550	4,500
De Cade	5,800	5,750	5,700	5,650	5,600	5,550	5,500	5,450	5,400	5,350	5,300	5,250	5,200	5,150	5,100	5,050	5,000	4,950	4,900	4,850	4,800
De Cade	6,000	5,950	5,900	5,850	5,800	5,750	5,700	5,650	5,600	5,550	5,500	5,450	5,400	5,350	5,300	5,250	5,200	5,150	5,100	5,050	5,000
De Cade	6,200	6,150	6,100	6,050	6,000	5,950	5,900	5,850	5,800	5,750	5,700	5,650	5,600	5,550	5,500	5,450	5,400	5,350	5,300	5,250	5,200
De Cade	6,500	6,450	6,400	6,350	6,300	6,250	6,200	6,150	6,100	6,050	6,000	5,950	5,900	5,850	5,800	5,750	5,700	5,650	5,600	5,550	5,500
De Cade	6,800	6,750	6,700	6,650	6,600	6,550	6,500	6,450	6,400	6,350	6,300	6,250	6,200	6,150	6,100	6,050	6,000	5,950	5,900	5,850	5,800
De Cade	7,000	6,950	6,900	6,850	6,800	6,750	6,700	6,650	6,600	6,550	6,500	6,450	6,400	6,350	6,300	6,250	6,200	6,150	6,100	6,050	6,000
De Cade	7,200	7,150	7,100	7,050	7,000	6,950	6,900	6,850	6,800	6,750	6,700	6,650	6,600	6,550	6,500	6,450	6,400	6,350	6,300	6,250	6,200
De Cade	7,500	7,450	7,400	7,350	7,300	7,250	7,200	7,150	7,100	7,050	7,000	6,950	6,900	6,850	6,800	6,750	6,700	6,650	6,600	6,550	6,500
De Cade	7,800	7,750	7,700	7,650	7,600	7,550	7,500	7,450	7,400	7,350	7,300	7,250	7,200	7,150	7,100	7,050	7,000	6,950	6,900	6,850	6,800
De Cade	8,000	7,950	7,900	7,850	7,800	7,750	7,700	7,650	7,600	7,550	7,500	7,450	7,400	7,350	7,300	7,250	7,200	7,150	7,100	7,050	7,000
De Cade	8,200	8,150	8,100	8,050	8,000	7,950	7,900	7,850	7,800	7,750	7,700	7,650	7,600	7,550	7,500	7,450	7,400	7,350	7,300	7,250	7,200
De Cade	8,500	8,450	8,400	8,350	8,300	8,250	8,200	8,150	8,100	8,050	8,000	7,950	7,900	7,850	7,800	7,750	7,700	7,650	7,600	7,550	7,500
De Cade	8,800	8,750	8,700	8,650	8,600	8,550	8,500	8,450	8,400	8,350	8,300	8,250	8,200	8,150	8,100	8,050	8,000	7,950	7,900	7,850	7,800
De Cade	9,000	8,950	8,900	8,850	8,800	8,750	8,700	8,650	8,600	8,550	8,500	8,450	8,400	8,350	8,300	8,250	8,200	8,150	8,100	8,050	8,000
De Cade	9,200	9,150	9,100	9,050	9,000	8,950	8,900	8,850	8,800	8,750	8,700	8,650	8,600	8,550	8,500	8,450	8,400	8,350	8,300	8,250	8,200
De Cade	9,500	9,450	9,400	9,350	9,300	9,250	9,200	9,150	9,100	9,050	9,000	8,950	8,900	8,850	8,800	8,750	8,700	8,650	8,600	8,550	8,500
De Cade	9,800	9,750	9,700	9,650	9,600	9,550	9,500	9,450	9,400	9,350	9,300	9,250	9,200	9,150	9,100	9,050	9,000	8,950	8,900	8,850	8,800
De Cade	10,000	9,950	9,900	9,850	9,800	9,750	9,700	9,650	9,600	9,550	9,500	9,450	9,400	9,350	9,300	9,250	9,200	9,150	9,100	9,050	9,000

Basin	1932	1936	1940	1944	1948	1952	1956	1960	1964	1968	1972	1976	1980	1984	1988	1992	1996	2000	2004	2008	2010
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Mermentau	1,500	1,450	1,400	1,350	1,300	1,250	1,200	1,150	1,100	1,050	1,000	950	900	850	800	750	700	650	600	550	500
Terrebonne	1,800	1,750	1,700	1,650	1,600	1,550	1,500	1,450	1,400	1,350	1,300	1,250	1,200	1,150	1,100	1,050	1,000	950	900	850	800
Atchafalaya	2,000	1,950	1,900	1,850	1,800	1,750	1,700	1,650	1,600	1,550	1,500	1,450	1,400	1,350	1,300	1,250	1,200	1,150	1,100	1,050	1,000
Touché-Vermilion	2,200	2,150	2,100	2,050	2,000	1,950	1,900	1,850	1,800	1,750	1,700	1,650	1,600	1,550	1,500	1,450	1,400	1,350	1,300	1,250	1,200
Barataria	2,500	2,450	2,400	2,350	2,300	2,250	2,200	2,150	2,100	2,050	2,000	1,950	1,900	1,850	1,800	1,750	1,700	1,650	1,600	1,550	1,500
De Cade	2,800	2,750	2,700	2,650	2,600	2,550	2,500	2,450	2,400	2,350	2,300	2,250	2,200	2,150	2,100	2,050	2,000	1,950	1,900	1,850	1,800
De Cade	3,000	2,950	2,900	2,850	2,800	2,750	2,700	2,650	2,600	2,550	2,500	2,450	2,400	2,350	2,300	2,250	2,200	2,150	2,100	2,050	2,000
De Cade	3,200	3,150	3,100	3,050	3,000	2,950	2,900	2,850	2,800	2,750	2,700	2,650	2,600	2,550	2,500	2,450	2,400	2,350	2,300	2,250	2,200
De Cade	3,500	3,450	3,400	3,350	3,300	3,250															

**Can be downloaded for free
at the USGS publications
warehouse at:**

<http://pubs.usgs.gov/sim/3164/>



Land Area Change in Coastal Louisiana

- Analyses show that coastal Louisiana has experienced an approximate net loss of 1,883 mi² from 1932-2010.
- This amounts to 91 times the land area of the island of Manhattan, lost over a 78 year period.
- If this loss were to occur at a constant rate, it would equate to losing a land area greater than the island of Manhattan every year.

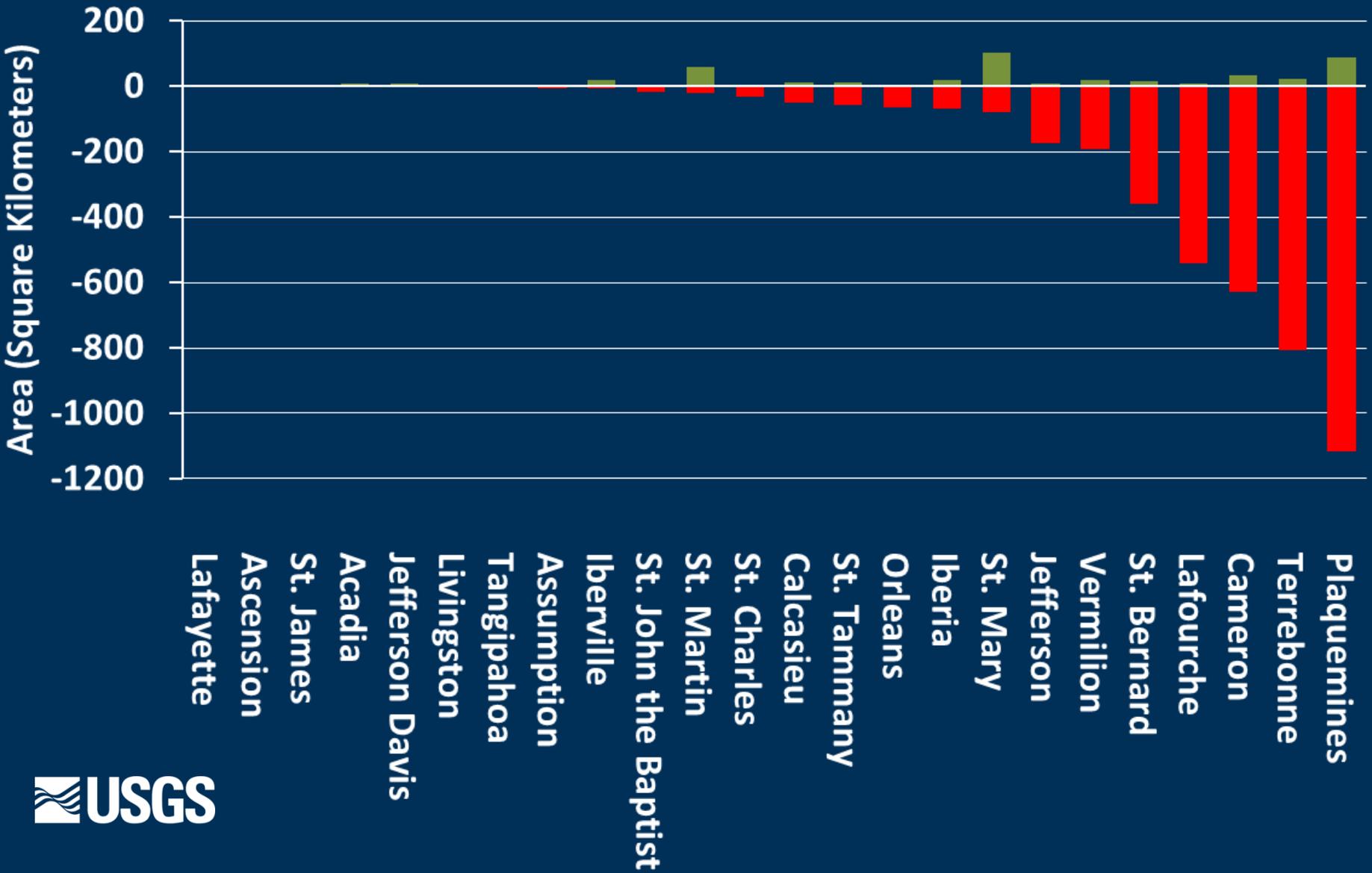


Land Area Change in Coastal Louisiana

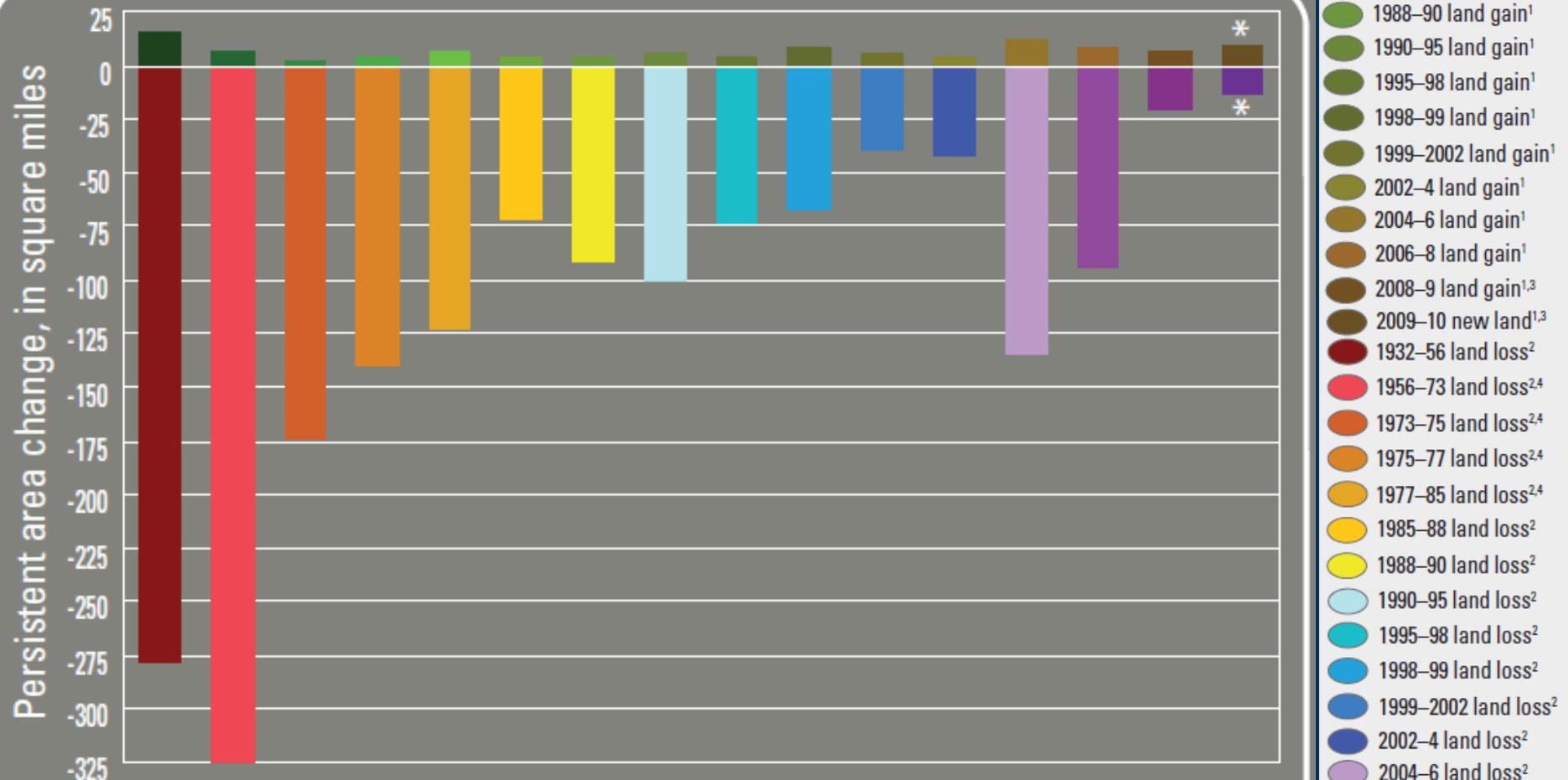
- Trend analysis from 1985-2010 show a wetland loss rate of 16.57 square miles per year.
- This equates to Louisiana losing more than a football field every hour (on average).



Total Land Change By Parish From 1932-2010



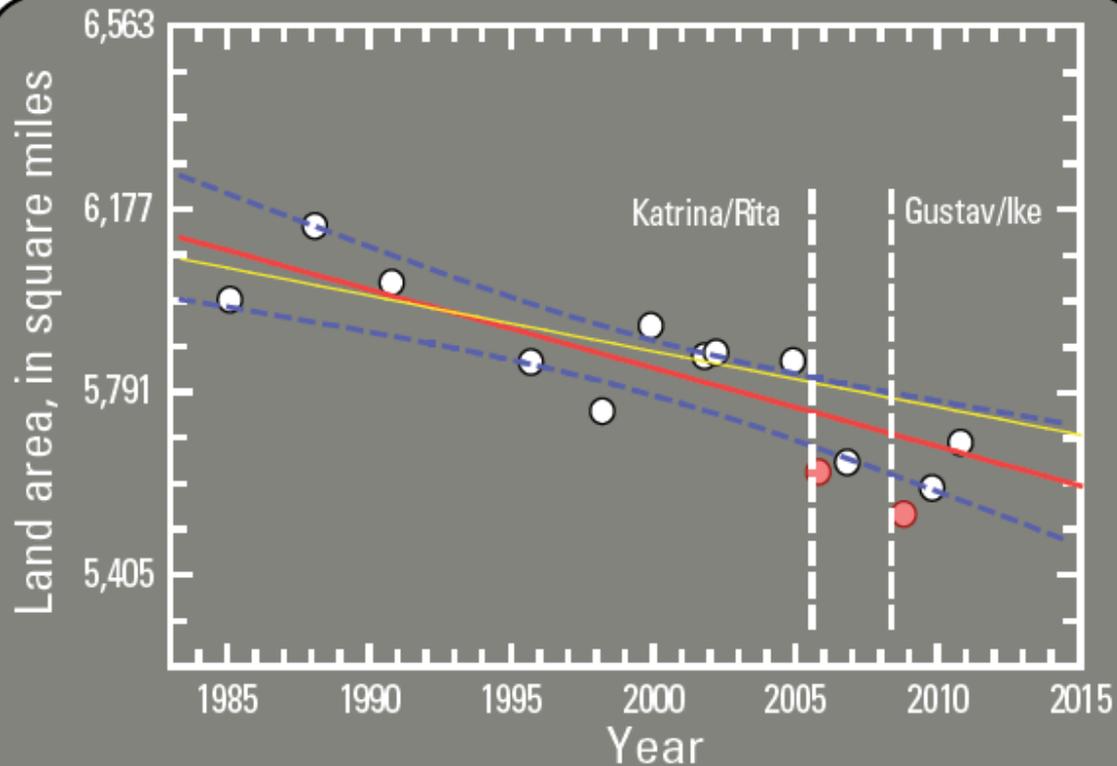
Land Change by Period



* As persistence of these changes cannot yet be determined, these areas are coined "new water investigation areas" and "new land investigation areas." These are areas under investigation for persistence of the changes observed.

- 1932-56 land gain¹
- 1956-73 land gain^{1,4}
- 1973-75 land gain^{1,4}
- 1975-77 land gain^{1,4}
- 1977-85 land gain^{1,4}
- 1985-88 land gain¹
- 1988-90 land gain¹
- 1990-95 land gain¹
- 1995-98 land gain¹
- 1998-99 land gain¹
- 1999-2002 land gain¹
- 2002-4 land gain¹
- 2004-6 land gain¹
- 2006-8 land gain¹
- 2008-9 land gain^{1,3}
- 2009-10 new land^{1,3}
- 1932-56 land loss²
- 1956-73 land loss^{2,4}
- 1973-75 land loss^{2,4}
- 1975-77 land loss^{2,4}
- 1977-85 land loss^{2,4}
- 1985-88 land loss²
- 1988-90 land loss²
- 1990-95 land loss²
- 1995-98 land loss²
- 1998-99 land loss²
- 1999-2002 land loss²
- 2002-4 land loss²
- 2004-6 land loss²
- 2006-8 land loss²
- 2008-9 land loss^{2,3}
- 2009-10 new water^{2,3}

Recent Trends



1985–2004 = $-11.76 \pm 4.47 \text{ mi}^2/\text{year}$ ($r^2 = 0.4969$)
1985–2010 = $-16.57 \pm 3.26 \text{ mi}^2/\text{year}$ ($r^2 = 0.7208$)

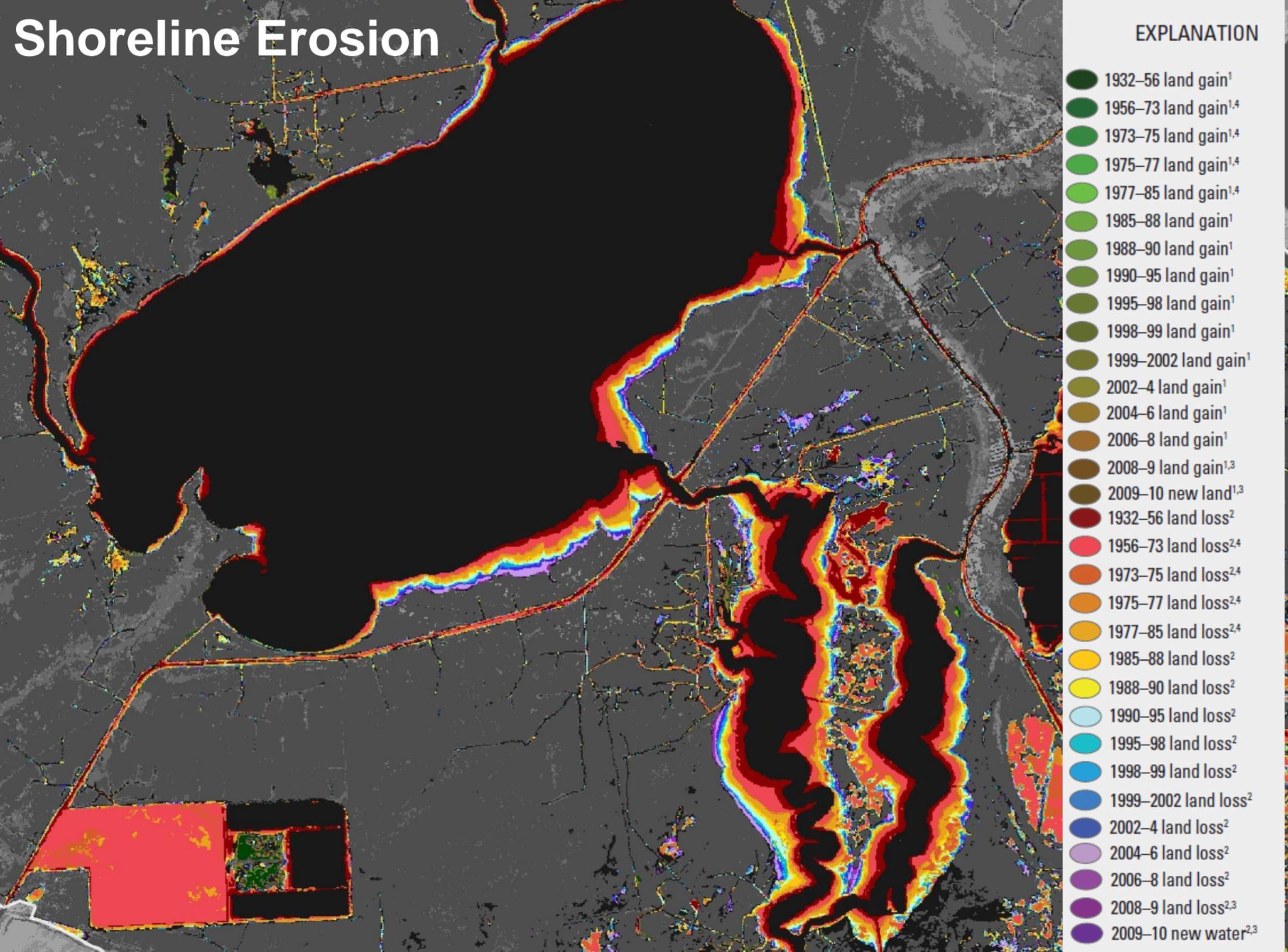
EXPLANATION

- Land area
- Excluded data points, 2005–8
- Regression trend line, 1985–2004
- Regression trend line, 1985–2010
- 95 percent confidence band, 1985–2010

Shoreline Erosion

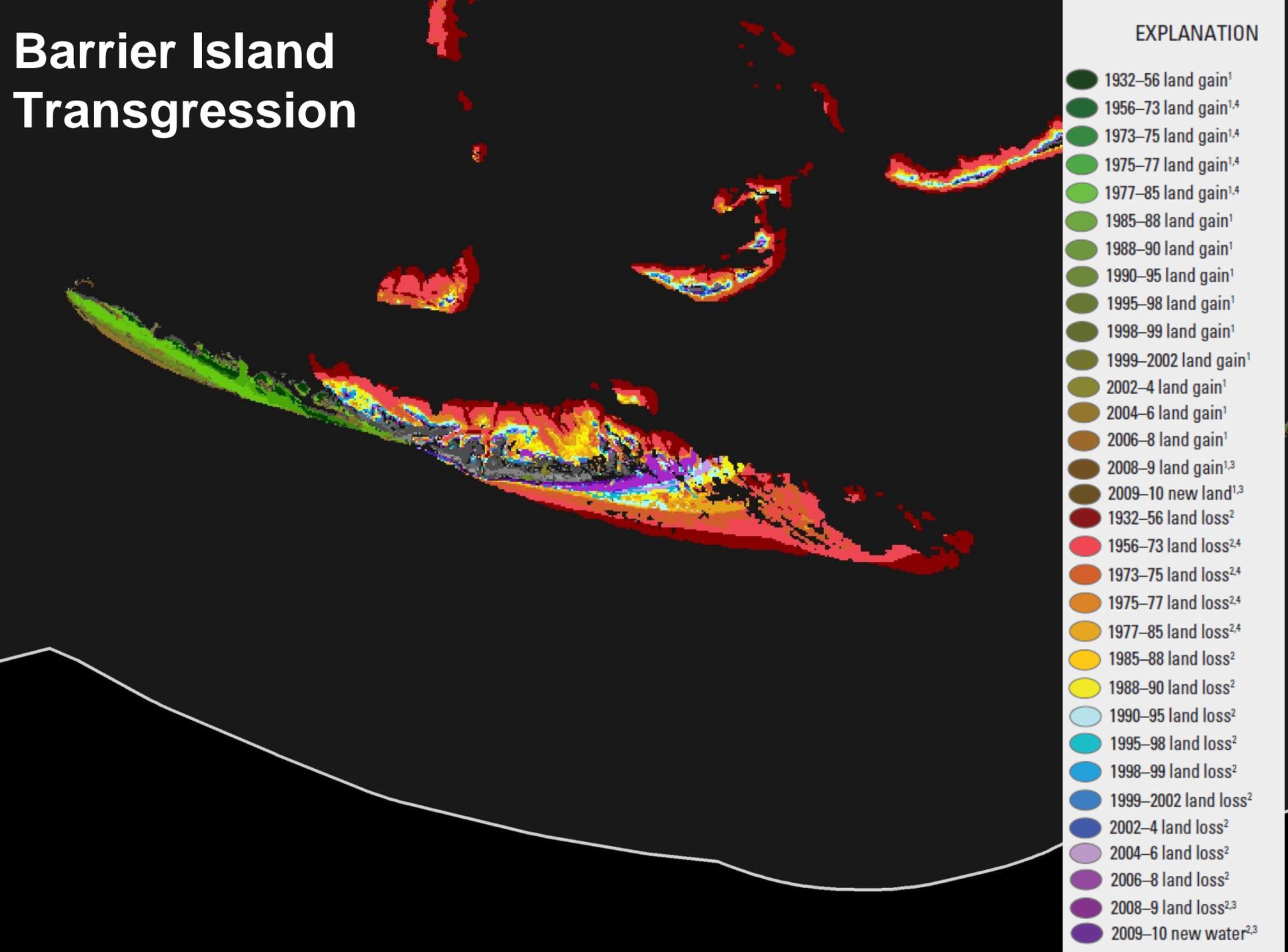
Shoreline Erosion

EXPLANATION



Barrier Island Transgression

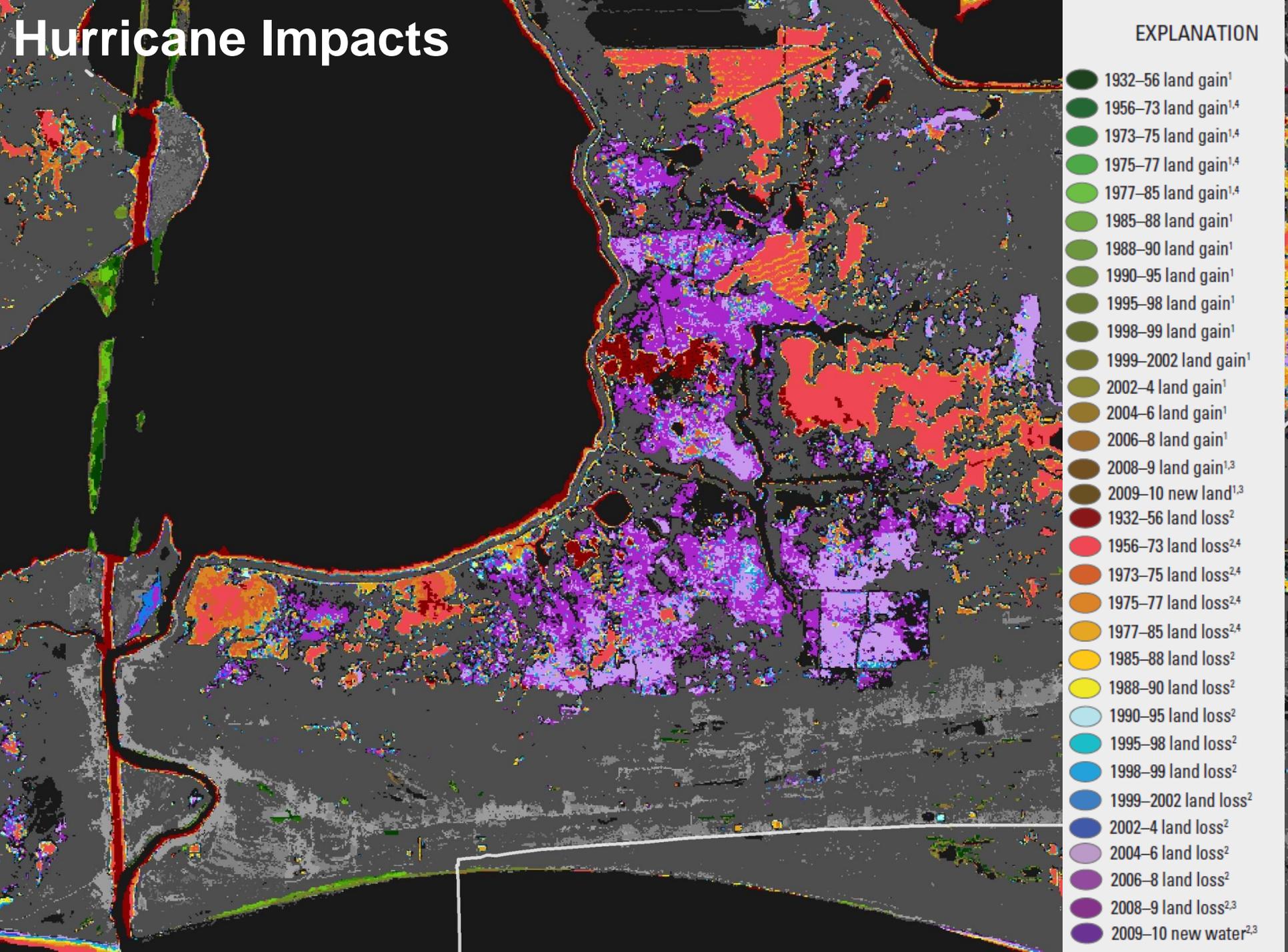
Barrier Island Transgression



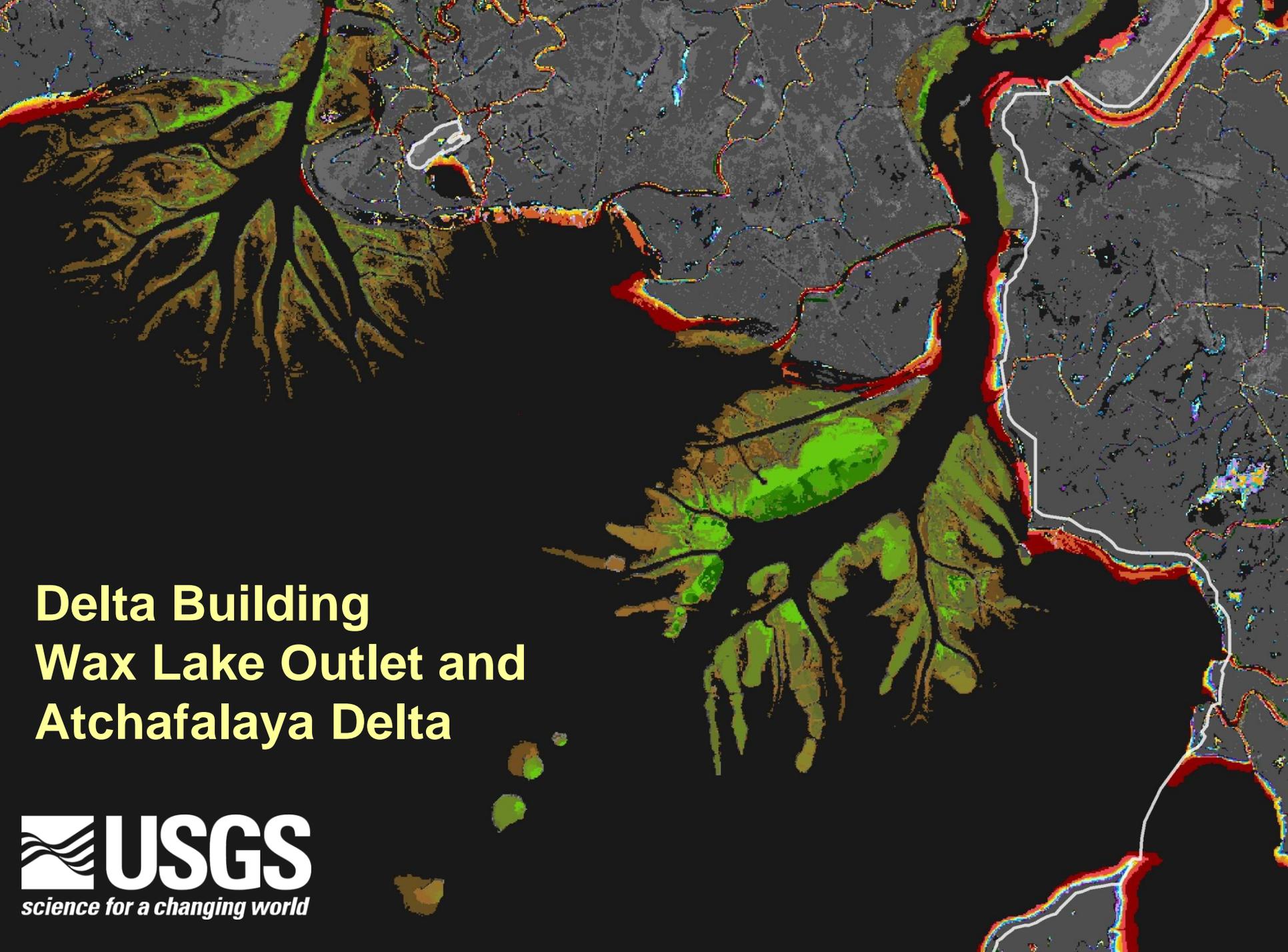
Hurricanes

Hurricane Impacts

EXPLANATION



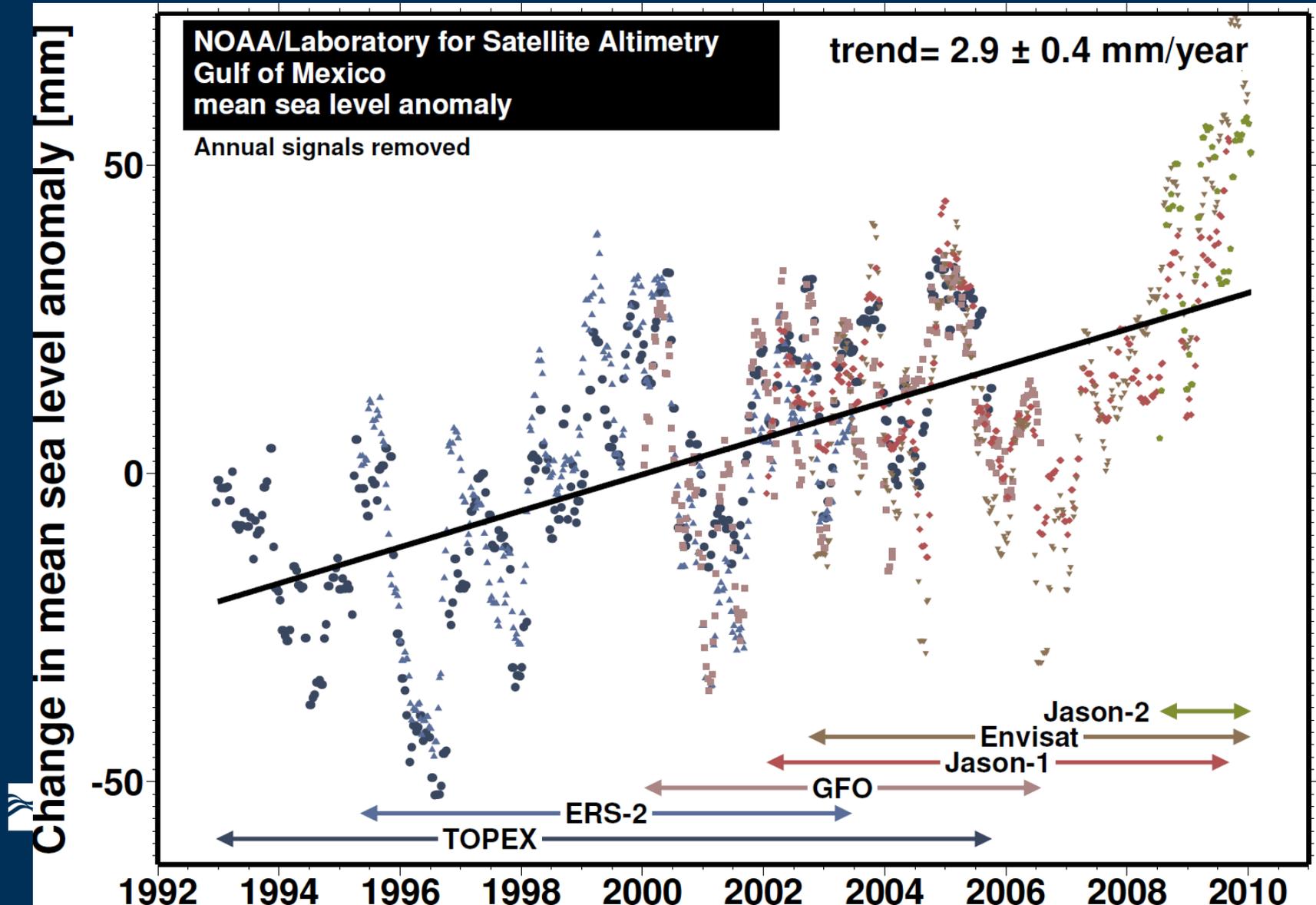
Delta Building



Delta Building Wax Lake Outlet and Atchafalaya Delta

Sea Level Rise

Sea Level Rise



Subsidence

Subsidence



Subsidence



Levees, Dams, Flood Control Structures, and Sediment

May 27th, 2011



Oil and Gas Extraction and Infrastructure



Navigation Infrastructure



Photo by: Greg Steyer

Herbivory



Initial Stages of Damage

Minor Damage



Monitoring and Research



<http://www.lacoast.gov/crms>

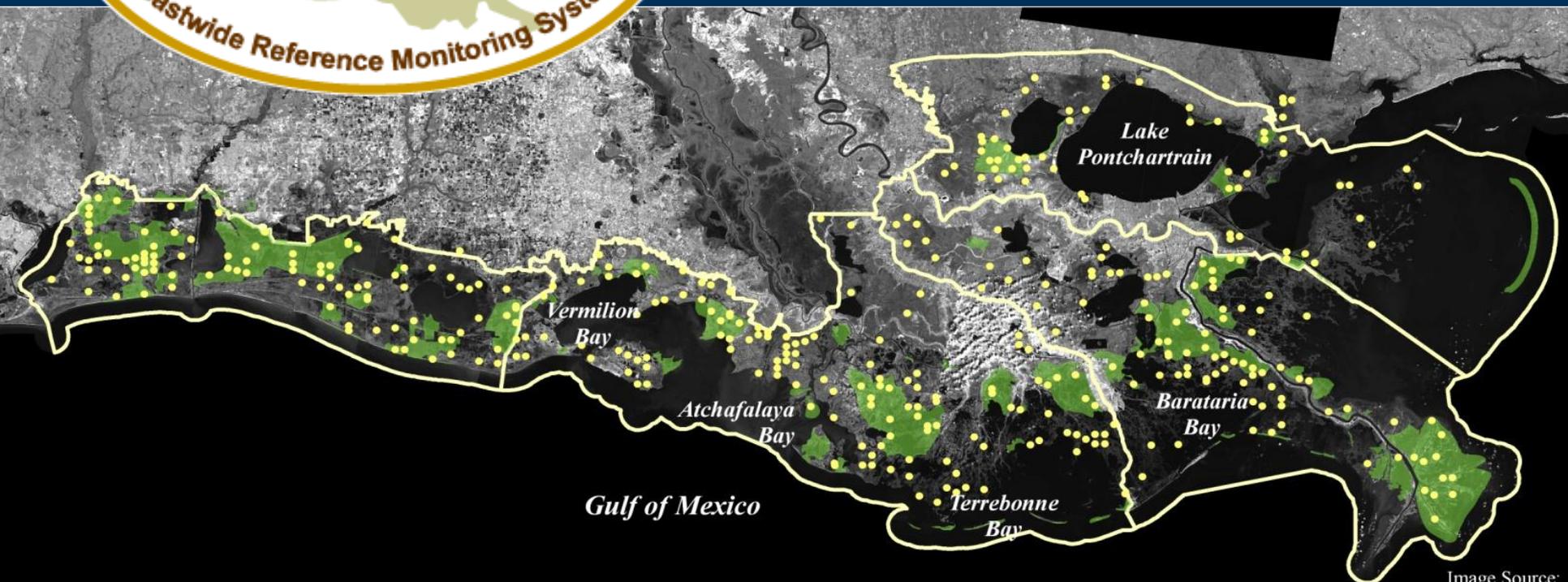


Image Source:
2006 Landsat Thematic Mapper

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

Map ID: USGS-NWRC 2010-11-0001
Map Date: October 13, 2009



- CRMS Sites
- CWPPRA Projects
- CWPPRA Regions

1:2,600,000

20 0 40
Kilometers

20 0 40
Miles





CRMS Website

Coastwide Reference Monitoring System

a CWPPRA funded project



Home Data Mapping Library Visualization Program

Spatial Viewer *DRAFT

Long: -93.42224, Lat: 31.8309

Map Satellite Hybrid

Map navigation controls: Home, Back, Forward, Pan, Zoom In, Zoom Out, Full Screen, Print, Scale

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Layers

- CRMS Sites
- 1 Km Buffer
- CWPPRA Projects
- Hydro Basins

Site Info

Click the yellow symbology on the map to view CRMS Site information.

Disclaimer

PROVISIONAL DATA SUBJECT TO REVISION.



<http://www.lacoast.gov/crms>



Coastwide Reference Monitoring System
a CWPPRA funded project

[Home](#) [Data](#) [Mapping](#) [Library](#) [Visualization](#) [Program](#)

Spatial Viewer *DRAFT

Long: -90.49606, Lat: 29.45395

Map | Satellite | Hybrid

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Layers

- CRMS Sites
- Zoom To: CRMS0002
- 1 Km Buffer
- CWPPRA Projects
- Hydro Basins

Site Info

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CRMS Website



Coastwide Reference Monitoring System

aCWPPRA funded project

Home Data Mapping Library Visualization Program

Spatial Viewer *DRAFT

Long: Lat:

Map **Satellite** Hybrid

Site Info Water Vegetation Soil Spatial Report Card

Site ID: CRMS0416
 Lat, Long: 29.476, -90.4792
 Marsh Elevation: 1.36ft NAVD1988
 NGS Benchmark: Not currently available.
 Pre/Post Construction Pictures:

Layers

- CRMS Sites
- Zoom To:
- 1 Km Buffer
- CWPPRA Projects



- Wetlands

Data Collection at each Site

Parameter	Method	Scale	Frequency
Land to Water Ratio	Satellite Imagery	Hydrologic Basin	3 years
Land to Water Ratio	Digital Aerial Photography	CRMS Site (1 Km ²)	3 years
Emergent Vegetation	Braun Blanquet: % Cover, Species Richness, Height of Dominant Species	(10) 2m x 2m plots/CRMS Site	Annually during peak biomass
Forested Vegetation	DBH and Canopy Cover	(3) 20m x 20m plots/CRMS Site	Annually during peak biomass
Vertical Accretion	Feldspar Plots/Cryogenic Cores	3 plots/CRMS Site	Bi-annually
Marsh Elevation Change	Rod Surface Elevation Table (RSET)	4 directions/CRMS Site	Bi-annually
Porewater Salinity	10 and 30 cm deep wells Syringe/Sipper	3 wells per depth/CRMS Site and at Vegetation Plots	Monthly Annually
Surface Water Salinity Temp and		in available water within 200 m of CRMS	



CRMS Website

Coastwide Reference

Home Data

Spatial Viewer *DRA

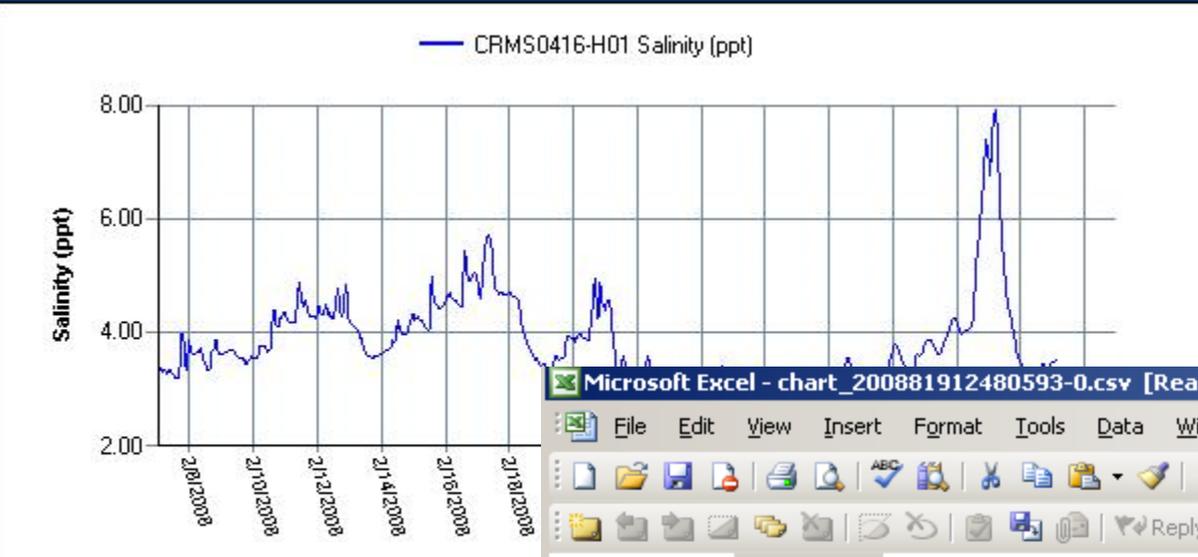
Long: -90.50

Site Info

Salinity

Water Salin

3 / 20
Min
Mean
Max



Microsoft Excel - chart_200881912480593-0.csv [Read-Only]

File Edit View Insert Format Tools Data Window Help

Reply with Changes... End Review...

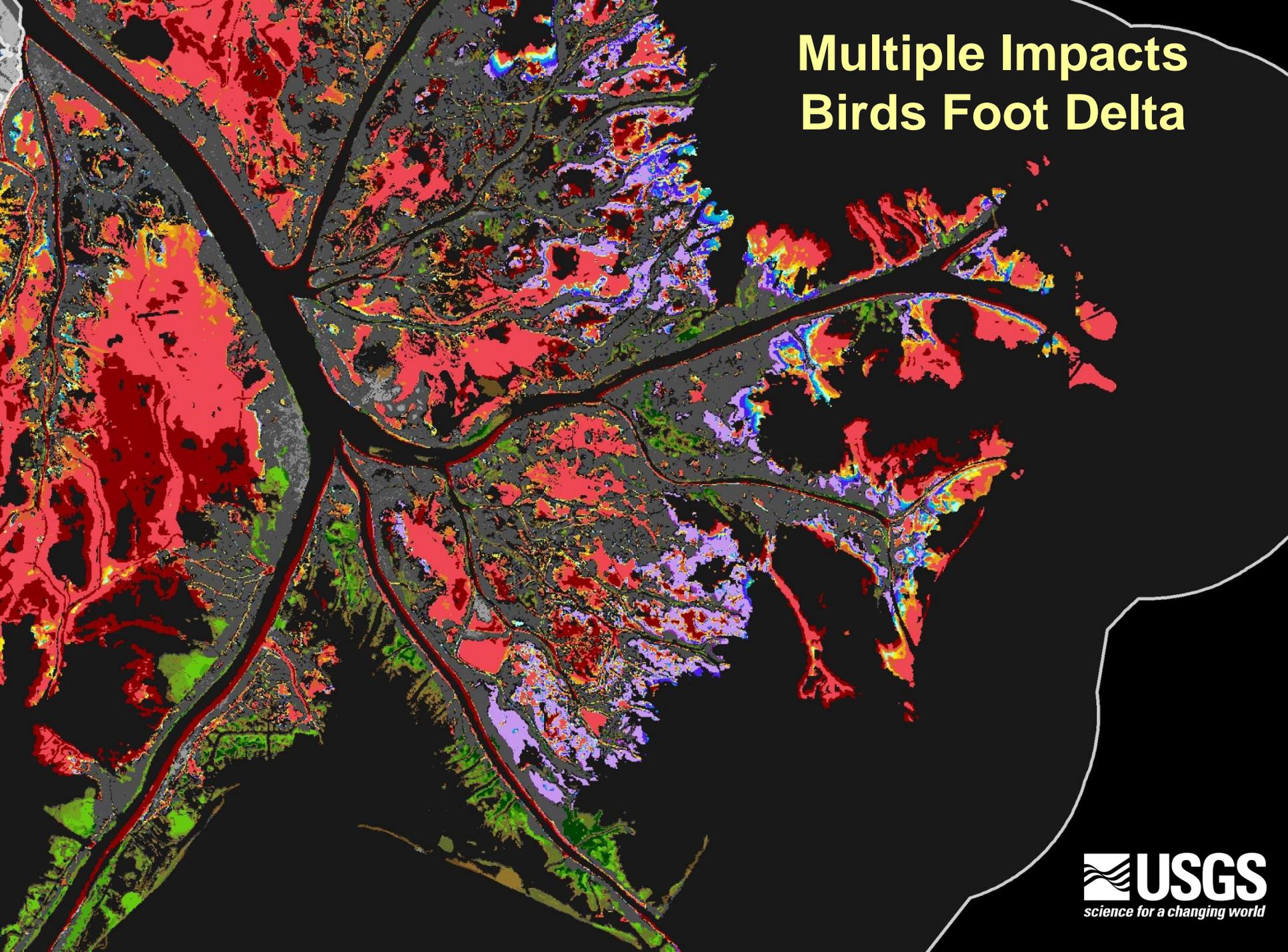
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3	1390237	3.36	1.26	18.5	2/7/2008 2:00	1.36
4	1390238	3.35	1.25	18.79	2/7/2008 3:00	1.36
5	1390239	3.31	1.24	17.66	2/7/2008 4:00	1.36
6	1390240	3.35	1.23	17.59	2/7/2008 5:00	1.36
7	1390241	3.33	1.22	17.57	2/7/2008 6:00	1.36
8	1390242	3.26	1.21	17.39	2/7/2008 7:00	1.35
9	1390243	3.33	1.2	17.47	2/7/2008 8:00	1.35
10	1390244	3.37	1.2	17.5	2/7/2008 9:00	1.36
11	1390245	3.3	1.2	18.2	2/7/2008 10:00	1.36
12	1390246	3.25	1.2	18.98	2/7/2008 11:00	1.36
13	1390247	3.24	1.1	19.96	2/7/2008 12:00	1.36
14	1390248	3.2	1.1	21.07	2/7/2008 13:00	1.36
15	1390249	3.18	1.08	21.77	2/7/2008 14:00	1.36
16	1390250	3.17	1.06	22.03	2/7/2008 15:00	1.36
17	1390251	3.22	1.04	22.07	2/7/2008 16:00	1.36
18	1390252	3.52	1.03	21.91	2/7/2008 17:00	1.36

Download Data

February 07, 2008 - March 06, 2008
Data Source: Continuous Hourly Observations



Multiple Impacts Birds Foot Delta





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National Wetlands Research Center

The mission of the National Wetlands Research Center (NWRC) is to develop and disseminate scientific information needed for understanding the ecology and values of wetlands and for managing and restoring wetlands, coastal habitats, and associated plant and animal communities throughout our world.

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The National Wetlands Research Center provides science with impact to ensure that its research is relevant and useful for resource managers, policy makers, and the public. To accomplish this, the Center seeks scientific discovery and knowledge, communicates timely science information, and engages in robust alliances with government, non-government, and university partners. To learn more, see the Center's Mission and [Strategic Plan](#).

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