



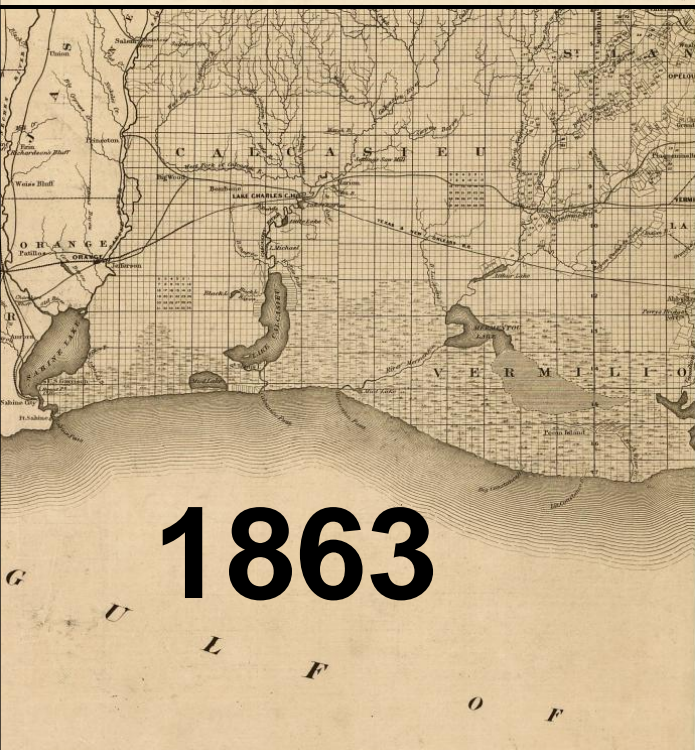
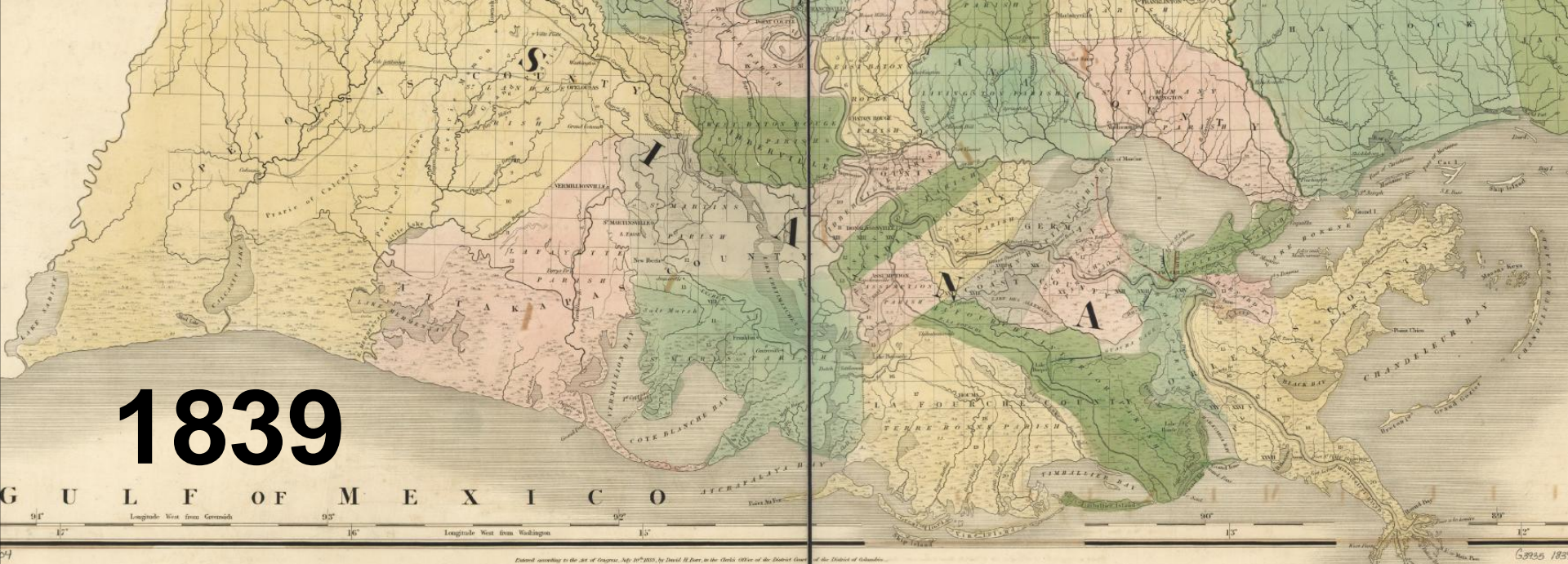
National Wetlands Research Center

Wetland Change in Coastal Louisiana 1932-2010

Brady R. Couvillion

USGS National Wetlands Research Center

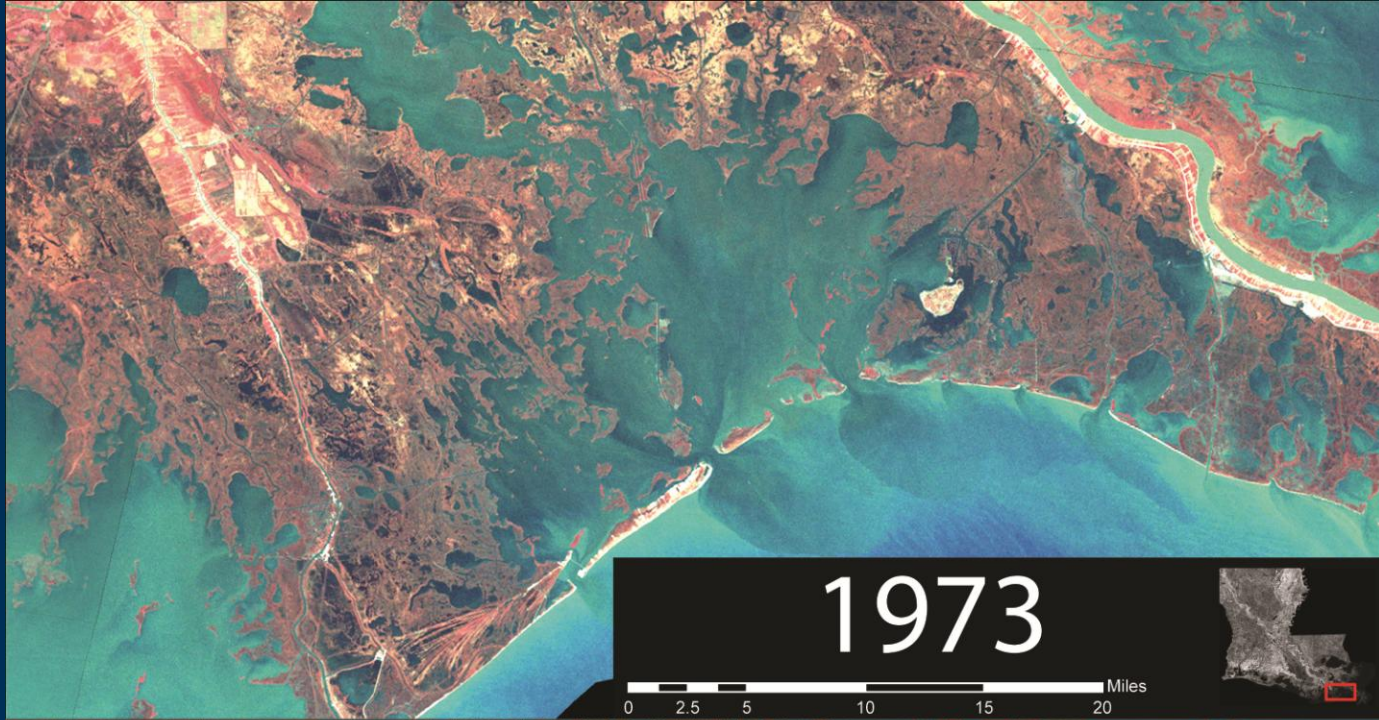














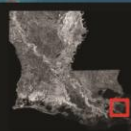
1973

0 3 6 12 18 24 Miles



2010

0 3 6 12 18 24 Miles





Land Area Change in Coastal Louisiana



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

Land Area Change in Coastal Louisiana (1932 to 2010)

By Brady R. Conner, John A. Barrow, Gregory S. Dwyer, William Davis, Michelle Tucker, Holly Baskin, Nadine Taylor, Brad Griffin, David Buckner

Introduction

The U.S. Geological Survey (USGS) Coastal Change Science Center (CCSC) is a multi-agency partnership between the USGS, the U.S. Army Corps of Engineers (USACE), and the U.S. Environmental Protection Agency (EPA). The CCSC was established in 2002 to address the need for a coordinated, multi-agency approach to understanding and managing coastal change in Louisiana. The CCSC's primary mission is to provide the scientific basis for coastal management decisions by conducting research, monitoring, and assessment of coastal change in Louisiana. The CCSC's research focuses on understanding the processes of coastal change, including land subsidence, sea-level rise, and erosion. The CCSC's monitoring efforts include the collection and analysis of satellite data, ground-based measurements, and historical maps. The CCSC's assessment efforts include the development of coastal change models and the evaluation of coastal management options. The CCSC's research, monitoring, and assessment efforts are critical to understanding and managing coastal change in Louisiana and to protecting the state's coastal resources.

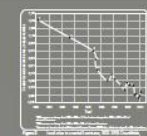
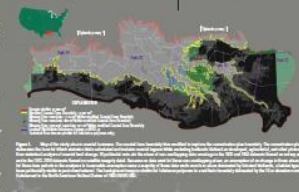


Table 1. Summary of land area change in coastal Louisiana, 1932 to 2010.

Basin	1932-1950	1950-1970	1970-1990	1990-2010	Total
Calcasieu-Sabine	1,200	1,500	1,800	2,000	6,500
Atchafalaya	1,000	1,200	1,400	1,600	5,200
Terrebonne	800	1,000	1,200	1,400	4,400
Barataria	600	800	1,000	1,200	3,600
Grand Bay	400	600	800	1,000	2,800
Bayou du Large	200	400	600	800	2,000
Bayou Lafourche	100	200	400	600	1,300
Bayou de l'Est	50	100	200	400	750
Bayou de la Plume	25	50	100	200	375
Bayou de la Fourche	12.5	25	50	100	187.5
Bayou de la Poudre	6.25	12.5	25	50	93.75
Bayou de la Riviere	3.125	6.25	12.5	25	46.875
Bayou de la Terre	1.5625	3.125	6.25	12.5	23.4375
Bayou de la Vierge	0.78125	1.5625	3.125	6.25	11.71875
Bayou de la Vierge	0.390625	0.78125	1.5625	3.125	5.859375
Bayou de la Vierge	0.1953125	0.390625	0.78125	1.5625	2.9296875
Bayou de la Vierge	0.09765625	0.1953125	0.390625	0.78125	1.46484375
Bayou de la Vierge	0.048828125	0.09765625	0.1953125	0.390625	0.732421875
Bayou de la Vierge	0.0244140625	0.048828125	0.09765625	0.1953125	0.3662109375
Bayou de la Vierge	0.01220703125	0.0244140625	0.048828125	0.09765625	0.18310546875
Bayou de la Vierge	0.006103515625	0.01220703125	0.0244140625	0.048828125	0.091552734375
Bayou de la Vierge	0.0030517578125	0.006103515625	0.01220703125	0.0244140625	0.0457763671875
Bayou de la Vierge	0.00152587890625	0.0030517578125	0.006103515625	0.01220703125	0.02288818359375
Bayou de la Vierge	0.000762939453125	0.00152587890625	0.0030517578125	0.006103515625	0.011444091796875
Bayou de la Vierge	0.0003814697265625	0.000762939453125	0.00152587890625	0.0030517578125	0.0057220458984375
Bayou de la Vierge	0.00019073486328125	0.0003814697265625	0.000762939453125	0.00152587890625	0.00286102294921875
Bayou de la Vierge	9.5367431640625e-05	0.00019073486328125	0.0003814697265625	0.000762939453125	0.001430511474609375
Bayou de la Vierge	4.76837158203125e-05	9.5367431640625e-05	0.00019073486328125	0.0003814697265625	0.0007152557373046875
Bayou de la Vierge	2.384185791015625e-05	4.76837158203125e-05	9.5367431640625e-05	0.00019073486328125	0.00035762786865234375
Bayou de la Vierge	1.1920928955078125e-05	2.384185791015625e-05	4.76837158203125e-05	9.5367431640625e-05	0.000178813934326171875
Bayou de la Vierge	5.9604644775390625e-06	1.1920928955078125e-05	2.384185791015625e-05	4.76837158203125e-05	8.94069671630859375e-06
Bayou de la Vierge	2.98023223876953125e-06	5.9604644775390625e-06	1.1920928955078125e-05	2.384185791015625e-05	4.470348358154296875e-06
Bayou de la Vierge	1.490116119384765625e-06	2.98023223876953125e-06	5.9604644775390625e-06	1.1920928955078125e-05	2.2351741790771484375e-06
Bayou de la Vierge	7.450580596923828125e-07	1.490116119384765625e-06	2.98023223876953125e-06	5.9604644775390625e-06	1.11758708953857421875e-06
Bayou de la Vierge	3.7252902984619140625e-07	7.450580596923828125e-07	1.490116119384765625e-06	2.98023223876953125e-06	5.58793544769287109375e-07
Bayou de la Vierge	1.86264514923095703125e-07	3.7252902984619140625e-07	7.450580596923828125e-07	1.490116119384765625e-06	2.793967723846435546875e-07
Bayou de la Vierge	9.31322574615478515625e-08	1.86264514923095703125e-07	3.7252902984619140625e-07	7.450580596923828125e-07	1.3969838619232177734375e-07
Bayou de la Vierge	4.656612873077392578125e-08	9.31322574615478515625e-08	1.86264514923095703125e-07	3.7252902984619140625e-07	6.9849193096160888671875e-08
Bayou de la Vierge	2.3283064365386962890625e-08	4.656612873077392578125e-08	9.31322574615478515625e-08	1.86264514923095703125e-07	3.49245965480804443359375e-08
Bayou de la Vierge	1.16415321826934814453125e-08	2.3283064365386962890625e-08	4.656612873077392578125e-08	9.31322574615478515625e-08	1.746229827404022216796875e-08
Bayou de la Vierge	5.82076609134674072265625e-09	1.16415321826934814453125e-08	2.3283064365386962890625e-08	4.656612873077392578125e-08	8.731149137020111083984375e-09
Bayou de la Vierge	2.910383045673370361328125e-09	5.82076609134674072265625e-09	1.16415321826934814453125e-08	2.3283064365386962890625e-08	4.3655745685100555419921875e-09
Bayou de la Vierge	1.4551915228366851806640625e-09	2.910383045673370361328125e-09	5.82076609134674072265625e-09	1.16415321826934814453125e-08	2.18278728425502777099609375e-09
Bayou de la Vierge	7.2759576141834259033203125e-10	1.4551915228366851806640625e-09	2.910383045673370361328125e-09	5.82076609134674072265625e-09	1.091393642127513885498046875e-09
Bayou de la Vierge	3.63797880709171295166015625e-10	7.2759576141834259033203125e-10	1.4551915228366851806640625e-09	2.910383045673370361328125e-09	5.45696821063756942749403125e-10
Bayou de la Vierge	1.818989403545856475830078125e-10	3.63797880709171295166015625e-10	7.2759576141834259033203125e-10	1.4551915228366851806640625e-09	2.728484105318784713747015625e-10
Bayou de la Vierge	9.094947017729282379150390625e-11	1.818989403545856475830078125e-10	3.63797880709171295166015625e-10	7.2759576141834259033203125e-10	1.3642420526593923568735078125e-10
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Bayou de la Vierge	5.684341886080801486968994140625e-12	1.136868377216160297393798828125e-11	2.27373675443232059478759765625e-11	4.5474735088646411895751953125e-11	8.5265128291212022304833923828125e-12
Bayou de la Vierge	2.8421709430404007434844970703125e-12	5.684341886080801486968994140625e-12	1.136868377216160297393798828125e-11	2.27373675443232059478759765625e-11	4.26325641456060111524169619140625e-12
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Bayou de la Vierge	4.336808689942017736029811203479766845703125e-17	8.67361737988403547205962240695953369140625e-17	1.73472347597680709441192448139190673828125e-16	3.4694469519536141888238489627838134765625e-16	6.50521303491302660449937524705869140625e-17
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Bayou de la Vierge	1.355252715606880542509316001087354278571428515625e-18	2.7105054312137610850186320021747085571428515625e-18	5.42101086242752217003726400434941711428515625e-18	1.084202172485504434007452800869941711428515625e-17	2.03800136404094027125465800054367713928571428515625e-18
Bayou de la Vierge	6.7762635780344027				

Land Area Change in Coastal Louisiana from 1932 to 2010

By Brady R. Couvillion, John A. Barras, Gregory D. Steyer, William Sleavin, Michelle Fischer, Holly Beck, Nadine Trahan, Brad Griffin, and David Heckman



Abstract

Coastal Louisiana wetlands make up the seventh largest delta on Earth, contain about 37 percent of the estuarine herbaceous marshes in the conterminous United States, and support the largest commercial fishery in the lower 48 States. These wetlands are in peril because Louisiana currently undergoes about 90 percent of the total coastal wetland loss in the continental United States. Documenting and understanding the occurrence and rates of wetland loss are necessary for effective planning, protection, and restoration activities.

The analyses of landscape change presented in this report use historical surveys, aerial data, and satellite data to track landscape changes. Summary data are presented for 1932–2010; trend data are presented for 1985–2010. These later data were calculated separately because of concerns over the comparability of the 1932 and 1956 datasets (which are based on survey and aerial data, respectively) with the later datasets (which are all based on satellite imagery).

These analyses show that coastal Louisiana has undergone a net change in land area of about -1.883 square miles (mi²) from 1932 to 2010. This net change in

First posted June 1, 2011

■ [Pamphlet PDF \(1.92 MB\)](#)

■ [Map PDF \(16.2 MB\)](#)

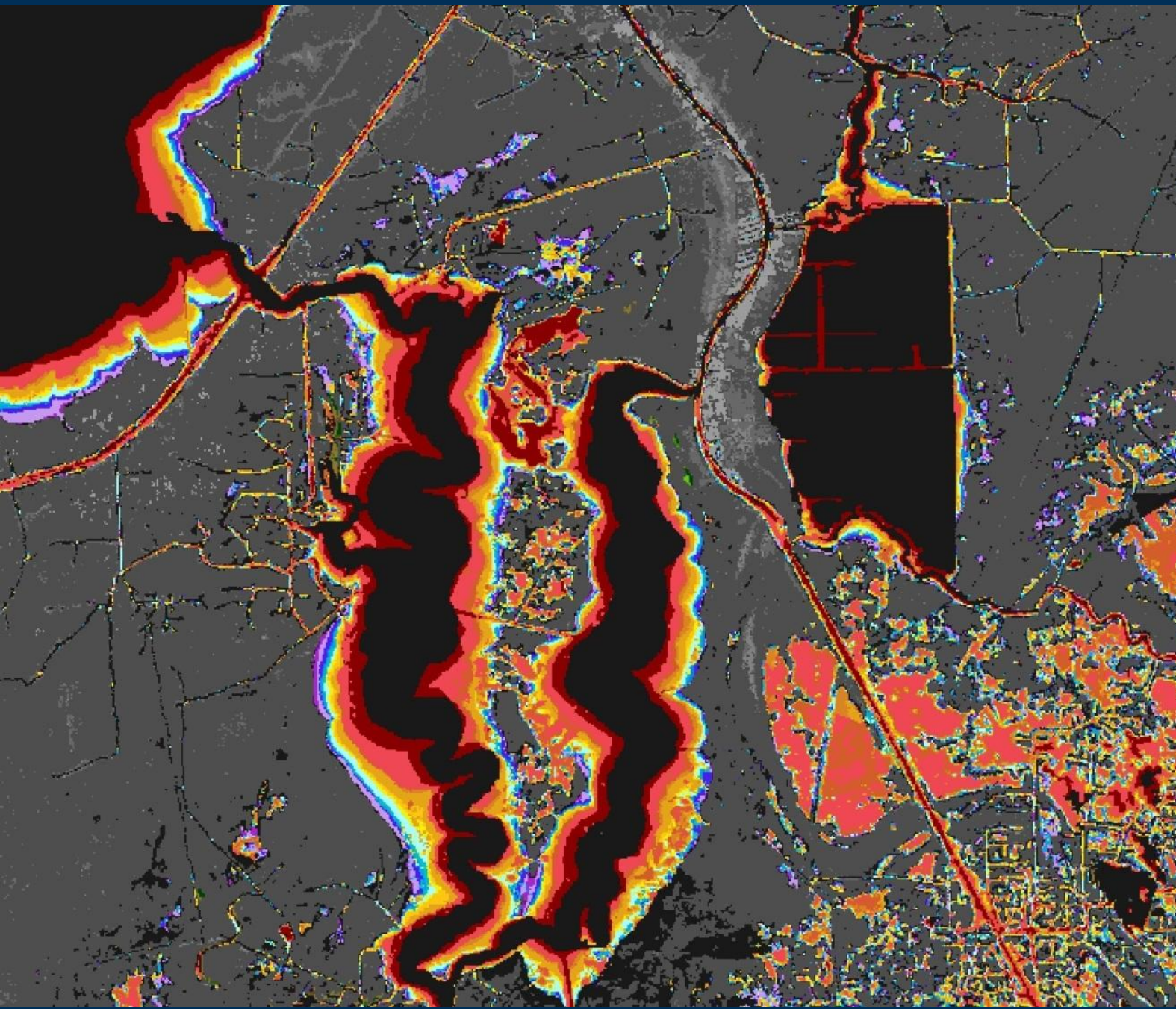
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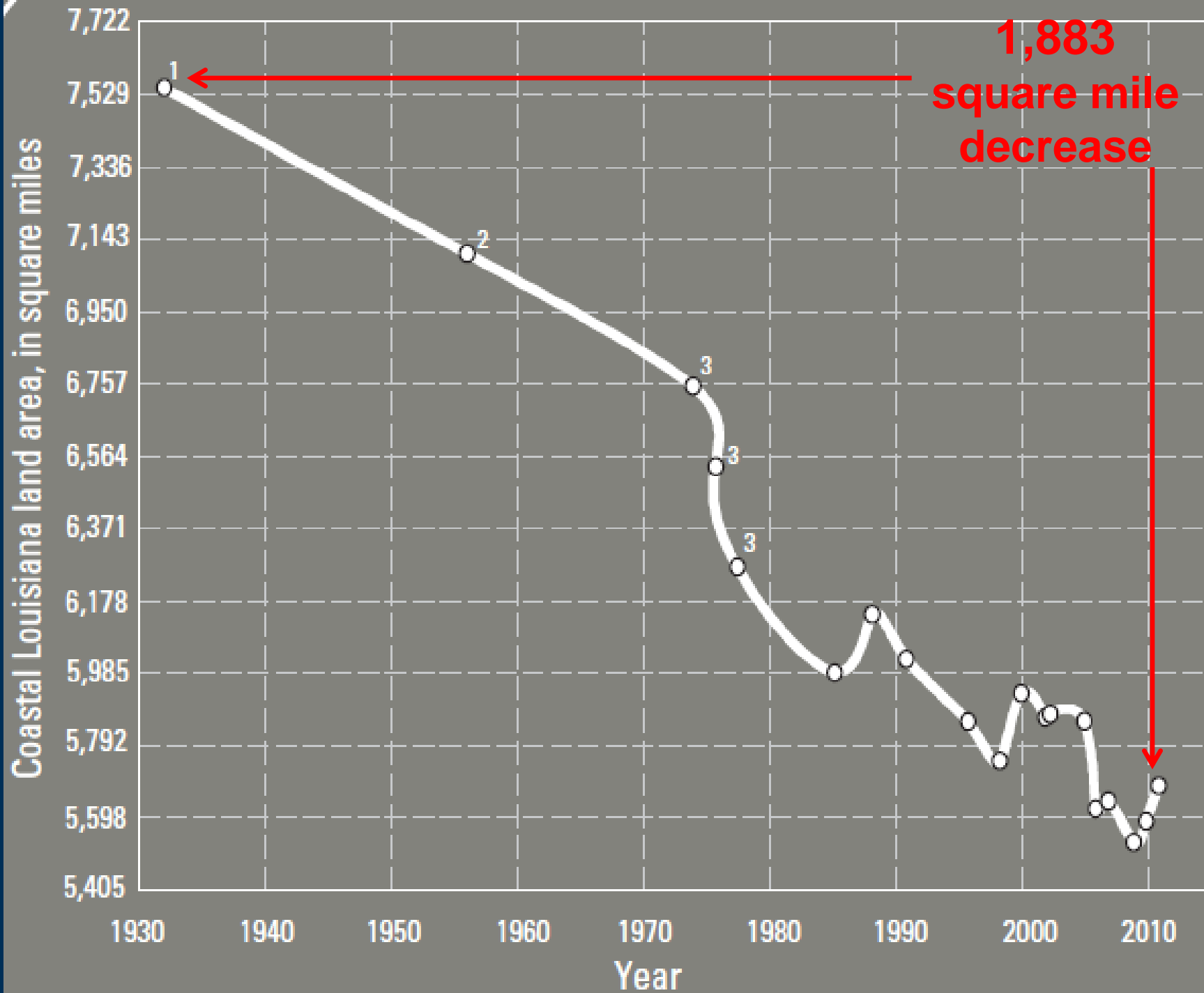
For additional information contact:

USGS National Wetlands Research Center
700 Cajundome Blvd.
Lafayette, LA 70506

EXPLANATION



- 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}



Land Area Change in Coastal Louisiana

- Analyses show that coastal Louisiana has experienced an approximate net loss of 1883 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.



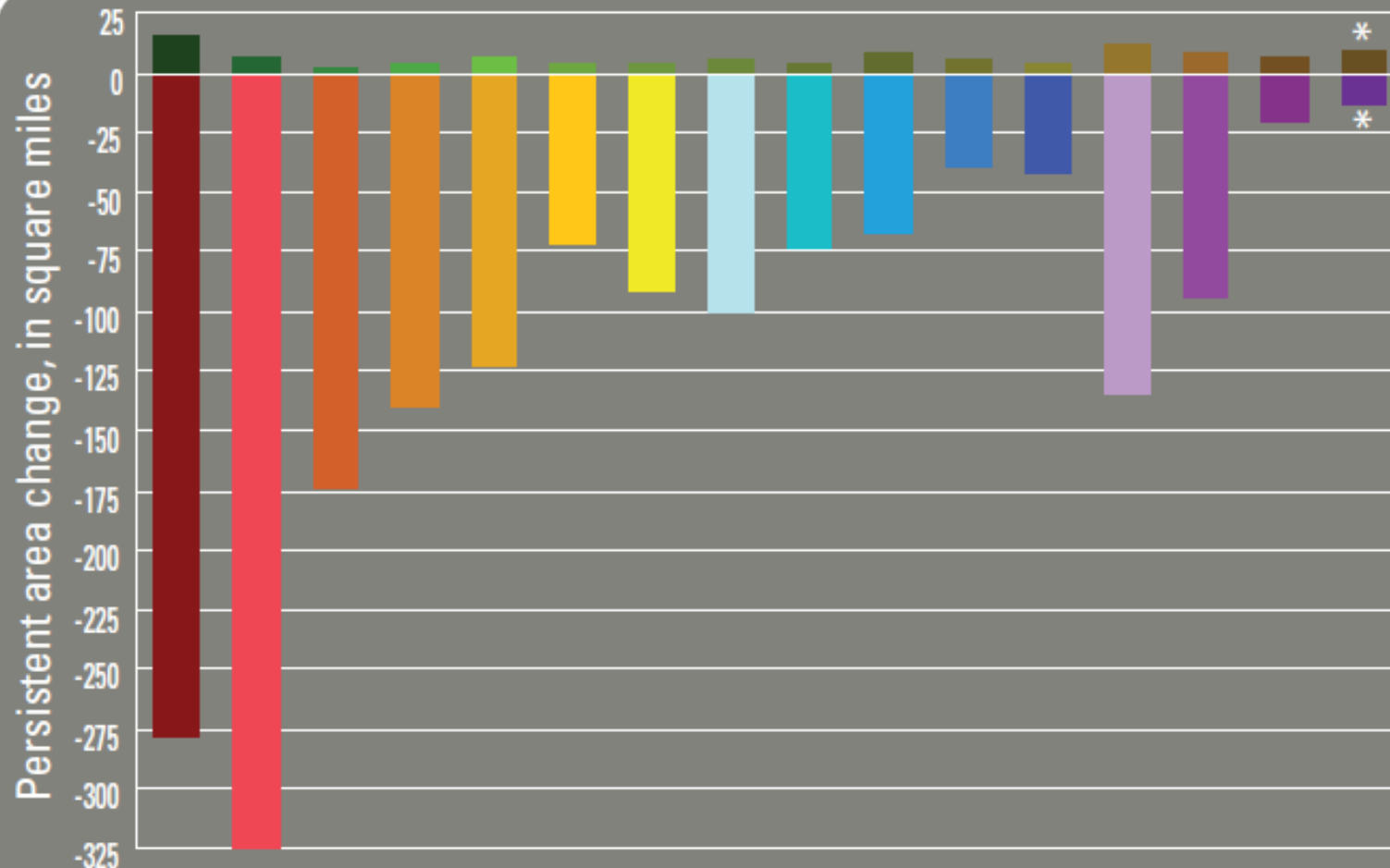
Land Area Change in Coastal Louisiana

- 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).



Land Change by Period

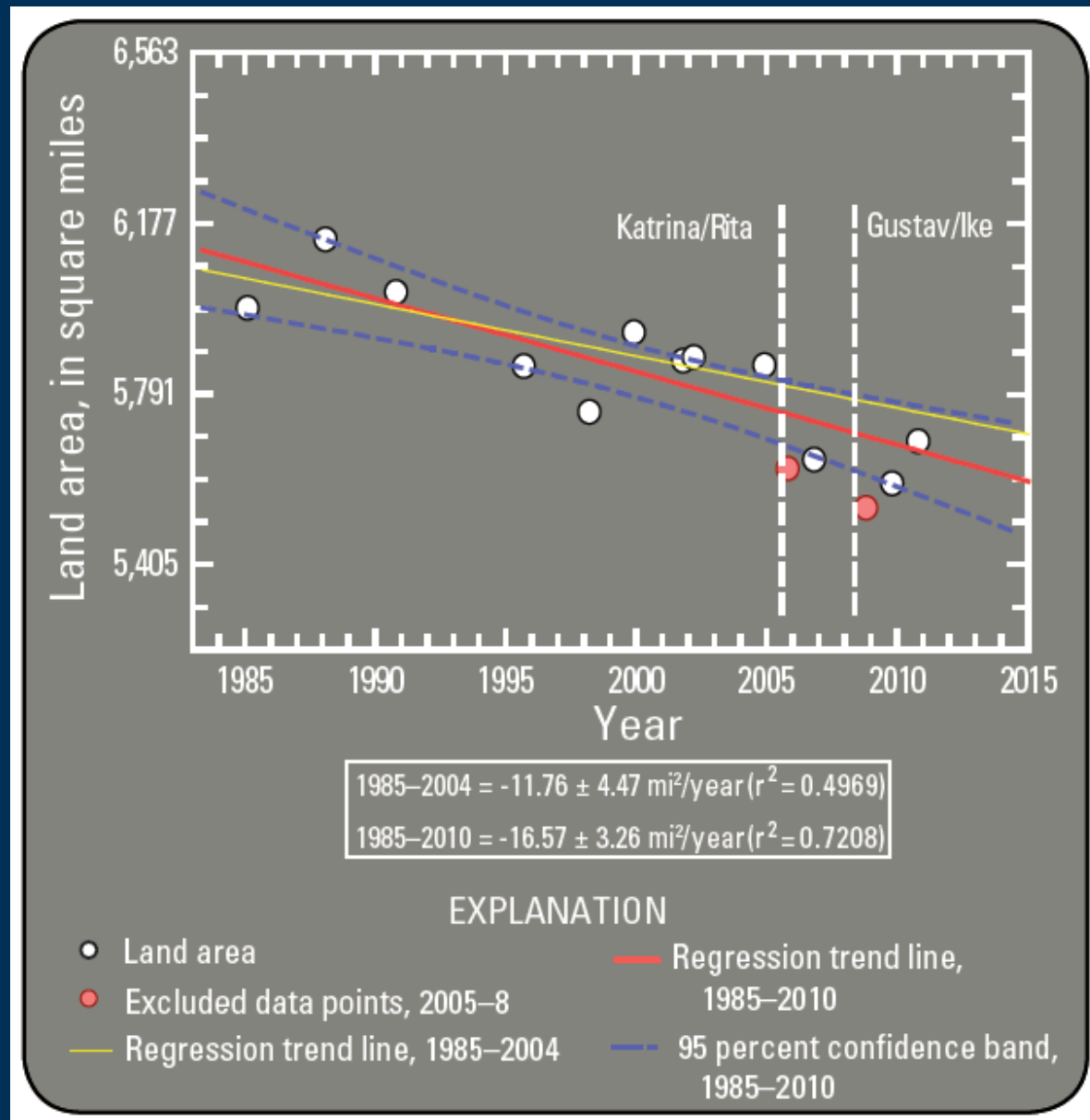
EXPLANATION



* 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}

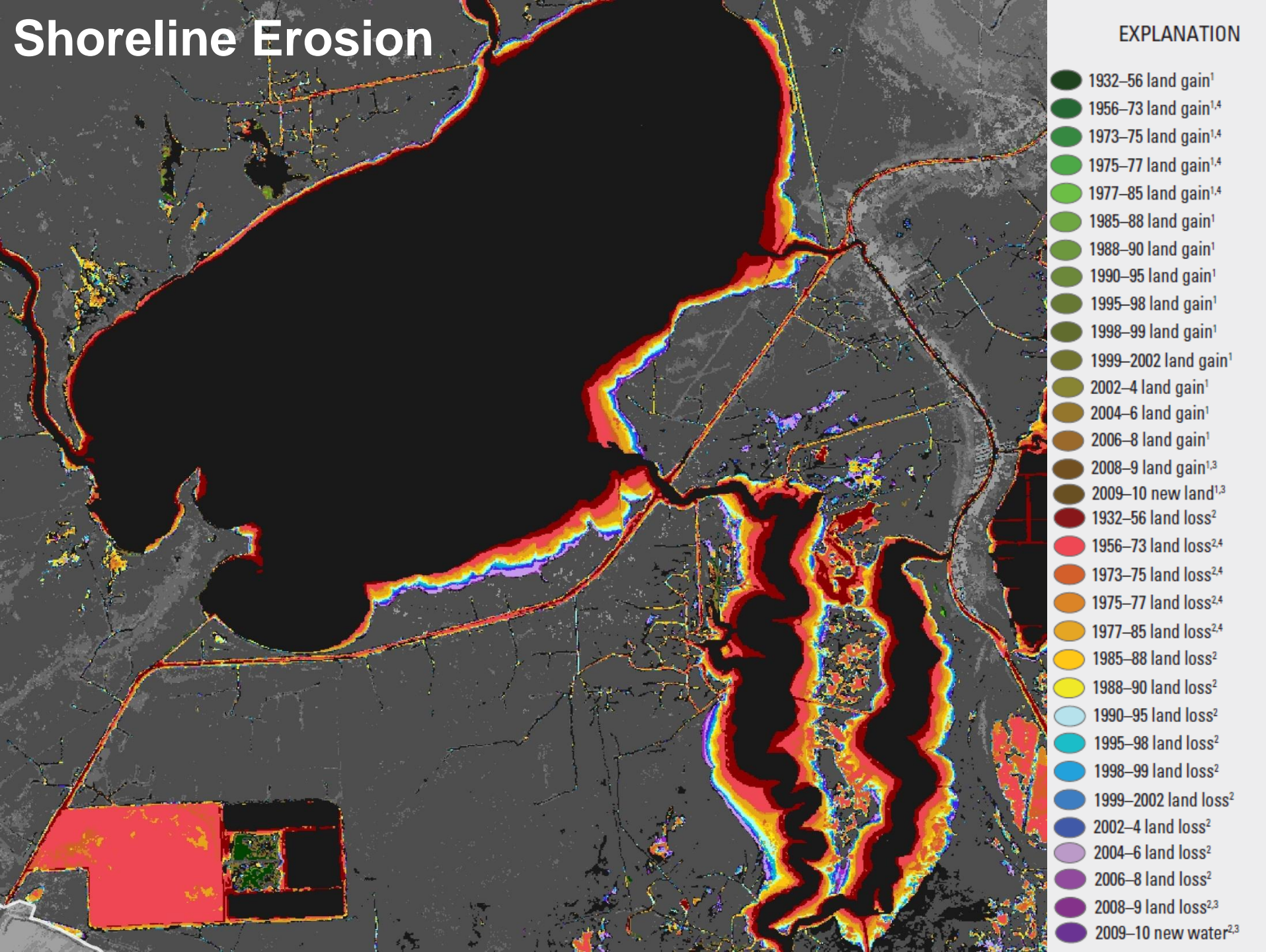
Recent Trends



Shoreline Erosion

Shoreline Erosion

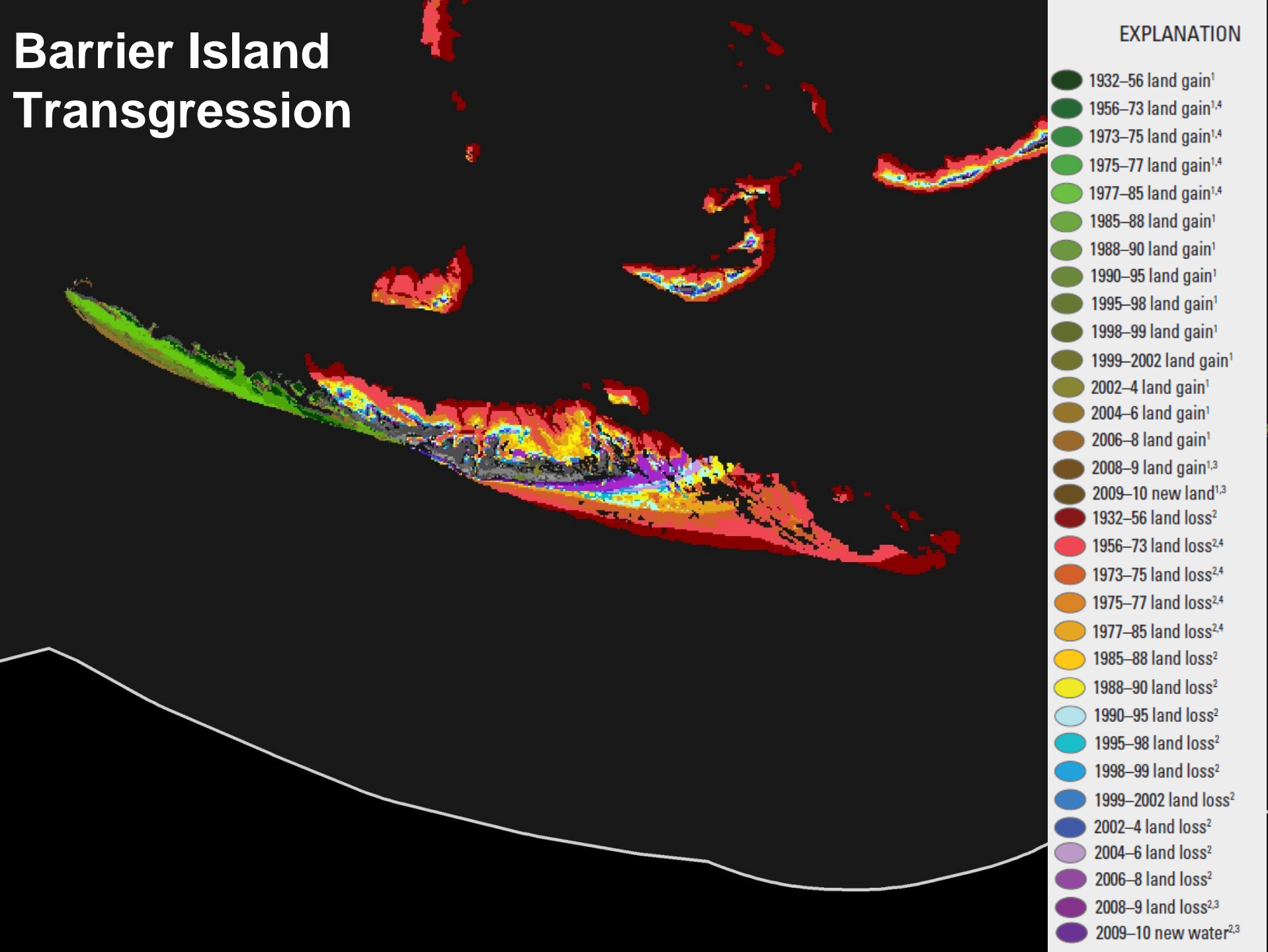
EXPLANATION





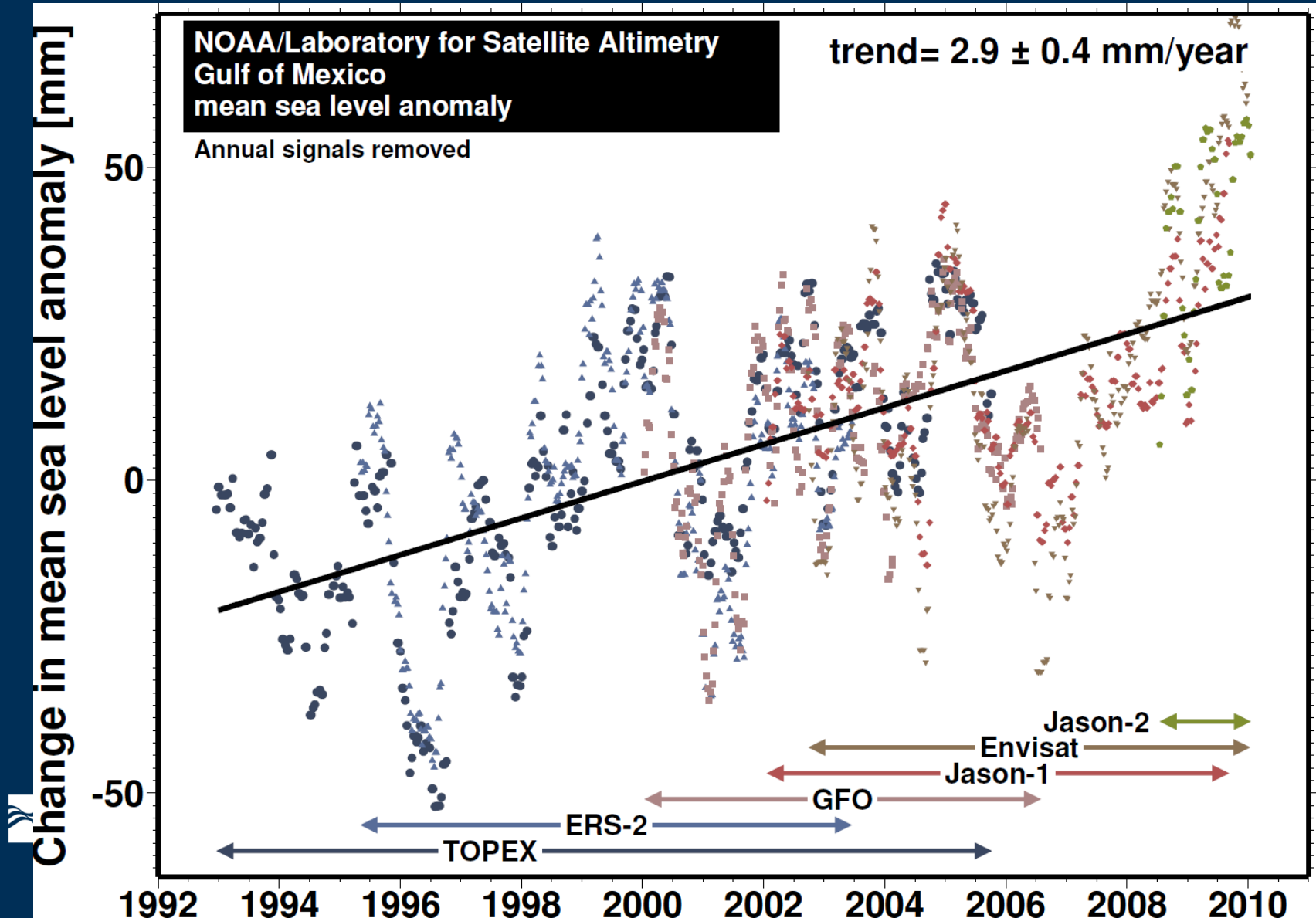
Barrier Island Transgression

Barrier Island Transgression



Sea Level Rise

Sea Level Rise



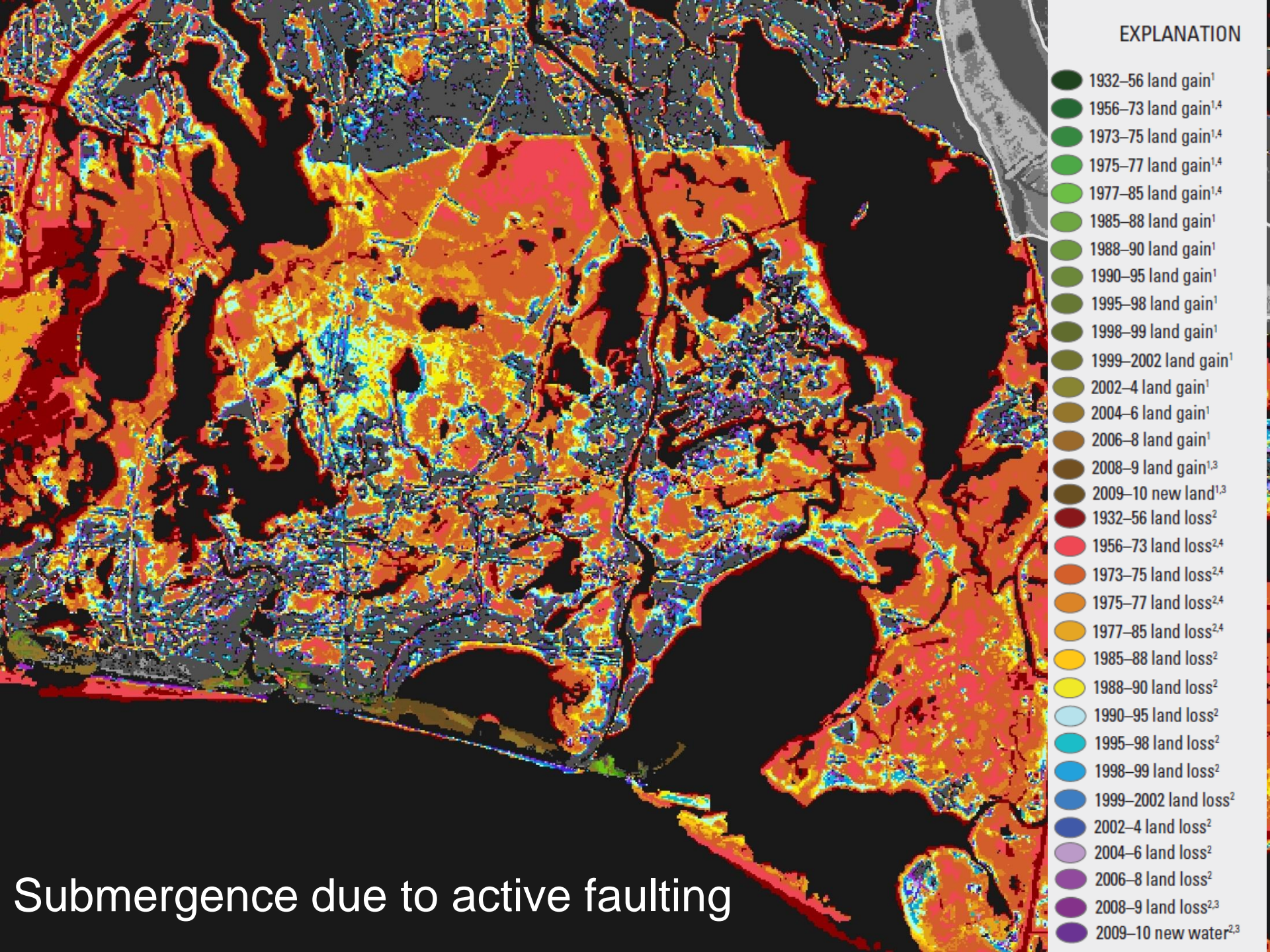
Subsidence

Subsidence



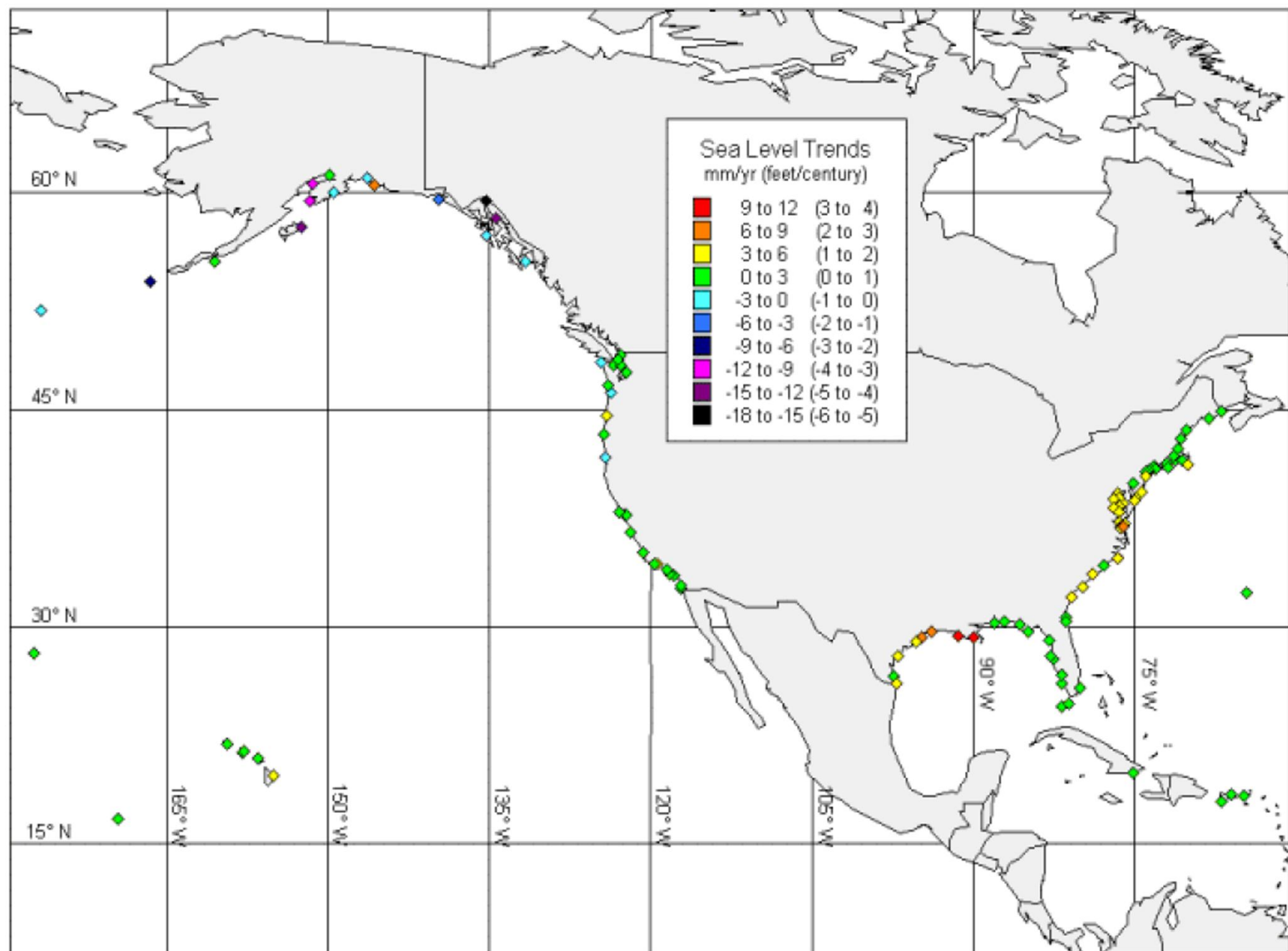
Subsidence





Submergence due to active faulting

Relative Sea Level Rise



EXPLANATION

- 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}

Levees, Dams, Flood Control Structures, and Sediment

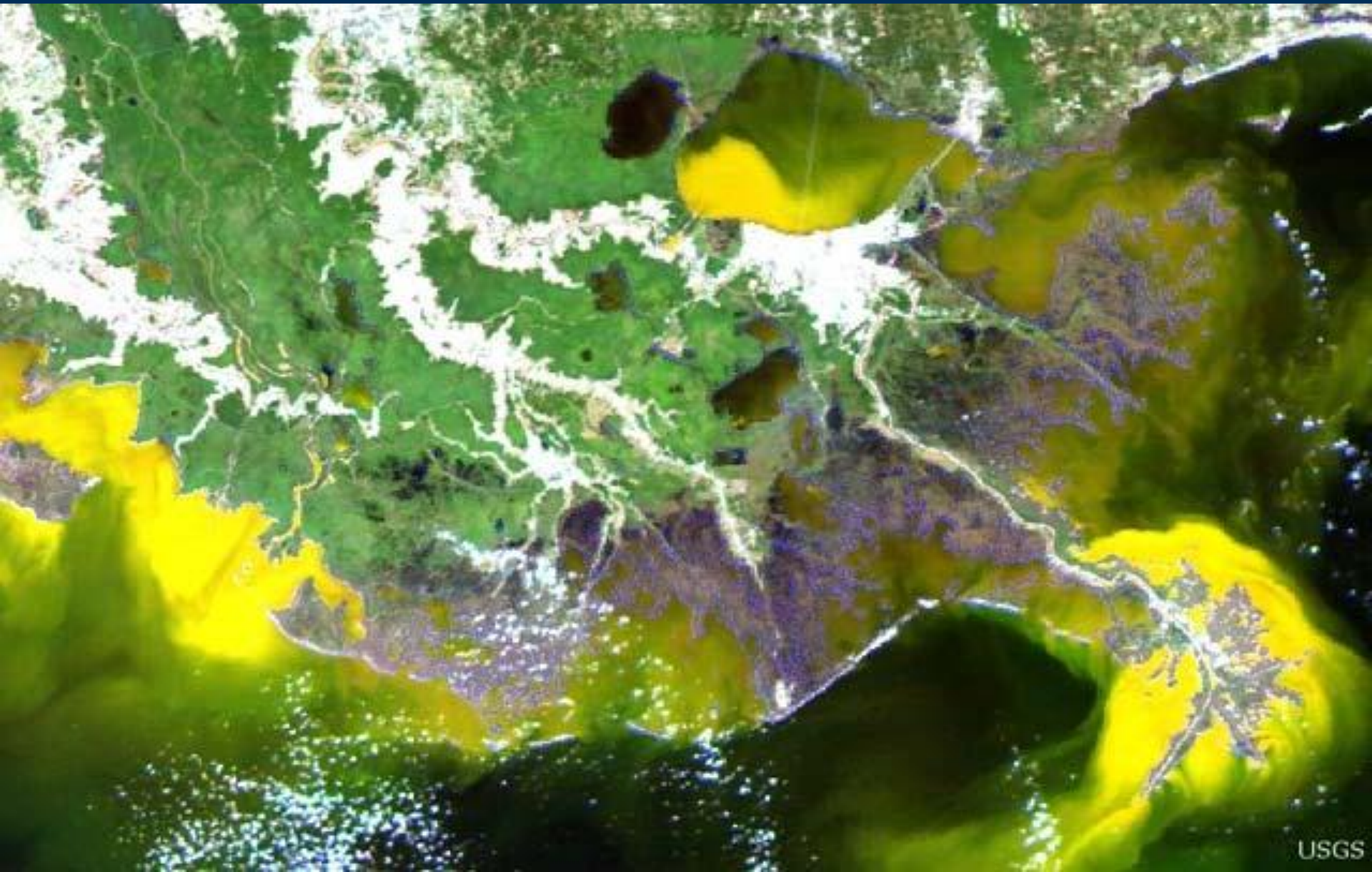
Human Settlement







May 27th, 2011



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Navigation Infrastructure



Navigation Infrastructure

EXPLANATION

- 1932-56 land gain¹
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- 1977-85 land gain^{1,4}
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- 1999-2002 land loss²
- 2002-4 land loss²
- 2004-6 land loss²
- 2006-8 land loss²
- 2008-9 land loss^{2,3}
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Altered Hydrology

EXPLANATION

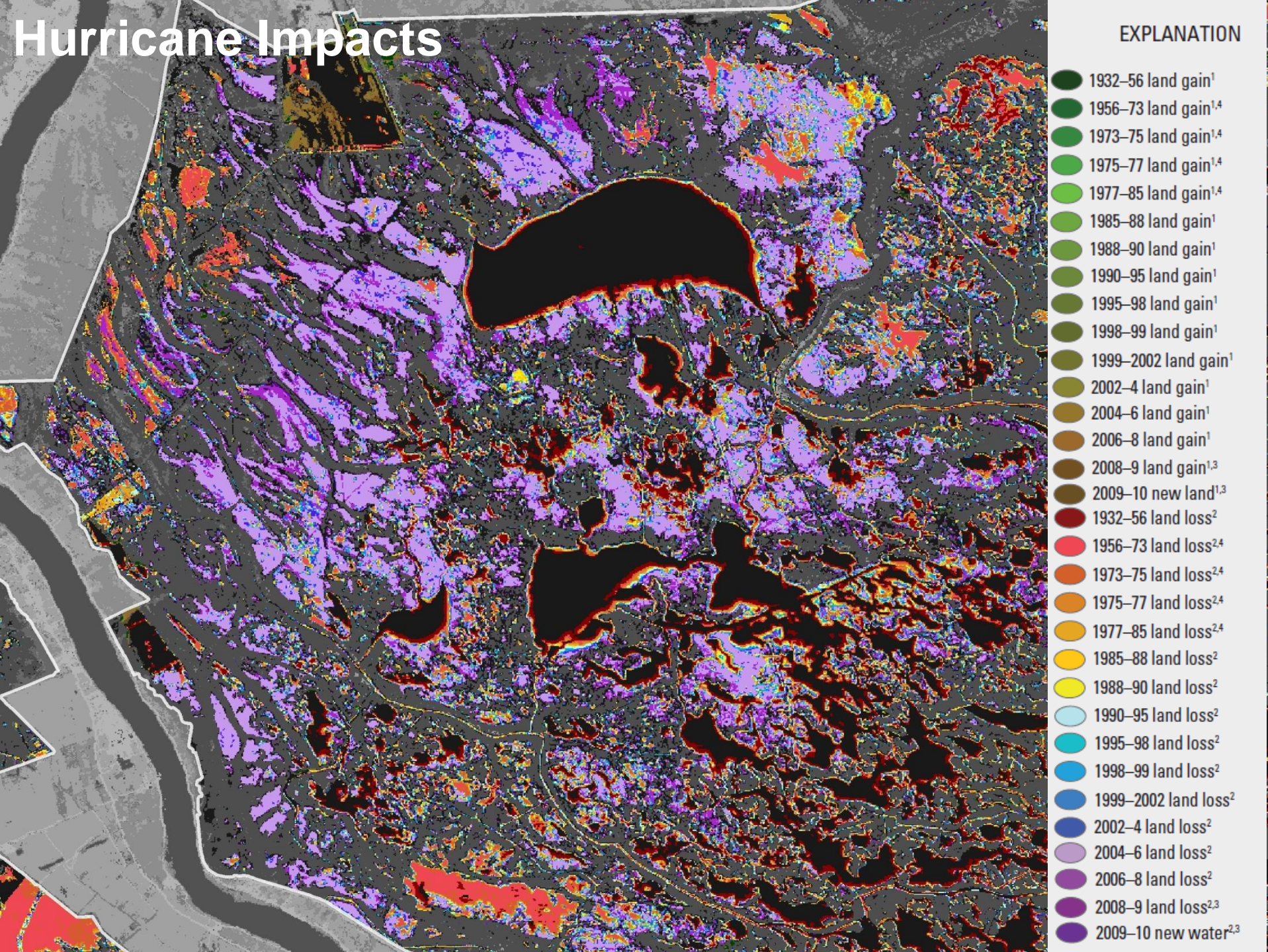
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Altered Hydrology



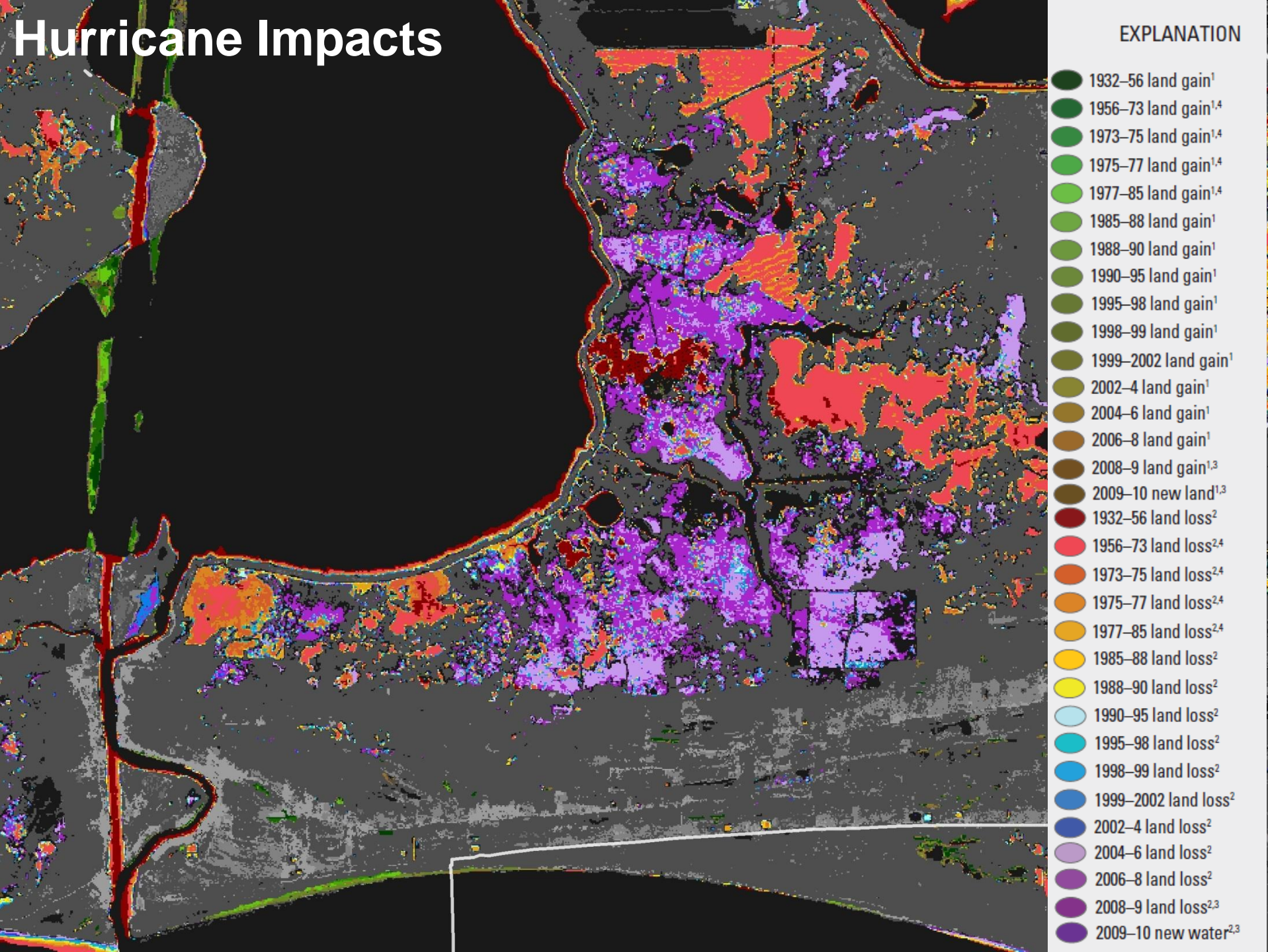
Hurricanes

Hurricane Impacts



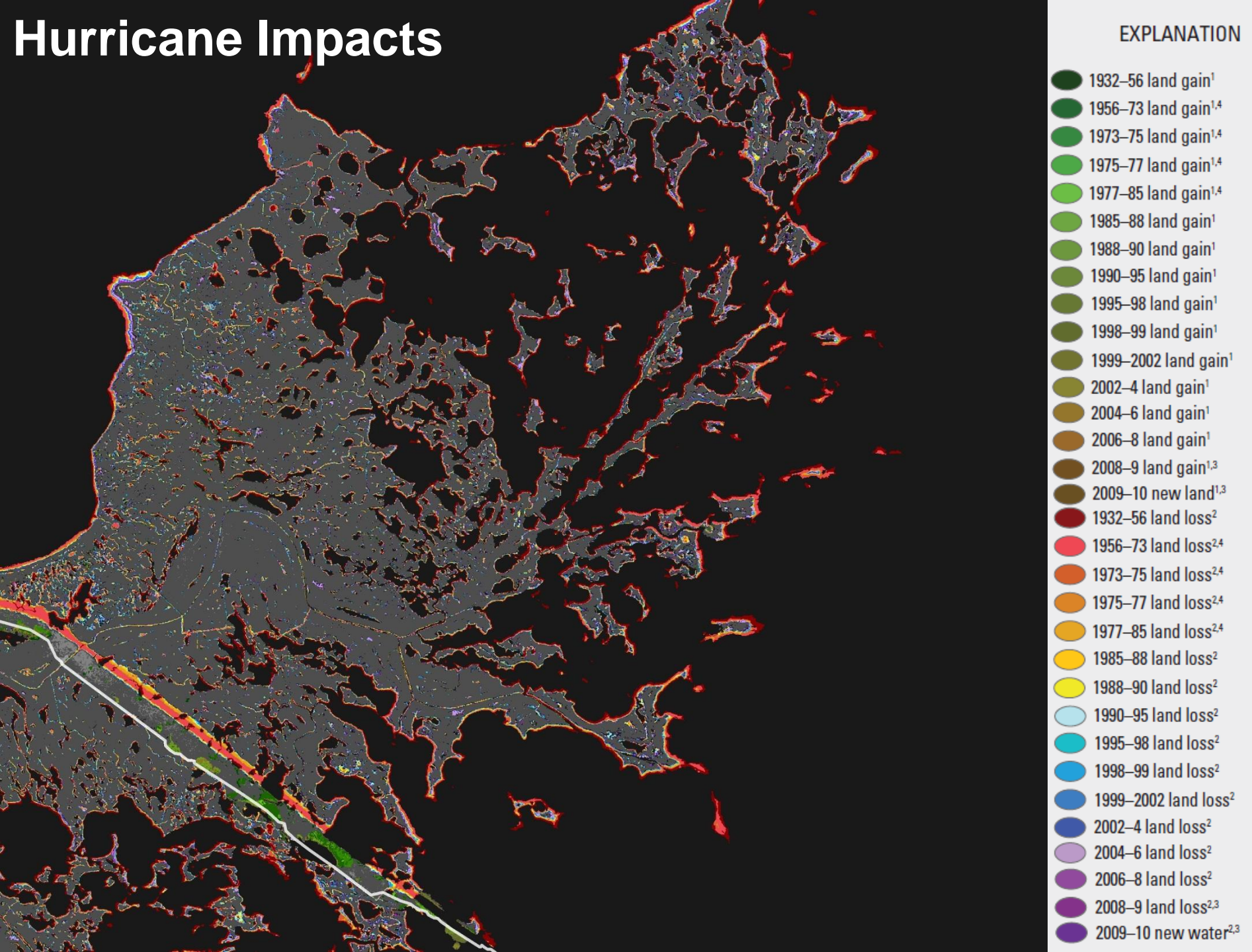
Hurricane Impacts

EXPLANATION



Hurricane Impacts

EXPLANATION



Herbivory



Initial Stages of Damage

Minor Damage



Multiple Interacting and Compounding Stressors

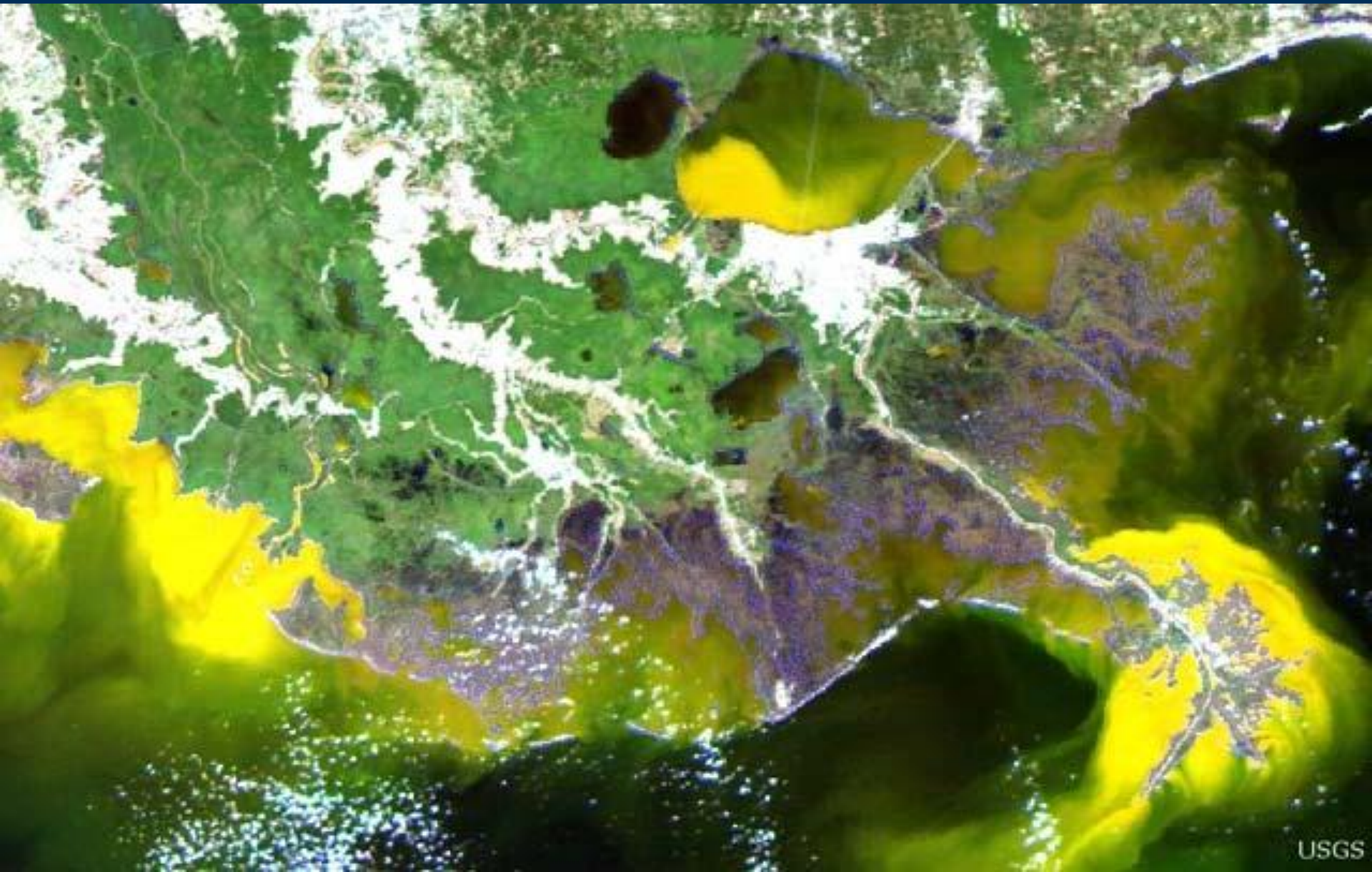
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- 2002–4 land loss²
- 2004–6 land loss²
- 2006–8 land loss²
- 2008–9 land loss^{2,3}
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Interaction of multiple stressors

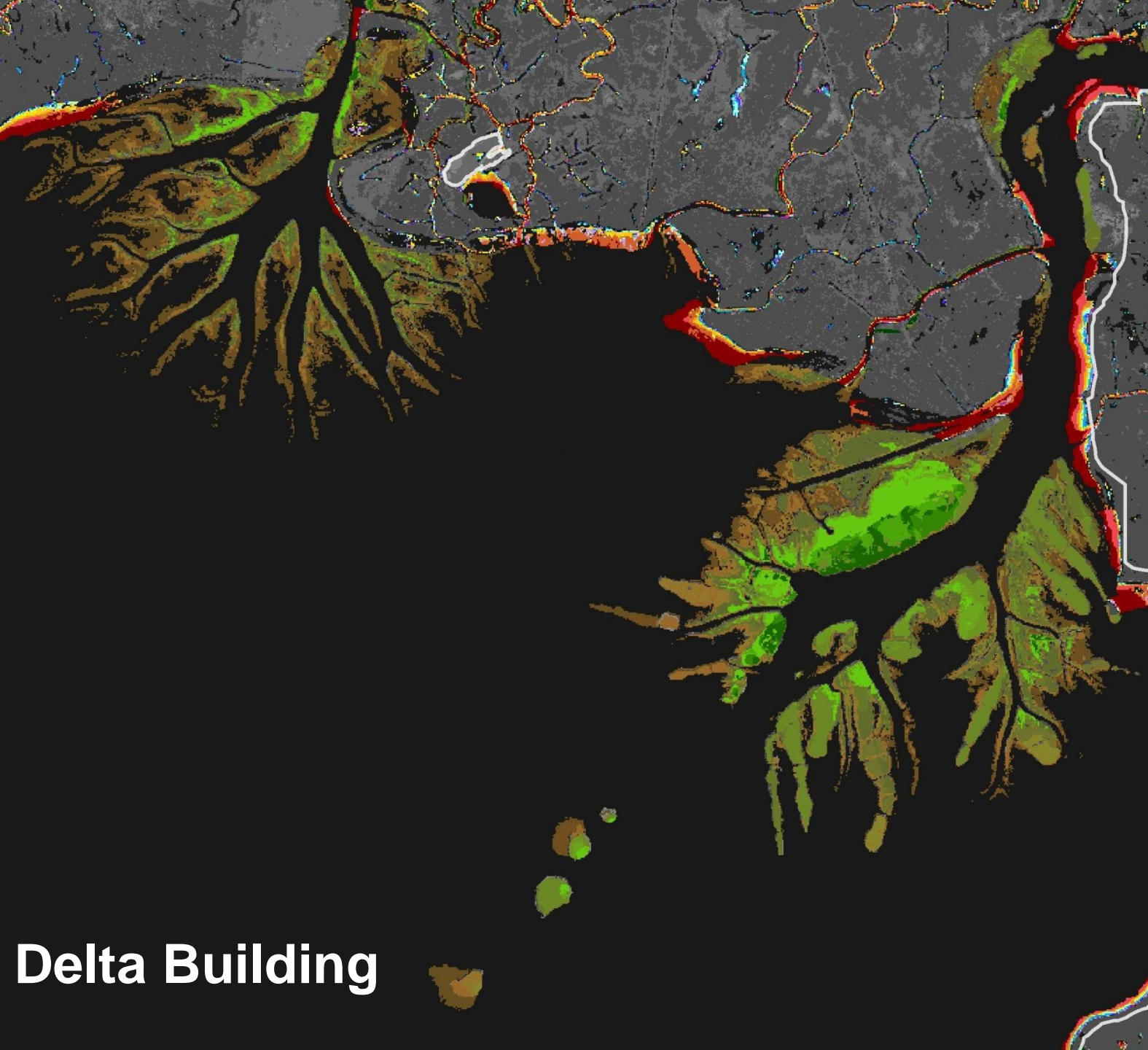
Delta Building

May 27th, 2011



EXPLANATION

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Delta Building



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Questions