Concerns About State Master Plan

Dr. Pat Fitzpatrick

- Crux of controversy – communication and lack of certain details
- Concerns regarding land-building timelines, Caernarvon erosion, and information on fishery studies
- Everyone involved agrees action is needed to restore the coast

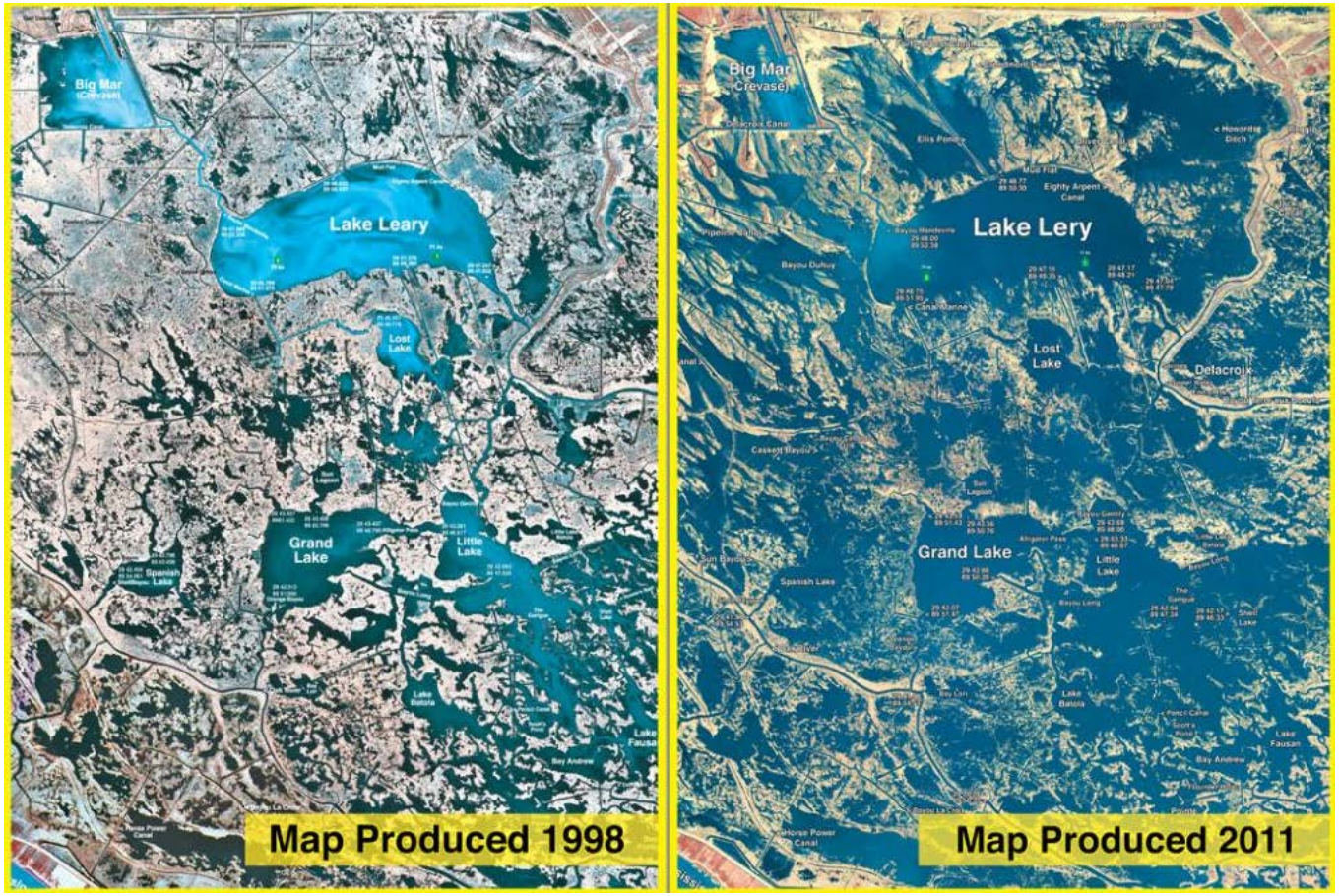
Two important statements:

1) Any opinions are my own and do not reflect any affiliations
2) Although I have concerns, I am an objective person, and have communicated as such to everyone

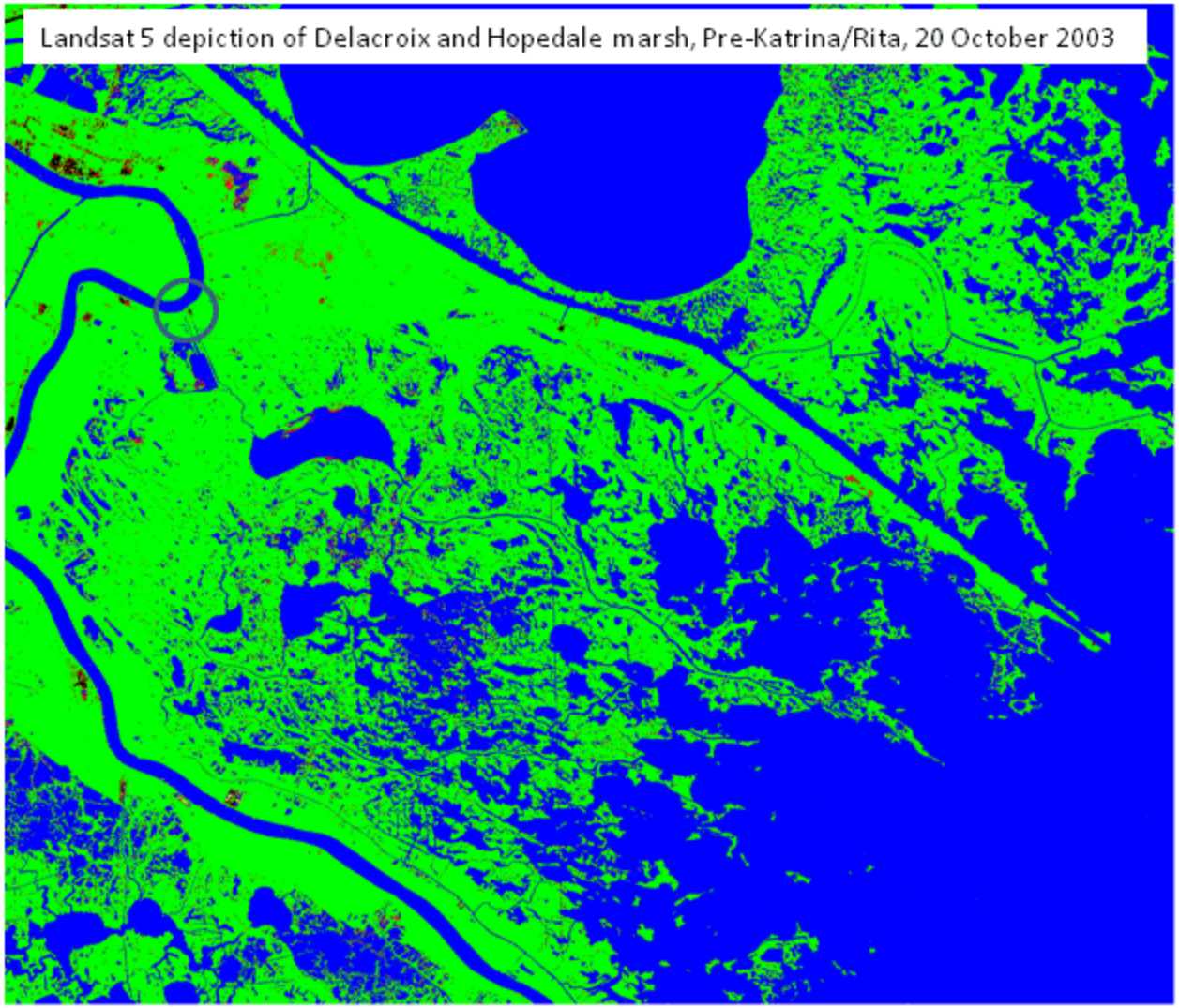
Issue – a marsh erosion issue exists near Caernarvon diversion

Erosion is pronounced after Katrina, Gustav, and Isaac

Erosion in saline marsh east of Twin pipelines and in Hopedale was much less.

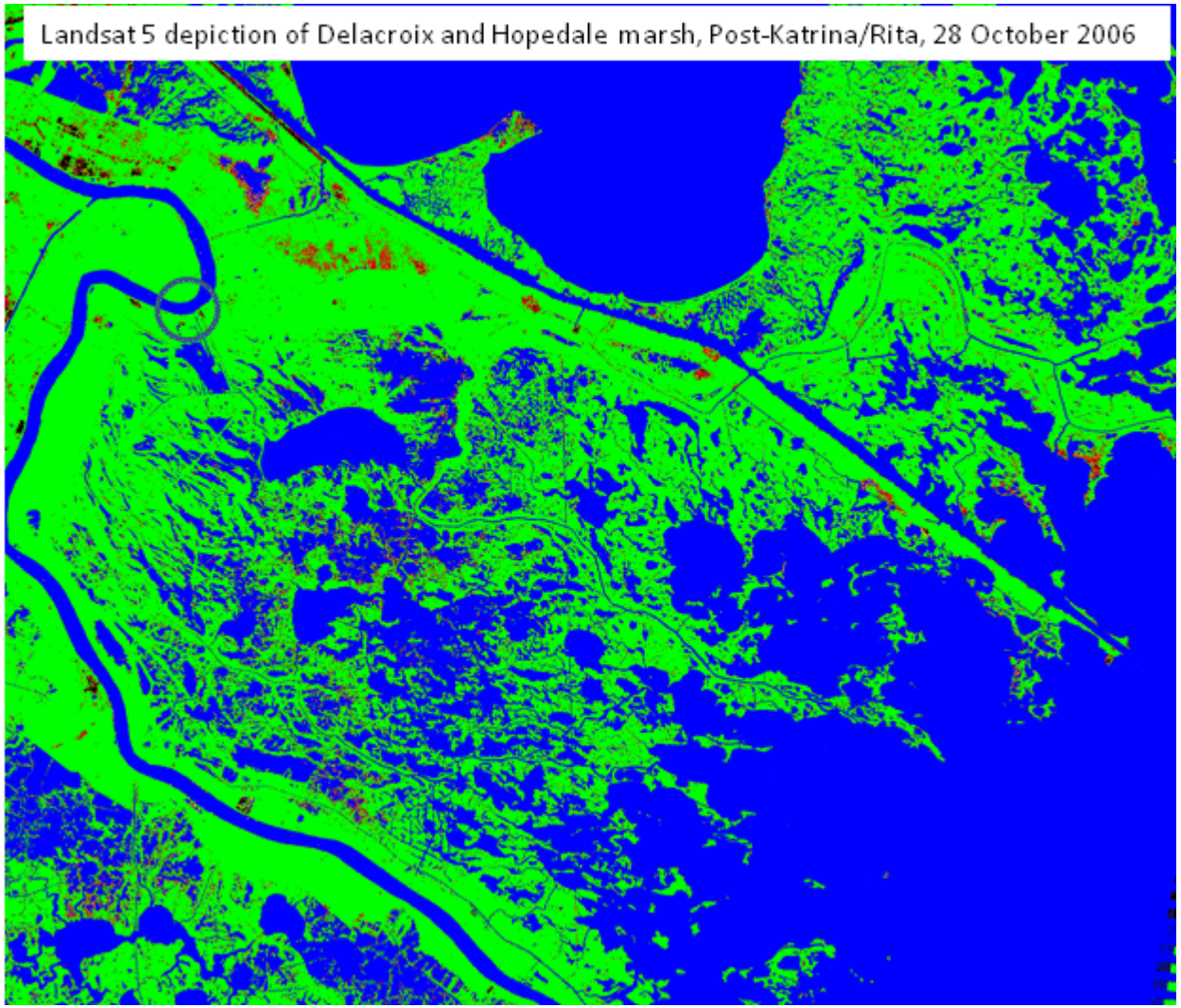


(Created by Standard Mapping)



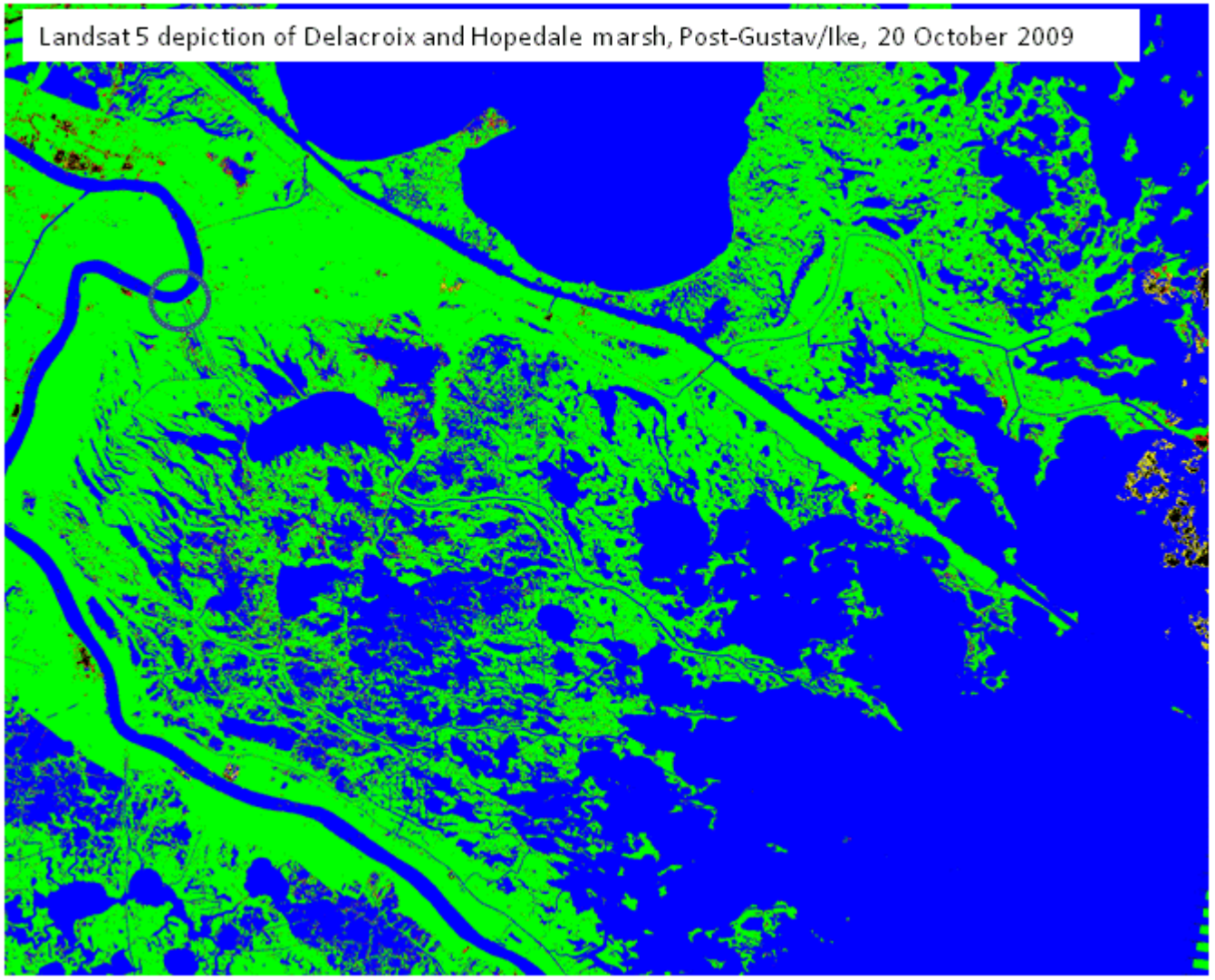
(Fitzpatrick et al. 2012)

Note that east Delacroix and Biloxi Marsh experienced much less erosion
Water coverage doubled near diversion. Erosion was 2-10% in salt marsh.



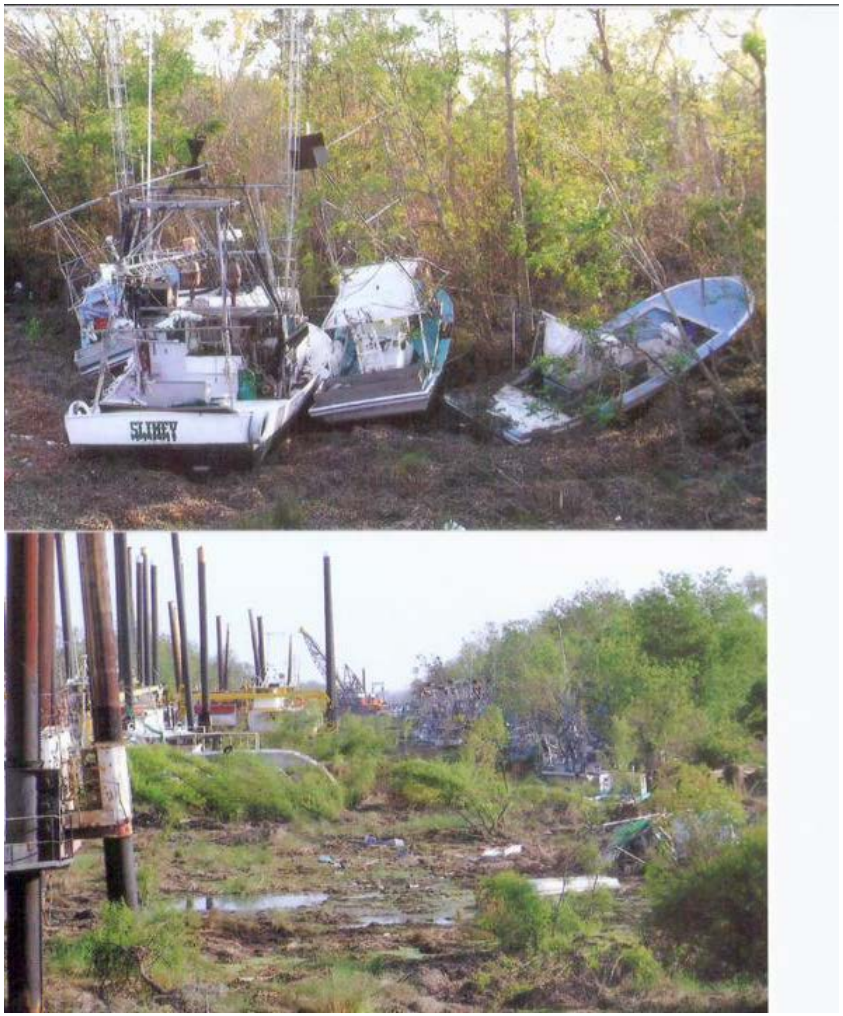
(Fitzpatrick et al. 2012)

Water coverage increased by another 30% near diversion. Erosion was 0-2% in salt marsh



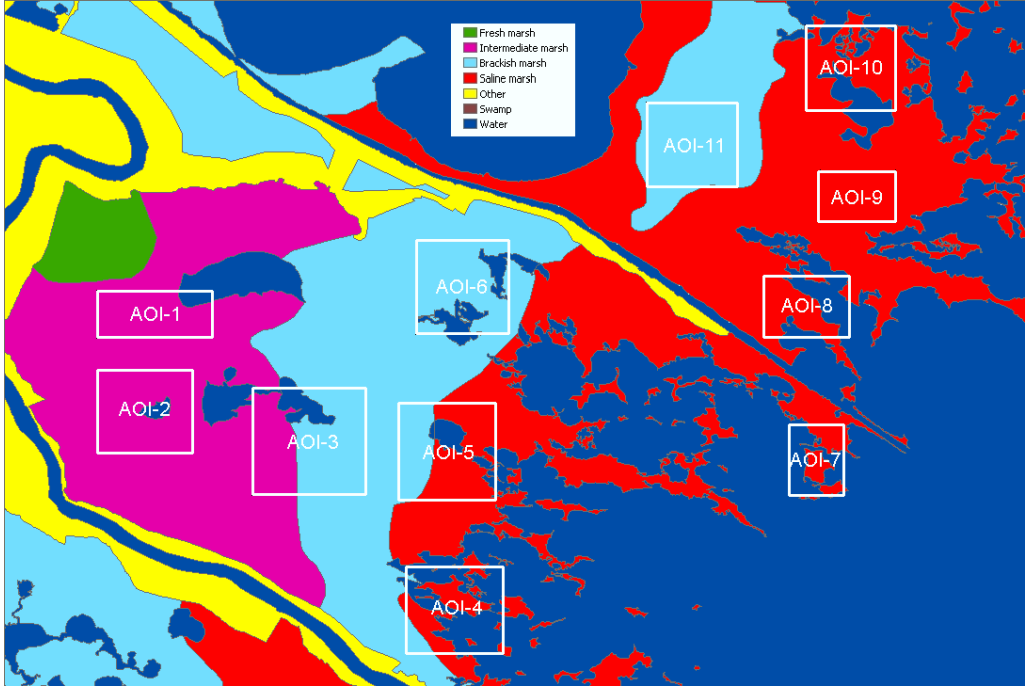
(Fitzpatrick et al. 2012)

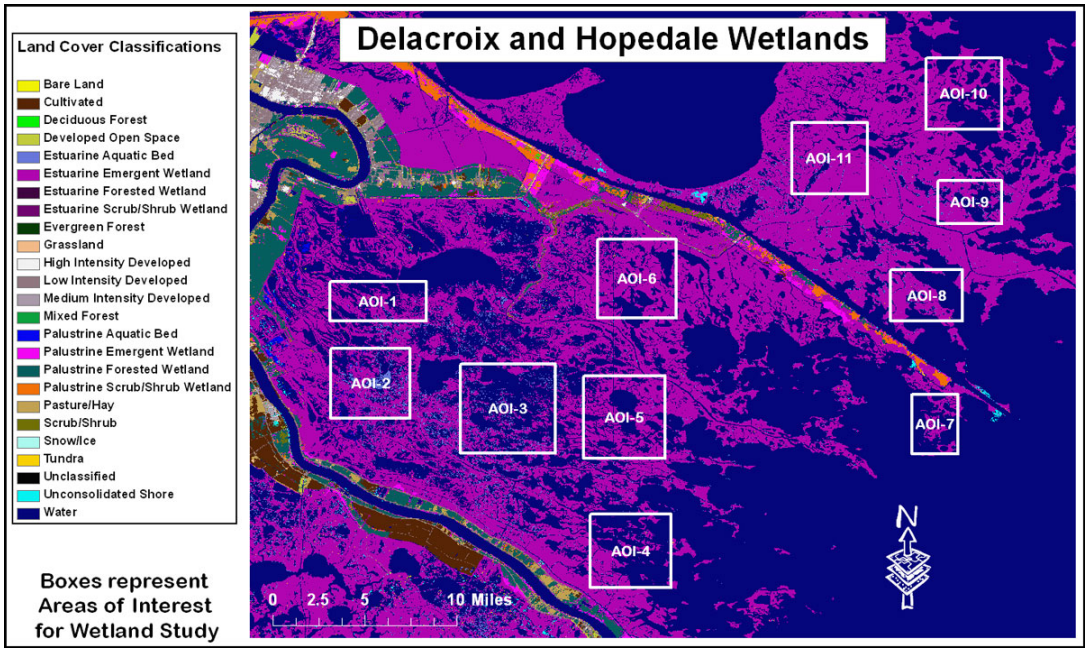
Plucked marsh, marsh mats, marsh balls, sediment, aquatics, organic matter, distributed throughout west Delacroix, even clogging some waterways



Canal to *Shallow Draft Elevating Boats, Inc.*

Waterway which parallels Caernarvon canal (east side) was clogged. So was Bayou Gentilly. No clogged waterways occurred in Hopedale or in eastern Delacroix.


Fresh marsh
Intermediate marsh
Brackish marsh
Saline marsh
Other
Swamp
Water
AOI-1
AOI-2
AOI-3
AOI-4
AOI-5
AOI-6
AOI-7
AOI-8
AOI-9
AOI-10
AOI-11

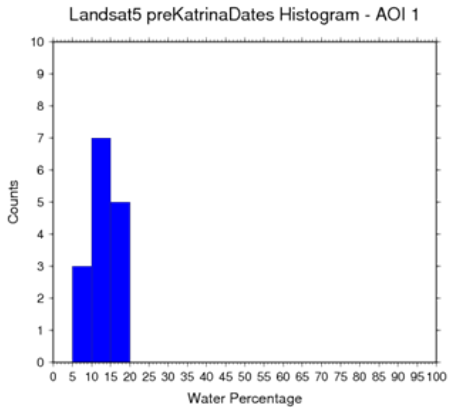

Land Cover Classifications
Bare Land
Cultivated
Deciduous Forest
Developed Open Space
Estuarine Aquatic Bed
Estuarine Emergent Wetland
Estuarine Forested Wetland
Estuarine Scrub/Shrub Wetland
Evergreen Forest
Grassland
High Intensity Developed
Low Intensity Developed
Medium Intensity Developed
Mixed Forest
Palustrine Aquatic Bed
Palustrine Emergent Wetland
Palustrine Forested Wetland
Palustrine Scrub/Shrub Wetland
Pasture/Hay
Scrub/Shrub
Snow/Ice
Tundra
Unclassified
Unconsolidated Shore
Water
Boxes represent Areas of Interest for Wetland Study
Delacroix and Hopedale Wetlands
AOI-1
AOI-2
AOI-3
AOI-4
AOI-5
AOI-6
AOI-7
AOI-8
AOI-9
AOI-10
AOI-11
N
0 2.5 5 10 Miles

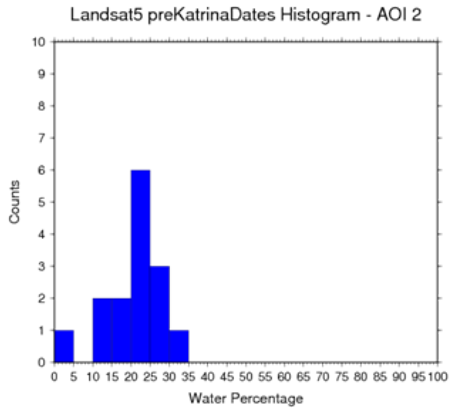
					C-CAP Percentage water		
Area Of Interest (AOI)	Distance from Caernarvon diversion (km)	Salinity	North or south of BTAB	North or south of MRGO	1996	Pre-Katrina/Rita (August 2005)	Post-Katrina/Rita
1	9.5	Low	S	S	11.7	13.5	52.5
2	16.1	Low	S	S	11.6	14.0	37.7
3	22.1	Low	S	S	54.1	56.1	68.4
4	38.5	High	S	S	66.5	67.1	69.1
5	28.4	High	S	S	37.1	38.1	41.8
6	21.5	High	N	S	29.7	30.9	34.1
7	48.2	High	N	S	72.6	72.9	75.3
8	44.9	High	N	N	49.6	49.6	51.1
9	46.2	High	N	N	38.4	38.5	40.1
10	46.9	High	N	N	48.8	49.0	50.9
11	34.5	High	N	N	12.0	13.0	14.5

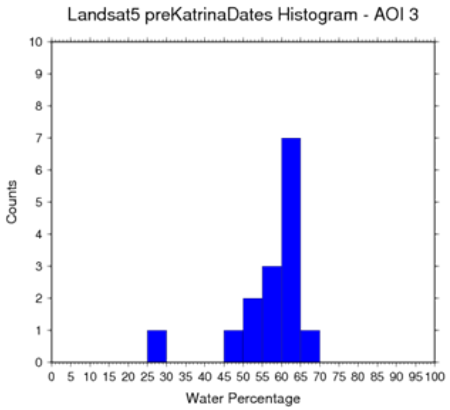
Landsat 5 Mean Percentage Water		
Pre-Katrina/Rita (n=15)	Post-Katrina/Rita (n=19)	Post-Gustav/Ike (n=11)
12.8	36.8	51.5
20.8	40.8	54.3
57.5	73.5	80.0
68.0	69.6	69.6
38.0	43.2	43.1
29.4	35.2	37.2
79.8	81.3	80.5
53.5	56.5	56.4
43.3	45.5	46.3
51.1	52.7	53.3
14.0	15.6	15.7

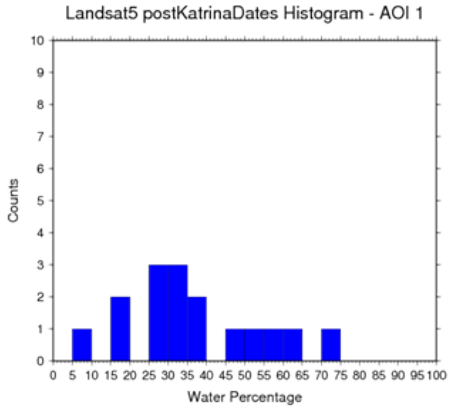
Table 3. Statistical significance results using Wilcoxon Rank-Sum test between Landsat 5 AOIs water coverage before and after Katrina/Rita and Gustav/Ike. ^ denotes $0.15 > p \geq 0.05$, * denotes $0.05 > p \geq 0.01$, ** denotes $0.01 > p \geq 0.001$, and *** denotes $p < 0.001$.

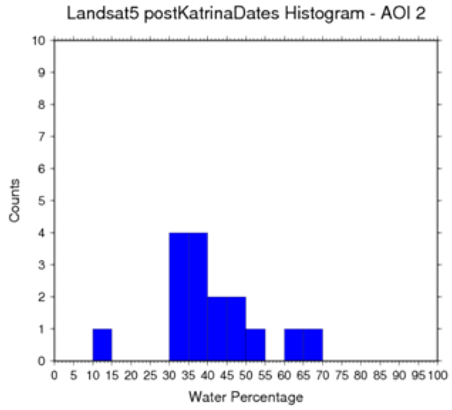
	Wilcoxon Rank-Sum Significance Test Difference in Water Coverage	
Area Of Interest (AOI)	Pre-Katrina/Rita vs. Post-Katrina/Rita	Post-Katrina/Rita vs. Post-Gustav/Ike
1	***	*
2	***	**
3	***	
4	**	
5	***	
6	***	^
7	*	
8	***	
9	**	
10	***	^
11	*	

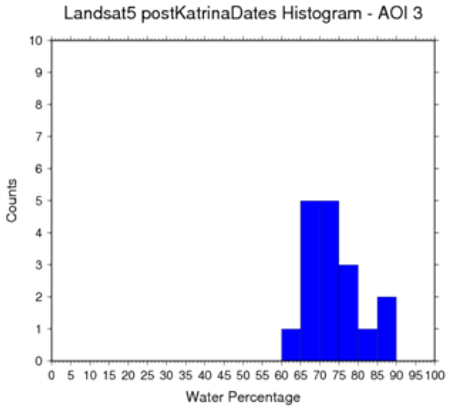

Landsat5 preKatrinaDates Histogram - AOI 1
Counts
Water Percentage

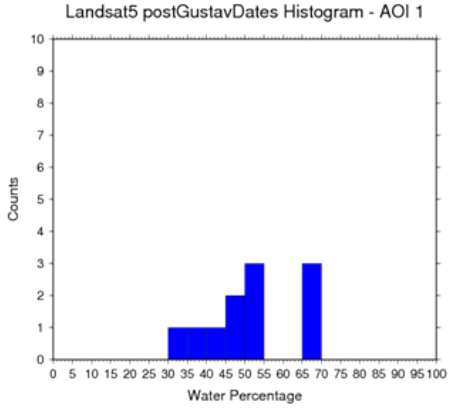

Landsat5 preKatrinaDates Histogram - AOI 2
Counts
Water Percentage

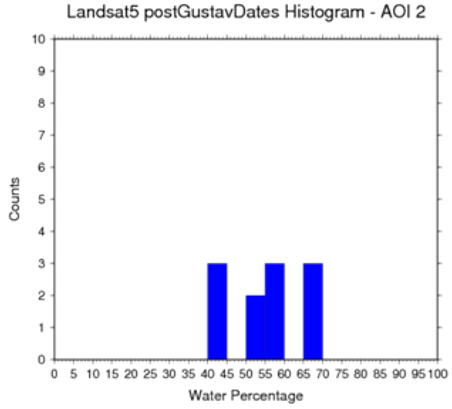

Landsat5 preKatrinaDates Histogram - AOI 3
Counts
Water Percentage

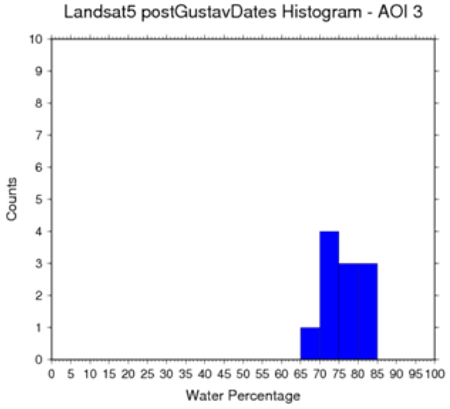

Landsat5 postKatrinaDates Histogram - AOI 1
Counts
Water Percentage

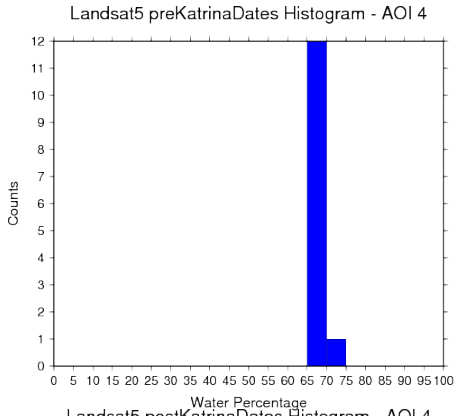

Landsat5 postKatrinaDates Histogram - AOI 2
Counts
Water Percentage

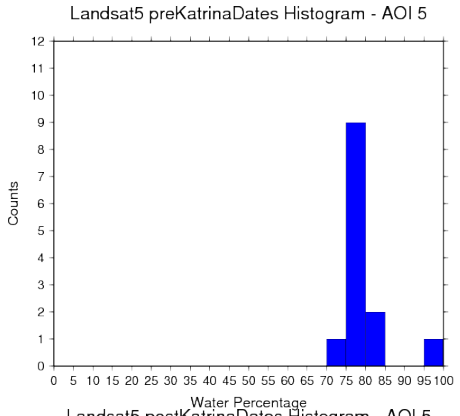

Landsat5 postKatrinaDates Histogram - AOI 3
Counts
Water Percentage

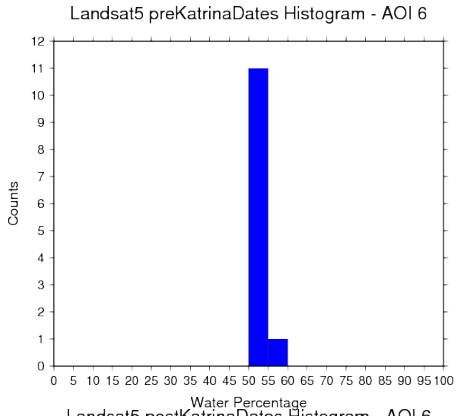

Landsat5 postGustavDates Histogram - AOI 1
Counts
Water Percentage

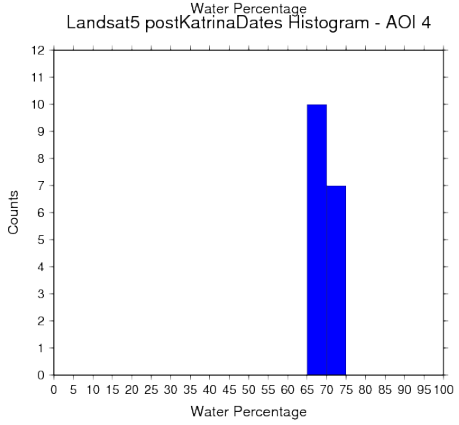

Landsat5 postGustavDates Histogram - AOI 2
Counts
Water Percentage

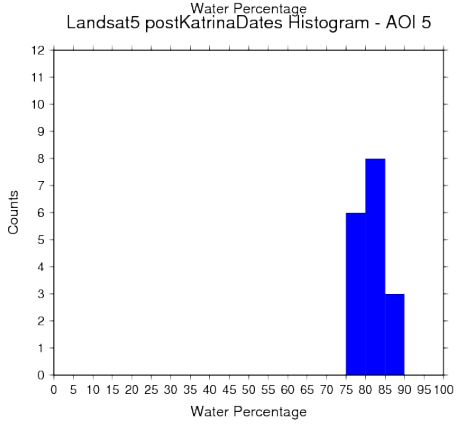

Landsat5 postGustavDates Histogram - AOI 3
Counts
Water Percentage

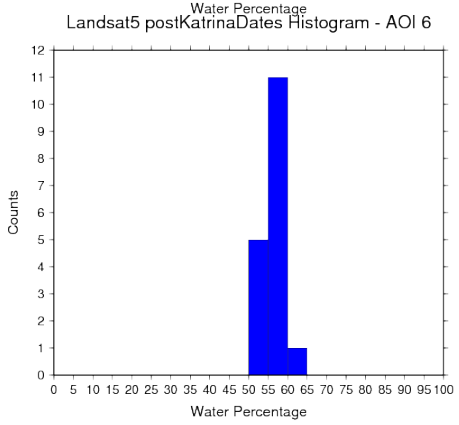

Landsat5 preKatrinaDates Histogram - AOI 4
Counts
Water Percentage

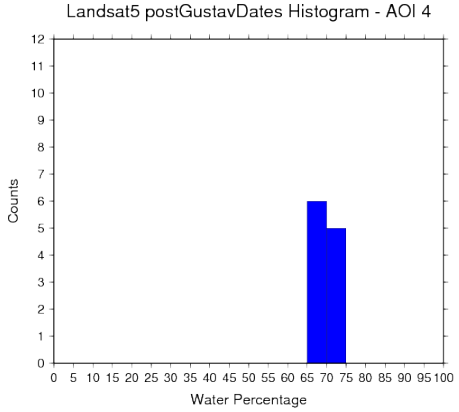

Landsat5 preKatrinaDates Histogram - AOI 5
Counts
Water Percentage

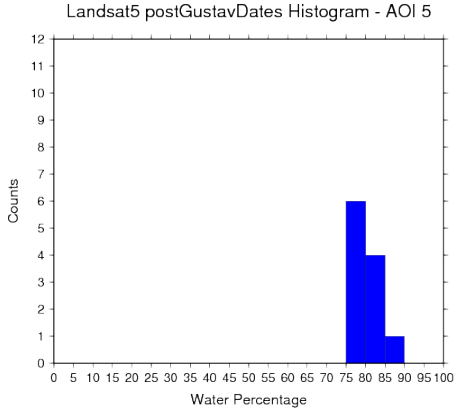

Landsat5 preKatrinaDates Histogram - AOI 6
Counts
Water Percentage

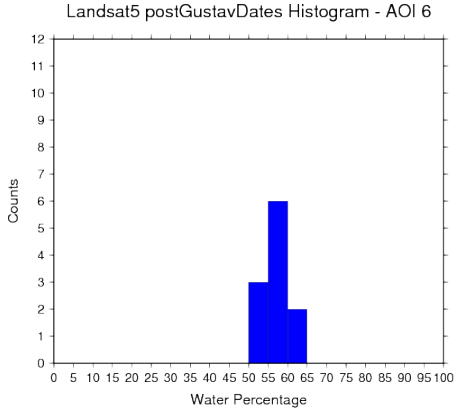

Landsat5 postKatrinaDates Histogram - AOI 4
Counts
Water Percentage


Landsat5 postKatrinaDates Histogram - AOI 5
Counts
Water Percentage

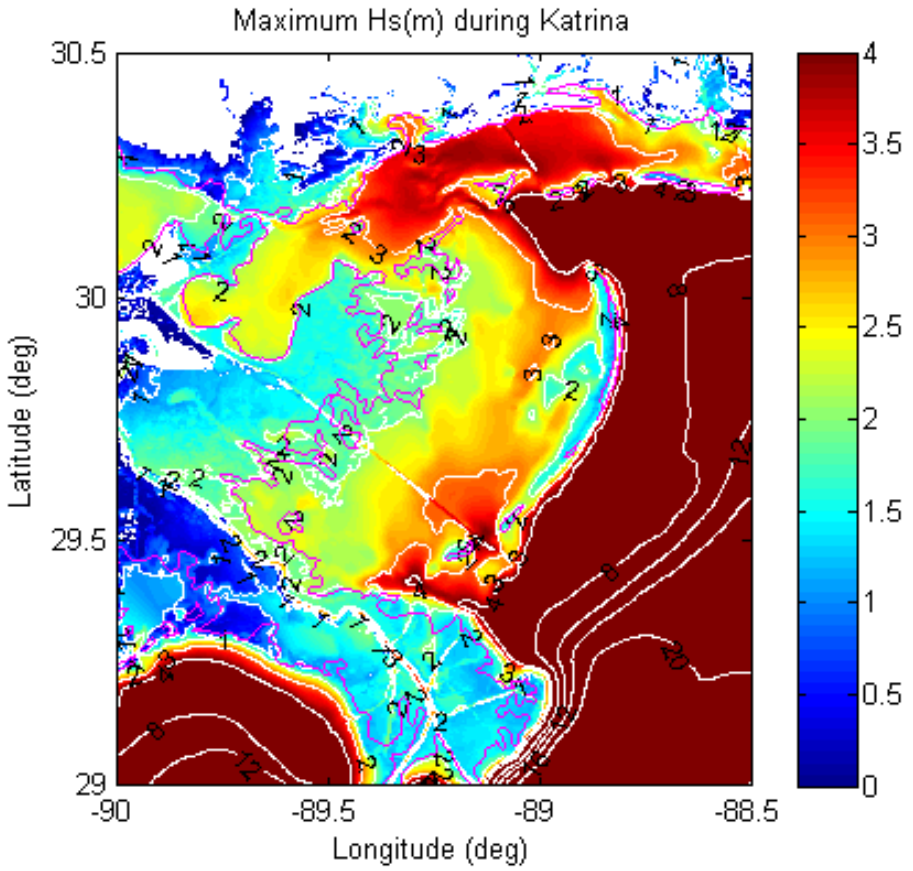

Landsat5 postKatrinaDates Histogram - AOI 6
Counts
Water Percentage

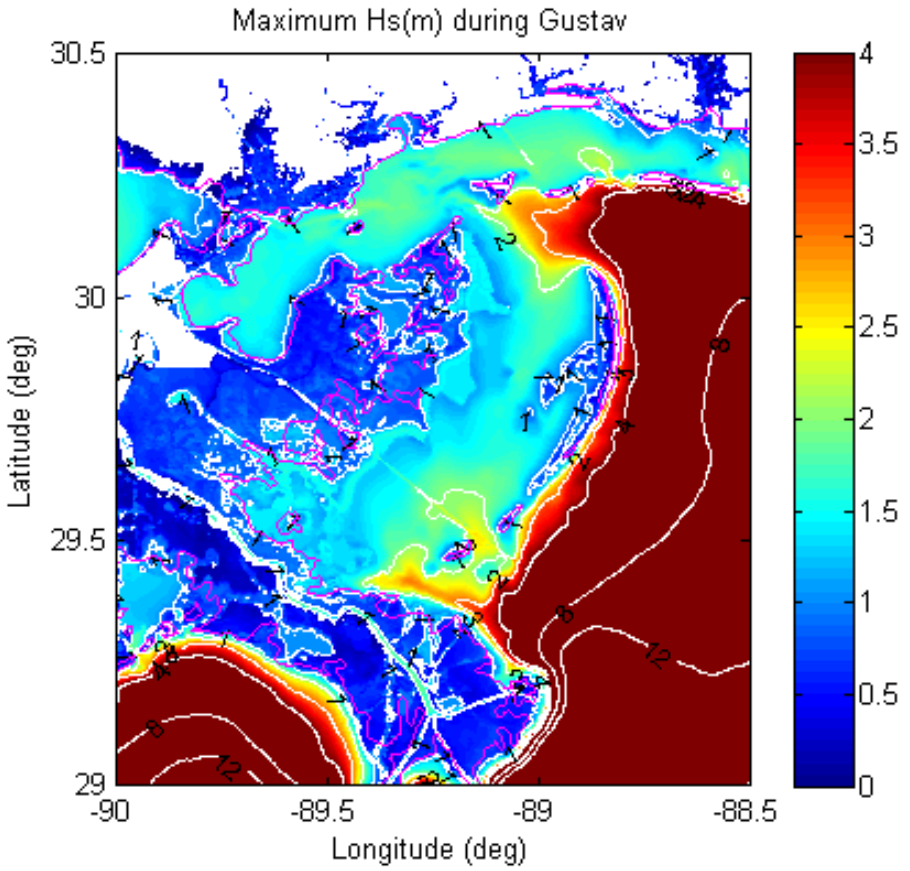

Landsat5 postGustavDates Histogram - AOI 4
Counts
Water Percentage


Landsat5 postGustavDates Histogram - AOI 5
Counts
Water Percentage

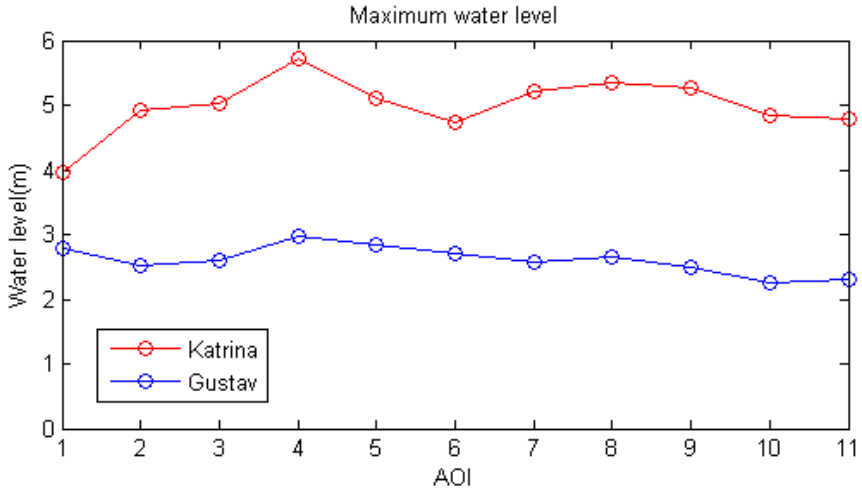

Landsat5 postGustavDates Histogram - AOI 6
Counts
Water Percentage

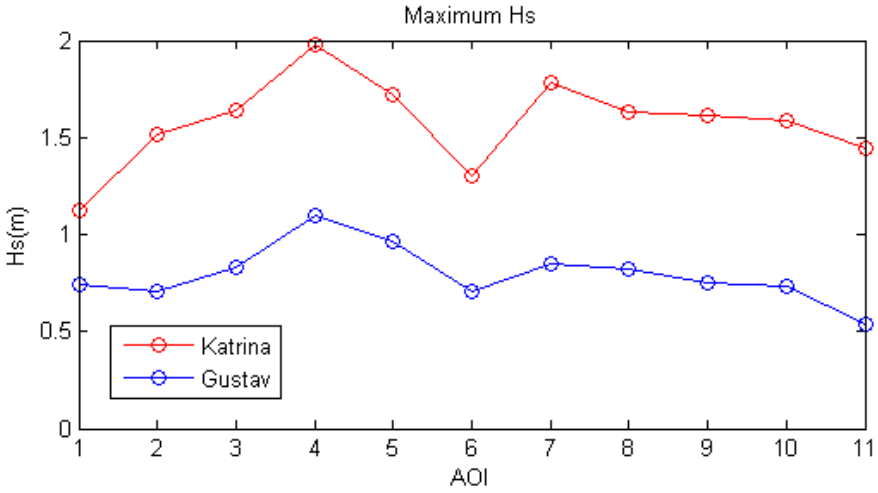
Are wave heights enhanced near diversion during hurricane surge events?





Peak surge and wave heights for eleven AOIs





Current theory relates to water quality and fertilizer issues
Other theories: ponding, poor transition from saltwater to freshwater vegetation

- Detailed studies on water quality impacts and soil type issues are needed
- Majority of studies propose belowground biomass/shallow roots/decomposition issues in organic soil, affecting resiliency in high energy events (waves, tides, especially storm surge). A spectrum of scientific opinion and affiliations (academic, government) either reach this conclusion, or at least express concern.
- VanZomeren (2011) disagrees with these studies on issues of nitrogen input and denitrification. Need this and other related studies/peer-review journals posted online by CPRA
- Suggest a symposium on this issue. It is critical to discuss the hypotheses and make sure erosion problems will not be exacerbated by diversions. Solutions should be discussed as well. This includes recommendations for improving water quality in the Mississippi River due to dead zone and possible wetland resiliency issues.

Some References

VanZomeran, C. M., 2011: Fate of Mississippi River diverted nitrate on vegetated and non-vegetated coastal marshes of Breton Sound Estuary. Master's Thesis, Louisiana State University, 102 pp.

Turner, R. E., 2011: Beneath the salt marsh canopy: loss of soil strength with increasing nutrient loads. *Estuaries and Coasts*, 34, 1084-1093.

Swarzneski, C. M., et al., 2008: Biogeochemical response of organic-rich freshwater marshes I the Louisiana delta plain to chronic river water flux, *Biogeochemistry*, 90, 49-63.

Teal, J.M., et al. ,2012: Mississippi River Freshwater Diversions in Southern Louisiana: Effects on Wetland Vegetation, Soils, and Elevation. Edited by A.J. Lewitus, et al. Final Report to the State of Louisiana and the U.S. Army Corps of Engineers through the Louisiana Coastal Area Science & Technology Program; coordinated by the National Oceanic and Atmospheric Administration. 49 pp.

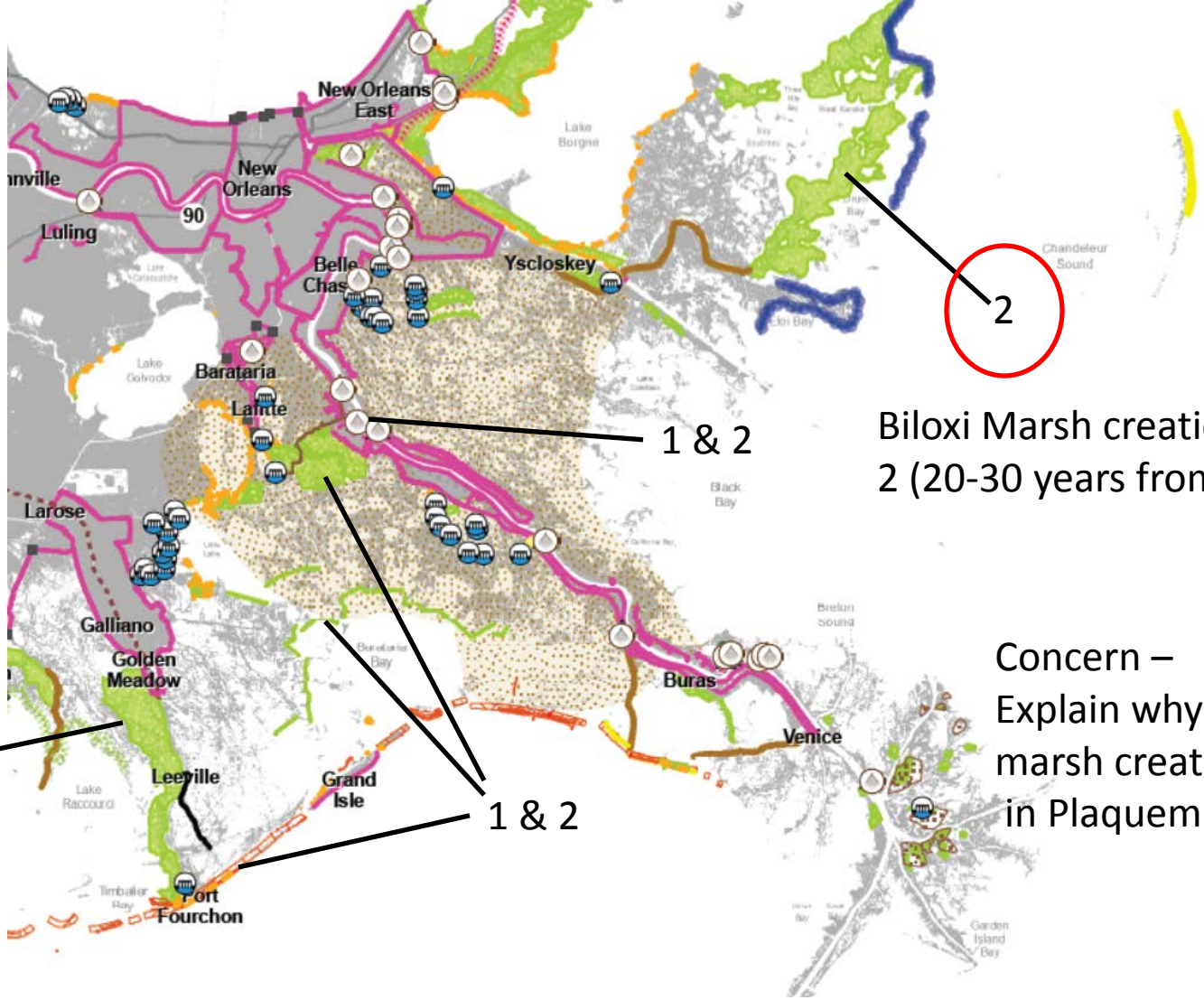
Howes, N. C., et al., 2010: Hurricane-induced failure of low salinity wetlands, *Proceedings of the National Academy of the United States of America*, 107(32), pp. 14014–14019.

Deegan, L. A., et al., 2012: Coastal eutrophication as a driver of salt marsh loss, *Nature*, 490, pp. 388-392.

Other concerns

All are Phase 1 except where noted.

Many Phase 1 begin within 3 years



2

Biloxi Marsh creation in Phase 2 (20-30 years from now)

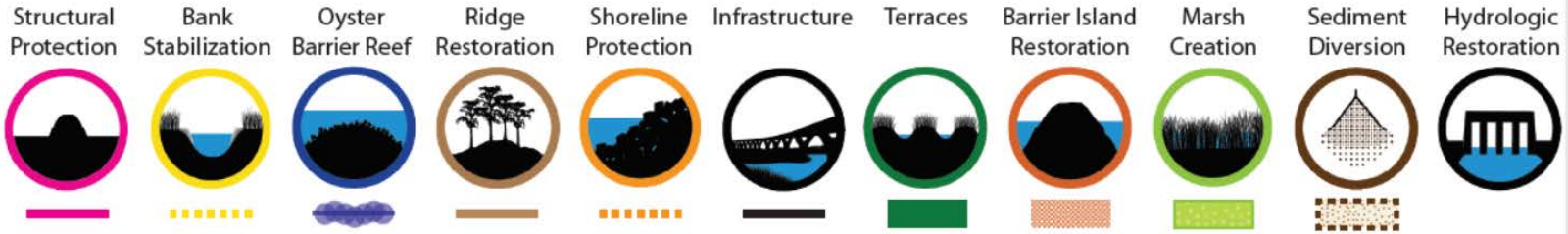
1 & 2

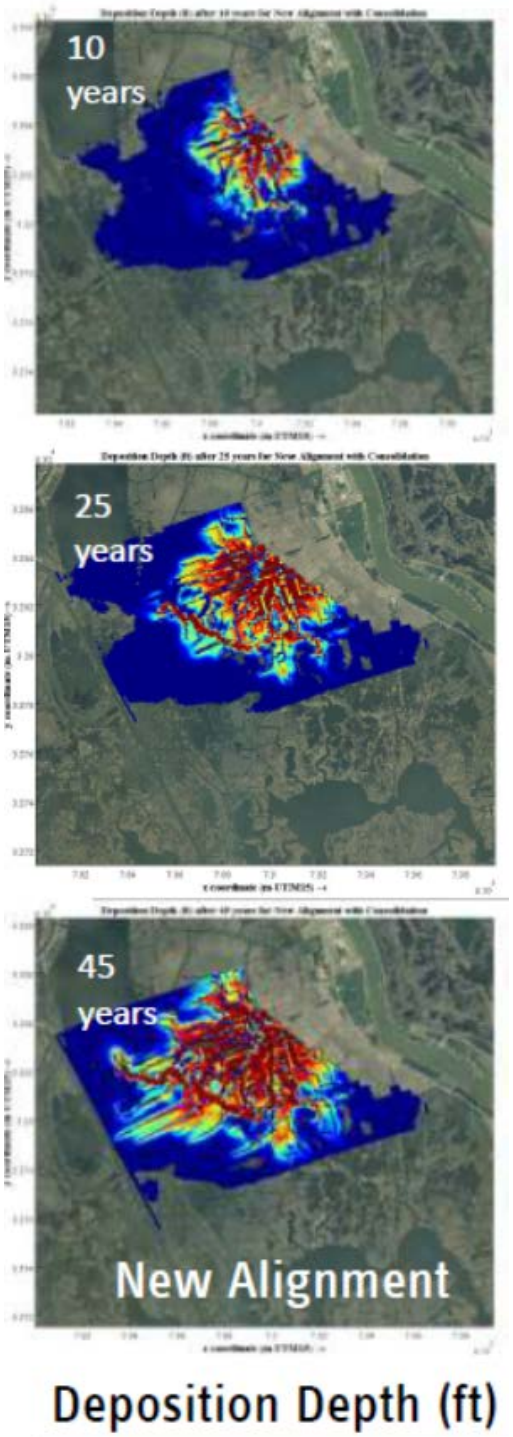
1 & 2

1 & 2

Concern –
Explain why no large marsh creation projects in Plaquemines Parish

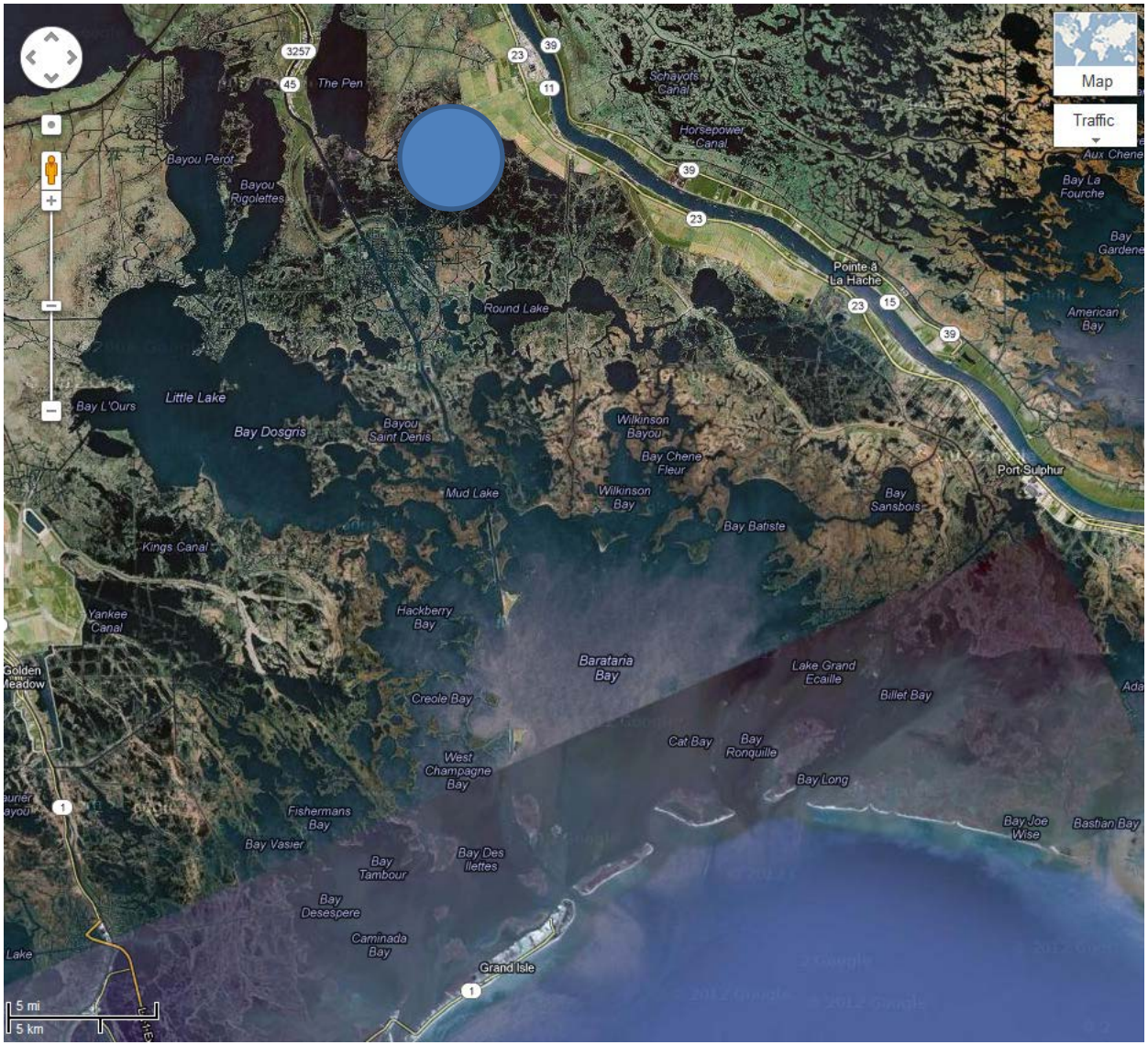
Project Types





Circle represents where marsh will hypothetically be built by Barataria Diversion at 45,000 cfs in 45 years.

Concern --- slow land building while erosion continues throughout coast.



Land Building

This decision driver helps us assess our projects' performance according to an important benchmark: how well our projects build or sustain land. Making this one of our two primary decision drivers helped us keep this crucial benefit front and center as we selected projects for the 2012 Coastal Master Plan. We used a project's ability to build or sustain land, along with cost, to evaluate that project's effectiveness.

We measured land built by evaluating each restoration project's ability to build or sustain land. Our modeling was able to capture the different types of land building that would occur with different project types, such as those described below.

- Marsh creation projects will build most of their land as soon as the project is constructed, and then over time, that land may erode and subside.
- Sediment diversions, in general, do not build substantial land early, but their land building potential continues to grow into the future.
- Barrier island restoration projects will provide land quickly, but waves and currents will redistribute this sediment and nourish adjacent islands. In time, the islands will roll back.

Concern – shouldn't a strong effort be conducted to maintain existing and new land (created by any method, dredge or diversion)?

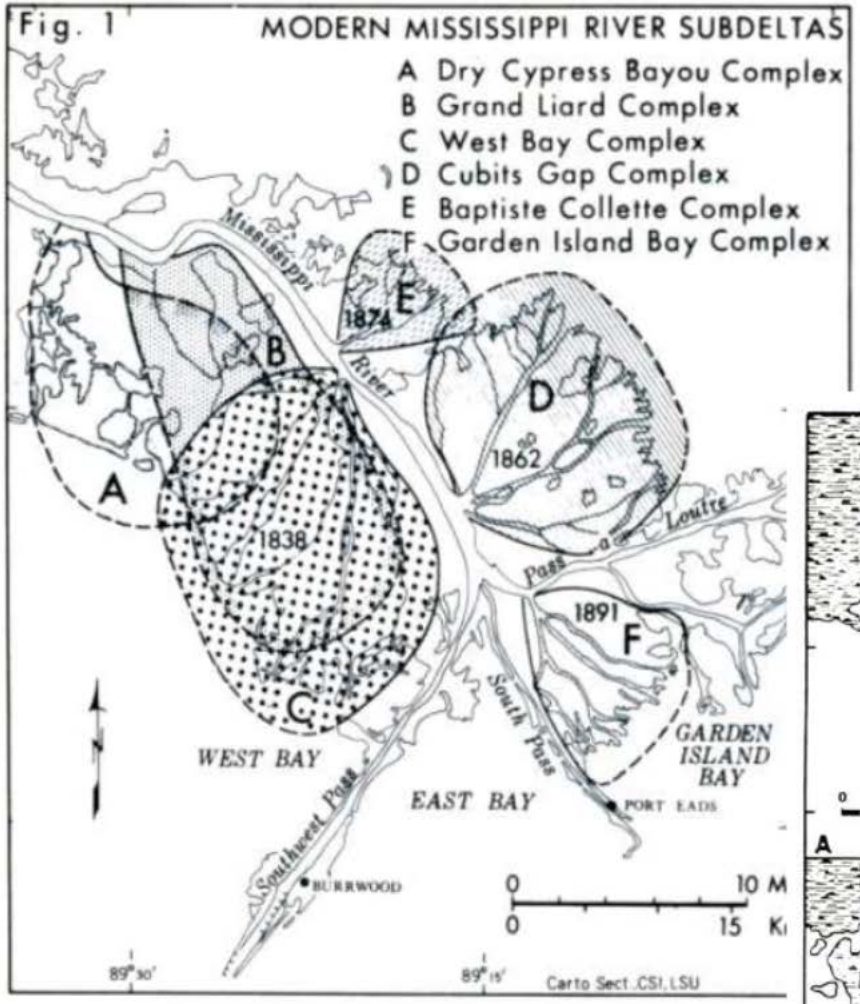
I propose a daily "strike" team which maintains marsh. Landsat satellites, UAS instruments, and boat patrols can monitor shoreline loss and subsidence.

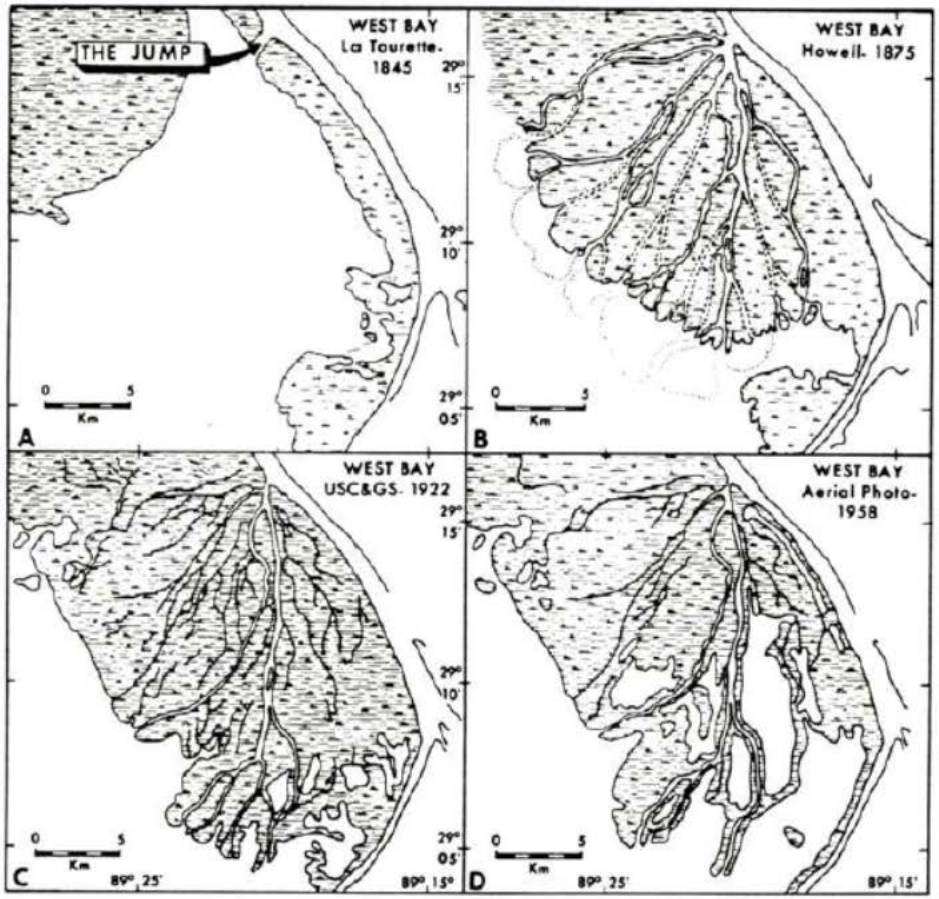
Goal – fix small problems before erosion issues accelerate. Use pipe slurry to combat subsidence and add shell-hardened shorelines. Replant grass.

I know this is a challenge.

- Concern regarding sediment diversions
  - Experimental
  - Slow (decades) even if they work as planned
- Can land building be accelerated with a combination of techniques and less freshwater flow? Master Plan showed land building possible with small diversions.
- Example – if dredged land is on periphery of a gentler diversion, can land gain be optimized? West Bay hints this is possible. Has such interactive modeling been done?
- Set tangible goal by acres built per decade per project by any combination of techniques. Use adaptive management.
- Also explain assumptions used in dredging costs online.
- Suggest a symposium which includes dredging companies
- Diversions need accountability metrics, in case they don't work as planned.
- Post reports on different modeling scenarios online.

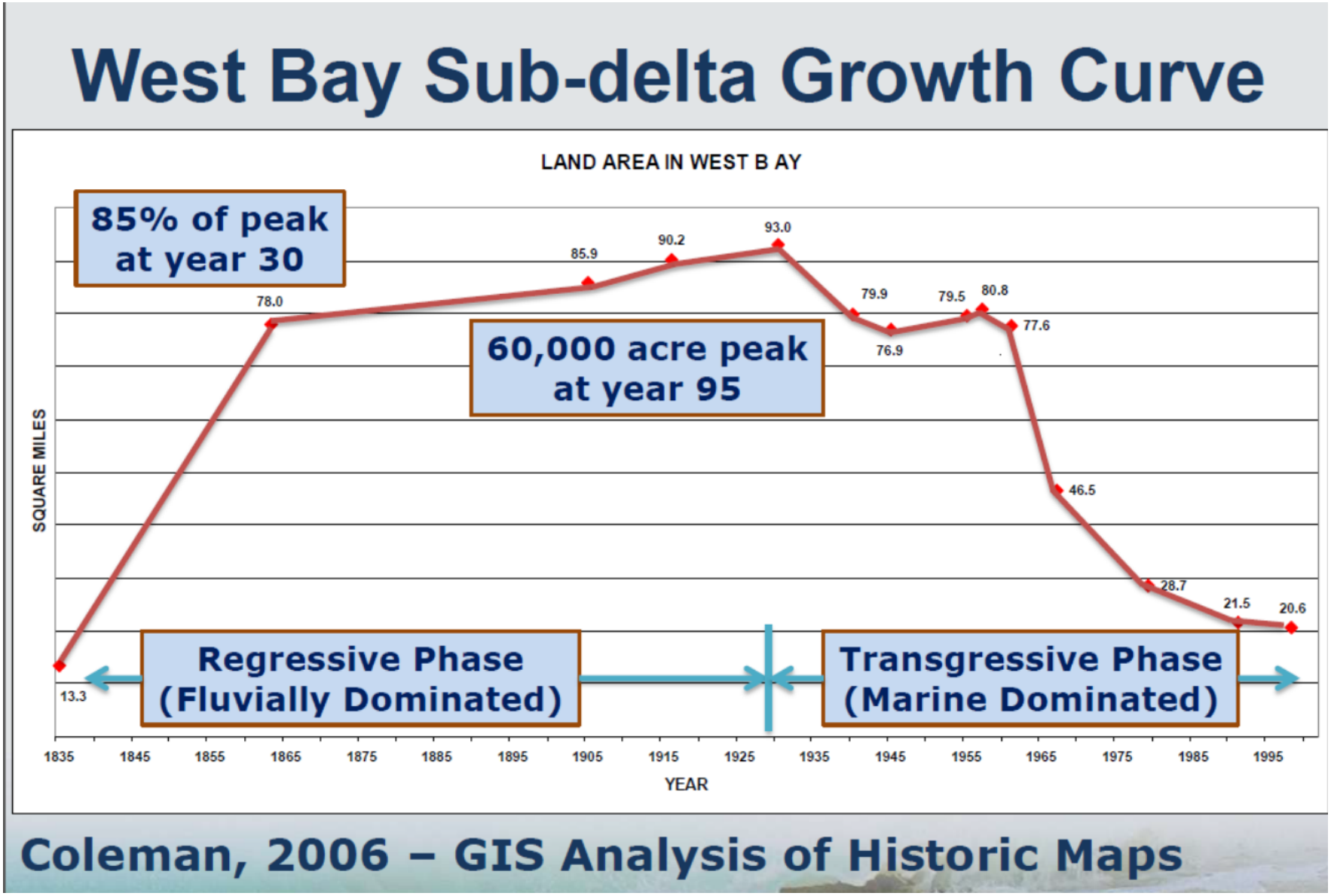
Mississippi River Delta and West Bay Sub-delta History





Coleman & Gagliano, 1964
(above)
Coleman & Prior, 1982
(right)

Possible land building goal using all tools: 30,000-60,000 acres per decade per project



SRED Construction 2010

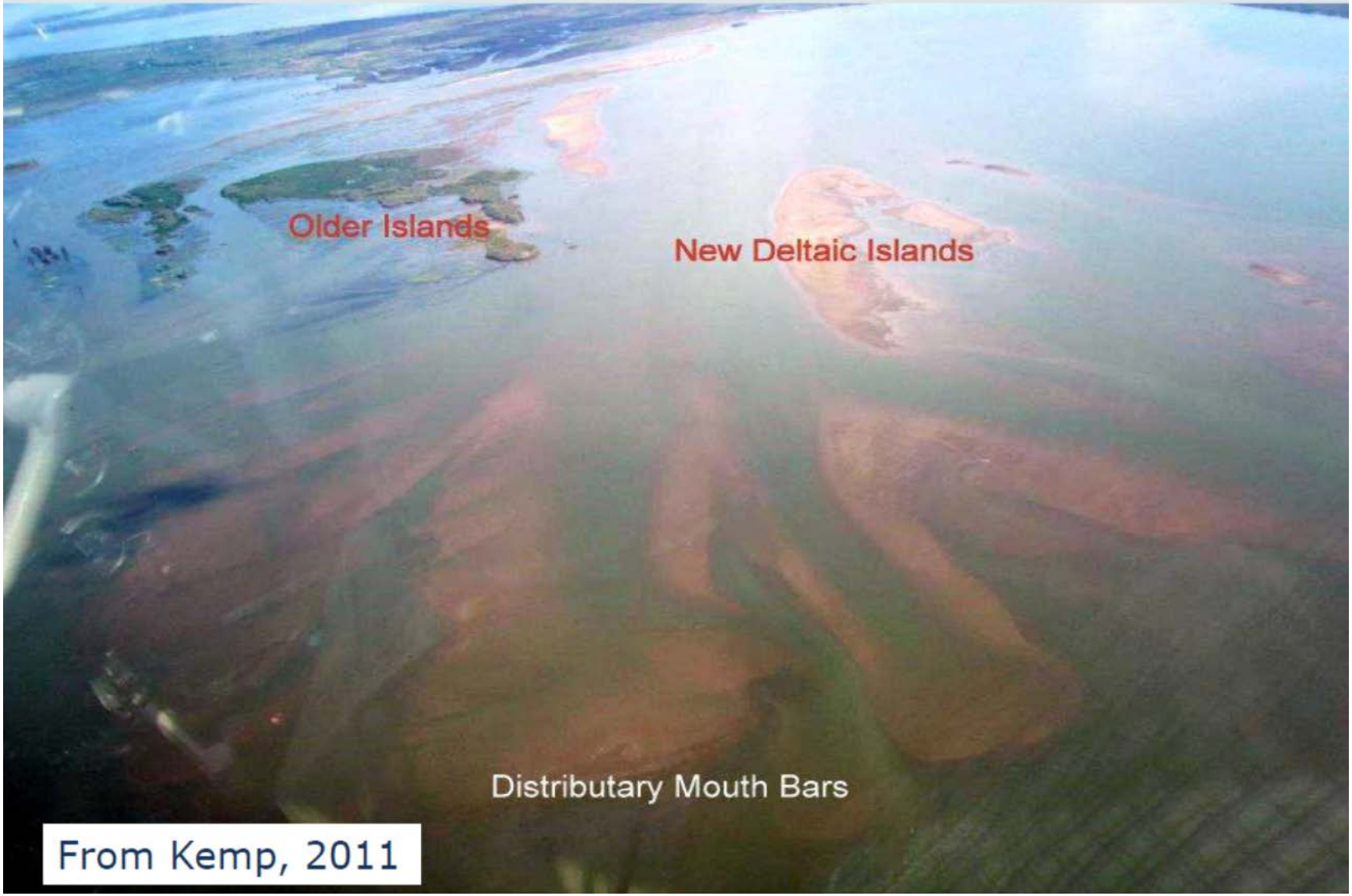
750,000 yd^3 placed from Anchorage

<u>Island Dimensions</u>:
5000' x 500' x 8' (+4' MSL)
60 acres

Total BU acres built to date=511acres at $20M
4.19MCY $4.75/CY

Diversion flow is 50,000-60,000 csf

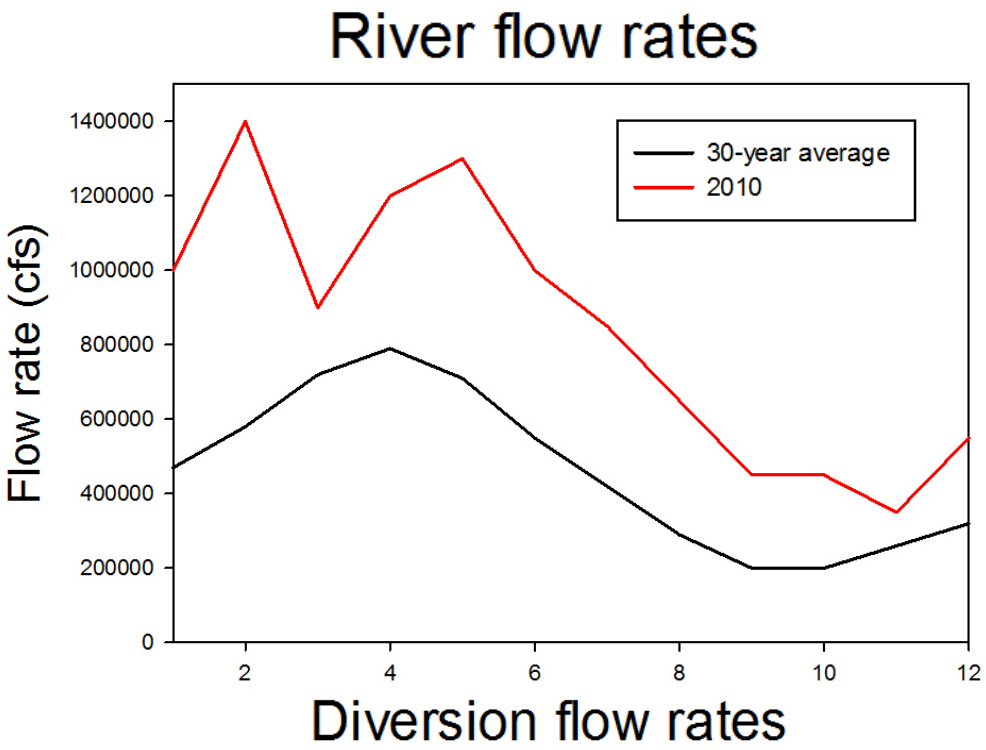
Spring 2011 High Water Event



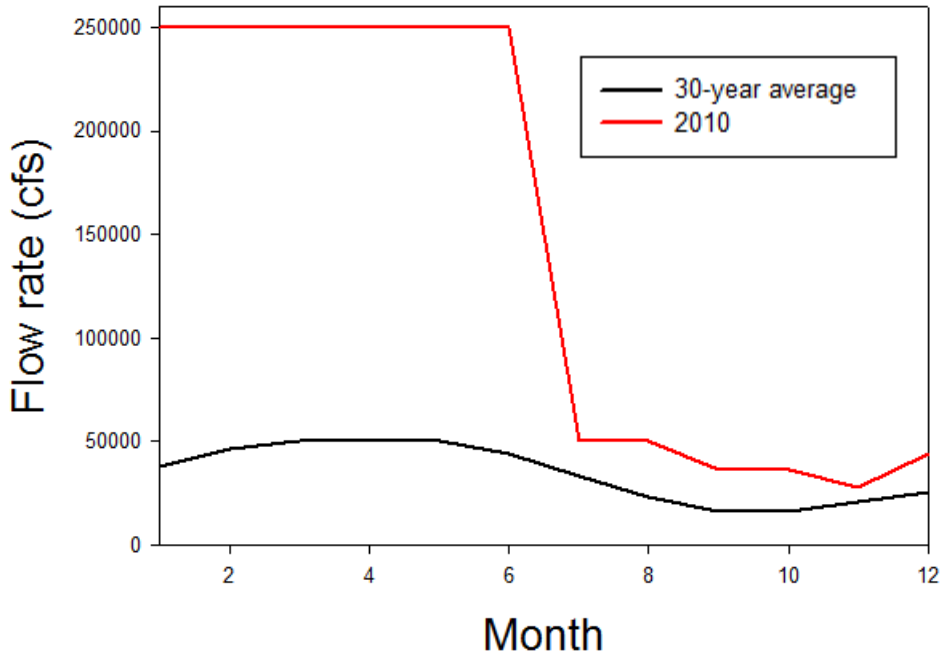
From Kemp, 2011

Concern – need clearer communication of diversion flow rates and timelines. Use examples from past river flow data. Show examples from "dry years" and flooding events. State where the flow rate criterions will be measured (Old River or elsewhere?). Post plots online. An example is shown for 2010 (Old River) and 30-year average.

Chart below does not look like a short pulse. Please clarify.



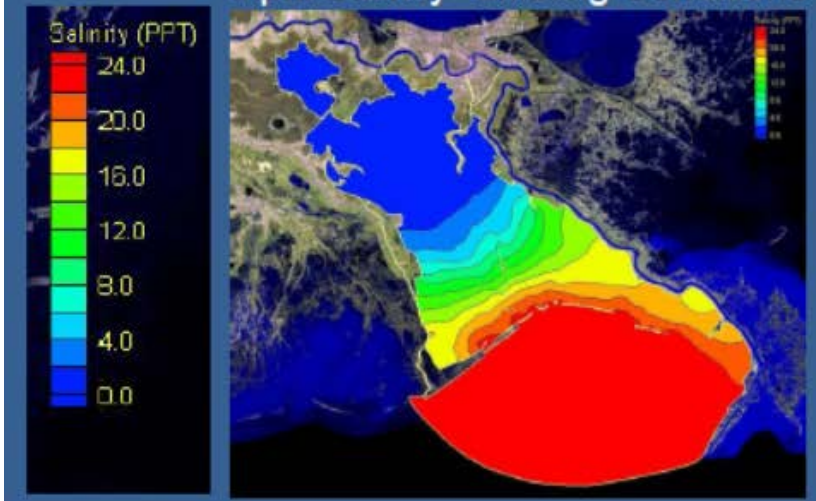
River flow (cfs)	Diversion flow (cfs)
>900,000	250,000
Between 600,000 and 900,000	50,000
Between 200,000 and 600,000	8% of flow (16,000 to 50,000)
<200,000	0



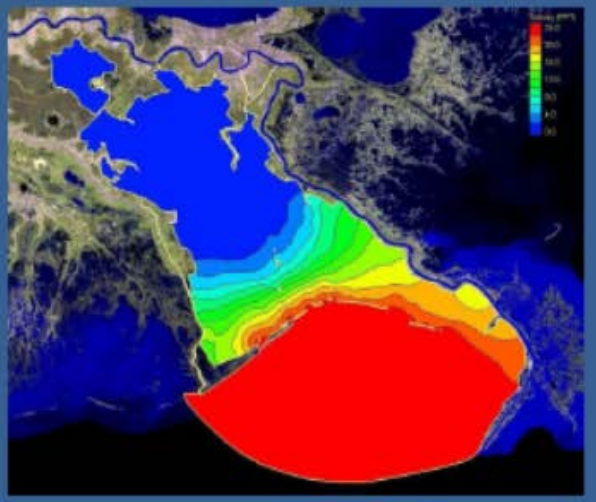
Fisheries concerns

Evaluating Changes in the Basin: Salinity in April

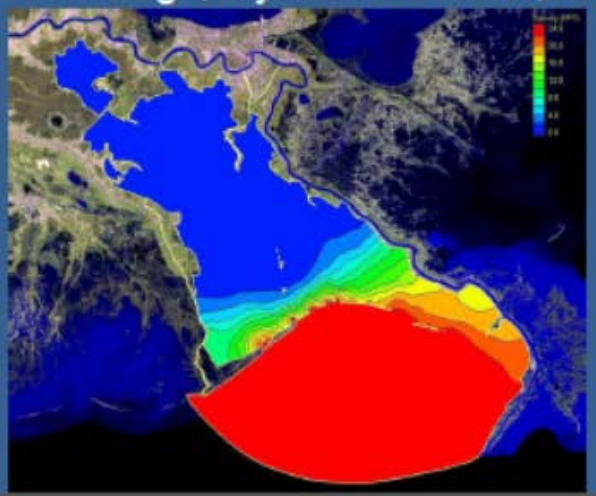
April Salinity "Existing Conditions"



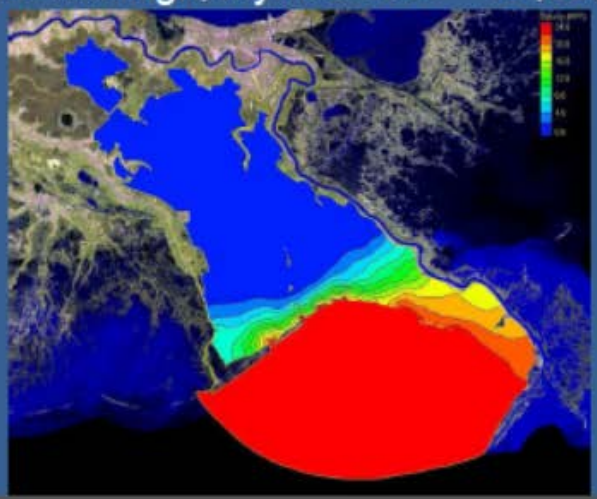
Davis Pond High ~ 10,000 cfs



Davis Pond High, Myrtle Grove ~ 20,000 cfs



Davis Pond High, Myrtle Grove ~ 39,000 cfs



• Concern – impacts on fisheries are unclear
• Suggestion – make all integrated studies of different scenarios with sustainability indexes available online. Show monthly or quarterly index evolutions in scenarios. Explain assumptions clearly. Provide references to peer-review papers on these results. Show sensitivities to inputs. Explain impacts on spawns.
•**Possibly the most important feedback needed on this controversy.**

• Also suggest showing model salinity results online for 50,000 cfs and 250,000 cfs scenarios

"Requires changing the landscape, not just tweaking what we already have."

"In some cases change creates dislocations……. Some….dislocations are happening now. We take these dislocations seriously."

Concern – more specifics needed on transition assistance.

Concern - Has CPRA performed an integrated cost benefit analysis regarding fishery changes, displacements, and dredging versus large diversions?

Transition Assistance

This plan supports the long term sustainability of south Louisiana so that our citizens can have more certainty about the future. The action we need requires changing the landscape, not just tweaking what we already have. As our Future Without Action analysis showed, the landscape and conditions we have now are not sustainable. In fact, as coastal residents well know, change is happening already. If we don't take large scale action, land loss and flooding will grow so severe that ours will be the last generation that benefits from Louisiana's working coast. We should also keep in mind that while some view large coastal restoration projects as having short term detrimental impacts, these projects also have positive and significant long term economic and ecosystem effects. By bolstering wetlands over time, these projects can support activities, such as fishing, that require healthy coastal habitats.

In some cases change creates dislocations small and large. Some of these dislocations are happening now as a result of our land loss crisis. We take these dislocations seriously and understand they represent real costs for real people.

Understanding that large scale projects may often be accompanied by long implementation timeframes, we will use the extended start up time for these projects to help communities and user groups in the following ways:

- Develop a planning framework to help communities, businesses and individuals adapt to anticipated changes in the landscape.
- Work with affected communities and stakeholders to design projects that consider ways to minimize unavoidable impacts while still meeting project, and master plan objectives necessary to avoid the loss of the entire coastal system.
- Identify public and private tools that may assist communities, businesses, and individuals in the transition process. These could include such things as helping specific industries with changes in equipment needs (e.g. docks, ice houses) and finding ways to help small businesses handle cost increases associated with changes in the landscape.

Landowners as Key Partners

Suggestion: Landowners Focus Group should begin this year to smooth dialogue

Approximately 80% of the coast is privately owned, and landowners should be partners with the state as projects are planned, designed, constructed, and operated. The rights of these landowners, including mineral rights, must be acknowledged, and landowners must be kept abreast of proposed changes that affect their properties. For example, it will be important to work with landowners to create a checklist of the steps involved in bringing specific master plan projects from concept to reality. To ensure that we engage in constructive communication early and often with landowners, the Coastal Protection and Restoration Authority will create a Landowners Focus Group. This group will meet regularly with the state to discuss projects still in the concept phase, as well as projects that are being designed and constructed.

Landowner assistance will be essential in understanding the complexities of land ownership and stewardship of natural resources. There are many options for navigating these complexities in order to build projects on private land. These measures could range from acquisition and easements, to separating surface rights from mineral rights and allowing the landowner to retain the latter while the state obtains the former. To insure that land rights negotiations are handled appropriately and with the urgency that our state's coastal crisis requires, we fully support future engagement with the Landowners Focus Group on projects that affect privately owned property.

Why a Violet diversion with more flow at 5000 cfs? Please explain.

- The rock dam has blocked salinity intrusions westward, and brackish water from west and south (including Violet canal) has influenced region. Salinities have been reduced by 10-20 ppt
- Salinity is near pre-MRGO conditions west of dam
- Shell Beach westwards has a freshwater fishery (bass and bluegill are becoming plentiful)
- Time for a fun picture, caught last Saturday by teenagers under my docked boat at Shell Beach while waiting out a thunderstorm