GULF COASTAL RESTORATION: USING SCIENCE FOR LONG-TERM PLANNING

June 27, 2016

Denise Reed, Chief Scientist

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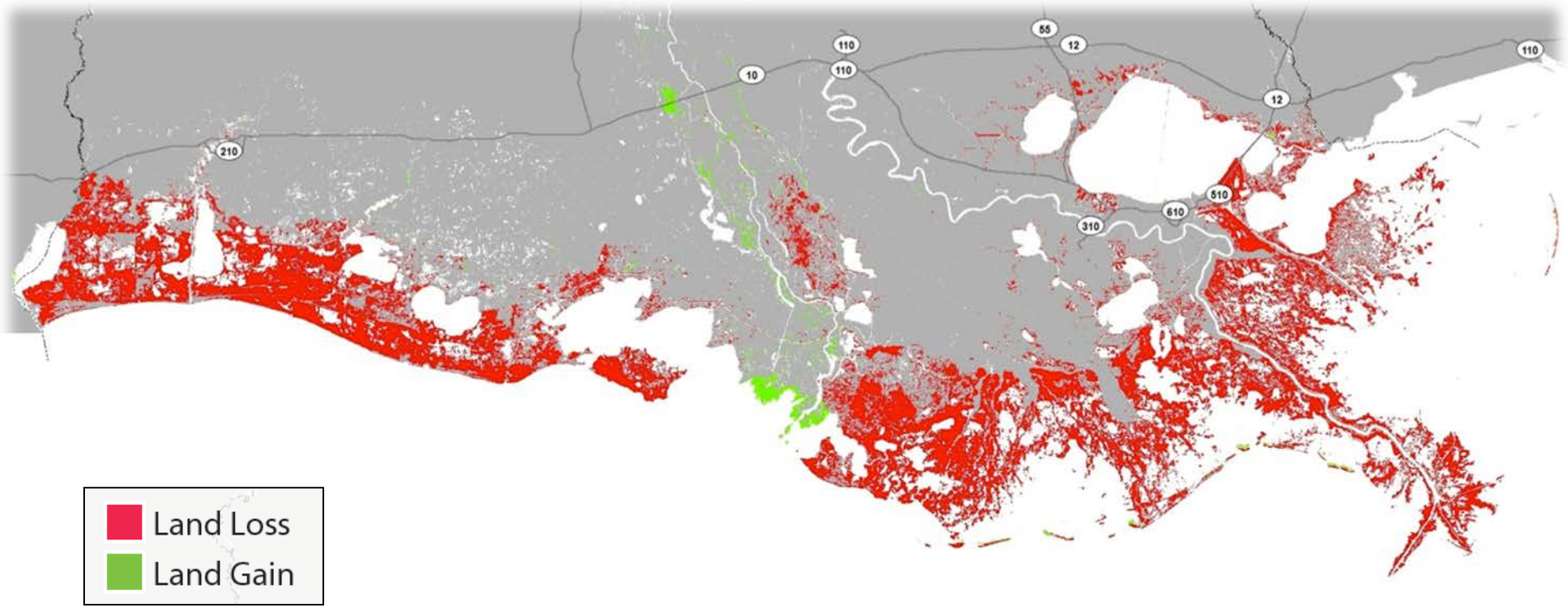
Land loss in coastal Louisiana

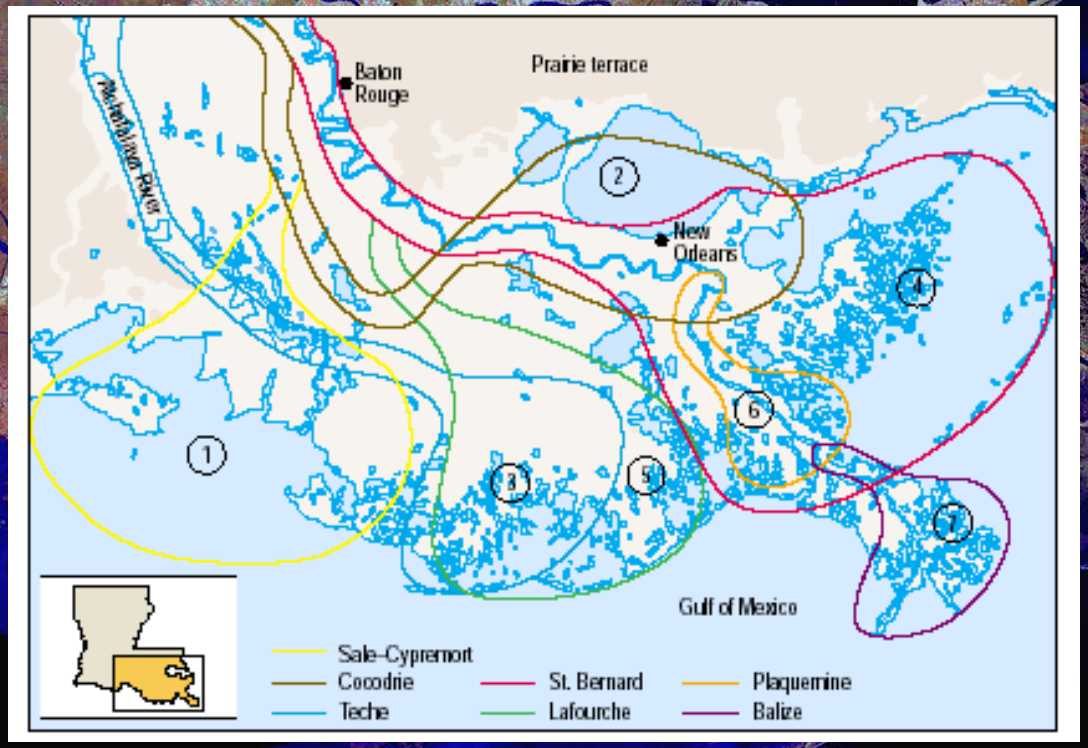


Potential to lose up to an additional 1,750 square miles of land over the next 50 years

Mississippi Delta Plain

7000 years of sediment deposition

Land loss balanced by land gain



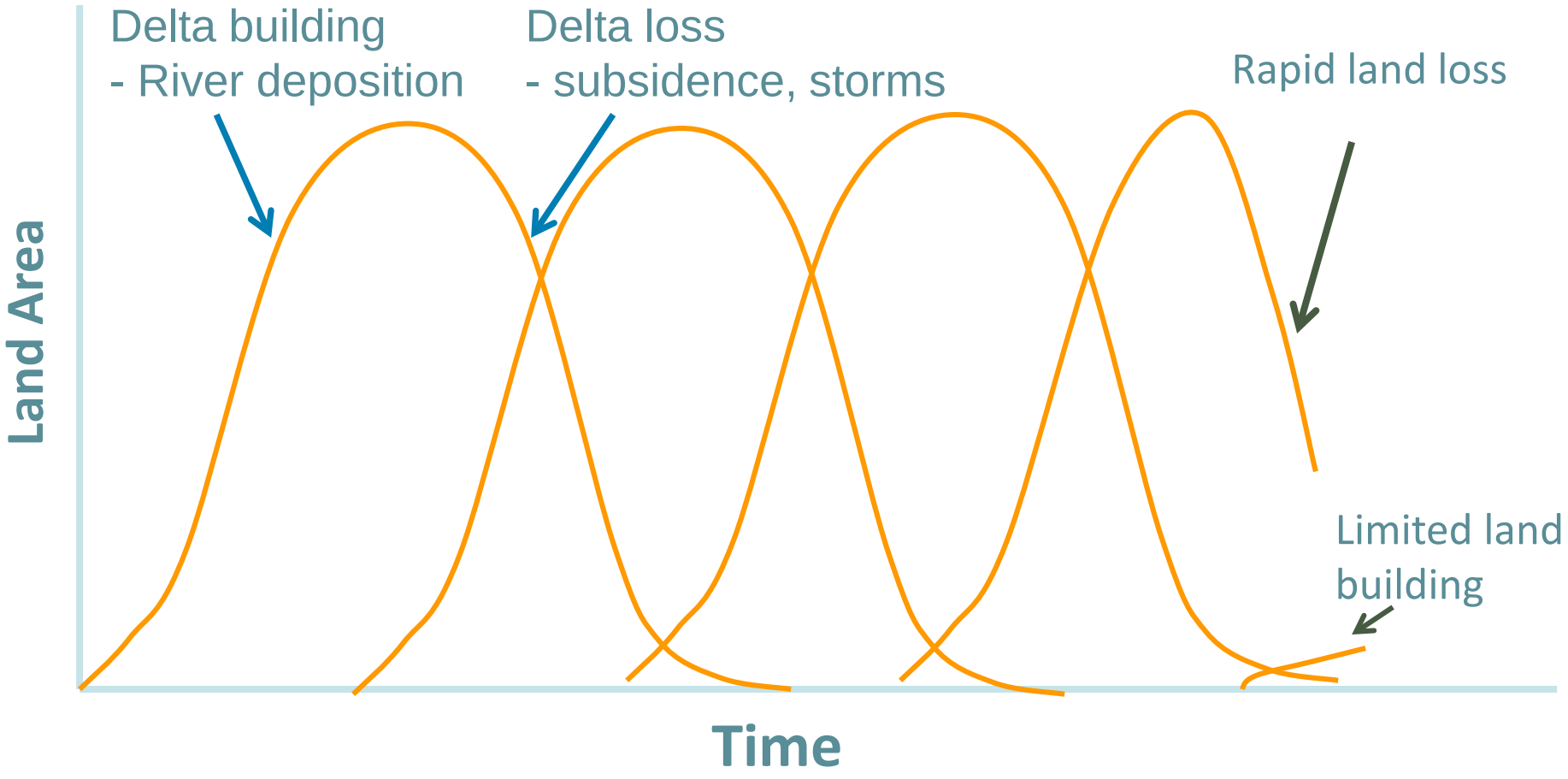
3000-4000 yrs old

Thickest and youngest

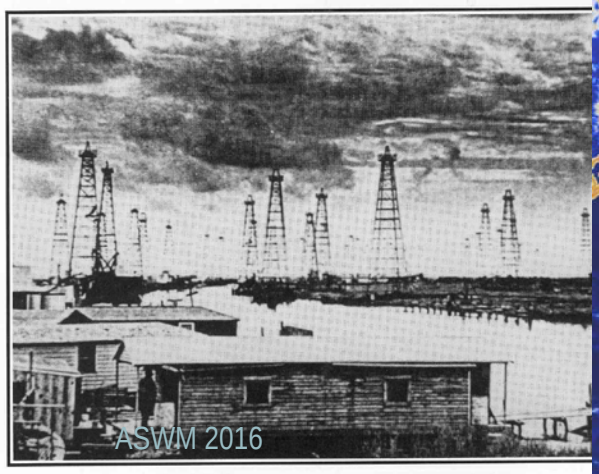
Varying sediment thickness

Natural cycles

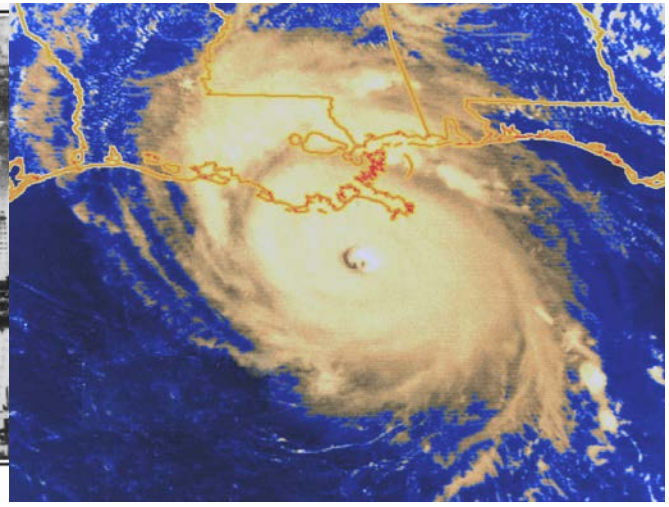
20th century

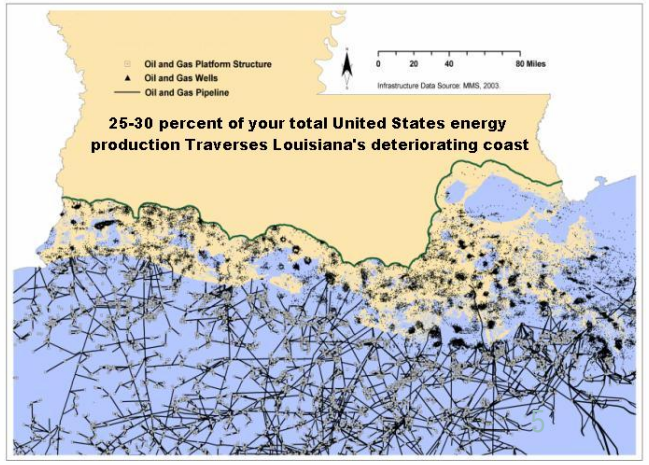


FLOOD CONTROL + NAVIGATION CHANNELS + OIL & GAS EXPLORATION + NATURAL DISTURBANCES + ……..



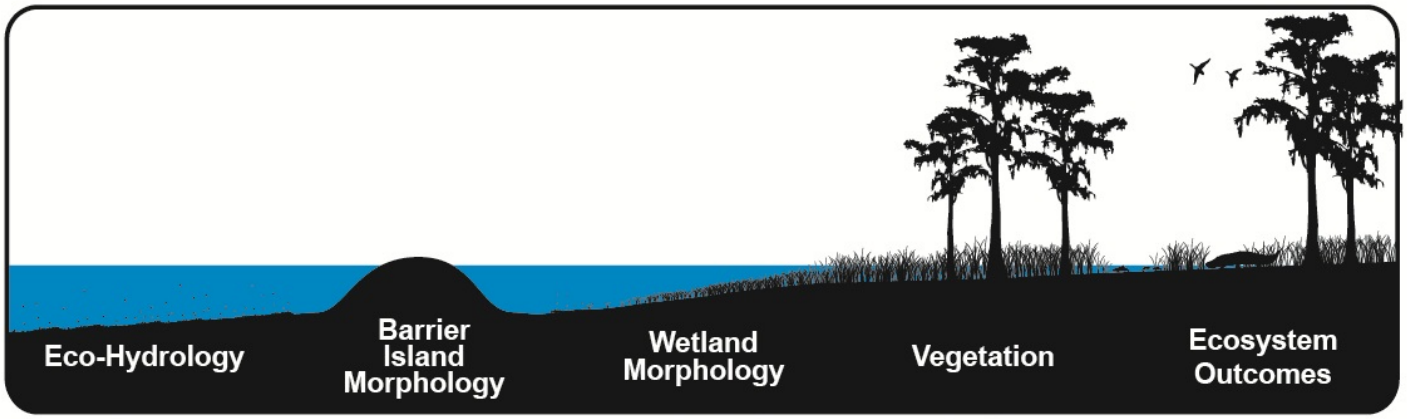
Oil Fields at Leeville in the early 1930's



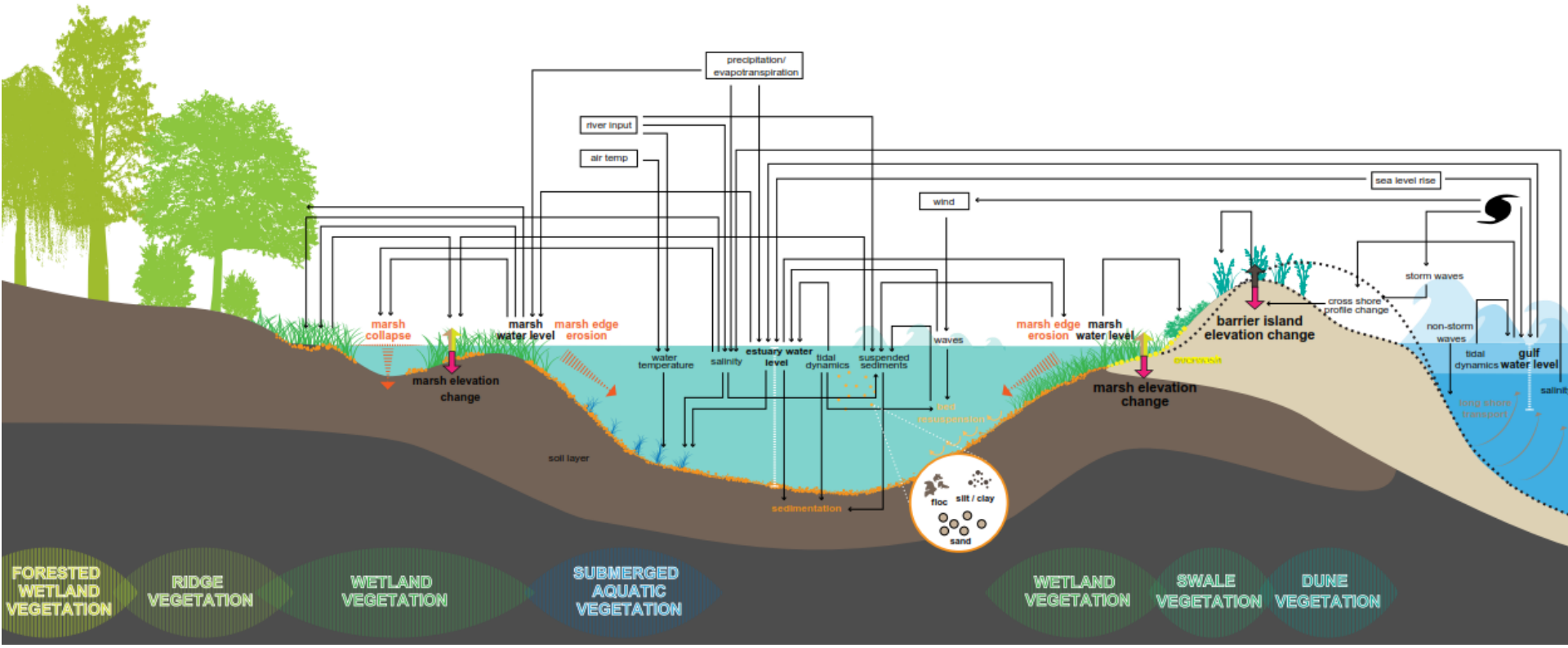


Using Science to Inform the 2017 Coastal Master Plan

Integrated Compartment Model (ICM)

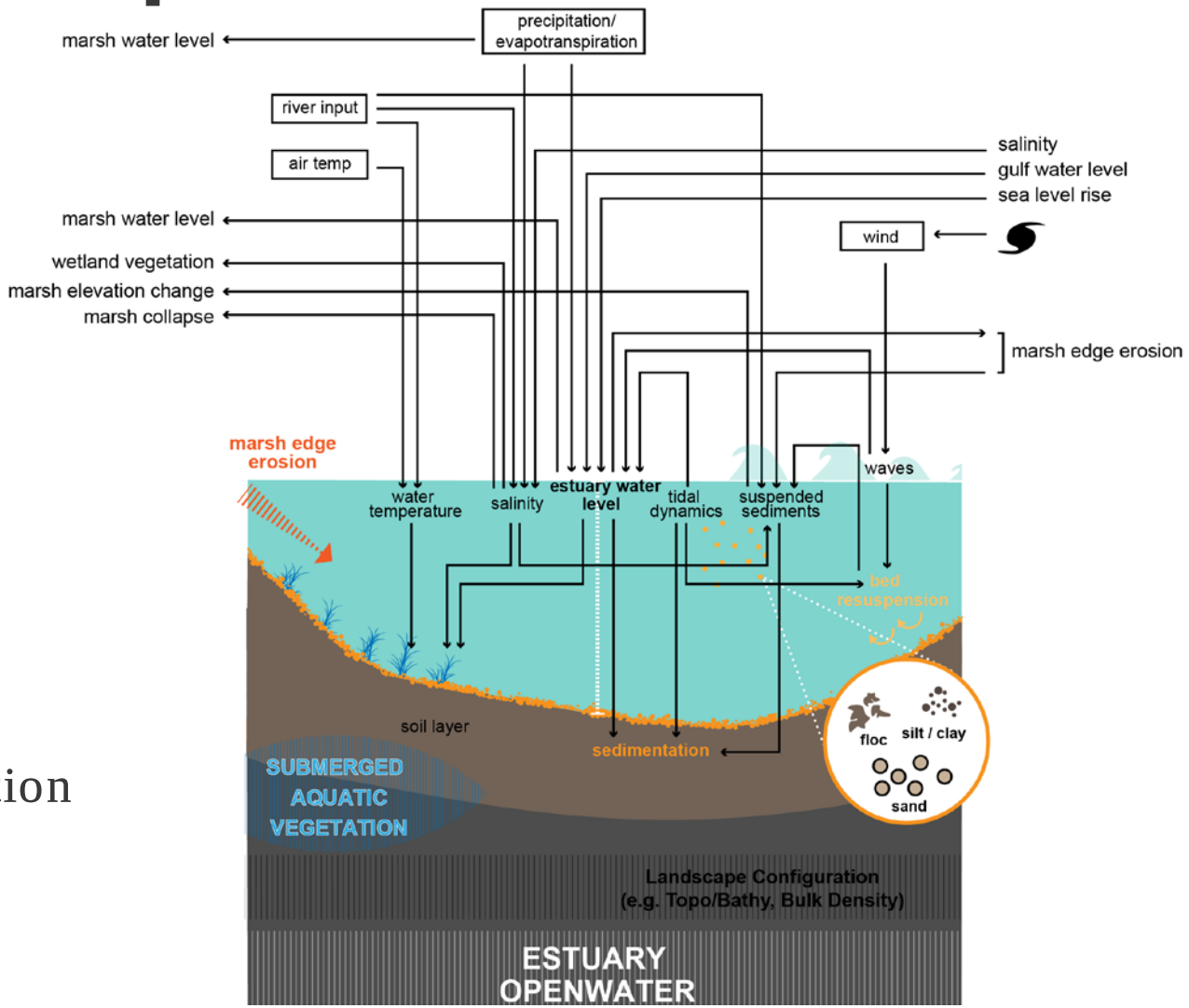


Integrated Compartment Model

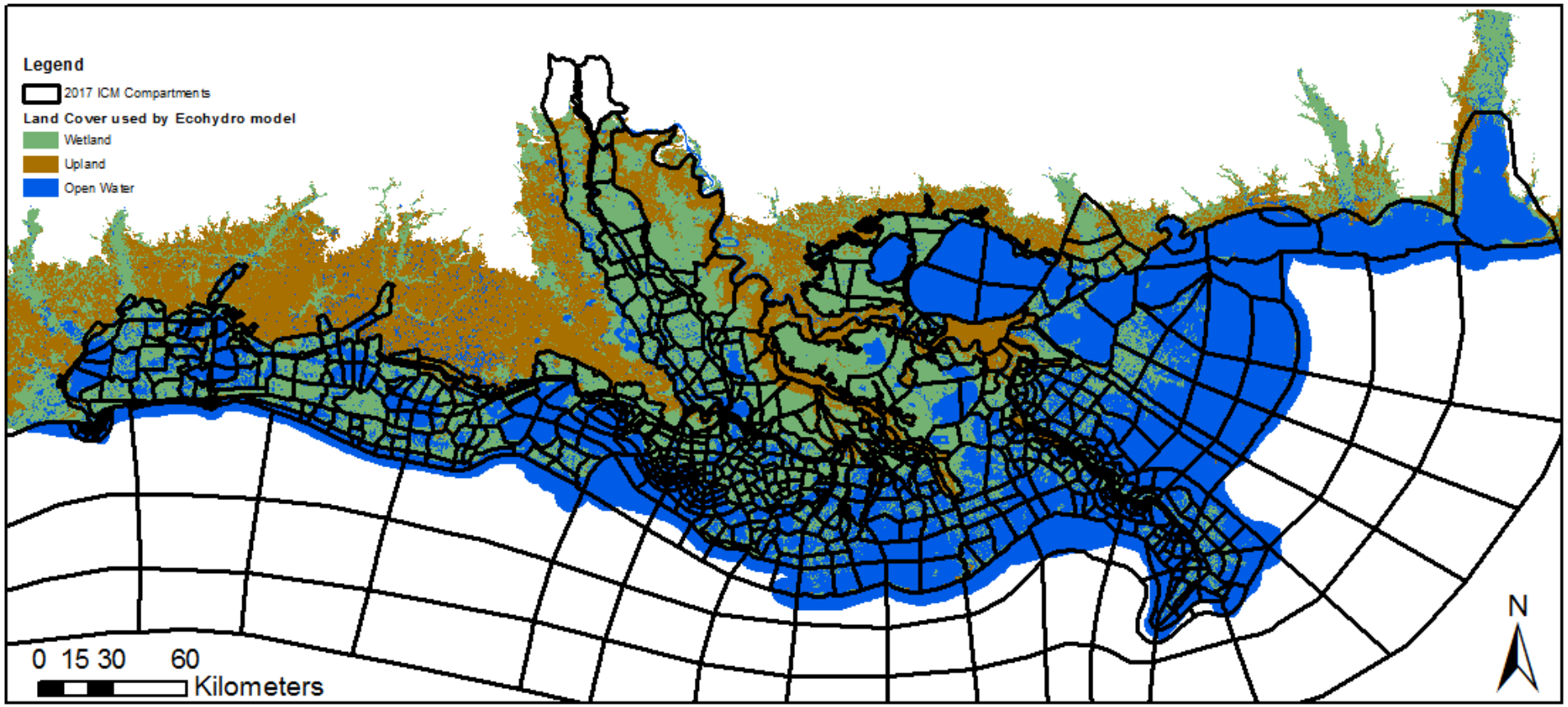


Estuary and Open Water Processes

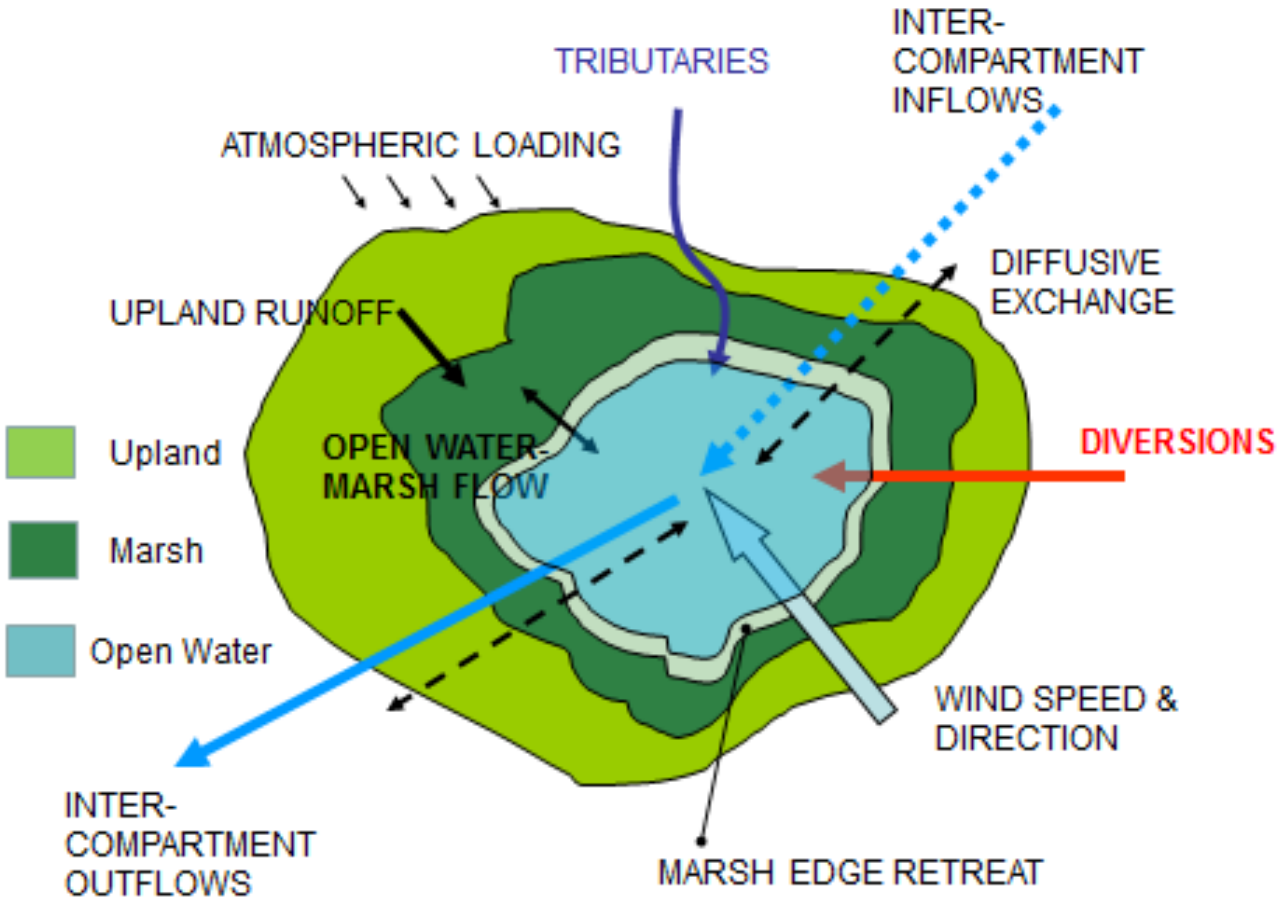
- Hydrodynamics
- Water quality
- Sedimentation
- Bed resuspension
- Sediment distribution



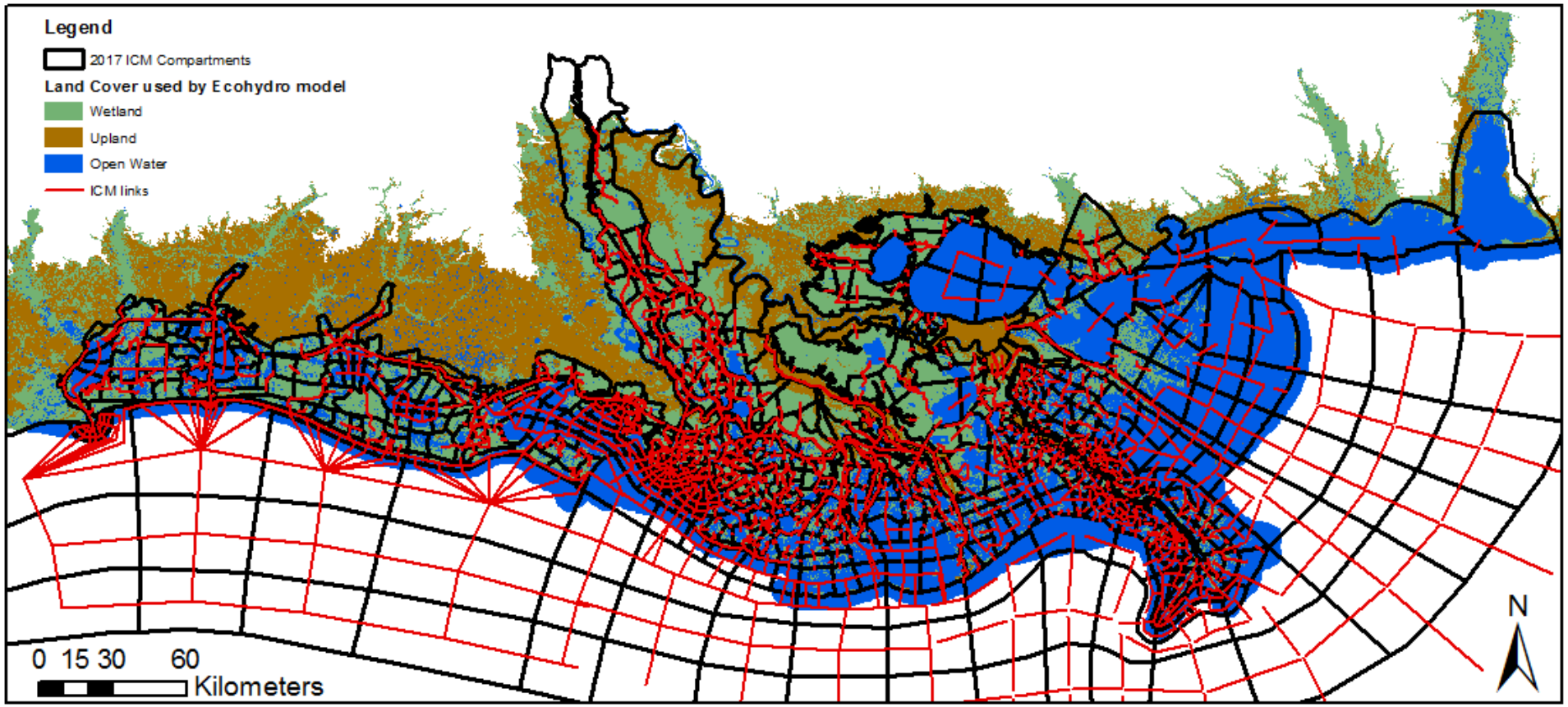
ICM Compartments



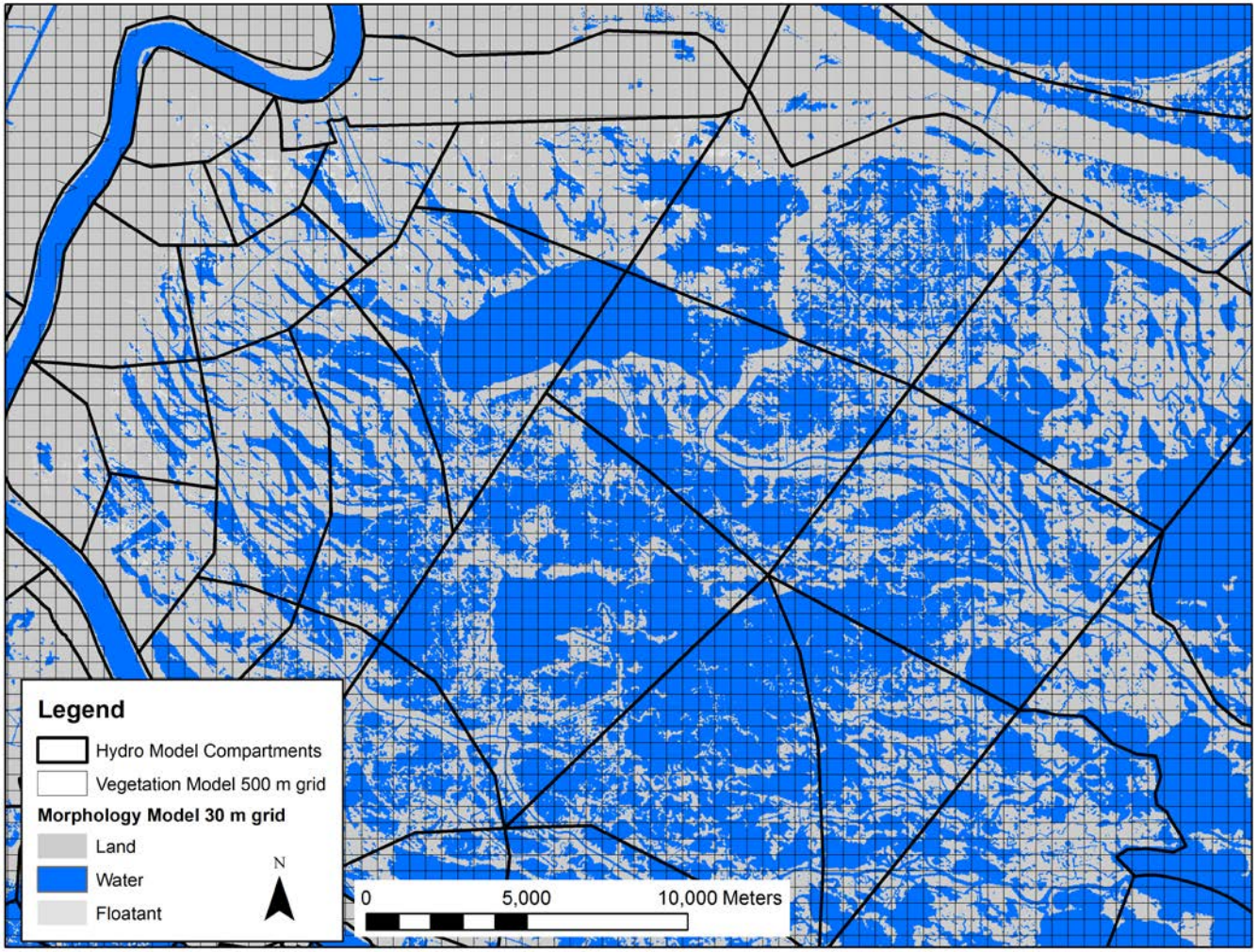
Hydrologic Compartment Layout



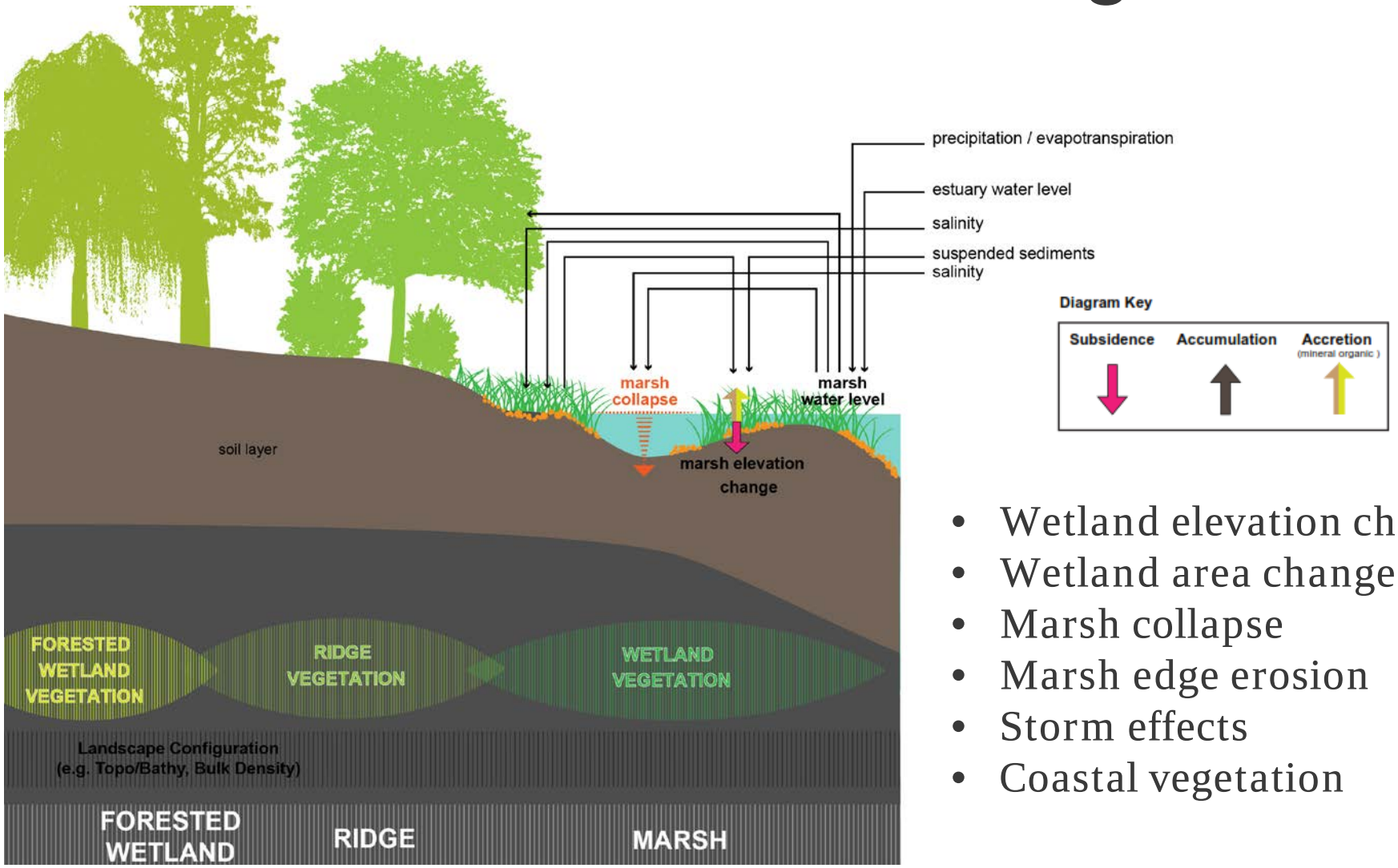
Hydraulic Link Network



Spatial Resolution of Subroutines



Wetland Processes and Vegetation

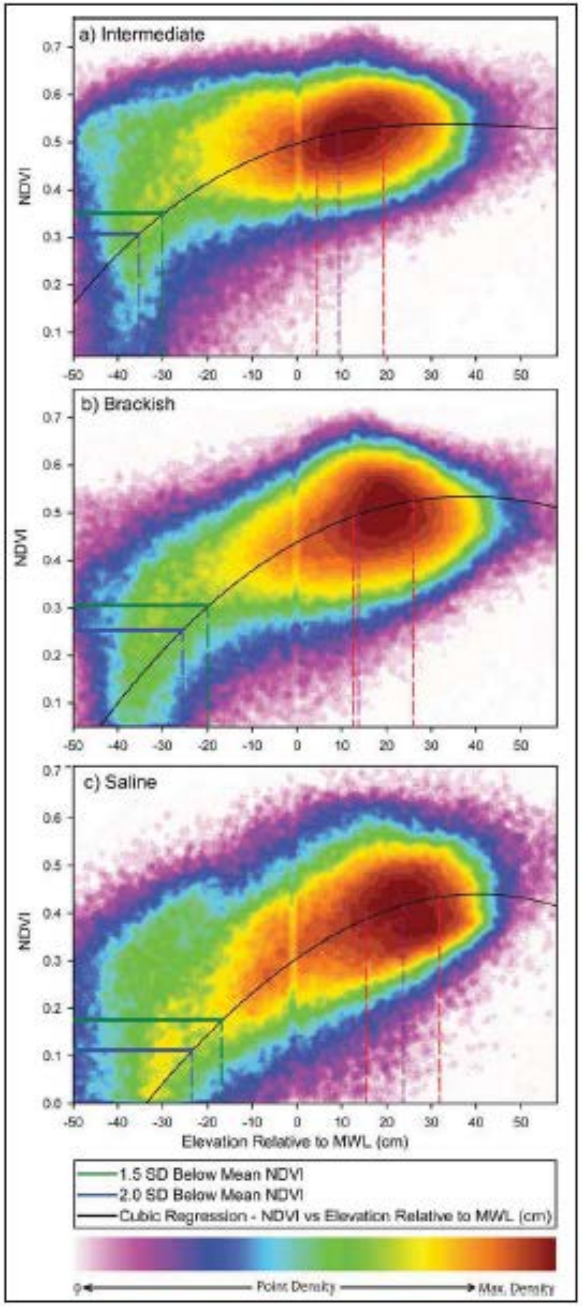


- Wetland elevation change
- Wetland area change
- Marsh collapse
- Marsh edge erosion
- Storm effects
- Coastal vegetation

Wetland Morphology

Predicts long-term, coast wide land change via:

- Sediment supply from tributaries and estuarine resuspension
- Marsh collapse due to:
  - salinity stress (fresher wetlands)
  - inundation stress
- Marsh edge erosion
- Subsidence
- Eustatic level rise



Thinking about the Future

Developing Future Scenarios

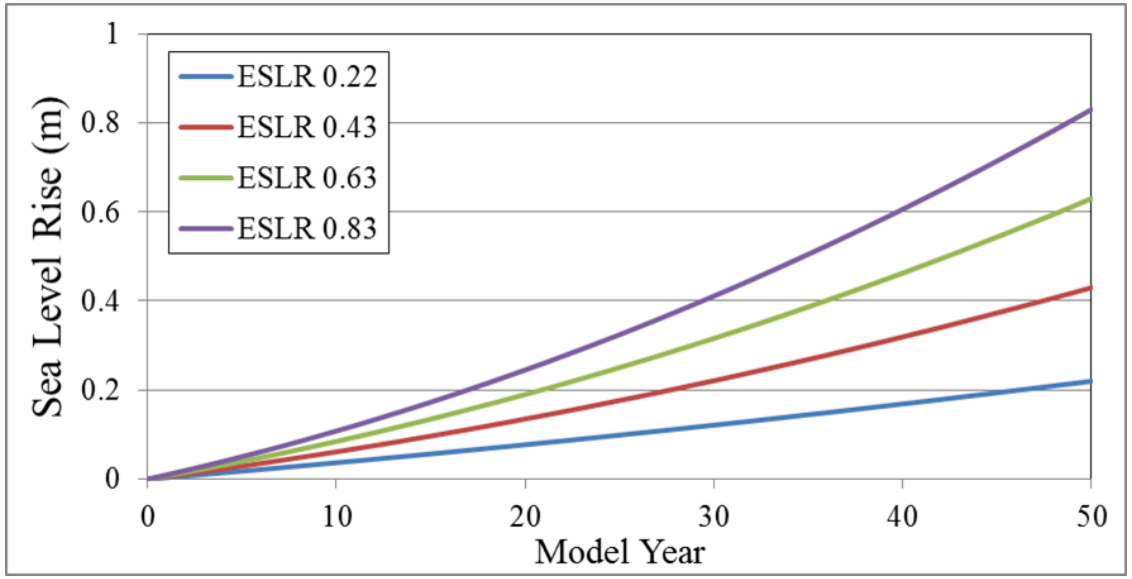
- Revisited 2012 Coastal Master Plan Future Scenarios approach
  - Reviewed list of variables and evaluated new information
- Designed focused numerical experiments and performed analysis to assess the response of key ICM output
- Evaluated model outputs for land change over 50 years
- Identified three scenarios (combination of values of environmental variables)

Evaluating Future Scenarios

- Sea Level Rise
  - Plausible range: 0.14 to 0.83 m over 50 years
- Subsidence
  - Plausible range: spatially variable; same as 2012 regions and values
- Precipitation
  - Plausible range: -5% to +14% of 50-yr observed cumulative
- Evapotranspiration
  - Plausible range: -30% to historic 50-yr cumulative

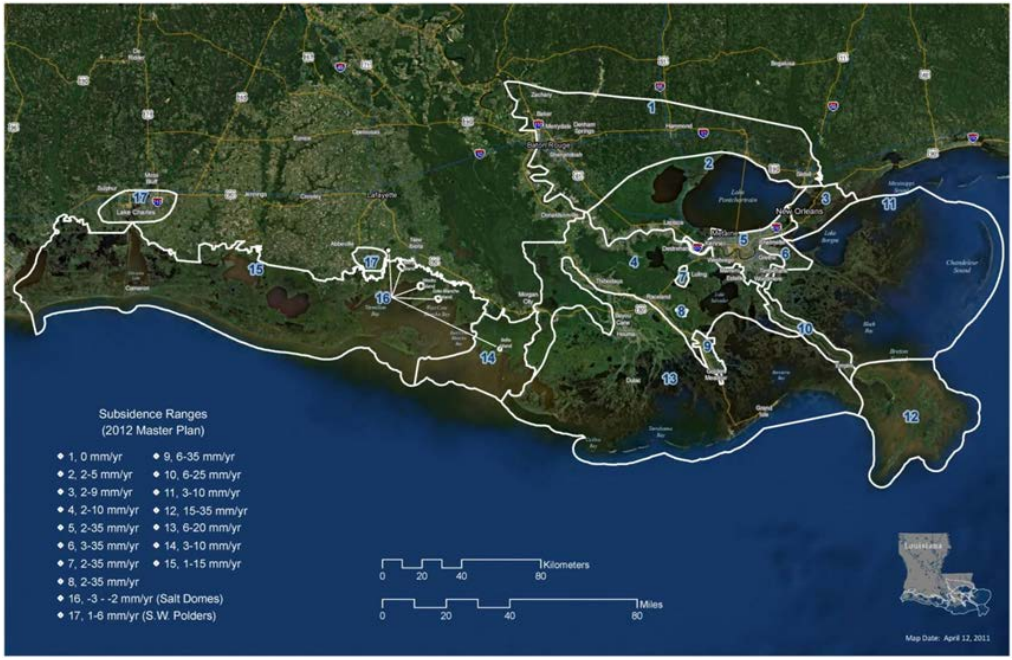
Sea Level Rise

- Plausible range: 0.14 to 0.83 m over 50 years
- Established on the basis of an extensive data and literature review
- Four ESLR rates were evaluated: 0.22, 0.43, 0.63, and 0.83 m/50year.



Subsidence

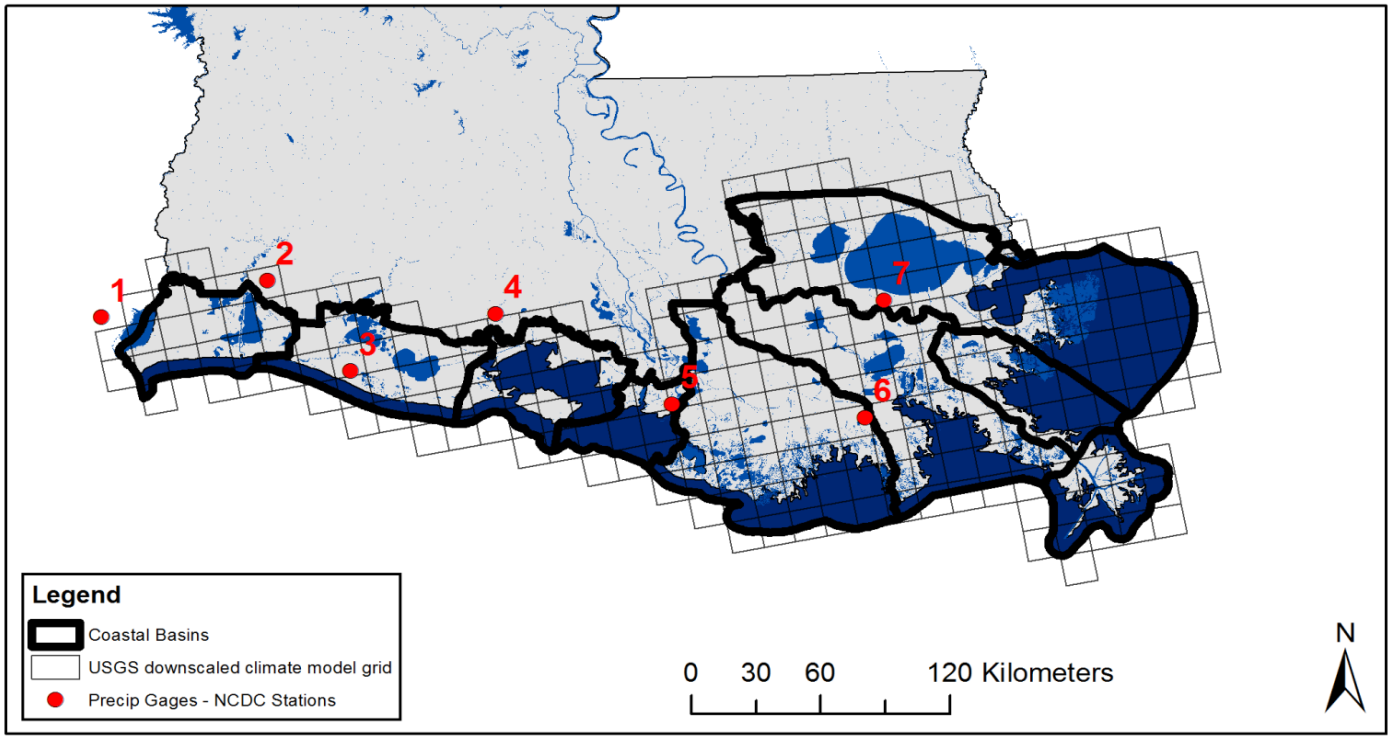
- Map with spatial variation ranging from 0 to 35 mm per year
- Differentiated into 17 geographical regions
- Same spatial regions and values as 2012 Master Plan
- Three subsidence rates were evaluated: 20%, 50%, and 75% of the identified rage for each region.



Downscaled Climate Data Precipitation & Evapotranspiration

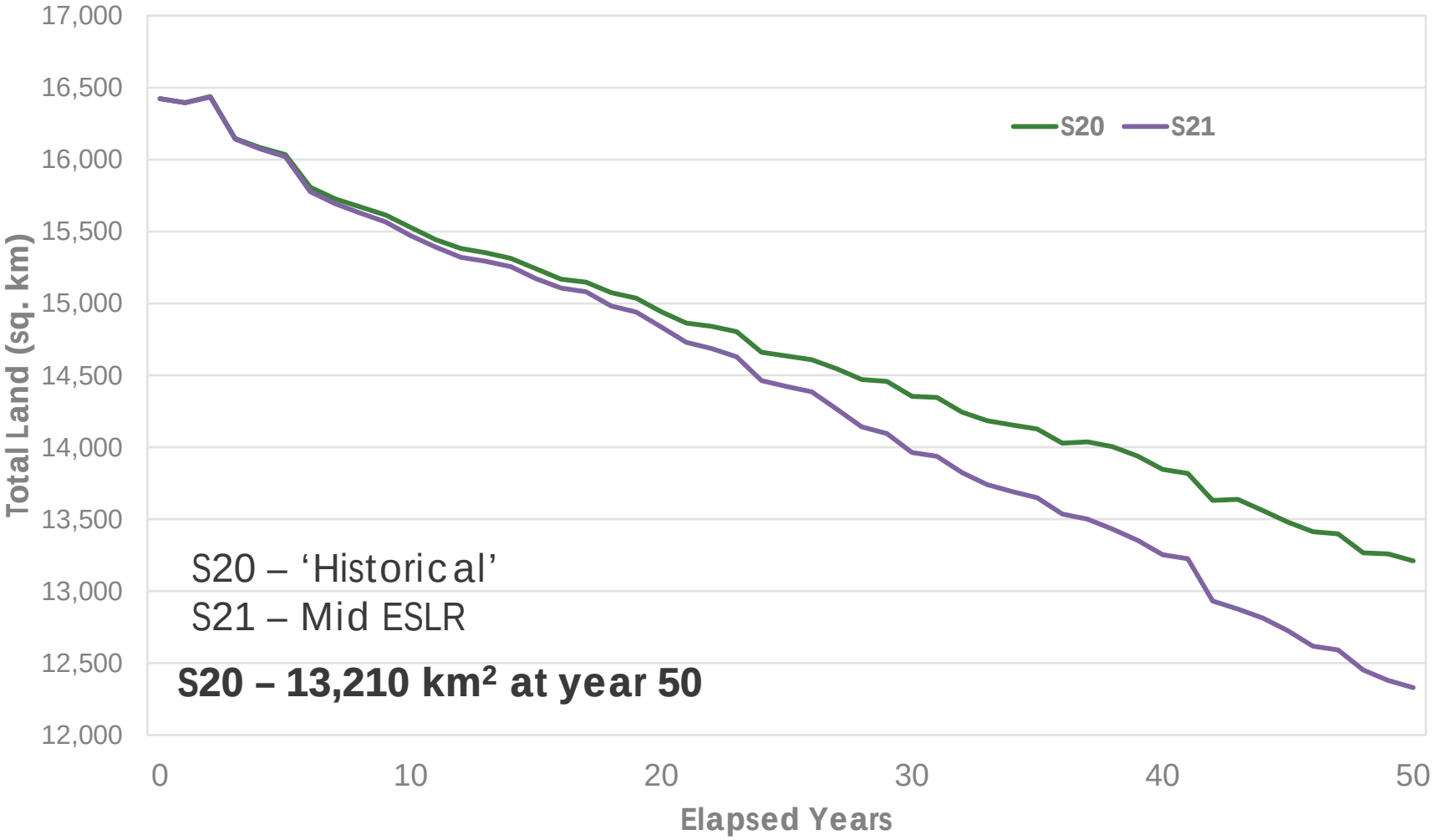
- USGS Dynamical Downscaled Daily Regional Climate V1.0 – Eastern North America
- Multiple datasets available:
  - All use the same regional climate model (RegCM3)
  - All use same emissions scenario (A2 from IPCC AR 4)
  - Different general circulation models used:
    - USGS GENMOM
    - GFDL CM2.0
    - MPI ECHAM5
- Other downscaled datasets are available (e.g. statistically downscaled), but spatial and temporal coverages are not consistent across datasets

Downscaled Climate Data



GCM used as boundary in RegCM3	Hindcast Period	Projected Period
GFDL	1970-1999	2040-2069
ECHAM	1970-1999	2020-2099
GENMOM	1980-1999	2020-2080

Sensitivity Test – Eustatic SLR

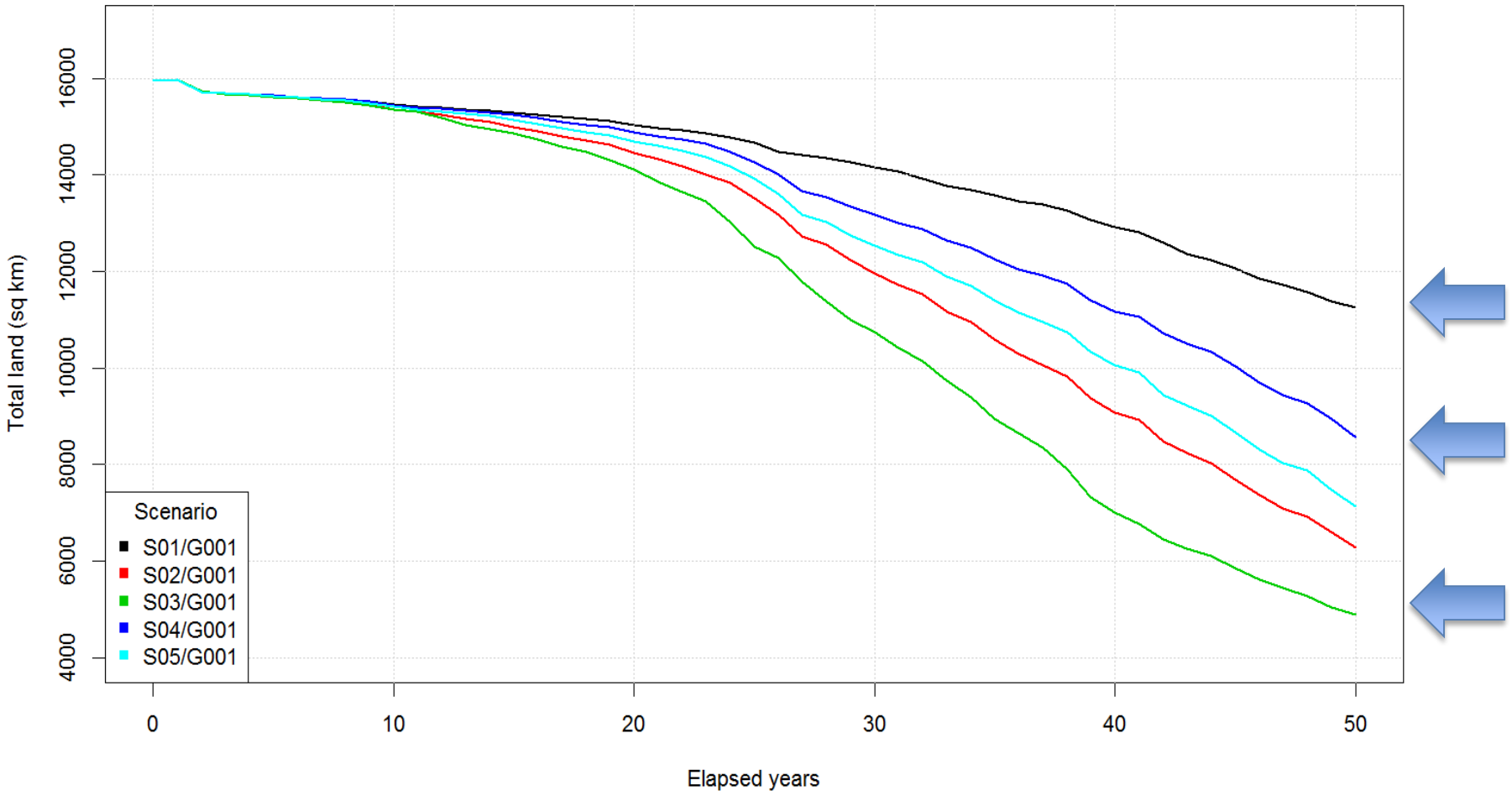


2017 Candidate Future Environmental Scenarios

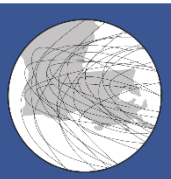
Scenario	Precipitation	ET	ESLR* (m/50yr)	Subsidence
1	>Historical	<Historical	0.43	20% of range
2	>Historical	Historical	0.63	50% of range
3	Historical	Historical	0.83	50% of range
4	>Historical	Historical	0.63	20% of range
5	>Historical	Historical	0.63	35% of range

** rate of change is **not linear***

Total Land (Sq. Km) Across Candidate Scenarios

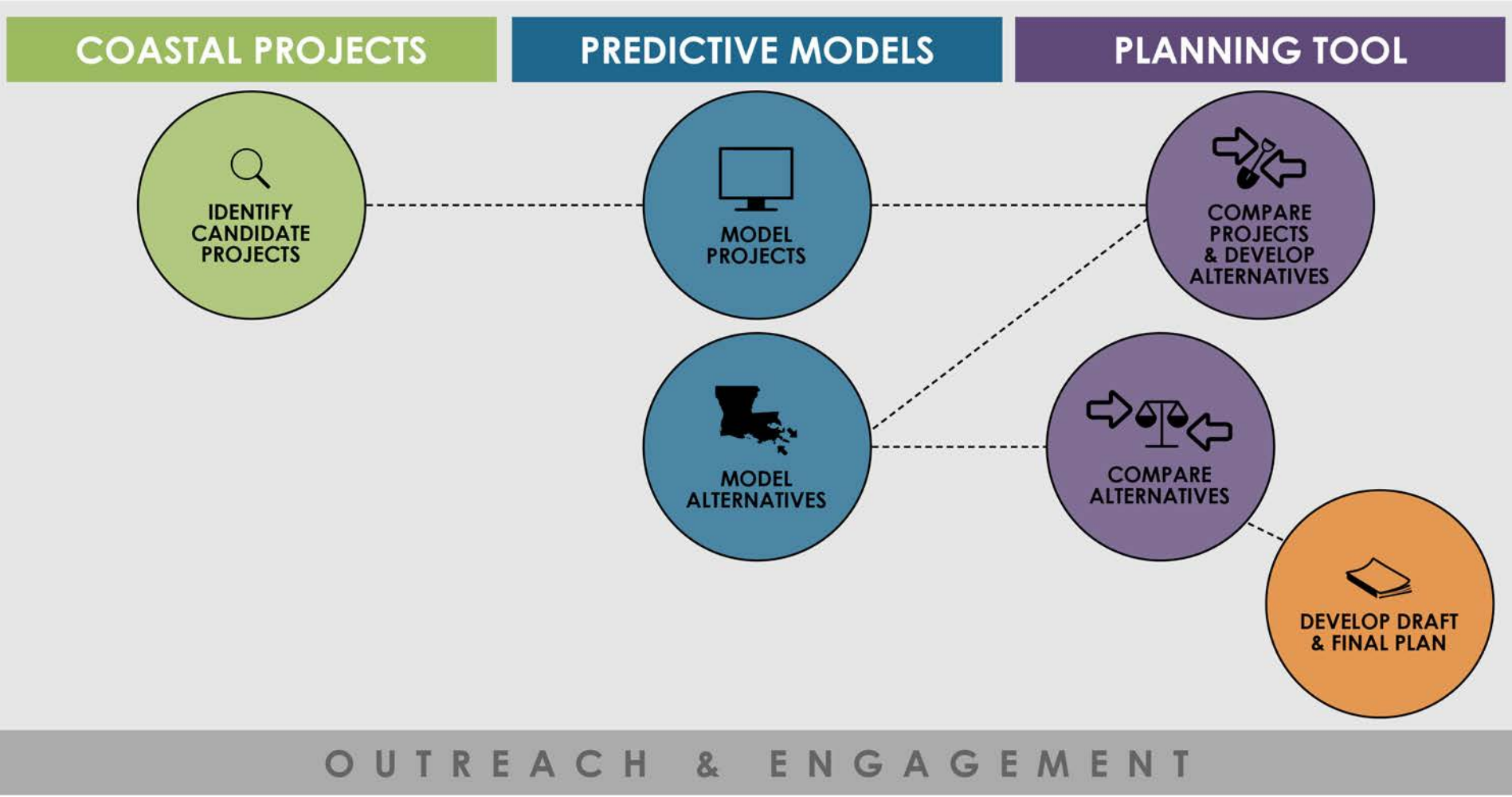


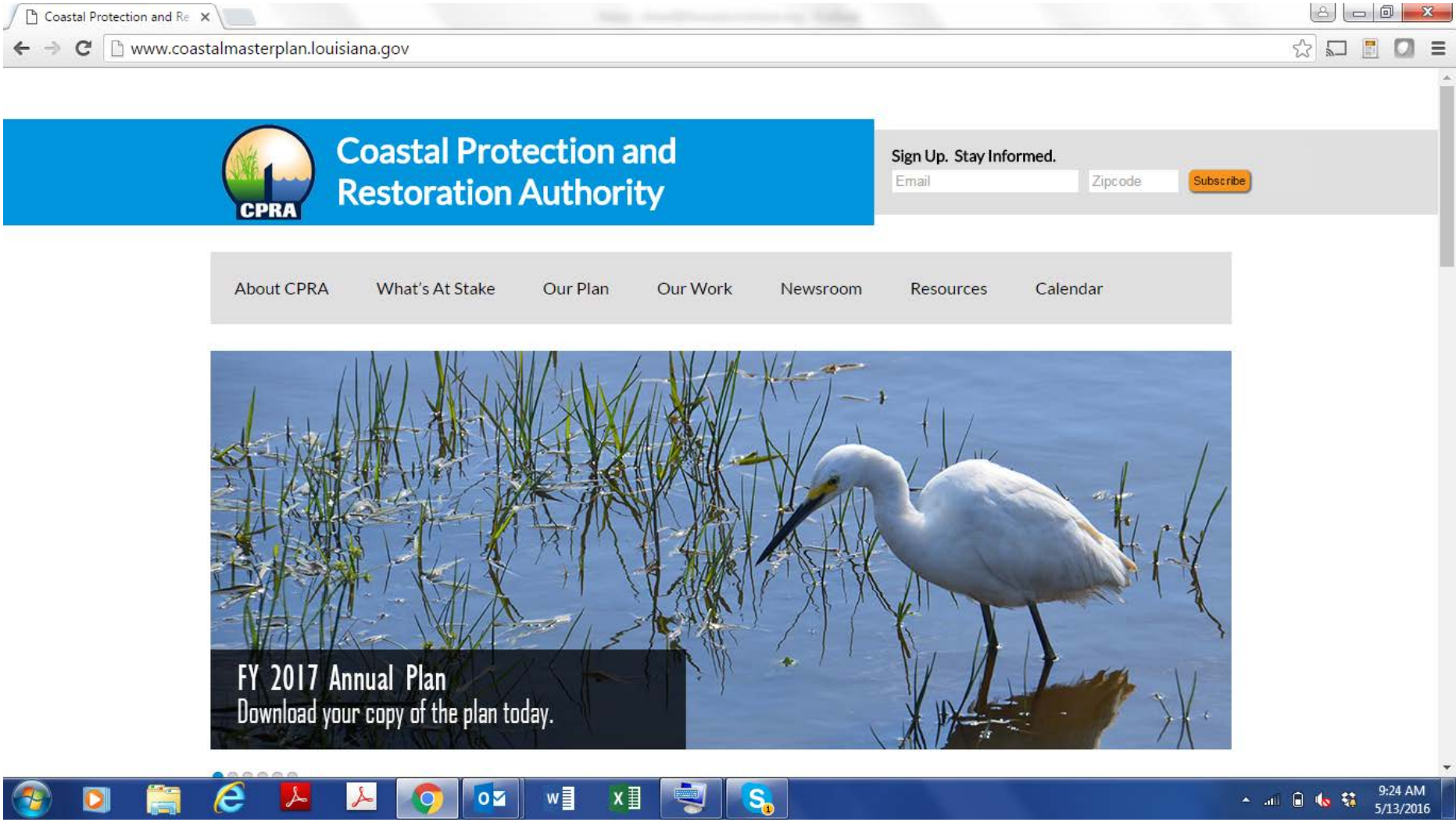
2017 Coastal Master Plan
Selected Environmental Scenarios

SCENARIO	 PRECIP	 ET	 SEA LEVEL RISE	 SUBSIDENCE	 STORM FREQUENCY	 AVG. STORM INTENSITY
2017 COASTAL MASTER PLAN						
LOW	>HISTORICAL	<HISTORICAL	1.41’	20% OF RANGE	-28%	+10.0%
MEDIUM	>HISTORICAL	HISTORICAL	2.07'	20% OF RANGE	-14%	+12.5%
HIGH	HISTORICAL	HISTORICAL	2.72’	50% OF RANGE	0%	+15.0%
COMPARED TO 2012 COASTAL MASTER PLAN						
MODERATE	>HISTORICAL	HISTORICAL	0.89’	20% OF RANGE	0%	+10.0%
LESS OPTIMISTIC	HISTORICAL	>HISTORICAL	1.48’	50% OF RANGE	+2.5%	+20.0%

(FEET/50 YEARS)

Developing the Coastal Master Plan

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FY 2017 Annual Plan
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coastal.la.gov/a-common-vision/2017-master-plan-update/

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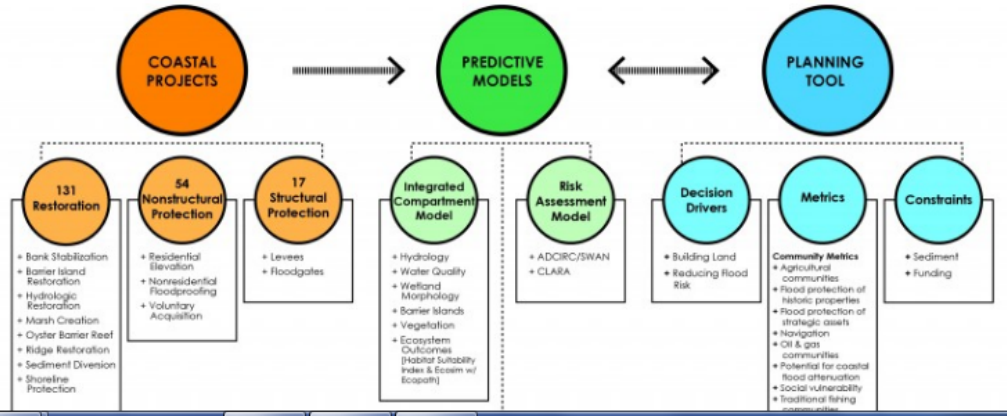
- Master Plan Overview
- 2012 Coastal Master Plan
- 2017 Coastal Master Plan Process
  - Technical Analysis
  - Flood Risk and Resilience Program
  - Planning and Technical Teams

2017 Coastal Master Plan Process



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http://coastal.la.gov/a-common-vision/2017-master-plan-update/

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- Master Plan Overview
- 2012 Coastal Master Plan
- 2017 Coastal Master Plan Process
  - Technical Analysis
  - Flood Risk and Resilience Program
  - Planning and Technical Teams
  - Working Together
  - Learn More

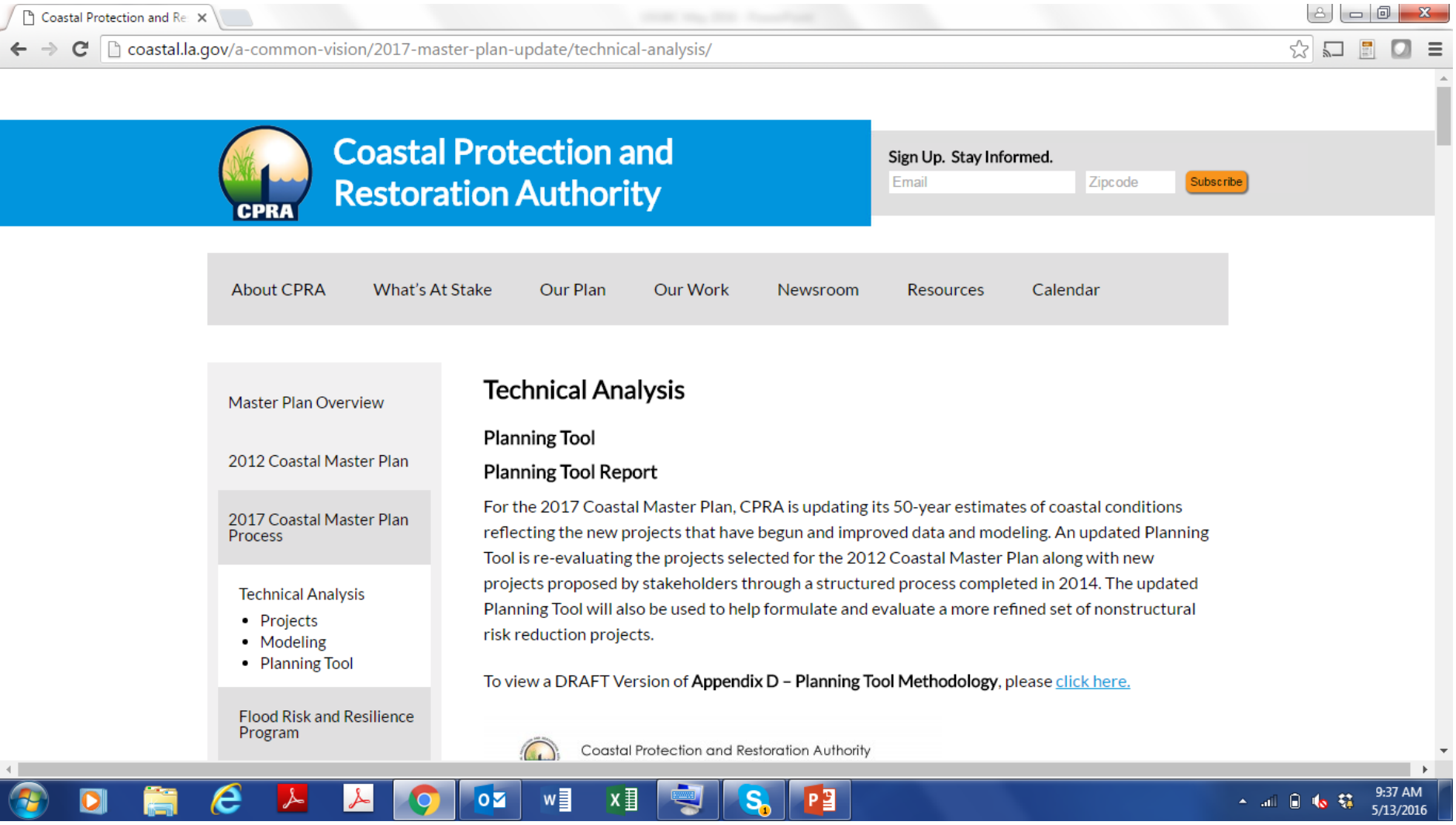
2017 Coastal Master Plan Process

The Coastal Master Plan sets forth an ambitious path to create a more sustainable coastal Louisiana landscape. The 2017 Coastal Master Plan will provide important information to Louisiana's coastal citizens, allowing them to protect their families, manage businesses, and plan for the future. The 2017 Coastal Master Plan moves us towards our protection and restoration goals of reducing coastal flood risk, promoting sustainable ecosystems, providing habitats for a variety of commercial and recreational activities coast wide, strengthening communities, and supporting regionally and nationally important business and industry.

Carrying forward the planning efforts from 2007 and 2012, the Coastal Master Plan builds on the past and establishes clear priorities for the future through an integrated and comprehensive approach.

So what's new? While we continue to implement projects to protect and restore coastal Louisiana, we're also working to advance the development of the 2017 Coastal Master Plan by:

- Emphasizing communities
- Focusing on flood risk reduction and resilience
- Incorporating new project ideas and information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Technical Analysis
Projects
Modeling
Planning Tool
Flood Risk and Resilience Program
Technical Analysis
Planning Tool
Planning Tool Report
For the 2017 Coastal Master Plan, CPRA is updating its 50-year estimates of coastal conditions reflecting the new projects that have begun and improved data and modeling. An updated Planning Tool is re-evaluating the projects selected for the 2012 Coastal Master Plan along with new projects proposed by stakeholders through a structured process completed in 2014. The updated Planning Tool will also be used to help formulate and evaluate a more refined set of nonstructural risk reduction projects.
To view a DRAFT Version of Appendix D – Planning Tool Methodology, please click here.
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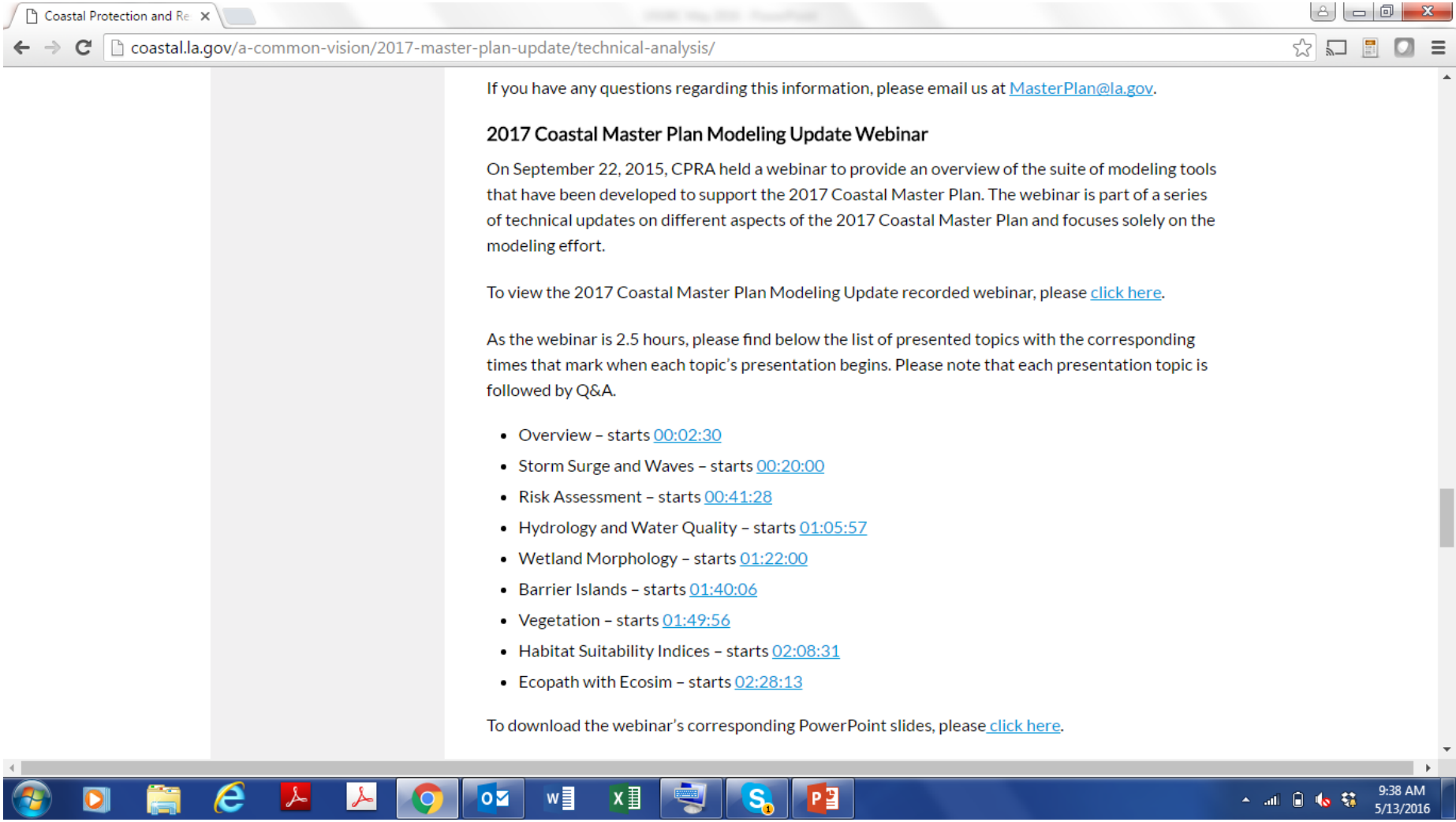
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coastal.la.gov/a-common-vision/2017-master-plan-update/technical-analysis/
If you have any questions regarding this information, please email us at MasterPlan@la.gov.
2017 Coastal Master Plan Modeling Update Webinar
On September 22, 2015, CPRA held a webinar to provide an overview of the suite of modeling tools that have been developed to support the 2017 Coastal Master Plan. The webinar is part of a series of technical updates on different aspects of the 2017 Coastal Master Plan and focuses solely on the modeling effort.
To view the 2017 Coastal Master Plan Modeling Update recorded webinar, please click here.
As the webinar is 2.5 hours, please find below the list of presented topics with the corresponding times that mark when each topic's presentation begins. Please note that each presentation topic is followed by Q&A.
Overview – starts 00:02:30
Storm Surge and Waves – starts 00:20:00
Risk Assessment – starts 00:41:28
Hydrology and Water Quality – starts 01:05:57
Wetland Morphology – starts 01:22:00
Barrier Islands – starts 01:40:06
Vegetation – starts 01:49:56
Habitat Suitability Indices – starts 02:08:31
Ecopath with Ecosim – starts 02:28:13
To download the webinar's corresponding PowerPoint slides, please click here.
9:38 AM
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