COASTAL RESILIENCE

Adapting Natural and Human Communities to Sea Level Rise and Coastal Hazards

Global Coastal Resilience Assessment Tool

Web-based mapping to address conservation, restoration, and climate issues

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marine map

GeoTools
George Raber, Ph.D.
March 22, 2011

Global marine assessment of Coastal Resilience

Coastal resilience refers to the ability of linked social, ecological, and economic systems within the coastal zone to adapt to and recover from disturbances such as hurricanes, tsunamis, floods, sea level rise, and harmful algal blooms. (Gunderson and Holling 2002, Berkes and Folke 2002).

Coastal Resilience Projects

The Global Assessment is one in a series of currently three related but distinct web applications have been developed with similar goals, interface and architecture that all share a common code base.

- Global (http://dev.global.coastalresilience.org/)
- Gulf of Mexico (http://dev.gulfmex.coastalresilience.org/)
- Long Island Sound (http://dev.lis.coastalresilience.org/)

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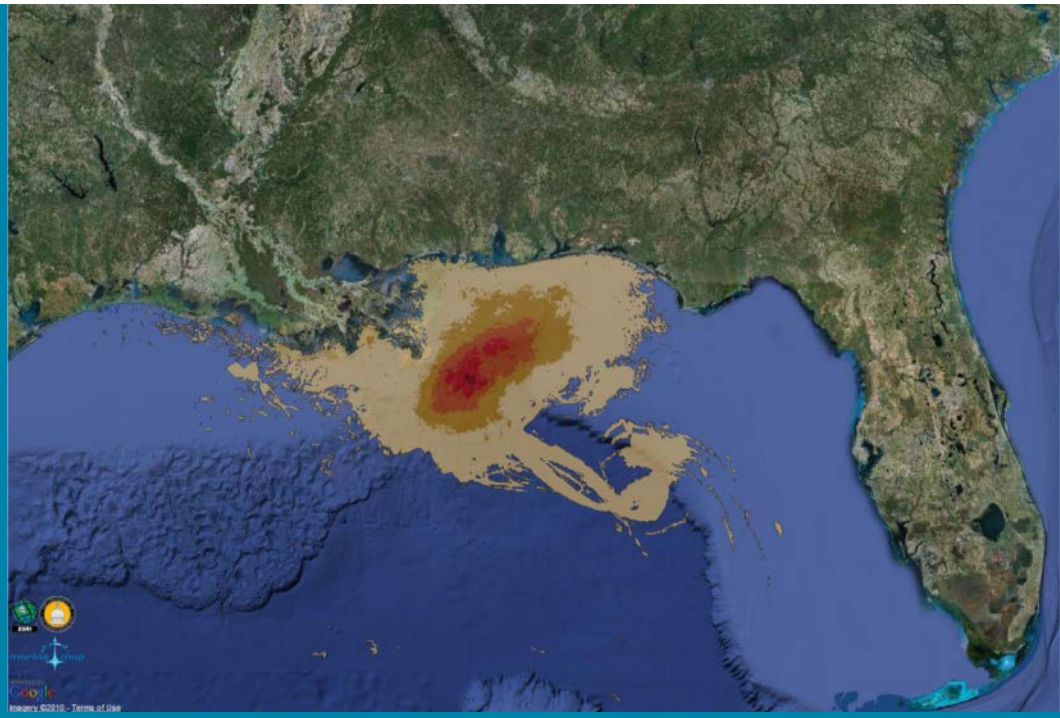
Gulf of Mexico restoration decision support:



- **Major themes**
  - Critical ecosystem restoration (shellfish, marshes, seagrasses, corals)
  - Coastal hazard mitigation (SLR, storm surge)
  - Marine Spatial Planning

- **Major messages**
  - Long-term recovery and restoration efforts (complimentary with NOAA)
  - Multiple scale interactive decision support (regional and local planning)

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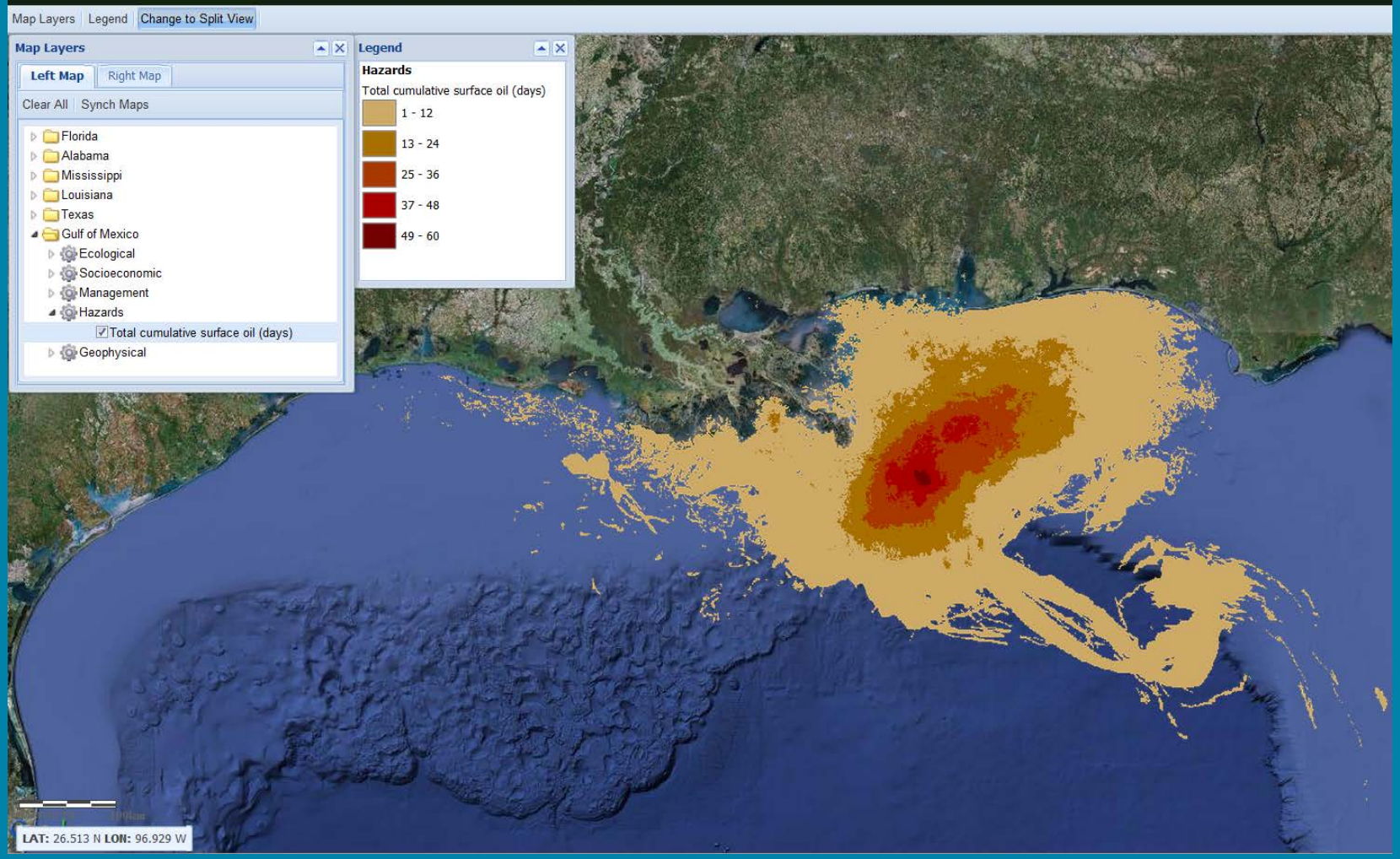
Gulf of Mexico Restoration Decision Support



COASTAL RESILIENCE

Adapting Natural and Human Communities to Sea Level Rise and Coastal Hazards

AN ECOSYSTEM-BASED ADAPTATION STRATEGY

MULTIPLE OBJECTIVE WEB MAPPING APPLICATION

INTERACTIVE DECISION SUPPORT

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Coastal Resilience Long Island Sound

Map Layers | Legend | Change to Single View | Flood Scenarios | Background

Map Layers

Left Map | Right Map

Clear All | Synch Maps

- Long Island Sound
  - socioeconomic
  - ecological
    - Potential Marsh Migration Impediments
    - [x] Marsh - Type
    - [x] Marsh - Potential Population Protection
    - Marsh - Potential Viability
    - Beach-Dunes
    - Plover Habitat - Barrier Islands
    - Benthic Habitats
    - Submerged Aquatic Vegetation
    - LiDAR Elevation
    - LiDAR Hillshade
    - Shoreline Exposure to Wave Energy

Legend

ecological

Marsh - Type
- Formerly Connected Marsh
- Freshwater Marsh
- High Marsh
- Low Marsh

Marsh - Potential Population Protection
- Least
- Most

Flood_Scenarios

Present_Catastrophic Storm
- Flooded

dev.lis.coastalresilience.org/#

Map data ©2011 Google - Terms of Use

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Global Marine Assessment Tool

Map Layers | Legend | Change to Split View | Guide

Background

Map Layers

Left Map | Right Map

Clear All | Synch Maps

- Global
  - Shellfish@Risk
  - The Nature Conservancy
    - Marine Ecoregions of the World
    - Major Emphasis Areas
    - Expanding Areas
  - UNESCO
- Mesoamerican Reef
  - Boundaries
  - Ecological
  - SLR
- US Virgin Islands
  - Boundaries
  - Coastal and Marine Resources
  - Infrastructure
  - Sea Level Rise Scenarios
  - Storm Surge
  - Terrestrial Resources

Legend

The_Nature_Conservancy

Major Emphasis Areas

- Coral Triangle countries
- Gulf of California and Mexico's Northern Pacific
- Insular Caribbean
- Mesoamerican Reef
- Micronesia
- U.S. and Canada

Expanding Areas

- Eastern Tropical Pacific
- Humboldt Current
- Western Indian Ocean

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Global Marine Assessment Tool

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Map Layers | Legend | Change to Split View | Guide

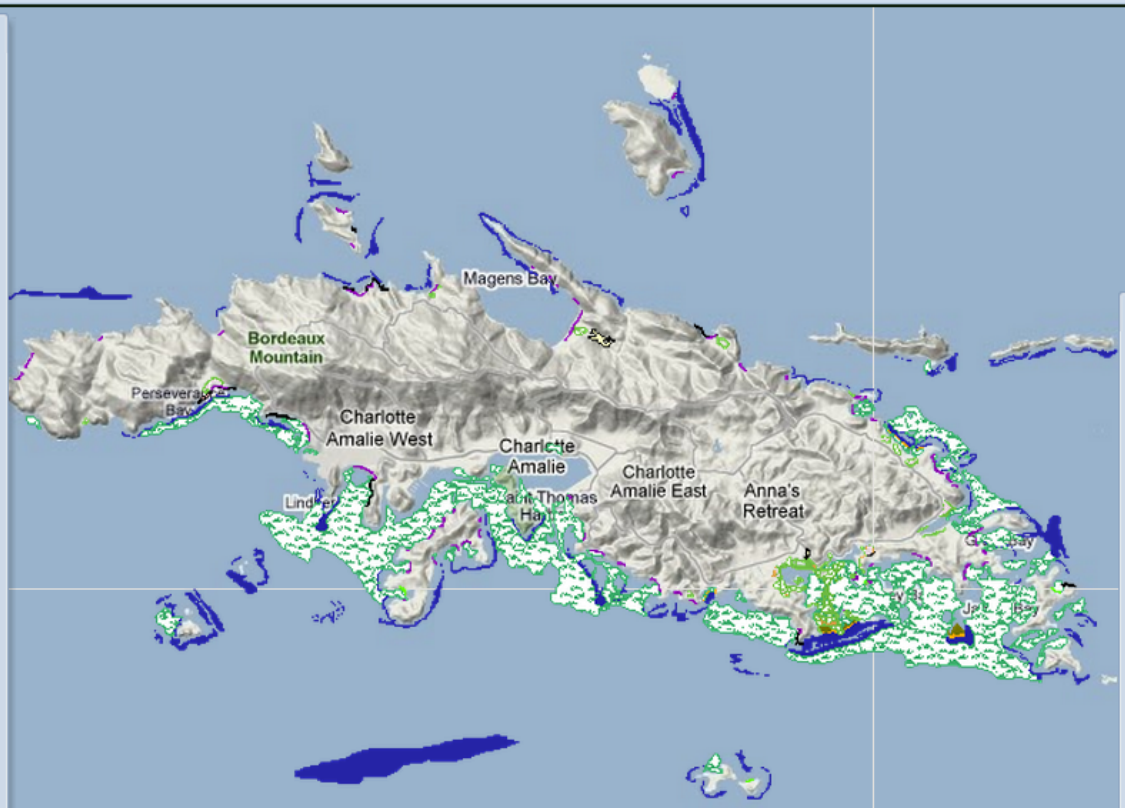
Background

Map Layers

Left Map | Right Map

Clear All | Synch Maps

- Global
- Mesoamerican Reef
- US Virgin Islands
  - Boundaries
  - Coastal and Marine Resources
    - ☑ Coastal wetlands
    - ☑ Turtle nesting beaches
    - ☑ Benthic habitats
  - Infrastructure
  - Sea Level Rise Scenarios
  - Storm Surge
  - Terrestrial Resources



Legend

Coastal_and_Marine_Resources

Coastal wetlands
- mangrove
- mixed swamp
- salt flat
- salt pond

Turtle nesting beaches
- prime turtle nesting beaches
- turtle nesting beaches

Benthic habitats
- backreef
- sea grass
- forereef
- reef crest
- shoreline intertidal

Coastalresilience.org

2 4km

POWERED BY Google

LAT: 18.252 N LON: 65.031 W

Coastal Resilience Architecture

- The individual sites are hosted on the Amazon cloud (development sites hosted at UCSB – Marine Map)
- They each utilize Esri's ArcGIS server technology
  - Some custom server side code written in Python
- The client interface now relies on the ArcGIS Javascript API, and has been developed in a modular, data driven approach.

Data Driven Application Enhancements

- When additions or modifications are made to the map services the changes are posted to the site without modifying the code base.
- This allows the tools to adapt to the data present in a specific area or for a specific task.
  - This requires a data (or service model) be in place for the published map services.
  - This structure can be read efficiently using calls to the REST interface.

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Gulf of Mexico Restoration Decision Support

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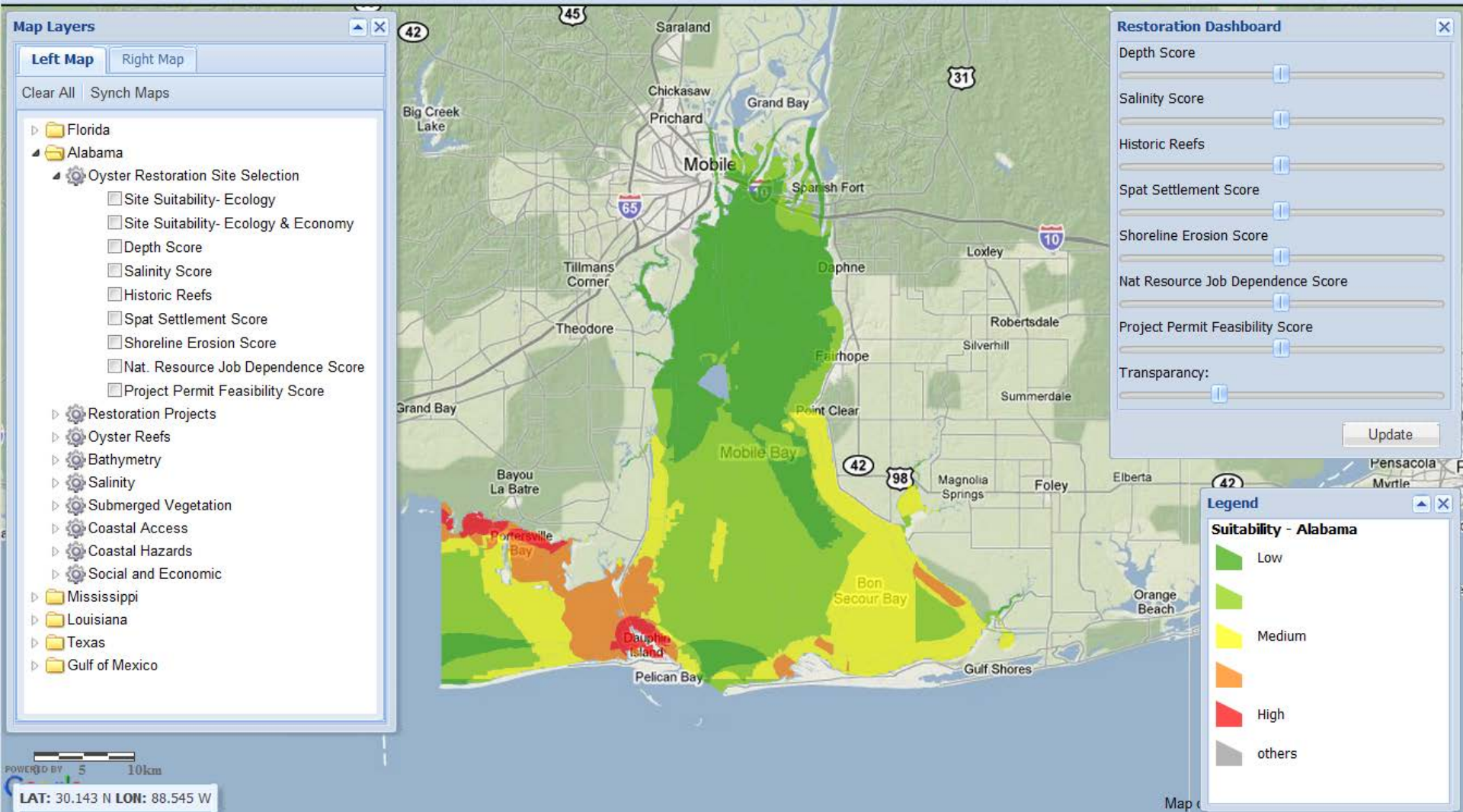
Map Layers | Legend | Change to Split View | Guide | Restoration Dashboard

Background



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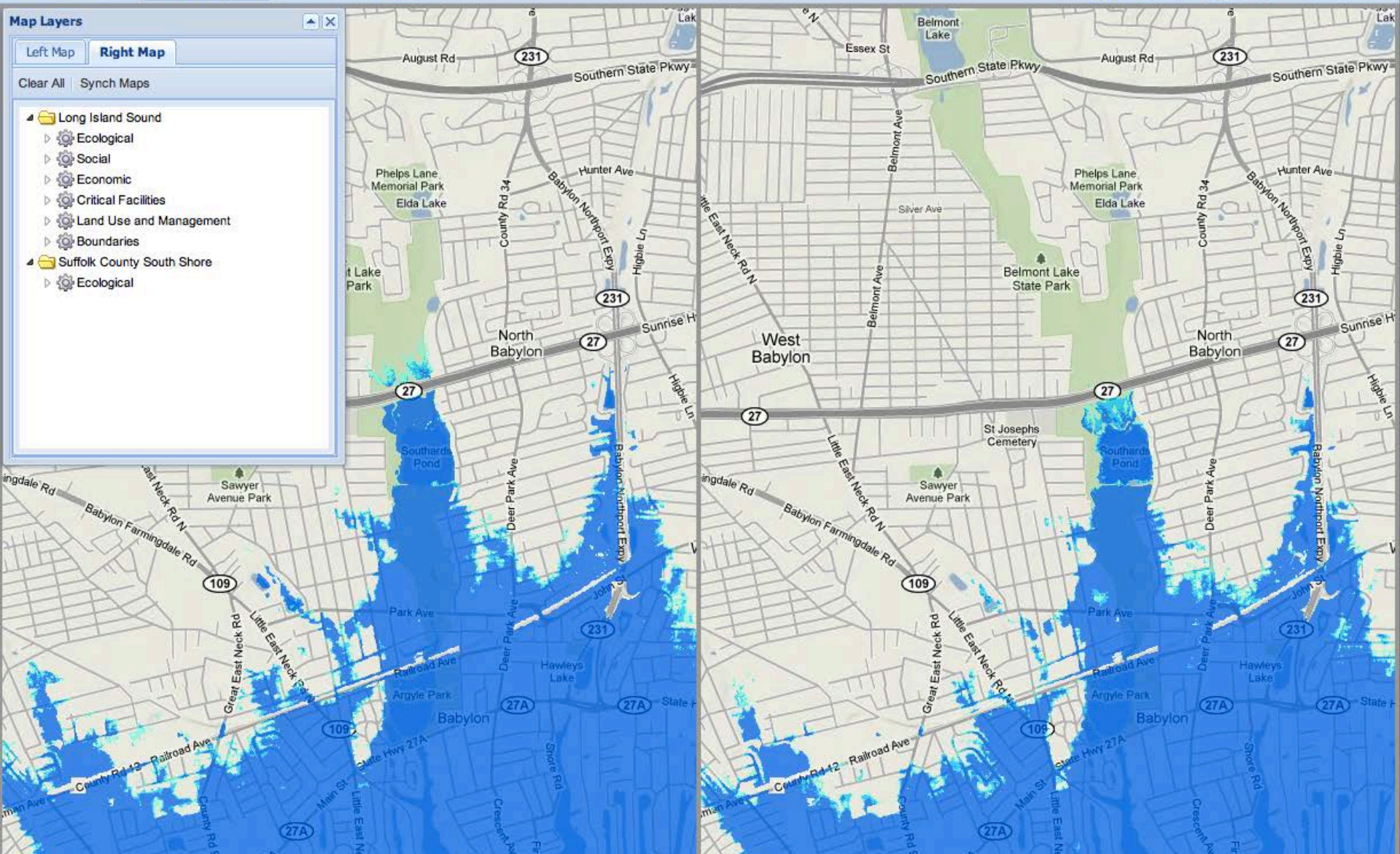
Map Layers | Legend | Change to Single View | Flood Scenarios | Guide | Background

Map Layers

Left Map | Right Map

Clear All | Synch Maps

- Long Island Sound
  - Ecological
  - Social
  - Economic
  - Critical Facilities
  - Land Use and Management
  - Boundaries
- Suffolk County South Shore
  - Ecological



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Comments / Questions

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