

Sustainable Ecosystem Management in the Chesapeake Bay and Mississippi Delta (USA)

Donald F. Boesch



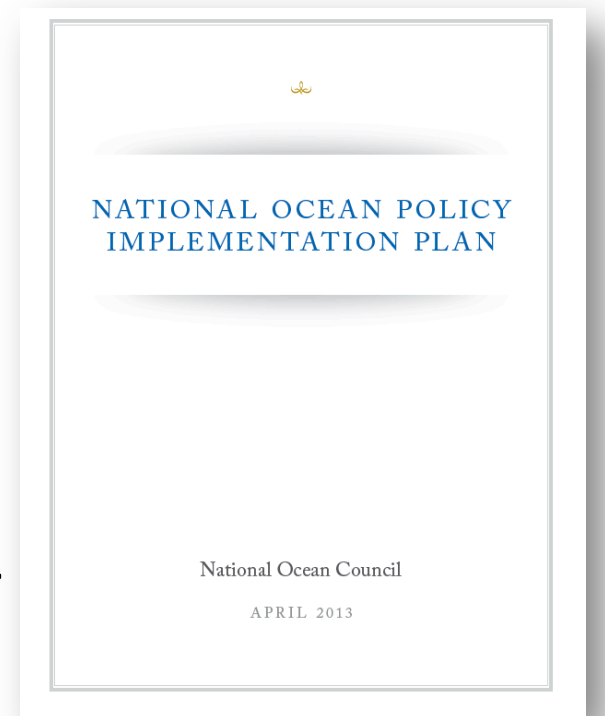
University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE



Ecosystem-Based Management

An integrated approach to management that considers the entire ecosystem, including humans. The goal is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need. It:

- is place-based in focusing on a specific ecosystem and the range of activities affecting it;
- explicitly accounts for the interconnectedness among systems, such as between air, land and sea; and
- integrates ecological, social, economic and institutional perspectives, recognizing their strong interdependences.



Key Elements of Ecosystem-Based Management

- ✓ **Integration**
 - Intergovernmental
 - Intermedium (air, land, water)
 - Ecosystemic
 - Intersectoral
 - Inderdisciplinary
- ✓ **Sustainability**
- ✓ **Precaution**
- ✓ **Adaptation**



Chesapeake Bay

Mississippi Delta

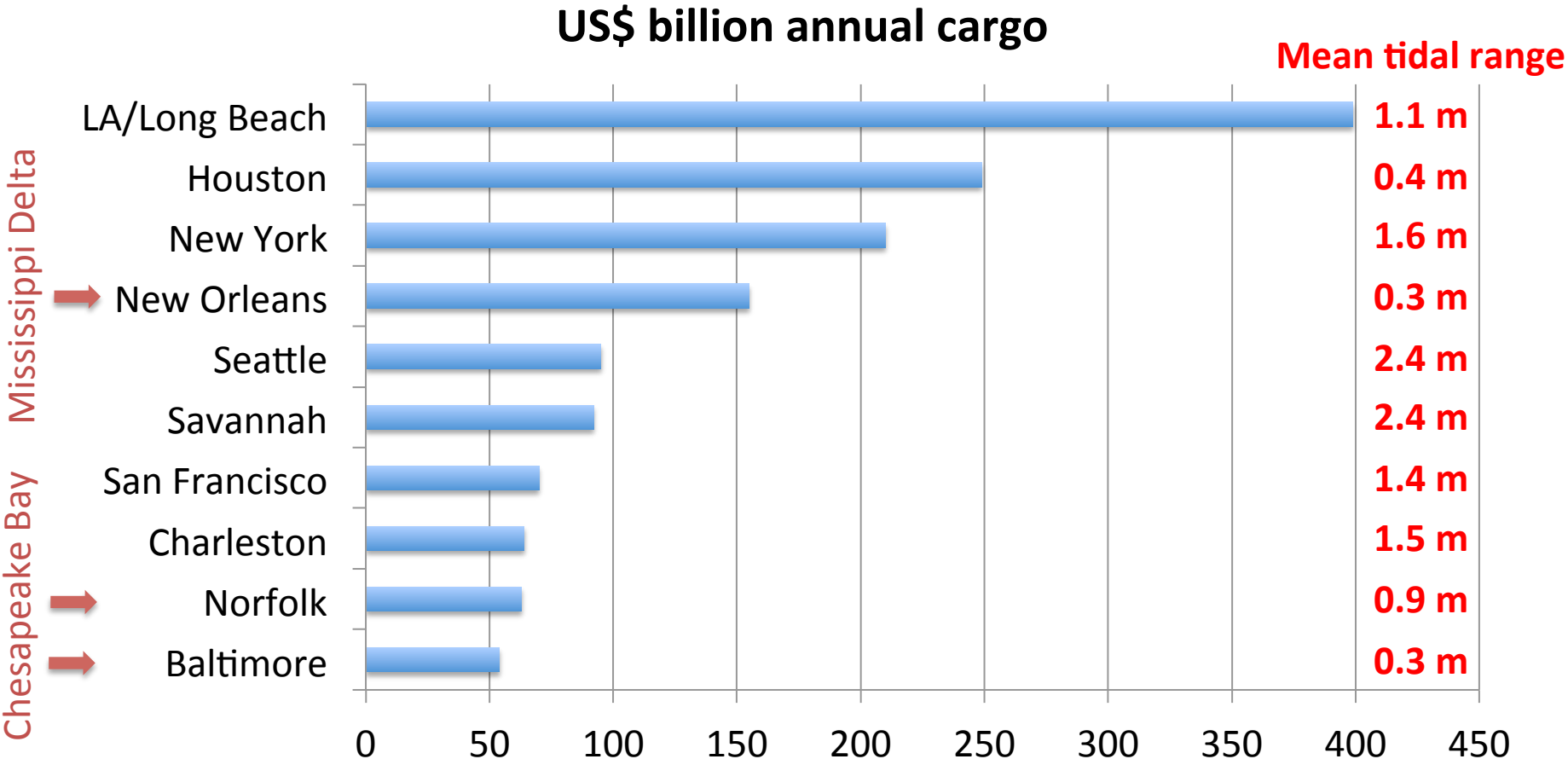
PHYSICAL LEGEND

- CITIES**
 - Over 1,000,000
 - 500,000 to 1,000,000
 - 50,000 to 500,000
 - Less than 50,000
 - National capital
 - State capital
- BOUNDARIES**
 - International
 - State
 - Continental Divide
- FEATURES**
 - River, lake
 - Canal
 - Dam, Falls
 - Depression, Mountain peak
 - Wetlands
- ELEVATION**

METERS	FEET
Over 3,048	Over 10,000
1,524 to 3,048	5,000 to 10,000
610 to 1,524	2,000 to 5,000
305 to 610	1,000 to 2,000
152 to 305	500 to 1,000
Sea level to 152	Sea level to 500
Below sea level	Below sea level
- DEPTH**

Sea level to 183	Sea level to 600
183 to 1,524	600 to 5,000
1,524 to 3,048	5,000 to 10,000
Below 3,048	Below 10,000

Most Important U.S. Ports



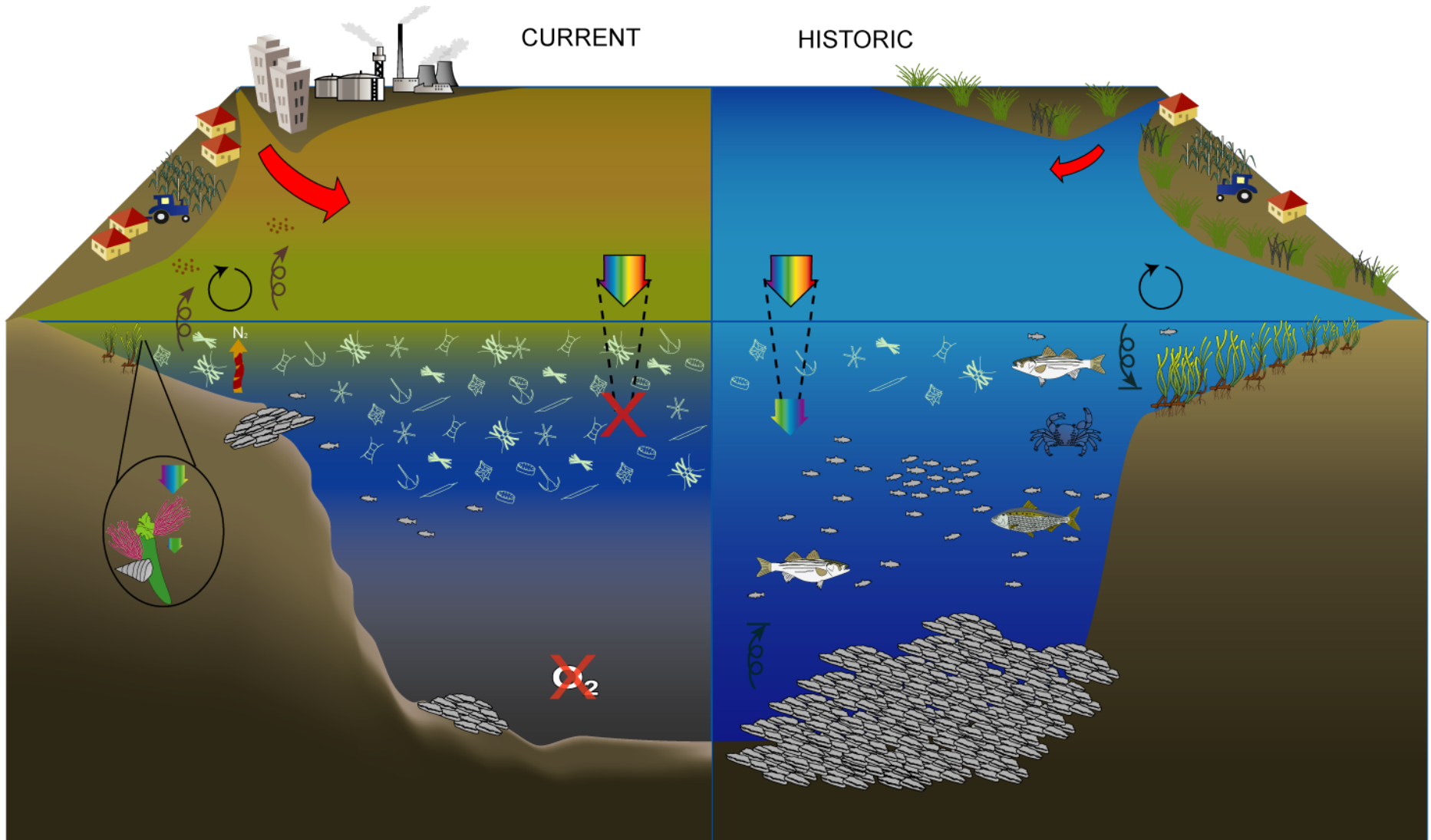
Chesapeake Bay and Catchment

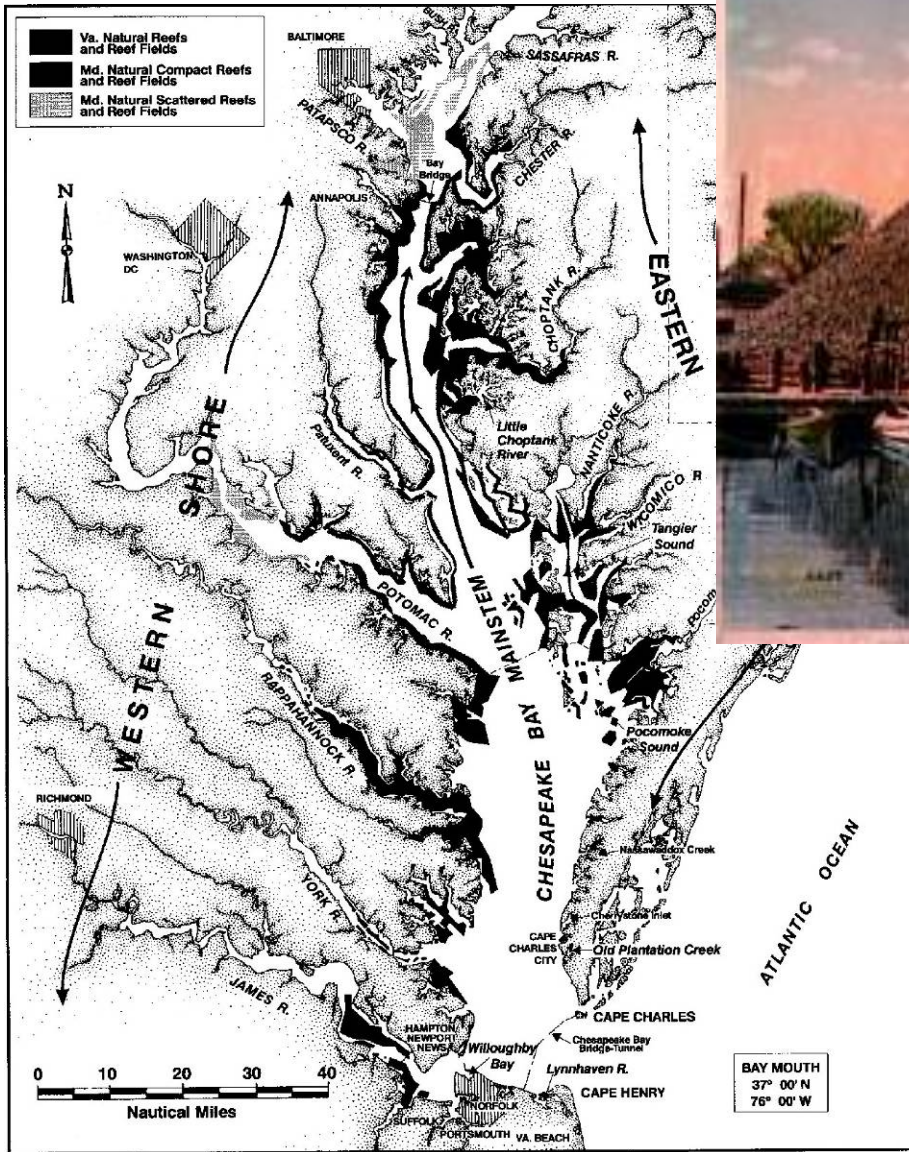


Maximum depth	53 m
Average depth	7 m
Total shoreline	7,400 km
Volume	$6.8 \times 10^7 \text{ m}^3$
Catchment area	165,000 km²
Freshwater inflow	2,400 m³/sec
Length	322 km
Age	>10,000 y
Tributaries	150

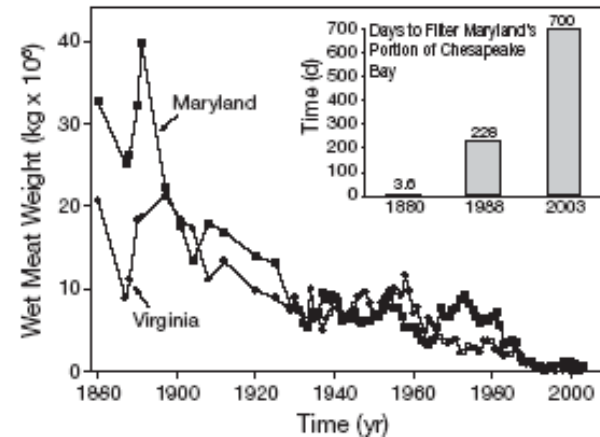
Chesapeake Bay Ecosystem

Eutrophication is a systemic, pervasive alteration



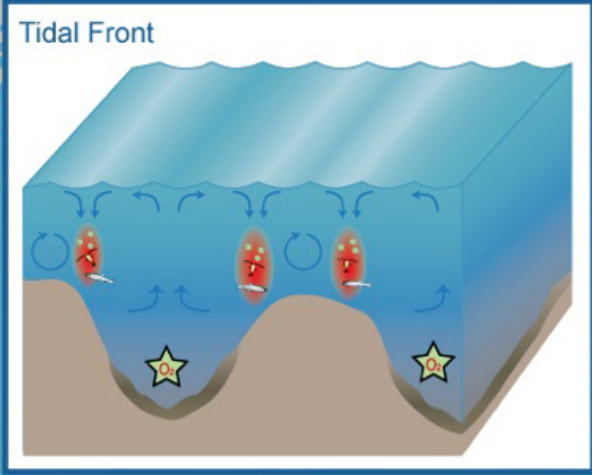
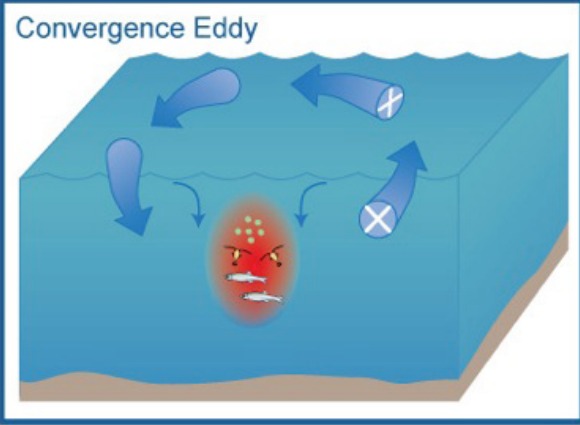
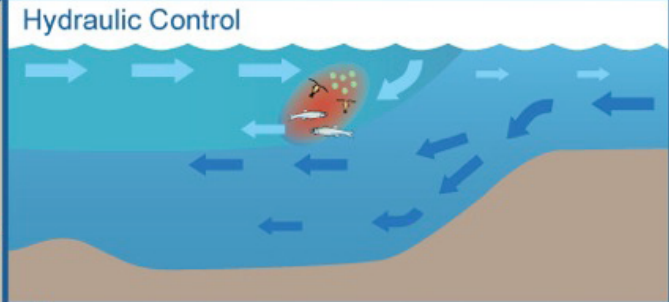
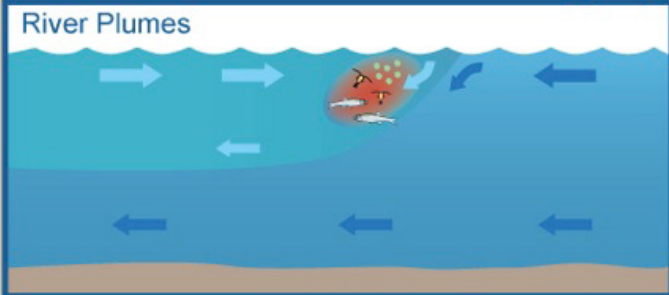
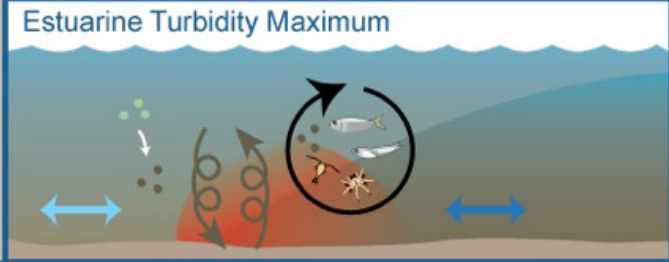
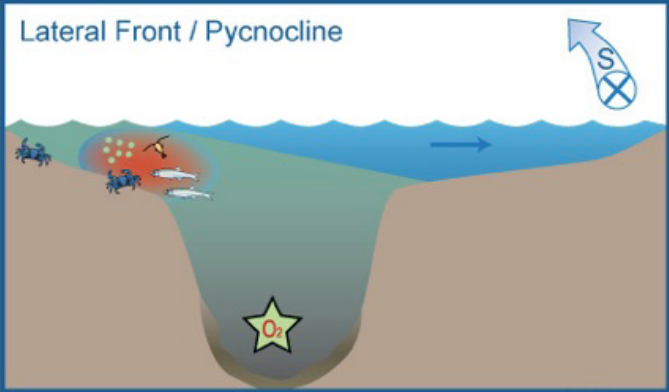


- ~ 1% of historic levels
- loss of habitat
- loss of filtration capacity



Historical Oyster Grounds

Estuarine Processes for Chesapeake Bay



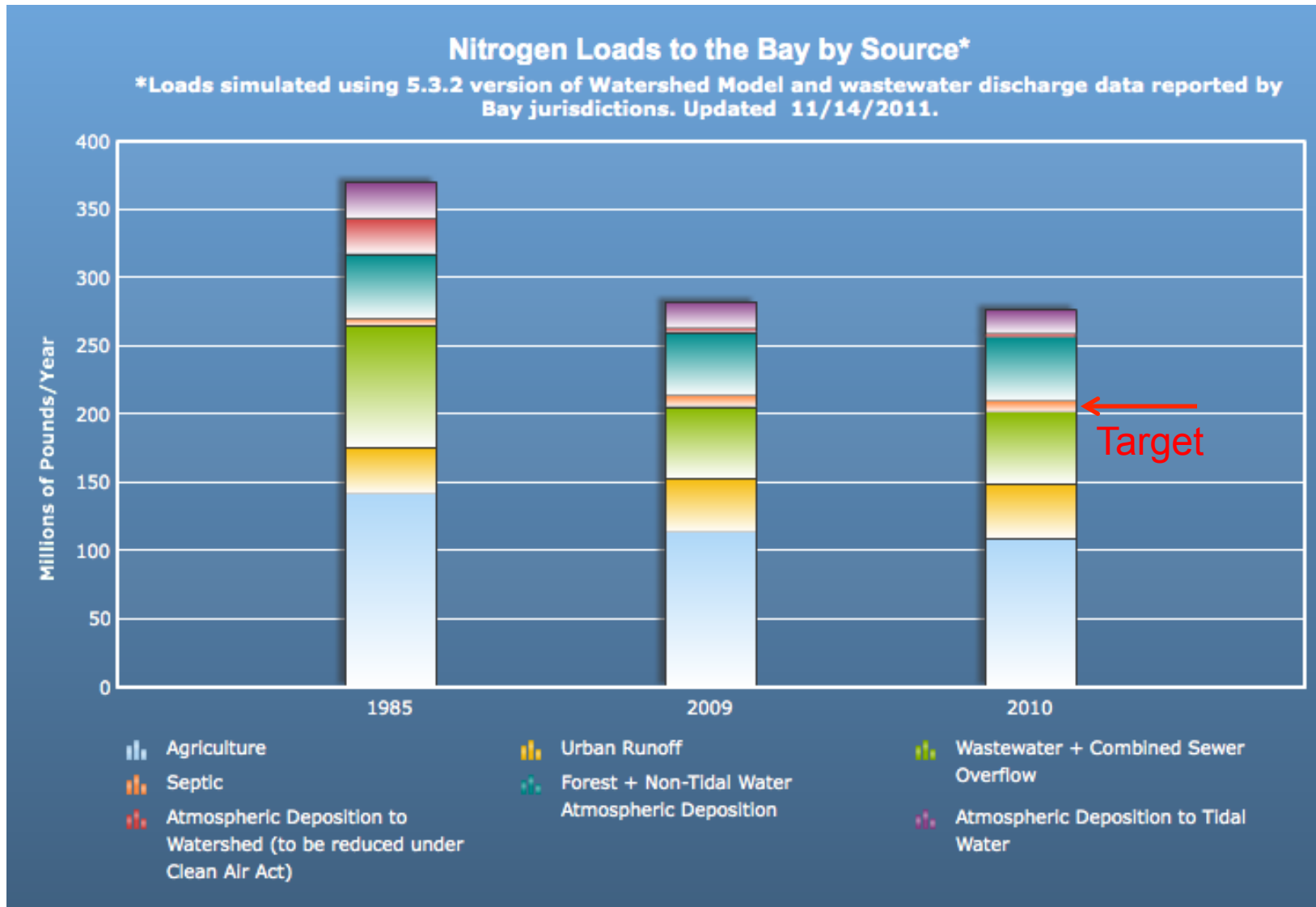
Roman et al. 2005. *Limnol. Oceanogr.* 50: 480-492.

Chesapeake 2000 Agreement

- **Living Resource Protection and Restoration**
 - Increase oysters 10 fold, multi-species management
- **Vital Habitat Protection and Restoration**
 - Restore historic abundance of submerged vegetation; restore 10,000 ha wetlands; forests; streams
- **Water Quality Protection and Restoration**
 - Reduce nutrient and sediment loadings to level needed to protect aquatic living resources
- **Sound Land Use**
 - Land conservation; reduce harmful sprawl
- **Stewardship and Community Engagement**
 - Education, community engagement, government by example

www.chesapeakebay.net

Reduction of Nitrogen Loads Measured & Model Estimates

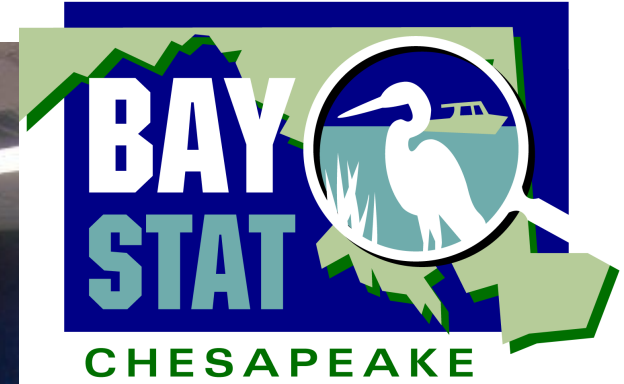


Requirements for Adaptive Management



1. management objectives that are regularly revisited and accordingly revised
2. a model or models of the managed system
3. monitoring and evaluation of outcomes
4. mechanisms for incorporating what is learned into models guiding future decisions
5. a collaborative process for stakeholder participation and learning

Maryland's BayStat Program



Governor Martin O'Malley:
erstwhile Irish rock band performer

Email Friend print page

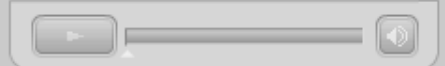


BAYSTAT



- SG&G
- GREENPRINT
- AGPRINT
- GROWTHPRINT
- STORMWATERPRINT
- STREAMHEALTH
- BAYSTAT**

- Current Health**
- Causes of the Problems**
- Solutions**
- Eyes on the Bay**
- Funding**
- Get Involved**
- Watershed Implementation Plan**



[video transcript](#)

CBF - The Truth about the "Tax on Rain"

A "tax on rain?" Try: "investments in local health and jobs." Local governments across Maryland are voting to create new stormwater pollution control fees, as required by a 2012 state law and EPA pollution limits for the Chesapeake Bay. Baltimore and Anne Arundel counties approved fees yesterday. [Learn more...](#)

Maryland Stormwater Symposium

A discussion with elected officials and public works and planning staff from Maryland counties and Baltimore City to discuss innovative and cost-effective practices to manage stormwater runoff as part of the cooperative effort to restore the Chesapeake Bay and our local waterways. [Learn more...](#)

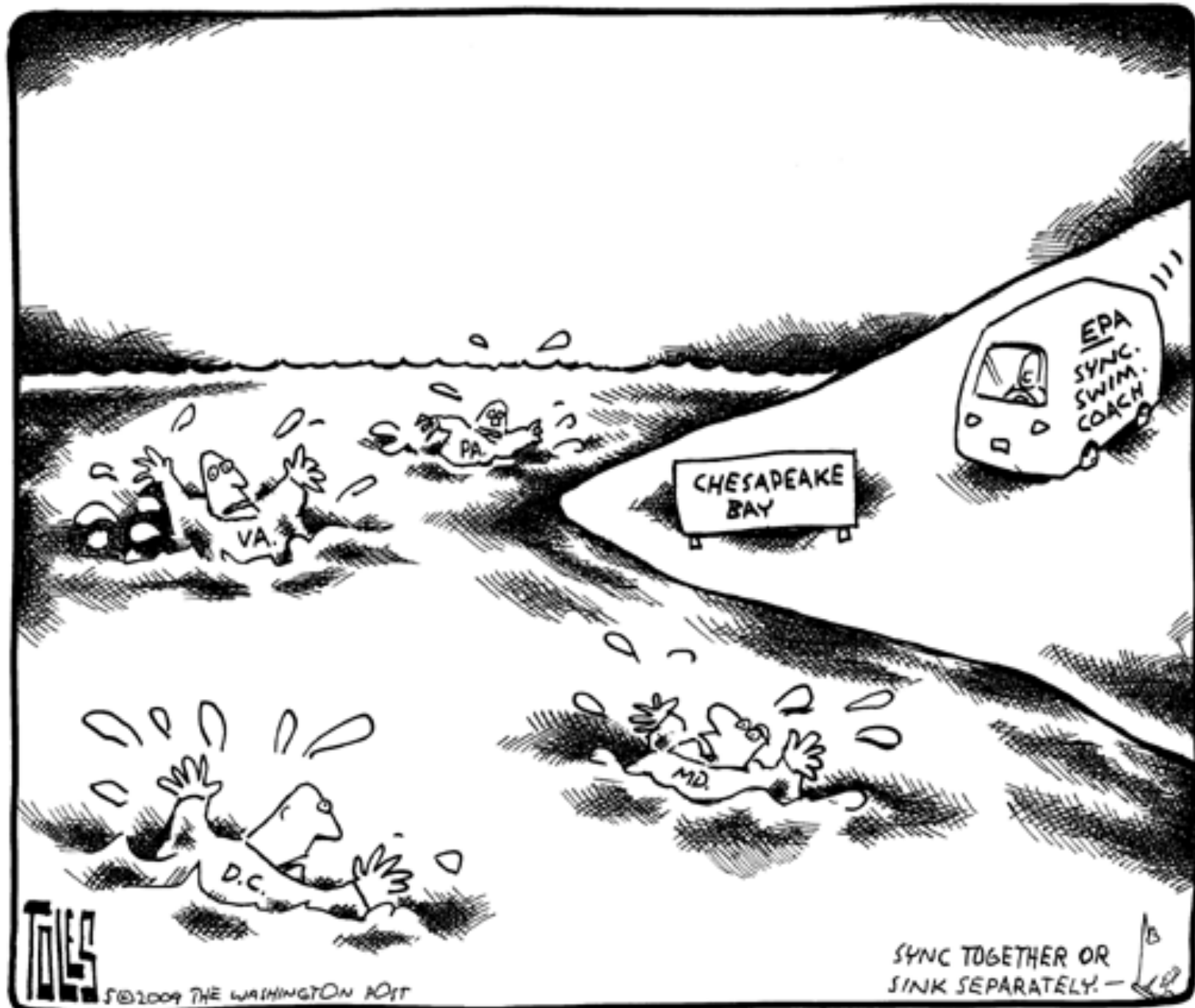
Reclaim the Chesapeake Bay Public Awareness Campaign



BayStat in the News

- [CBF - The Truth about the "Tax on Rain" - Bay Daily 4/16/13](#)
- [Maryland hosts stormwater runoff meeting for officials - The Reporter 3/4/13](#)
- [City moving on stormwater fee - Water World 3/3/13](#)
- [Save the river, save the bay - The Evening Sun 3/2/13](#)
- [Pesticide reporting protects public - Gazette.Net 3/1/13](#)
- [An Certainty: Making Certain that the](#)

- How to Navigate Site
- A Message from the Governor
- Executive Order
- Fact Sheet
- News
- FREE Email Newsletter
- PARTICIPANTS**
- Office of the Governor



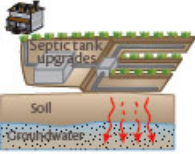





TOLES

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SYNC TOGETHER OR
SINK SEPARATELY. —

Implementation of Total Maximum Daily Loads by Catchment

TMDL implementation actions	Example
Upgrade wastewater treatment plants (WWTPs)	Upgrading plants' technology to enhanced nutrient removal will remove more nutrients from WWTP discharges 
Install green infrastructure	Green roofs reduce heating and cooling costs and also stormwater runoff. 
Retrofit septic systems	New technologies allow bacteria to break down organic material and convert nitrogen to harmless gas. 
Additional controls on animal operations	Poultry and livestock waste structures prevent waste from running into local streams 
Additional controls on crop agricultural	Water control structures, wetland restoration, and increased nutrient management plan compliance decreases nutrient runoff 
New development rules	Larger riparian buffers with infiltration practices along waterfront developments will help to filter pollutants and reduce runoff. 



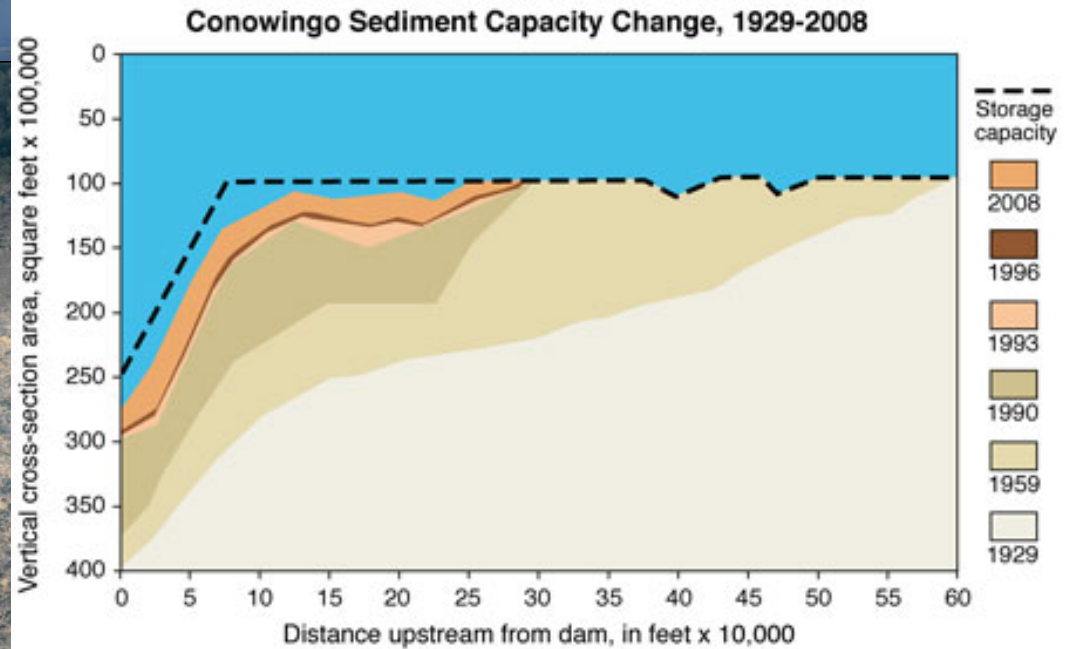
Poplar Island

“Beneficial Use” of Dredged Material



Sediment Behind Dams Smoking Time Bomb?

Conowingo Dam, Susquehanna River





I TOLD YOU
THAT WE DIDN'T
HAVE TO GO FIX
THE CHESAPEAKE...

SEE, IT
CAME TO US...

CLIMATE
SEA-LEVEL
RISE

HOW MUCH WILL IT COST TO
RAISE THE NEW VISITORS CENTER?

TOLES

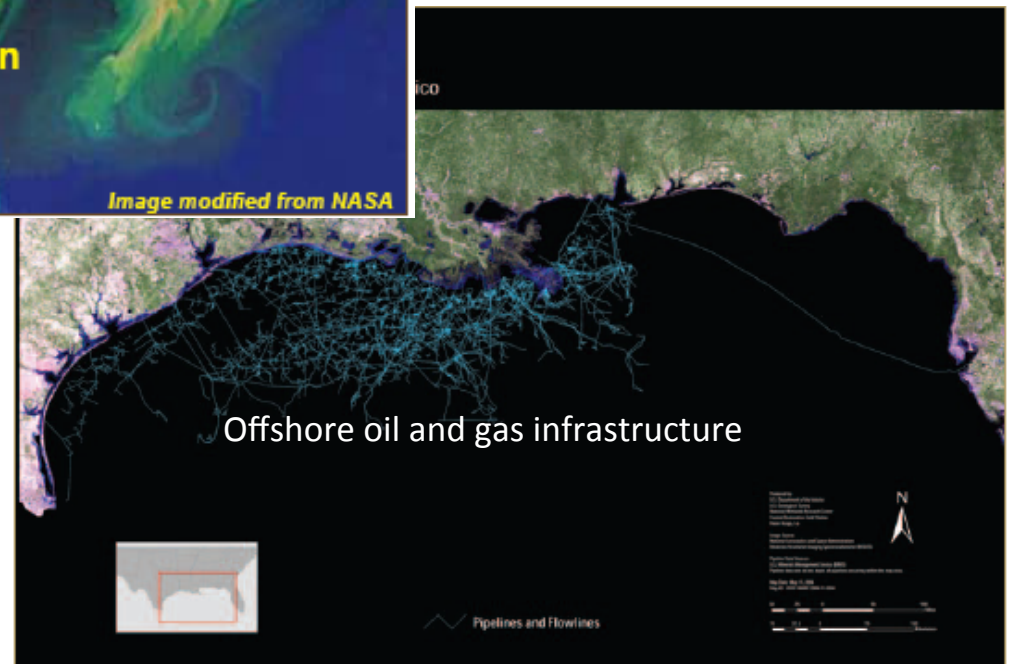
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Mississippi Delta Ecosystems

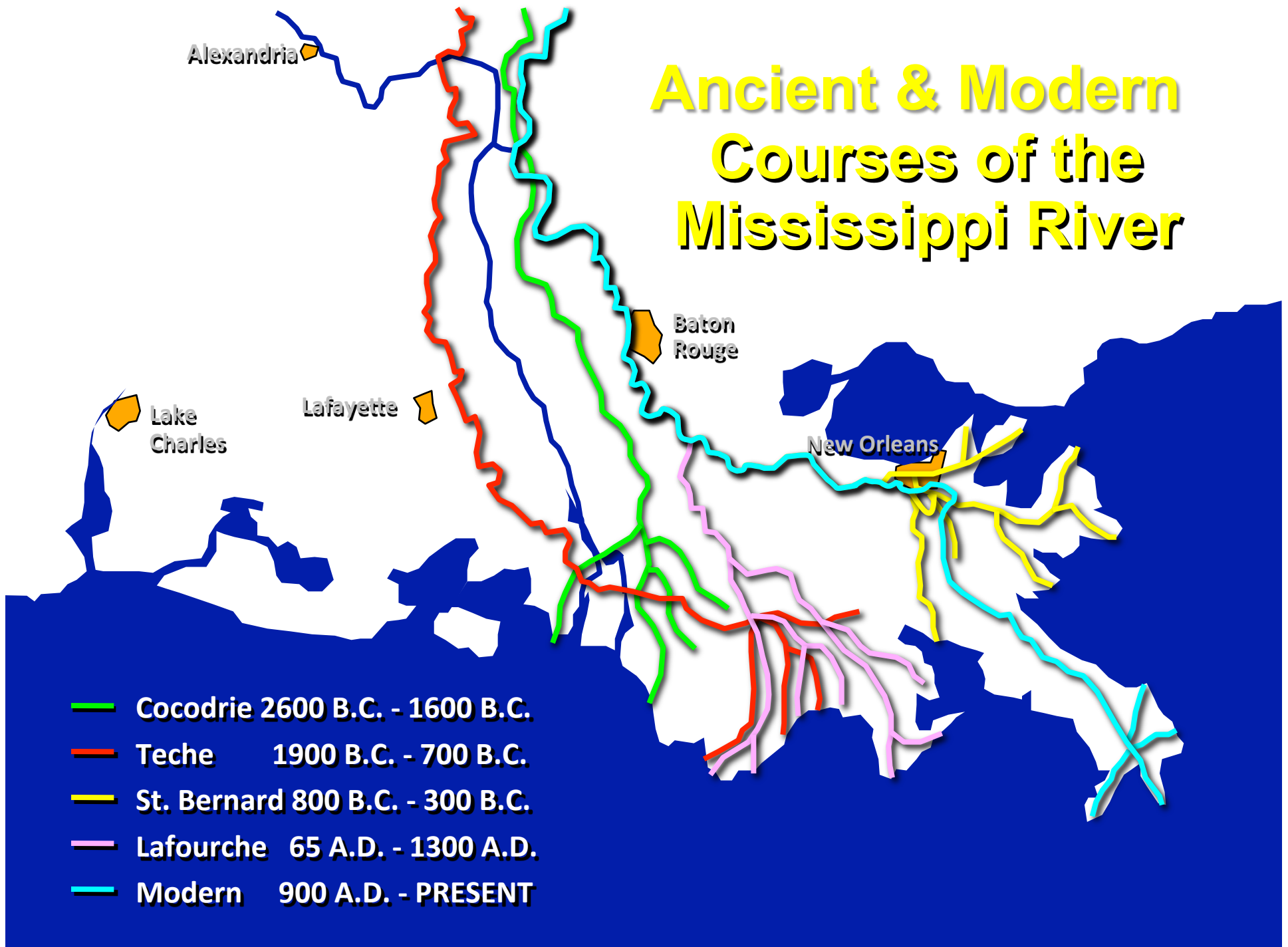
Large river built extensive wetlands built over a few 1000 years, but rapidly changing in 100



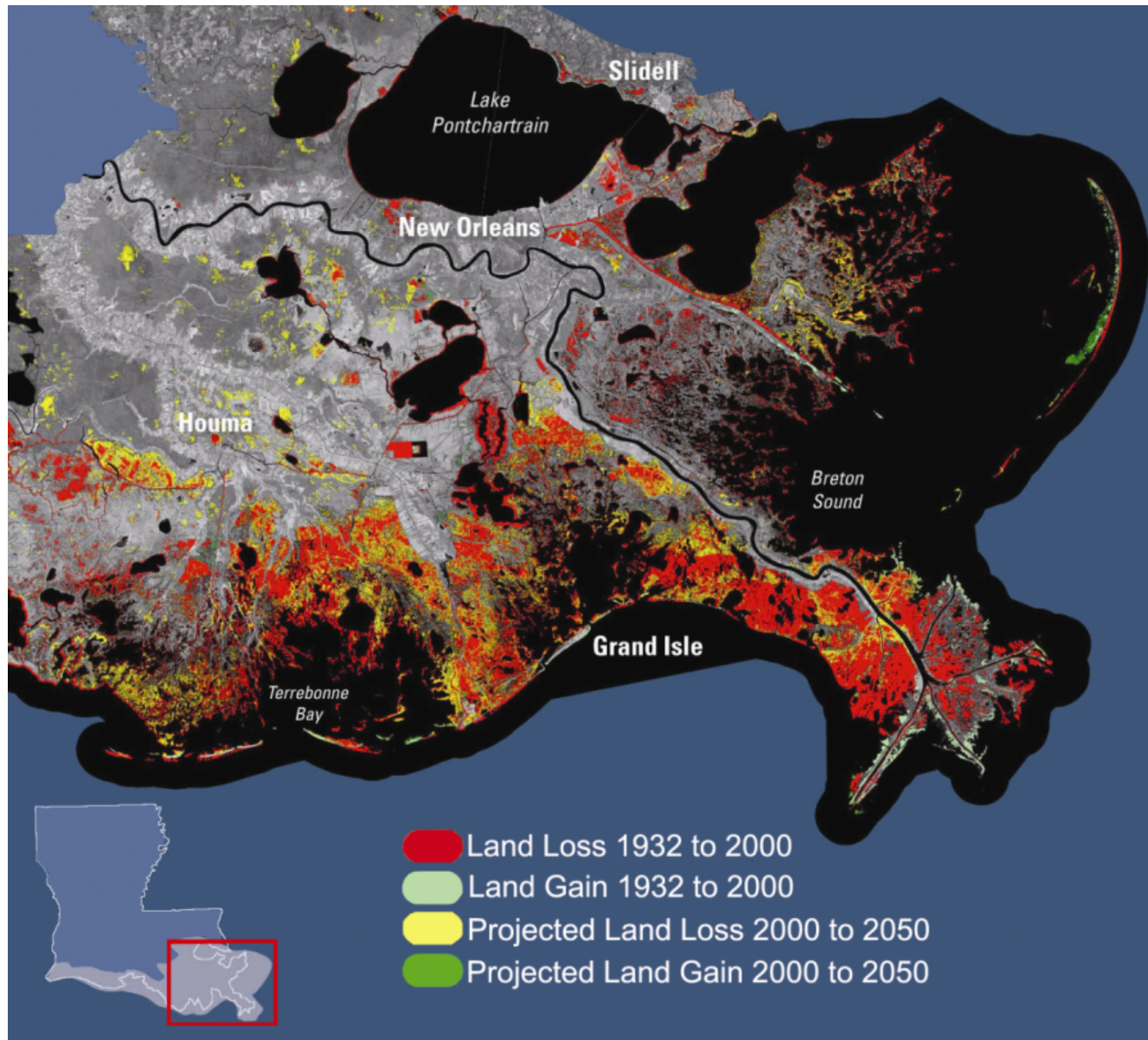
Highly productive and economically important



Ancient & Modern Courses of the Mississippi River

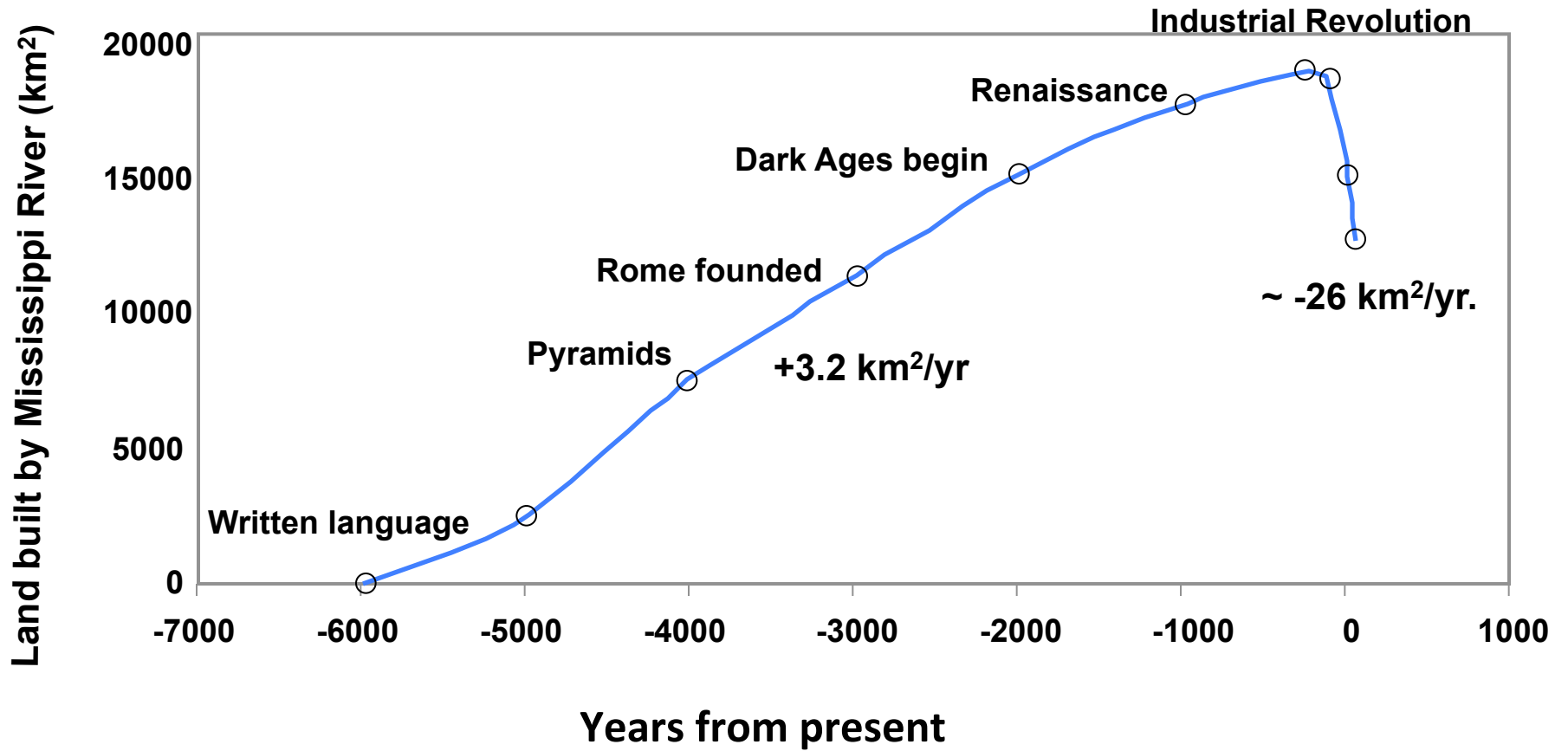


Dramatic Land Loss in 20th Century



Historical Context

Rapid reverse of 6000 year process



Causes of Wetland Loss

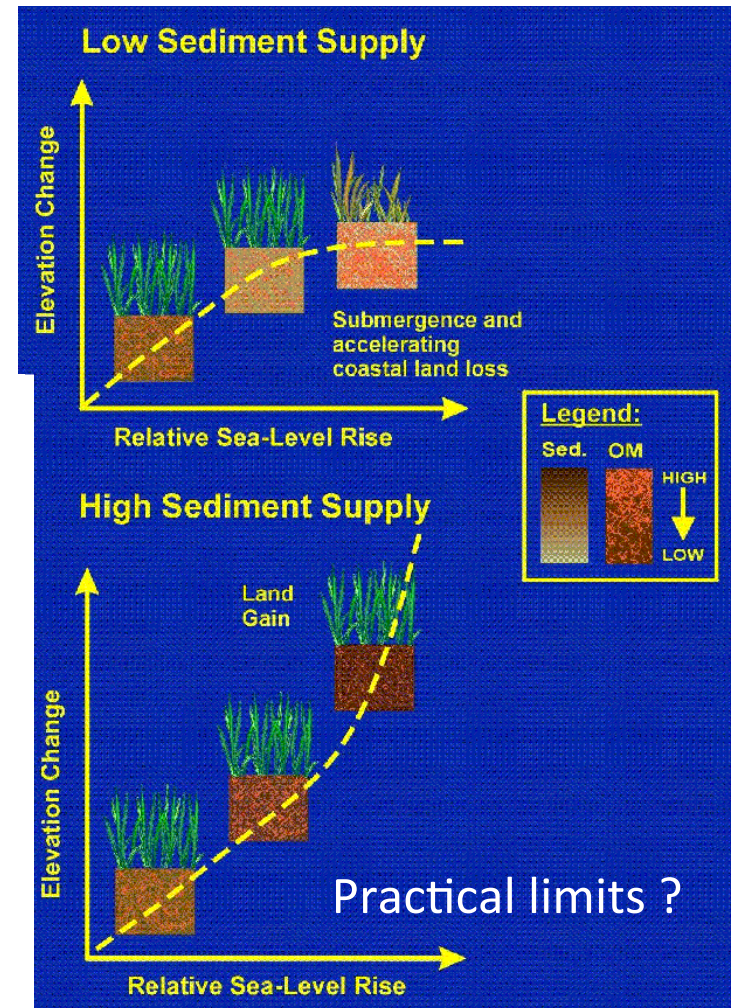
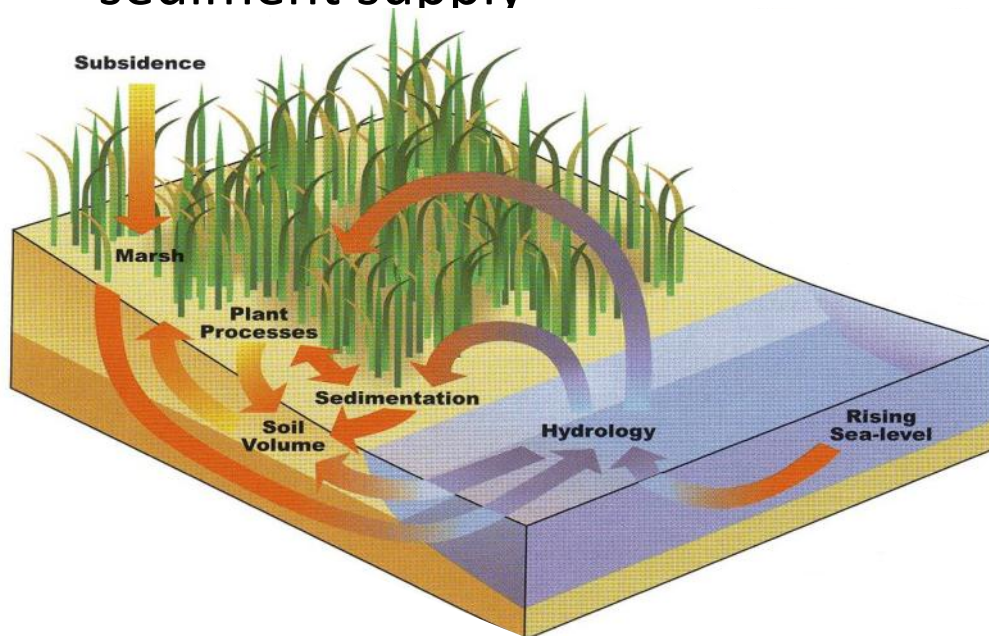
Many and Interactive



Coastal Wetlands and Sea Level Rise

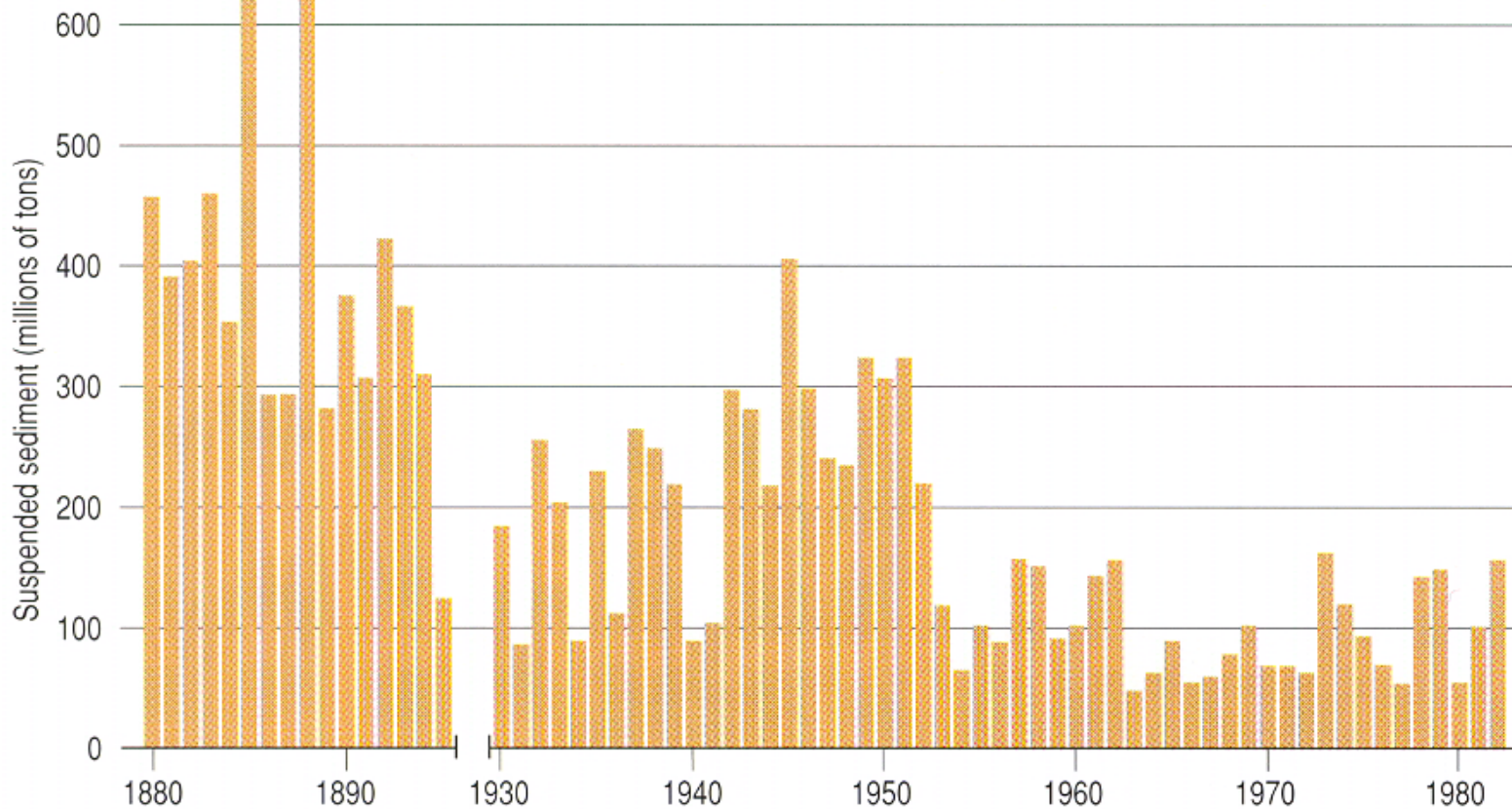
Depends on:

- relative sea-level rise
- tidal hydrology
- sediment supply



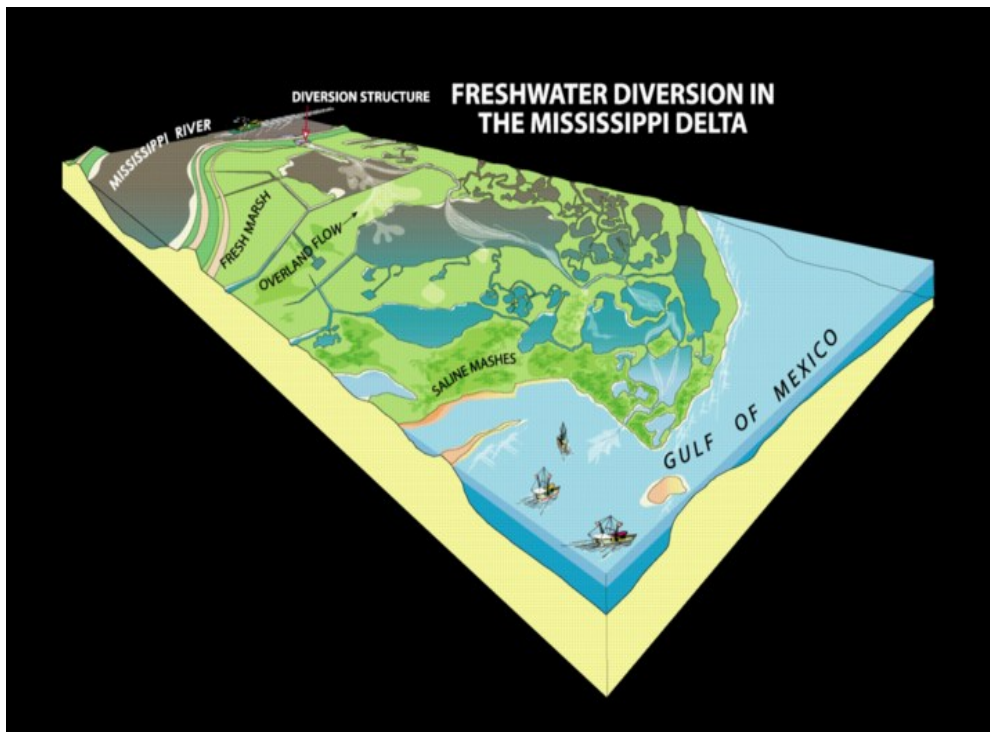
Relative sea level rise in Louisiana 4 to >10 mm yr⁻¹

Decline of Suspended Sediment in Mississippi River



Kessel 1987

Coastal Louisiana Restoration Measures



- River diversions
- Marsh creation
- Barrier restoration & shoreline protection
- Hydrologic restoration



Hurricane Katrina Brought Attention to Hurricane Protection & Role of Wetlands



New floodgate on Gulf Intracoastal Waterway

Integration

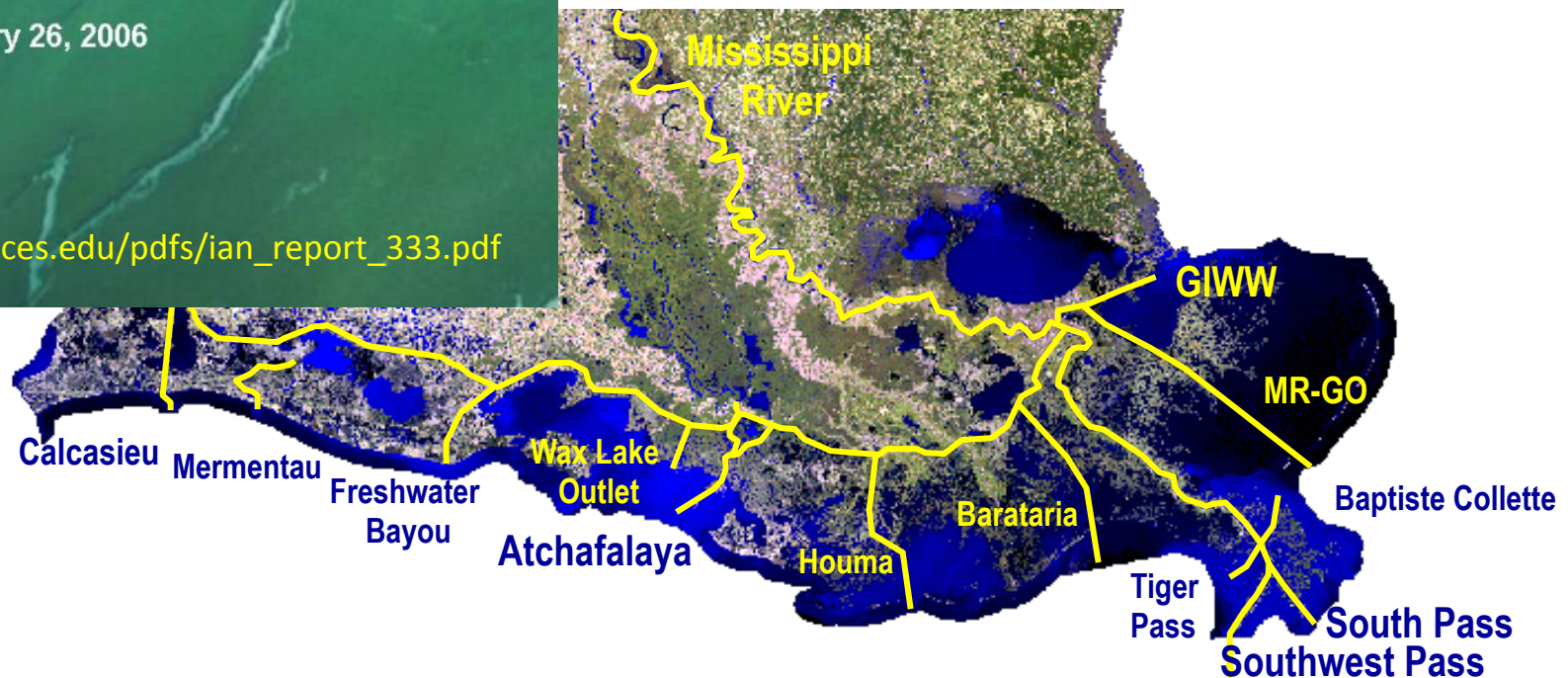
- Flood protection
- Navigation
- Coastal ecosystem restoration
- Energy & other infrastructure

A New Framework for Planning the Future of Coastal Louisiana after the Hurricanes of 2005

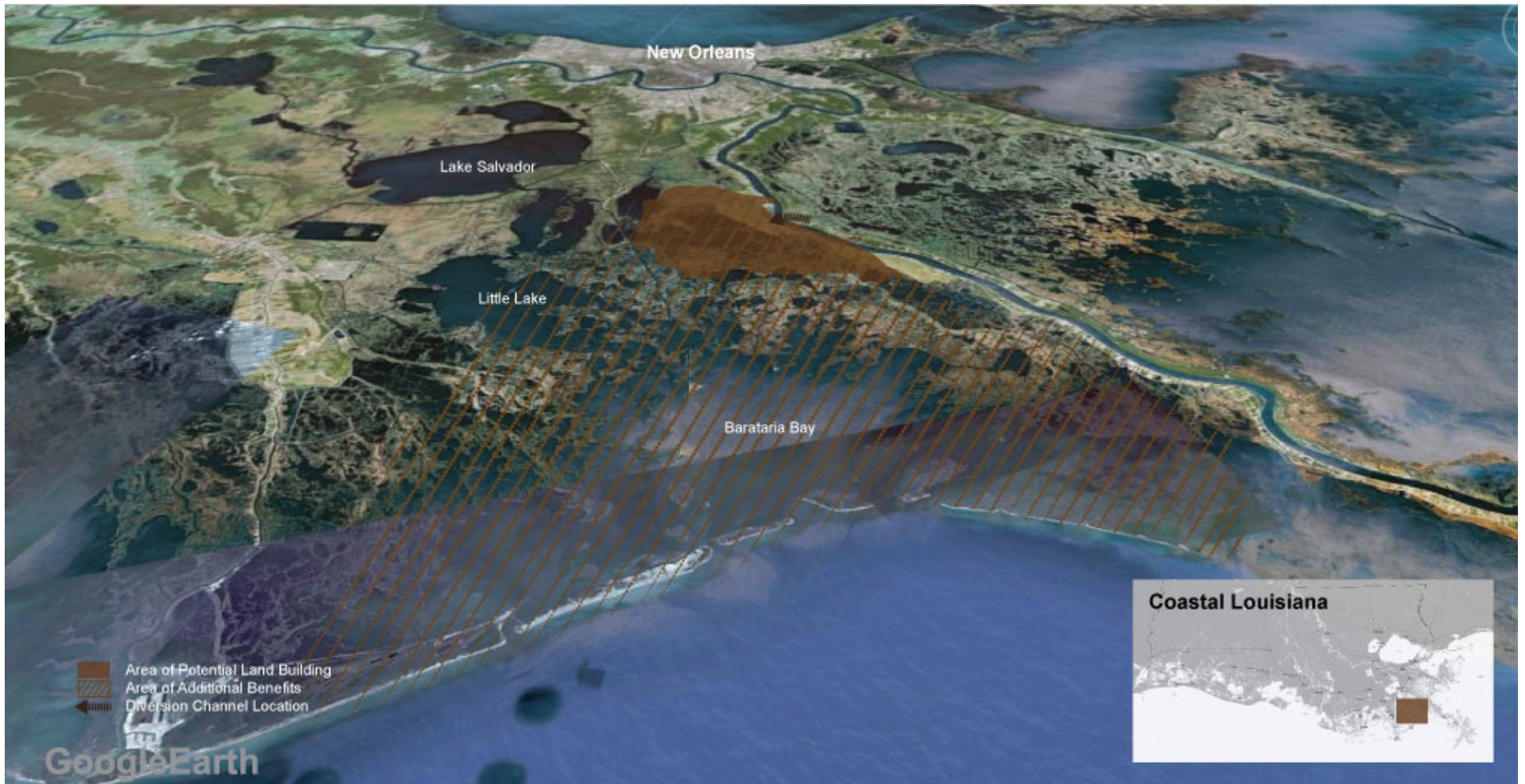
by Working Group for Post-Hurricane Planning for the Louisiana Coast

January 26, 2006

ian.umces.edu/pdfs/ian_report_333.pdf

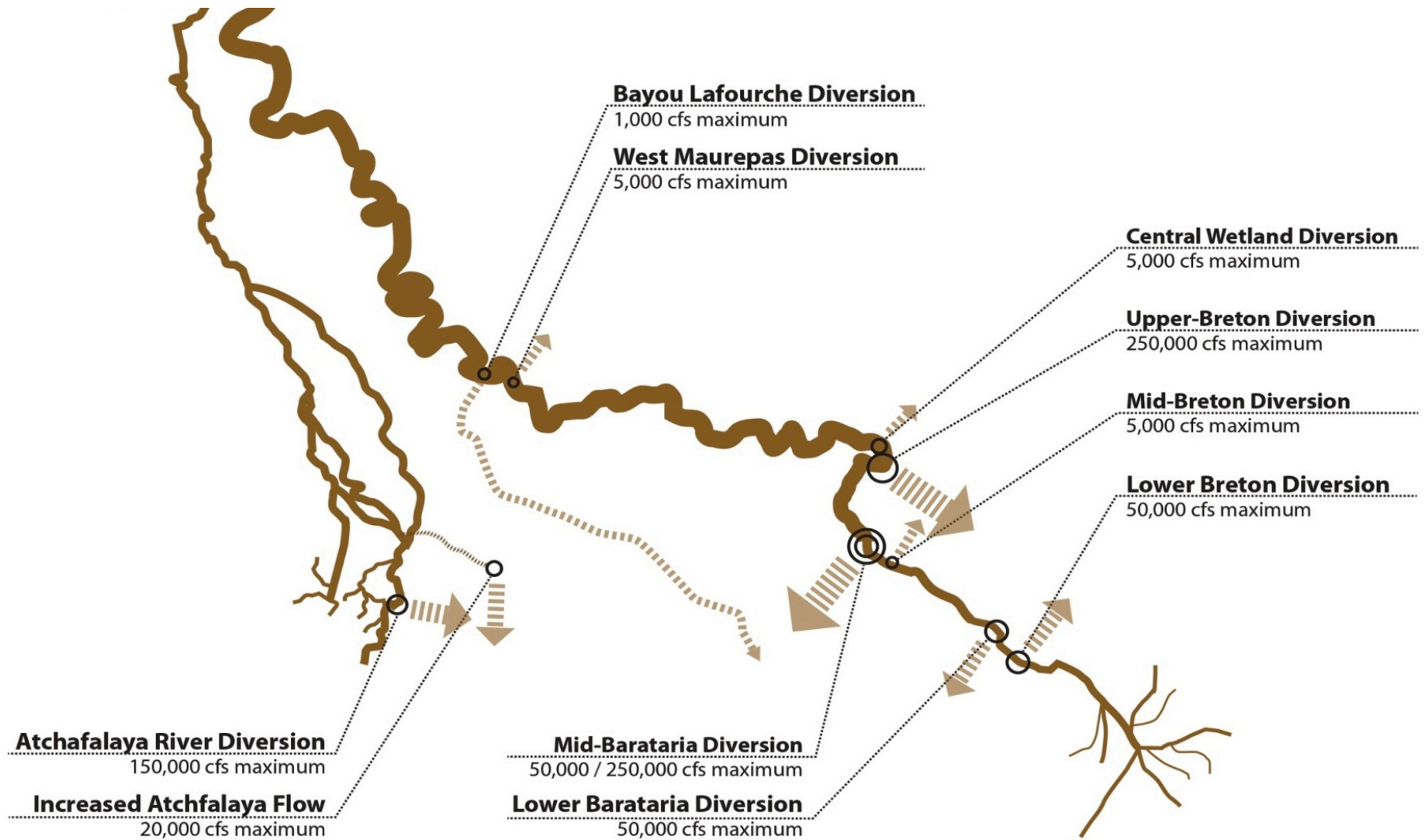


River Sediment Diversions



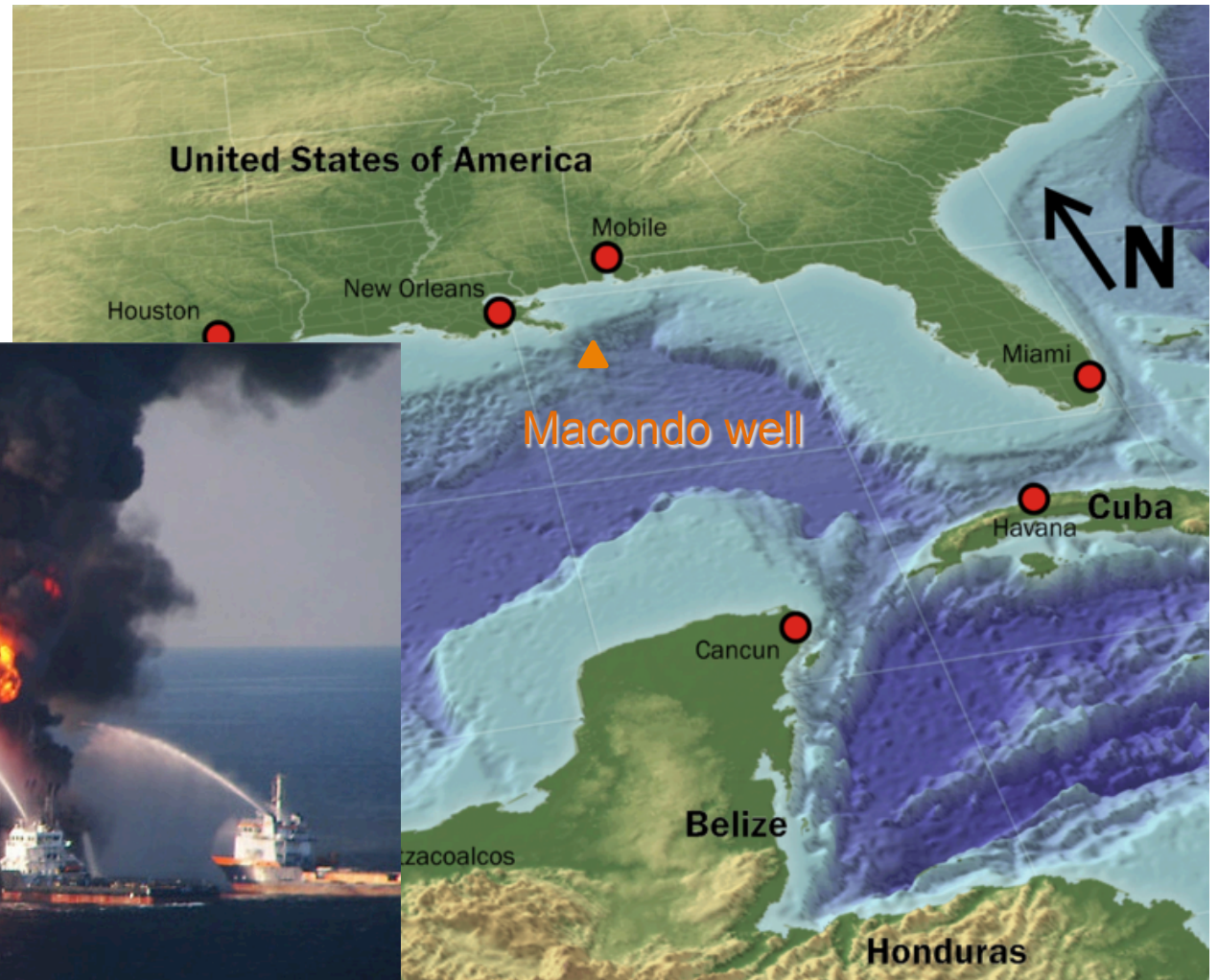
- Affect larger areas, take time, but are sustainable.
- Expensive and create fishing and shipping user conflicts.

Proposed Lower River Diversions



Southwest Pass
Main shipping entrance to the river

An Opportunity Out of A Tragedy

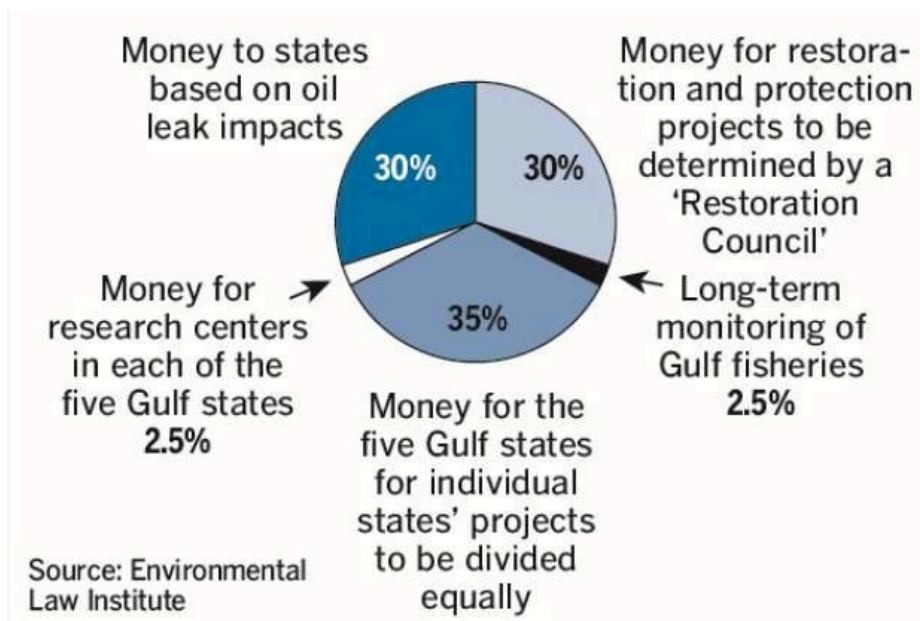


Oil Spill Commission



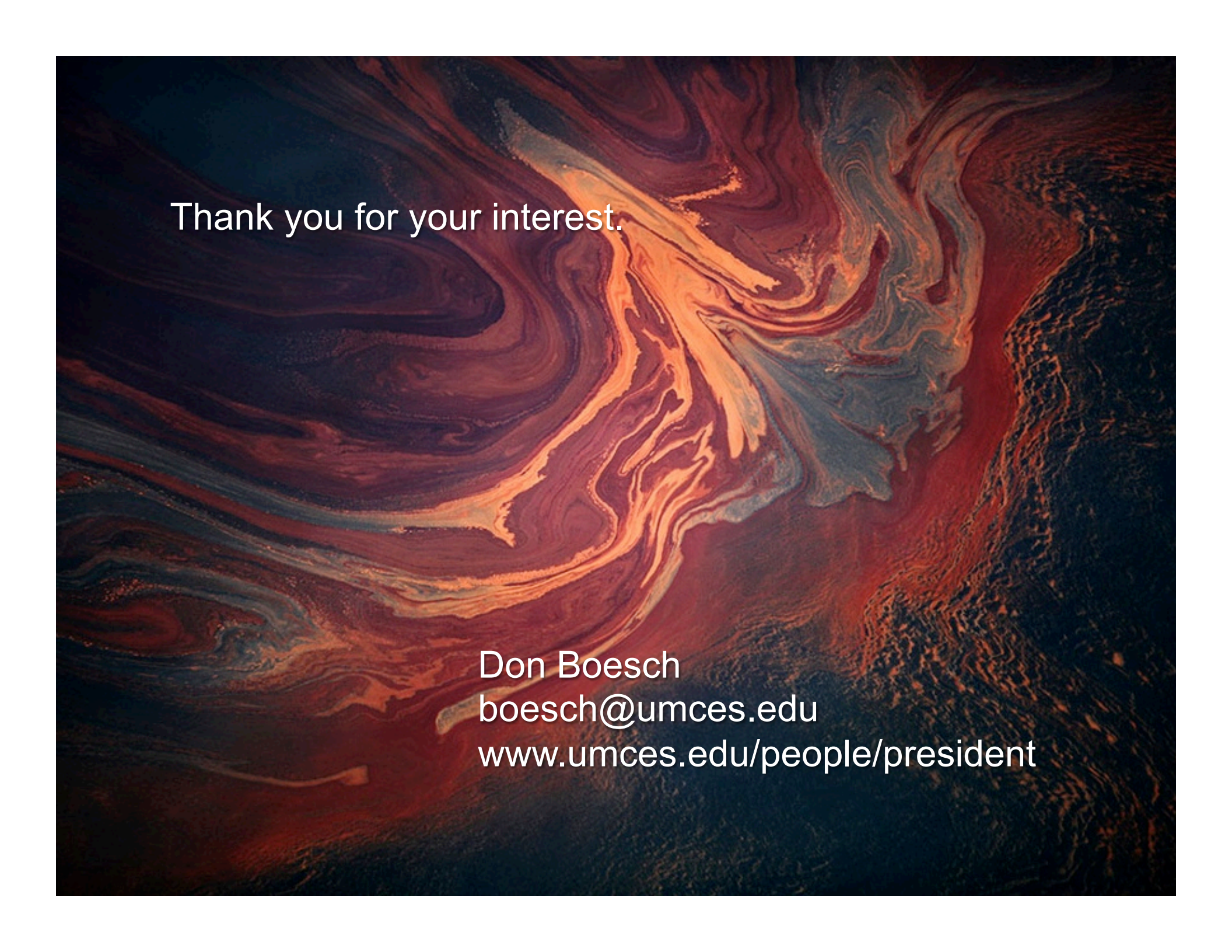
www.oilspillcommission.gov

RESTORE Act



Eligible activities for funds provided to the States

1. Coastal restoration
2. Mitigation of damage to natural resources
3. Implementation of coastal management plans
4. Promotion of tourism
5. Promotion of Gulf seafood
6. Education regarding natural resources
7. Planning assistance
8. Workforce development & job creation
9. Improvements to state parks
10. Infrastructure projects
11. Coastal flood protection
12. Administrative costs



Thank you for your interest.

Don Boesch
boesch@umces.edu
www.umces.edu/people/president