



Nova Southeastern University
Oil Spill in the Gulf of Mexico:
Potential Environmental Impacts
on Florida's Coral Reefs

June 16, 2010



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RATIONALE for CONCERN:

**Why Fuss about Coral Reefs?
Who cares?**

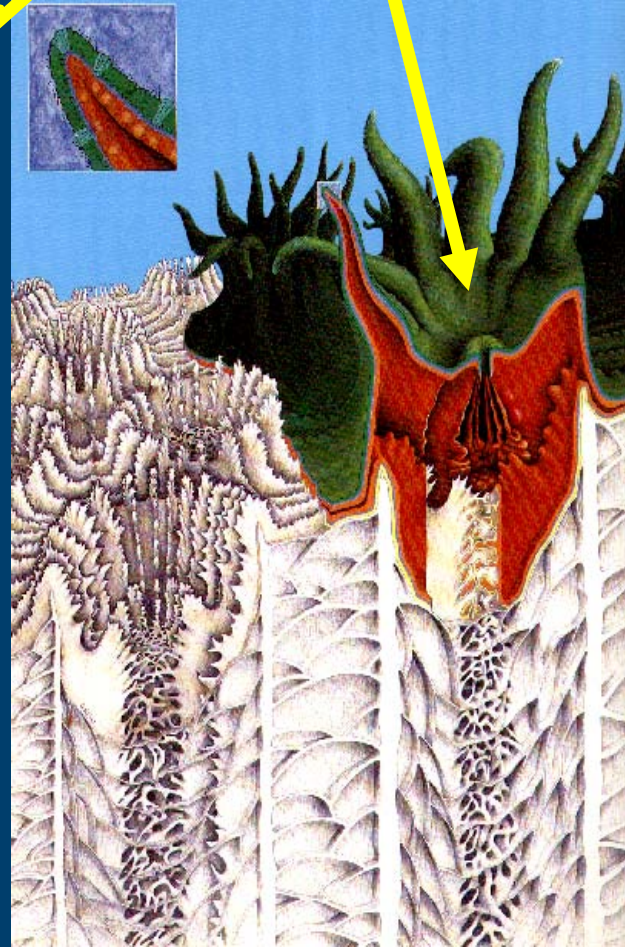
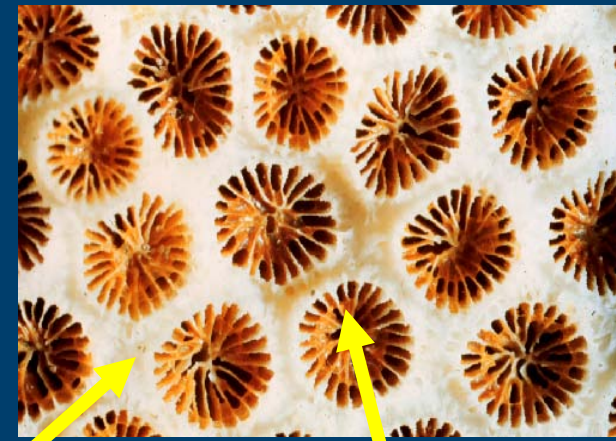
PRESENTATION OVERVIEW:

- Reef Definition
- Reef Ecosystems Value
- Southeast Florida's reefs
- Threats from Oil

Coral Reef Definition

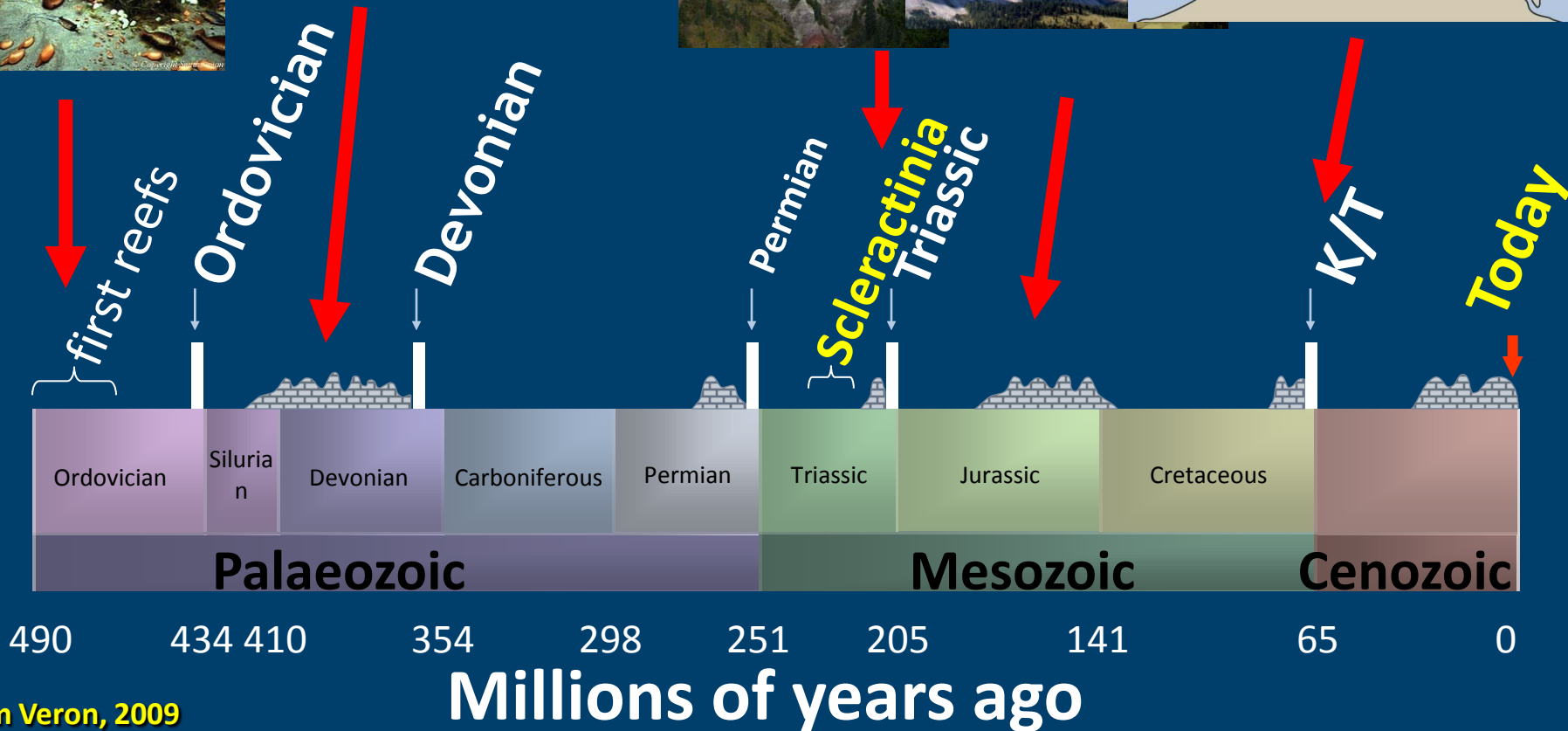
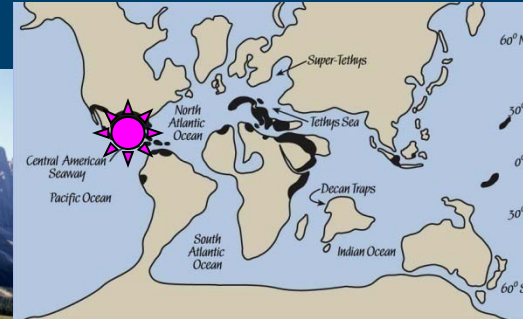
Wave resistant structures composed of a FRAMEWORK of hermatypic (reef building) corals.

Corals are animals with included plants.

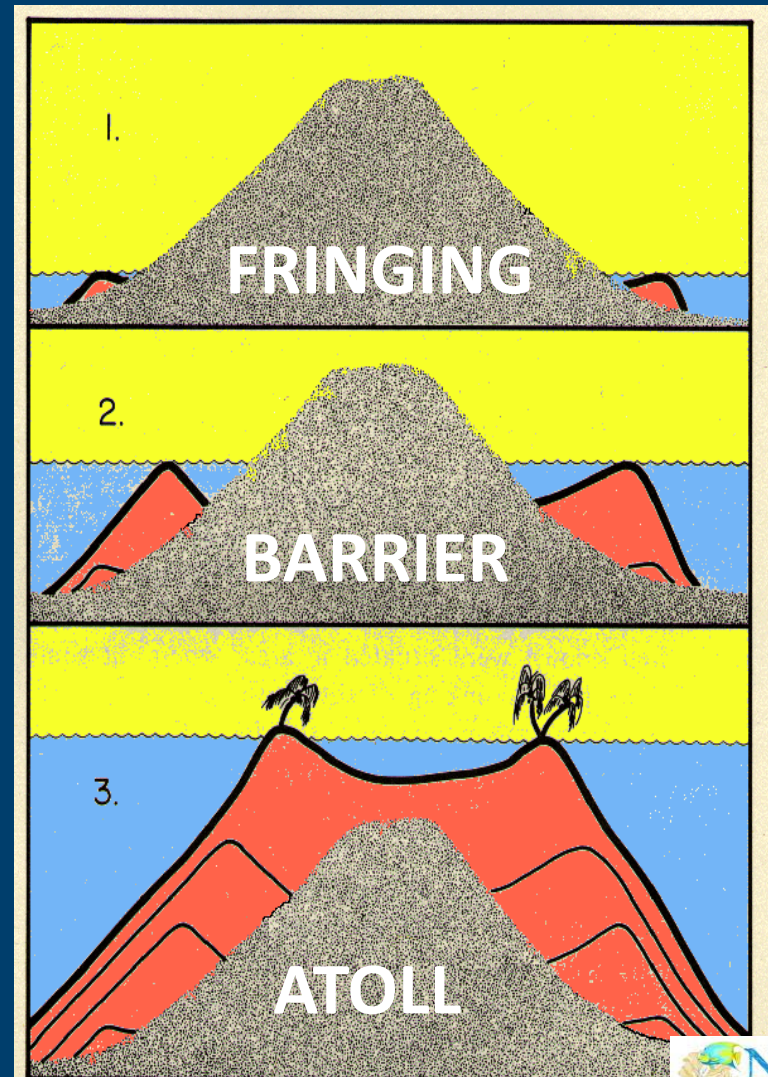


Extensive Geological History

(Geology = oil repositories)

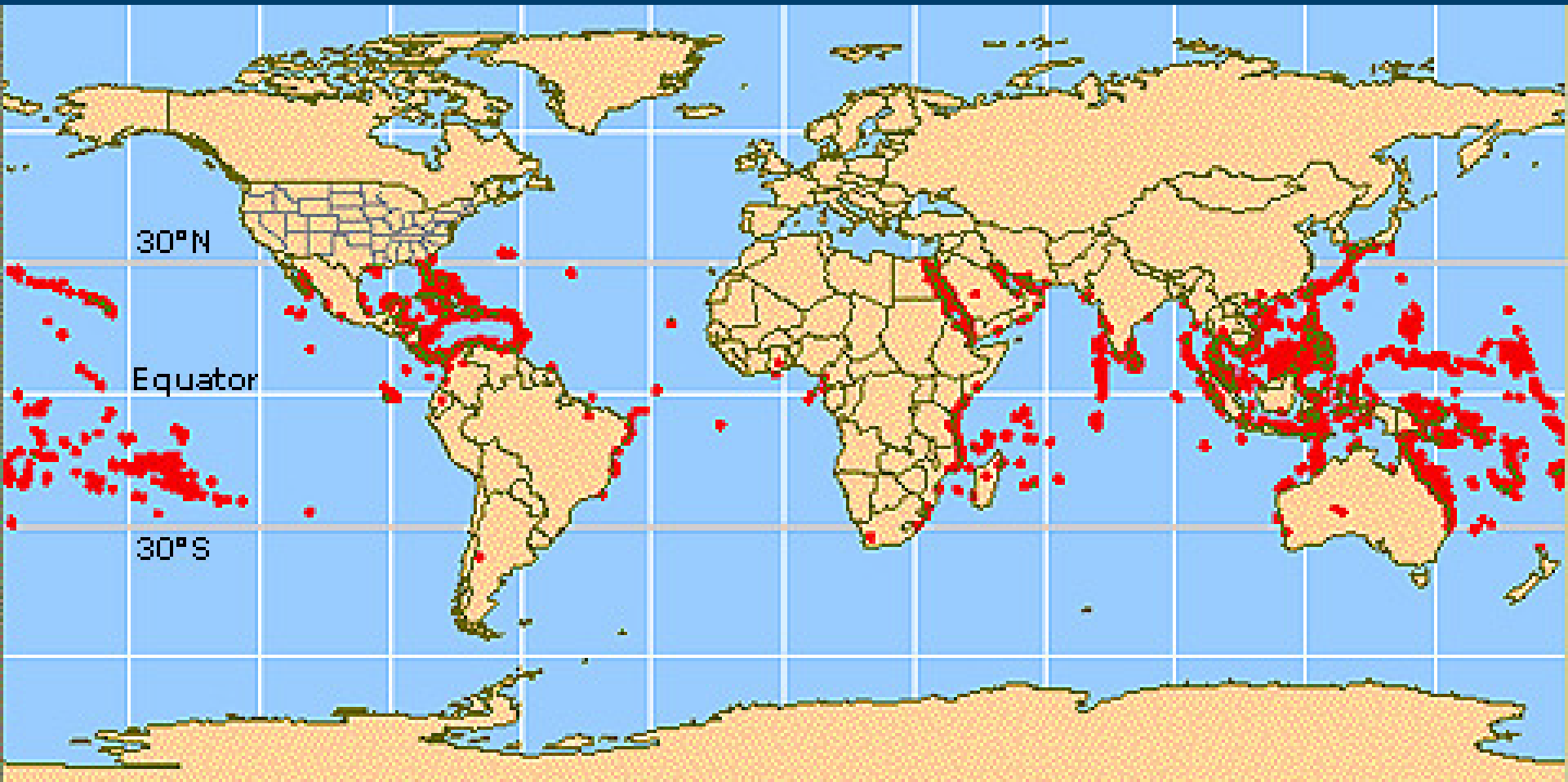


Types of Coral Reefs



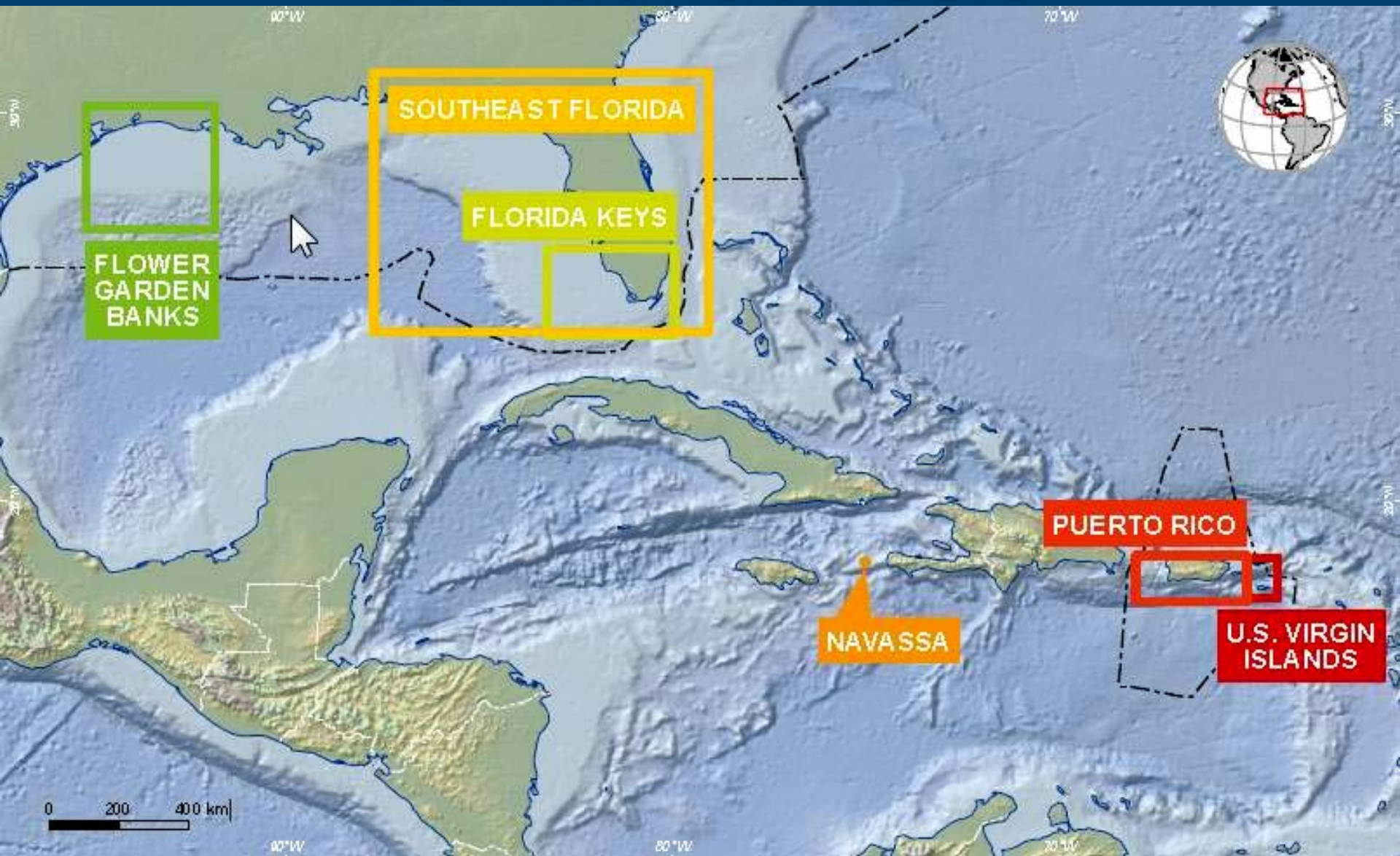
Global Reef Distribution

East coasts of continents; tropics to subtropics, upper 50m; warm clear, low nutrient sea water



US 3rd largest Coral Reef Country:

US Atlantic Reefs



**FLORIDA ONLY STATE IN
CONTINENTAL N.A.M WITH
SHALLOW WATER MARINE
ECOSYSTEMS OF MANGROVES, SEA
GRASS, AND CORAL REEFS.**



Daytona to Jupiter

Ivory Tree Coral



West Florida Shelf
Offshore ledges



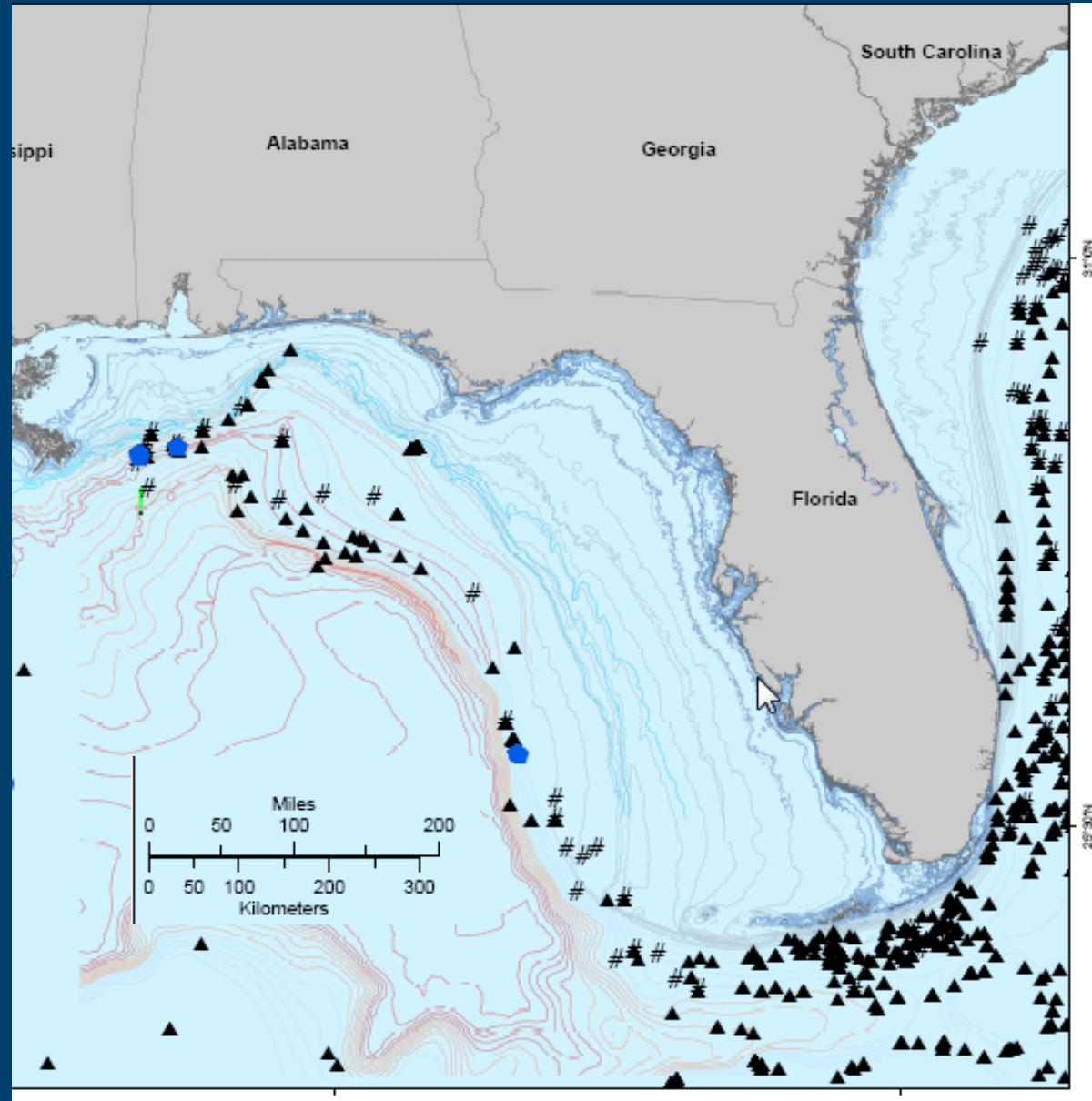
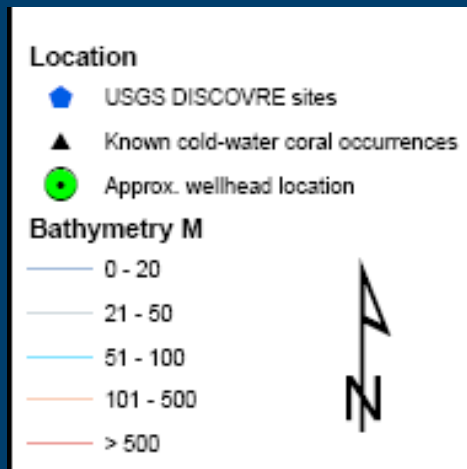
SE Coral Reefs & Communities



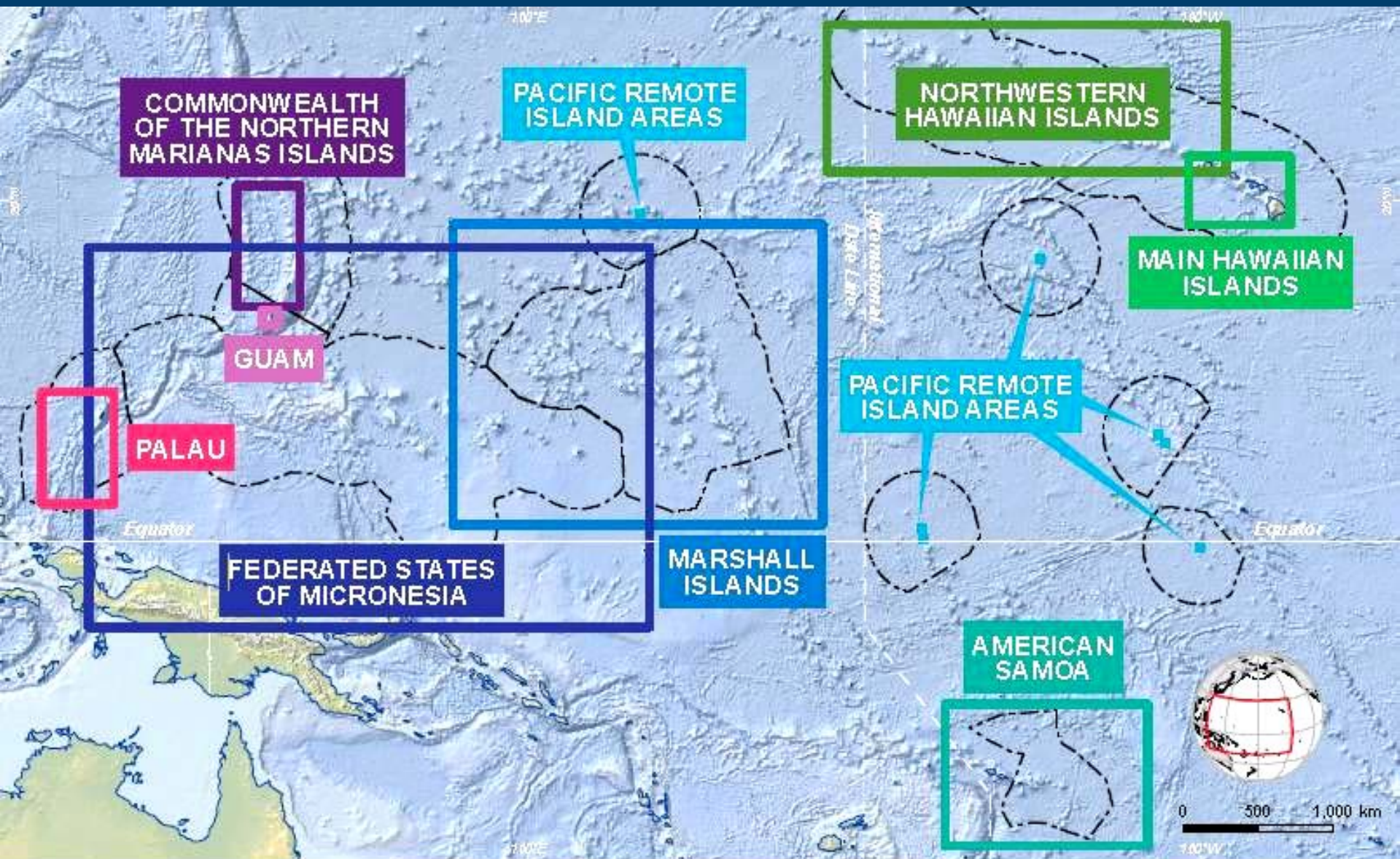
S. Florida Reef Tract
Dry Tortugas through Keys

FLORIDA'S CORAL RESOURCES

Florida has Extensive Deep Cold- Water Coral Ecosystems as well



US Pacific Reefs



Florida Leads in the Nation in area / amount of Coral Reef Ecosystems! (NOAA potential)

Florida 84%

PR & VI 7%

Hawaii 8%

Other 1% (Guam, American Samoa,
CNMI, Other Pacific)



FLORIDA:

- 36,813 sq km inside 10-fm depth (2X NJ!)
- 43,059 sq km inside 100-fm (area of Iowa!)

Value of Coral Reefs

Local/National/Global

Ecological

- Habitat & Structure
- Biodiversity

Economic

- Commercial Fishery
- Recreation:
 - Diving, fishing, boating
- Erosion protection
- Sand source

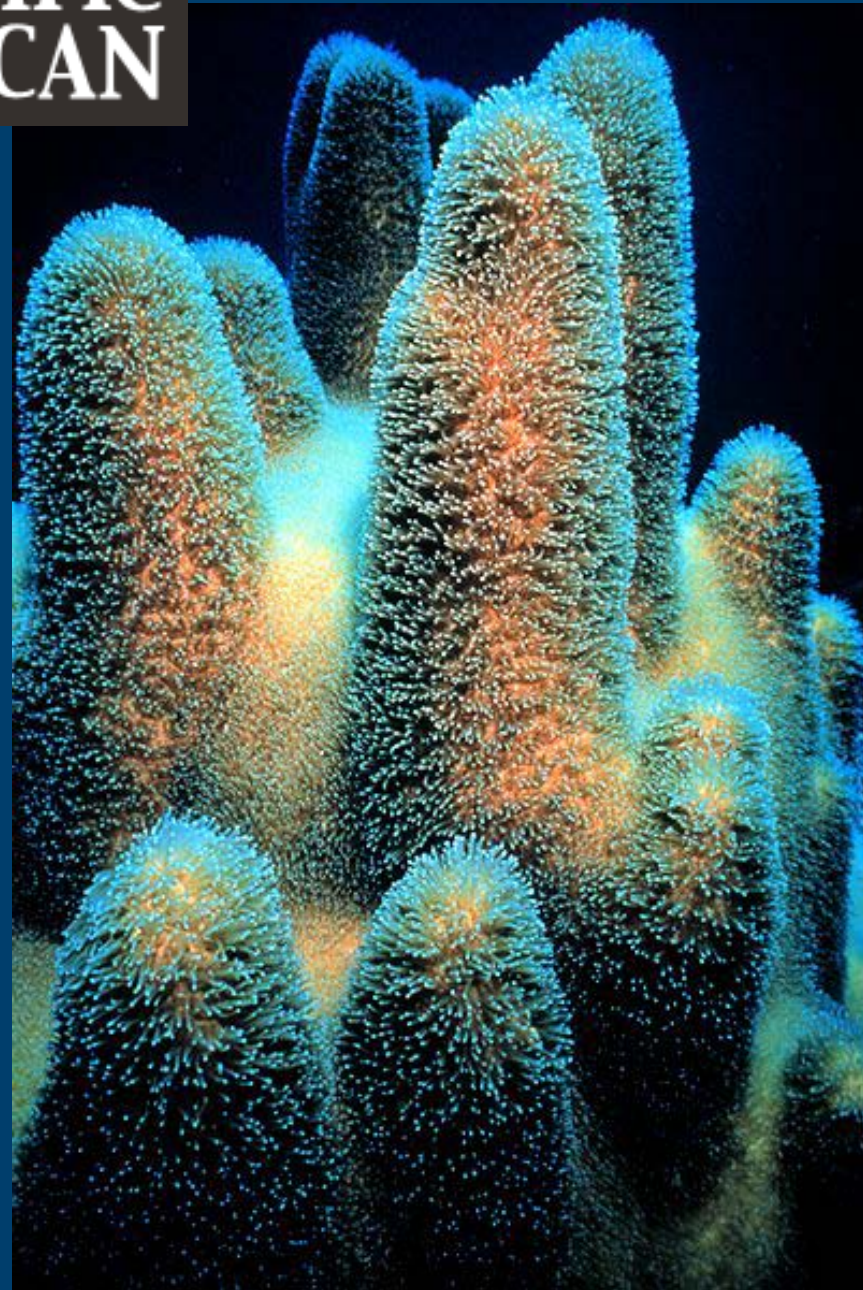


Observations –
October 22, 2009

How much are coral ecosystems worth? Try \$172 billion--A year UNEP

Pavan Sukhdev

Food, raw materials,
ornamental resources; Climate
regulation, moderation of
extreme events, waste
treatment / water purification,
biological control; Cultural
services (recreation/tourism)
Maintenance genetic diversity





Direct Economics For FLA.

- President Obama take note: Coral Reefs are their own Stimulus Package
- 5 Florida Counties >US\$6 Billion annual use value, 71,000 jobs!
- Broward County alone:>US\$2 Bill./yr !!



Coral Reefs Globally In Crisis

“Coral reefs continue to deteriorate in all areas where human activities are concentrated... in addition... increase in sea surface temperatures resulted in extensive coral bleaching and mortality over large parts...” Wilkinson, C., Ed., [Status of Coral](#)

[Reefs of the World 2000](#)

Coral Reef Stressors:

- Ship/Anchor groundings
- Sedimentation/turbidity
- Eutrophication
- Over-harvesting
- Hurricanes
- Disease
- OIL & other Pollution
- Exotic Species

Global:

- **CLIMATE CHANGE: Global Warming & Bleaching;**
- **CO₂ / acidic ocean**
- **Lack of basic scientific data from individual reefs up to the ecosystem**

Coral Reef Trouble



<http://media.economist.com/images/20090516/D2009WW0.jpg>

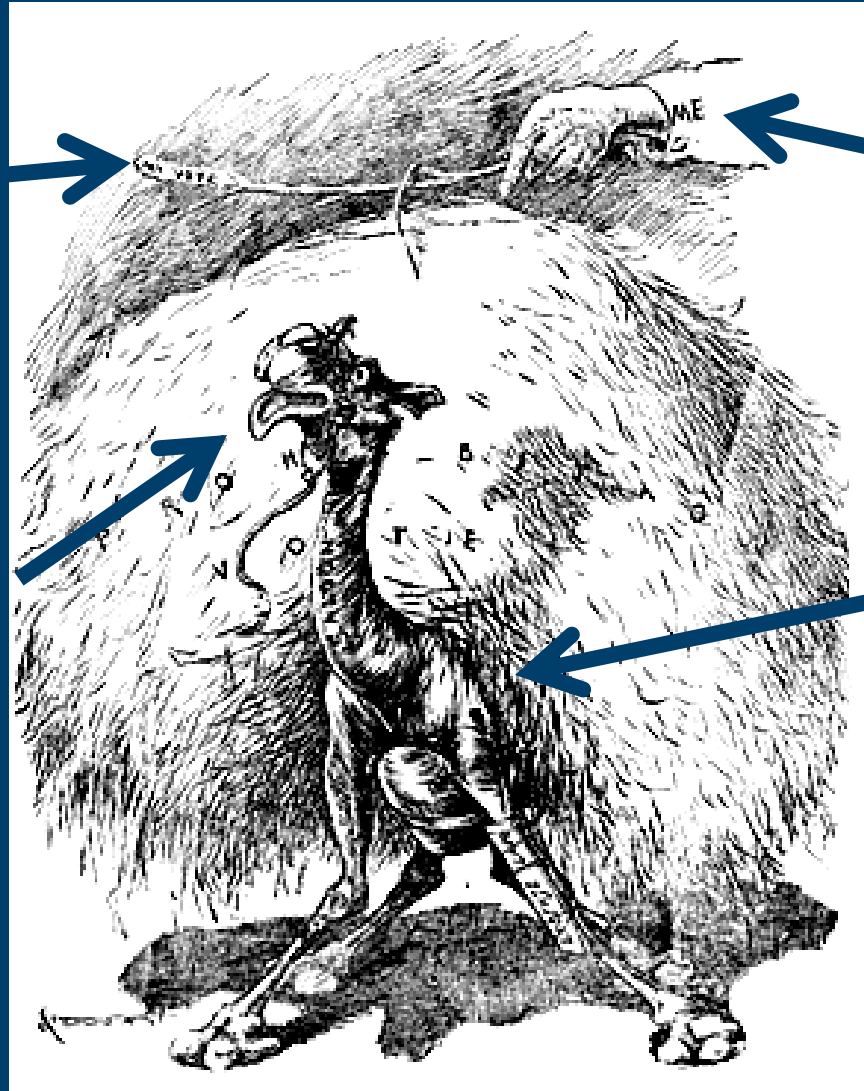
**On top of multiple existing stressors,
will DWH Oil impacts be the straw...?**

STRAW

DWH OIL

**CAMEL
NAMED
CORAL**

**SAGGING
BACK**



Oil and Corals Do Not Mix

- Short exposure to floating oil: survivable
- Longer and/or chronic oil exposure leads to:
 - ✓ Excessive mucous production
 - ✓ Behavioral changes
 - ✓ Reproductive failure
 - ✓ Tissue Bleaching
 - ✓ Morality
- **Dispersed Oil (Dispersant and Oil) are especially toxic & onerous for Coral Reefs**

Oil Spill Laboratory and Field Studies and Experiments

- **Floating oil**, longish exposure
 - High levels of injury, slow growth
 - Chronic sediments and oil from mangroves degradation
 - Decreased reproduction
 - Morality
- **Dispersed Oil** (Dispersant and Oil)
 - High mortality (corals, sponges, crustaceans)
 - Mangroves and sediments saved
 - Long term effects on reefs

Are our Coral Reefs at Risk?

Yes:

➤ Almost certainly as spill continues:

➤ **FLOATING &**

➤ **SUBMERGED**

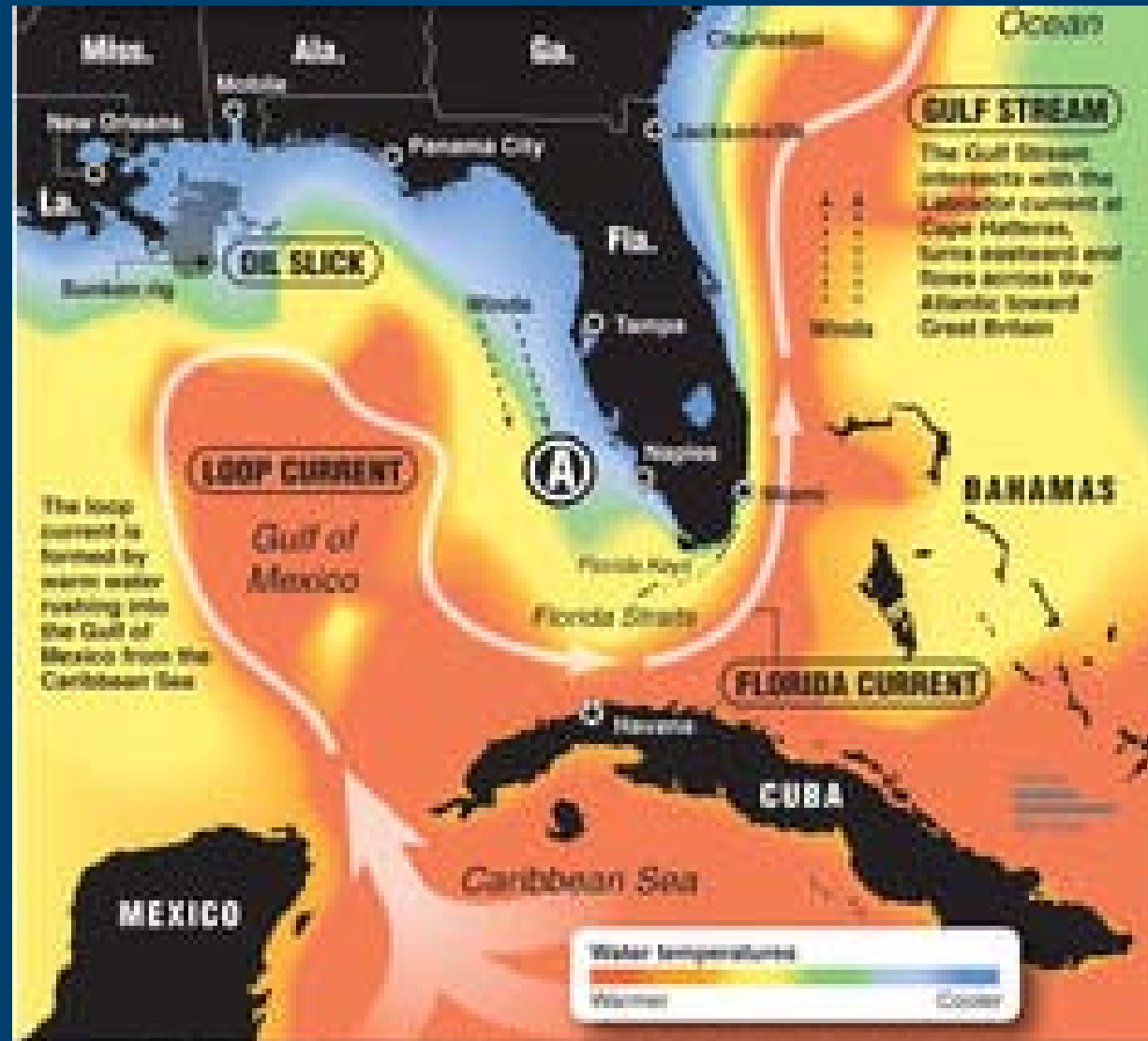
➤ Entrainment in:

➤ Loop Current

➤ Fla Current

➤ Gulf Stream

➤ Likely Impacts to Reef Ecosystems of Keys & Southeast Florida



Source: Lamont-Doherty et al., "The Spread of the Deep Tide in North Carolina During Storms," University of North Carolina Sea Grant, 1998. NOAA Coastal Services Center, 1998. U.S. National Oceanic and Atmospheric Administration. NOAA's Great Lakes National Science Center, 2000. NOAA's Great Lakes National Science Center, 2000.

Degree of Impact Depends on:

- Amount of Oil
- Type of Oil: Floating vs. Submerged
- Degree of Weathering
 - Amount of dissolved Toxics
- Duration of Exposure
- Dispersant Use
- Chronic re-exposure
- Actions of Other Stressors

Visualizing the size of the spill

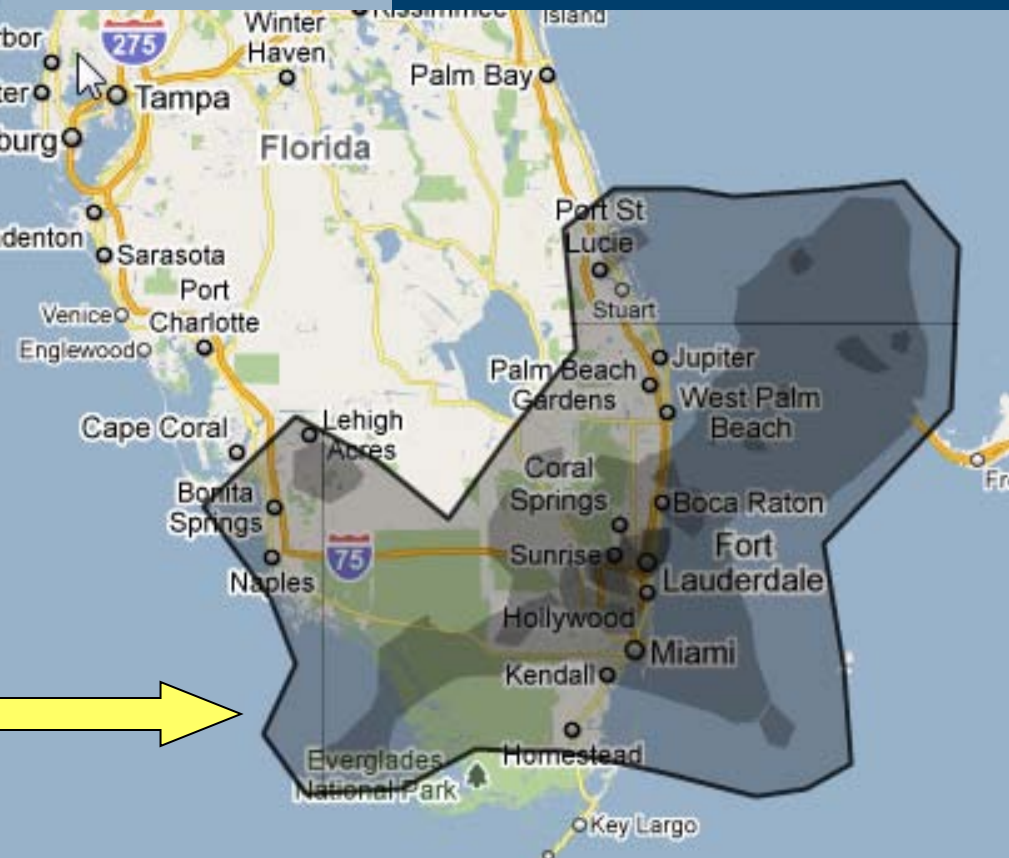
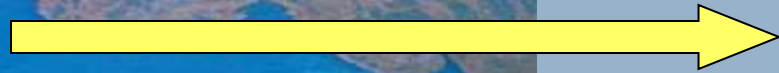


Current Surface Slick in Gulf



<http://www.ifitwasmymhome.com/>

Scale (if it were here in Davie!)



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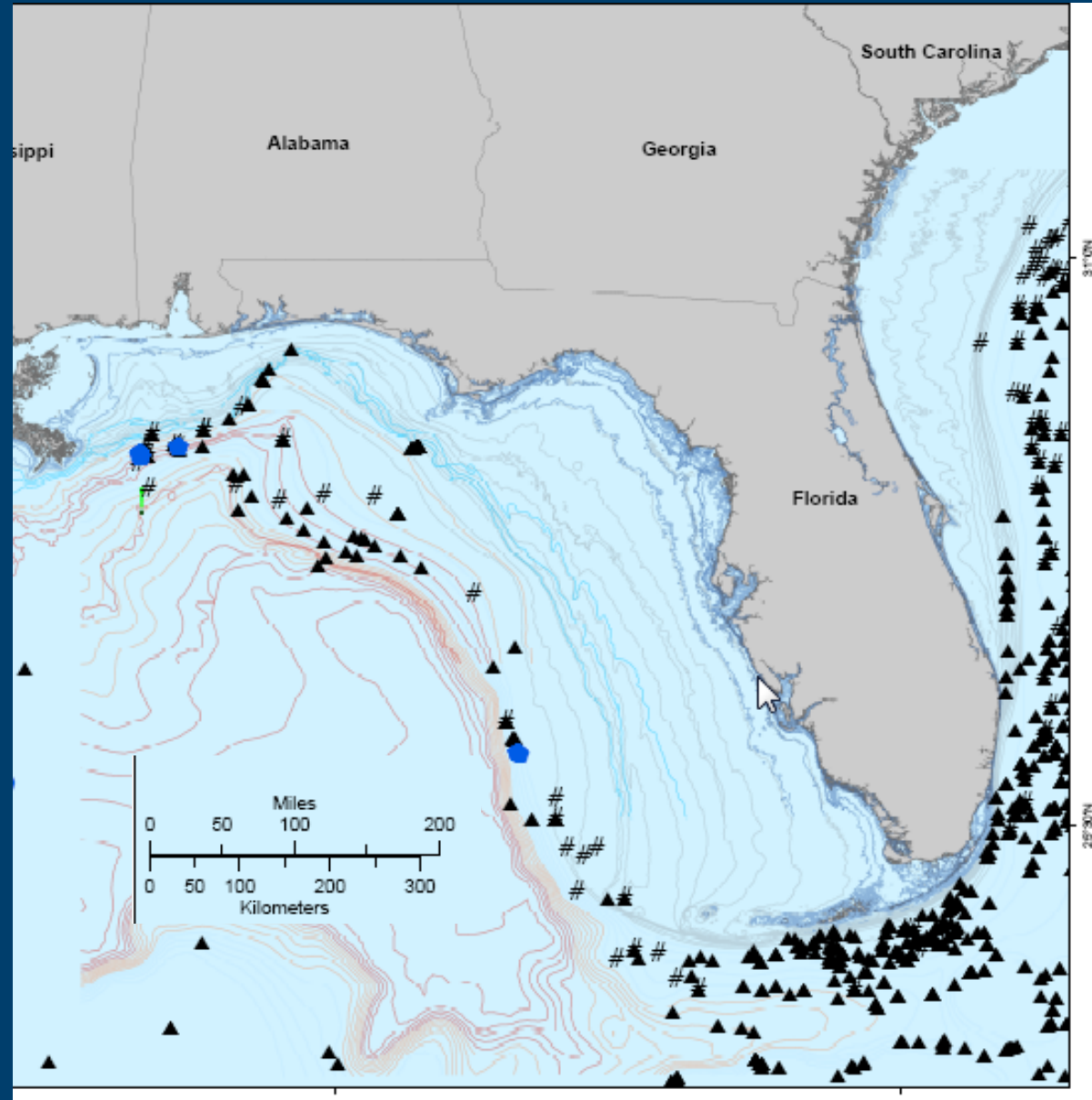
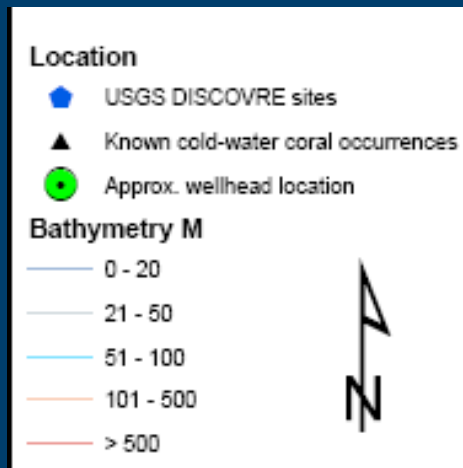


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FLORIDA'S CORAL RESOURCES

Deep Cold-Water Coral Ecosystems

- At risk, especially from submerged oil



Culprit is the Loop Current

The victim may be Florida



Sources: ESRI, NOAA. Graphics reporting by LEB DUNSEITH

What can we do?



- ❖ Try to stop the Leak
- ❖ Dilute Oil **BEFORE** it reaches sensitive Florida Reef Ecosystems
- ❖ Understand dimensions and trajectories of Floating & Submerged Oil
- ❖ No dispersant use near reefs
- ❖ Best Case Scenario: Oil is floating and highly weathered upon arrival; little or no effect!
- ❖ Worst Case: Significant impacts
- ❖ PREPARE with infrastructure & research for next event





SECOORA

Southeast Coastal Ocean Observing
Regional Association

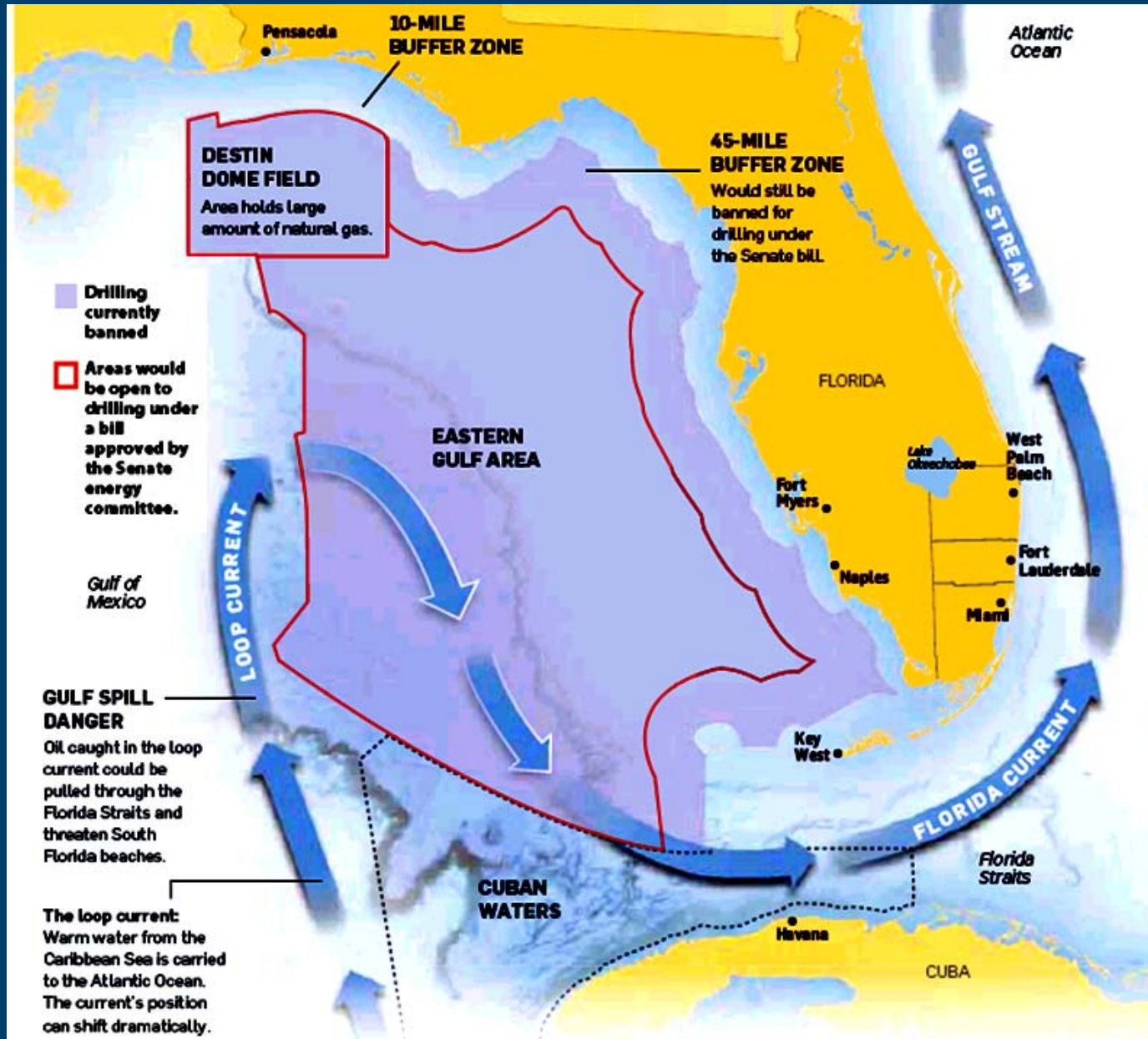
FL, GA, SC, NC

We Need (better) Ocean Observing

- One of 11 RAs nationwide through the Integrated Ocean Observing System (IOOS®).
- Integration of coastal/ocean observing in SE US
- Coordinate coastal and ocean observing activities
- Facilitates dialogue among stakeholders
- Benefits from the sustained operation of a COOS

The Latest Gulf Oil Spill Information from SECOORA

True for spills and for drilling



Drilling Impacts Ocean Observing System (DIOOS):

*Observing oil and gas drilling waste and spills
in the Straits of Florida and Gulf of Mexico:*

*Understanding
impacts on the
coastal ocean,
resources, and
economy.*

*NSU Proposal to NOAA,
January 2007*





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THANK YOU!



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