DWH OIL SPILL: COASTAL AREAS

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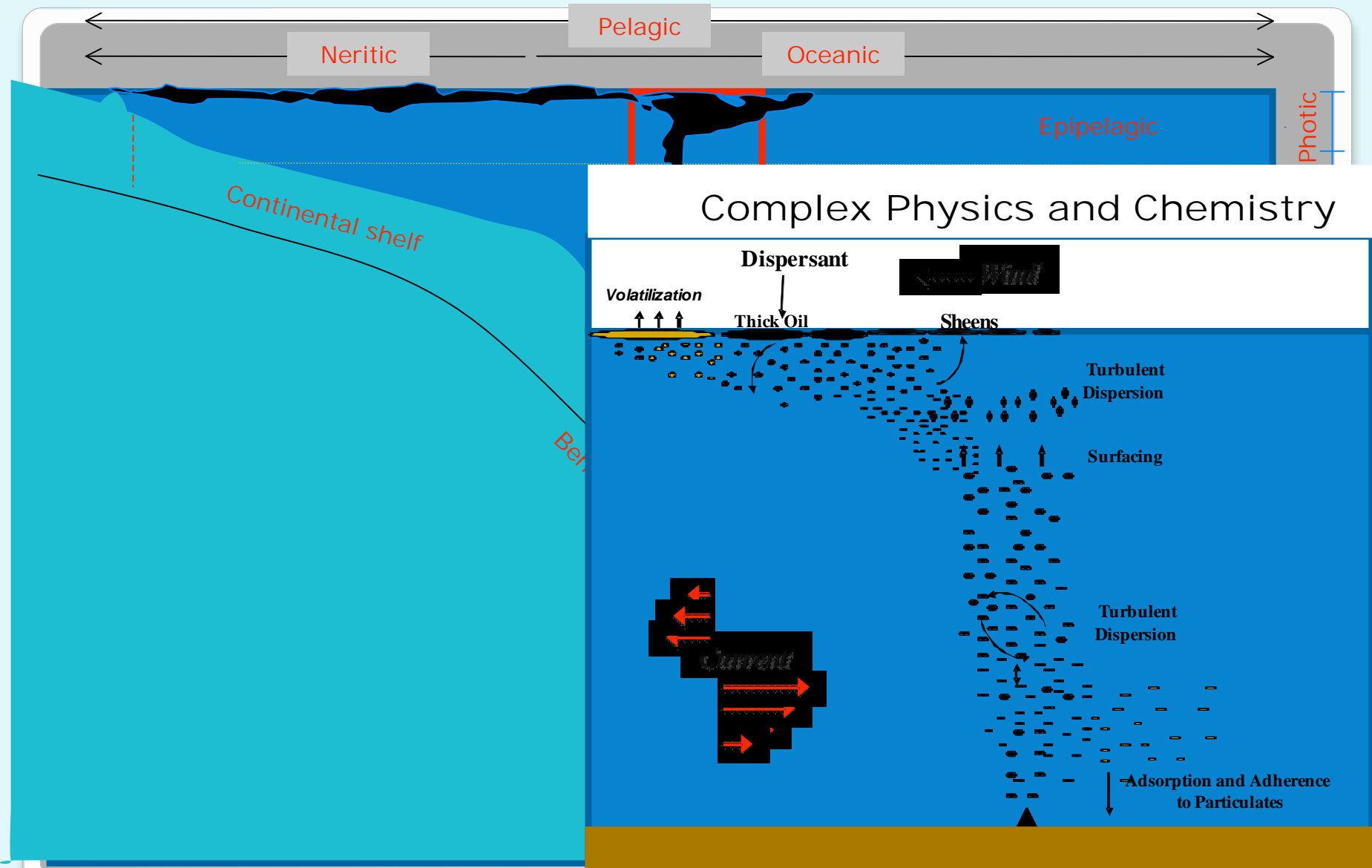
Perspective

- NCEAS Ecotoxicology working group (Met Dauphin Island Sea Lab - September)

- FSU NSF Coastal Rapid Award recipients

- NOAA NRDA Trustee Working Groups

- 10 yrs in Prince William Sound examining lingering effects (Herring)

- 60,000 Barrels (2.4 million gallons) of oil and methane discharged per day

- Oil flowed for 86 days following the Deepwater Horizon explosion

- ~200 million gallons of oil discharged.

- Meterological and oceanic conditions initially favored an offshore entrainment.

- After 4 -6 weeks oil began impacting nearshore habitats of Louisiana, Mississippi, Alabama and NW Florida.

- Flow stopped on July 15, 2010

Deepwater Horizon Oil Spill

Pelagic

Neritic

Oceanic

Photic

Epipelagic

Continental shelf

Complex Physics and Chemistry

Volatilization

Dispersant

Wind

Thick Oil

Sheens

Turbulent Dispersion

Surfacing

Current

Turbulent Dispersion

Adsorption and Adherence to Particulates

Oceanography of the spill

Coastal Nearshore impacts

- Despite herculean efforts (dispersants, burning, booming, etc.) to keep oil offshore-oil entered nearshore/estuarine environments
- Mitigate nearshore impacts vs. scientific uncertainty offshore (Policy & Science Question)
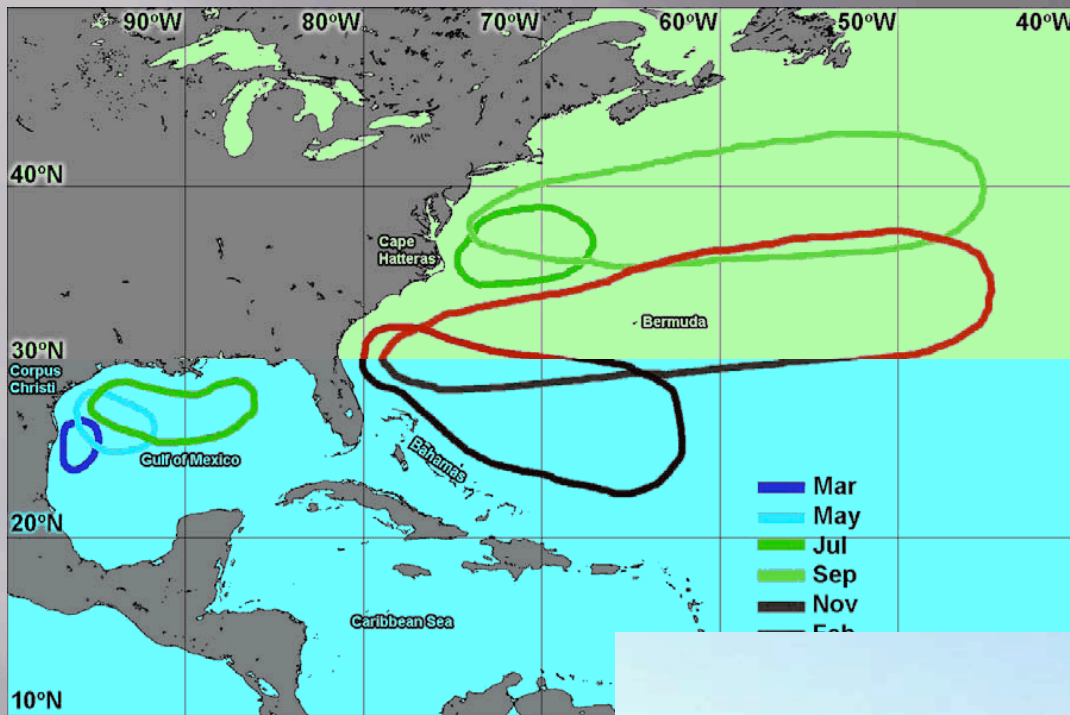- Observations suggest oil has remained

AIS Vessel Overview as of 18th July, 2010
(All Position Approximate to Well)

Estuarine & Marine Habitats
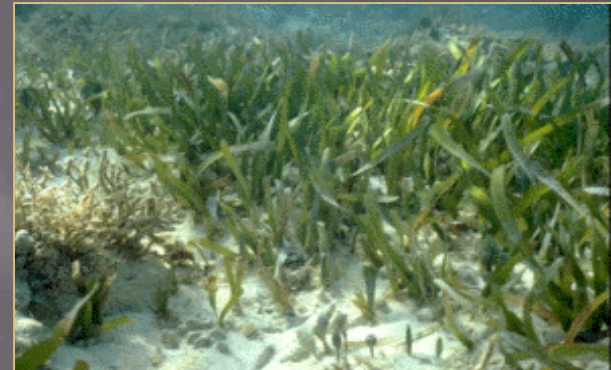
Sargassum

- 11 million gallons of North Slope crude released in short period.

- Fisheries closed for several years in PWS, Herring has still not recovered after 20 yrs.

- 30 resources (habitat or species) seriously injured - Four remain injured/unknown recovery.

- Extensive socio-economic and ecological injury.

- Habitat injury responsible for many direct, indirect and lingering effects.

- Response activities resulted in significant damage

- Socio-ecological damages are linked and still linger.

Some Lessons from *Exxon Valdez*

Oil in benthos

Potential mechanisms for habitat degradation

- Contaminant Impacts
  - Oiling

- Response Associated Impacts
  - Dispersants
  - Freshwater diversions/atleration
  - Boom deployments
  - Physical disturbance from clean-up
    - Debris removal
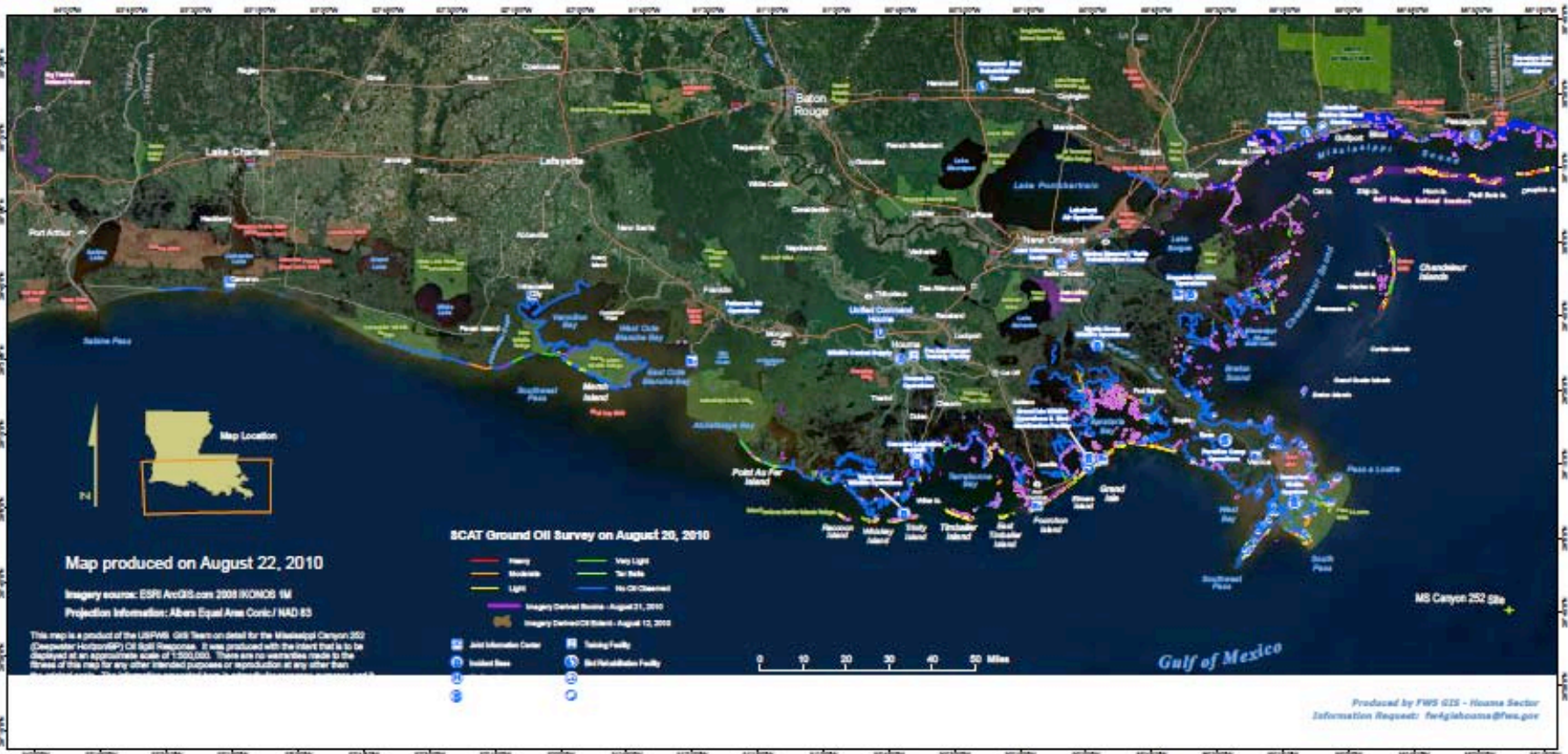   - Deep beach excavation/cleaning
    - Traffic
    - Human Activity

Deepwater Horizon/BP - Daily Oil Impact Assessment DAY 89

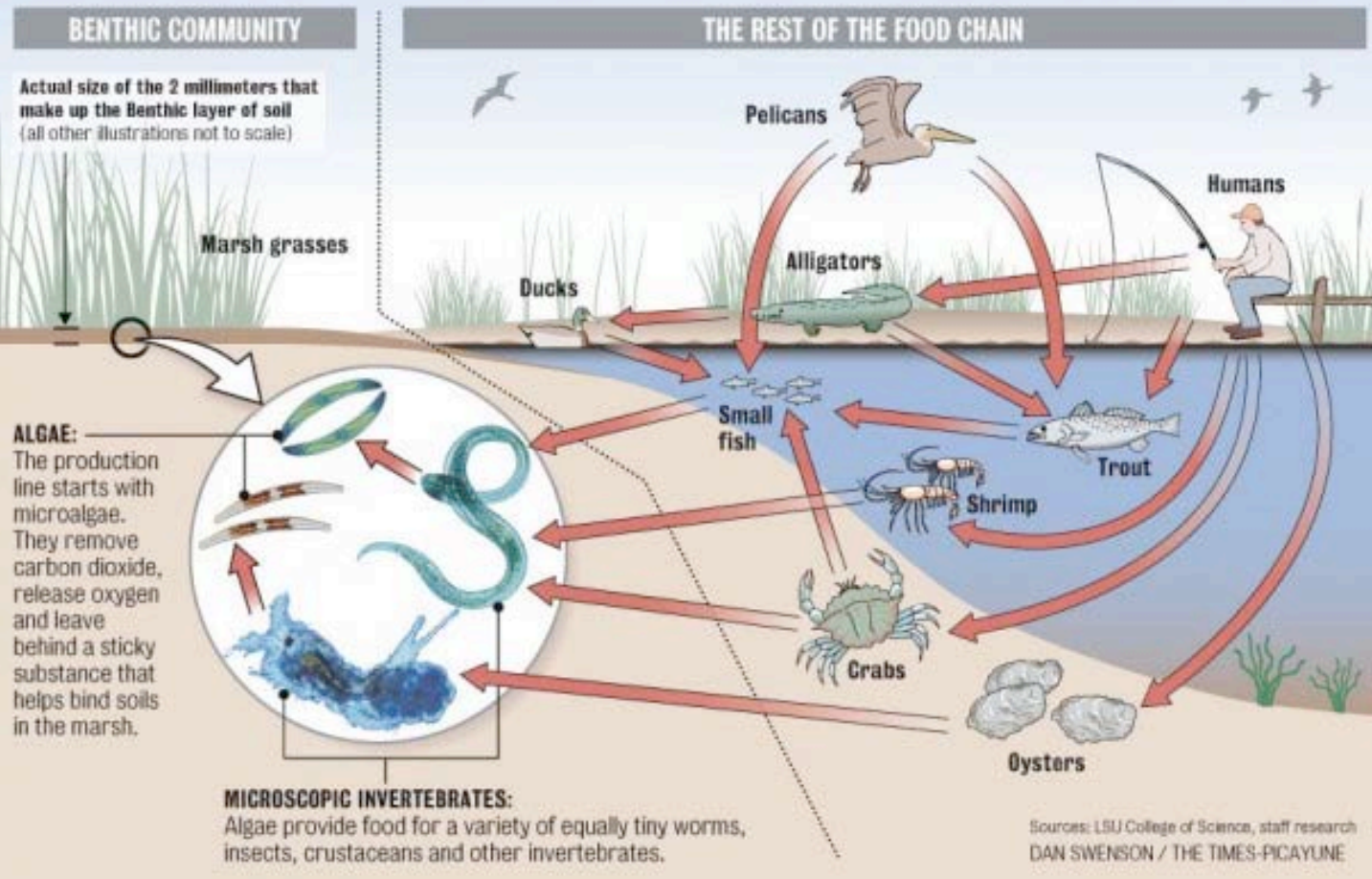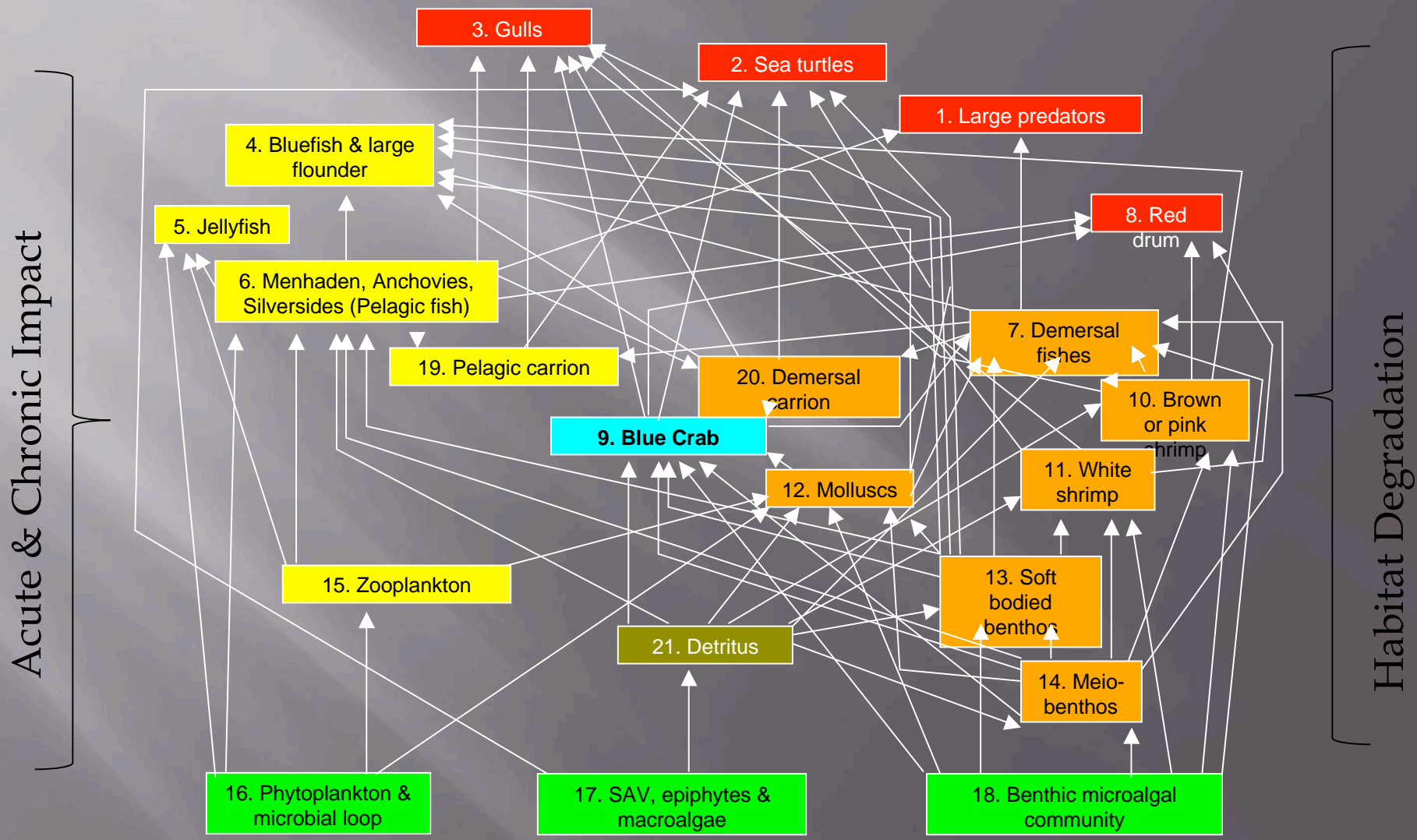Deepwater Horizon/BP - 5 Day Oil Impact Assessment DAY 140 HOUMA SECTOR

Linking Habitat with Fisheries Production

THE BENTHIC COMMUNITY'S IMPORTANCE TO COASTAL ESTUARIES

The **top 2 millimeters of marsh mud** is host to a teeming community of micro-organisms that make up the food base that drives the entire coastal estuary. While many are concerned with oil-covered birds, scientists are just as concerned about the less photogenic algae and invertebrates living in that top layer that account for half of all life within Louisiana's coastal marshes. If the oil spill seeps its way into the estuaries and smothers the micro-organisms and nutrients, all other animals and plants, assuming they escape the oil themselves, could starve and die.

BENTHIC COMMUNITY

THE REST OF THE FOOD CHAIN

Actual size of the 2 millimeters that make up the Benthic layer of soil (all other illustrations not to scale)

Pelicans

Humans

Marsh grasses

Alligators

Ducks

ALGAE:
The production line starts with microalgae. They remove carbon dioxide, release oxygen and leave behind a sticky substance that helps bind soils in the marsh.

Small fish

Trout

Shrimp

Crabs

Oysters

MICROSCOPIC INVERTEBRATES:
Algae provide food for a variety of equally tiny worms, insects, crustaceans and other invertebrates.

Sources: LSU College of Science, staff research
DAN SWENSON / THE TIMES-PICAYUNE

Model Outline

Acute & Chronic Impact

Habitat Degradation

3. Gulls

2. Sea turtles

1. Large predators

4. Bluefish & large flounder

5. Jellyfish

8. Red drum

6. Menhaden, Anchovies, Silversides (Pelagic fish)

7. Demersal fishes

19. Pelagic carrion

20. Demersal carrion

10. Brown or pink shrimp

9. **Blue Crab**

11. White shrimp

12. Molluscs

13. Soft bodied benthos

15. Zooplankton

21. Detritus

14. Meio-benthos

16. Phytoplankton & microbial loop

17. SAV, epiphytes & macroalgae

18. Benthic microalgal community

C enters foodweb?

Some Myths (FSU Workshop)

- *Myth 1: Now that the well is capped, we no longer need to be worried about oil on our Gulf shores.*

- The reality is that much oil persists in the environment close to sensitive habitats, and this oil could be the source of long-term, persistent, low-level exposures to coastal life. We have learned from previous oil spills, such as the Exxon Valdez and Ixtoc I near Mexico, that toxic oil can persist in the environment for decades.

Some Myths

- *Myth 2: Dead animals reflect the most significant negative impacts from oil contamination. .*

- Most people are deeply disturbed by images of oiled birds, turtles, and dolphins that are struggling to survive the immediate crisis of oil exposure. These effects are highly visible, are clearly appalling, and demand our attention and action. However, the non-lethal effects on wildlife are significant sources of injury and can affect the long-term integrity of populations.

Some Myths

- *Myth 3: Since scientists have learned much from studying other oil spills, nothing new is to be learned from studying the BP spill.*

- The Gulf of Mexico harbors many sensitive and complex ecosystems that will respond in unique ways to oil, including seagrass beds, mangrove forests, sub-tropical coral reefs, and salt marshes. All oil spills share some common risks and effects. However, since the chemical nature of crude oils vary extensively and since each ecosystem is different, major oil spills require uniquely tailored and focused research programs to document and learn about their effects.

Some Myths

- The massive response activities may result in large areas receiving relatively low concentration of contaminants (although some areas did receive heavy oiling). A key question is what is the effect, if any, of low concentrations of contaminants.

Some myths

- *Myth 4: Oil cleanup activities can only help the environment*
- Well-recognized is that some well-intentioned interventions can have serious unintended consequences, and these should be considered together with the risks of oiling.

Coastal Questions

- What oil and dispersant contamination has been observed in different coastal regions?

- How can we more effectively monitor and detect contamination in different environments? Alternatively, what methods and techniques are appropriate for monitoring and detection in different coastal environments?

- What impacts on ecosystems and ecosystem services have been observed or can be expected given levels of contamination? What types of studies are needed to better characterize these impacts?

Coastal Questions

- What is the effectiveness of different mitigation strategies? What are potential negative impacts of response and mitigation strategies?

- How can coastal monitoring efforts among federal and non-federal programs be better coordinated and information sharing be promoted?

- What are the methodologies being used by the different NRDA Technical Working Groups and what are the opportunities for other scientists to be involved in NRDA efforts?

Sargassum

- Pathway and risk of exposure high
- Complex habitat – fills a unique role offshore in "coastal" systems