



Nutrient Criteria Research Framework

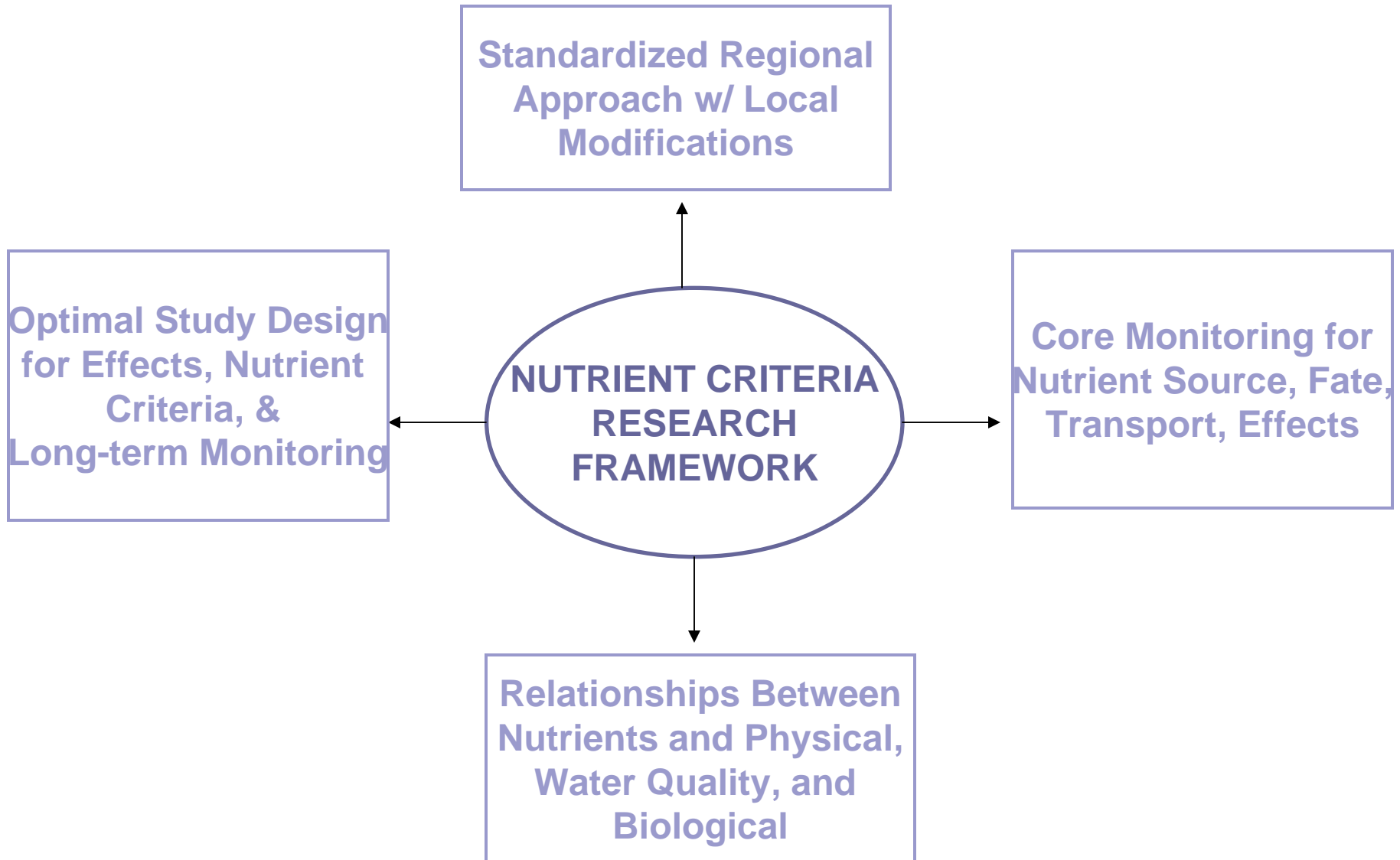
Gulf of Mexico Alliance

Nutrients Workshop

June 4, 2008

Laurie Rounds, NOAA Ocean & Coastal
Resource Management

Framework Goals





Framework Strategies

Atmosphere, Water, Biota, Sediments

Watershed
Approach

Monitoring,
Remote Sensing

Models: Optimal Design,
Ecological Response,
Classification



Research Questions

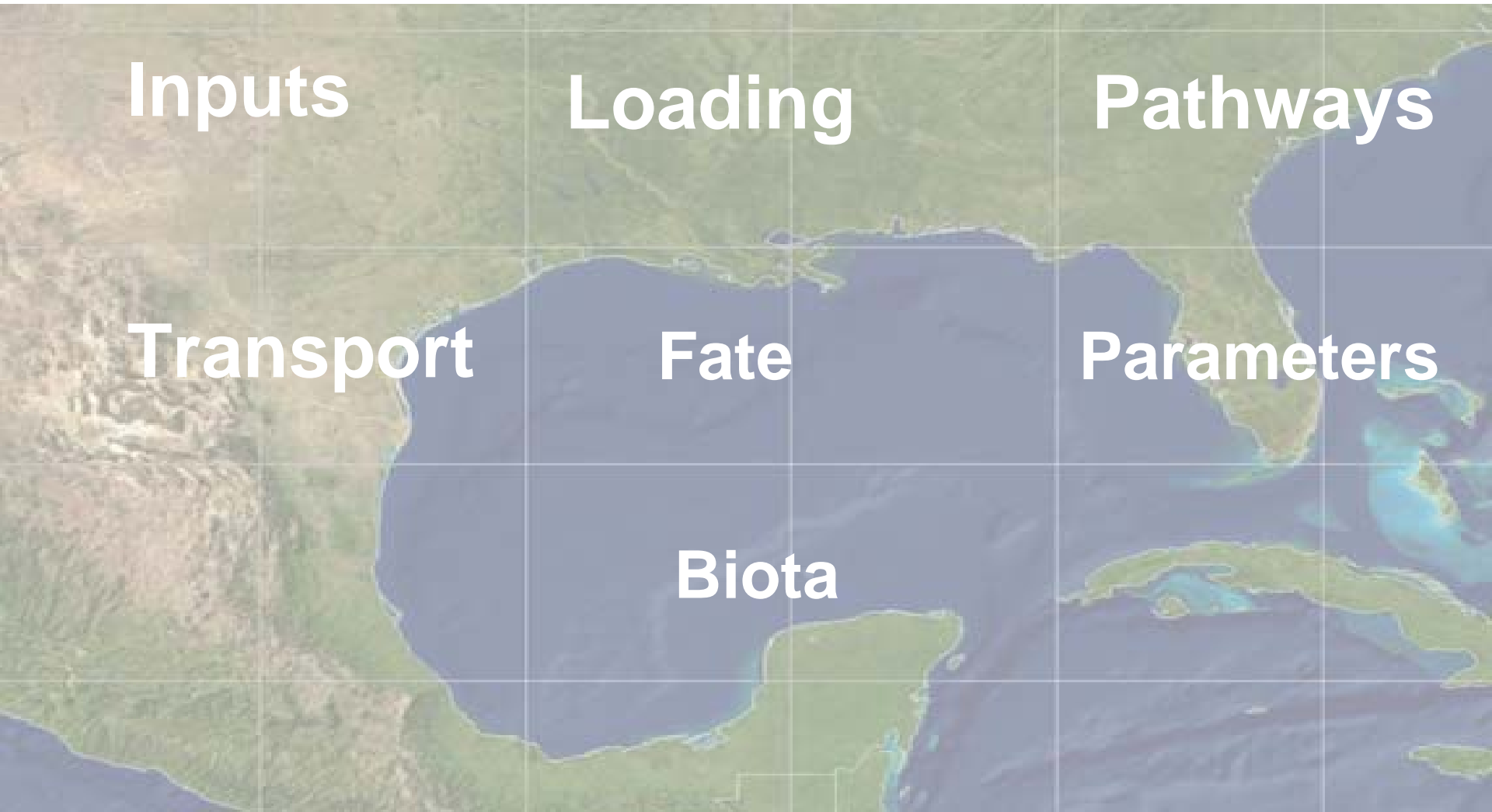
- What are the sources, nutrients (species), and loads over space and time?
- What are the dominant transport processes over 3-D space and over time (both intra- and inter-annual cycles)?
- How are biological components interacting with and affected by nutrients as they are transported over space and time?



Research Questions

- What factors determine a system's capacity to assimilate nutrients and what are the thresholds for nutrient related impacts?
- How can nutrients be managed in coastal ecosystems to support healthy ecosystem functions and human uses?
- How are Gulf of Mexico coastal ecosystems similar in their assimilative capacity, responses, and needs?

Framework Components



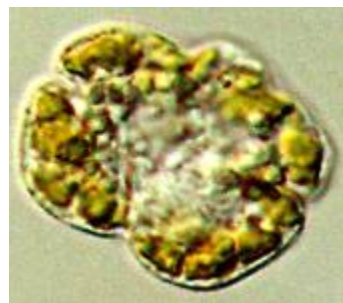
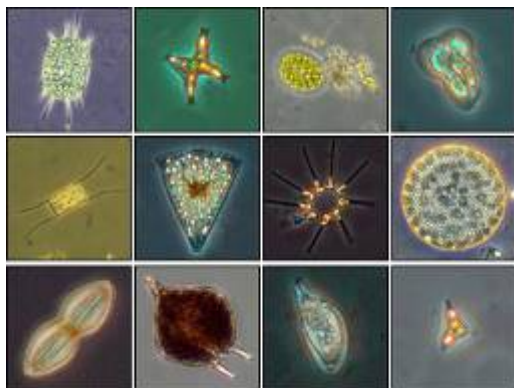


Framework Endpoints

- Subset of biota that are most sensitive to nutrients
- Reduce costs while protecting the full community
- Set predictive, quantitative relationships for criteria
- Can be both positive and negative responses
- Represent important ecosystem links with human uses and goals
- Provide a scientific basis for management decisions that are legally defensible

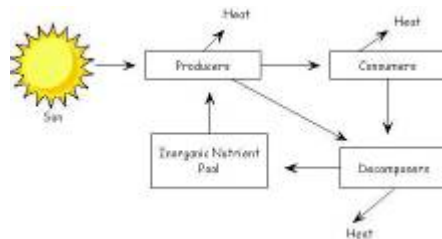
Ecological Endpoints

Phytoplankton
HABs



Karenia brevis

Net Ecosystem
Metabolism



Hypoxia



Photo: Moryz Hubicki, Louisiana Universities Marine Consortium

Shell and Fin
Fisheries



Benthos



SAV





Implementation Plan

- Framework test case

- 1 system rich in data
- Identify gaps and refine framework

- Pilot studies

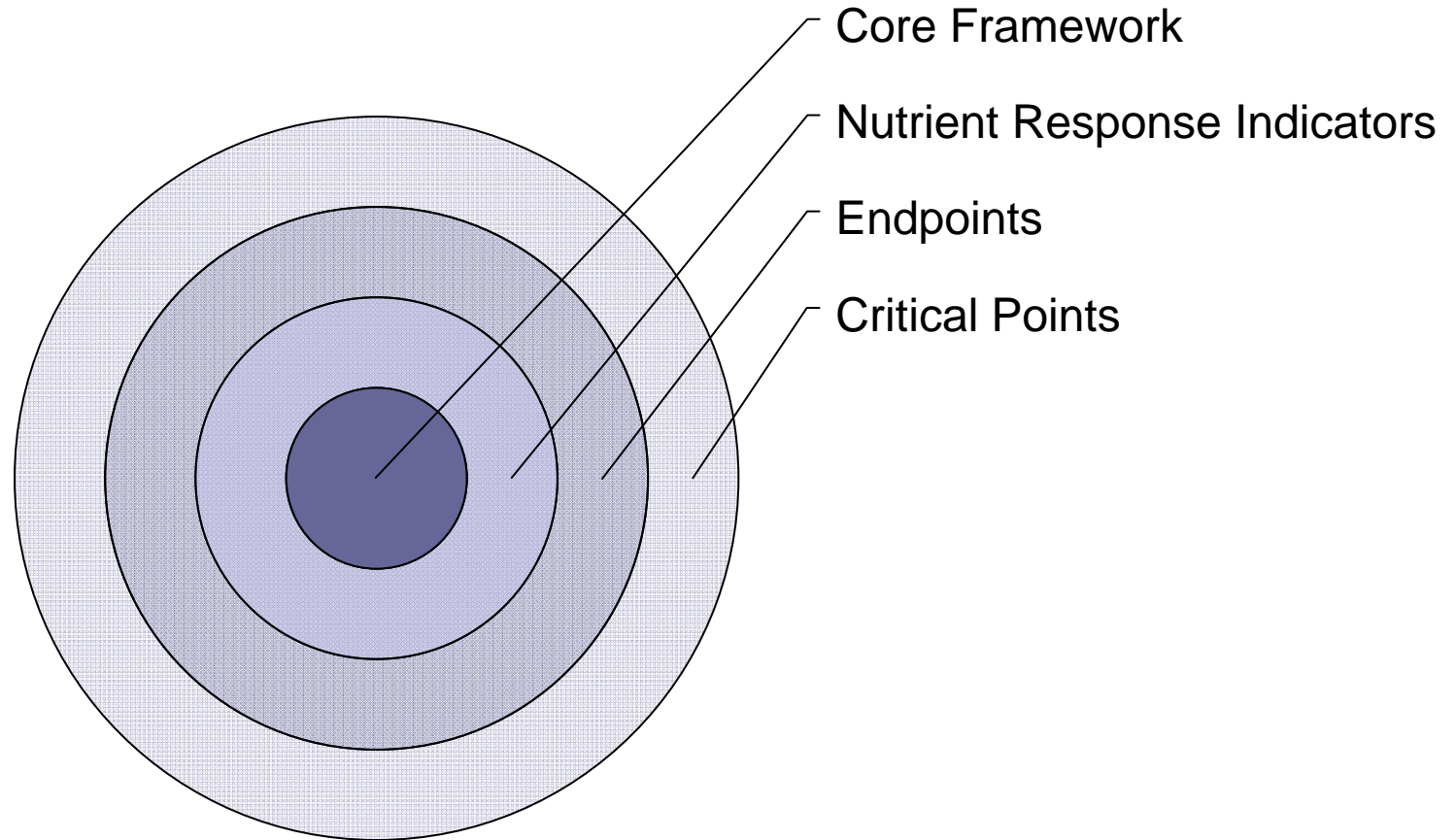
- 4-5 significantly different systems rich in data
- Parallel round robin studies for comparability
- Identify ecosystem specific minimum monitoring



Core Framework

- Simplest, least expensive nutrients monitoring program to define effects
- Developed for classes of systems
- Regionally comparable
- Minimum number of endpoints & indicators
- Guide long-term monitoring program

Core Framework Questions





Model Approaches

- Budgets: simple box models of long-term fluxes and partitioning between different system components;
- Watershed models to estimate nutrient loading;
- Hydrodynamic (circulation) models to characterize water and solute residence times in spatial dimensions;
- Biogeochemical models to simulate the biological, chemical, and geological sources and sinks of nutrients and related quantities;
- Ecosystem models to simulate the linkages between nutrient-related water quality and ecosystem dynamics.



Monitoring Approach

- National Water Quality Monitoring Design
- Surface water, ground water, water column, porewater sediments, atmospheric deposition
- Spatial and temporal distributions, trends, and variability for each parameter
- Compare shallow and relatively deep waters and between nearshore and offshore waters

