Assessment of Science Needs Based on an Integrated Conceptual Ecosystem Model: The MARES Project

Peter Ortner, William Nuttle, Jerry Ault, Jim Fourquarean, Grace Johns, Chris Kelble, Donna Lee, Bob Leeworthy, Diego Lirman, Dave Loomis, and Jerry Lorenz
This talk . . .

- MARES approach
- Utility to managers
- How can it be used
MARES Project (2009-2012)

- 3 marine regions
- Approach
  - Conceptual models
  - Indicators
  - Consult with managers, public
- Results
  - Report card
  - Synthesis of existing science
  - Identify needs
DPSER Framework

- Builds on conceptual models developed in CERP/RECOVER
- Human dimensions incorporated in new elements:
  - Ecosystem services
  - Response

Ogden et al. 2005 DPSIR Model

Drivers → Pressures → State → Ecological Effect → Attributes → Response

Ecosystem Services
Drivers and Pressures

- Drivers
  - Global – climate change
  - Regional – inputs from South Florida region
  - Local – activities in Keys

- Pressures
  - Far-field
  - Near-field
State – Define Attributes

- Represents conditions in the marine environment
- Divided into 5 components
- Detail at component level:
  - Pressures
  - Pathways
  - Measurable attributes
  - “Attributes that people care about”

DPSER “STATE” - Seagrass submodel

Ecosystem attributes that we measure:
- Genetic Diversity
- Depth Distribution
- Elemental and Isotopic content
- Species Composition
- Spatial Extent
- Biomass

Ecosystem attributes that people care about:
- Asthetics - seagrass improves water clarity and fish species abundance and diversity
- Erosion protection - Seagrasses reduce erosion at edge of resident yards along coast.
- Commercial Shrimp Harvest – Seagrass provides key habitat for larvae and juveniles.
- Recreational fishing – seagrass provides key habitat for bonefish, tarpon, and permit
- Intact and functioning natural system – Seagrass beds are essential component

Water Quality Submodel:
- Phytoplankton
- Water clarity
- Stormwater runoff
- Coastal development
- Nutrient availability

Nutrient availability
- Fishing-Harvest
- Fishing-Gear impacts
- Boating
- Coastal development
- Stormwater runoff
- Climate Change
Response

- Individual behavior
- Institutional (historical)
  - Controls on development
  - Regulation on marine activities
  - Ecosystem research and monitoring
- Ecosystem evolution and adaptation

Population

- Indexed to 1990
- South Florida
- Monroe County
How can it be used?

- Shared vision of South Florida marine ecosystems
- Develop indicators, report cards
- Identify science information needs
- Regional communication, collaboration, cooperation