LINKING SCIENCE TO MANAGEMENT

A CONFERENCE & WORKSHOP ON THE FLORIDA KEYS MARINE ECOSYSTEM

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Methods and Benefits of Incorporating Human Dimensions into Integrated Conceptual Ecosystem Models

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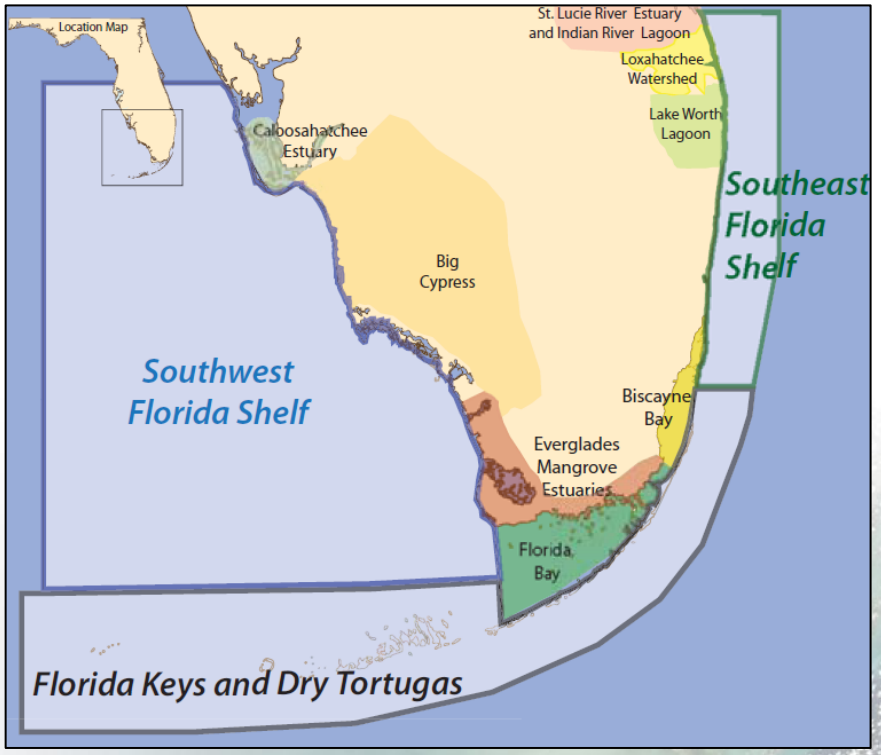
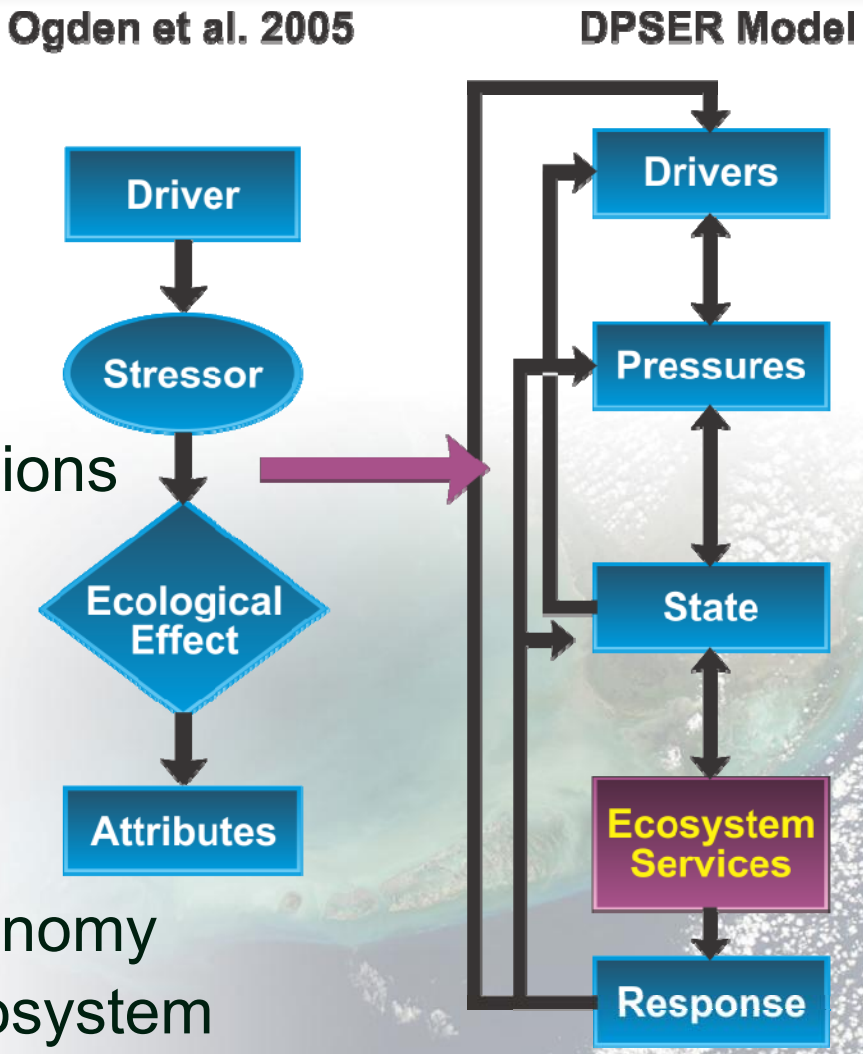
Marine and Estuarine Goal Setting for South Florida (MARES) Project

- 3 marine regions
- Approach
  - Develop conceptual models
  - Identify indicators
  - Consult with managers, public
- Results
  - Synthesize existing science
  - Identify data needs
  - Develop ecosystem health report card



Integrated Conceptual Ecologic Model (ICEM) incorporates human dimensions

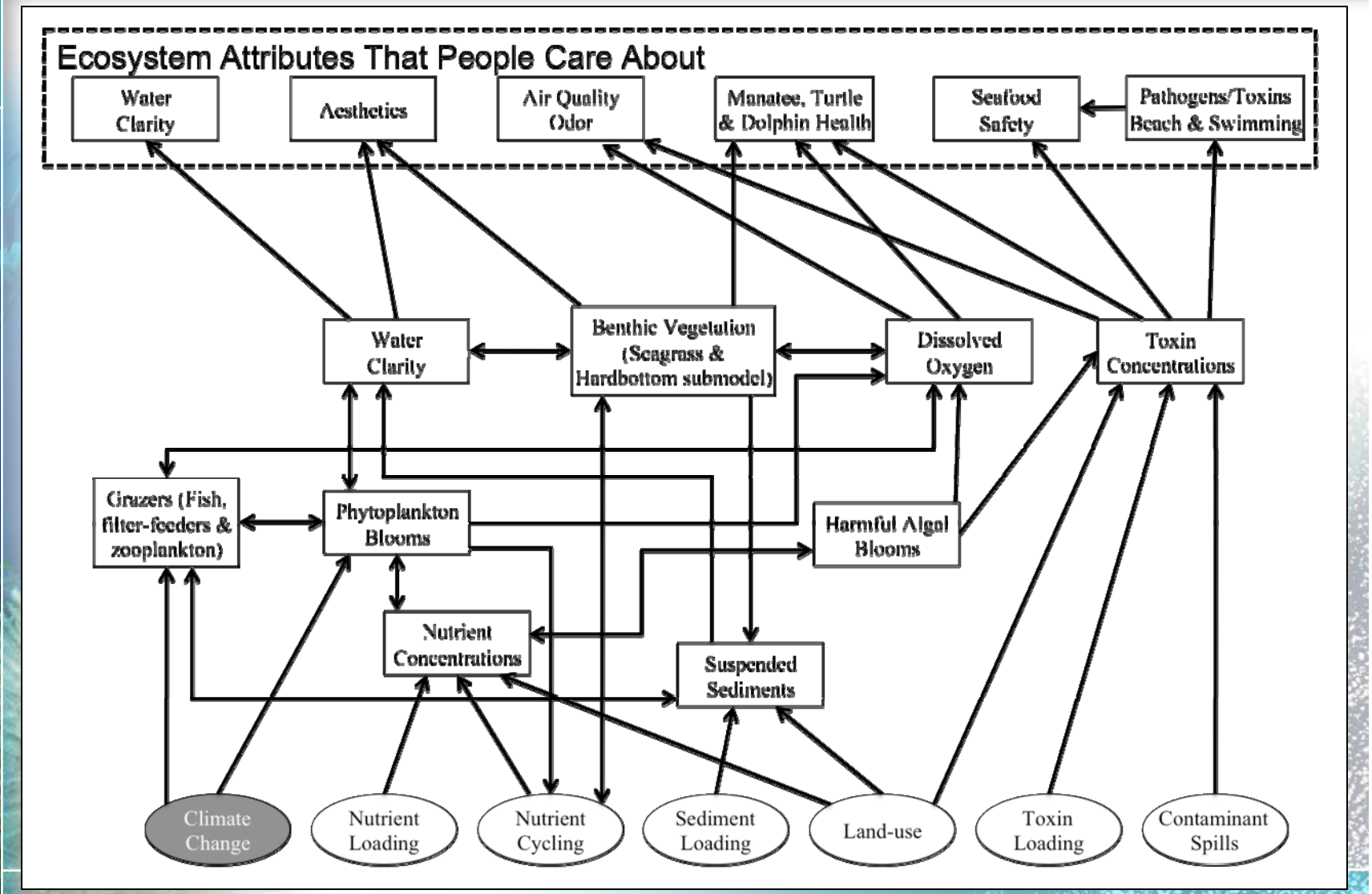
- Builds on conceptual models developed in CERP/RECOVER
- DPSER ICEM model includes human dimensions
  - Pressures
  - Ecosystem services
  - Response
- Human wellbeing & economy benefit from healthy ecosystem



Attributes People Care About	Effect of Subsystem State on Attribute D = Direct; I = Indirect				
	Water Quality	Coral/ Hard-bottom	Fishery	Man-grove	Sea-grass
Aesthetics:					
On land				D	D
Water-based	D	D	D	D	D
Lots of and large variety of:					
Healthy coral	I	D		I	
Fish	I	I	D	I	I
Large wildlife	I		D		I
Quality of Beach / Shoreline	D			D	I
Intact habitat for quick species recovery	I	D		D	D

Attributes People Care About	Effect of Subsystem State on Attribute D = Direct; I = Indirect				
	Water Quality	Coral/ Hard-bottom	Fishery	Man-grove	Sea-grass
Coastal erosion		D		D	D
Air quality / odor	I				I
Environmental education		D	D	D	
Seafood safety	I		D		
Large variety, numbers of birds				I	
Critical habitat for species		D		D	D
Natural filter – wastewater, runoff				D	D
Carbon sequestration		D		D	D

Water Quality submodel maps State to Ecosystem Attributes



Cultural ecosystem services provide value to economy, use and non-use values

Ecosystem Service	Attributes People Care About

1. Beautiful, unique environment	• Aesthetics:
	  • Land
	  • Water-based recreation
	• Large numbers & variety of:
	  • Healthy coral
	  • Fish
	  • Wildlife

2. Opportunity for beach activities & shoreline views	• Quality of beaches & shoreline
3. Opportunity for wildlife recreation activities 4. Protection of wildlife species	• Critical habitat for protected species (e.g. orchids, key deer, goliath grouper)
5. Opportunity for bird watching	• Large number & variety of birds

Cultural ecosystem services provide value to economy, use and non-use values, con.

Ecosystem Service	Attributes People Care About
6. Opportunity for recreational fishing, diving, snorkeling, boating	• Intact habitat for quick species recovery • Large expanse and variety of healthy coral • Large number and variety of fish, large wildlife
7. Clean air and quality of life	• Air quality / odor
8. Resources for R & D	• Environmental education
9. Living laboratory for education	• Environmental education
10. Protection of wildlife species and habitats for current and future generations	• Intact habitat for quick species recovery • Critical habitat for protected species

Types of values associated with ecosystem services

- Use value – Willingness to pay to enjoy ecosystem service currently and in future
- Non-use value – Willingness to pay to maintain or improve ecosystem services for the benefit of future generations and for the benefit of knowing that the ecosystem service exists
- Value to economy – Contribution of ecosystem service to output, income, employment & tax revenue
- Market & non-market value of commercial fish landings
- Avoided flood damages and property loss
- Avoided cost of illness
- Replacement cost of ecosystem services

Regulating ecosystem services are valued

Ecosystem Service	Attribute People Care About	Value of Service
11. Protection of property from storm damages	Coastal erosion and storm protection	Avoided cost of damages
12. Supply of high quality seafood	Seafood selection, availability & safety	• Avoided cost of damages from illness • Market value of products sold
13. Wastewater & stormwater treatment	Natural filter for wastewater, storm water runoff	Replacement cost of ecosystem service

Provisioning ecosystem services are valued

Ecosystem Service	Attribute People Care About	Value of Service
14. Opportunity to harvest commercial fish species	• Large number and variety of fish • Intact habitat for quick species recovery	• Market and non market value of fish • Value to economy
15. Opportunity to catch recreational fish species	• Large number, variety fish • Large expanse, variety coral • Intact habitat for quick species recovery	• Use value • Value to economy

Ecosystem services values can be and have been estimated

Value of Ecosystem Service	Methods to Estimate Value
Use Value	Survey research of ecosystem service users – contingent valuation, travel cost modeling
Non-Use Value	Survey research of all Floridians or U.S. residents – contingent valuation of ecosystem attributes or services
Value to Economy	Survey research focused on ecosystem service-related spending by residents and visitors

Ecosystem services values can be and have been estimated, con.

Value of Ecosystem Service	Methods to Estimate Value
Consumer and producer surplus by fish species	• Total value estimated using demand & supply functions for fish species • Measures demand for the fish and profits from fishing
Avoided cost of reduced flood damage	• Avoided cost or risk analysis • Hedonic price analysis
Avoided cost of illness	Avoided cost or risk analysis
Avoided cost of alternative water treatment	Replacement cost analysis – mangroves and seagrass are natural filter for stormwater runoff

Ecosystem services valuation needed in Florida Keys

- Information on economic values can be useful in selecting and validating management alternatives
- Values of Florida Keys ecosystem services are not routinely estimated
- Existing studies are dated with no plans for updates

Recommendations

- Fund basic valuation research in the Florida Keys every 5 years
- Conduct research to identify the relationship between economic values and measureable indicator variables

Knowledge of human dimensions values improves ecosystem management

- Our ICEM approach called DPSER integrates human values and goals by linking ecosystem services with attributes people care about and value
- While the value of ecosystem services is “infinite” to some people, this assessment is not helpful in making management and fiscal decisions
- Good estimates of economic value improve decision making and long term ecosystem management

Next steps for FK-DT Marine Goal Setting

- Develop measurable indicators that link attributes to ecosystem services (in progress)
- Consult with managers (on going)
- Develop Report Card that includes human dimensions elements

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