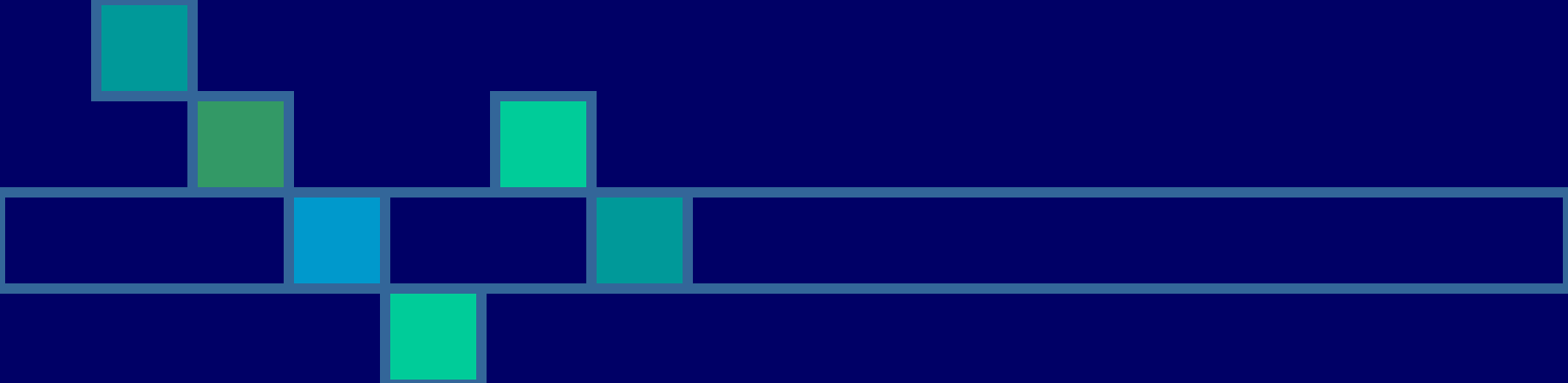
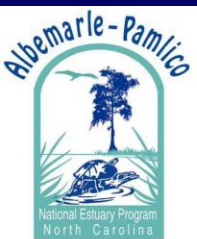




Decision Support Activities for the Albemarle-Pamlico Region

Dean E. Carpenter
Albemarle-Pamlico National Estuary Program

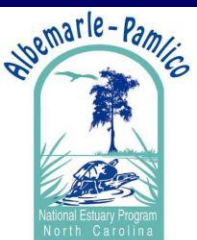
3 February 2010



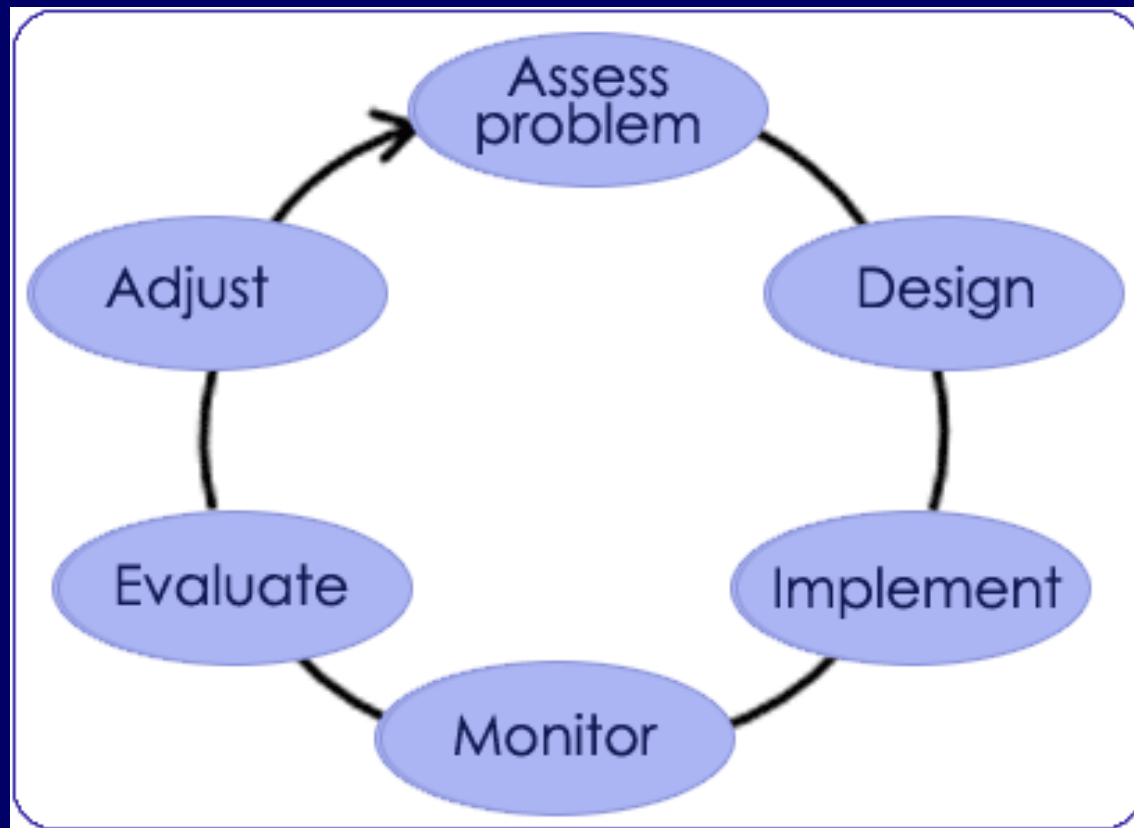
Environmental Intelligence

- "...good decisions depend on the ability to create 'environmental intelligence' that can be accessed by decision makers. The strongest intersection between human decision making and environmental stresses is at a regional or local level. Its five critical elements are integrated regional observations, a comprehensive and accessible regional data and information system, process studies designed to improve regional prediction, a regional climate modeling capability appropriate for society's needs, and efforts to promote the intersection between research, operations, and applications. The uniqueness of this framework stems from the level of integration, scale of prediction, and promotion of new modes of research."

Barron EJ. 2009. Beyond climate science. Science 326(5953):643.



APNEP CCMP 1.0: *Adaptive* Management

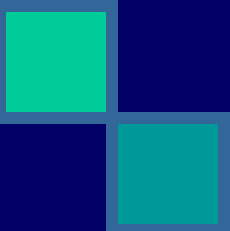


APNEP Targets 2008-2009

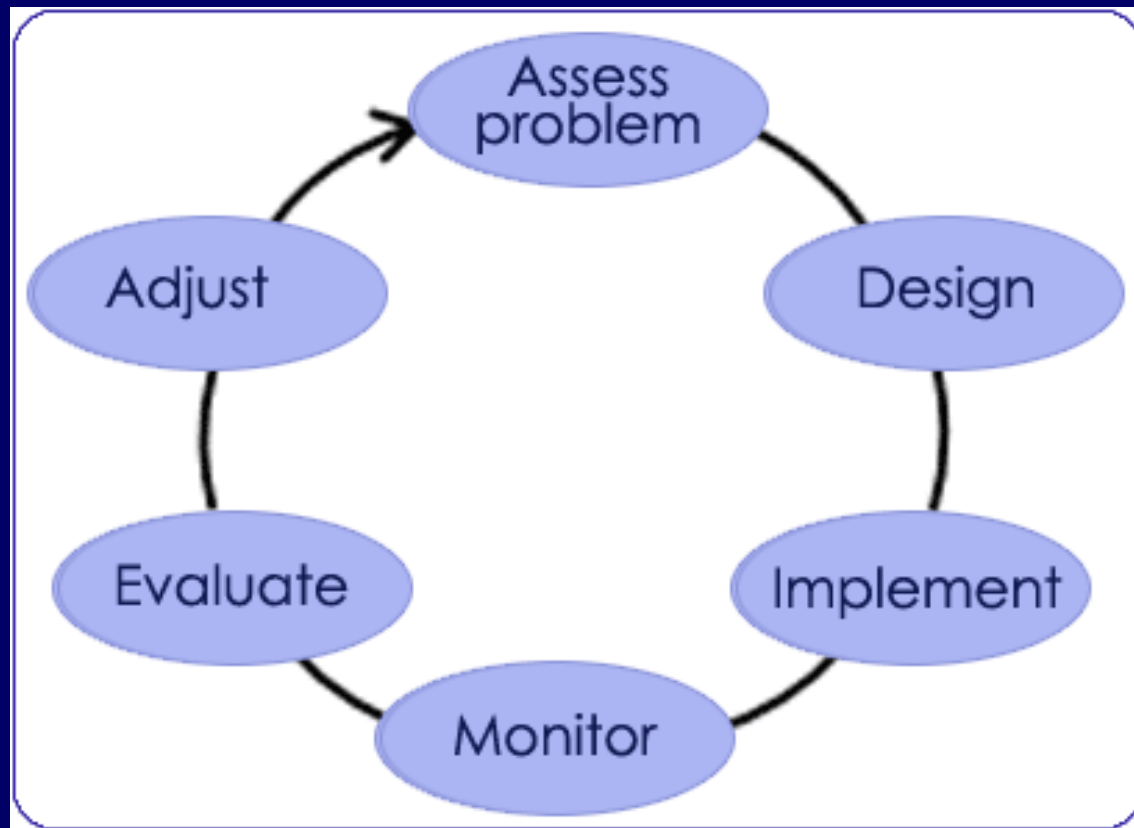
- Comprehensive Conservation & Management Plan (CCMP) 2.0
- Indicator Specification 1.1
- Integrated Monitoring Strategy 1.0
- Ecosystem Assessment 1.0
- Ecosystem-Based Management Plan 1.0



CCMP 2.0

- 
- CCMP Steering Committee
 - Kickoff Meeting: Objectives by Theme
 - Objectives Brainstorm Meeting
 - Objectives Classification by Staff
 - NEP Requirement: December 2010

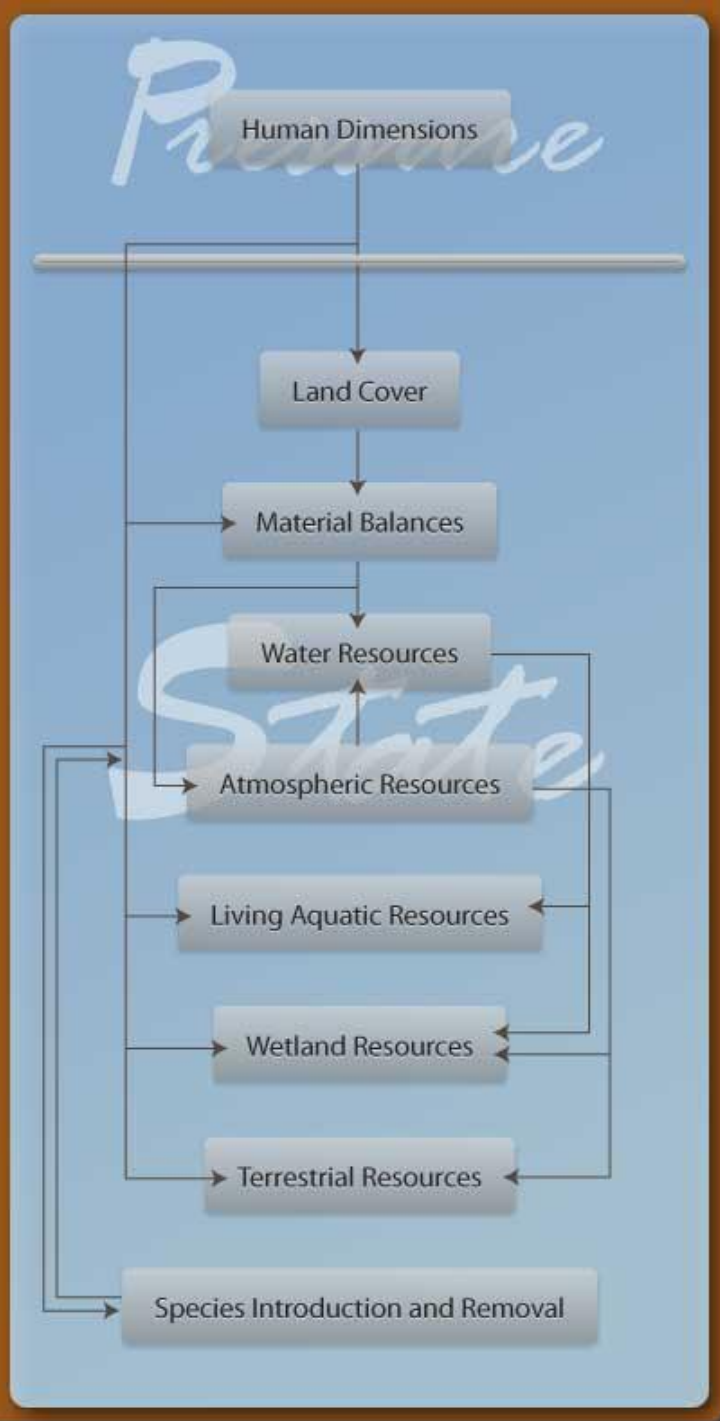
APNEP CCMP 2.0: *Ecosystem-Based* Management



Indicator Specification 1.1

- Science & Technical Advisory Committee Initiation
- Indicator Definition
- Indicator Criteria
- Conceptual Model
- National Estuary Program Guidance
- Indicator Steering Committee Evaluation
- APNEP Adoption
- Resource Monitoring & Assessment Teams Refinement
- Indicator Steering Committee Evaluation
- Management Conference Evaluation
- Public Feedback

Regional Ecosystem Model



Living Aquatic Resource Indicators



Module	Category	Dimension	Indicator
VI: Living Aquatic Resources	VI-A: Incidents of Concern	VI-A-1: Community Simplification	VI-A-1-a Fish Fauna Integrity
		VI-A-2: Acute Events	VI-A-1-b Low-Diversity Benthic Macroinvertebrate Faunas
			VI-A-2-a Fish Kills
		VI-A-3: Fish and Shellfish Diseases/Parasites	VI-A-3-a Acute Fish Disease Incidence
			VI-A-3-b Chronic Fish Disease/Parasite Incidence
	VI-B: Aquatic Habitat	VI-B-1: General Habitat Condition	VI-A-3-c Incidence of Dermo (<i>Perkinsus marinus</i>) in Oysters
			VI-B-1-a Rare Taxa Presence
			VI-B-1-b Rare Community Representation
			VI-B-1-c Freshwater Hard Bottom
		VI-B-2: Anadromous Fish Habitat	VI-B-1-d SAV Area/Zone/Density/Potential/Phenology by Species
			VI-B-2-a Quality & Extent of Anadromous Fish Spawning/Nurseries Areas
		VI-B-3: Aquatic Protected Areas	VI-B-2-b Inaccessible Fish Spawning Area by Obstruction Type
			VI-B-3-a Oyster Sanctuaries & Shellfish Harvest Closure Areas
	VI-C: Living Resource Populations	VI-C-1: Marine Mammals	VI-C-1-a Bottlenose Dolphin Range and Population Condition
			VI-C-2-a Fish Stock Condition (SSB and Age Structure) by Commercial and Recreational Species
		VI-C-2: Fish	VI-C-2-b Fish Population Condition by Ecologically Important Species
			VI-C-2-c Atlantic Sturgeon and Carolina Madtom Occurrences
		VI-C-3: Reptiles	VI-C-3-a Diamondback Terrapin Range and Population Condition
			VI-C-3-b Freshwater Turtles Range and Population Condition
			VI-C-3-c American Alligator Range and Population Condition
			VI-C-3-d Sea Turtles Range and Population Condition
		VI-C-4: Crustaceans	VI-C-4-a Blue Crab Spawning Stock Biomass
			VI-C-4-b Penaeid Shrimp Stock Condition
		VI-C-5: Bivalve Molluscs	VI-C-4-c Spiny Crayfish Occurrence
			VI-C-5-a Eastern Oyster Bed Extent and Densities
			VI-C-5-b Hard Clam Bed Extent and Densities
			VI-C-5-c Freshwater Mussels Range and Population Condition
		VI-C-6: Freshwater Invertebrates	VI-C-6-a EPT Index
		VI-C-7: Microbes	VI-C-6-b Invertebrate IBI Index
			VI-C-7-a Zooplankton Community Structure
		VI-C-8: Algae	VI-C-8-a Algal Community Structure
	VI-D: Toxicant Burdens	VI-D-1: Toxicants in Tissue	VI-D-1-a Total Toxicant Body Burdens in Species (TBD)
			VI-D-1-b Mercury in Species (TBD) Tissues
			VI-D-1-c Dioxin in Fish Tissue
			VI-D-1-d Fish Consumption Advisories
			VI-D-1-e Marine Mammal Tissue Contaminants
IX: Species Introductions & Removals	IX-A: Invasive Species	IX-A-4: Amphibian Invasives	IX-A-4-a TBD Species Population Status/Occurrences
		IX-A-5: Estuarine Fish Invasives	IX-A-5-a TBD Species Population Status/Occurrences
		IX-A-6: Freshwater Fish Invasives	IX-A-6-a TBD Species Population Status/Occurrences
		IX-A-7: Mollusc Invasives	IX-A-7-a TBD Species Population Status/Occurrences
		IX-A-9: Crustacean Invasives	IX-A-9-a TBD Species Population Status/Occurrences
		IX-A-10: Aquatic Insect Invasives	IX-A-10-a TBD Species Population Status/Occurrences
		IX-A-11: Aquatic Macrophyte Invasives	IX-A-11-a Eurasian Watermilfoil Population Status/Occurrences
		IX-A-14: Aquatic Microbial Invasives	IX-A-14-a TBD Species Population Status/Occurrences
	IX-B: Vulnerable Species	IX-B-3: Vulnerable Reptiles	IX-B-3a Diamondback Terrapin Range & Population Condition
		IX-B-4: Vulnerable Amphibians	IX-B-4-a Neuse River Waterdog Range & Population Condition
		IX-B-5: Vulnerable Estuarine Fish	IX-B-5-a Atlantic Sturgeon Population Status
		IX-B-6: Vulnerable Freshwater Fish	IX-B-6-a Carolina Madtom Population Status
			IX-B-7-a Triangle Floater Occurrences
			IX-B-7-b Roanoke Slabshell Occurrences
			IX-B-7-c Tar Spiny Mussel Occurrences
		IX-B-7: Vulnerable Molluscs	IX-B-7-d Dwarf Wedge Mussel Occurrences
		IX-B-9: Vulnerable Crustaceans	IX-B-9-a North Carolina Spiny Crayfish Occurrences
		IX-B-10: Vulnerable Aquatic Insects	IX-B-10-a TBD Species Population Status/Occurrences
		IX-B-11: Vulnerable Aquatic Macrophytes	IX-B-11-a TBD Species Population Status/Occurrences



Integrated Monitoring Strategy 1.0: Continuum

- **Independence:** Knowledge of partners monitoring strategies
- **Cooperation:** Taking advantage of common geography, timing
- **Collaboration:** Opportunities to leverage partners' monitoring networks
- **Integration:** Working toward a common set of regional ecosystem objectives

Ecosystem-Based Management Plan 1.0

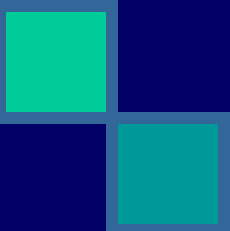
- Staff Interest
- National Estuary Program Interest
- Policy Board Briefing
- STAC Meeting Theme
- Implementation Paper
- **EBM Working Group**
- Proposal to Policy Board

Essential Elements of EBM

- A holistic vision and plan that includes a **comprehensive description** of the A-P system and articulation of multiple management objectives.
- A community that has **effective engagement** of policy makers, managers, scientists, & stakeholders.
- A process that includes **effective adaptive management** to address a changing system.
- A **framework** that includes appropriate authority, implementation area, management institutions, financial resources, and effective communications.



STAC Action Plan: Ecosystem Assessment 1.0

- 
- **Contributors:** APNEP federal, state, local partners (lead = Resource M & A Teams)
 - **Content:** Timely technical information within a decision support system to help answer seven policy-based questions involving ecosystem services: magnitude, extent, trend, cause, source, risk, and solutions
 - **Target Dates:** 2010 (condition), 2011 (diagnosis), and 2012 (forecasts)

APNEP Ecoregions EPA Level IV in NC and TNC in VA



Legend

EPA NC Ecoregions

- Carolina Piedwoods
- Carolina State Belt
- Carolinian Barrier Islands and Coastal Marshes
- Chesapeake-Pamlico Lowlands and Tidal Marshes
- Mid-Atlantic Piedwoods
- Mid-Atlantic Floodplains and Low Terraces
- Northern Outer Piedmont
- Rolling Coastal Plain
- Southeastern Floodplains and Low Terraces
- Southern Outer Piedmont
- Swamps and Pastlands
- Waxic Basins
- Virginian Barrier Islands and Coastal Marshes

TNC Ecoregions

- Chesapeake Bay Lowlands
- Mid-Atlantic Coastal Plain
- Piedmont
- Sub-Basins

0 12.5 25 50 75 100 Miles



Heinz Center's State of the Ecosystem Assessment Format

- Summation Table: What do the most recent data show? Have data values changed over time?
- Part 1: Why is the indicator important?
- Part 2: What does this indicator report?
- Part 3: What do the data show?
- Part 4: Understanding the data (or discussion)
- Part 5: Why can't the entire indicator be reported at this time?
- Technical note (appendix)