APNEP's Progress and Plans for Implementing Ecosystem-Based Management

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Policy Board and Science & Technical Advisory Joint Meeting
Greenville Centre, East Carolina University
24 February 2017

APNEP's Transition to Ecosystem-Based Management

- 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.

APNEP EBM Transition Team

- Policy Board
- Science & Technical Advisory Committee
- Citizens Advisory Committee
- State Planner
- Federal Planner
- EBM Tech Transfer
- Staff

Step 1: Articulate program goals

- Objectives Hierarchy Structure
  - Goal-Objective-Management Action-Step (1994)
  - Goal-Subgoal-Objective-Management Action (2008-2010)
  - Goal-Outcome + Component-Objective-Action (2012)
- Objectives Hierarchy Content
  - Five Goals, 15 Objectives, 49 Actions (1994)
  - Three Goals, 12 Outcomes + 5 Components, 15 Objectives, 58 Actions (2012)

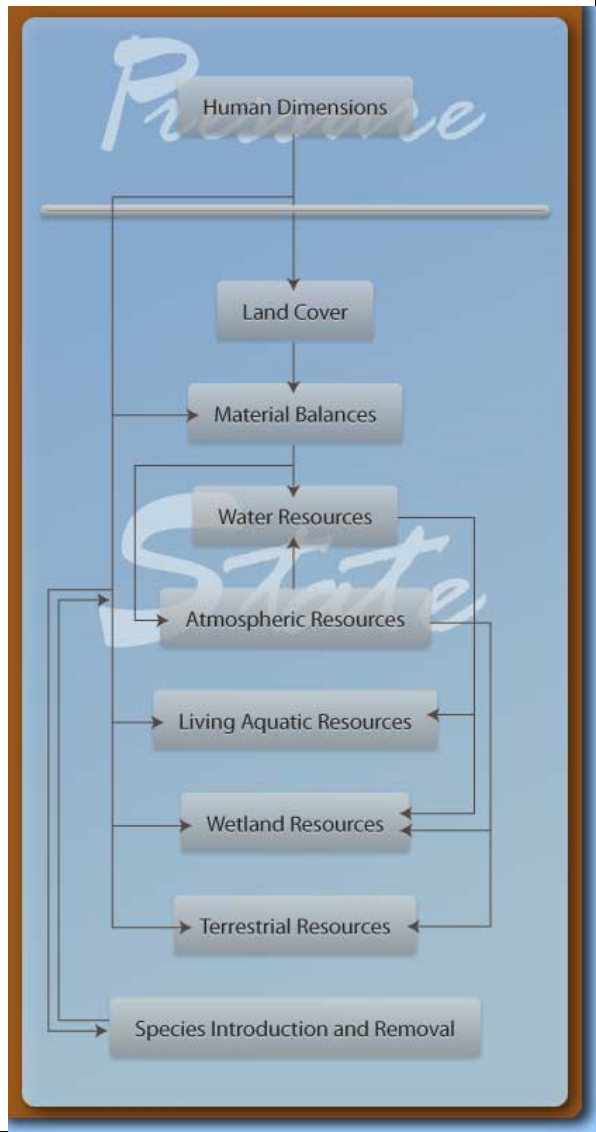
APNEP's Ecosystem Health Goals

- **A region where human communities are sustained by a functioning ecosystem**
- **A region where aquatic, wetland, and upland habitats support viable populations of native species**
- **A region where water quantity and quality maintain ecological integrity**

Step 2: Develop system level model for goal attainment

Ecological management actions (stressor mitigation) can impact multiple ecosystem endpoints

Multiple stressors (including other endpoints) impact directly and indirectly ecosystem endpoints

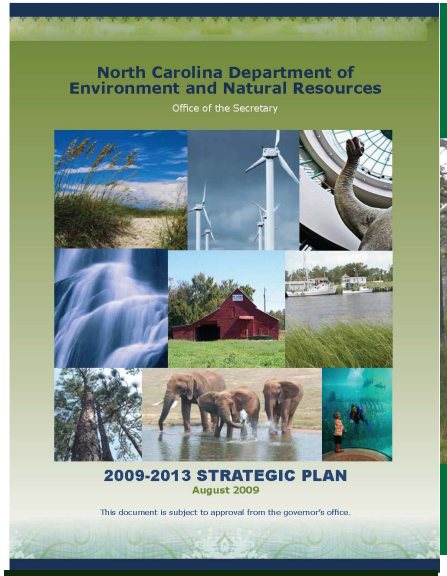


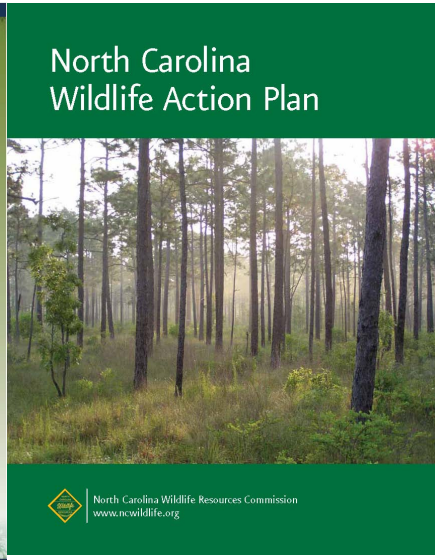
	Goal 1: human communities sustained by functioning system						Goal 2: habitats protected, enhanced, restored, supporting native species							Goal 3: water quantity and quality										
	safe contact	safe consume	support activities	fish/game safe	access protected	sustained harvesting	aquatic community	wetland community	upland community	estuarine habitats	freshwater habitats	upland habitats	non-native	hydrologic regime	nutrients and germs	toxics		identify	protect	restore	preve nt	eotab orate	monit or
biological factors																							
• fauna																							
• manage non-native species introduction and impacts						M-M	M-M	M-M	L-M	L-L	M-L						3		x				
• preserve/protect RTE species							M-M										1		x				
• preserve and restore shellfish communities (reefs)										H-H							1		x	x			
• management of native/non-native grazers (deer)												H-M					1		x				
• management of predators (red wolf, coyote, domestic animals)												L-M					1		x				
• flora																							
• manage non-native species introduction and impacts						M-M	M-M	M-M	M-M	L-L	M-L						4		x				
• preserve/protect RTE species							M-M										1		x				
• preserve and restore submerged aquatic vegetation										H-M/L							1		x	x			
• preserve and restore coastal wetlands										H-M							1		x	x			
• preserve and restore coastal forests																	1		x	x			
• management of native forests, shrub/scrub communities (fire management)												H-M					1		x				
• microorganisms																							
• manage sources and loads of pathogens	H-M	H-M		H-M									L-L				3		x				
• manage introduction/spread of pathogens						M-M	L-L						L-L				1		x				
physical factors																							
• structure																							
• preserve/establish public access to public lands and waters					H-H												1		x				
• manage landuse to minimize conflict/negative impacts on use diversity						H-M											1		x				
• manage conversion of aquatic habitats							H-H			H-H							2		x				
• manage wetland buffer conversion								H-M									1		x				
• preserve wetland migration opportunities								H-M/L									1		x				
• maintain hubs and corridors for green infrastructure									H-M								1		x				
• identify critical conservation areas									H-H			H-H					2	x					
• manage floodplain and riparian area conversion											H-M						1		x				
• manage channel modification											H-H						1		x				
• green infrastructure												H-M					1		x				
• hydrology																							
• MIF adequate to support all desired uses			H-M														1						
• manage consumptive uses of water						H-H											2		x				
• preserve natural hydrographs							H-M	H-M			L-H						2		x				
• temperature																							
manage alteration of natural temperature regimes						L-L					L-H						2		x				
• control modification of riparian vegetation											L-M						1		x				
chemical factors																							
• salinity																							
• pH																							
• nutrients																							
• implement TMDL management for nutrients							M-M				M-M				H-M/L		2		x				
• toxics																							
• manage sources and loads	L-L			H-M		H-H	L-M				L-M					H-M	1		x				
human factors																							
• use objectives																							
• establish appropriate use designation for waters	H-H	H-H		H-H											H-H		4	x					
• establish and implement public access/use plan					H-H												1	x					
• manage potential use conflicts that reduce sustainability of natural capital						H-M											1	x	x				
• manage potential use impacts on habitat diversity and quality							H-M			H-M							2	x	x				
• manage landuse in wetlands and wetland buffers								H-H									1		x				
• identify and control incompatible uses (receiving waters, shipping, recreation, etc.)			H-H														1	x	x				
• land use management (maintain green infrastructure)												H-H					1	x	x	x			
• forestry management												H-H					1		x				
• manage consumptive uses														H-H			1		x				
• management of agricultural pollutant sources															H-M		1		x				
• management of developed land pollutant sources (stormwater)																			x				
• modification of system																							
• establish/implement TMDL for pollutants	H-H	H-H		H-M													2	x	x				
• avoid privatization of public lands and access points					H-M												1	x			x		
• manage conversion of habitats that reduce diversity or productivity										H-M							1		x				
• manage dredging, filling, and water withdraw							H-H										1		x				
• manage hydrology modification			M-H					H-M			H-M						2		x				
• manage permanent conversion of wetland buffers								H-M									1		x		x		
• manage landuse/green infrastructure									H-M								1		x		x		
• manage channel modification											H-H						1		x				
• manage floodplain/riparian land conversion											H-M				H-M		1		x		x		
• manage road development												H-H					1		x				
• manage development												H-H					1		x				
• manage dam construction														M-H			1		x				
• manage flood plain conversion														H-M			1		x		x		
• knowledge																							
• technical understanding of health risks (sources, thresholds)	M-H	H-H		H-H													2	x					
• technical understanding of use thresholds for sustainability					M-M	H-M	M-M										1	x					
• technical understanding of system trajectory and implications for sustainable uses						H-M		H-M		M-M							2	x					
• technical understanding of landuse impacts on wetland function								M-M									1	x					
• technical knowledge of structure-function relationship									M-M	M-M							2	x					
• technical understanding of critical blue infrastructure											M-M						1	x					
• technical understanding of green infrastructure requirements												M-M					1	x					
• technical understanding of non-native species impacts													H-M				1	x					
• technical understanding of MIF requirements			H-H											H-M			1	x					
• tech understanding of TMDLs to meet WQ standards															M-M/L		1	x					
• technical understanding of compound toxicities																H-M	1	x					
• technical understanding of source/route of introduction																H-M	1	x					
• public understanding of monitoring and advisories	H-H	H-H		H-H													3					x	
• public appreciation of the values of natural capital					M-M	M-M/L	M-M	H-M		M-L	M-L						1					x	
• public appreciation of the thresholds for sustainable use			M-M/L		H-M				H-M			M-M					2					x	
• public understanding of actions that negatively impact							H-M										1					x	
• public appreciation of need/methods for control of non-native introduction																	1					x	
• public appreciation of MIF needs														M-L			1					x	
• public appreciation of risks and need for management															M-L/M	M-M	1					x	
• policy understanding of need for monitoring	H-H	H-H		H-H													3					x	
• policy understanding of need for regulation	H-H	H-H	M-H	H-M	M-M	H-L	H-M	H-H	H-M	M-M	M-M		M-L		M-M	H-M	1					x	

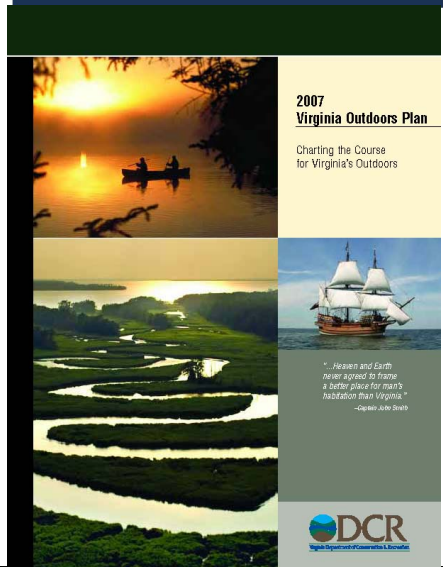
H-H	
H-M	
H-M/L	
H-L	
M-H	
M-M	
M-L	
L-H	
L-M	
L-L	

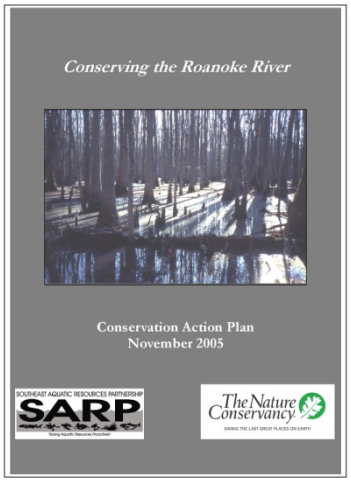
Step 3: Assess current management efforts –identify gaps

- Directed by conceptual models
- Survey of partners' strategic/action plans
  - Specificity and publication date
  - Action extraction
  - Align with APNEP outcomes/strategies
- Interview senior management









Step 4: Implement CCMP

- Fourth CCMP question
- Ten-year horizon
- 58 CCMP actions
- Super-Aggregated into five components
- Aggregated into 15 CCMP objectives

2b. The extent and quality of upland, freshwater, estuarine and near-shore marine habitats fully support biodiversity and ecosystem function

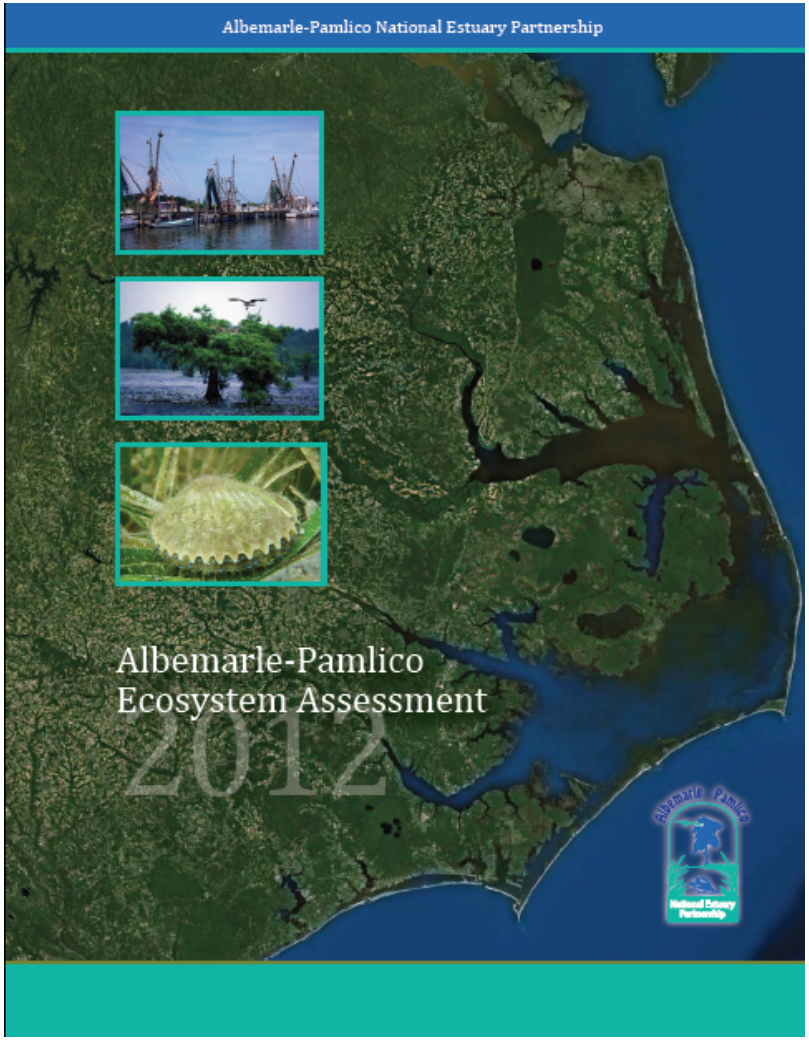
Outcomes	Actions					Action Teams
1a	A1.1	B1.1	C1.1	D1.1	E1.1	Freshwater Habitats and Fish Passage
1b	A1.2	B1.2	C1.2	D1.2	E1.2	Policy & Economics
1c	A2.1	B1.3	C1.3	D1.3	E1.3	Decision Support Tools
1d	A2.2	B1.4	C1.4	D1.4	E2.1	Education & Engagement
1e	A2.3	B1.5	C1.5	D1.5	E2.2	Water Quality Improvements
2a	A2.4	B2.1	C2.1	D2.1		Shorelines
2b	A2.5	B2.2	C2.2	D2.2		Contaminant Management
2c	A3.1	B2.3	C2.3	D2.3		Invasives
3a	A3.2	B2.4	C3.1	D3.1		Restoration Strategies
3b	A3.3	B2.5	C3.2	D3.2		Monitoring Networks
3c		B2.6	C3.3	D3.3		Oysters
3d		B3.1	C4.1			SAV
		B3.2	C4.2			Flows
		B3.3	C4.3			
			C4.4			
			C5.1			
			C5.2			
			C5.3			

Step 5: Develop monitoring program

- Linking candidate indicators to CCMP outcomes
- Indicator-specific monitoring strategies
  - Justification for indicator
  - Goal of sampling/monitoring program
  - Existing sampling/monitoring program
  - Enhanced sampling/monitoring program
  - Reference(s)
- Integrated monitoring strategy

Step 6: Assess performance

- "Interim" regional ecosystem assessment (2012)
  - Select provisional indicators
  - Status & trends from 1995 to present
  - Heinz Center format
- Phase 2 assessment
  - Diagnosis
- Phase 3 assessment
  - Forecasting



APNEP Ecosystem Assessment

Coasts, Sounds, Near Marine: Extent & Pattern

- *Phragmites australis*
  - Why Is the Extent of the Wetland Plant Species *Phragmites australis* Important?
  - What Will This Indicator Report?
  - What Do the Data Show?
  - Why Can't This Entire Indicator Be Reported at This Time?
  - Discussion
  - Technical Notes

Assessment Planning

- "The greatest challenge in developing a large-scale biogeographic assessment is the synthesis and subsequent analysis of spatial data collected at different scales for varied objectives."

  Source: NOAA 2003, citing Gotway and Young 2002

Bioregional Assessment Questions

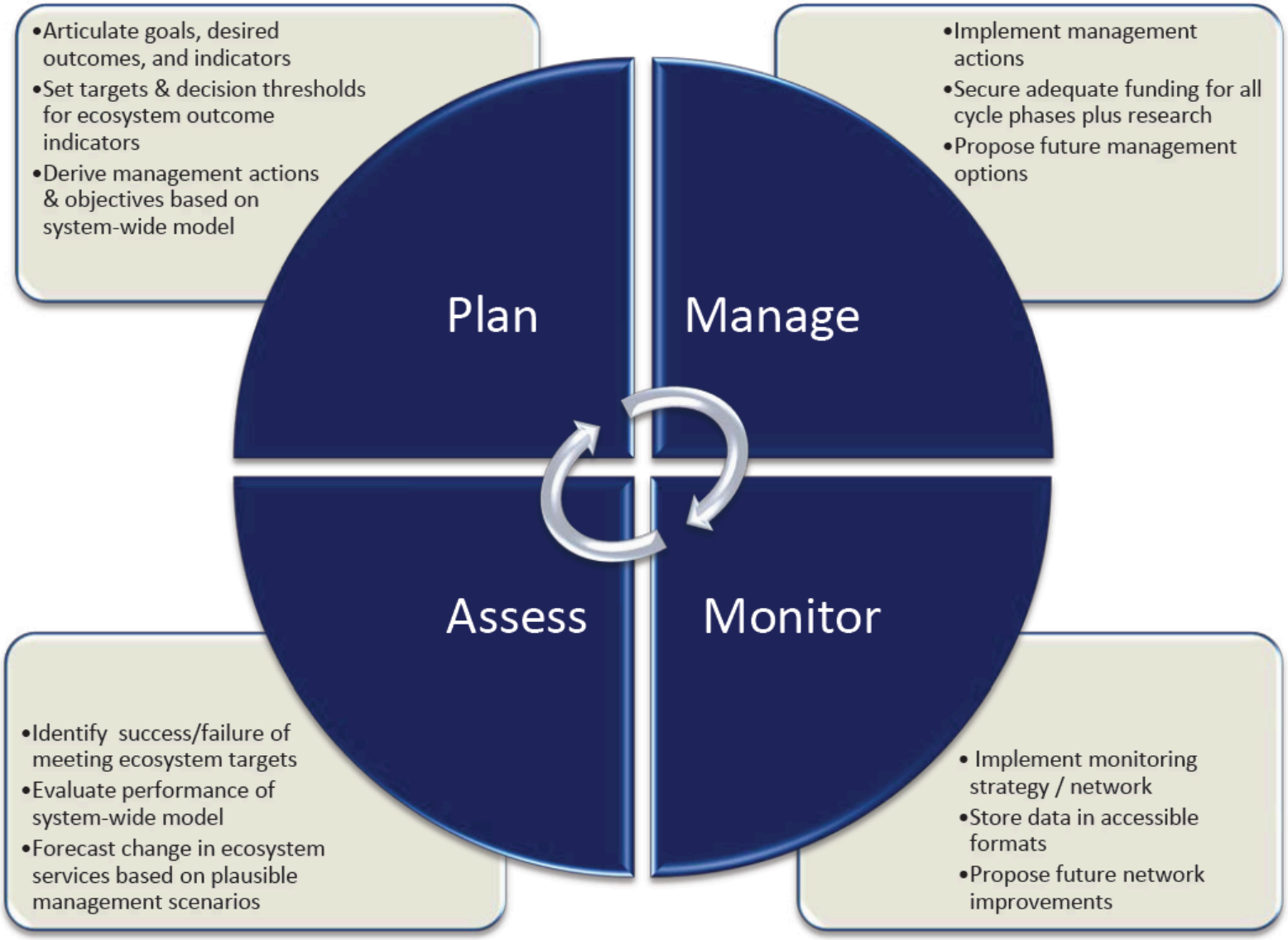
- What were historic ecological, social, and economic conditions, trends, and variability?
- What are current ecological, social, and economic conditions?
- What are trends and risks under current policies and management?
- What policy choices will achieve ecological sustainability consistent with social well-being?
- What are the implications of these choices?

Source: Erman (1999)

Step 7: Manage adaptively

- Most difficult step?
- Senior management engagement
- Trigger levels in plan

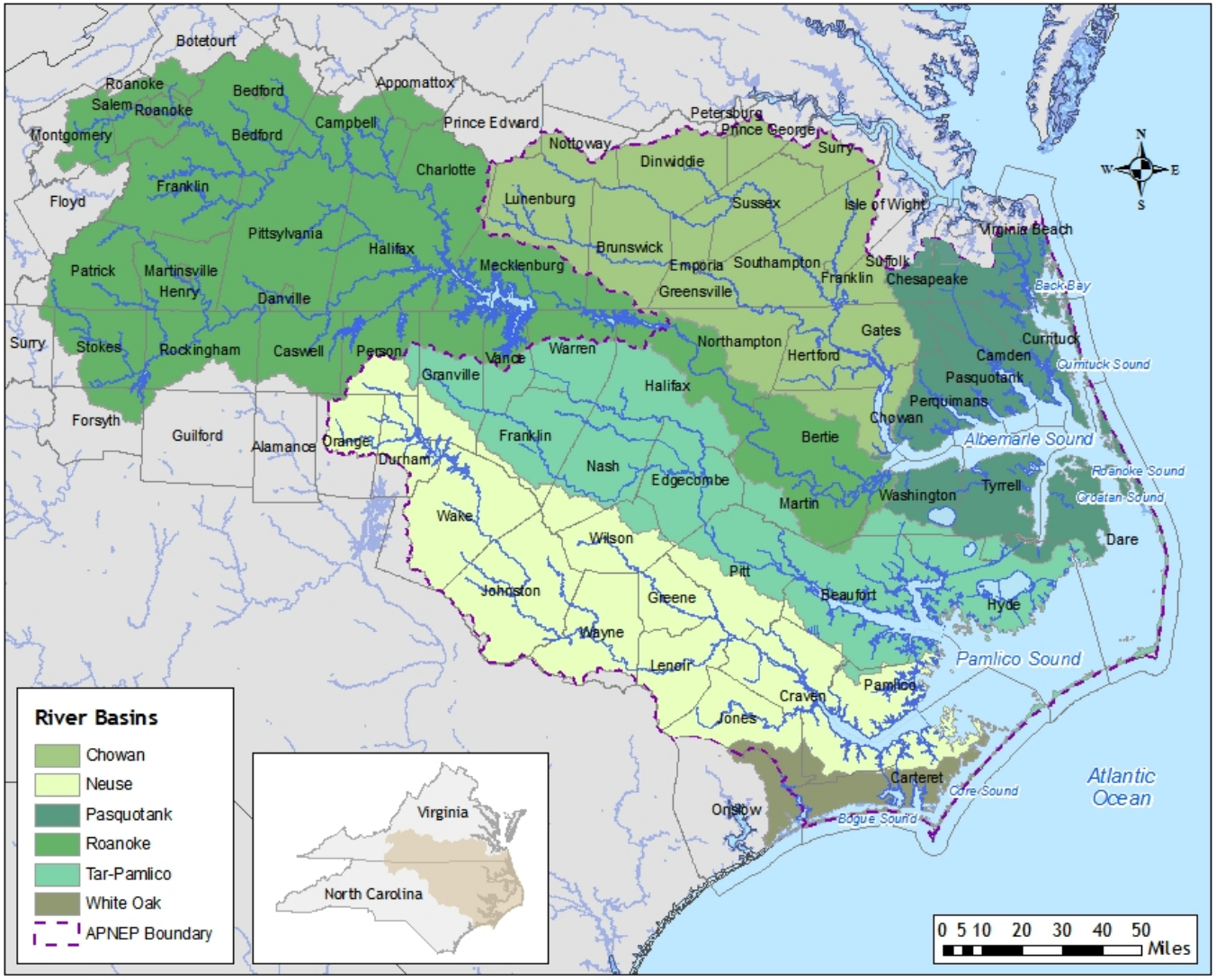
Figure 2: APNEP's adaptive management cycle.

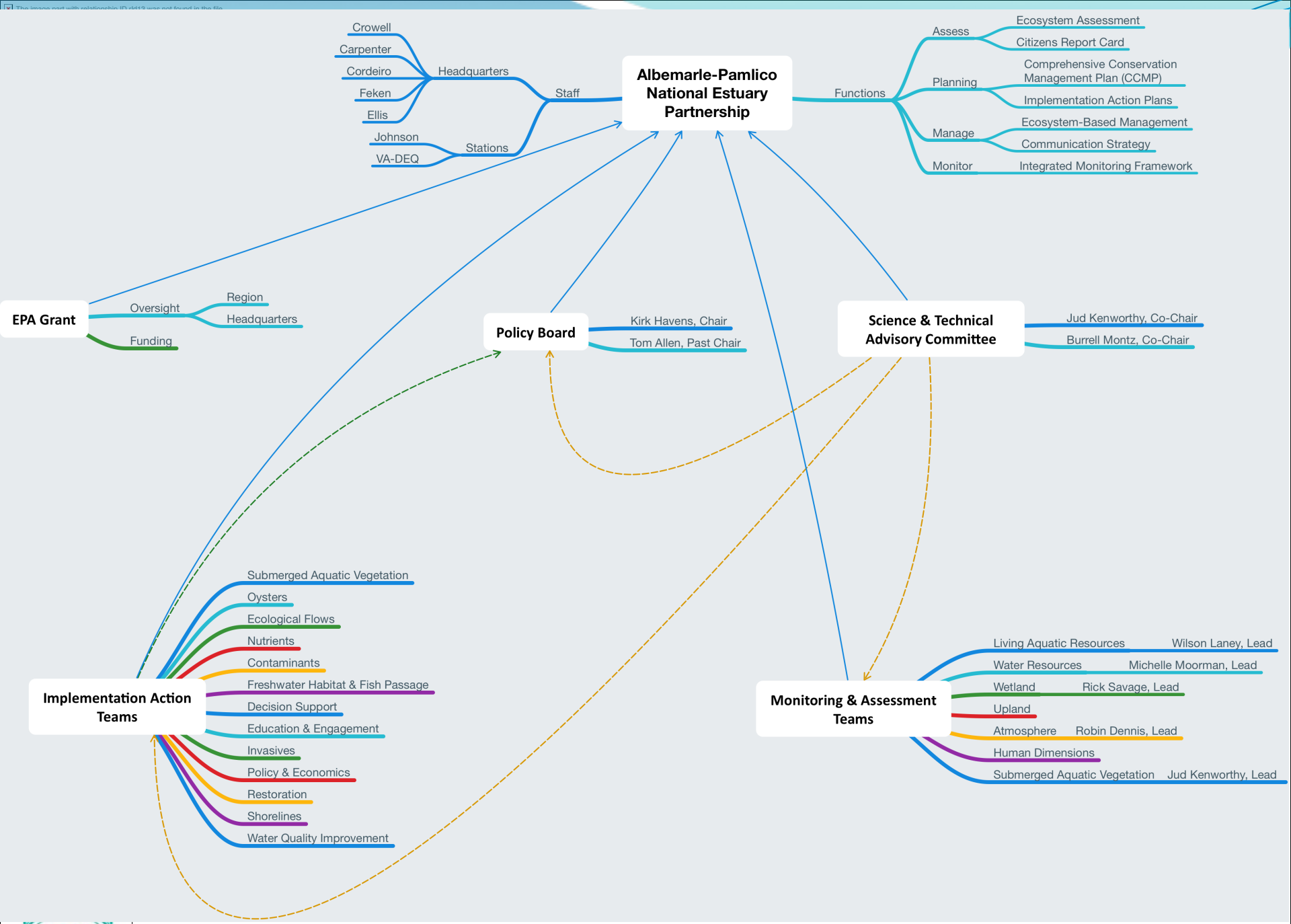


Indicator Planning Decisions

- **What indicator(s) map to each environmental outcome?**
- **What are the fair, good, and excellent health target values for each ecosystem outcome indicator?**
- **What is the expected trajectory of an indicator value, based on how CCMP actions are implemented?**
- **What is the "trigger" value for a given interval since action steps are implemented, outside of which means the system is not behaving as forecast and change in business (e.g., research, revised action step, partner commitment) is required?**

APNEP Implementation Area and Management Institutions



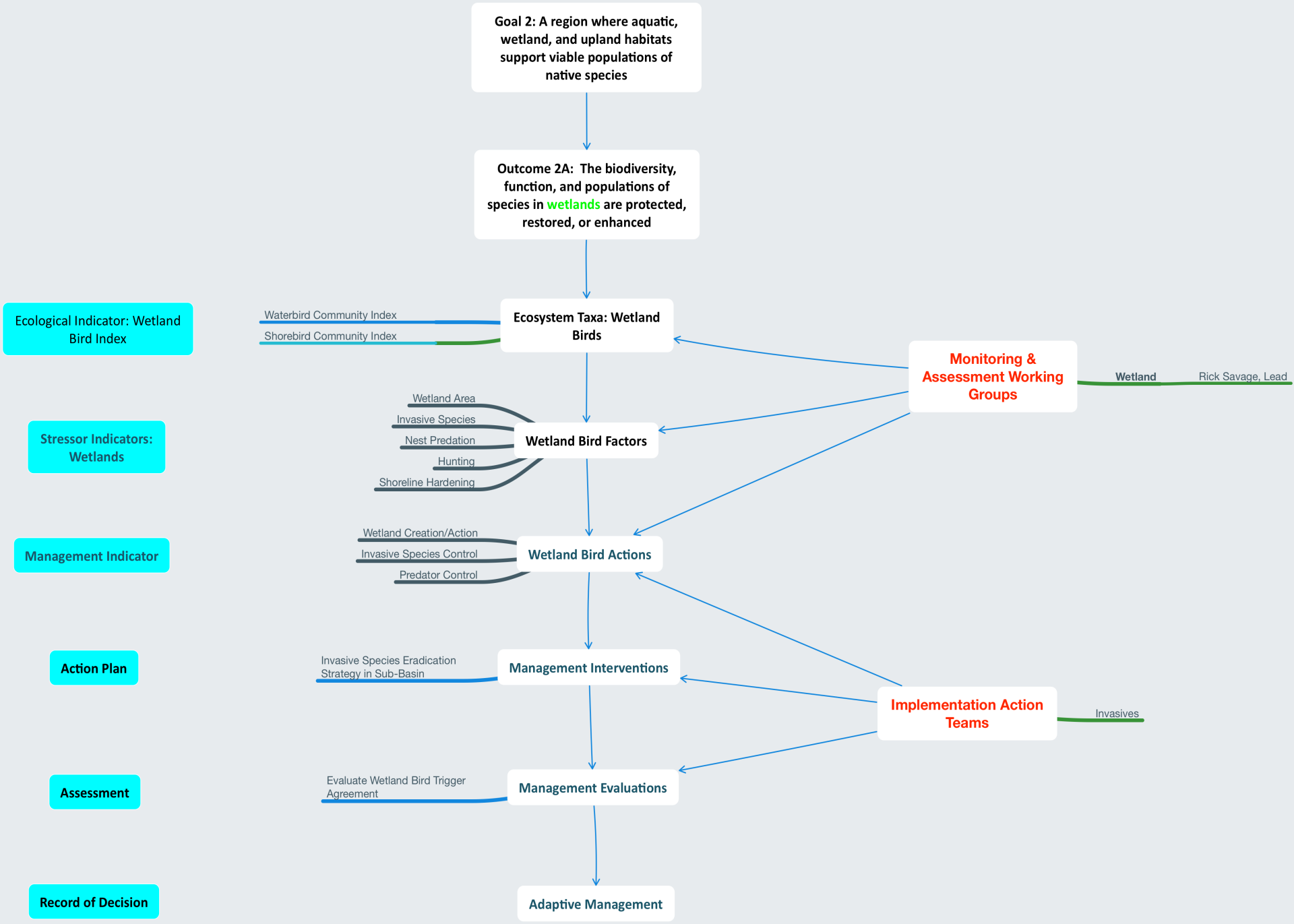

Albemarle-Pamlico National Estuary Partnership
Staff
Headquarters
Crowell
Carpenter
Cordeiro
Feken
Ellis
Stations
Johnson
VA-DEQ
Functions
Assess
Ecosystem Assessment
Citizens Report Card
Planning
Comprehensive Conservation Management Plan (CCMP)
Implementation Action Plans
Manage
Ecosystem-Based Management
Communication Strategy
Monitor
Integrated Monitoring Framework
EPA Grant
Oversight
Region
Headquarters
Funding
Policy Board
Kirk Havens, Chair
Tom Allen, Past Chair
Science & Technical Advisory Committee
Jud Kenworthy, Co-Chair
Burrell Montz, Co-Chair
Implementation Action Teams
Submerged Aquatic Vegetation
Oysters
Ecological Flows
Nutrients
Contaminants
Freshwater Habitat & Fish Passage
Decision Support
Education & Engagement
Invasives
Policy & Economics
Restoration
Shorelines
Water Quality Improvement
Monitoring & Assessment Teams
Living Aquatic Resources
Wilson Laney, Lead
Water Resources
Michelle Moorman, Lead
Wetland
Rick Savage, Lead
Upland
Atmosphere
Robin Dennis, Lead
Human Dimensions
Submerged Aquatic Vegetation
Jud Kenworthy, Lead

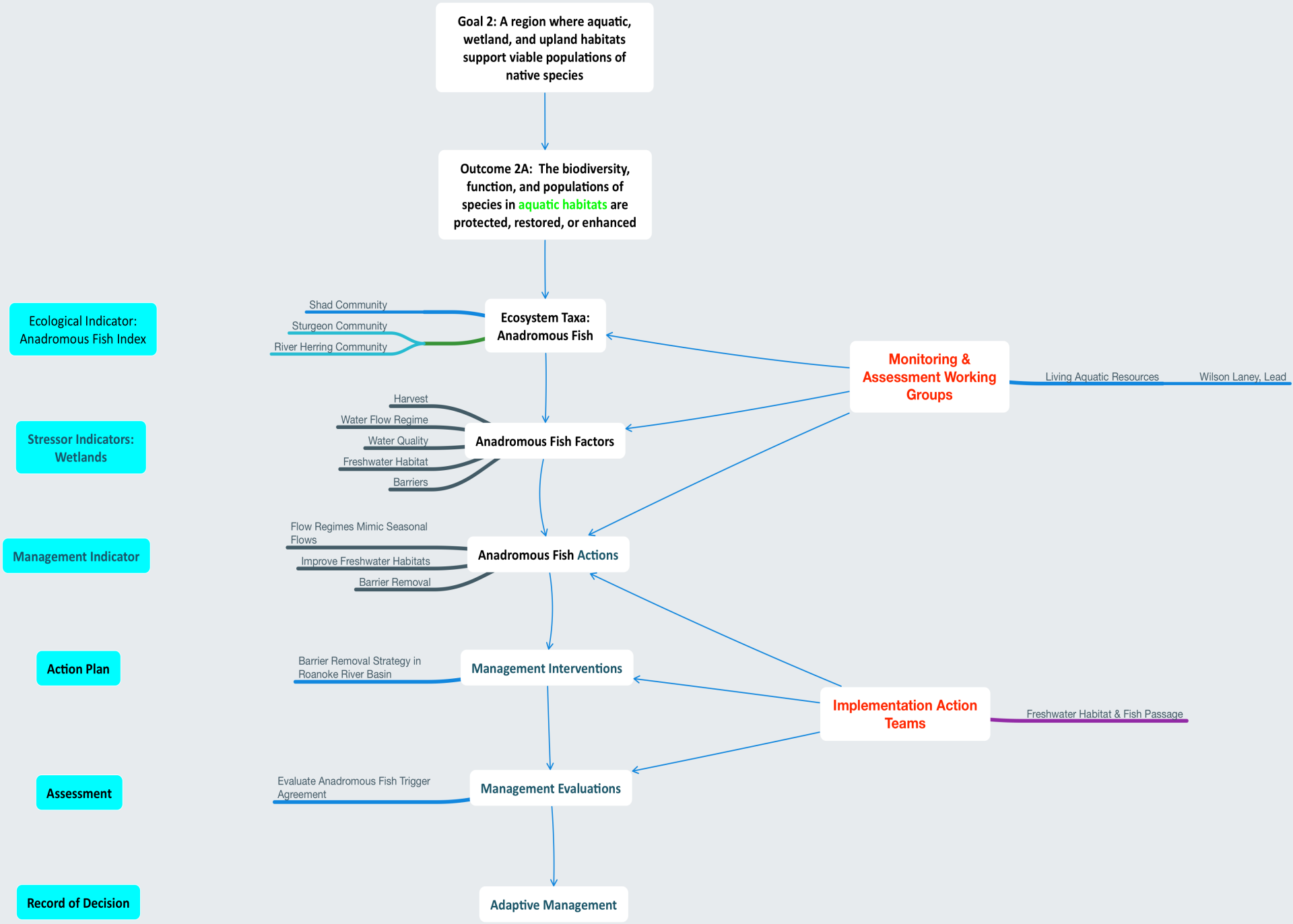
APNEP Deliverables 2017-2018

- Regional Ecosystem Assessment 1.1
- Comprehensive Conservation & Management Plan (CCMP) 2.1
  - Indicator Specification & Targets 1.1
  - Ecosystem-Based Management (EBM) Plan 1.1
- Action Team Implementation Plans 1.0
- Integrated Monitoring Strategy 1.0
  - Indicator Specification 1.1
- Regional Ecosystem Model 1.0

CCMP's Four Questions

- **What is a healthy Albemarle-Pamlico Estuarine System?**
- **What is the status of Albemarle-Pamlico Estuarine System?**
- **What are the biggest threats to Albemarle-Pamlico Estuarine System?**
- **What actions should be taken that will move us from where we are today to a healthier Albemarle-Pamlico Sounds by 2022?**


Goal 2: A region where aquatic, wetland, and upland habitats support viable populations of native species
Outcome 2A: The biodiversity, function, and populations of species in wetlands are protected, restored, or enhanced
Ecological Indicator: Wetland Bird Index
Waterbird Community Index
Shorebird Community Index
Ecosystem Taxa: Wetland Birds
Monitoring & Assessment Working Groups
Wetland
Rick Savage, Lead
Stressor Indicators: Wetlands
Wetland Area
Invasive Species
Nest Predation
Hunting
Shoreline Hardening
Wetland Bird Factors
Management Indicator
Wetland Creation/Action
Invasive Species Control
Predator Control
Wetland Bird Actions
Action Plan
Invasive Species Eradication Strategy in Sub-Basin
Management Interventions
Implementation Action Teams
Invasives
Assessment
Evaluate Wetland Bird Trigger Agreement
Management Evaluations
Record of Decision
Adaptive Management


Goal 2: A region where aquatic, wetland, and upland habitats support viable populations of native species
Outcome 2A: The biodiversity, function, and populations of species in aquatic habitats are protected, restored, or enhanced
Ecological Indicator: Anadromous Fish Index
Shad Community
Sturgeon Community
River Herring Community
Ecosystem Taxa: Anadromous Fish
Monitoring & Assessment Working Groups
Living Aquatic Resources
Wilson Laney, Lead
Stressor Indicators: Wetlands
Harvest
Water Flow Regime
Water Quality
Freshwater Habitat
Barriers
Anadromous Fish Factors
Management Indicator
Flow Regimes Mimic Seasonal Flows
Improve Freshwater Habitats
Barrier Removal
Anadromous Fish Actions
Action Plan
Barrier Removal Strategy in Roanoke River Basin
Management Interventions
Implementation Action Teams
Freshwater Habitat & Fish Passage
Assessment
Evaluate Anadromous Fish Trigger Agreement
Management Evaluations
Record of Decision
Adaptive Management

On Course?