Role of APNEP's Invasives Action Team

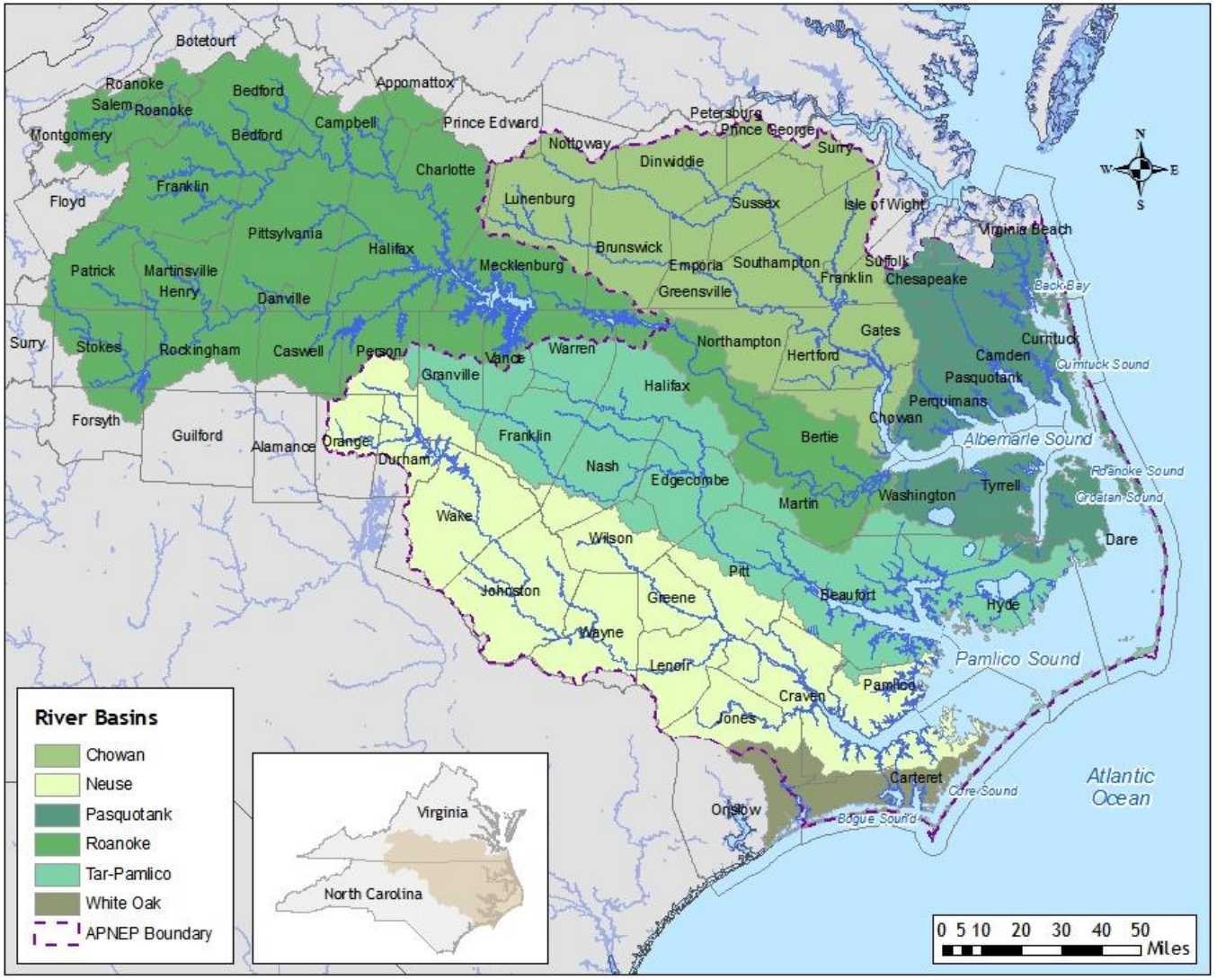
Dean Carpenter
Albemarle-Pamlico National Estuary Partnership

Invasives Action Team Kickoff Workshop
Imperial Centre for Arts and Sciences
24 January 2017

APNEP Mission

"To identify, restore, and protect the significant resources of the Albemarle-Pamlico estuarine system."

APNEP Implementation Area and Management Institutions



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)

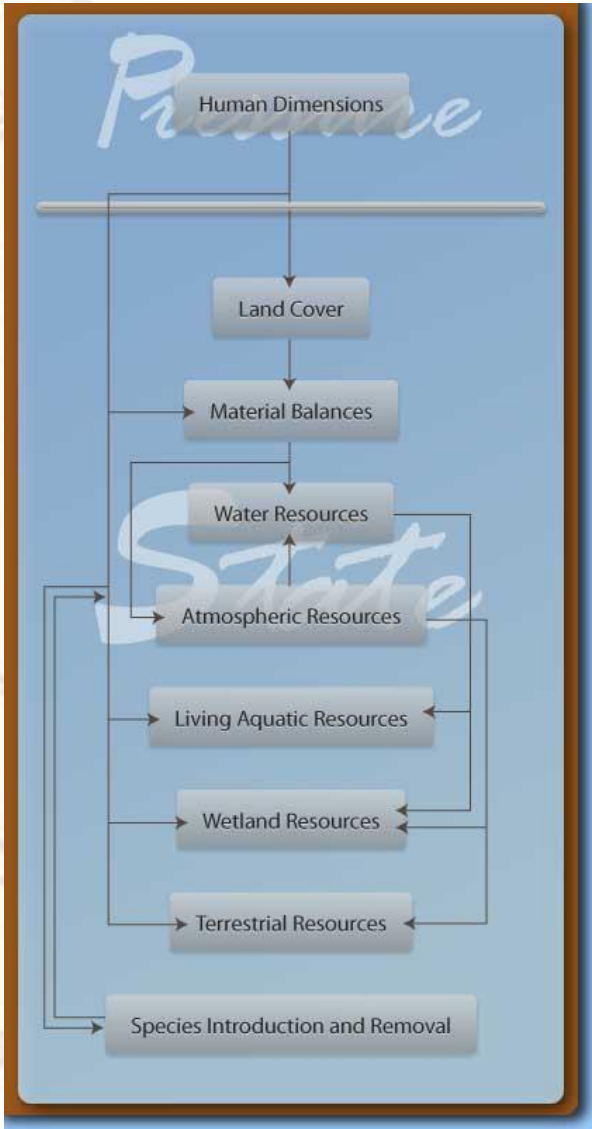
APNEP's Ecosystem Health Goals

- **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**

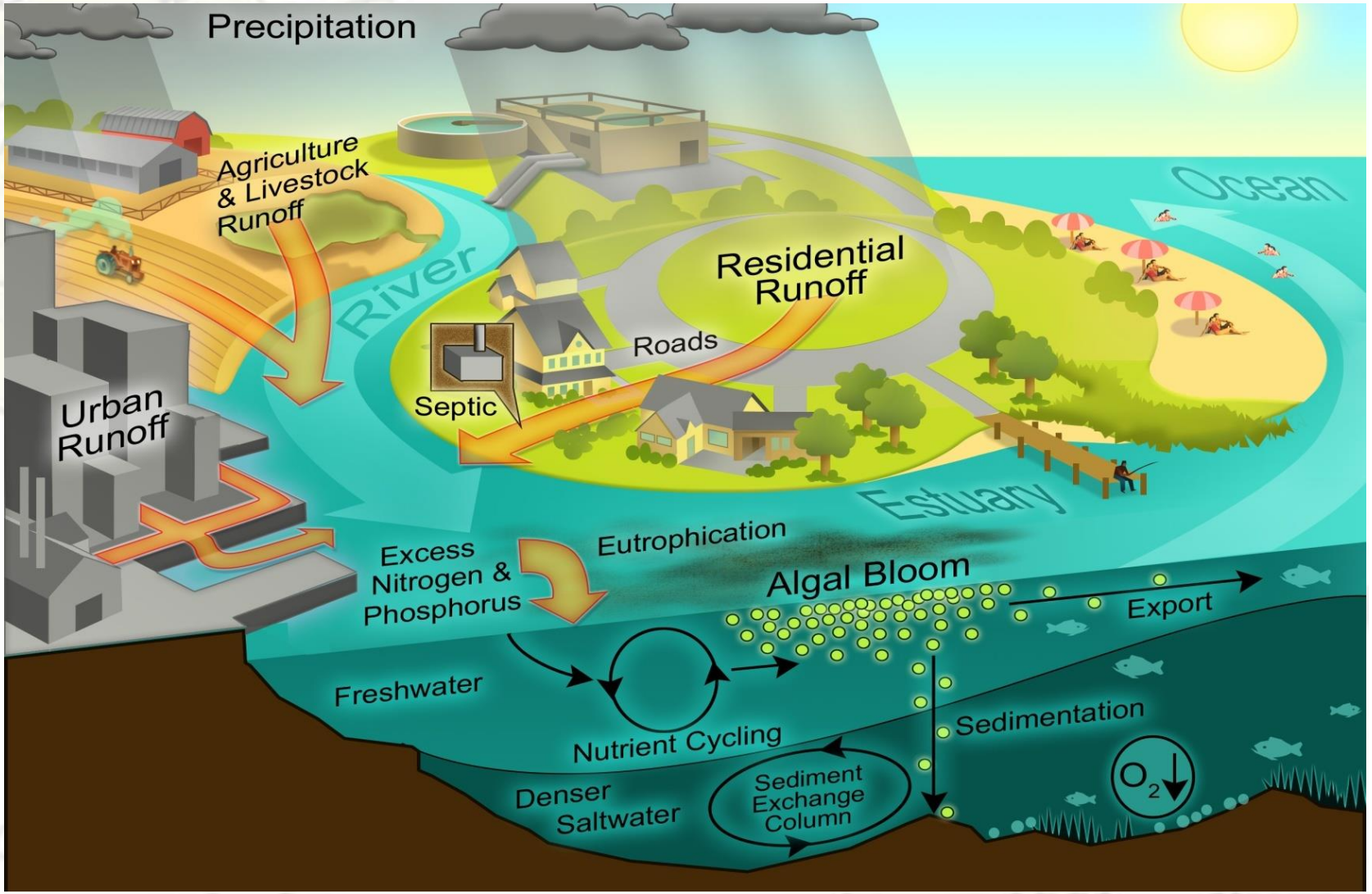
Step 2: Develop system level model for goal attainment

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

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



Conceptual Model of Nutrient Cycle



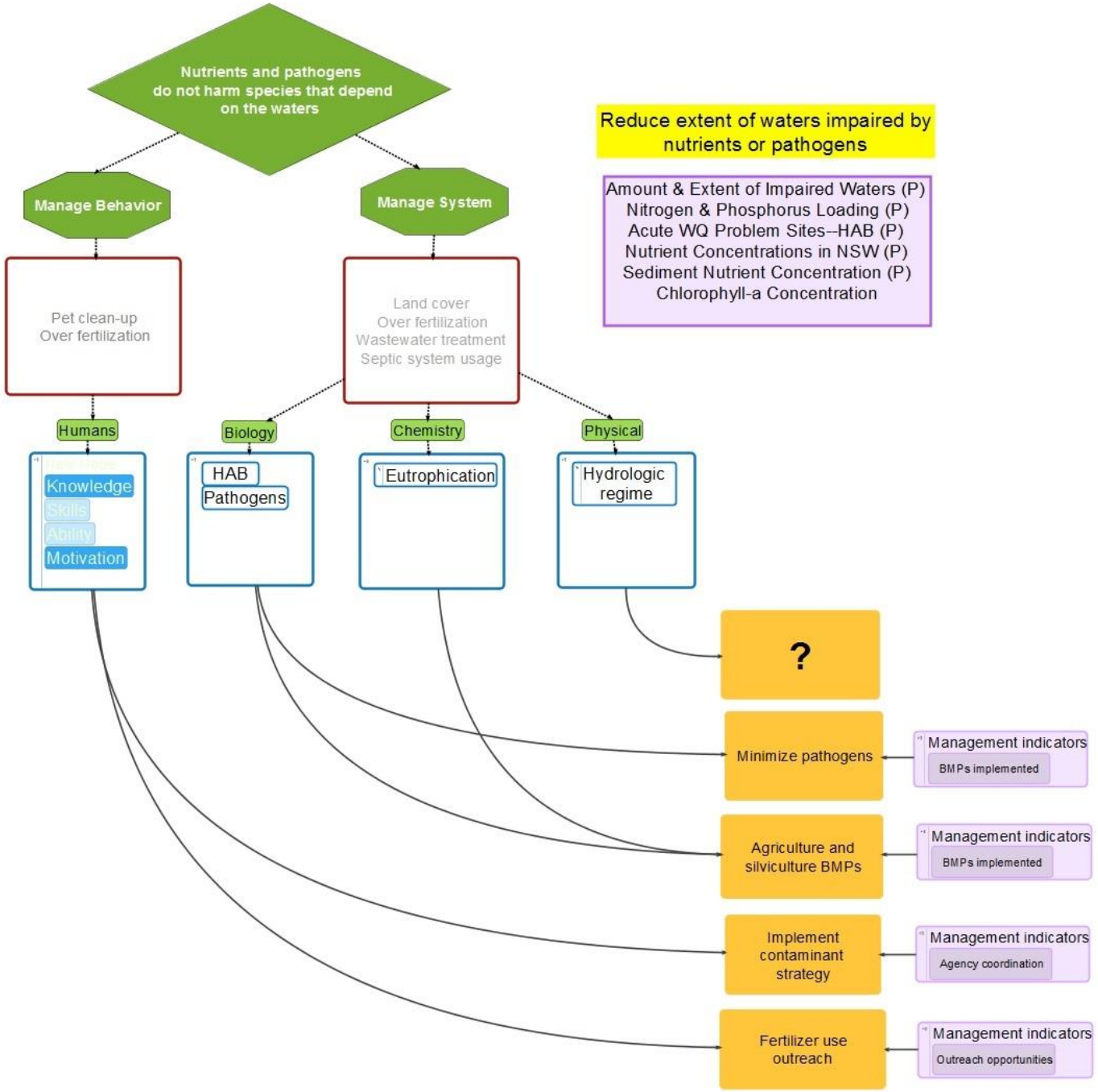
Modified from H. Paerl

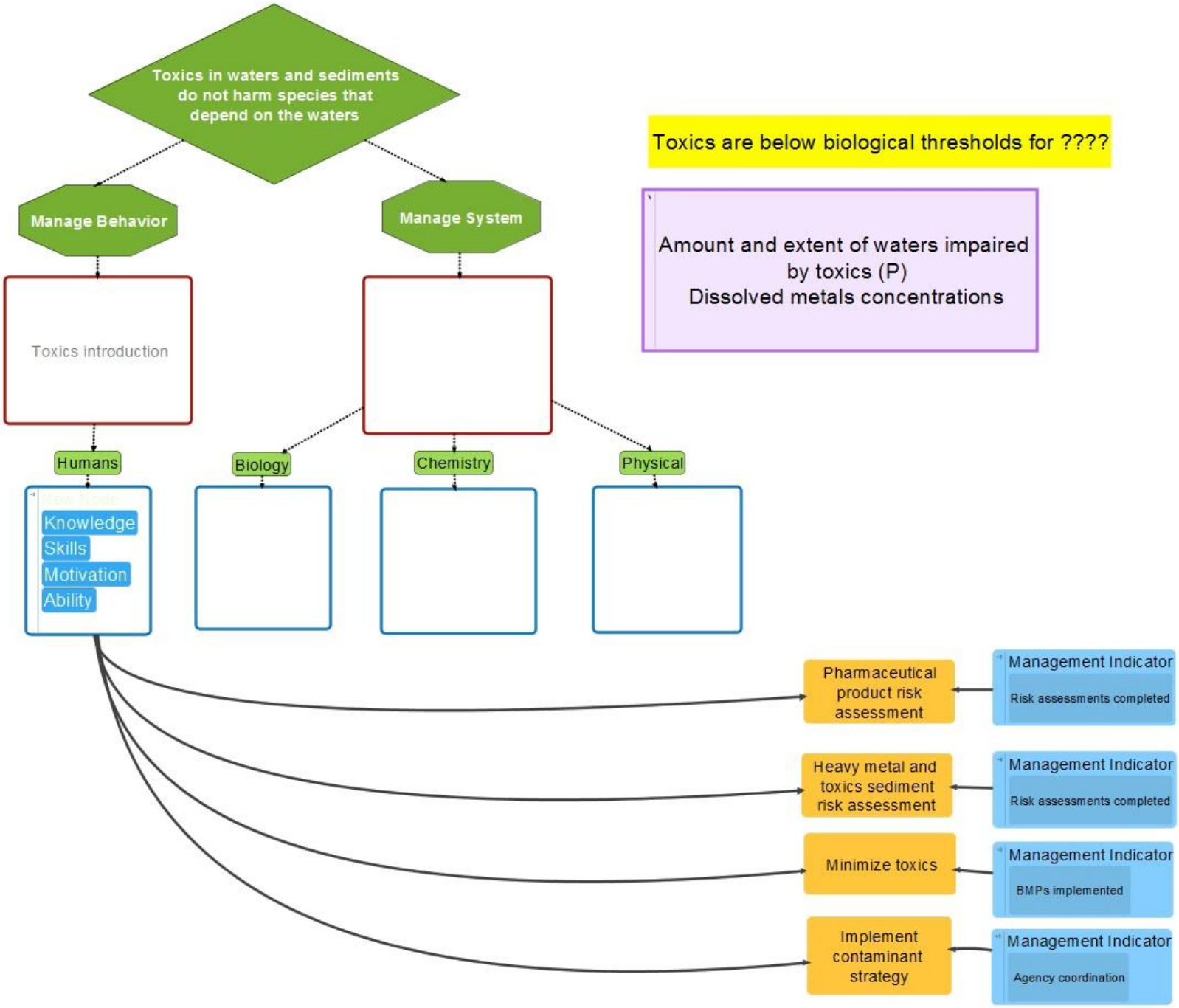
Outcome: Nutrients and pathogens do not harm the species that depend on the waters

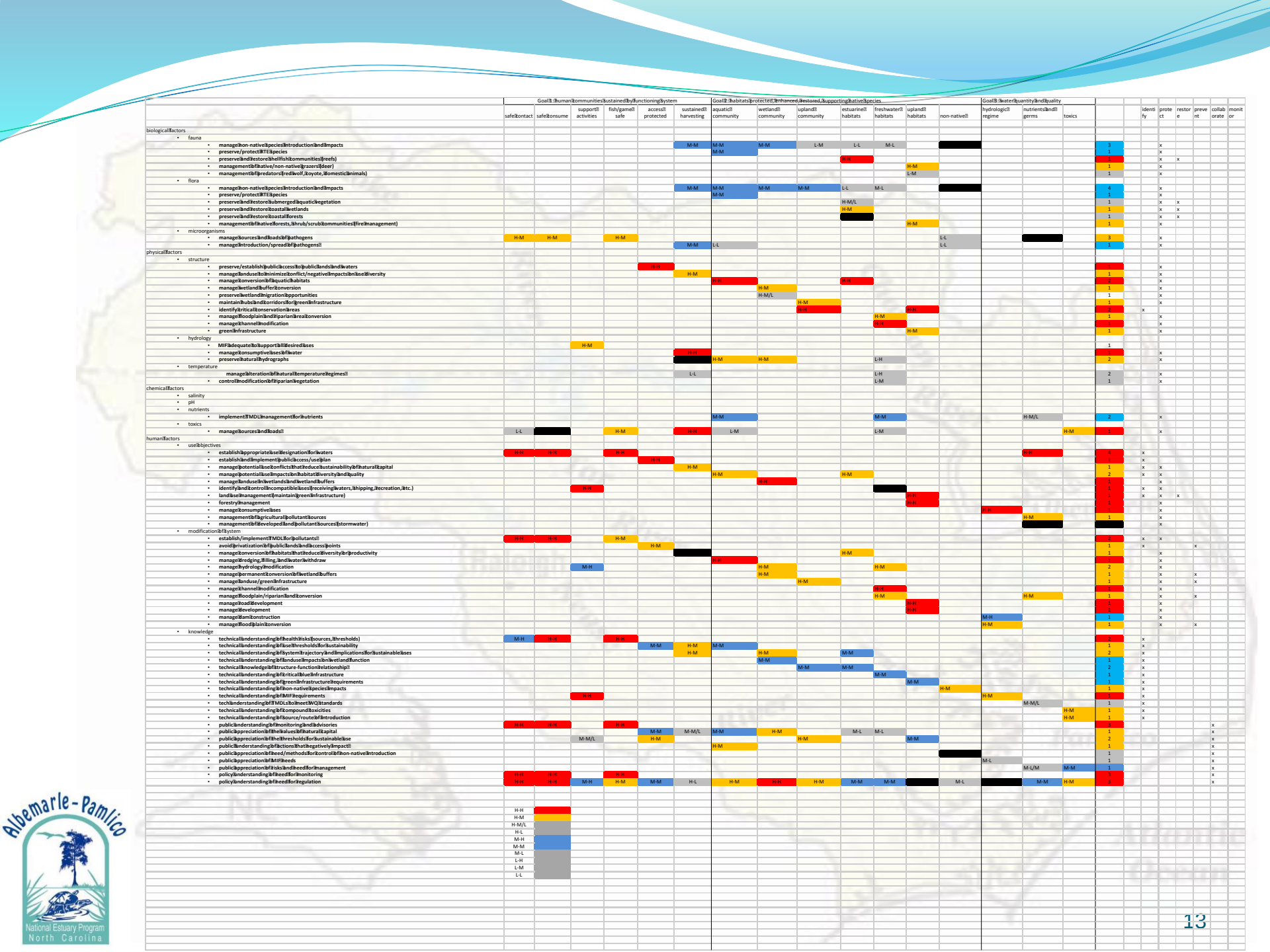
- ***Biological Factors***
  - ***Fauna***
  - ***Flora***
  - ***Microorganisms***
    - **pathogen source control**
      - **human (septic)**
      - **animal (pasture, CAFO manure management)**
      - **wildlife population (?)**
- ***Physical Factors***
  - ***Structure***
  - ***Hydrology***
  - ***Temperature***

Outcome: Nutrients and pathogens do not harm the species that depend on the waters

- ***Chemical Factors***
  - ***Salinity***
  - ***pH***
  - ***Nutrients***
    - **Load controls for nitrogen and phosphorus (air deposition, runoff, groundwater, point source)**
- ***Human Factors***
  - ***Use objectives***
    - **Management of agricultural pollutant sources**
    - **Management of developed land pollutant sources (stormwater)**
    - **Water body use designation (WQ standard development)**
  - ***Modification of system***
    - **Land-use management (particularly riparian lands)**
  - ***Knowledge***
    - **Technical understanding of Contaminant Management Strategies to meet WQ standards**
    - **Public appreciation of risks and need for management**
    - **Policy appreciation of regulatory needs**

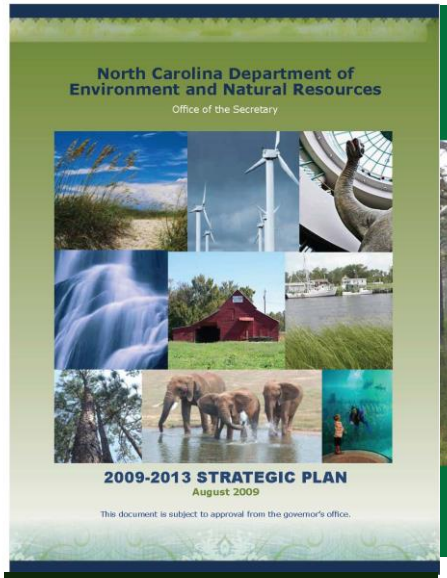

Nutrients and pathogens do not harm species that depend on the waters
Reduce extent of waters impaired by nutrients or pathogens
Amount & Extent of Impaired Waters (P)
Nitrogen & Phosphorus Loading (P)
Acute WQ Problem Sites--HAB (P)
Nutrient Concentrations in NSW (P)
Sediment Nutrient Concentration (P)
Chlorophyll-a Concentration
Manage Behavior
Manage System
Pet clean-up
Over fertilization
Land cover
Over fertilization
Wastewater treatment
Septic system usage
Humans
Biology
Chemistry
Physical
Knowledge
Skills
Ability
Motivation
HAB
Pathogens
Eutrophication
Hydrologic regime
?
Minimize pathogens
Management indicators
BMPs implemented
Agriculture and silviculture BMPs
Management indicators
BMPs implemented
Implement contaminant strategy
Management indicators
Agency coordination
Fertilizer use outreach
Management indicators
Outreach opportunities

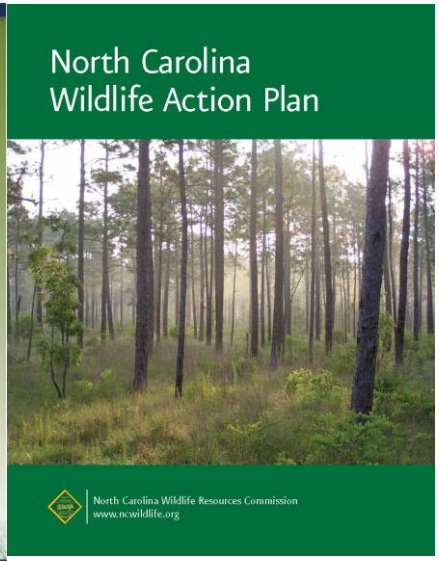

Toxics in waters and sediments do not harm species that depend on the waters
Manage Behavior
Manage System
Toxics introduction
Humans
Biology
Chemistry
Physical
Knowledge
Skills
Motivation
Ability
Toxics are below biological thresholds for ????
Amount and extent of waters impaired by toxics (P)
Dissolved metals concentrations
Pharmaceutical product risk assessment
Management Indicator
Risk assessments completed
Heavy metal and toxics sediment risk assessment
Management Indicator
Risk assessments completed
Minimize toxics
Management Indicator
BMPs implemented
Implement contaminant strategy
Management Indicator
Agency coordination

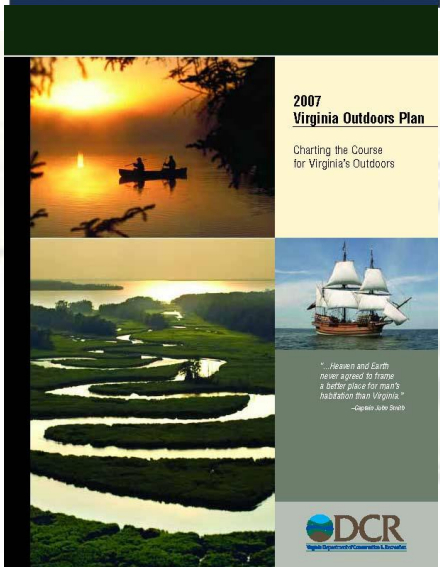

Goal 1: human communities sustained by functioning system
Goal 2: habitats protected, enhanced, restored, supporting native species
Goal 3: water quantity and quality
safe contact
safe consume
support activities
fish/game safe
access protected
sustained harvesting
aquatic community
wetland community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

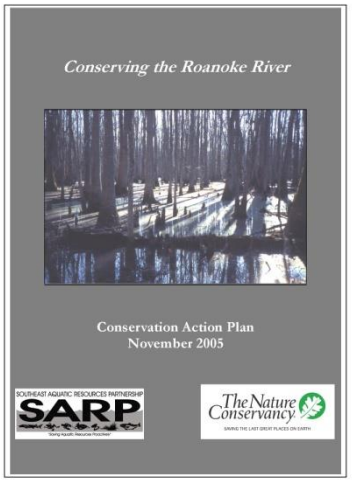
EBM Step 3: Assess current management efforts –identify gaps

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





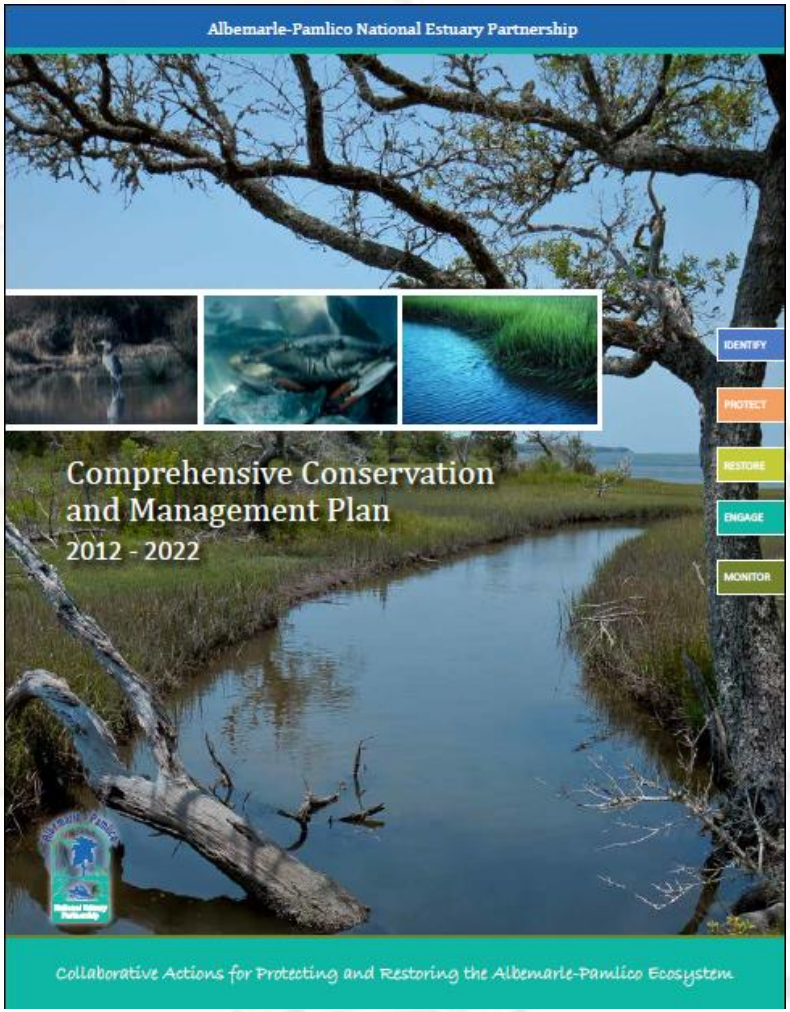




Albemarle-Pamlico National Estuary Program North Carolina

Implement CCMP

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



APNEP CCMP Action Teams

- highlighting indicates individual action team responsibilities for program actions and outcomes

Outcomes		Actions				Workgroups
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 Imnprovements
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			Public Access
			C4.4			
			C5.1			
			C5.2			
			C5.3			

Invasives Contribution

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		Flows
3c		**B2.6**	C3.3	D3.3		Oysters
3d		B3.1	C4.1			SAV
		B3.2	C4.2			
		B3.3	C4.3			
			C4.4			
			C5.1			
			C5.2			
			C5.3			

Invasive Team Actions

- **Action A2.1**: Facilitate the development of protocols and conduct rapid assessments to determine presence and potential threat of invasive species. Aquatic and terrestrial invasive species can cause significant ecological damage. The timely identification and assessment of invasive species threats can ultimately result in cost-effective management if addressed before threshold levels are reached.
- **Action B2.6**: Minimize and rapidly respond to the introduction of invasive species through the development and implementation of integrated prevention and control strategies. Management strategies include education of the public and actions to prevent introduction of invasive species. Existing populations of invasive species will be managed to prevent further encroachment into natural habitats.

Invasive Team Actions

- **Action C3.1**: Develop and refine integrated invasive species eradication and control strategies. Invasive species that adversely impact native populations must be systematically removed. A restoration strategy for habitats populated by invasive species will be comprehensive and consider the natural processes of all species within the ecosystem.
- **Action D1.3**: Coordinate outreach and engagement efforts regarding the impacts of invasive species. Effective outreach and engagement is an important part of any integrated invasive species management effort. There are many ways citizens can help limit the spread of invasive species and informed volunteers can report on the presence and spread of these organisms.

APNEP CCMP Outcomes

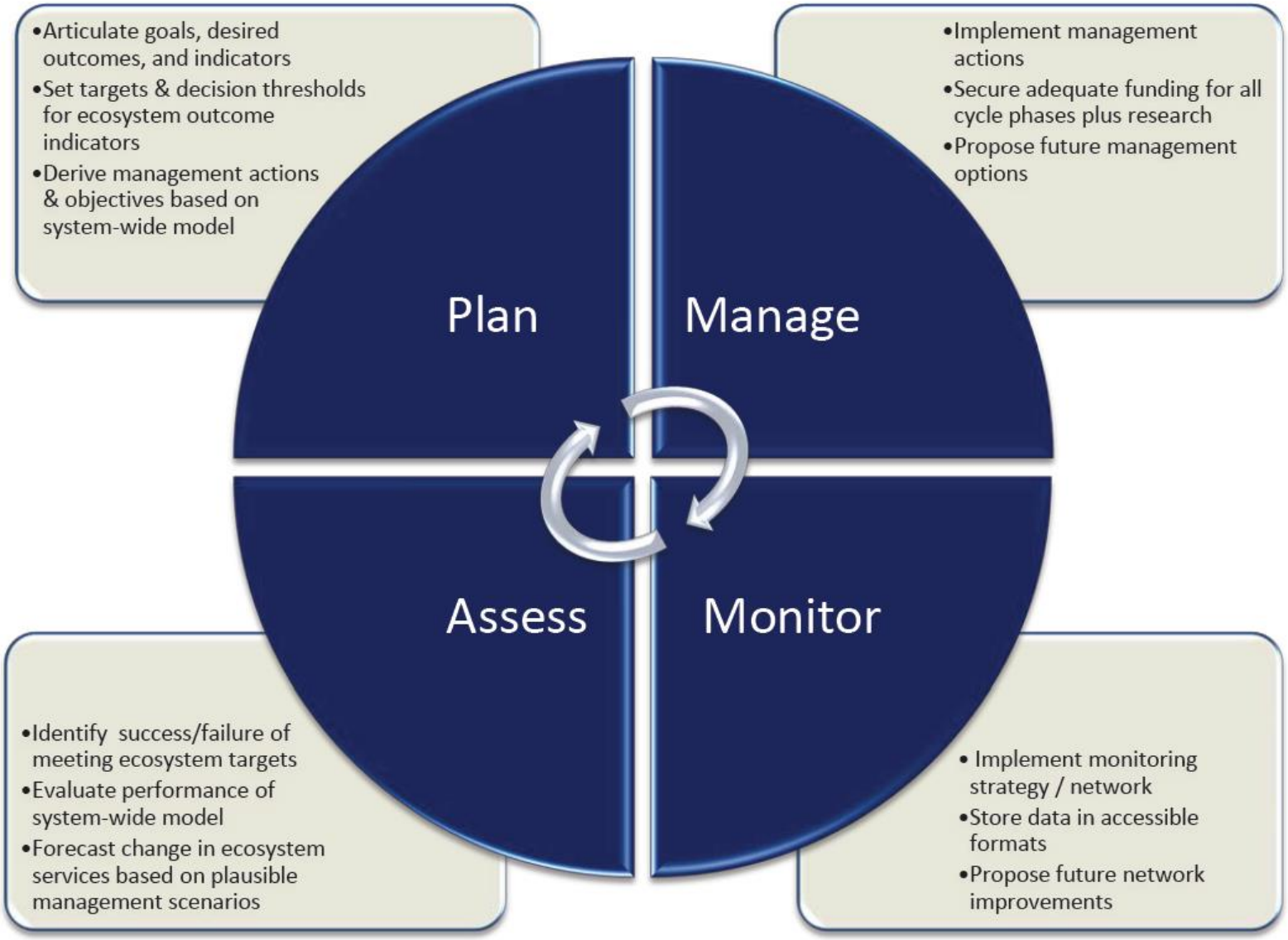
- highlighting indicates actions and teams responsible for each outcome
- actions are color-coded to indicate the responsible teams

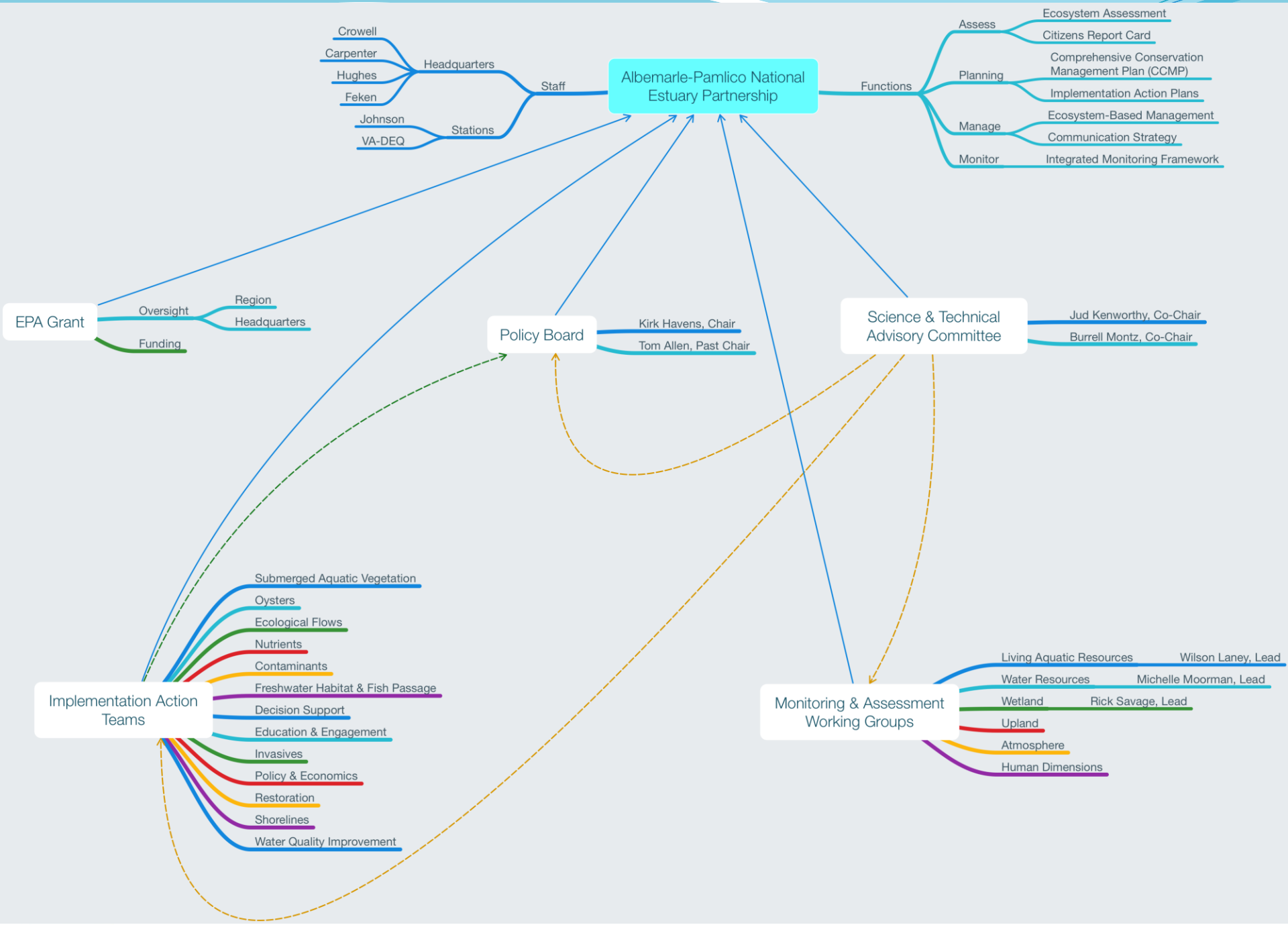
Outcomes	Actions					Workgroups
1a	A1.1	B1.1	C1.1	D1.1	E1.1	Freshwater Habitats and Fish Passage
1b	A1.2	B1.2	C1.2	D1.2	E1.2	Policy & Economics
1c	A2.1	B1.3	C1.3	D1.3	E1.3	Decision Support Tools
1d	A2.2	B1.4	C1.4	D1.4	E2.1	Education & Engagement
1e	A2.3	B1.5	C1.5	D1.5	E2.2	Water Quality Imnprovements
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			Public Access
			C4.4			
			C5.1			
			C5.2			
			C5.3			

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

Outcomes	Actions					Workgroups
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 Imnprovements
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			

Figure 2: APNEP's adaptive management cycle.




Albemarle-Pamlico National Estuary Partnership
Staff
Headquarters
Crowell
Carpenter
Hughes
Feken
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 Working Groups
Living Aquatic Resources
Wilson Laney, Lead
Water Resources
Michelle Moorman, Lead
Wetland
Rick Savage, Lead
Upland
Atmosphere
Human Dimensions

Policy Learning Factors

- Importance participants ascribe to process
- How participants are engaged
- How scientific conflict and uncertainty are managed

Beem B. 2006. Planning to learn: blue crab policymaking in the Chesapeake Bay. Coast Manage 34(2):167-182.

Cooperative Planning: Roles and Responsibilities

- Conventional consultative process
- Non-governmental stakeholders identify priorities

Safford TG, ML Carlson, ZH Hart. 2009. Stakeholder collaboration and organizational innovation in the planning of the Deschutes Estuary Feasibility Study. Coast Manage 37(6):514-528.

New Invasives in APNEP Region

- The invasive Australian jellyfish, *Phyllorhiza punctata*, first reported in great quantities in the Gulf of Mexico in 2000, has made a vigorous reappearance this summer in waters from southwestern Louisiana to Morehead City, North Carolina. (Dauphin Island Sea Lab, 17 August 2007)

Collaborative Invasives Projects in A-P

- Mid-Atlantic Regional Panel on Aquatic Nuisance Species (ANS)
- NC Aquatic Weed Control Council (2006)
- NC Invasive Species Committee (2008)
- NC Invasive Species Advisory Committee (ISAC, 2009)
- NC Exotic Pest Plant Council (2010)
- VA Invasive Species Council (2011)
- Phragmites featured invasive in APNEP Ecosystem Assessment (2012)
- Rapid Assessment Protocol for Invasive Species in the A-P Estuary (2013)
- NC ANS Plan (2014-2016)
- APNEP/DMF Hydrilla Monitoring in Chowan River (2015)
- APHIS feral swine control in Currituck Area (2016)

Other Collaborative Invasives Projects

- Invaders Citizen Science Program (2006)
- USGS Aquatic Nuisance Species Expert Database (2007)
- Invasive Species Notice via Smartphone app (2012)

Case Study: New York Partnerships (2013)

- “New York State recently finalized a contract establishing the final of eight Partnerships for Regional Invasive Species Management (PRISM) in Western New York, achieving the important statewide milestone. Each PRISM is funded by the state Environmental Protection Fund (EPF) and has a full time coordinator.”
- "By partnering with non-profits, universities and consultants, New York is establishing one of the nation's most comprehensive approaches to invasive species management. A regional, coordinated approach that benefits from research, statewide education and outreach, online resources and a robust database are critical to New York's success in managing invasive species."

Case Study: New York Partnerships

- “New York's PRISMs are regional private-public partnerships that have diverse memberships, including local and state governments, conservation and trade organizations, academia, landowner associations and interested citizens. The partnerships are focused on shared goals including education and outreach, developing and coordinating volunteer invasive species monitoring programs, and controlling select invasive species in priority locations.”