Governance Recommendations for the Implementation of Ecosystem-Based Management within the Albemarle-Pamlico National Estuary Partnership

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Masters project submitted in partial fulfillment of the

Requirements for the Master of Environmental Management degree in

The Nicholas School of the Environment

Duke University

2013

Abstract

The Albemarle-Pamlico National Estuary Partnership (APNEP) is an estuarine management program operating from within the North Carolina Department of Environment and Natural Resources with financial support from USEPA. The program area extends across most of the Albemarle-Pamlico watershed, including a large portion of southern Virginia. Recently, APNEP has revised its management plan to implement an Ecosystem Based Management (EBM) strategy that takes a multimodal approach to conservation. In this report, we use case studies of other individual state, bi-state, regional, and international conservation partnerships to produce a set of objectives for APNEP to increase its institutional ability to implement EBM goals throughout its program area. Findings include recommendations and advice to: (a) establish mechanisms of accountability for essential management organizations; (b) develop EBM agendas for specific agencies; (c) establish priority management areas; (d) expand APNEP's program area to include the entire Roanoke River Basin; (e) expand cooperative GIS mapping capability between NC and VA; (f) update and renew the MOA between NC and VA agencies for cooperative regional conservation management; and, (g) address the possible relocation of the APNEP office from a state agency.

List of Acronyms

APES	Albemarle-Pamlico Estuarine Study
APNEP	Albemarle-Pamlico National Estuary Partnership
BTNEP	Barataria-Terrebonne National Estuary Program
CBBEP	Coastal Bends Bays and Estuaries Program
CCMP	Comprehensive Conservation and Management Plan
CWA	Clean Water Act
CWMTF	Clean Water Management Trust Fund
EBM	Ecosystem-based Management
ELI	Environmental Law Institute
EPA	Environmental Protection Agency
EPA PE	Environmental Protection Agency Program Evaluation
FAO	Food and Agriculture Association of the United Nations
GIS	Geographic Information Systems
GOMA	Gulf of Mexico Alliance
IEA	Integrated Ecosystem Assessment
LDEQ	Louisiana Department of Environmental Quality
LUMCON	Louisiana University Marine Consortium
MHM	Marine Habitat Mapping
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPA	Marine Protected Area
NC DAS	North Carolina Department of Agriculture and Consumer Services
NC DENR	North Carolina Department of Environment and Natural Resources
NEP	National Estuary Program
NOAA	National Oceanic and Atmospheric Administration
NY DOS	New York Department of State
OCPCA	Office of Conservation, Planning, and Community Affairs
PIT	Priority Issues Team
PREP	Piscataqua Region Estuaries Partnership
PSP	Puget Sound Partnership
RIDEM	Rhode Island Department of Environmental Management
STAC	Science and Technical Advisory Committee (APNEP)
TCEQ	Texas Council on Environmental Quality
UNH	University of New Hampshire
URI	University of Rhode Island
VA DCR	Virginia Department of Conservation and Recreation
VA DEQ	Virginia Department of Environmental Quality

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I. Introduction

An all-inclusive approach towards governance of National Estuary Programs (NEPs) has been the focus of many Comprehensive Conservation and Management Plans (CCMP). The CCMP is the guiding document that all NEPs use to implement their management strategies. While the Albemarle-Pamlico National Estuary Partnership (APNEP) includes portions of North Carolina and Virginia, the management of the program area takes places within the auspices of the North Carolina Department of Environment and Natural Resources. Recently, APNEP has revised its CCMP to include EBM as a main focal point of their conservation efforts. EBM takes all facets of an area into consideration when determining a management strategy, as opposed to single sector management. This management strategy includes humans as part of the ecosystem, and their effects on the area.

This study examines: (1) the essential components of an EBM framework; (2) the complications that arise in implementing EBM; (3) the organizational structure of APNEP and how it can best serve its goals listed within the CCMP; (4) examples from other states that have authoritatively implemented EBM; and (5) ways in which APNEP can increase cooperative efforts between the states of North Carolina and Virginia.

Section II provides an overview of the evolution the National Estuary Program and introduces APNEP, including the biophysical, institutional and human ecology of the organization and program area. Section III discusses the definition and implementation of EBM as used by various organizations and specifically APNEP's interpretation. Section IV defines the problem for the project, including limited funding with a vast program area, the programmatic location of APNEP, and a gap in cooperation with the state of Virginia. Section V discusses our

methods in conducting this project, including an extensive literature review and contacting state agencies, NEPs and other individuals.

Section VI contains the bulk of the report, with discussion of the deliverables presented to the client. The final recommendations are based on analyses of: APNEP's organizational structure through case studies of other NEPs that have transitioned to non-profit organizations; bi-state NEP case studies; individual state case studies involving state legislation; priority areas for estuarine management; program area expansion; and GIS mapping capabilities across state lines.

Section VII includes a proposed MOA for increasing cooperation on estuary management with the state of Virginia. Next, Section VIII presents the conclusions based on the research, and Section IX features acknowledgements.

II. The National Estuary Program and APNEP

A. History and Evolution of the National Estuary Program

Over the course of the last century, the U.S. government has enacted several laws with the purpose of protecting America's freshwater and marine resources. The Federal Water Pollution Control Act of 1948 initiated regulation of all discharges into navigable waters of the United States. The Marine Protection, Research and Sanctuaries Act of 1972, commonly referred to as the Ocean Dumping Act, regulated marine waste disposal and authorized the designation of marine sanctuaries. The Clean Water Act of 1972 established the National Pollutant Discharge Elimination System, a technology-based permitting program to control point-source discharges.

Yet, despite the growing collection of federal water pollution control laws, the challenges faced by particularly sensitive and vulnerable estuarine systems proved to be poorly addressed by conventional approaches focusing on point-source pollution and chemical water quality. With public alarm over fish kills, beach closures, and contaminated seafood growing, the awareness of the detrimental effects of nonpoint-source pollution from upland watersheds and increasing coastal development spurred action. The governors of Maryland, Virginia, and Pennsylvania and the administrator of the EPA signed the Chesapeake Bay Agreement of 1983, the first collaborative effort devoted to the research, restoration, and protection of a nationally important estuary system. This program would raise awareness about the need to focus on the health of other critical American estuarine systems (Chesapeake Bay Program, 2013).

It was evident that a more comprehensive and integrated approach with a greater management and decision making role for local stakeholders and state agencies with technical and financial support from EPA could potentially yield greater gains for estuaries than would traditional command and control regulation. The approaches taken in the Chesapeake Bay Program and Great Lakes Program provided a conceptual blueprint for such a cooperative, integrated management program that might be applied to other estuaries. The 100th United States Congress, led by Rhode Island Senator John Chafee, passed the Water Quality Act of 1987 (P.L. 100-4) as part of a series of amendments to the Clean Water Act. The Act had tremendous bipartisan support and passed in the House by a vote of 406-8 and Senate by 93-6. The bill was then pocket-vetoed by President Ronald Reagan; the House overrode the veto by a vote of 401-26 and the Senate by 86 to 14 to make the Water Quality Act a law (Library of Congress, 2013).

Title III of the 1987 Water Quality Act established what would become known as the National Estuary Program (NEP). The act authorizes the governor of any state to nominate any estuary of national significance within his or her state's jurisdiction for inclusion in the program and to request a management conference to develop a non-regulatory comprehensive management plan. The Administrator of the EPA must convene the conference if the need for a management plan is sufficiently documented. Once the EPA gives approval, the NEP is created through the signing of an Executive Order by the Governor of the managing state (Poole, 1996).

The EPA is authorized to administer the NEP through Section 320 of the CWA, which allows EPA to designate estuarine areas that are considered "estuaries of national significance" (Poole, 1996). The statute initially named ten priority estuary systems: Long Island Sound (NY-CT), Narragansett Bay (RI), Buzzards Bay (MA), Puget Sound (WA), New York-New Jersey Harbor (NY-NJ), Delaware Bay (DE-NJ), Albemarle Sound (NC), Sarasota Bay (FL), San Francisco Bay (CA), and Galveston Bay (TX). Initial appropriations for the program were made for FY 1987 through 1991 (Library of Congress, 2013).

Today the NEP includes 28 estuaries in eighteen states and territory of Puerto Rico. The individual units have produced significant environmental improvements through the cooperative efforts of many different branches and levels of government that had previously not operated with significant coordination. The programs have leveraged tools to pass local ordinances addressing issues, such as stormwater runoff and nitrogen loading, and initiated programs to create artificial wildlife habitats and wetlands and to restore natural ones. Research grants awarded by NEPs have led to discoveries such as the threat of airborne nitrogen, the existence of the toxic fish-killing *Pfiesteria* dinoflagellate, and the true impact of invasive species in watersheds and estuarine systems (USEPA, Office of Water, 1998). Together, the NEPs have

amassed an authoritative base of knowledge and experience toward addressing the common problems faced by all estuaries. The programs have established a network for exchanging technical assistance and management approaches, as well as serving as a critical resource for community outreach and education. Tangible benefits of the program thus far include the reopening of acres of shellfish beds, an increase in seagrass acreage, the restoration of habitats and stabilization of shorelines (USEPA, Office of Water, 1998).

The NEP requires congressional reauthorization. In 2004, the 108th Congress reauthorized the program for 5 years (P.L. 108-399), authorizing $35 million annually for program support. Authorization lapsed in 2009, although the program continued to receive funding from Congress. In 2010, proposed legislation to reauthorize the NEP, refocus the scope of the program and to allocate $1,000,000 annually for each NEP did not pass the Senate (Buzzards Bay National Estuary Program, 2012). Previously, the total annual amount authorized for the NEP was $35 million, although EPA to support other marine management programs retains $7-10 million. In practice, the NEP program actually received $22-25 million to divide among the EPA offices and the 28 offices, or approximately $600,000 annually for each local NEP (USEPA, Office of Water, 1998). The NEP was reauthorized in 2011 with bipartisan support, with an allocation of $35 million per year, roughly maintaining the annual $600,000 per program allocation. The 2011 reauthorization also requires each NEP's Comprehensive Conservation Management Plan to characterize risk and possible mitigation strategies related to the impacts of climate change on their estuaries.

In general, NEP offices have leveraged other federal grants, state resources, and fundraising by nonprofit partners to supplement their financial resources in addition to the regular EPA grant.

B. The Albemarle-Pamlico National Estuary Partnership

1. *Biophysical Ecology*

The APNEP program area spans the states of North Carolina and Virginia with a watershed area of approximately 31,000 square miles (Figure 1). This region includes everything from the headwaters of the streams and tributaries to the sounds, including 38 counties and cities within Virginia and 43 counties in North Carolina. There are two major sounds within the APNEP area, the Albemarle and the Pamlico Sounds, from which the APNEP gets its name. There are also six smaller sounds within the program area: the Back, Bogue, Core, Croatan, Currituck, and Roanoke sounds (APNEP, 2012).

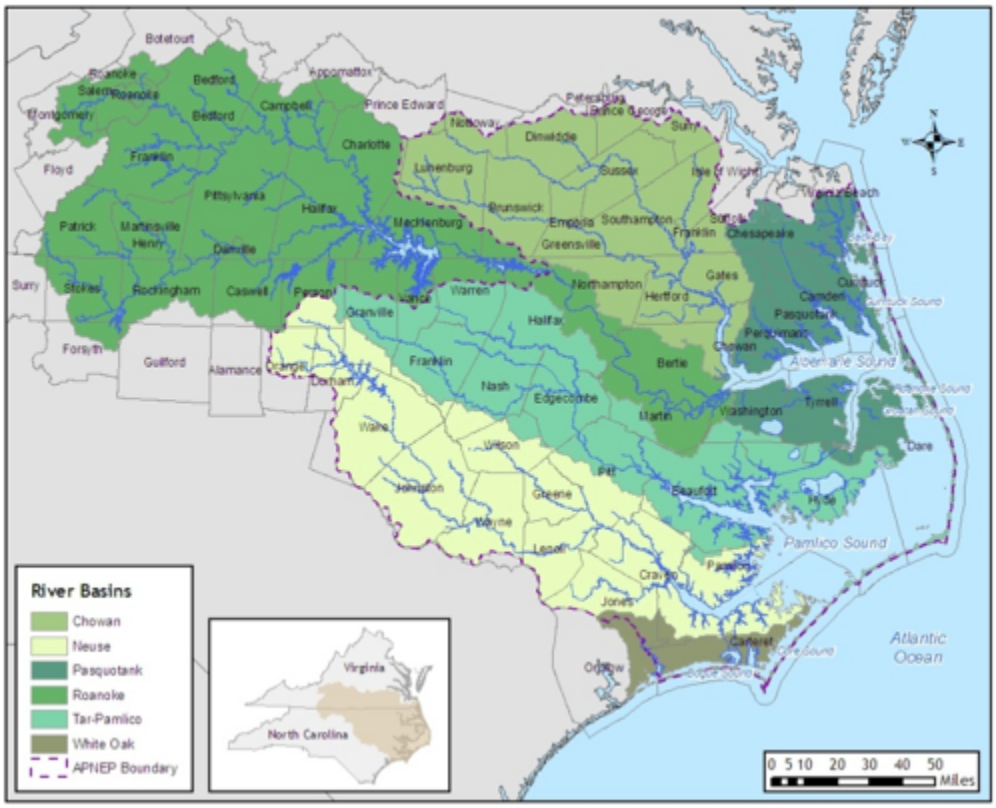

Figure 1: The Albemarle-Pamlico National Estuary Partnership Area. Source: http://portal.ncdenr.org/web/apnep/apnep-basin-and-counties

2. *Institutional Ecology*

The comprehensive management of the NEP is performed by the host state through a guiding document referred to as the Comprehensive Conservation and Management Plan (CCMP, or Management Plan).

APNEP initiated its first CCMP in 1994. From 1987 to 1994, APNEP was referred to as the Albemarle-Pamlico Estuarine Study (APES). APES was primarily a scientific and research program that facilitated the assessment of Albemarle-Pamlico region through a multiple year scientific assessment. However, with the initiation of the first CCMP, APNEP broadened its horizons to include management, conservation and community engagement initiatives.

The 2012 CCMP focuses on the recent integration of ecosystem-based management practices. The CCMP is supported by APNEP's three main advisory bodies: (1) a policy board; (2) a science and technical advisory committee; and (3) an implementation committee. These components help support the APNEP mission "[t]o identify, restore, and protect the significant resources in the Albemarle-Pamlico estuarine system" (APNEP, 2012).

3. *Human Ecology*

Considering that APNEP is incorporating EBM as a main pillar of its CCMP, the human ecology of APNEP could include all individuals that live within the 43 counties in North Carolina and 38 counties and cities in Virginia that are contained within the program area. APNEP has a long list of partners that include various government entities from federal to tribal (although the tribes have not yet played an active role within APNEP). The Partnership also includes: the citizens, fishermen, private industries, and environmental managers who sit on the Implementation Committee; the educational and non-profit institutions on the Science and

Technical Advisory Committee (STAC); and all other individuals that rely on the estuarine area for their livelihoods (APNEP, 2012).

III. Overview of Ecosystem-Based Management

The NEP was created in 1987 under the auspices of the CWA and is administered by the United States Environmental Protection Agency (EPA). The program was created to:

> (1) Take into account all interactions between living and nonliving resources;
> (2) Consider human communities as part of the ecosystem; and
> (3) Involve all parties that have an interest in the management of the area during the decision making process (Poole, 1996).

Therefore, within the initial legislation that created the NEP, EBM was already the main focus of the program.

While EBM is a method of integrated environmental management that has been applied to terrestrial landscapes since the 1950s, this management tool was applied within the marine and coastal management regimes much more recently (Agardy et al., 2011). EBM marries competing interests for ocean and coastal resources within a robust framework and spatial planning perspective (Agardy et al., 2011). This approach takes into account all facets of an ecosystem, including humans, and relevant stakeholders to create an all-encompassing management strategy. The APNEP CCMP adopted the EBM definition provided by ebmtools.org, a guidance network of over 4,000 coastal and marine conservation practitioners. The definition states that EBM is a management approach that: (1) takes into account the integration of ecological, social, and economic goals and recognition of humans as key components of the ecosystem; (2) considers the ecological- not just political- boundaries; (3) accounts for the complexity of natural processes

and social systems and using an adaptive management approach in the face of resulting uncertainties; (4) engages multiple stakeholders in a collaborative process to define problems and find solutions; (5) incorporates understanding of ecosystem processes and how ecosystems respond to environmental perturbations; and (6) is concerned with the ecological integrity of coastal-marine systems and the sustainability of both human and ecological systems (ebmtools.org, 2013).

Transitioning from a traditional management regime to an EBM approach has many theoretical benefits (Table 1). EBM, especially for marine and coastal environments has been advocated by the Pew Oceans Commission; US Commission on Ocean Policy report; the 2005 Millennium Ecosystem Assessment; a Scientific Consensus Statement on Marine Ecosystem-based Management; and a Food and Agriculture Organization of the United Nations (FAO) Fisheries Technical Paper on the ecosystem approach to fisheries (Cogan et al., 2009).

Table 1: Traditional Management versus EBM Management. Source: Layzer, J. (2012) The purpose and politics of Ecosystem-Based Management. Sustainability Science: the emerging paradigm and urban ecology. Spinger. New York

Attribute	Traditional natural Resource management	Ecosystem-based Management
Underlying view of nature	A collection of resources to be controlled	Complex, dynamic, inter-related, and inherently unpredictable systems
Relevant science	Equilibrium perspective: succession leads to stable climax communities; reductionist methods; goal is predictability	Flux-of-nature perspective: disturbance is normal; holism; embrace of uncertainty and surprise
Goal(s) of management	Maximum sustainable yield of commodities	Sustainable ecosystems, ecological integrity OR Balance between commodity production, amenities, and ecological integrity
Decision making	Centralized, top-down, expert-driven	Decentralized, participatory, collaborative
Implementation/ solutions	Prescriptive, uniform, piecemeal, technology-based; emphasis on control and remediation of damage	Incentive-based or voluntary, locally tailored, and performance-based; emphasis on prevention
	Management that is rigid and aims for control	Management that is experimental, adaptive

The recent Final Recommendations of the Interagency Ocean Policy Task Force shed light on the importance of EBM by making it "Objective 1" within the National Ocean Policy. The new focus on EBM may make implementation easier by increasing the level of federal funding for APNEPs efforts and general overall support from the EPA.

IV. Problem Definition

A. Actual Implementation of EBM

The initiative to implement EBM within a new CCMP began in late 2009 through an APNEP staff-sponsored EBM transition proposal to the APNEP Policy Board. Once approved in December of that year, an APNEP-EBM Transition Team was formed to guide the evolution of its management strategy in an efficient and effective manner.

The implementation of EBM has been the focal point of several studies. Political constraints have been a major cause of difficulty in implementation. EBM requires various agencies and government entities to cooperate toward effective implementation. There tend to be overlapping jurisdictions that lead to duplication of effort and resources. Bridging traditional disciplinary and professional boundaries is necessary to effectively manage the APNEP ecosystem (Slocombe, 1993). Some effective ways to implement EBM and bridge boundaries is through interstate and interagency cooperative agreements, as well as drafting legislation to create enforcement regimes and structure for facilitating EBM.

Each of these avenues should incorporate the precautionary principle at the core for effective implementation. The precautionary principle states that "where there are threats of

serious or irreversible damage [the] lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (ELI, 2007). The precautionary principle shifts the burden onto those who may potentially harm the environment from those who are trying to protect it. This strategy allows for legislation and soft-law cooperative agreements to create EBM frameworks that could effectively protect the Albemarle-Pamlico region. Although, particularly during periods of economic constraint arguments have arisen claiming EBM has impediments to economic growth. However, there has not been substantiated evidence to support these claims.

B. Funding with Size

Under the CWA all 28 National Estuary Programs, including APNEP, receive equal funding regardless of the size of the region that they manage or the population contained within the program area. The EPA provides APNEP approximately $600,000, which must be matched 'in kind,' by the local hosting organization, meaning in this case equal amounts of money in office space, employees' salaries, etc. from the State of North Carolina. Part of the 'in-kind' funding is met through the North Carolina Clean Water Management Trust Fund, which is a state trust fund receiving public dollars for clean water projects to protect water quality.

A lack of other non-federal discretionary funding hampers the extent and effectiveness of APNEP's estuarine management. APNEP receives neither state nor sub-state – such as planning districts, counties, and municipalities – funding, whereas other NEPs have incorporated these sources into their budgets to diversify their income streams.

The EPA funding and matched 'in-kind' funding provides a total of roughly $1.2 million annually to manage the 24,000 square miles of the Albemarle-Pamlico region (about $50 per

square mile). Compare this amount to the Tampa Bay NEP, which has 400 square miles (about $3,000 per square mile) or the Buzzards Bay NEP, which is 230 square miles (about $5,217 per square mile) and it becomes easier to compare the relative influence of the equal budgets on estuaries of significantly different sizes. (TBEP, 2013; BBNEP, 2013)

Although not the most populous, APNEP constitutes the largest geographical program area of any NEP. Therefore, the funds they receive are stretched thin when managing the estuaries and influent watersheds, which creates challenges for implementing a new management system such as EBM. In response, APNEP utilizes numerous partnerships to try to supplement available direct funding. Going forward, however, APNEP will need to determine how to use their limited funds as efficiently as possible, and potentially evaluate options for increasing their funds through a number of measures, discussed in subsequent sections.

While APNEP remains the largest program area of any NEP, there are other considerations to take into account when discussing the importance of funding within a NEP. The population living within a program area remains relevant, especially considering the competing interests that individuals have in more densely populated areas. Further, the impairment of the watershed in comparison to other NEPs would be important in examining allocation of funds.

C. Structural Location of APNEP

There are many possible configurations that a particular NEP might choose for its institutional structure. An NEP may be located within the regional office of the EPA, a non-profit organization, an educational institution, or a state agency. All of these possibilities receive a portion of their funding through the federal EPA - NEP program, and those located within a

state agency or a state university system also receives portions of their funding from the state. All NEP locations may be seen in Table 2 below.

Table 2: Listing of all NEPs and their institutional housing. Source: Doug Jacobson EPA Region 6 NEP coordinator

NEP Name	Host Entity	NEP Name (Cont'd)	Host Entity (Cont'd)	NEP Name (Cont'd)	Host Entity (Cont'd)
Albemarle-Pamlico (NC)	State Agency - NC DENR	Indian River Lagoon (FL)	St. Johns River Water Management District	Peconic Estuary (NY)	NEP program office is part of Local Government
Barataria-Terrebonne (LA)	Louisiana Universities Marine Consortium	(NY& CT) Long Island Sound	EPA Long Island Sound Office Regions I and II	Puget Sound (WA)	
Barnegat Bay (NJ)	Ocean County College	Lower Columbia River (OR)	Lower Columbia River Estuary Partnership	San Francisco Bay (CA)	State Agency
Buzzards Bay (MA)	State Agency (MA EOEA - CZM)	Maryland Coastal Bays (MD)	Nonprofit - Maryland Coastal Bays Foundation	San Juan Bay (PR)	Non-Profit
Casco Bay (ME)	University of Southern Maine	Massachusetts Bay (MA)	State Agency - Mass CZM	Santa Monica (CA)	California State Water Resources Control Board (State Agency)
Charlotte Harbor (FL)	Southwest Florida Regional Planning Council	Mobile Bay (AL)	Dauphin Island Sea Lab, State University system	Sarasota Bay (FL)	Independent State Agency
Coastal Bend Bays (TX)	Nonprofit - Coastal Bend Bays and Estuaries Program, Inc.	Morro Bay (CA)	Nonprofit – Bay Foundation of Morro Bay	Tampa Bay (FL)	Independent Special District of the State
Delaware Estuary (PA, NJ, DE)	Non-profit-Partnership for the Delaware Estuary	Narragansett Bay (RI/MA)	University of Rhode Island Coastal Institute	Tillamook Bay (OR)	Nonprofit
Delaware Inland Bays (DE)	Nonprofit-Delaware CIB	New Hampshire Estuaries (NH)	University of New Hampshire (UNH)		
Galveston Bay (TX)	State Agency - TCEQ	NY/NJ Harbor (NY)	EPA Region II		

APNEP is located within the North Carolina state agency the Department of Environment and Natural Resources (NC DENR). In November 2012, Governor Beverly Perdue issued Executive Order #133 which renamed APNEP from a "Program" to a "Partnership." This Partnership includes the Virginia Department of Conservation and Recreation, which signed a Memorandum of Agreement (MOA) with NC DENR in 2001. One of the main concerns expressed within the 2009 EPA Program Evaluation (EPA PE) was that APNEP does not have the independence it needs to fully achieve all of the goals that are set out within their CCMP. An analysis of organizational theory and suggestions of APNEP organization is discussed below.

D. Cooperation with Virginia

APNEP is one of several NEPs that include a transboundary program area. Most of the Chowan river basin and a small part of the Pasquotank river basin lie in in southeastern Virginia and represent roughly 18% of the entire APNEP study area. Further, the Roanoke River Basin drains an additional large area of southern Virginia into the APNEP program area; however, only a small part of the basin, south of the Roanoke Rapids Dam, is currently within the APNEP program area. In the past the APNEP Policy Board discussed the possibility of the program expanding geographically to include the entire Roanoke watershed, to work within all of watershed of Albemarle Sound. As of now, the APNEP programmatic area includes the Virginia counties of Brunswick, Charlotte, Dinwiddie, Greensville, Isle of Wright, Luneburg, Mecklenburg, Nottoway, Petersburg, Prince Edward, Prince George, Southampton, Surry and Sussex. The Virginia portion of the APNEP area includes areas of Virginia congressional districts 3, 4 and 5 currently represented by Robert Scott (D), Randy Forbes (R), and Robert Hurt (R) respectively. APNEP municipal partners in Virginia are the City of Chesapeake, City of Suffolk, and Virginia Beach.

APNEP has Virginia representation within its advisory committees. The policy board includes Sara Benghauser, the Special Assistant for Policy to the Virginia Secretary of Natural Resources, and Dr. Kirk J. Havens of the College of William and Mary. The APNEP Science and Technical Advisory Committee include Dr. G. Rich Whittecar of Old Dominion University and Dr. Kirk Havens. Educational partners from Virginia include Virginia Commonwealth University, Virginia Tech and Virginia Institute of Marine Science. Virginia state government partners include the Virginia Dept. of Conservation and Recreation, Virginia Dept. of Environmental Quality, Virginia Dept. of Game and Inland Fisheries, Virginia Division of Soil

and Water Conservation, Virginia Marine Resources Commission, Virginia Natural Heritage Program, Virginia Office of the Secretary of Natural Resources, and Virginia State Parks.

In addition to the aforementioned partners, APNEP references management plans of other Virginia organizations in order to build partnerships and identify common strategic interests. Such organizations include the Virginia Invasive Species Council; Virginia Department of Forestry; Virginia Department of Mines, Minerals and Energy; Virginia Department of Health; and Virginia Department of Agriculture and Consumer Services.

In 2001, NC DENR and the Virginia Department of Conservation and Recreation (VA DCR) signed a memorandum of agreement (MOA) in which the two agencies agreed to cooperate as partners with APNEP in support of the program's objectives within its shared river basins. The MOA was a positive step in encouraging a joint and equal interstate commitment to protecting the estuary system.

Since the MOA was signed, a number of different circumstances have developed including a new APNEP CCMP and turnover at staff level, senior management, and elected positions. Moreover, APNEP decided to implement EBM within its program area, which allows for an opportunity for a renewed commitment to cooperation between the two states. As part of this project, this study group proposes a new MOA that reflects organizational changes, the interests of other interstate workgroups, and the new CCMP's focus on the EBM approach to watershed management (Appendix E). The original MOA did not include specific directives for any signatory party and the proposal maintains the non-binding, non-directive structure for the draft. The attached draft does, however, identify additional areas in which agencies should cooperate to promote regional efficiency.

V. Methods

A. Literature Review

The study group conducted an extensive literature review of many different studies regarding EBM principles and structure, state implementation of EBM, and methods for interagency and interstate coordination. The Duke University Library's online journal access system allowed the group to readily access the most current issues of *Marine Policy* and similar academic sources.

B. Contacting State Agencies/NEPs

State agencies and other NEPs were contacted to gain more information regarding the implementation of EBM through state agency examples, as well as through cooperative agreements between states. The New York State's Office of Parks, Recreation and Historic Preservation, New York-New Jersey Harbor NEP, Long Island Sound NEP, Narragansett Bay NEP, and the Piscataqua Region Estuaries Partnership were utilized to gain insights into EBM programs.

Individuals from New York State's Office of Parks, Recreation and Historic Preservation were contacted in order to receive information on their statewide implementation of EBM. All employees contacted suggested Lynn Bogan, who serves all 12 of New York's State Park Regions. She provides informational workshops and materials to New York's state agencies in an effort to incorporate EBM's principles into a wide variety of the state's work. Ms. Bogan provided copies of PowerPoint presentations and workshop schedules that were presented to

various state agencies, as well as directed us in the right direction when prompted with follow-up questions.

Bob Nyman, Director of the New York-New Jersey Harbor NEP provided information concerning the nature of the NY-NJ operational partnership for their program and the merit of being located within a federal agency.

Mark Tedesco, Director of the Long Island Sound NEP provided information concerning the nature of the NY-CT partnership in that program and the working relationship with the states and EPA Regions 1 and 2.

Richard Ribb, Director of the Narragansett Bay NEP provided information concerning the cooperative relationship between Rhode Island and Connecticut and the implications of program reorganization.

Derek Sowers, Conservation Manager with the Piscataqua Region Estuaries Partnership shared helpful insights concerning some of the similar circumstances faced by PREP and APNEP. Mr. Sowers discussed the advantages of the program's move to UNH from the New Hampshire state government, expansion into Maine, and goals for greater interstate cooperation going forward.

C. Contacting other Individuals

We contacted multiple individuals to discuss ideas regarding organizational theory and the challenges of working within a state agency as a NEP, many of whom were suggested by the APNEP staff. We also spoke with employees at EPA Region 6 because they house two NEPs of particular interest and because they are not the Region that deals with APNEP, thus preventing a conflict of interest.

Dr. Kirk Havens and Dr. Carl Hershner from the Virginia Institute of Marine Science (VIMS) were contacted via conference call to discuss the transition process that APNEP conducted for the implementation of EBM. Each provided a comprehensive review of the strides APNEP took in reworking their CCMP to incorporate transition towards EBM.

Ray Allen (Executive Director of Coastal Bends Bays and Estuaries Program) was contacted via conference call to discuss the advantages and disadvantages of operating a NEP within a 501(C)(3) non-profit organization. Mr. Allen provided a first hand perspective on the transition from a state agency to a non-profit and what the challenges might be.

Kerry St. Pe (Executive Director of the Barataria-Terrebone National Estuary Program) was contacted via conference call to discuss the advantages and disadvantages of operating a NEP within a state university program. Mr. St. Pe gave a first hand testimonial on the transition process from a state agency to a state university program.

Lastly, Doug Jacobson from EPA Region 6 was contacted via conference call to discuss an overall perspective of the different ways in which a NEP can be situated.. Mr. Jacobson is the EPA program coordinator of the NEPs within Region 6, which include: Galveston Bay NEP; Barataria-Terrebonne NEP; and Coastal Bends Bays and Estuaries Program. All of these NEPs are housed in different institutions; therefore Mr. Jacobson was contacted to give an overview on the varying programs. EPA Region 4 (APNEPs Region) was not selected for discussion to keep this project politically neutral.

VI. Results

There are three main categories that our recommendations fall under for APNEP to focus its effort to effectively manage the area through EBM:

(1) Assess the implementation strategies that have been used before to evaluate potential gaps in the CCMP's implementation process.
(2) Use cooperative agreements to build a transparent and cohesive process between the major authorities within the APNEP region.
3) Draft legislation to create an enforceable EBM implementation strategy. Different state legislative examples are provided below.

First, in reviewing recommendations for altering APNEP's organization structure, we examined two case studies of NEPs that switched their location from state government to non-profit organizations. Second, we reviewed five bi-state NEP case studies addressing interstate cooperation issues. Third, we researched two case studies pertaining to state legislation promoting and strengthening EBM by the managing agencies. Fourth, a multi-state management system of a coastline that established priority areas for regulation was reviewed. Following these case studies, we reviewed options for expanding the program area as well as increasing GIS mapping coordination between Virginia and North Carolina.

A. Organizational Structure Recommendations for APNEP

In this section, we will discuss APNEP as a boundary organization and cover the possibilities of moving APNEP's structural location to meet their evolving needs using examples from the Coastal Bends Bay and Estuaries Program and the Barataria-Terrebonne NEP.

1. *Introduction of APNEP as a Boundary Organization*

APNEP is a boundary organization. Generally, boundary organizations are institutions that help bridge the divide between information producers, like scientists, and the information users, such as policy makers. To accomplish this, boundary managers are engaged in enhancing and sustaining communication, translating the jargon rich scientific information into more usable forms. These organizations also are used in mediating conflicts that arise between certain parties (Kirchkoff, 2013). However, APNEP differs from other boundary organizations in that they have their own information producers and information users within their role as a program partner. APNEP does have a role as an organization that bridges gaps between these two groups. This is especially evident within the new CCMP. This document provides a platform for APNEP to discuss issues that concern the watershed and the estuary as a whole. Within the 2012 CCMP, there are recommendations based on scientific information that have been examined by a policy team to address the best possible ways that improvements can be made within the area.

2. *Location of APNEP and Possibilities for Transition*

A successful criterion for an NEP is to have a governance structure that provides a forum conducive in bringing together a diverse set of stakeholders, and creates a level decision-making process (NEP Booklet). A current concern within APNEP is whether or not organizational structure of the Partnership is properly placed within the NC DENR. As previously mentioned, under the auspices of CWA Section 320, a NEP may be located within government agency, educational institution, or a non-profit organization (Poole, 1996). Coastal Bends National Estuary Program (CBBEP) is a 501(c)(3) organization that operates independently; and Barataria-Terrbonne National Estuary Program (BTNEP) is housed within a state university

program that has a non-profit foundation attached to it. Both of these NEPs used to be located within a state agency, but transitioned out to gain more independence to effectively implement their initiatives. According to the EPA's 2009 Program Evaluation of APNEP:

> APNEP became much more visible after it was moved into the Secretary's Office in the Department of Environment and Natural Resources (NC DENR) in 2002. Moving from a Division to the Secretary's Office elevated the Program's status and gave APNEP name recognition, created opportunities for APNEP to develop relationships with senior staff in other State agencies, and enabled the Program to leverage other organizations' resources. (EPA PE, 2009)

APNEP addressed this concern on July 1, 2010 when the office relocated to be housed within the Office of Conservation, Planning, and Community Affairs (OCPCA). The OCPCA reports to the Assistant Secretary for Natural Resources. APNEP stresses that this move strengthens APNEP's role within NC DENR, as opposed to being located within a division, and will likely allow APNEP to more effectively accomplish its mission (Bill Crowell, Personal Communication, 2013).

However, for NEPs within state agencies, remaining an independent organization has proven to be difficult due to shifts in political control of state agencies through elections. This causes attention, and sometimes-financial resources, to shift towards or away from NEPs (Kerry St. Pe, Personal Communication, 2013). Being located in a state agency causes bureaucratic issues regarding implementation and funding (Ibid). For a program to be effective there needs to be a separation between politics and administration. Unfortunately, public agencies are unavoidably political. They are under constant pressure from politicians and interest groups, and are subject to political control of their program budgets through appropriations, and funding for

personnel, and thus public agencies are compelled to become strategic political actors in order to last long enough to accomplish their goals (Moe, 1991)

The EPA made the recommendations that NC DENR: (1) reverse its decision to move APNEP into a Division; and (2) re-locate the Program to an organizational home where the Program is highly visible and regarded as a model of ecosystem-based management (EPA PE, 2009). These recommendations may be addressed by moving the Program to a non-profit organization. The option to move to an educational institution can have political implications as well as regarding whether or not the program should be moved to a public or private university, along with management decisions through the institution's board (Kerry St. Pé, Personal Communication, 2013).

Non-profit organizations are likely to also have a board of directors that make overall guiding decisions. However, the political influences from a board of directors within a non-profit are likely to be limited compared to the state government political influences that change along with political party dominance within North Carolina and Virginia. Appendix A shows examples of costs and benefits of being located within different institutional settings. The two examples that were used are: (1) the Barataria-Terrebonne National Estuary Program (BTNEP) that is located within an educational institution; and (2) the Coastal Bays Bends and Estuary Program (CBBEP) that is located within a non-profit organization.

3. Possibility for APNEP to Transition to a Non-Profit Organization

CBBEP and the BTNEP illustrate the benefits of moving towards a non-profit organization structure. However, both of these NEPs are relatively small in physical size compared with APNEP. The amount of resources that are provided through NC DENR for

APNEP to fully achieve its mission may not be achievable through a non-profit organization given the vastness of the program.

However, in terms of implementing EBM within the Albemarle-Pamlico region, there needs to be an effort to have enhanced institutional collaboration. APNEP has transitioned its name from a "Program" to a "Partnership" and is developing partnerships to assist with EBM implementation. Though, efforts to institutionalize collaboration through a principal institution located within a public agency (i.e. APNEP within NC DENR) may be biased towards placing administrative power and influence within public agencies. Cooperation derived from a specific policy may produce more reliable results and, if given a flexible structure, may be able to accommodate changes as they are brought about (Brummel, 2012).

While any type of organization is bound to have their own biases and politics associated with their organization, the fact that the APNEP is within a state agency can create an imbalance of powers when collaborating with other organizations. The fact that most APNEP goals are currently non-controversial in nature (due to the fact that goals in themselves are less controversial than action items or outcomes), there will come a time when the implementation of EBM has a conflict of interests that will likely be more favorably received if it comes from a entity that does not have state government influences. APNEP could relocate to an existing 501(c)(3) non-profit organization, or possibly create their own. The benefits of relocating to an existing institution are: (1) pre-existing funding sources; (2) pre-existing administrative capacity (i.e. office space and administrative personnel); and (3) capital costs of creating a non-profit have already been paid.

However, APNEP receives a large portion of their funding from the North Carolina Clean Water Management Trust Fund (CWMTF, or the Trust Fund). The CWMTF was established in

1996 by the North Carolina General Assembly (Article 18 NC Statute Section 113A). The Trust Fund receives monies from annual appropriations, as well as from the Scenic Rivers special license plate registration. This money is given to local governments, state agencies and conservation non-profits to help fund projects that address water pollution problems (CWMTF, 2013).

While this represents a significant source of funding, cuts are constantly being made to the appropriations to the Trust Fund. The 2011 budget reduced the biennial appropriation to the Trust Fund from the $100 million to $11.25 million for both FY2011-12 and FY2012-13. This represents an 89% cut from the levels previously required by statute and annually appropriated to the program every year since the FY 1999-2000 (Freyer, 2012). Another issue with the Trust Fund is that it only funds projects that take place within the State of North Carolina. Projects within APNEP that occur in Virginia would possibly have to find other sources of funding. If APNEP is to stay within NC DENR, there is a need to restructure the formal context of the agency's relationship with the bureaucrats and politicians in such a way that the prospects for control are actually reduced (Moe, 1984).

B. Bi-State NEP Case Studies

In this section, we discuss how other NEPs that manage study areas that cross state boundaries have dealt with the administrative challenges of operating in different states. We define the specific challenges posed by this scenario and examine how the structures of five other NEPs have equipped or hindered them from achieving consistent program implementation across state lines. Finally, we include recommendations for APNEP that can be gained from evaluating similarly situated NEPs.

1. *Challenges Posed by Trans-Boundary Study Areas*

As the issues affecting estuarine ecosystems are transboundary in nature, the most effective community-based watershed management approaches are those that can be implemented consistently at the ecosystem level, which is a requisite feature for effective EBM. Consistent management of this sort is most feasible when two conditions are met: (1) the management program possesses the administrative freedom to operate freely and effectively across borders; and (2) program objectives are given equal priority by partners in all included administrative units. As a matter of circumstance and practicality, it is rare for a program to completely satisfy both conditions as several barriers may impart considerable difficulty. Such barriers are described below:

(1)NEP Institutional Hosting. NEP programs may be housed in any of a variety of types of institutions (see Table 3). A program may enjoy varying degrees of operational freedom and insulation depending on where it is housed. For example, programs operating out of federal agencies, universities or nonprofit organizations may be better able to avoid state level political pressures and be better equipped to operate, spend, and leverage funds across state borders than programs housed in state agencies. The optimal program housing arrangement is the principle investigation of this project.

(2) Geography. For multi-state NEPs in which either a vast majority of the estuary or a majority of the contributing watershed is located in one state, it can be difficult to encourage commitment and participation from organizations in the minor area state.

(3) Competing priorities. Compounding the previous issue, states underlying a minor portion of one program area often focus state level resources toward other management programs, especially if the minor area state hosts its own NEP or has a similar commitment.

(4) Differences in ordinances and standards. Policy differences across administrative borders may preclude seamless program implementation. Program managers must work closely with local stakeholders to tailor solutions for factors such as varying local zoning laws, construction ordinances, and larger scale discontinuities such as differing water quality standards on either side of trans-boundary water.

2. *Studies of Multi-State NEPs*

When considering how APNEP might best overcome barriers such as those mentioned above, some lessons can be taken from the successes and challenges of other multi-state NEPs that face similar issues. Some NEPs, especially those that are roughly evenly divided geographically among member states were deliberately initially organized to avoid interstate challenges. For example, the New York-New Jersey Harbor and Long Island Sound Studies include significant areas of New York and New Jersey and New York and Connecticut respectively, and both programs are hosted by EPA, which is able to operate effectively across borders and modulate state interests, thus avoiding the pitfalls of issue (1) listed above. We interviewed staff from several of these interstate NEP programs to gain insights into how APNEP might increase its implementation efficiency. Interviews and results from these four case studies are shown in Appendix B.

3. Recommendations Based on Bi-State NEPs

A recurring theme represented in discussions with the various NEP personnel is that program flexibility, autonomy, and efficacy is superior when the program is *not* housed within a state agency. Whether administered by a federal agency or university affiliation, the ability of trans-state NEPs to work across state lines is far greater than when associated with a single state government agency or division. Additionally, in situations where an adjoining state is more of a minor partner in NEP administration and state-level participation is difficult to guarantee, it is critical to achieve a strong cooperative relationship with local and grassroots stakeholder groups across the border. Implications for APNEP are that there are clear benefits in terms of interstate

flexibility and personnel management to be gained from relocating to an organization outside of the North Carolina state government. The MOA that APNEP has in place joining efforts by North Carolina and Virginia agencies is actually a rare feature among cooperative relationships between interstate NEPs. Although APNEP was not constrained by particularly onerous interstate traveling and spending limitations like those previously faced by the Narragansett Bay Program, the MOA remains a positive feature that might be used to maintain cohesion in the event of a program reorganization or expansion further into Virginia.

C. Individual State Case Studies

1. *Introduction to Possibilities for State Legislation*

Following are examples from other states that provide clarity on ways that EBM has been legislatively implemented through various state governments. Both New York and Washington enacted state legislation to support the implementation of EBM at different management levels. State legislation offers an opportunity to grant more authority to programs managing ecosystems. As opposed to MOA/MOU, legislation passed at the state level regarding EBM allows more power to regulate a region and create incentives and disincentives for compliance. A few states, discussed below, have taken the lead in reinforcing their commitment to environmental principles. While North Carolina's Governor Perdue recently passed an Executive Order renaming the organization and reaffirming commitment to APNEP, significant potential exists to expand APNEP's ability to enforce its management plan via its regulatory partners to fulfill the various responsibilities of an EBM regime. Appendix C analyzes individual case studies from New York and Washington to arrive at our conclusions.

2. Recommendations for APNEP for State Legislation/Bolstering Regulatory Authority

Legislation in Washington and New York has brought EBM to the forefront of each state's environmental agenda. While Washington enacted EBM for one program area within the state, the Puget Sound Partnership, New York enacted EBM for all state parks. Both of these case studies provide a number of lessons can be obtained from states' implementation strategies.

a. Increase regulatory authority to hold parties accountable.

In order to ensure accountability of implementation, granting a regulatory body certain authorities would help to achieve this end. Both the New York Council and Washington's PSP have certain powers of implementation that allow them to pursue EBM objectives at multiple levels of state government. In New York, the Council serves as the "accountability mechanism for achieving the desired results…[and] is established as the governing body for the work of advancing EBM" (NYDOS, 2007).

Under Washington law SB 5372, Section 17, reporting of non-compliance is mandated of the permanent PSP; the PSP has to "notify an agency if it is in substantial non-compliance with an action agenda, and if no agreement is reached on corrective action, hold a public meeting to present its findings" (ELI, 2009). Moreover, the Washington law provides certain financial incentives and disincentives for compliance. If organizations that receive PSP funding do not follow the action plan, the PSP has the ability to suspend funds or place restrictions on future funding. If non-compliance continues after the aforementioned public meeting, the PSP may report to the governor with the recommendation that the entity become ineligible for state funds until compliance is achieved (Ibid, page 23).

Both of these authoritative bodies resemble the structure of APNEP's newly created Implementation Committee, whose members "shall serve as liaisons to agencies and relevant parties regarding environmental and natural resource management relevant to the CCMP implementation" (Bogan and Cady-Sawyer, 2006). Hence, this would be the ideal body to receive additional powers to ensure compliance of EBM policies. This measure could be achieved through subsequent Governor's Orders pertaining to APNEP or state legislation granting the authority. In New York and Washington, powers were granted through state legislation; however, Governor's Orders may be a more politically expedient option.

Increasing APNEP's regulatory authority would help foster an interagency understanding and adherence to EBM's principles. The ability to hold public meetings for non-compliance, as well as providing fiscal incentives and disincentives, could encourage compliance and advance the notion of interagency cooperation. This positive feedback between adhering to EBM principles and interagency cooperation would create an atmosphere conducive to effective management of the Albemarle and Pamlico estuarine system.

b. Tailor the introduction of EBM to specific agencies

As EBM is an interdisciplinary strategy involving a wide variety of stakeholders, there are a number of local, state and federal agencies invested in the process. EBM permeates most state agencies in some fashion, and for many of these agencies, the core concepts of EBM are relatively new. Agency coordinators need to be introduced to the strategy before they can successfully implement EBM's tenants, and information needs to be disseminated to all agency employees. Therefore, workshops and presentations should be tailored to each specific department to demonstrate how they will be affected by such policies.

Materials should be created for dissemination to specific state agencies. For example, implementation materials for the North Carolina Department of Agriculture and Consumer Services (NC DACS) would need to know agricultural policy may be altered to adhere to EBM. Further, employees within NC DACS need to be informed on how their everyday work might need to incorporate different principles and values when managing the state's' farms and ranches. These materials may come in the form of specifically tailored PowerPoint presentations or workshops. New York States has achieved much success with this strategy as they have implemented EBM in all state parks and along their coastlines.

D. Priority Areas

Creation of priority areas, or main categories of estuary importance, represents a strategy used by other organizations in implementing multi-state management. In this section, the Gulf of Mexico Alliance (GOMA) will be covered in how it allowed states to cooperate on estuary management, even when they have different sizes of coastlines. Lessons from GOMA can be applied APNEP and recommendations will follow.

1. *Overview of the Gulf of Mexico Alliance (GOMA)*

A few lessons from the Gulf of Mexico Alliance (GOMA) could be applied to this potential enlargement of APNEP's jurisdictional realm. GOMA is a regional agreement between the five Gulf of Mexico states – Texas, Louisiana, Mississippi, Alabama and Florida – to promote EBM along the coast. In advancing EBM, GOMA has five priority issues:

(1) Water quality for healthy beaches and shellfish beds;
(2) Wetland and coastal conservation and restoration;
(3) Environmental education;

(4) Identification and characterization of Gulf habitats; and
(5) Reductions in nutrient inputs to coastal ecosystems. (Carollo and Reed 2009)

Since Alabama's coastline is much smaller than that of Texas or Florida, it may appear that Alabama is not being proactive in GOMA and promoting the EBM principles. However, GOMA's structure mandates that a "Priority Issue Team (PIT) [be] formed for each of the priority issues listed above. Each one of the five US Gulf States assumed the leadership of a PIT" (Carollo and Reed, 2009). This resulted in each state having an active role in the Alliance as it moves forward.

2. Recommendations for APNEP to Include Priority Areas of Management

APNEP could incorporate GOMA's principles to advance EBM at a more widespread level. However, one major difference is that, while GOMA has five states heading five priority issues, APNEP has only two states involved. One possible solution is to create two wide-ranging categories that each state can spearhead as it pertains to EBM. For example, North Carolina could take the lead on broader water themes while Virginia focuses on land issues. As North Carolina has the majority of the coastal region, it would be intuitive for the State to take the lead on water issues for the Sounds.

Distinguishing between land and water issues would become even more intuitive if the program area were expanded to include the Upper Roanoke River Basin. Figure 2 shows that the new boundary would add a terrestrial landscape of considerable distance from the coast, most of which is located in Virginia.

Obviously there will be overlap in responsibilities if the distinction is simply between land and water themes. This could lead to overlapping jurisdictions for watershed areas that may be classified 'terrestrial' yet undoubtedly have a significant influence on water sources such as rivers and estuaries where runoff eventually flows. However, the potential overlapping of responsibilities could lead to enhanced communication and cooperation between states in advancing EBM. This dual deliberation would promote the interconnectedness of systems that is inherent to EBM management and could result in more state-to-state collaboration on joint watershed projects.

E. Expanding the APNEP Program Area

While most NEPs attempt to collaboratively manage within watershed boundaries, as opposed to political boundaries, potential exists for APNEP to expand in order to improve its management of the estuary. Possibilities for incorporating the Upper Roanoke River Basin into the program area will be provided, as well as a discussion on the prospect of uranium mining in Virginia. Finally, we provide recommendations for APNEP in terms of creating a larger program area.

1. *Including the Upper Roanoke River Basin*

While the estuaries of the Albemarle and Pamlico Sounds are almost entirely located in North Carolina, the watershed region contains roughly equal parts in the states of North Carolina and Virginia. However, the program area for APNEP contains more area in North Carolina than it does in Virginia, as the Upper Roanoke Basin is excluded. Since ecosystem boundaries are rarely analogous with political boundaries taking entire watershed boundaries, such as including

the Upper Roanoke would be appropriate for EBM. Moreover, while APNEP is a cooperative effort between North Carolina and Virginia state agencies (APNEP, 2013), the main functions of the organization are focused in the state of North Carolina. For example, the only Virginia field representative for APNEP is on contract from the state of North Carolina, which indicates the majority of governance for the region occurring in North Carolina.

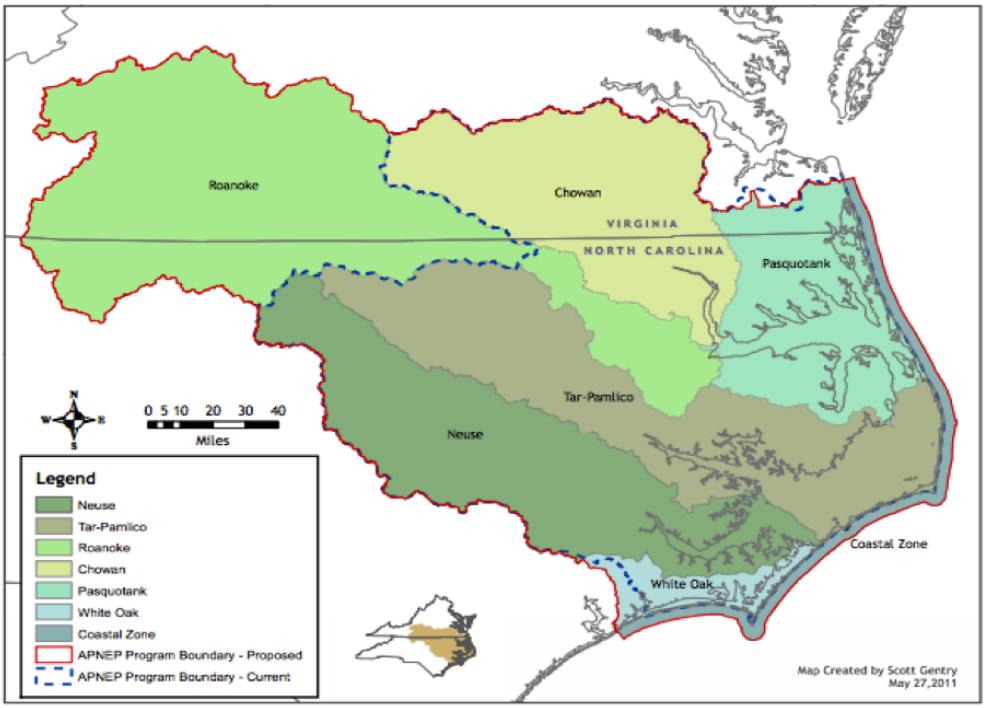

Figure 2: APNEP area with Upper Roanoke Basin included

The Upper Roanoke Basin was excluded from the initial boundary in 1987, which comprises about one-third of the APNEP region (APNEP STAC, 2010). This region was left out "because of complicating water rights issues during the late 1980s and early 1990s" (APNEP STAC, 2011). Essentially, considerable water was taken from the Upper Roanoke and transported to the Hampton Roads area containing the populous communities of Virginia Beach, Norfolk and Newport News. Hence, the current breakdown of estuarine management is 82% in North Carolina and 18% in Virginia (Table 4).

Table 4. Breakdown without Upper Roanoke

State	*Area (sq km)*	*Area (sq mi)*	*Percent of APNEP*
NC	51,053.9	19,712.0	82%
VA	11,106.7	4,288.3	18%
Grand Total	**62,160.6**	**24,000.3**	**100%**

Table 5. Breakdown without Upper Roanoke

State	*Area (sq km)*	*Area (sq mi)*	*Percent of APNEP*
NC	56,709.1	21,895.5	67%
VA	27,356.5	10,562.4	33%
Grand Total	**84,065.6**	**32,457.9**	**100%**

Including the Upper Roanoke River Basin in the program area would create a more even split in program areas between the two states, with two-thirds of the updated program area located in North Carolina and the remaining third in Virginia (Table 5). This could potentially increase funding and resources that the state of Virginia allocates towards APNEP efforts. Moreover, this enlargement could strengthen the state of Virginia's commitment to APNEP, and possibly more importantly, to the implementation of EBM.

Previous work by APNEP's Science & Technical Advisory Committee (STAC) supported including the Upper Roanoke Basin into the jurisdictional boundary for the following reasons:

> (1) All upstream areas that contribute water, biota, and materials that effect environmental health and quality of the estuary
> (2) Marine areas that can exchange water, biota, and materials with the estuary
> (3) Participation by agencies that have jurisdictional and administrative responsibilities for contributing areas. (STAC Issue Paper 4, 2011)

The APNEP STAC supports this expanded boundary in order to " fully allow application of EBM principles to management of the APNEP which are consistent with the newly adopted policies of the APNEP Policy Board" (STAC Issue Paper 4, 2011). However, it should be noted that there could be potential backlash from this expansion. If the program area is expanded without additional financial support from Virginia, then already thin funding is now spread over

an even larger area. This would make it more difficult to manage many of the measurable objectives outlined in the CCMP.

2. *Cross-State Complications: The Possibility of Mining for Uranium in Virginia*

Uranium mining has been a politically divisive issue within the Commonwealth of Virginia for the past few years, and has inevitably influenced North Carolina politics due to possible downstream effects. And while the location of the potential uranium mine is in Coles Hill, Virginia, which is in Southside Virginia in Chatham County is in the overall APNEP watershed, it is not within the APNEP program area (Upper Roanoke River Basin). A map of the location of the uranium mine site can be seen in Figure 3 below.

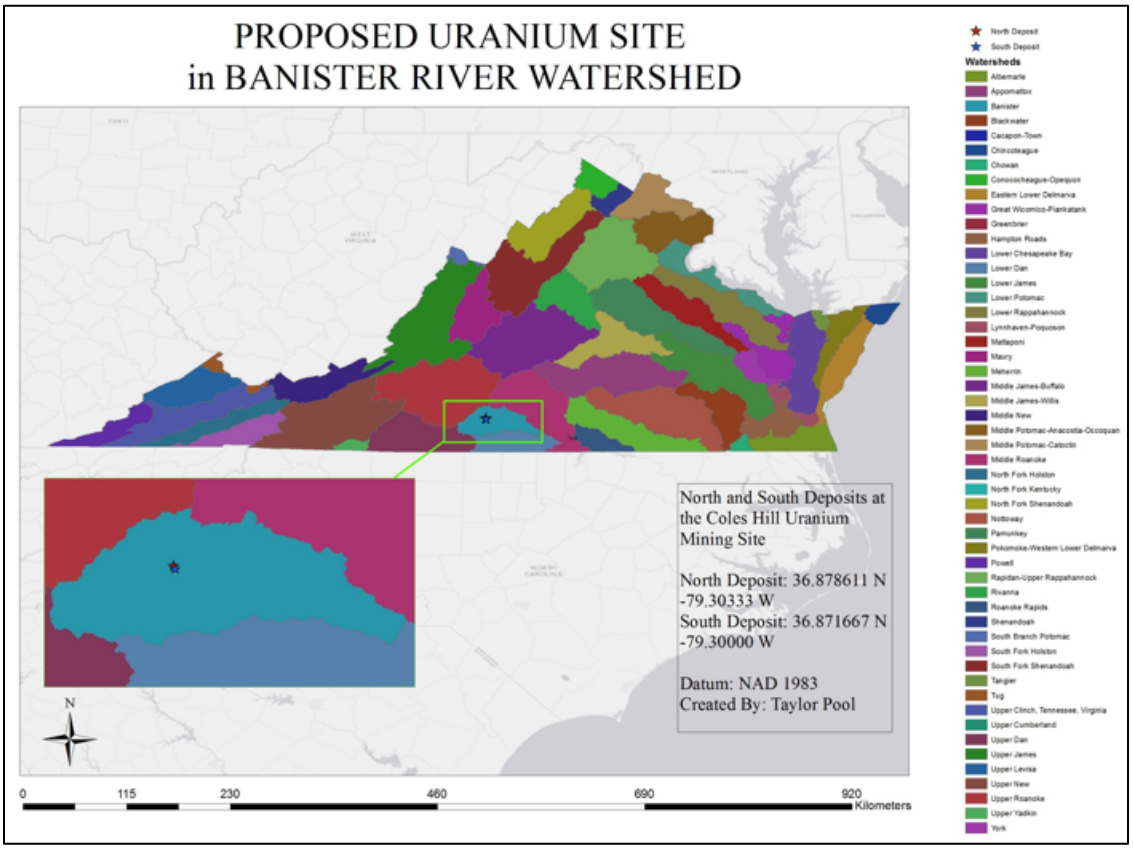

Figure 3: North and South Deposits of Uranium at Coles Hill by watershed

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Currently, the proposed state legislation was removed by its sponsor Virginia State Senator John Watkins (VA-10) due to the lack of support for the bill. The bill would have lifted a decades old ban on uranium mining within the State of Virginia. Currently, Virginia Governor Bob McDonnell is currently considering an executive order to develop regulations for uranium mining which would effectively lift the ban on uranium mining within Virginia. The environmental issues of concerns for the APNEP region are water contamination from uranium mining tailings (waste product from the mining process) that could get into the water system via Mill Creek which borders the mine site; and it is a tributary to the Banister and Dan Rivers which flow into the APNEP watershed. This issue adds increased political pressure to control what happens within the APNEP region, and gives added caution and concern as to whether APNEP should expand into the Upper Roanoke River Basin.

3. Recommendations for APNEP to Expand Program Area

Creating a roughly even split in the program area between North Carolina and Virginia could increase Virginia's role in the management of the estuaries. This could influence the state of Virginia to increase its financial resources and in-kind contributions to APNEP. Moreover, any organization implementing EBM needs have some degree of authority over an entire ecological boundary, which is currently not the case. By expanding the program area, APNEP would be able to manage the entire Roanoke watershed and have a more comprehensive strategy for the waterway.

Whether or not the ban is lifted, the uranium mining issue presents a case study on cross state collaboration, and significant increase in collaboration that is needed if the Upper Roanoke

River watershed were added to the APNEP region. The Upper Roanoke River watershed area includes Smith Mountain Lake and the dam that operates to support the lake. There would likely need to be more Virginia government involvement within the APNEP program. However, Virginia has a large participatory role within the Chesapeake Bay Program and contributes state funds towards this program. Virginia's role in the Chesapeake Bay Program could limit their budgetary contributions towards APNEP if a proposed expanded area is adopted, which has the potential delay initiatives for implementing EBM. Increasing Virginia' role could also have added complications due to political influences on the APNEP program.

F. Expanding GIS Mapping Cooperation

In this section, the importance of GIS will be highlighted as it relates to comprehensive management of ecosystems. Many organizations, including APNEP, have cited how vital mapping technologies are to understanding ecological problems and prescribing solutions. In the next section, examples of state, regional and international programs aimed at managing along ecosystem boundaries instead of political ones, will be provided. The discussion will also include the ways in which enhanced GIS mapping have already benefited these practices. Finally, we provide recommendations for APNEP in expanding its mapping technology to improve estuary management practices.

1. *Importance of GIS in Estuary Management*

Many large-scale implementations of EBM require significant sharing of Geographic Information Systems (GIS) maps. Sharing of spatial data is crucial because "a key element of EBM is the recognition that species distributions and derived ecological boundaries, and not

administrative or political boundaries, should guide…[EBM] management" (Cogan et. al., 2009). Unfortunately, a number of states in the U.S. have centralized mapping services that span the extent of a state's political boundaries and no further. Currently, maps created by the states of North Carolina and Virginia maps are available to the other state. However, both states use maps that utilize data from within the state boundary, not across state lines. This opens the opportunity for enhanced cooperation through creation of a widespread atlas of maps of the APNEP program area.

The main problem of isolated state-specific maps is that they have boundaries at political lines. This becomes especially problematic when an organization attempts to incorporate EBM into a multi-state region. For example, if APNEP has a specific restoration plan for the Chowan River Basin and it is examining only North Carolina maps, or North Carolina and Virginia maps separately. Separation of GIS data by political boundaries causes a divide in the information that could hinder effective implementation of a management plan. APNEP needs quality maps that respect ecological boundaries, such as entire water basins or sounds, in order to effectively implement EBM.

APNEP personnel have acknowledged not only the need for increased information via GIS mapping systems, but also the existing gap between current information resources and the amount needed for effective management of APNEP region. The 2012 CCMP recognizes that the:

> [P]ackaging and delivery of information to resource managers and local governments is of critical importance and can be substantially improved by incorporating advances in mapping technologies…[and] work must be done to integrate information generated on both sides of the North Carolina-Virginia border. (APNEP, 2012)

Action A1.1 of the CCMP calls for facilitation of mapping of significant ecological, bathymetric, geologic, demographic, and cultural features. Clearly, much potential exists for cooperation to increase through sharing of information, specifically the creation of an atlas to incorporate both states pre-existing maps.

The importance of quality mapping of entire ecosystems to implementation of EBM cannot be overstated. First, "consistently mapped ecological boundaries and zones can be used to support specific applications," (Cogan et al, 2009) which are necessary for effective implementation of EBM policies. In promoting adaptive management, "the process of mapping and monitoring provides a consistent ecosystem-wide approach to determine when management changes are needed" (Cogan et al, 2009).

Data collection is an integral part of EBM management, as countless datasets – habitat inventory, measures of disturbance regime dynamics, baseline species assessments, and many more – need to be integrated for comprehensive review. This information can be "integrated into GIS and consolidated across spatial scales…to address multiple scientific objectives…and facilitating data synthesis for a broad range of research and EBM needs" (Cogan et al, 2009). Appendix D evaluates local, regional, national and international case studies where GIS has enhanced EBM implementation.

2. Recommendations for APNEP to Expand GIS Capabilities

A major recommendation for APNEP is the expansion of program-wide Atlas of maps created using GIS software as well as increased coordination with Virginia on the creation of such a database. This could be accomplished by hiring a GIS expert to act as a liaison between the NC DENR and the designated agency partner in Virginia (VA-NHP or VA-DCR) to combine

current statewide maps and generate new APNEP-specific maps that would be used for EBM implementation. Since APNEP currently only has one Virginia field representative, increasing their program area, as described above, could enhance their role in the management of the Albemarle Sound watershed. Moreover, establishment of a MOA on information sharing could create a renewed sense of cooperation between the two states in an effort to integrate the various statewide ecological maps. The visualization of entire watersheds, especially those that cross state lines, is essential to any effort of a place-based management scheme.

VII. Draft MOA for NC-VA Program Cooperation: Explanation of Updates

We have made substantive and editorial updates to the original MOA. The full Draft MOA may be found in Appendix E. The updates are explained as follows:

(1) Signatories. We determined that as the lead environmental agency in Virginia, The Virginia Department of Environmental Quality was a more appropriate signatory than the Virginia Department of Conservation and Recreation. In order to ensure that the MOA is given priority at the state level, we have included agency secretary-level signatories.

(2) We have referenced the Roanoke River Basin Bi-State Commission as well as APNEP. The Commission, established in Virginia, is composed of legislators from Virginia and North Carolina working toward a cooperative management strategy for the Roanoke River Basin, the entirety of which may become part of the APNEP program area.

(3) We have included EBM as a joint strategy for regional management (item a.). EBM is a prominent feature of the updated CCMP and must figure strongly into a cooperative management scheme to be successful.

(4) We have included an objective to share, centralize and standardize information and data sets (item d.). A challenge to cooperation thus far has been the decentralization and heterogeneity of information such as GIS data.

(5) We have included an objective to share state-to-state information with other relevant partner state agencies that are not signatories to the MOA, in order to streamline the transfer of critical information.

(6) We have included an objective to keep both EPA regions represented “in the loop” concerning joint efforts and objectives, in order to maximize available regional support.

(7) We have included a list of non-signatory agencies and organizations to copy on the signed MOA, to generate awareness of the collaborative goals and commitment to cooperation among important partners.

VIII. Conclusions

The Albemarle-Pamlico National Estuary Partnership is one of the first 28 National Estuary Programs established under the Clean Water Act in 1987. APNEP and other NEPs were created to incorporate all aspects of the estuarine system into a management process to insure that these ecologically sensitive areas remained protected for future enjoyment. Recently, APNEP revised and amended its principal management document, the Comprehensive Conservation and Management Plan, to include ecosystem-based management as a focal point for implementing conservation and governance structures. EBM is relatively new to the coastal and marine ecosystem management, and implementation still contains a host of challenges. To adequately address these challenges APNEP can: (1) structurally reposition itself to create political independence; (2) help implement state based legislation to provide authority towards implementation efforts; and (3) increase cooperation with Virginia through soft law agreements, such as memorandums of agreement, that enforce EBM.

1. *Organizational Structure*

Through conversations with other NEPs and examination of literature written on the fundamentals of organizational structure and theory, it appears that EBM is best implemented through a program that does not have outside political pressures directing their efforts towards a particular agenda. The EPA conducted a program evaluation in 2009 and recognized the fact that

APNEP is vulnerable to state politics and could potentially benefit from relocating to a site that gives the program more independence and visibility. Examples of other NEPs moving from state agencies to other locations exist, and have presented complications and benefits from this process. Ultimately, the choice resides within APNEP and whether or not they see more benefits from moving from a state agency than costs.

2. *State Legislation*

Based on individual state case studies, a few lessons from New York and Washington states may apply to APNEP's program area. First, APNEP's partners to have regulatory authority, through holding various agencies accountable with public reporting, can advance EBM principles through financial incentives and disincentives. Further, since EBM will undoubtedly affect many state agencies other than NCDENR and VADCR, therefore implementation materials should be presented and tailored specifically to these agencies. Because of its interdisciplinary nature, EBM will mean different policy changes for NC Department of Agriculture and Consumer Services than it will for NC Department of Secretary of State.

3. *Increasing Cooperation with Virginia*

If APNEP is to implement EBM along the entire program region, it needs to increase participation and cooperation from the state of Virginia. Expanding the program area to include the Upper Roanoke Basin could increase Virginia's commitment because the program area would be roughly split into equal parts between Virginia and North Carolina. In addition, current GIS mapping cooperation between the two states is minimal, and could be greatly expanded to incorporate both state's ecological GIS maps to get an ecosystem and watershed focus.

Uranium mining legislation was recently pulled from the Virginia state legislature; however, Gov. Bob McDonnell is still considering an executive action to develop mining regulations, and mine the Coles Hill site. Whether or not this issue is resolved during this Virginia General Assembly session, the need for greater cooperation between North Carolina and Virginia is still present. Issues such as uranium mining affect both states and should be dealt as such.

4. *Memorandum of Agreement*

Twelve years ago, APNEP took an innovative step in bringing together NC DENR and VA DCR under an MOA to cooperatively work toward the protection and restoration of the Albemarle-Pamlico estuary system. The MOA approach is the exception rather than the rule in multi-state NEP coordination, but APNEP recognizes it as a valuable tool to unite the conservation efforts of agencies and stakeholders on both side of the border in the Albemarle-Pamlico watershed system. APNEP continues to recognize the value of the bi-state MOA and the need to update the agreement to reflect the evolution of the partnership and the focus on EBM options to achieve program goals. If APNEP ever does commit to institutional reorganization, the MOA will continue to be a valuable option to maintain close working relationships with NCDENR and the Virginia environmental agencies.

Concerning institutional reorganization, multi-state NEPs that have moved away from state government in favor of nonprofits or educational institutions as program hosts generally reflect that such moves have increased their ability to work across state lines and meaningfully involve stakeholders in different states. The general sense is that despite best efforts, quartering an multistate NEP program within the agency offices of one state tends to skew the focus of the

program toward interests in that state, risking the alienation of critical partners across the border. We take from this that APNEP's ability to work with southern Virginia partners in order to implement a basin wide EBM framework could only be increased by a relocation of the program to a non-state organization.

5. *Steps Forward*

As APNEP remains committed to implementing EBM in the program area, continuous evaluation and improvement are needed. Adaptive management is, after all, one of the major tenets of Ecosystem-based Management and regular retrospection to determine not only how effective APNEP's implementation strategies are, but also how to improve upon them in the future. Master's Projects, such as these, can help identify potential areas for improvement, such as structural relocation and enhanced cooperation with Virginia, and also emphasize the positive implementation strategies to continue in the future.

IX. Acknowledgements

Our group would like to acknowledge the guidance and support that we have received from our advisors Dr. Rebecca Vidra and Dr. Michael Orbach. We would also like to thank our client for setting up this project, as well as facilitating great lines of communication that clearly established the needs of this project. Specifically, Dr. Bill Crowell, Dr. Dean Carpenter and Jim Hawhee were incredibly helpful in narrowing our research objectives to create a set of useful deliverable actions. Last but not least, we would like to thank all of the sources of information that we contacted for this project. Of particular importance are: The New York State Office of

Parks, Recreation and Historic Preservation (Lynn Bogan, Peter Glouse, Pamela Otis); Doug Jacobson of EPA Region 6; Ray Allen from the Coastal Bends Bays and Estuaries Program; Kerry St. Pe from the Barrataria-Terrbonne National Estuary Program; Richard Ribb of the Narragansett Bay Estuary Program; Bob Nyman of the New York-New Jersey Harbor Program; Derek Sowers of the Piscataqua Regional Estuary Partnership; Mark Tedesco of the Long Island Sound Study; and Dr. Kirk Havens and Dr. Carl Hershner from the Virginia Institute of Marine Science. Without all of your continuing support this project would not have succeeded.

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APPENDIX A: Case Studies for Organizational Structure

1. *Coastal Bends Bays and Estuaries Program*

The Coastal Bends Bays and Estuaries Program (CBBEP) is a 515 square mile area estuarine system that includes the Copano, Aransas, Corpus Christi, Nueces, Baffin and upper Laguna Madre bay systems (CBBEP, 2013). CBBEP is a 501(c)(3) non-profit organization that began within the Texas Council on Environmental Quality (TCEQ) during the initial planning stages. However, once the program was operational the CBBEP decided that it would function more efficiently if the CBBEP were its own entity.

CBBEP considered moving into a local or regional government program, as well as possibly within a port authority before creating the non-profit organization, but those ideas all seem to pose conflicts within their management plan. Local stakeholders did not want to have any sort of regulatory authority that could potentially cross lines between regulations and partnerships. Therefore, the organization set up an inter-local agreement with entities to provide a continual source of funding. This agreement was a contract that established the CBBEP as a non-profit and allowed for the confidence that there would be continuous funding to allow the implementation of the CCMP (Ray Allen, Personal Communication, 2013).

The creation of the non-profit organization gave the organization the independence it needed to create quicker decision-making abilities, and a conflict-free process when implementing its CCMP. Being a non-profit also creates a great mechanism to request funds for other implementation projects by applying for grants and soliciting corporations that can write-off their donations come tax season (Ray Allen, Personal Communication, 2013).

However, the CBBEP operates individually, which tends to have a few complications. This means that all of their administrative costs are provided by their funding solicitations. One

of the benefits of being within a state agency is that the agency will provide personnel funds and administrative operational costs, as well as an office location. But, these costs can be frozen during a state budget crisis. Also, a sense of ownership in the CBBEP comes from the local and regional people operating in complete collaboration absent any political agenda that is being pushed through the state. Board of director's membership consists of a wide range of participants, ranging from environmental non-profit organizations to members of the port authority (Ray Allen, Personal Communication, 2013).

2. *Barataria-Terrebonne National Estuary Program*

Similarly to the Coastal Bends program, the Barataria-Terrebonne NEP (BTNEP) began within a state agency, the Louisiana Department of Environmental Quality (LDEQ). The BTNEP estuarine system includes 4.2 million acres (0.00625 square miles) of wetlands, ridges, forests, farmlands, and communities between the Mississippi and Atchafalaya River Basins in southeast Louisiana (BTNEP, 2013). BTNEP developed its CCMP under the auspices and funding of the LDEQ. However, during the implementation of the initiatives within their CCMP, BTNEP found that its goals did not match the goals of the LDEQ. Most of the conflicts arose when BTNEP began working on cultural projects, and projects that did not enforce the LDEQ regulatory agenda. Consequently, in 2001 BTNEP Executive Director Kerry St. Pé decided to move the office to the state university program, the Louisiana University Marine Consortium (LUMCON). Since BTNEP's action plans in the program's management plan cover a broad range of ecological, fish and wildlife, educational and cultural issues, LUMCON seemed like the best match as a state host for the program at this time (Guadet, 2001). BTNEP had a discussion with the LDEQ

and the department agreed that their placement might be better suited under a state university program.

This transition was completed through Louisiana state legislation House Bill 1 (HB.1) in 2001. However, the administrative transition within HB.1 included a funding cut of $100,000, which placed BTNEP in danger of not meeting the federal match requirements required under CWA Section 320. However, the Board of Regents who presides over the state university program provided an additional $30,000 to help BTNEP meet their requisite match. BTNEP was also required to cut two programs to fully meet the match requirements (Guadet, 2001).

Once the transition was complete, BTNEP established a non-profit foundation to attach to the state university program to provide additional funds. A non-profit foundation can solicit funds from sources that are unable to donate to state universities and state agencies, and thus create an additional source of revenue.

Progression of BTNEP has been steady and consistent. The NEP has reached a level of autonomy and independence that it was unable to reach within a state agency. BTNEP has seen considerable differences within the effectiveness of their program. Under LDEQ, BTNEP was "pushed" towards acting in accordance with state agency agendas and state political wishes. Divisions within the state agency had previously created silos for each individual component of the CCMP. Now, BTNEP under LUMCON is able to have multiple coordinating bodies syphoned down into one body that has the efficacy to manage all aspects of their implementation plans (Kerry St. Pe, Personal Communication, 2013).

APPENDIX B: Case Studies for Bi-State Cooperation

1. *New York-New Jersey Harbor (NY-NJ)*

The New York-New Jersey Harbor NEP overlays large parts of both states. New York contains most of the watershed, while both states have significant lengths of harbor coastline. Uniquely, the program had been hosted with EPA Region 2, but the EPA grant was received and managed by the New England Interstate Commission (NEIC). The incorporation of a third party management partner has been useful toward ensuring the equitable allocation and use of program funds throughout the bi-state program area. The program does not utilize any sort of cooperation compact beyond the CCMP (Bob Nyman, personal communication, 2/1/2013).

On March 5, 2013, EPA Region 2 concluded that HEP would be optimally managed by an entity outside of EPA and the forthcoming transition of the program. EPA stated that an independent management structure would allow for enhanced programmatic flexibility, the ability to seek significant additional sources of funding, and additional support from outside parties. At this time, EPA and HEP are reviewing options for a new programmatic home (Enck, 2013).

2. *Long Island Sound Study (NY-CT)*

The Long Island Sound Study predates the national NEP, having been created by Congressional act in 1985. EPA hosts the program in a collaborative effort between Regions 1 and 2. Stakeholders in New York and Connecticut offer generally equal involvement although there is likely more priority given by the Connecticut government as the entire state is in the program area, compared with only a portion of New York. In addition, there is no separate cooperative agreement outside of the CCMP. The program is not directly supported with funds

from either state. The program has recently begun working with upstream states that are outside of the program area in order to achieve greater watershed benefits. According to Mark Tedesco, Director of the program, EPA has been a satisfactory host in terms of authoritative flexibility (Mark Tedesco, personal communication, 2/4/2013).

3. Narragansett Bay (RI-MA)

The Narragansett Bay program offers many similarities and some predictive value with which to characterize APNEP's options. The program region includes an estuarine area mostly within Rhode Island borders; however, the contributing river basins of the Blackstone, Ten Mile, Warren, and Taunton are primarily within the state of Massachusetts. For 10 years, the program was located within the Rhode Island Department of Environmental Management (RIDEM), which presented barriers such as those described in (1), NEP Institutional Housing, above.

In this location the program lacked the autonomy to conduct activities across state boundaries, and indeed, could not even drive a state-owned vehicle into Massachusetts. The location within the Rhode Island state government presented personnel challenges as well, as state and union hiring regulations at times hindered acquiring appropriate staff. In addition, the program received no funds matching package from Rhode Island. In 2003, the program began a transition to the University of Rhode Island Graduate School of Oceanography. There, the program has enjoyed significantly more operational freedom and autonomy, but still experiences fragmentation due to lasting administrative ties to the state agency. The program staff includes two members from URI, two from an NGO, and a staff member from RIDEM, an arrangement that actually requires three separate operating budgets.

The Narragansett Bay program faces challenges described in (2) and (3) above. Although the area of the program in Massachusetts was expanded in 2003 and four of the 15-person stakeholder management committee is in Massachusetts, there has not been a move toward a strong bi-state ecosystem management approach. At the state level, priorities lie with the Massachusetts Bay NEP and locally, Massachusetts representatives feel that the program is too 'Rhode Island specific' and lament the lack of funds available for projects and priorities in Massachusetts. The Narragansett Bay program continues to look to the future as it works toward institutional consolidation and ways to improve working relationships with Massachusetts's stakeholders (Richard Ribb, personal communication, 2/1/2013).

4. *Piscataqua Region Estuaries Partnership (NH-ME)*

The Piscataqua Region Estuaries Partnership (PREP), formerly the New Hampshire Estuaries NEP, has structural similarities with APNEP that create opportunities to learn from shared experiences. The program area includes 52 communities in New Hampshire and 10 in Maine. The program expanded into Maine in 2005 in order to incorporate the watershed area immediately to the east of the Piscataqua River, after which time the program name was changed to reflect the regional partnership. The program was previously housed with the New Hampshire State Planning Office, but has since moved to the University of New Hampshire (UNH). The location within UNH has facilitated more effective work across state lines and has unencumbered the program from political influence.

There are four members of the program management committee based in Maine, including an official from the Maine Department of Environmental Protection, and the program enjoys strong local and grassroots support from the 10 included communities. However, due to

the small size of the Maine area included in the program, there has not been strong support at the state level from Maine, as described in Situation 2 above. It is therefore unlikely that New Hampshire and Maine would pursue an MOA of the type employed by North Carolina and Virginia.

PREP faces some interstate challenges related to data standardization, such as discontinuous GIS data sets between the two states, which remains a problem area for most bi-state ecological regions. PREP staff agrees that the inclusion of the Maine watersheds and move to UNH has substantially increased the ability to accomplish program goals (Derek Sowers, personal communication, 2/7/2013).

APPENDIX C: Case Studies for Individual States

1. *New York Case Study*

On July 23rd, 2006, New York unanimously passed the New York Ocean and Great Lakes Ecosystem Conservation Act (S-8380 A-10584B), which established ecosystem-based management as a tool to preserve and protect New York's ocean and Great Lakes' ecosystems. In order to achieve this goal, the Act creates the New York Ocean and Great Lakes Ecosystem Conservation Council consisting of "nine members: the commissioners of agriculture and markets, economic development, environmental conservation, general services, parks, recreation and historic preservation, and transportation; the secretary of state, the president of energy research and development authority; and the chancellor of the state university of New York" (NY Stat. 8380). Since each of these nine authorities ultimately affects New York's coastal ecosystems, they were directed to advance EBM through weaving in the six aforementioned principles into their agency-wide activities and programs (NY DOS, 2009)

The Act requires the Council to meet at least quarterly and is charged with eight main responsibilities (Appendix E), mainly "to improve coordination, reduce duplication of effort, and ensure accountability among those responsible for marine resources" (NRDC, 2006). These meetings were meant to facilitate drafting of a report to present to the governor and legislature regarding the current state of New York's bodies of water and identifying priorities and recommendations for implementing ecosystem-based management.

The principles of EBM that New York employs are consistent with APNEP's interpretation, namely that there should be a place-based focus, scientific foundation for decision-making, measurable objectives, adaptive management, recognition of interconnections within and among ecosystems, and involvement of stakeholders (Bogan and Cady-Sawyer, 2006).

However, quite similar to APNEP, there are a number of obstacles that impede these organizations to implement EBM in such large program areas. For example, the following are major challenges to EBM implementation: educating employees on a new management system; competing interpretations; the impression that EBM is already being employed; limited resources; and difficulty with monitoring and enforcement (Bogan and Cady-Sawyer, 2006)

The Council's Guidelines and Recommendations document aimed at evaluating current state of EBM in New York after three years of implementation. Here, each of the nine Council members examined their relative programs and identify how agency decision-making could be enhanced towards transitioning to EBM. Specific executive and legislation actions were to be reported in an effort to integrate EBM into New York's programs and laws.

The report outlined five common themes when reviewing the successes and shortcomings of EBM implementation in 2009:

> (1) Increased funding: Funds would go toward supporting additional staff members and directly to agencies for program implementation.
> (2) Need for training: Staff members will require initial and ongoing training for EBM implementation.
> (3) Information: Agencies need better data and information management to complete EBM objectives, including data acquisition and sharing, mapping and GIS atlases, and database management.
> (4) Stakeholder participation: Involving the public, particularly at the local level, is needed to advance EBM directives. Public education and outreach of the impact of land use decisions on environmental resources is crucial.
> (5) Better coordination: Agencies feel the need to enhance coordination both within and among agencies. Enhanced information sharing would help, particularly through formalized MOAs at the State level. (New York Ocean and Great Lakes Ecosystem Conservation Council, 2009

To address these themes, they identified four major recommendations

> (1) More detail regarding timeline and budget for EBM implementation: With current budget cutbacks, the Council should provide more specific outlines within its steps for implementation, including timelines and associated costs.

> (2) Additional program plans: Agencies should be encouraged to determine programs where incorporation of EBM might not be as obvious.
> (3) Legislative actions: While most agencies could not specific which legislative actions needed to occur, agencies need a legislative framework in which to work if EBM is to be implemented successfully.
> (4) Redefine administrative boundaries: Many agencies suggested refining regulatory areas on a watershed basis as opposed to municipal jurisdictions. (New York Ocean and Great Lakes Ecosystem Conservation Council, 2009

Each theme and recommendation has significant relevance to APNEP's situation as an organization recently incorporating EBM into state agencies (New York Ocean and Great Lakes Ecosystem Conservation Council, 2009).

In order to address these concerns, New York Environmental Management Bureau (NY EMB), took a number of initiatives in order to ensure that EBM successfully permeated all state parks and relevant state agencies. The NY EMB: held staff trainings based on the six EBM principles; had employees apply EBM into their specific work elements; held educational panels for people to learn about affected ecosystems; developed EBM language for official policies; and incorporate adaptive management to facilitate successful integration of EBM (Bogan and Cady-Sawyer, 2006).

New York State, along with APNEP, has incorporated demonstration projects to introduce communities to EBM. It is incredibly challenging to completely transition from a different management system to EBM overnight, especially in program areas as large as APNEP or the totality of all New York state parks. Therefore, demonstration projects are local implementations of EBM to introduce smaller communities to the process. It benefits the communities because they receive the attention of larger organizations, and it benefits implementation organizations by having a 'trial run' of the process to determine where they can improve upon their implementation strategy. New York's two main demonstration projects were located in Sandy Creeks and the Great South Bay. The Sandy Creeks' implementation activities

involve: invasive species control, forestry workshops and a dam removal. The Great South Bay implementation activities involve transplanting hard clams and planting new eelgrass seeds (NY DOS, 2007).

2. Washington State Case Study

In 2005, then Washington Governor Christine Gregoire charged the Puget Sound Partnership (PSP) with "develop[ing] recommendations for preserving the health and ecosystem of Puget Sound, and [helping] educate and enlist the public in achieving recovery of the sound by 2020" (Manning, 2006). During this scoping stage, the first partnership consisted of 22 members from various state interests to investigate and develop a report to present to the governor, which was eventually released in December of 2006.

On May 7th, 2007 Washington Governor Gregoire signed into law Senate Bill 5372, which created a permanent Puget Sound Partnership (PSP) (Washington Votes, 2007). The law charged the PSP with continuing recovery efforts for the Puget Sound region (ELI, 2007). In order to maintain institutional knowledge over time, SB 5372 established staggered appointments for the council and board. (ELI, 2007).

The PSP also includes an ecosystem coordination board whose main role is "to advise the Puget Sound Partnership's Leadership Council on carrying out its responsibilities" (Puget Sound Partnership, 2013). One of the responsibilities of this body is to identify conflicts and disputes among ecosystem projects and convene when necessary to reconcile the conflict with the underlying objective of advancing the recovery of the Puget Sound (SB 5372 § 8(6)(c)). In all, Washington State has created "[o]ne of the most sophisticated EBM processes underway in the U.S." (Tallis et al., 2009), and serves as a model for other organizations attempting to implement EBM at a regional level.

APPENDIX D: Case Studies for GIS Expansion

Many coastal regions have demonstrated that development and maintenance of data rich ecosystem maps is necessary to implement ecosystem management for a region. For example, 'MarineMap' helped the state of California develop a network of Marine Protected Areas (MPAs) to implement EBM. Internationally, the Palauan government incorporated GIS tools to create soil maps on an ecologically degraded island that were able to "highlight those areas that are best and worst for land uses like development and agriculture in terms of impacts on sedimentation and pollution of downstream coastal ecosystems" (Packard Foundation, 2010).

There have been various instances where sharing information that crosses political boundaries has led to increased cooperation between jurisdictions and more effective management plans. First, a regional agreement between the five Caspian Sea riparians – Azerbaijan, Turkmenistan, Iran, Kazakhstan and the Russian Federation – was reached due to depleted fisheries. The declining bioresources and depleted fisheries spurred action to assist the littoral states in agreeing on "political commitments made to ecosystem-based joint action on sustainable fisheries and bioresources and introduce institutions and reforms to catalyze implementation of policies reducing over-fishing and benefiting communities" (Farshchi, 2011). The project aimed at strengthening regional environmental governance and creates new methods for conservation and sustainable management of the Caspian's resources. The agreement has been viewed as a wide success due to the vast amount of information sharing:

> The project enhanced data and information sharing through the establishment of a web-based CIC [Caspian Information Centre], incorporating available environment status data, assessable and transparent for public – as a critical element to facilitating good regional environmental governance (Farshchi, 2011).

Another example of international agreements incorporating shared GIS maps involves marine habitat mapping (MHM) with five nations in Northwest Europe: Belgium, France, Ireland, Netherlands, and the United Kingdom. MESH (Mapping European Seabed Habitats), the European Union-funded project, is charged with creating common and information systems used at the transnational level to manage seabed habitats through establishing a spatial planning framework. The primary output is a harmonized seabed habitat map and habitat modeling for regions with incomplete data (Coggan et al, 2005).

Domestically, the National Oceanic and Atmospheric Administration (NOAA) has emphasized the importance of information sharing for effective fisheries oversight. NOAA's Strategic Guidance for Implementing Ecosystem-Based Approach to Fisheries Management, states that:

> Identification and systematic assessment of the existing use of geographically based fishery management measures in the US, including EFH, should be conducted at a multi-national, federal, regional/interstate, Council, state, and local levels. Areas should be documented and mapped using GIS (NOAA, 2003).

NOAA stresses mapping using GIS as a vital component strategic planning for fisheries that span political boundaries, which is particularly relevant to APNEP's management of the vital fisheries along North Carolina and Virginia coasts.

Even within a state fragmentation exists among the various local state agencies that produce maps. New York for example, has implemented EBM at a statewide level for all state

parks and their coastline. In response, the New York Council created a program to implement EBM that:

> Developed an online mapping program, the Atlas, which includes more than 300 datasets. The Atlas is meant to provide citizens and decision-makers with spatial information about New York's ecosystems, including both administrative and ecological information (ELI, 2009).

APPENDIX E: Draft Memorandum of Agreement

Memorandum of Agreement
Between the
State of North Carolina Department of Environment and Natural Resources
And the
Virginia Department of Environmental Quality
For the
Cooperative Conservation and Management Objectives of the Albemarle-Pamlico Region

This Memorandum of Agreement provides for the continued and expanded coordination and cooperation between the North Carolina Department of Environment and Natural Resources (NCDENR) and the Virginia Department of Environmental Quality (VADEQ) and other key partners as named in the Albemarle-Pamlico National Estuary Partnership (APNEP) Comprehensive Conservation Management Plan (CCMP) and Roanoke River Basin Bi-State Commission toward the protection and restoration of water and ecosystem resources throughout the Albemarle-Pamlico watershed and estuary system.

This MOA does nothing to diminish the independent authority of each agency in the administration of its statutory authority. This MOA is intended to expedite the missions of the agencies responsible for natural resource identification, protection, and restoration by facilitating interagency and interstate coordination of related activities. All activities conducted under or pursuant to this MOA are subject to the availability of appropriated funds and resources and no provision herein shall be interpreted to require obligation of payment of funds in violation of the Anti-Deficiency Act, 31 U.S.C. 1341. This MOA is not a funding document and does not represent the obligation or transfer of funds or resources.

Agreement

The State of North Carolina, as represented by the Secretary, N.C. Department of Environment and Natural Resources and The Commonwealth of Virginia, as represented by the Director, Virginia Department of Environmental Quality agree that continuing a coordinated effort on the part of both agencies is the most effective means to develop and implement strategies to protect, restore, and maintain the chemical, physical, and biological integrity of the Albemarle-Pamlico Region, estuarine network, and six constituent watersheds.

The states hereby agree to the following management goals in the Chowan, Neuse, Pasquotank, Roanoke, Tar-Pamlico, and White Oak watersheds in support of the objectives pursued by the APNEP CCMP and by the Roanoke River Bi-State Commission.

a. Evaluate Ecosystem Based Management strategies as identified in the APNEP CCMP and implement such strategies as supported by agency discretion
b. Maintain regular communication across state lines on critical activities of regional significance
c. Improve understanding and communication concerning priorities, goals, and objectives of the respective States with respect to regional importance
d. Initiate steps to share, centralize and standardize information and data sets, specifically including monitoring and GIS data, across state lines as necessary for consistent regional research and management
e. Explore, identify and share opportunities for supplemental funding to protect, research, maintain, or restore critical resources
f. Coordinate cooperative strategic programs for the reduction and control of nonpoint source pollution to alleviate stress on water quality, habitats, and other natural resources including designates priority rivers and streams
g. Coordinate planning and management strategies to encourage sustainable and responsible growth
h. Promote greater understanding among the region's citizens regarding the natural resources of the region, policies and programs designed to protect them, and to encourage individual responsibility and stewardship for the shared resources of the region
i. Sponsor joint scientific and programmatic stakeholder meetings
j. Share strategies and information resulting from interstate collaboration with other state agencies having common purview and interest in the protection of environmental and cultural resources in the region
k. Maintain collaborative relationships with EPA Regions 3 and 4 in support of regional management objectives

Effective and Termination Dates

This MOA is effective upon signatures of authorized representatives of both agencies and shall remain in effect until terminated. This MOA may be modified in writing by the mutual consent of the parties and may be terminated at any time in writing by either party at its discretion, subject to the negotiation and completion of ongoing actions and projects.

Signatories to the MOA

As to the North Carolina Department of Environmental and Natural Resources

_____

John E. Skvarla III, Secretary

As to the Virginia Department of Environmental Quality

_____

David K. Paylor, Director

Cc:

Office of the Governor of North Carolina
Office of the Governor of Virginia
USEPA Region 3
USEPA Region 4
Army Corps of Engineers North Atlantic Division
Army Corps of Engineers South Atlantic Division
Albemarle-Pamlico National Estuary Partnership
Roanoke River Bi-State Commission
North Carolina Division of Coastal Management
North Carolina Division of Environmental Health
North Carolina Division of Forest Resources
North Carolina Division of Land Resources
North Carolina Division of Marine Fisheries

North Carolina Division of Parks and Recreation
North Carolina Division of Soil and Water Conservation
North Carolina Division of Water Quality
North Carolina Division of Water Resources
North Carolina Clean Water Management Trust Fund
North Carolina Coastal Reserve Program
North Carolina Coastal Resources Commission
North Carolina Cooperative Extension Service
North Carolina Ecosystem Enhancement Program
North Carolina Environmental Management Commission
North Carolina Natural Heritage Trust Fund
North Carolina Natural Heritage Program
North Carolina Wildlife Resources Commission
North Carolina Marine Fisheries Commission
Office of Environmental Education and Public Affairs
Office of Conservation, Planning, and Community Affairs
Virginia Department of Conservation and Recreation
Virginia Department of Environmental Quality
Virginia Department of Game and Inland Fisheries
Virginia Division of Soil and Water Conservation
Virginia Marine Resources Commission
Virginia Natural Heritage Program
Virginia Office of the Secretary of Natural Resources
Virginia State Parks
Virginia Institute of Marine Sciences
Duke University Marine Laboratory
University of North Carolina at Wilmington Center for Marine Science
University of North Carolina Institute of Marine Sciences
North Carolina State University Center for Marine Science and Technology
University of North Carolina Coastal Studies Institute
Albemarle Ecological Field Site