H.R. 4715

CLEAN ESTUARIES ACT OF 2010

Final Report

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THE CLEAN ESTUARIES ACT OF 2010

EXECUTIVE SUMMARY

The Clean Estuaries Act of 2010 (CEA) will extend the authorization of the National Estuary Program through 2016. The National Estuary Program (NEP) was established by Congress in 1987 to improve the quality of estuaries of national importance by the Environmental Protection Agency (EPA). The Clean Water Act Section 320 directs the EPA to develop plans for attaining or maintaining water quality in an estuary (USEPA). While there has been a general consensus on the nature of the environmental problems addressed by the NEP, there have been serious policy discussions as to the value proposition offered by resource investments in the NEP. Proponents of the Act stress the economic benefits of improved estuaries. Opponents of the Act question whether the current Act is the best or most cost effective way of achieving the goal of improving the estuaries.

This report defines the new proposed approach to evaluation and assessment policy based on a Results-Based Management (RBM) and accountability framework. It details the program evaluation organizational structure and responsibilities, NEP evaluation requirements, and program evaluation assessment and rating schemes, along with risks and assumptions for consideration. Included are the main pillars of the CEA and the political context in which it exists. The new program design is framed by the challenges that are faced by national estuaries, the examination of some solutions that have been enacted, and how the success of these solutions will be scientifically measured.

Chesapeake Bay. *Photo: Emmett Duffey, 2008*

INTRODUCTION

Environmental science and policy enables government, business, industry, academia, and non-governmental organizations to advance in the research of policy relevance on environmental issues. Research and development provides a better understanding of our environment and allows us to develop solutions to our many existing problems. A challenge for environment policy makers is to make the best use of research and the new scientific findings in order to develop and implement policy. Environmental science policies must be cost effective, based on sound scientific assessments and in partnership with all major stakeholders. Sound scientific research and assessment is increasingly important for good policy making (Europa).

IMPORTANCE OF ESTUARIES

Estuarine ecosystems are economically, ecologically, and culturally important zones. Occupying only 13% of total US land area, coastal areas account for 49% of Gross Domestic Product, support roughly 28 million jobs, and house 43% of the US population. Notably, estuaries provide habitat for 75% of commercial and 80-90% of recreational fish catch in the US, an industry that earns $185 billion in revenues annually and sustains 2 million jobs (H. Rpt. 111-442).

The Chesapeake Bay is one of the largest estuaries in the world, and one of the most polluted bodies of water in the United States. *Source: University of Richmond, 2010.*

Estuaries function as natural water filtration systems and coastal buffers against storms, and prevent flooding and erosion. The combination of fresh water and saltwater creates a unique habitat for diverse terrestrial and aquatic organisms. Estuaries are also centers for important leisure outlets such as beach-going, recreational fishing, and coastal wildlife viewing, which annually generate $30, $26, and $49 billion in economic value, respectively (H. Rpt. 111-442).

THE SCIENCE OF ESTUARIES

ENVIRONMENTAL PROBLEMS FACING ESTUARIES

In order to sustainably manage estuaries, it is necessary to understand the complex problems that develop in these unique ecosystems. The principal environmental problems facing the nation's estuaries are water quality degradation, biodiversity loss, and impacts of global climate change.

Water Quality Degradation

Estuaries act as water filters between the land and ocean; when they are overloaded with contaminants, water quality declines. Specialized estuarine plants filter pollutants from the water and store them in their roots. However, the pollutants may reenter the water or food chain when the plants leaves are ingested or biodegrade (Oberrecht, 2005). Pollutants can enter the ecosystem in two ways: through point source (a single identifiable source such as a sewer line) or nonpoint source pollution. Nonpoint source pollution comes from contaminants that are widely distributed throughout the environment. The three main types of pollutants that affect estuaries are excess nutrients, pathogens, and toxic chemicals. Though all of these components exist in nature to some degree, human activity has greatly increased their occurrence and concentration.

One of the most common problems associated with nutrient overload in estuaries is eutrophication, the process by which excessive nutrients, especially nitrogen and phosphorus, inundate bodies of water (Smith, 1998). Humans can initiate eutrophication through sewage discharge and runoff from agricultural fertilizer (Manahan, 2010), causing an overgrowth of plants, phytoplankton, and algae that inhibits the penetration of sunlight. The overgrowth depletes oxygen levels, resulting in dead zones, where other marine species are unable to survive. In 2007, scientists from the National Oceanic and Atmospheric Administration (NOAA) determined that 65% of the estuaries observed in the U.S. showed moderate to high-levels of eutrophication (Bricker et al, 2008).

Algal Bloom in the Chesapeake Bay.
Source: Harper, 2010

Pathogens are bacteria, viruses, or other disease-causing microorganisms such as Cyrptosporidium species that enter waterways from public sewage or livestock runoff. Their presence in drinking water and recreational swimming areas can lead to public health concerns, closures of commercial fisheries, and decreased recreational activities. Toxic contaminants from a variety of sources, mostly industrial, present serious threats to human and ecological health. Toxic chemicals also poison plants, fish, and other wildlife. Cleanup efforts are often extremely difficult and costly.

Biodiversity Loss

Estuaries are home to a vast array of birds, mammals, fish, reptiles, insects and plants. Many are specialized for a particular level of salinity and placement within the estuary. Slight changes in the ecosystem can have substantial consequences. When invasive species are introduced to a new area, they often thrive unchecked and can outcompete native species, leading to population decline or even extinction.

Climate Change Impacts

The Clean Estuaries Act of 2010 specifically addresses the importance of preparing for the effects of climate change in the CCMPs. According to the Climate Change Science Program, sea level is projected to rise between 0.18–0.59 meters by 2100 (Julius and West, 2008). Sea level increases could lead to land loss by inundation and erosion, removal of natural material from beaches, and increased flood events. Increased temperatures may lead to altered species distributions and interactions, increased microbial metabolic rates, and alternative reproductive and migration timing (Julius and West, 2008). Increases in atmospheric carbon dioxide (CO_2) will lead to acidification of the oceans and waterways, reduced photosynthesis rates, and changes in water chemistry.

The proposed solutions to these complex problems are multi-faceted and vary from estuary to estuary. Common approaches to estuary restoration and remediation include implementation of wastewater pollution management techniques, sediment dredging, invasive species monitoring, and reduction of agricultural pollution. These approaches are discussed in greater detail in Appendix A. Scientific indicators such as dissolved oxygen content are essential to measuring the success of management efforts; a detailed listing of common scientific indicators is found in Appendix B.

LEGISLATIVE HISTORY AND POLITICAL BACKGROUND

Legislative History

Water is a vital natural resource to all nations. Recognizing this – while simultaneously encouraging vigorous and ever-expanding industrial growth – Congress passed our country's first Clean Water Act over six decades ago, in 1948. Despite the well-intentioned mission of this bill, water quality and health were still left as a primary responsibility of individual states. The federal government was simply called upon to "provide financial assistance to the states, conduct basic water research, and maintain water quality in interstate waters". But the creation and enforcement of quality standards for most of the waters in the United States—interstate lakes, rivers, streams, wetlands, and ponds—were left to state and local governments (Water Encyclopedia). Following high profile environmental incidents in the late 1960s such as the burning of the Cuyahoga River, Congress passed an updated Clean Water Act in 1972 that has significantly improved the quality of our nation's waterways.

As water health continued to improve through the 1970s and 1980s, environmental advocates, concerned citizens, and private industries that depended on clean coastal waters to support their livelihoods backed an amendment to the 1972 Clean Water Act, known as Section 320. This amendment, added to the Clean Water Act in 1987, established the National Estuary Program that would provide administrative oversight and financial assistance to the country's most vital estuaries. State and local officials from across the nation applied to have their estuaries considered for inclusion into the program. To date, twenty-eight member estuaries spanning the East, West and Gulf Coasts are now included in the NEP and are overseen by a

division within the EPA's Coastal Water Management Branch. These member estuaries are supervised and guided by Management Conferences made up of local civic, business, and scientific leaders who best know the conditions and needs of their waterways, as well as local and regional EPA employees. The legislation directs the EPA to oversee development of plans for attaining or maintaining water quality in a member estuary. This includes protection of public water supplies and the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife, and allows recreational activities both in and on water and requires control of point and nonpoint sources of pollution to supplement existing pollution controls (National Estuary Program).

Initially funded in 1987 with an annual budget of $12 million, "Congress reauthorized the program in 2000 for five years and increased the authorization amount to $35 million. In 2004, Congress again reauthorized section 320 at the same annual funding level through fiscal year 2010" (HR 4715). With annual funding ending in 2010, Representative Timothy Bishop (D-NY) sponsored the Clean Estuaries Act of 2010 with co-sponsor Frank LoBiondo (R-NJ). Chellie Pingree (D-ME) also played an important role in presenting the bill to Congress. In introducing the reauthorization, these legislators mentioned their recognition of the importance and positive impacts the program has had on these vital waterways and the nation's wellbeing.

Composition of the Legislation

In addition to increasing current funding levels of the program, the 2010 reauthorization will amend and improve the existing NEP using three core strategies: expanding the governing requirements of local Comprehensive Conservation Management Plans (CCMPs); mandating Management Conferences to use collaborative processes in the development and revision of their CCMPs; and ensuring that federal agency actions abide by the CCMPs to the maximum extent possible. These strategies are identified below:

- Expanding the governing requirements of CCMPs: This strategy is designed to expand the scope of CCMPs through standardized content and directed guidance that will be overseen and approved by the Administrator of the EPA. Each Management Conference is directed to incorporate the following actions into its newly developed CCMPs:
  - Identify the estuary boundaries and its associated upstream waters
  - Recommend priority corrective actions and compliance schedules
  - Consider sustainable commercial activities in the estuary
  - Address the impacts of climate change on the estuary
  - Increase public education and awareness
  - Identify and assess upstream impairments outside the CCMP
  - Include performance measures and goals to assess implementation
  - Include a coordinated monitoring strategy
  - Track the introduction of non-native species (EPA-led initiative)
  - Monitor and make results available to the public
- Mandating the use of collaborative processes in the development of CCMPs: This strategy encourages a participatory approach to estuary management planning through multi-level stakeholder contributions.
- Ensuring federal action abides by the CCMPs to the maximum extent possible: The EPA is the lead federal agency for implementing the Act and the NEP. Other federal agencies will abide by CCMPs as much as possible.

Implementation Timeframe

If signed into law, The Clean Estuaries Act of 2010 will extend the current NEP until 2016 and introduce amendments to make the program function as efficiently as possible. These amendments include:

- Requiring the EPA Administrator to:
  - Evaluate the implementation of each CCMP every four years to determine the degree to which the goals of the plan have been met.
  - Submit results to the Management Conference for review and comment.
  - Report results of the evaluation and make reports available to the public.
- Requiring each Management Conference to update its CCMP within eighteen months after the EPA evaluation is published, incorporating the recommendations of the Administrator.
- Authorizing the EPA Administrator to:
  - Place a Management Conference on probationary status if the Conference has not received CCMP approval within three years of initial evaluation.
  - Terminate a management conference and cease funding for the implementation of the plan if in probationary status for two years.

Political Background and Current Status

A variety of issues has surrounded passage of the legislation. These include the current atmosphere of partisan politics, the emergence of fervent fiscal conservative legislators opposed to spending any money at the current time, the high profile environment catastrophe created by the Deepwater Horizon oil spill in the Gulf of Mexico, and the ongoing high levels of unemployment that affect economic decisions within estuaries.

Proponents of the Act have relied on positive economic results produced by improved estuaries as evidence of the need for an extension of the NEP and an increase in funding. They have also emphasized the success of the multi-stakeholder framework that guides the program, and championed the locally based management of these programs.

There has been a general consensus on the nature of the environmental problems that the NEP aims to address, but political debate has focused on the appropriate response. Virginia Foxx (R-NC) charged that the 43% increase in funding that the Act would provide to the NEP is inappropriate given the then-current national deficit of $12.8 trillion (and growing). Foxx also cited a watchdog for federal government program performance, ExpectMore.gov, which describes the NEP's performance as merely 'adequate' (HR 4715). She criticizes the Act's strategy, unconvinced that increased funding will improve the program's performance. Instead, Foxx argues for structural reform and more ambitious goals, without a dramatic increase in funding.

The Clean Estuaries Act of 2010 passed in the House of Representatives on April 15, 2010 without compromise on funding stipulations. There were 278 votes for and 128 against; twenty-four representatives did not vote. The act has now been referred to the Senate Committee on Environment and Public Works (HR 4715).

CURRENT PROGRAM AND PROPOSED PROGRAM DESIGNS

Current Program

This description of the current program evaluation design is based on the NEP Program Evaluation Guidance document updated in 2007. Using this framework, staggered evaluations of each member estuary are undertaken every three years, led by an assessment team of existing EPA employees. Evaluation team membership rotates based on region, with two core members from EPA headquarters – the federal NEP coordinator, and another member of the Wetlands, Oceans and Watersheds Division of the EPA – and two members from the regional EPA, including the regional NEP coordinator. Evaluations are based on the following criteria:

- Workplan summaries that describe key goals and activities;
- Self-assessment of a series of standardized performance measures covering core elements of ecosystem targets and program implementation; and
- A budget summary and a 1-2 day on-site visit by evaluators. The length of stay is based on past standards in the NEP evaluation process.

The member estuaries are then rated on a pass-conditional pass-fail scale, and provided with a letter of recommendation outlining their results.

Outline of the New Program Design

The proposed approach to the NEP evaluation and assessment policy is founded on a Results-Based Management (RBM) and accountability framework. It encourages outcome-based, rather than process-based, evaluation and management. This system of evaluation incorporates strategic planning processes, targeted goals and scientific indicators, and mechanisms for public reporting – all of which have been incorporated into the proposed NEP evaluation policy outlined below. This design is based on efforts to bolster the quality of NEP evaluation, while refining the specificity of performance measures.

Program Evaluation Organizational Structure & Responsibilities

In contrast to the rotating membership of the evaluation team in the current design, the proposed design would establish a permanent team of evaluation professionals stationed at the EPA headquarters, within the Office of Wetlands, Oceans and Watersheds. This team is the National Estuary Program Evaluation and Assessment Team (NEPEAT). These individuals will have experience in performance management, and they should reflect expertise in estuarine science, public administration, and public outreach. This team will be responsible for evaluating member estuaries, including assessing NEP evaluation requirements and on-site visits. The NEPEAT will also act as an advisory body for Management Conferences on topics of strategic planning and performance measurement on a permanent basis. In addition to individual

assessments, the Team will be responsible for consolidating member estuary evaluations into a national-scale evaluation, and will make all reports available to the public online to encourage transparency.

Additionally, the NEPEAT will work in concert with third-party consultants in the development of a comprehensive database of indicators and measurement tools, available to member estuaries to facilitate their planning, implementation, and performance measurement. These consultants will likely hold expertise in performance measurement in project management and also in estuarine science. Through university partnerships, the NEP will take advantage of advanced research and knowledge for the development of performance indicators. This institutional arrangement will encourage a continuous learning process and facilitate the transfer of knowledge. The NEPEAT will act as a central coordinating body with the responsibility for distributing best practices to estuaries across the country, and leveraging participation in the National Estuary Program.

The organizational structure of the NEPEAT will be divided into two task groups: the Performance Management Unit and the Estuarine Health Unit. Each task group will have the following responsibilities:

- Performance Management Unit:
    - Development of management metrics
    - Support, collection, and analysis of performance indicator data
    - Educational stewardship development
    - Budget monitoring
    - External program partnerships
    - Development of e-governance structure
    - Institutional compliance
    - Knowledge transfer
    - Human resources management
- Estuarine Health Unit:
    - Development of scientific metrics
    - Data accountability
    - Knowledge transfer

NEP Evaluation Requirements

Each member estuary will be responsible for a number of components to complete the program evaluation. As a key tool in RBM, the logical framework (logframe) matrix will be an essential element of member estuary workplans. The logframe matrix is a systematic approach to project management that involves consideration for stakeholders and the establishment of criteria for success and major assumptions. This action matrix should clearly demonstrate how project inputs and subsequent activities

lead to outputs that support the purpose and goals of the NEP. A key feature of the logframe matrix is the use of objectively verifiable indicators for measurement. Once approved by the NEPEAT, this document will serve as a basis for the implementation and evaluation of CCMP activities. In addition, each member estuary must produce a line-item budget that corresponds to a results-based budgeting strategy. The NEPEAT will standardize budget reporting, which will be conducive to consolidating financial data for a national-level budgetary assessment. Additionally, longer on-site visits (2-3 days) will be an integral part of the evaluation process. These visits will consist of a knowledge transfer and capacity-building component for both the member estuary and the evaluation team, to encourage growth and development in member estuaries, and to facilitate the sharing of best practices.

Program Evaluation Assessment & Rating

According to this reformed evaluation framework, member estuary assessments will move beyond a pass-fail system. The rating scheme will be expanded to include assessments and ratings in a number of categories, including water quality, climate change adaptation strategies, biodiversity conservation, public outreach and education, and financial planning, among others. These ratings will be directly related to the targets developed in the logframe analysis by the member estuaries. This will lend itself to evaluation of specific activities and will be consistent with the priorities established by each member estuary. The NEPEAT will evaluate each member estuary based on targeted goals developed within its CCMP, and will also consider the comprehensiveness of those goals as a criteria. Subsequent funding allocation will be affected by the results of these assessments. Evaluations will continue to provide recommendations for improvement within this evaluation process.

Program Evaluation Schedule

Member estuary evaluations will be staggered and will occur every three years, as in the current program design. However, the NEPEAT will be permanently available as a resource to Management Conferences for guidance, as opposed to only during each member estuary's respective evaluation year. This information is presented graphically in Appendix C.

Year 1 Deliverables

<u>Hire and Train NEPEAT</u> – Months 1-3

- Assemble a hiring and training committee for the NEPEAT
- Establish job functions and criteria for employment
- Interview candidates
- Select candidates
- EPA and NEP employee training

Update Evaluation Guidelines – Months 3-6

- Assess current guidelines' strengths and weaknesses
- Develop 5-year workplan for evaluation schedule
- Develop estuarine health indicator database
- Develop performance management indicator database
- Develop an online feedback mechanism
- Distribute evaluation guidelines and indicator sets to all member estuaries and relevant EPA staff for feedback

Preliminary Site Visit – Months 7-8

- Prepare for site visit: develop feedback mechanism
- Conduct visit
- Collect data on performance management
- Collect data on estuarine health assessment
- Collect and compile member estuary feedback

Revise Evaluation Guidelines – Months 8-10

- Assess member estuary feedback
- Integrate new information
- Present rough draft to EPA headquarters
- Compile and assess EPA feedback
- Produce and distribute final draft

NEPEAT Self Assessment – Months 11-12

- Identify and address any objectives that have not been achieved
- Integrate any incremental adjustments of evaluation guidelines
- Integrate NEPEAT feedback

Risks and Assumptions for Consideration

The Year 1 calendar has been designed to be cumulative and sequential; each task requires the successful implementation of the previous task. The underlying assumption is that each task will be implemented in a timely manner. If this assumption is not met, there is a risk that the calendar's scheduling will not be fulfilled. The calendar is not designed to be a rigid series of requirements; rather, it is a rough guideline for the first year's outputs and is intended to be flexibly implemented.

A Success Story

The Sarasota Bay NEP

Sarasota Bay Watershed Improvement

- ***64% reduction in Nitrogen pollution since 1988***
- ***Scallops returned to the Bay in 2008***
- ***Restoration of 650 acres of wetland***
- ***Creation of the Gulf Coast Heritage Trail***

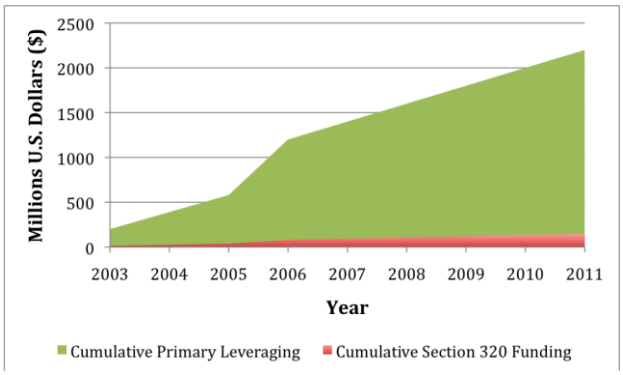
The Sarasota Bay Estuary Program has been recognized as a leading element in promoting Sarasota Bay's historical, cultural and environmental heritage and in generating public recognition of its economic value. The culmination of this recognition was the creation of the "Gulf Coast Heritage Trail", the first regional eco-heritage based tourism trail program in Florida.

ECONOMICS

The NEP has been funded by Congress since 1987. In 1987, the program was authorized $11.1 million in total funding. More than a decade later, the Clean Estuaries Act of 2000 (PL 1-6-457) authorized $35 million per year for the NEP for the years from 2001 to 2005, and a funding level of $35 million was reauthorized from 2005 through 2010. While this is the amount authorized, it was not the amount recommended in the President's budget, or appropriated by Congress. The actual appropriations for the NEP have been roughly $22 to $25 million annually during the past five years. However, not all of these funds are awarded to the member estuaries; about $7-10 million is kept by EPA to support other coastal and ocean management programs. Specifically, between the years 2002 and 2010, Congress appropriated approximately $24.5 million to the NEP annually via the VA/HUD Appropriations Subcommittees. Of this total, roughly $14 million was distributed to the twenty-eight local member estuaries, such that each program received between $500,000 and $600,000. Some member estuaries may receive additional funds from Congressional earmarks in other programs.

Each year the President submits a budget to Congress with requested expenditures, including expenditures for EPA and the NEP. Congress considers this request, but ultimately decides the final appropriations, as it is required to do. The House and Senate appropriations committees may develop different recommendations for a particular program. If there are differences in funding between the House and Senate appropriations subcommittees, a joint conference committee will recommend the final amount.

The NEP is currently re-authorized at $35 million in the Estuaries Water Act of 2000 (PL 106-457, Title III) under Section 320 of the Federal Water Pollution Control Act (Commonly known as the Clean Water Act) through amendments made in 1987. The Clean Estuaries Act of 2010 (HR 4715) passed the House of Representatives in April of 2010 by a bipartisan majority vote. Originally requesting an additional $15 million, to bring the total to $50 million, the bill was amended by the Senate Committee on Environmental and Public Works to include a provision increasing the funding level for the NEP to $75 million. This bill looks to extend funding through 2016. Congress has raised the authorization level in the act in recognition of the fact that the NEP contains some of the most ecologically and economically productive habitats in the United States (Charlotte Harbor National Estuary Program, 2004).



Source: EPA

At the local level, as stipulated by the EPA, the NEP grant awards go towards supporting staff, program office costs, and specific projects. The majority of these projects include habitat restoration and monitoring programs, pollution reduction programs, education and public outreach initiatives, and municipal assistance projects.

Member estuaries are required by Congress each year to raise a certain percentage of funds, known as a match requirement, in conjunction with the federal funding they receive. Member estuaries are able to leverage other funds through both public and private sources. The funds raised are used to implement the CCMPs. By leveraging EPA money into additional funds, the member estuaries are able to accomplish much more and give their organizations a more stable financial foundation. A federal study in 2004 showed that some member estuaries were able to leverage eight local dollars for every federal dollar they received. Today, some member estuaries are able to raise nearly fifteen dollars (including non-federal sources) for every dollar provided by the EPA (Charlotte Harbor Estuary, 2004). This additional funding is generated through developing finance plans, building strategic alliances, demonstrating environmental results, and providing seed money or staff to initiate and develop new funding sources. Between 2003 and 2008, the member estuaries leveraged $1.48 billion from $99 million in EPA grants, with the additional funding coming from a variety of sources including federal, state, and local governments, as well as private entities. Roughly 50% of the funds raised in this capacity have gone to protect and restore important habitats. In fact, since 2000, more than 1.3 million acres of coastal wetlands have been restored (Lower Columbia River Estuary, 2009).

Implementation of Economic Considerations

Assuming that Congress passes the Clean Estuaries Act of 2010 at a funding level of $75,000,000, and appropriates approximately 75% of this total to the NEP, our overall budget is $56,250,000. At a funding level of $75,000,000, and subject to congressional appropriations, the NEP will have an overall budget of $56,250,000.

At a funding level of $75,000, and subject to congressional appropriations, the NEP will have an overall budget of $56,250,000. The Act requires that a minimum of 90% of all funding go directly to member estuaries, and that a maximum of 10% go toward administrative costs.

For a proposed budget analysis, the budget includes total personnel services of $730,400 and total other-than-personnel services have been calculated at $36,000. An allocation of $48,000 for administrative expenses appears on the line item budget for the funding of a biennial symposium. The remainder of the budget, or $55,435,200, goes entirely to NEP grants. Of this total, $39,855,200 goes to individual member estuaries, such that each of the twenty-eight estuaries receives $1,423,400. The remaining $15,580,000 goes toward specific, federally directed programs including: non-NEP threats ($8,000,000), National Coastal Condition Reports ($5,000,000), research ($2,000,000) and a merit-based incentive program ($580,000).

Budget Analysis and Breakdown: Year One of Implementation

Funding the NEPEAT

Funding the NEPEAT, as described in the “Proposed Program Design” section of this report, consisting of seven full-time staff members (one administrator, two managers and four coordinators) within the Office of the National Estuary Program. Salaries and fringe benefits for these individuals were set at 40%, and total to $715,400, while other-than-personnel services require expenditures of $10,500. The total cost for funding the NEPEAT is $725,900.

NEP Evaluation Cycle

Funding for the evaluation cycle includes $15,000 in personnel costs going to IT consultants that would be responsible for creating a new database to efficiently assist program managers in collecting and synthesizing information. Other-than-personal services cost an additional $10,500. During the first year, the NEPEAT is responsible for conducting two on-site visits for

two member estuaries. The cumulative associated travel costs for these visitations are $6,000. The NEPEAT will also schedule annual group meetings with three member estuaries in Group A, thereby incurring a travel expense of $9,000. The total cost for funding the evaluation cycle in the first year of implementation is $40,500.

Biennial Symposium

Every two years, the Office of the NEP will host a conference that focuses on the sharing of best practices in the field of estuarine management. The conference will take place over two days at the University of Maryland, and will bring together more than 200 participants, including twenty presenters from various scientific disciplines and representatives from all twenty-eight member estuaries. Funding for this symposium includes travel and accommodation stipends for presenters ($43,000), and printed symposium material ($2,800), and facility fees paid to the University of Maryland ($2,400). Individual attendees from the member estuaries will be responsible for paying registration fees through their own budgets. The total cost of the symposium is $48,400.

Merit-Based Incentive Program

The NEPEAT will be responsible for administering a merit-based incentive program. The program provides additional funding for member estuaries that have met specific objectives in accordance with their CCMPs. The amount of funding distributed and the number of member estuaries that receive additional funding is left entirely to the discretion of the NEPEAT. The total cost of the incentive program is $580,000.

Additional Programs

The total grant money allocated towards additional programs is $15,580,000 (this includes the aforementioned merit-based incentive program). These programs include non-NEP threats, the National Coastal Condition Report (NCCR), and research. Non-NEP threats include issues such as targeting hypoxia in the Gulf of Mexico, helping to find financing for coastal protection and restoration from local communities and/or other organizations, development of green infrastructure and smart growth, and adapting estuaries for impacts related to climate change. The NCCR requires monitoring and assessing the condition of the coasts. Research could include any topic that encompasses estuarine management, best practices, estuarine science, or climate change effects.

CONCLUSION

Since its inception in 1987, the NEP has demonstrated significant success in improving overall estuarine health. The challenges to the nation's estuaries continue, however, as shifting environmental, economic, and political pressures have created new stresses on these critical and vulnerable ecosystems. The CEA seeks to help the NEP meet these new threats through increased funding and a more robust and accountable evaluation process. Enhanced evaluation standards and a thorough evaluation process will help to demonstrate the value of continued investment in estuarine restoration.

The prospect of global climate change introduces a host of potential ramifications that could significantly impact estuaries. The CEA urges member estuaries to begin to think about some of the anticipated impacts, although the legislation is particularly vague and does not prescribe specific corrective actions. This is likely because of the large degree of uncertainty that surrounds climate change and its future trajectory. Additionally, the size and extent of climate change mitigation is beyond the scope of the NEP. The climate change component of the legislation should be viewed as a beginning step toward a strategy for adaptation.

Other environmental threats, such as non-point source agricultural runoff, have origins that are similarly external. These challenges are incontrovertibly deleterious to estuarine health, but their prevention would require more comprehensive and national regulation that is beyond the scope of the NEP. The NEP is therefore charged with the task of reducing environmental damage, the cause of which it has no jurisdiction to prevent. Without proactive and far-reaching legislation, there is a danger that the NEP will fall perpetually behind, and ultimately fail in its objective of improving and maintaining estuarine health.

Although the challenges facing estuaries are extensive, there have been proven successes. The Sarasota Bay Estuary Program is an example of the ways in which effective management can help restore and improve ecological integrity. The program design outlined in this report seeks to build on best practices such as those demonstrated in Sarasota. Through an enhanced and systemized national evaluation process, the NEP will be able to strengthen managerial effectiveness. This centralized evaluation process will help to ensure that member estuaries function efficiently, lending the NEP political credibility and ensuring that it continues to be policy-relevant. The evaluation design program outlined in this report is therefore a means of reinforcing the fundamental value of the NEP.

Because the passage of the CEA and the continued success of the NEP are subject to external political pressures, it is essential that the benefits are clearly visible and easily understood. In an economic recession, there is a strong motivation for politicians to reduce spending. A rigorous and effective evaluation process will help the NEP address concerns of unnecessary spending, to demonstrate that it merits continued investment.

The Clean Estuaries Act of 2010 was introduced in the committee on environment and public works and reported to the Senate amended on September 16, 2010. The outcome of the votes is still unclear. What is clear, however, is that without purposeful and effective management, the future integrity of the nation's estuaries remains tenuous.

APPENDIX A

SOLUTIONS

This section gives specific examples of scientific and management approaches for the restoration and remediation of estuaries, with examples from the New York-New Hersey Harbor Estuary.

Wastewater Pollution Management

The two primary sources of wastewater pollution in estuaries are point sources of untreated municipal sewage and combined sewage overflow (CSO). New York City addressed the problem of untreated municipal sewage by building sewage treatment facilities (Brosnan and O'Shea, 1996). Dissolved oxygen content at the New York-New Jersey Harbor Estuary increased substantially as sewage treatment became effective. Another possible solution for CSO is the construction of overflow storage units that hold combined flow until treatment facilities are ready to treat it. Small-scale projects—e.g., maintaining green spaces and green rooftops, and increasing porous paving materials in urban environments—may also alleviate the CSO issue (Montalto et al, 2007).

One challenge of nutrient removal is deciding whether the economic and environmental costs (i.e., increased greenhouse gas emissions) are worth the gains in water quality. Upgrading current infrastructure for the removal of carbon and nitrogen is associated with increased fossil-fuel based energy consumption. A study at New Jersey Harbor Discharger's Group wastewater treatment plants showed that removing high levels of nitrogen would result in an aggregate emission of 247 million pounds of carbon dioxide per year (Metcalf and Eddy, 2008). High levels of carbon removal would result in an aggregate emission of approximately 272 million pounds of carbon dioxide per year. Corresponding oil consumption would be approximately 332,000 barrels per year for nitrogen removal and 374,000 barrels per year for carbon removal (Metcalf and Eddy, 2008).

Dredging

Dredging is a possible solution for removing heavy metals and PCBs from an estuary. Sediment is treated and then relocated to a disposal site. Dredging the Hudson River reduced cadmium levels at a site upriver of the New York-New Jersey Harbor Estuary (Mackie et al, 2007). Unfortunately, after dredging the Hudson River to remove heavy metals and polychlorinated biphenyls (PCBs), increased contamination levels were reported in fish around the site of dredging (Richter, Cane, and Skinner, 2010). However, if the water is not dredged and no alternate method for removing contaminants is proposed, then PCBs will continue to be a significant source of contamination to the lower Hudson River under average stream flow conditions. Successful remediation depends on effective management of the stream of dredged materials. The scientific consensus is that removing contaminated sediments will accelerate the recovery of the river ecosystem (Baker, 2001).

Tracking Invasive Species

The estuaries in the NEP are home to a great number of invasive species that compete with native plants and animals for resources. The New York-New Jersey Harbor Estuary is home to dozens of problematic non-native plant species including: *Trapa natans* (water chestnut), *Phragmites australis* (common reed), *Lythrum salicaria* (purple loosestrife) (Laba et al, 2008). It is also home to many non-native animal species such as: *Dreissena polymorpha* (zebra mussel), various *Orconectes* species (crayfish), and *Oncorhynchus mykiss* (rainbow trout) (Mills et al, 1996). Recent research in the estuary has focused on using satellite imagery to map the invasive species (Laba et al, 2008). Mapping reveals the species location and allows managers to examine distribution patterns that provide more information about their behavior, enhancing their ability to control the species (Laba et al, 2008).

Reducing Agricultural Pollution

Several sustainable farming practices have been shown to reduce pesticide and nutrient runoff (Kay, Edwards and Foulger, 2009). One example is the practice of Integrated Pest Management (IPM), which has shown the potential to reduce the need for pesticide-intensive farming. Another example is the establishment and maintenance of ecological buffer strips that can provide protection from the effects of pollutants. Buffer strips are either naturally or artificially maintained ecosystems that absorb pollutants from runoff and act as a buffer between the agricultural system and the natural environment.

APPENDIX B

SCIENTIFIC INDICATORS OF SUCCESS

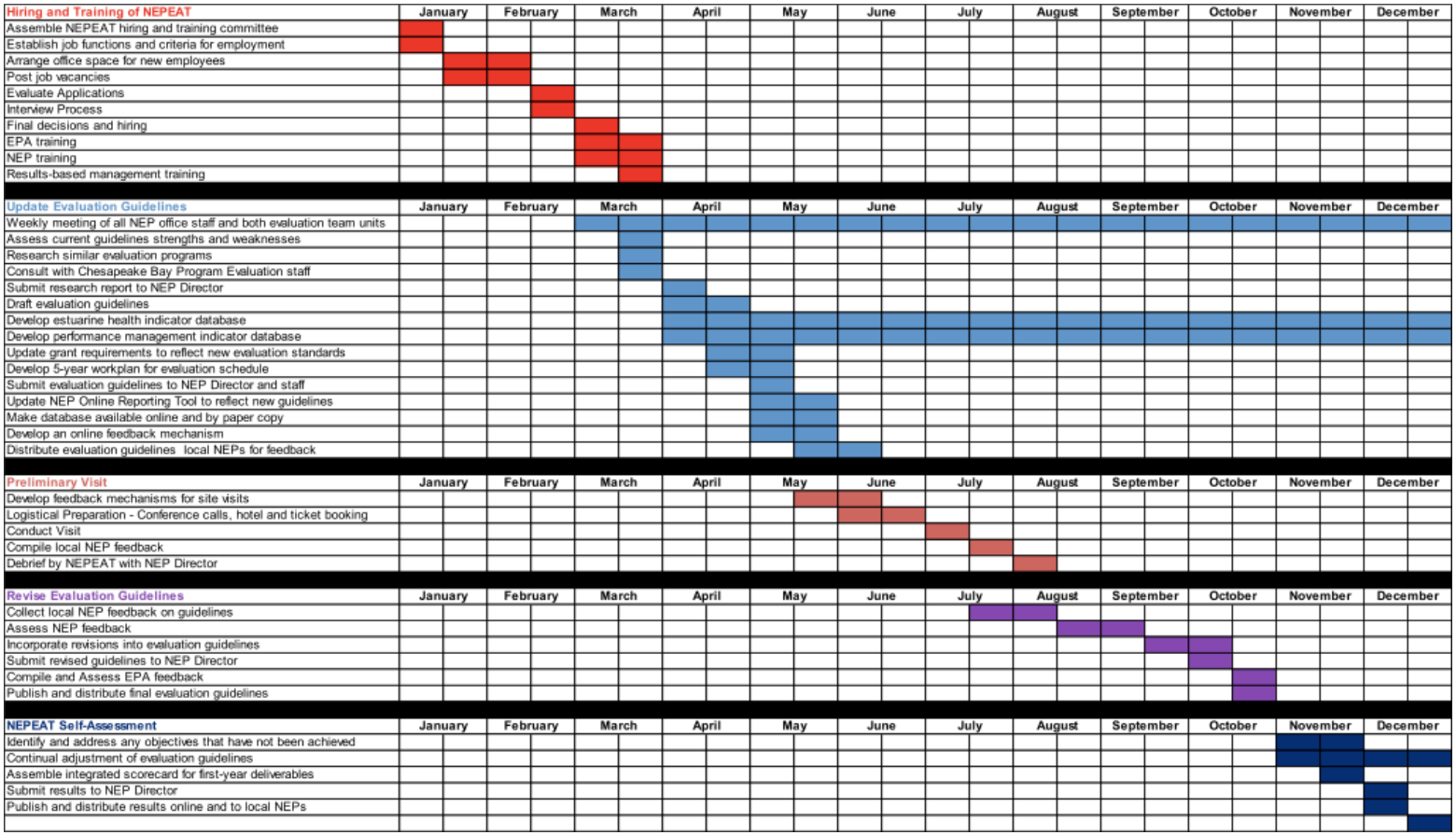
Monitoring the status of an estuary is a complex undertaking. Measuring water and living resource quality at all times, locations, and depths would be prohibitively expensive. Scientific indicators provide a means to measure specific properties related to ecosystem restoration goals in a cost-effective manner. They can express complex biological, physical, or chemical attributes as simple measures of spatial and temporal trends, and can be used to inform diverse audiences (Bain et al, 2007).

Generally, scientific indicators of estuarine health are related to water quality, but biodiversity loss is also an indicator. The following are examples of common scientific indicators:

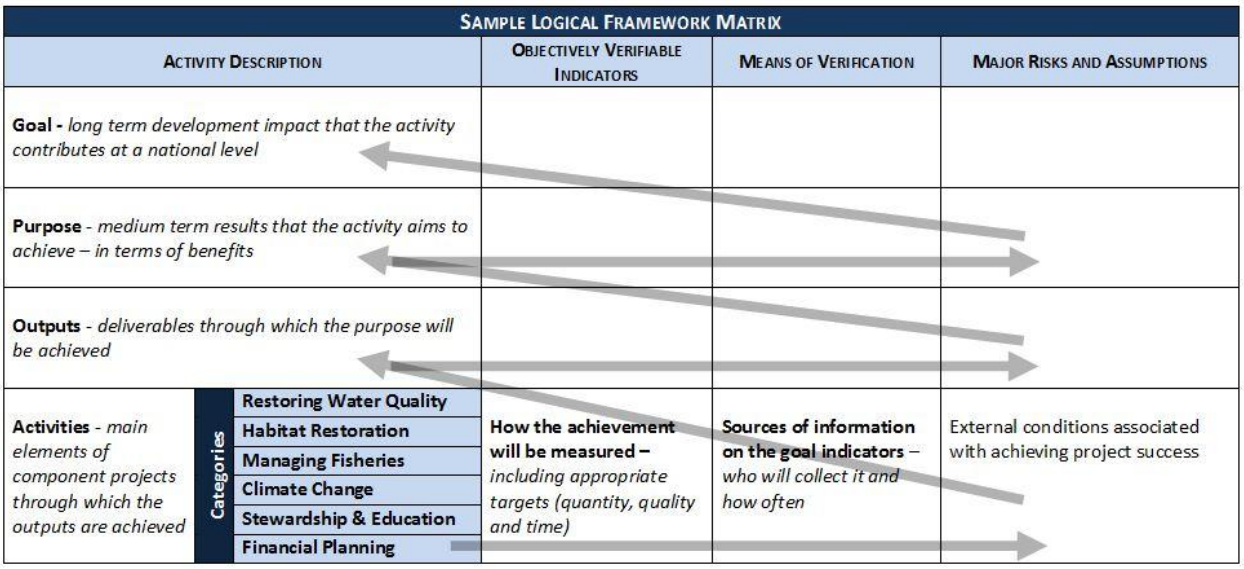
Fecal Coliform: widely used as indicator organisms of the presence of sewage-related wastes and pathogenic bacteria in water.	**Dissolved Oxygen:** one of the most universal indicators of overall water quality, habitat and ecosystem conditions because it is critical for respiration of most aquatic life forms.
Chlorophyll 'a': a green pigment found in most macro-algae and phytoplankton that is vital for photosynthesis. Chlorophyll 'a' found in phytoplankton can be used as an indicator of primary productivity - the base of the food chain in the water. Overgrowth of primary producers can cause eutrophication.	**Nutrient overload:** includes nitrogen, phosphorous, ammonia and nitrite-nitrate concentrations from sources including agricultural runoff, storm water runoff, wastewater discharge, atmospheric deposition, and other anthropogenic inputs. Data collection involves sampling standard limnological and water quality parameters, as well as conducting algal and bacterial dilution bioassays to identify limiting nutrients.
Secchi Transparency: a Secchi disk is used to estimate the clarity of surface waters. High Secchi transparency (greater than 5.0 feet) is indicative of clear water, with declines in transparency typically due to high-suspended solids concentrations or plankton blooms. Low Secchi readings (less than 3.0 feet) are typically associated with degraded waters and indicate limited light, which in turn affect primary productivity and nutrient cycling (New York-New Jersey Harbor, 1996).	**Toxic chemicals:** predictions of the fate of specific chemicals can, to some extent, be modeled from chemical properties and laboratory test. In real aquatic ecosystems, accurate predictions of eventual sinks, trends and concentrations in biota and response to remedial measures are site specific (Adams and Benyi, 2003). Individual toxins can be identified using unique analytical techniques such as gas chromatography for the determination of pesticides in aquatic ecosystems (Edinger, 2002).

APPENDIX C

Year One Master Calendar



APPENDIX D



Sample Logical Framework Matrix				
Activity Description		Objectively Verifiable Indicators	Means of Verification	Major Risks and Assumptions
Goal - *long term development impact that the activity contributes at a national level*				
Purpose - *medium term results that the activity aims to achieve – in terms of benefits*				
Outputs - *deliverables through which the purpose will be achieved*				
Activities - *main elements of component projects through which the outputs are achieved*	Categories: **Restoring Water Quality**; **Habitat Restoration**; **Managing Fisheries**; **Climate Change**; **Stewardship & Education**; **Financial Planning**	**How the achievement will be measured –** *including appropriate targets (quantity, quality and time)*	**Sources of information on the goal indicators** – *who will collect it and how often*	External conditions associated with achieving project success

Sample Logical Framework Matrix (derived from AusAID, 2005) – this exhibit offers an example of the framework that can be used by the local Management Conferences to generate the goals and strategies for estuary management as well as the framework by which the CCMP and the local estuary program can be evaluated by the NEPEAT. The precision of this framework allows for it to simultaneously be used as an internal constructive tool as well as an external evaluation tool.

WORKS CITED

Adams, Darvene, and Sandra Benyi. *Sediment Quality of the NY/NJ Harbor System: A 5-year Revisit*. Rep. EPA Region 2, Dec. 2003. Web.

AusAid. *AusGuideline 3.3: The Logical Framework Approach*. Australian Government, Oct. 2005. Web. 2 Oct. 2010.

Bain, Mark, et al. *Target Ecosystem Characteristics for the Hudson Raritan Estuary: Technical Guidance for Developing a Comprehensive Ecosystem Restoration Plan*. Rep. Hudson River Foundation, 2007. Web. 30 Nov. 2010.

Baker, Joel E., et al. *PCBs in the Upper Hudson River: The Science Behind the Dredging Controversy*. Rep. Hudson River Foundation, 29 Oct. 2001. Web. 30 Nov. 2010.

Bricker, S. B., et al. "Effects of Nutrient Enrichment in the Nation's Estuaries: A Decade of Change." *Harmful Algae* HABs and Eutrophication 8.1 (2008): 21-32. *ScienceDirect*. Web. 25 June 2010.

Brosnan, Thomas M., and Marie L. O'Shea. "Long-Term Improvements in Water Quality Due to Sewage Abatement in the Lower Hudson River." *Estuaries and Coasts* 19.4 (1996): 890-900. *Springerlink*. Web. 28 Nov. 2010.

Charlotte Harbor National Estuary Program. *Legislative Agenda*. Tech. no. 03-5. Charlotte Harbor National Estuary Program, Nov. 2003. Web. 19 Nov. 2010.

Charlotte Harbor National Estuary Program. *Long Range Funding Strategy*. Tech. no. 04-4. Charlotte Harbor National Estuary Program, Nov. 15, 2004.

"Clean Water Act." Water Encyclopedia. 2010. Web. 19 Nov. 2010.

Duffy, Emmett. "The Disappearing Chesapeake?" *Natural Patriot*. 24 May 2008. Web. 07 Dec. 2010.

Edinger, G.J., et al (eds). “Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. (Draft for review).” New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY, 2002. Web. 05 Dec. 2010.

Europa. "Science for Environmental Policy." *DG Environment News Alert Service*. European Commission, 12 Feb. 2010. Web. 23 Nov. 2010.

Harper, Scott. "Environmentalists Focus on Chesapeake Bay Cleanup." *HamptonRoads.com*. 19 Sept. 2010. Web. 07 Dec. 2010.

Julius, S. H., and J. M. West, eds. *Preliminary Review of Adaptation Options for Climate-sensitive Ecosystems and Resources*. Rep. U.S. Climate Change Science Program and the Subcommittee on Global Change Research, 20 June 2008. Web. 18 June 2010.

Kay, Paul, Anthony C. Edwards and Miles Foulger. "A review of the efficacy of contemporary agricultural stewardship measures for ameliorating water pollution problems of key concern to the UK water industry." Agricultural Systems (2009): 99: 67-75.

Laba, Magdeline, et al. "Mapping Invasive Wetland Plants in the Hudson River National Estuarine Research Reserve Using Quickbird Satellite Imagery." *Remote Sensing of Environment* 112.1 (2008): 286-300. *ScienceDirect*. Web. 30 Nov. 2010.

Lower Columbia River National Estuary Partnership. “Appropriations Request Form, Oregon House Delegation.” 13 Feb. 2009.

Mackie, Joshua A., et al. "Declining Metal Levels at Foundry Cove (Hudson River, New York): Response to Localized Dredging of Contaminated Sediments." *Environmental Pollution* 149.2 (2007): 141-48. *ScienceDirect*. Web. 30 Nov. 2010.

Manahan, Stanley E. *Environmental Chemistry*. 9th ed. Boca Raton: CRC, 2010. Print.

Metcalf and Eddy (AECOM). Nutrient Reduction Cost Estimation Study Summary Report. Summary Report. New York, NY: New-York New-Jersey Harbor Estuary Program, 2008.

Mills, Edward L., et al. "Exotic Species in the Hudson River Basin: A History of Invasions and Introductions." *Estuaries and Coasts* 19.4 (1996): 814-23. *Springerlink*. Web. 30 Nov. 2010.

Montalto, Franco, et al. "Rapid Assessment of the Cost-effectiveness of Low Impact Development for CSO Control." *Landscape and Urban Planning* 82.3 (2007): 117-31. *ScienceDirect*. Web. 28 Nov. 2010.

National Estuary Program. "National Estuary Program." *EPA Office of Water*. Web. 08 Dec. 2010.

New York-New Jersey Harbor National Estuary Program. *Comprehensive Conservation and Management Plan*. *NY-NJ Harbor Estuary Program,* New York-New Jersey Harbor National Estuary Program, 1996. Web. 30 Nov. 2010.

Oberrecht, Kenn. "The Estuary as Pollution Trap and Filter." *South Slough National Estuarine Research Reserve*. Oregon.gov, 2005. Web. 20 June 2010.

Richter, Wayne, Michael W. Cane, and Lawrence W. Skinner. *Analysis of Fall Fish Data Collected Under the Baseline and Remedial Action Monitoring Programs of the Hudson River PCBs Superfund Site from 2004 through 2009*. Rep. New York State Department of Environmental Conservation, Apr. 2010. Web. 30 Nov. 2010.

Smith, Val H. "Cultural Eutrophication of Inland, Estuarine, and Coastal Water." *Successes, Limitations, and Frontiers in Ecosystem Science*. Ed. Michael L. Pace and Peter M. Groffman. New York: Springer, 1998. 7-49. Print.

"Students Meet with Chesapeake Bay Foundation CEO Will Baker." *University of Richmond Newsroom*. University of Richmond, 25 Feb. 2010. Web. 1 Dec. 2010.

U.S. House, Committee on Transportation and Infrastructure. “The Clean Estuaries Act of 2010 (H. Rpt. 111-442). Washington, DC: Government Printing Office, 2010.

United States. Cong. 111th Congress, 2nd Session. *H.R. 4715, Clean Estuaries Act of 2010* [introduced in the U.S. House of Representatives; 2 March 2010]. 111th Cong., 2nd sess. Congressional Bills, *Library of Congress*. Web. 2 Mar 2010.

United States Environmental Protection Agency. *National Estuary Program: Program Evaluation Guidance.* 28 September 2007. Web. 15 September 2010.

United States Environmental Protection Agency. National Estuaries Program: Sustainable Financing Strategies. 19 April 2010. EPA.gov. 2010. Web. 9 December 2010.

United States Environmental Protection Agency. Office of Water, Office of Research and Development. *National Estuary Program Coastal Condition Report*. *EPA.gov*. 2006. Web. 7 September 2010.