Coastal Wetlands Initiative: Mid-Atlantic Review

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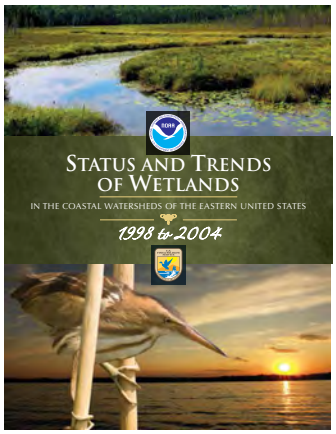
National Picture

Coastal wetlands provide important ecosystem services that are vital to the health and well-being of our nation. They serve as buffers, protecting coastal areas from storm damage and sea level rise. They are vital to the health of commercially and recreationally important fisheries resources, providing food and essential fish and shellfish habitat. Wetlands also serve as nesting and foraging habitat for birds and other wildlife. As "living filters," wetlands improve water quality by removing pollutants, nutrients, and sediments. Furthermore, coastal wetlands provide direct value to people in other ways, such as minimizing erosion of upland, protecting infrastructure and supporting the tourism, hunting, and fishing sectors of the economy.

There are a number of threats to coastal areas, in particular wetland habitats. The most significant threats include conversion of wetlands to other land uses and climate change, in particular, sea level rise and increases in hurricane intensity and frequency. In some regions, wetlands are being converted to open water due to land subsidence.

Numerous recent reports have examined coastal wetland loss and potential strategies to address threats like climate change. The Association of State Wetland Managers (ASWM, 2009) recommended a national wetland and climate change initiative. The report contains measures to reduce impacts and adapt coastal/estuarine wetlands to climate change. The U.S. Army Corps of Engineers (Army Corps) and the National Oceanic and Atmospheric Administration (NOAA) both published frameworks to guide how they will consider impacts of climate change and sea level rise as they implement restoration activities, including those in coastal wetlands (Army Corps, 2009; NOAA, 2010a).

NOAA and the U.S. Fish and Wildlife Service (USFWS) analyzed the status and trends of wetland acreage along the Atlantic Coast, Gulf of Mexico, and the Great Lakes to provide an estimate of losses or gains that occurred in those coastal watersheds. Their report, released in 2008, found that 361,000 acres of coastal wetlands were lost in the Eastern United States alone between 1998 and 2004 (Stedman and Dahl, 2008). This amounts to an average net decrease of 59,000 acres each year. The vast majority of the loss (82 percent) occurred in freshwater wetlands, both tidal and nontidal. Nearly 60 percent of the total loss of coastal freshwater wetlands is attributed to "other development," which includes conversion of wetlands to unknown or undetermined land uses (Figure 1). There were also losses of saltwater tidal wetlands to open water (deeper than 2 meters), particularly in the Mid-Atlantic region. The 2008 NOAA and USFWS Status and Trends report did not examine the loss of wetland condition or function.



In response to these reports, EPA established a two-part Coastal Wetlands Initiative. The first part is the Coastal Wetlands Team, which is a joint effort between EPA's Wetlands Division and the Oceans and Coastal Protection Division. The team's goals are: 1) confirming wetland loss and better understanding contributing stressors; 2) identifying and disseminating tools, strategies, policies, and information to protect and restore coastal wetland resources; and 3) raising awareness of the functions and values of coastal wetlands, threats to these resources, and opportunities to protect and restore coastal wetlands.

To achieve its goals, the Coastal Wetlands Team met with stakeholders in the Mid-Atlantic, South Atlantic, Gulf of Mexico, and North Atlantic regions (see Figure 2). For each of these Coastal Wetland Reviews (CWRs), the team identified key stressors; examined regulatory and voluntary efforts at the federal, regional, state, and local level to reduce or reverse coastal wetland loss; and assessed whether successful strategies can be replicated elsewhere. The information from the reviews could be used to help inform policy decisions, influence program direction, and develop projects to reduce or reverse

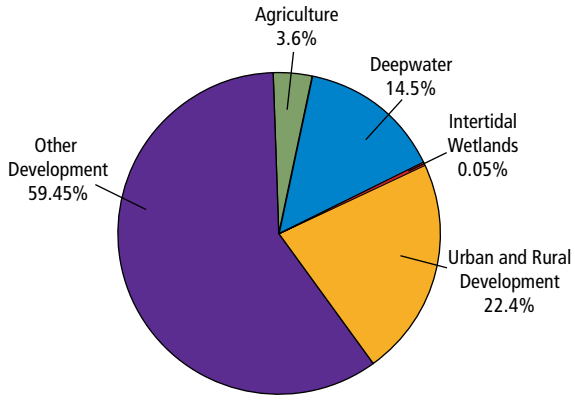
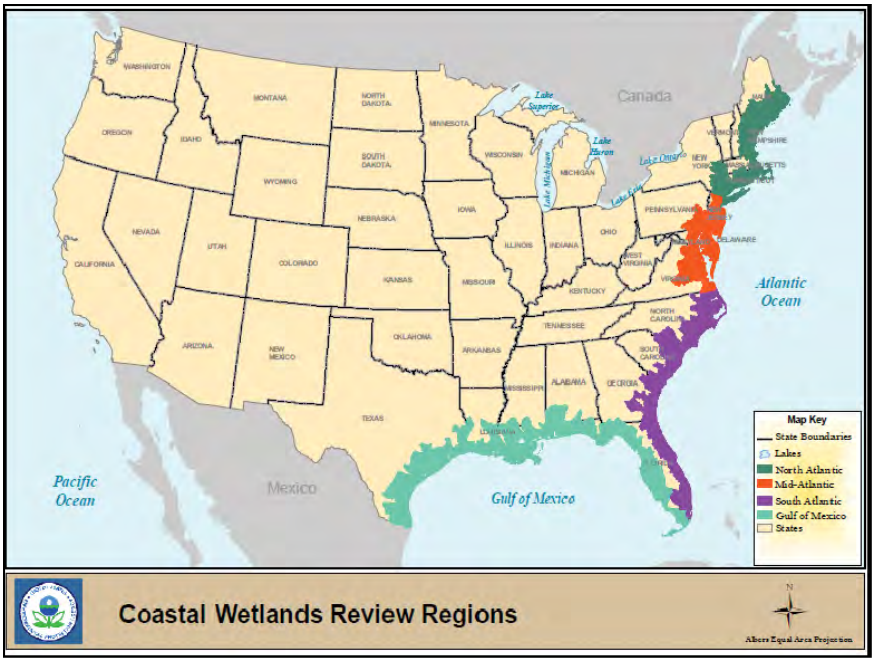


Figure 1. Wetland loss and changes in land cover, 1998-2004: Atlantic, Gulf of Mexico, and Great Lakes. *Source: Stedman and Dahl, 2008.*



Consistent with other federal agencies, EPA is defining "coastal wetlands" as saltwater and freshwater wetlands* within HUC-8 watersheds that drain to the Atlantic, Pacific, or Gulf of Mexico. "Coastal wetland loss" is defined as "a decline in the areal extent and/or ecological integrity of wetlands in coastal watersheds" (Figure 2).**

Figure 2. Coastal wetlands regions identified in EPA's Coastal Wetlands Initiative.

coastal wetland loss nationally. The results of these CWRs are provided in a report distributed to the respective participants, and will also be posted on EPA's website. This document is the CWR report for the Mid-Atlantic region.

The second part of the Coastal Wetlands Initiative is the federal Interagency Coastal Wetlands Workgroup, which is composed of members from EPA, NOAA, USFWS, the U.S. Geological Survey, the U.S. Department of Agriculture's Natural Resources Conservation Service, the Army Corps, and the Federal Highway Administration. The Interagency Coastal Wetlands Workgroup serves in an advisory capacity to EPA's Coastal Wetlands Team by helping to identify CWR watersheds, participating in the CWR on-site discussions, and providing input on the report.

EPA Coastal Wetland Regional Reviews

EPA conducted these CWRs to identify and better understand the stressors on coastal wetlands and the strategies needed to protect and restore them. EPA's Coastal Wetlands Team is interested in identifying the cause(s) of losses in the areal extent of wetlands, as well as examining losses in wetland function and/or ecological integrity. Though quantifiable data on functional loss are limited in availability, EPA recognizes that it is an issue in many watersheds and included qualitative information to reflect this concern where appropriate. EPA coordinated with the Interagency Coastal Wetlands Workgroup and stakeholders to gather information on available tools and strategies used to address wetland function and condition within the region(s) of interest. The CWRs and the subsequent regional reports will not be used to evaluate specific wetland assessment tools or methodologies, but rather to describe which tools are being used and discuss participants' views on their experiences and relative success with such tools.

The purpose of the CWRs is to facilitate dialogue among stakeholders who share a vested interest in coastal wetland resource protection such that continued local, regional, and national efforts to stem coastal wetland losses can be increasingly effective. They are not considered a commitment of future resources to address issues identified during the review process. Each CWR is intended to provide information on a particular focal watershed or region and should not be considered a final assessment of the study area. Instead, each review should be considered a baseline reconnaissance to aid in moving the entire Coastal Wetlands Initiative forward.

This report contains points raised during the course of the discussions with stakeholder groups. EPA affords participants an opportunity to comment on CWR notes and draft reports in order to provide the broadest perspective possible. EPA also endeavors to supplement these perspectives with documentation (e.g., relevant references, citations), but it is not possible to do so for every comment provided. Thus, the information presented in this report cannot be considered the definitive and most comprehensive presentation of issues within the region or within specific focal watersheds. Instead, it can serve as a starting point for identifying priority stressors, tools and strategies to address them, and key information and data gaps that need to be filled in order to reduce wetland loss in the future.

The process for the CWRs was intended to be flexible and encouraged participation from a diverse and representative group of stakeholders in each of the focal watersheds. Four steps were followed for each CWR:

* For the purposes of this initiative, "wetlands" means those areas meeting the definition of wetlands in: Cowardin, L., et al. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS 79/31. 131 pp

** EPA recognizes that there are limited quantifiable data currently available regarding loss of wetland ecological integrity.

1. Identify focal watersheds.

USFWS identified candidate watersheds for the CWRs based on observed wetland loss in the USFWS/NOAA Status and Trends report. These are generally areas where the most wetland loss has occurred, due to development, other human actions, or where losses were attributed to inundation or other coastal processes.

The Coastal Wetlands Team further refined this larger candidate watershed to focus in on specific eight-digit HUC watersheds ("HUC 8 watersheds"). The focal watersheds selected for analysis are based on existing wetland conditions assessments, available data, a variety of efforts to protect and restore coastal wetlands, and the willingness of local stakeholders to participate.

The HUC 8 watersheds identified may correspond directly to National Estuary Program (NEP) study areas (the geographic boundary in which the NEPs work to improve estuary health). In other words, the CWRs often occur in the same watersheds as the NEP study areas or a sub-set thereof.

NEPs provide an effective mechanism to assist the CWRs in a few important ways. They consist of broad-based stakeholder groups that work in close partnership to protect and restore habitats in their study area. These groups represent a wide range of interests and expertise at local, state, and federal levels (e.g., general public, state natural resource agencies, academics, local governments, watershed groups). EPA uses stakeholder lists from the NEPs along with contacts provided by the Interagency Coastal Wetlands Workgroup to invite participants to attend the CWRs.

NEPs and their partners create and implement a management plan that is based on scientific characterization of the study area, and contains actions to address habitat loss and modification. This characterization is a collection of scientific information that includes an assessment of extent and condition of habitats such as wetlands. These data can help provide key information for the CWR assessments and reports.

2. Conduct a review of current, readily available information.

For the selected review area, the Coastal Wetlands Team gathered more specific existing information on coastal wetland loss, stressors contributing to coastal wetland loss, tools and strategies used to protect and restore coastal wetlands, and key information gaps that, if addressed, could help reverse the trend of wetland loss. Information was gathered from the Internet, reports provided by the "host" organization, and CWR invitees or participants in advance of the local stakeholders discussions. In addition, to estimate coastal wetlands loss, the Coastal Wetlands Team consulted with NOAA's Coastal Change Analysis Program (C-CAP), which uses

NEPs are already employing a variety of efforts to protect and restore wetlands. NEPs can assist by: 1) convening the appropriate stakeholders to participate in the CWRs, 2) providing scientific data on wetland conditions in their study areas, and 3) providing a strong platform and scientific understanding to support the CWRs.

satellite imagery to measure land cover change in coastal areas. The Team also requested permit data from the Army Corps and state agencies, where applicable, in order to quantify authorized losses and associated mitigation gains for wetlands which are under the jurisdiction of Section 404 of the federal Clean Water Act (CWA) or similar state programs. When made available by the relevant agency, these data were provided in the CWR report. Due to database limitations, permit data provided by the Army Corps did not cover the same time frame as C-CAP (1996-2006) and therefore it was not possible to compare the magnitude of losses identified by each. See Appendices C and D for more information on the CWA Section 404 program and C-CAP, respectively.

3. Conduct stakeholder discussions.

EPA sought an entity to serve as the "host" of each review and to help identify a broad range of local stakeholders to participate in the discussions. The host organization (such as an NEP) helped to arrange the meeting logistics and used their partnerships to invite all the appropriate participants to that dialogue. Invited participants included a broad cross-section of business, environmental, academic, and government representatives. Invitee lists were collected from the organization hosting the event, as well as suggestions from the Interagency Coastal Workgroup (which includes their regional representatives).

The Coastal Wetlands Team convened a stakeholder forum

Questions posed during stakeholder discussions:

1. **What are the root causes of coastal wetland loss in your area? Are there differences between fresh and saltwater stressors? Which are the top three stressors?**
2. **What are the current regulatory and non-regulatory protection and restoration tools being used to adapt to or mitigate wetland loss in your area?**
3. **What are the successful strategies being employed to protect and restore coastal wetlands in your area?**
4. **What information gaps would be most helpful to address loss, and how can these gaps be addressed?**

of the invitees in each selected focal watershed. These one- or two-day facilitated dialogues provided additional insights about on-the-ground (existing) condition of coastal wetlands within the focal watershed and growing pressures within the region; i.e., issues often best identified by those with the most vested interest in the outcome of such efforts. Attendees were asked to provide information on threats to coastal wetlands (including reduction in acreage as well as function and conditions) and tools and techniques used locally to reduce or reverse wetland loss. The term "stressor" was not defined for participants in advance of the reviews. While stressors are traditionally limited to "physical, chemical, or biological entities, or processes that adversely affect the ecological condition of a natural ecosystem" stakeholders in every CWR also identified programmatic issues as stressors related to loss or degradation of coastal wetlands. While state and federal regulatory programs are tools for wetland protection, limits to regulation are captured in the report under the "Stressors" sections in accordance with commonly expressed stakeholder input. EPA acted as a neutral facilitator and captured the discussion in meeting notes. While there may be disagreements among parties regarding the validity of the data presented or provided, EPA considered all documented sources of information. EPA also recognized that reference documents will not be available for all points raised by participants in the discussion.

To coincide with the stakeholder discussions, EPA scheduled a visit to nearby wetland protection, restoration, or mitigation projects when feasible. This enabled EPA to obtain a first-hand view of local stressors or approaches being employed to address wetland loss in that watershed. Collection and analysis of raw field data is outside the scope of these field visits.

4. Assemble a coastal wetland regional review summary.

Once the notes from the stakeholder discussions were vetted with the participants, they were combined with the available data collected in Step 2 to form the basis of a regional report. Although these reports are not exhaustive and only reflect readily available, existing documentation and the viewpoints of participating stakeholders, EPA believes they are a good indicator or snapshot of wetland issues in the focal watersheds.

The results of the Mid-Atlantic review are summarized below, and are also presented in Tables 2 and 3 and the "Conclusion" section of this report.

- Major stressors:
  - » Development.
  - » Limitations of regulations.
  - » Coastal erosion and shoreline hardening.
- Major tools and strategies:
  - » The Virginia Institute of Marine Science (VIMS) tidal wetland inventory and assessment protocol, which systematically assesses coastal wetlands and measures incremental wetland losses over time.
  - » Regulatory program coordination and strengthening such as the Mid-Atlantic Wetlands Work Group and the Partnership for the Delaware Estuary.
  - » The VIMS Wetlands Data Viewer tool, used to collect information for regulators about the quality/condition of non-tidal wetlands in which development is proposed.
  - » Stabilizing shorelines by allowing landward migration of coastal wetlands through rolling easements or living shorelines.
- Major gaps:
  - » Additional funding for programs including monitoring and assessment.
  - » Improved collaboration between state and federal regulatory agencies and VIMS.
  - » Access to geographic information systems (GIS) tools and higher-resolution Light Detection and Ranging (LiDAR).
  - » Increased public and stakeholder education and outreach.

Figure 3. Mid-Atlantic focal watersheds. *Source: ESRI, NRCS.*

Mid-Atlantic Review

The Mid-Atlantic region hosts a wide variety of coastal wetlands due to variations in climate, hydrology, soils, vegetation, and other factors. The gradual transition from fresh to salt water supports shrub and forested wetlands in the headwater areas, brackish marshes and tidal freshwater wetlands in the salt–freshwater transition zones, and salt marshes, mudflats, and beaches near the shore. In addition, many open water areas such as lakes and ponds are often regulated with wetlands within the focal watershed. Together, this network of coastal wetlands provides important ecosystem services and is vital to the health of commercially important fisheries resources and other sectors of the economy. Tidal wetlands in particular are likely to provide more ecosystem services than any other habitat type in the region (Partnership for the Delaware Estuary, 2008).

The first Mid-Atlantic watersheds chosen for the review were in the Delaware Estuary (Figure 3 and Figure 7), in the states of Delaware, New Jersey, and Pennsylvania. The second review targeted the Pamunkey, Mattaponi, and York watersheds located along the York River in Virginia (Figure 3 and Figure 10). Based on previous work by the Interagency Coastal Wetlands Workgroup, the Delaware Estuary watershed was highlighted as an area experiencing significant coastal wetland loss. In contrast, the York River watershed (a tributary of the Chesapeake Bay) was selected because, despite the presence of stressors, wetland losses seemed disproportionately low. EPA chose to further examine this disparity, i.e., why losses were occurring in some areas, but not in others, in the presence of similar stressors. The focal watershed reviews were conducted to help compile and validate baseline information and provide a more in-depth understanding of what is happening on the ground.

Mid-Atlantic Coastal Wetland Stressors

Historically, coastal wetlands in the Mid-Atlantic region have been subject to losses due to the effects of a variety of stressors from activities such as commercial, residential, and industrial development and associated infrastructure and conversion for agricultural uses. Coastal wetlands have also been affected by dredging projects (e.g., deposition of dredge spoils in wetlands)and conversion of tidal wetlands to open water by construction of impoundments and sea level rise (Tiner, 1987).

Data from NOAA's C-CAP were used to estimate acreage losses of coastal wetlands for the Mid-Atlantic region from 1996 to 2006 (see Appendix D for more information on the C-CAP methodology). C-CAP examines overall land use change, including wetlands (excluding submerged aquatic vegetation), for the coastal regions of the United States. The data set currently reports changes in wetland acreage only and does not measure change in wetland function. The C-CAP data was used in order to be consistent across all regions when comparing wetland loss. According to C-CAP estimates, approximately 40,000 acres were lost in the Mid-Atlantic region during this 10-year period and half of all the wetland losses were attributed to conversion to agriculture (Figure 4). Almost 80 percent of these changes to agriculture occurred within the Chesapeake Bay watershed.

The literature reviewed (see Appendix B), as augmented by discussions with stakeholders, revealed the following wetland stressors:

- Hydrologic alterations such as dredging, ditching, channelizing streams, mosquito control practices, stormwater runoff, impervious surfaces, and water supply withdrawals.
- Climate change and sea level rise exacerbate other stressors such as erosion, and can cause changes in salinity, sediment deficits, and conversion of vegetated wetlands to open water due to inundation (Figure 5 and Figure 6).

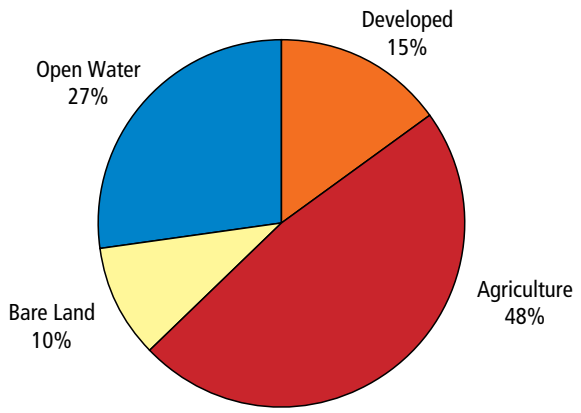


Figure 4. Wetland loss and changes in land cover, 1996-2006: Mid-Atlantic. *Source: NOAA, 2010b.*

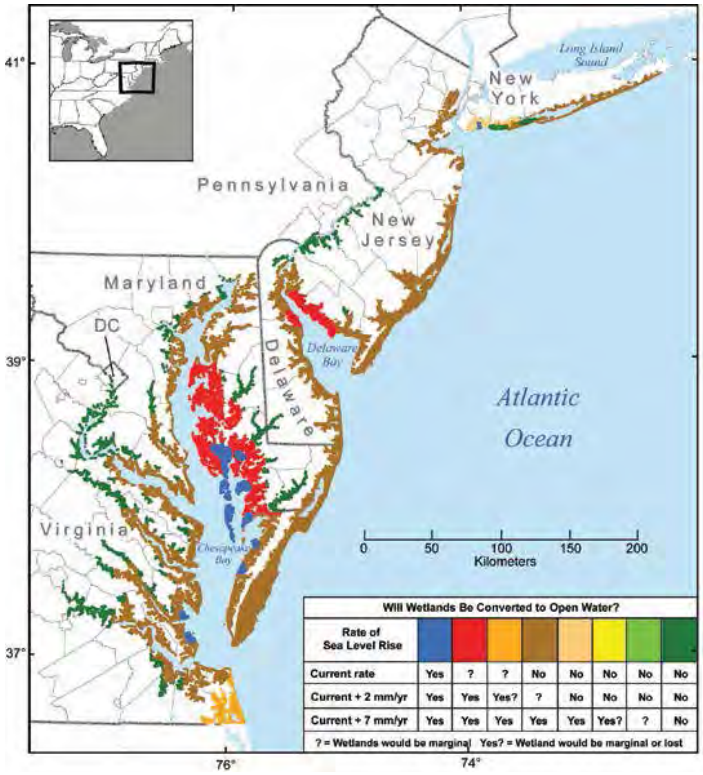


Figure 5. Areas where wetlands would be marginal or lost (i.e., converted to open water) under three sea level rise scenarios (in millimeters per year). *Source: CCSP, 2009.*

- Conversion and filling of wetlands and/or adjacent riparian or upland buffers through construction of residential and commercial development and associated infrastructure.
- Degraded ecosystems due to invasive species, salt marsh die-back, habitat fragmentation, and lack of buffers.
- Point and nonpoint source pollution and associated impacts such as eutrophication, and emerging contaminants such as pharmaceuticals.
- Hard structures along shorelines including seawalls, bulkheads, and other armoring exacerbate erosion and prevent wetland migration.

These stressors include both near-term and long-term issues, which will require a shift in response strategies. For example, impacts from residential and commercial development are an immediate issue, whereas climate change and sea level rise represent longer-term impacts. In this regard, the strategies employed to address these stressors must consider temporal variability. In fact, threats associated with sea level rise are receiving increased attention in the Mid-Atlantic region as a result of current (near-term) observations and longer-term projections. A recent report (CCSP, 2009) predicts that this region (as well as the Gulf Coast) will be particularly vulnerable to sea level rise over the next century. The Mid-Atlantic coast's vulnerability is attributed to a sandy shoreline, a high rate of erosion, a "sediment-starved" coast, localized sinking of the land surface, and the geomorphology of the coastal plain and the continental shelf. Approximately 53 percent of the relative sea level rise within at least the lower Chesapeake Bay is due to subsidence, as described in the "Chesapeake Bay Land Subsidence and Sea Level Change" prepared for the Army Corps' Norfolk District by VIMS (VIMS, 2010). Over one million acres of coastal wetlands are at risk of inundation assuming a one meter rise in sea level along the Mid-Atlantic coast (see Table 1). In Virginia, eighty-three percent of the acreage losses of estuarine wetlands in southeast Virginia have already been attributed to submergence, most likely due to rising sea level (Tiner et al., 2005). The Governor's Commission on Climate Change (2008) expects sea level to rise between 2.3 and 5.2 feet over the next 100 years, which could inundate 50 to 80 percent of Virginia's tidal wetlands.

Hardening (or armoring) of shorelines is another example of an activity that is prevalent throughout the region, and can lead to a host of short-term and long-term adverse effects. Armoring of the coast has been a major issue in the Mid-Atlantic states due to some of the same factors that render the area vulnerable to sea level rise. In Maryland, 28 percent of the shoreline has been armored (CCRM, 2004); in New Jersey, 43 percent of the developed shoreline has been hardened. In Virginia alone, 220 miles of shoreline were hardened between 1993 and 2004, with an average rate of 18 miles of hard structures permitted by regulatory agencies each year (Duhring, 2005).

Mid-Atlantic Tools and Strategies

In the Mid-Atlantic, multi-faceted programs use a variety of tools to address stressors through wetland assessment, protection, mitigation, and restoration. They include non-regulatory programs such as land protection incentives, land acquisition or conservation easements, public outreach and education,

Figure 6. Eroding wetland. *Source: Danielle Kreeger, Partnership for the Delaware Estuary.*

Table 1. Land Within 1 Meter Above High Water Along the U.S. Mid-Atlantic Coast

State	Area		
	Dry Land (acres)	Non-tidal Wetlands (acres)	Tidal Wetlands (acres)
NY	40,772	2,471	36,819
NJ	67,954	42,502	242,163
PA	5,391	741	1,483
DE	31,135	7,907	88,217
MD	110,950	30,147	275,770
DC	988	0	247
VA	90,193	36,572	400,064
Total	347,924	120,340	1,044,762

Coastal areas at risk of inundation due to sea level rise. Source: Titus et al., 2009.

training and technical assistance, monitoring, assessment, mapping, and restoration projects. A number of common regulatory tools are also used throughout the Mid-Atlantic region including permitting, compliance monitoring and assistance, site inspections, regulatory guidance, policies, enforcement, and wetlands compensatory mitigation requirements.

Wetland regulatory programs in the Mid-Atlantic region involve a combination of tools from both federal and state agencies. The Army Corps' Regulatory Program, administered by staff employed by the New York, Philadelphia, Baltimore, and Norfolk Districts, has a programmatic goal of no net loss of wetlands and generally requires compensatory mitigation for impacts authorized through its permits. Since the no net loss goal was established in 1990 (Executive Order 11990), the program has contributed to wetland protection in partnership with states that have legislation tailored to protect wetlands. "No net loss of wetlands" policies covering all jurisdictional wetlands (see Appendix C) have been adopted by EPA and all five of the coastal Mid-Atlantic states.

The Army Corps administers day-to-day federal regulation (including individual and general permit decisions), conducts or verifies jurisdictional determinations, develops policy and guidance, and enforces Section 404 provisions. EPA develops and interprets policy, guidance, and environmental criteria used in evaluating permit applications; determines the scope of geographic jurisdiction and applicability of exemptions; approves and oversees state and tribal assumption; reviews and comments on individual permit applications; has authority to prohibit, deny, or restrict the use of any defined area as a disposal site; can elevate specific cases; and enforces Section 404 provisions. EPA also provides funding, guidance, and training for a variety of wetland programs and works closely with the states through its regional offices and the National Estuary Program. Each state in this region has its own wetland laws and regulations that work in concert with Section 404, such as compensatory mitigation policies and/or guidance.

An important strategic component of coastal wetland protection in the Mid-Atlantic region is the prevalence of regional partnerships, most notably the multi-state Chesapeake Bay Agreement and the Partnership for the Delaware Estuary (one of 28 National Estuary Programs). In addition, wetland monitoring and assessment tools are considered important aspects of the wetland protection programs in this region. Coordination occurs through the Mid-Atlantic Wetlands Workgroup, funded through a Wetland Program Development Grant from EPA to the Pennsylvania Department of Environmental Protection. The group consists of federal, state, and academic staff and scientists from Delaware, Maryland, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Virginia, and West Virginia. Collaboration also occurred to develop a Mid-Atlantic tidal wetland assessment method to assess the condition of coastal wetlands. The method was developed by the Delaware Department of Natural Resources and Environmental Control, the Maryland Department of Natural Resources, and VIMS.

The Partnership for the Delaware Estuary and VIMS are two examples of groups providing scientific support for improved decision-making in this region. Both groups have developed strong collaborative relationships as well as valuable coastal wetland resources intended for local, state, and federal agencies to draw upon for priority setting as well as policy making.

CLEAN WATER ACT SECTION 404 PERMITS

Section 404 establishes a permit program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. An applicant must show that steps have been taken to avoid impacts to aquatic resources; that potential impacts have been minimized; and that compensation will be provided for all remaining unavoidable impacts. General permits can be issued on a nationwide, regional, or statewide basis for categories of activities that will have only minimal adverse effects. State Programmatic General Permits (SPGPs) are a type of general permit issued by the Army Corps and administered by a state agency. They are designed to improve the regulatory approval process for applicants, reduce unnecessary duplicative project evaluations, and promote more effective and efficient use of Army Corps' resources.

Of particular note are strategies under development to address threats of coastal erosion, storm surges, and sea level rise. To address erosion and potential storm surges, Mid-Atlantic states have historically relied on shoreline hardening methods to stabilize vulnerable coastlines along both estuarine and ocean-facing shores. Alternative strategies are now being proposed and implemented for both ocean and estuarine shorelines. The banks of estuaries in particular are receiving much attention; in these areas nourishment rarely occurs and hardening is more common due to lower wave energy and other factors. In order for the region to begin addressing projections for sea level rise over the next century, alternatives to hardening, such as conservation or rolling easements and "living shorelines," are gaining more traction (Titus, 1998; CCSP, 2009; EPA Climate Ready Estuaries website, 2010 http://www.epa.gov/climatereadyestuaries/). Allowing wetlands to migrate inland is a method of sea level rise adaptation, which ensures that coastal wetlands are maintained. Inland migration of wetlands can be accomplished through setbacks, density restrictions, and land acquisition. Regulatory rolling easements refer to a broad range of legal mechanisms used to prevent property owners from armoring their shoreline while allowing other uses of the property. Rolling easements work by automatically moving or "rolling" the restriction landward with rising sea level. This allows sediment transport to move inland and wetlands to migrate naturally. Rolling easements prevent armoring of the shoreline regardless of how threatened the structure is by rising sea level. If erosion threatens the structure, the owner has two choices: either relocate the building or allow it to succumb to the encroaching sea (Titus, 1998). EPA's Climate Ready Estuaries program has developed a "Rolling Easements Primer" which identifies regulatory and non regulatory options for implementing rolling easements (Titus, 2011).

To address the impacts of climate change, the Partnership for the Delaware Estuary (PDE), which is participating in the Climate Ready Estuaries program, released a report called "Climate Change and the Delaware Estuary: Three Case Studies in Vulnerability Assessment and Adaptation Planning." These case studies looked at three key resources: tidal wetlands, drinking water, and bivalve shellfish. With technical assistance from experts, the Sea Level Affecting Marsh Model (SLAMM) was applied to project how the spatial extent of different coastal habitats will change as sea level rises. In addition to significant acreage losses, PDE expects to see shifts in community species composition, desiccation of marsh sediments, and change in habitat support. To address these vulnerabilities, the case study identified six management tactics as potential adaptation strategies for crucial infrastructure and tidal wetlands: watershed flow management; strategic retreat; structure setbacks; creation of buffer lands; living shorelines; and building dikes, bulkheads, and tide gates.

Mid-Atlantic Gaps and Needs

In addition to identifying tools and strategies, the Coastal Wetlands Team gathered baseline information related to needs and gaps to improve coastal wetland protection in this region. In general, there appeared to be a need for:

- Increasing coordination and collaboration between wetland regulators and stakeholders.
- Increasing resources (staffing and funding) to administer monitoring, assessment, and regulatory programs.
- Developing comprehensive and integrated databases using common temporal and geographic scales and standardized categorization methodologies.
- Increasing understanding of wetland condition, function, values, and emerging issues such as sediment budgets, sediment management strategies and climate change impacts.

Tables 2 and 3 summarize key stressors, tools and strategies to address them, and gaps and needs for both focal watersheds in the Mid-Atlantic region.

Table 2. Stressors, Tools and Strategies, and Gaps Identified by Participants During the Delaware Estuary CWR

Stressors	Tools and Strategies	Gaps and Needs
Limitations of regulations	• Regulatory authority • Collaboration	• Integrated mapping, monitoring, and data collection system
Cumulative impacts	• Mapping • Watershed-level wetland condition assessment	• Sustained funding to better understand wetland function and loss • Integrated mapping, monitoring, and data collection system • LiDAR mapping • Coordination among states and NEPs to consistently and comprehensively track losses and condition changes
Hydrologic alterations	• Watershed-level wetland condition assessment	• Sustained funding to better understand wetland function and loss • Better understanding of sediment budgets and natural processes
Shoreline hardening	• Living shorelines	• Better understanding of sediment budgets and natural processes • Educate public and increase awareness
Mosquito control practices and salt marsh hay impoundments	• Watershed-level wetland condition assessment	• Sustained funding to better understand wetland function and loss • Better understanding of sediment budgets and natural processes
Climate change and sea level rise	• Land acquisition • Rolling easements	• Educate public and increase awareness

Table 3. Stressors, Tools and Strategies, and Gaps Identified by Participants During the York River CWR

Stressors	Tools and Strategies	Gaps and Needs
Limitations of regulations • **Inconsistencies in State Regulations** • **Regulatory Exemptions**	• Wetland monitoring and assessment • Strong scientific support • Restoration	• State and federal coordination • Improved collaboration between state agencies • Consistent shoreline management plans • Stronger federal enforcement presence • GIS tools and LiDAR
Commercial and residential development	• Outreach and training	• Consistent shoreline management plans • Development restrictions
Shoreline hardening	• Restoration • Living shorelines	• Nutrient management plans for all land uses • Consistent shoreline management plans
Cumulative impacts	• Wetland monitoring and assessment • Restoration	• Improved collaboration between state agencies • Centralized database tracking permits, wetland loss, and restoration • GIS tools and LiDAR
Climate change impacts	• Living shorelines	• Consistent shoreline management plans

Focal Watershed Review: Delaware Estuary Watershed

Introduction

The Delaware Estuary watershed (HUCs 02040201, 02040202, 02040203, 02040205, 02040206, 02040207) covers 13,611 square miles and includes portions of New York, New Jersey, Delaware, and Pennsylvania, and a very small portion of Maryland. The tidal river, one of the largest freshwater tidal estuaries in the world, runs through the fourth-largest U.S. urban center. It supports the world's largest freshwater port system, including the Port of Philadelphia, which generates more than $19 billion annually. The upper watershed is considered a relatively pristine recreational resource providing a portion of New York City's drinking water supply. The lower estuary is noted for its biological richness, with waterfowl (boasting the second-highest concentration of shorebirds in North America), fin and shellfish (oyster landings exceed $1.5 million), and the largest breeding population of horseshoe crabs on the planet. This resource gained distinction as home to one of the 28 National Estuary Programs—the only tri-state National Estuary Program (PDE, 2006).

Figure 7. Delaware Estuary focal watershed (cross-hatched area).

Periodic evaluations of coastal wetlands (tidal and non-tidal) of the Delaware Estuary watershed are conducted by PDE. The State of the Delaware Estuary report (PDE, 2008) is a comprehensive assessment effort that tracks more than 20 indicators of overall estuarine and watershed health. The report measures progress as well as challenges associated with implementing the Delaware Estuary Comprehensive Conservation and Management Plan. For example, with respect to tidal marshes, the report concluded the following:

> Much of our remaining wetlands appear to be considerably degraded and vulnerable to storms, erosion, and sea level rise. These marshes would normally move landward as sea levels rise. However, the "buffer" lands adjacent to them have long been developed in the Upper Estuary, and buffer loss in the Middle and Lower Estuary has escalated during the past decade. . . .
>
> . . . A 1992 to 2001 land cover data comparison (for both tidal and non-tidal wetlands combined) showed wetlands loss throughout the estuary, except along the New Jersey side of Delaware Bay where extensive marsh restoration may have offset this trend. . . .
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> . . . Despite proactive laws protecting marshes, a growing awareness of their ecological value, and mounting restoration attention, marsh acreage and condition are still lost from human-caused impairments, land uses, and sea level rise. [See Figure 8].

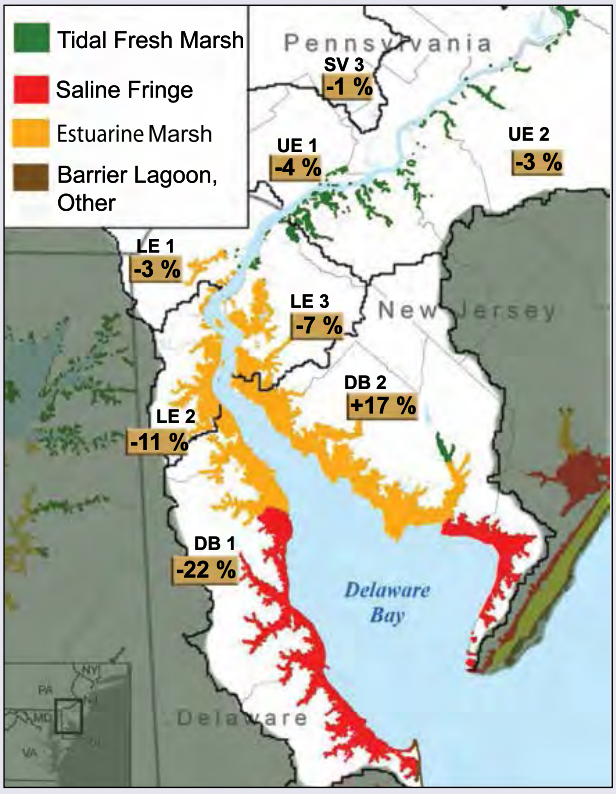


Figure 8. Relative change in tidal wetland acreage, 1992–2001.
Source: PDE, 2008.

Highlight: Analysis of Wetland Condition in the St. Jones River Watershed

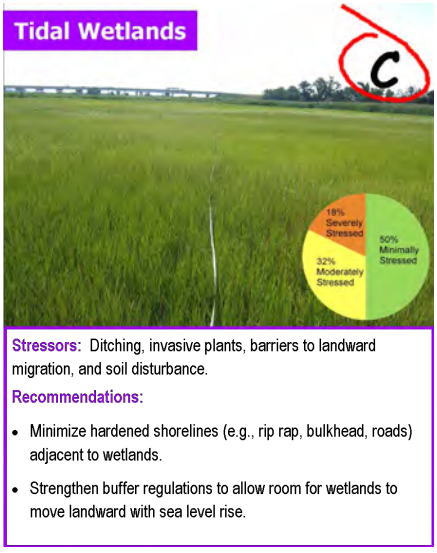
The Delaware Department of Natural Resources and Environmental Control (DNREC) Wetland Monitoring and Assessment Program recently released the results of a detailed study to examine the condition of wetlands in the St. Jones River watershed. The St. Jones River watershed drains 57,643 acres into the Delaware Bay Estuary. The study is part of a statewide effort by DNREC to assess the condition of wetlands on the watershed scale. The St. Jones study, summarized by Rogerson et al. (2010), examined both tidal and non-tidal wetland condition, changes in overall wetland acreage, and stressors responsible for wetland degradation.

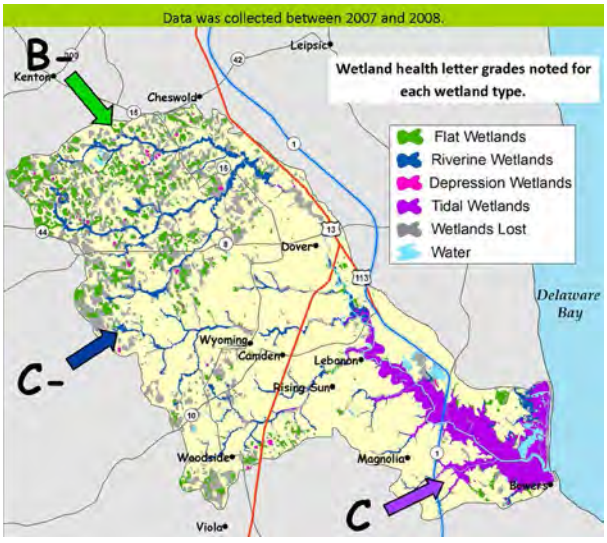
The study first looked at the change in wetland area in the watershed by comparing the 1992 Delaware state wetland inventory to historic wetland acreage based on hydric soils. Next, to assess the condition of wetlands and identify the prominent stressors, a rapid assessment method was applied to 32 headwater wetland sites, 29 riverine wetland sites, five depressional wetland sites, and 50 tidal wetland sites, randomly located on both private and public land. Indicators of condition and stressors related to plant community, hydrology, and wetland buffers were evaluated for each site. A probabilistic sampling design allowed for extrapolation of sample results to overall wetland condition in the watershed.

Since European colonization, the St. Jones watershed has lost approximately 47 percent of its wetland resources. Of the wetlands remaining, 50 percent of the wetland area is considered minimally stressed while 16 percent is severely stressed. The condition of wetlands varied by wetland type: headwater wetlands scored a "B-," riverine wetlands scored a "C-," and tidal wetlands scored a "C." Compared to the nearby Murderkill and Inland Bays watersheds, the condition of wetlands in the St. Jones River watershed was similar to the Murderkill watershed in the Delaware Estuary basin but has more minimally stressed wetlands and fewer severely stressed wetlands than the Inland Bays watershed.

This information will be used to guide Delaware's protection and restoration efforts. Protection resources will be focused on the types of wetlands with the highest risk for loss and degradation, and restoration efforts will be targeted on wetlands with the highest restorative value. The results of this study can also be used as baseline information to monitor future changes in the watershed. In collaboration with the Delaware National Estuarine Reserve, DNREC will use the information from this report to educate citizens and decision-makers on the health and importance of wetlands and actions that they can take to improve the condition of wetlands in the watershed. The study recommendations included:

- Thoroughly tracking permitted impacts.
- Restoring and re-establishing degraded and fragmented flat wetlands to improve wetland services such as water quality, wildlife habitat, and native biodiversity.
- Improving tidal and non-tidal wetland buffer regulations.
- Collaborating with partners to enhance education and outreach efforts and share coastal wetland information with professionals and decision-makers.
- Identifying restoration and protection priority areas.
- Ensuring that wetland functions are replaced before they may be destroyed or degraded by adopting assessment methods and monitoring results into the Army Corps' review process and by strictly enforcing current guidelines.
- Controlling invasive plants to improve wetland condition, promote native communities, and improve biodiversity.





Data from NOAA's C-CAP were used to estimate acreage losses of coastal wetlands for the Delaware Estuary (see Appendix D for more information on C-CAP methodology).

According to C-CAP estimates, the Delaware Estuary watershed lost approximately 7,500 acres of coastal wetlands between 1996 and 2006. This represented a loss of 1.5 percent of all coastal wetlands present in 1996. Losses were fairly evenly split between freshwater (approximately 52 percent) and saltwater (approximately 44 percent) wetlands, with some unconsolidated shore losses (approximately 4 percent). Wetland areas were lost to open water (approximately 47 percent), agriculture (approximately 28 percent), and development (approximately 19 percent), with approximately 6 percent lost to bare land (Figure 9). More than 75 percent of all the saltwater marsh losses were to open water.

The C-CAP data are intended to provide a general indication of trends observed on a national level, and may be one of several important screening tools used in the identification of threatened areas, key stressors, and the identification and prioritization of conservation/restoration strategies. This "big picture" view is best supplemented by more detailed, field-based, state-level analysis. For example, C-CAP (consistent with many wetland mapping methodologies) only measures coastal wetland losses according to loss of wetland acreage. Some states are taking a more comprehensive approach and are beginning to measure both wetland acreage and condition. A notable example occurs within the state of Delaware and is described in the report "Condition of Wetlands in the St. Jones River Watershed" (Rogerson et al., 2010). This report determined the condition of both tidal and non-tidal wetlands and identified the presence of wetland stressors that are degrading wetlands. Wetland condition was measured using 15 metrics representing habitat characteristics (e.g., plant composition, invasives); hydrology (e.g., ditching, draining, fill, stormwater inputs); and condition of the wetland buffer (e.g., extent and intensity of surrounding development, barriers to landward migration). The information will be used to inform and improve future protection and restoration activities for Delaware's wetland resources.

It should be noted that the information below is based on the opinions and observations of participants, who provided feedback on draft versions of this document and supplemented statements with documentation, where available.

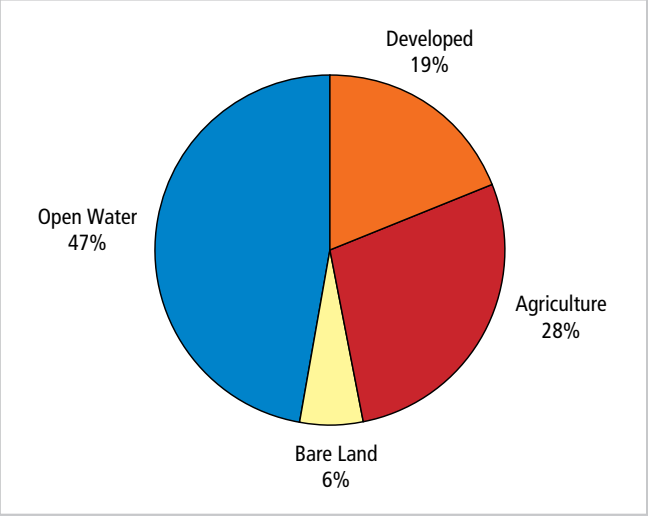


Figure 9. Wetland loss and changes in land cover, 1996-2006: Delaware Estuary watershed. Source: *NOAA, 2010b.*

Stressors

The following major coastal wetland stressors emerged from the Delaware Estuary watershed review:

- **Limitations of regulations.** During discussions, stakeholders reported a lack of clarity in the field amongst regulators and the regulated community over what is considered federally regulated waters pursuant to CWA Section 404 caused by recent Supreme Court decisions (*Rapanos v. United States,* 547 U.S. 715, 810 [2006]; see Appendix C). This lack of clear guidance was cited as contributing to losses to coastal wetland resources within this focal watershed. For example, Delaware state officials noted increasing losses in the last decade, particularly because the state has very little authority to protect non-tidal wetlands. Although state efforts may be showing more acres of mitigation than losses, there is uncertainty about long-term sustainability and the condition and functioning of the mitigation sites. According to review participants, early mitigation failures have led to more focus on ensuring replication of hydrology, but the ability to replicate hydrology is still in the trial phase. It was also noted that there are regulatory barriers (e.g., terminology used in regulations) to the adoption of alternative shoreline stabilization methods such as those contained in "Living Shorelines" guidance (VIMS, 2009).
- **Cumulative impacts through incremental filling.** Cumulative impacts are caused by a combination of small incremental stressors such as wetlands alterations below regulatory thresholds, cutting of vegetation, road crossings, and increased imperviousness. This was a recurring theme throughout the Delaware Estuary watershed.

A major concern is that small individual acreage losses are adding up to large impacts. For example, in Delaware the greatest wetland loss is occurring to non-tidal wetlands. These losses are often small losses (both permitted and unpermitted) that are being made on a site-by-site basis and not being put into a larger watershed or landscape context to understand the cumulative effects on ecosystem health and the reduction in the services the wetlands provide. Other states noted that incremental losses are occurring as older bulkheads are replaced with newer structures, and as landscaping (including lawns) encroaches into wetland and wetland buffer areas.

- **Hydrologic alterations.** Various natural and artificial factors have converged to modify the hydrology of the Delaware Estuary and its related hydrodynamics and sediment deposition patterns. For example, while dredging has historically resulted in direct wetland acreage loss via deposition (fill) of dredge materials into nearby marshes, the recurrence of channel deepening events (from an average pre-project depth of 18 feet to a deepening of 40 feet) has led to numerous secondary effects on important hydrologic parameters, including increased tidal range, increased shoreline erosion, and upstream intrusion of saline waters. These effects are exacerbated by sea level rise (Sutton et al., 1996). In addition, stormwater runoff and impervious surfaces alter the hydrology of both non-tidal and tidal wetlands by reducing natural recharge and increasing peak flooding.
- **Shoreline hardening.** Shoreline hardening impedes the ability of coastal wetlands to migrate landward in response to sea level rise. The State of the Delaware Estuary report (2008) tracks availability of tidal wetland buffers and notes that, in the lower estuary, buffers are lost and/or fragmented as agricultural lands are developed for residential and other uses. The report identified the Delaware side of the Delaware Bay as having the greatest potential for landward migration of tidal marshes, and therefore should be a priority for preservation.
- **Mosquito control practices.** Historic mosquito control ditching and other mosquito control activities are considered a common stressor of coastal wetlands. Open water marsh management for mosquito control, intended to reduce pesticide use, may be acting as a stressor because of changes associated with hydrology and species composition. The creation of open water areas often reduces the amount of wetland vegetation (including wildlife habitat), and may have secondary impacts associated with disturbance including the introduction or spread of invasive species (Strait and Balletto, 2005).

- **Salt marsh hay impoundments.** The historic practice of diking and impounding salt marshes for hay production has isolated wetlands from the estuary. Participants indicated that this has reduced wetland productivity and other ecosystem functions, though we uncertain about the full range of impacts this isolation may have on sediment dynamics and species composition.
- **Climate change and sea level rise.** Climate change will lead to increasing frequency and intensity of storms, which affect coastal erosion, saltwater intrusion, and conversion of vegetated wetlands to open water (Kreeger et al., 2010a). Secondary impacts include marsh dieback/browning and changes in species composition due to changes in geomorphology, salinity, and temperature. These vegetation changes lead to a loss in wetland function.
- **Pollution.** Point and nonpoint sources of pollution from development and agriculture include stormwater runoff, wastewater discharges, and industrial discharges. Of particular concern are nutrients (e.g., nitrogen, phosphorous), bacteria, sediment, metals, organic compounds (e.g., pesticides), as well as emerging contaminants such as pharmaceuticals and endocrine disruptors (PDE, 2008).
- **Invasive species.** Disturbance (e.g., hydrologic alteration, land clearing) enables opportunistic species to invade and out-compete valuable endemic species. In particular, *Phragmites* (common reed) invasion is a significant stressor in this watershed, which participants believe is likely to spread as wetland disturbances increase.

Tools and Strategies

There are currently a number of effective tools and strategies in use or under development in the Delaware Estuary watershed to address the above stressors. The focal watershed review highlighted the following:

- **Mapping.** Accurate, current data and high-resolution wetland maps are essential tools to monitor and track changes in wetlands due to the above stressors. The state of Delaware, in partnership with USFWS and Virginia Tech, created wetland maps from aerial imagery in order to complete an analysis of wetland changes between 1992 and 2007 (Tiner et al., 2011). The state of New Jersey also has high resolution wetland GIS data by county.
- **Regulatory authority.** Participants highlighted the importance of exploring the uses of existing state and federal regulations. For example, the implementation of TMDLs and the use of grants provided under CWA Section 319 can be used to improve wetland water quality.
- **Collaboration.** State and local agencies should collaborate in order to protect shared resources and reduce the adverse effects of the identified stressors through consistent regulation and outreach efforts. Inter-state collaboration can also be an effective tool, as shown by the efforts of the Partnership for the Delaware Estuary (PDE).
- **Land acquisition.** Acquisition of land and/or securing protective easements are critical for protecting wetlands and the buffer areas around them, allowing landward migration of coastal wetlands due to sea level rise. Examples discussed in the review included USFWS land acquisition projects and wildlife management areas, which have protected large amounts of bay shore areas in New Jersey, and the U.S. Department of Agriculture's use of Conservation Reserve Enhancement Program (CREP) funds to purchase tidal wetland buffers. The state of Delaware and Gloucester County, New Jersey, both have active programs to purchase agricultural preservation easements on low-lying farmland (Craghan et al., 2010; Hudgens et al., 2010; Titus et al., 2009).
- **Public access.** Along parts of the Delaware Estuary, New Jersey public access regulations require that access to and along the shore be enhanced and preserved whenever permits are issued for more than two homes or a commercial land use (CCSP, 2009). Public access is also a key component of redevelopment along the Pennsylvania shore. Although public access does not directly increase habitat, it does facilitate people's enjoyment of the coastal environment, thereby enhancing public education and support for environmental quality.
- **Monitoring and assessment.** The PDE is leading a collaborative effort to establish the Mid-Atlantic Coastal Wetlands Assessment (MACWA). This large-scale, tri-state assessment will establish baseline conditions and new research methods to assist in decision making, priority setting, and future survey design in the region (Kreeger et al., 2010b).

What's Needed? What's Missing?

Despite the above array of tools and strategies to reduce stressors to coastal wetlands, there are still gaps that need to be addressed to enable more effective application of these tools and strategies in order to better protect and restore coastal wetlands:

- Sustained funds to understand wetland loss, including condition, function, and stressors, and also to implement outreach and incentive programs. Directed wetland development grants to focus on building state capacity and coordinating across geopolitical boundaries through NEPs.
- Better understanding of sediment budgets, hydrologic alterations, and their effects upon natural processes such as erosion and accretion.
- An integrated mapping, monitoring, and data collection system to inform decision-making, set priorities, and track progress for applications such as the State of the Delaware Estuary report.
- Improved National Wetland Inventory (NWI) mapping for quality baseline data at a higher resolution. LiDAR technology is especially needed for coastal mapping because of the dynamic conditions associated with coastal processes.
- New tools to address emerging threats such as sea level rise and potential sediment deficits. Several states outside the Mid-Atlantic have rolling easement regulations to ensure that beaches migrate inland as sea level rises (CCSP, 2009).
- Increased state regulatory authority over non-tidal wetlands.
- Increased interagency collaboration and integration of tools/authorities/enforcement, especially bringing agencies together to prioritize wetland management.
- Good information to educate the public and increase awareness.

Focal Watershed Review: York River Watershed, Virginia

Introduction

The Virginia coastal zone contains all 310,813 acres of Virginia's tidal wetlands and 909,097 acres (approximately 80 percent) of the state's non-tidal wetlands. Most of the historical non-tidal losses are attributed to agriculture, while most of the historical tidal wetland losses have been caused by commercial and residential development along the shoreline, shoreline hardening (VA DEQ and VIMS, 2001) and, potentially, sea level rise.

At 2,669 square miles, the York is among the smallest of Virginia's Chesapeake Bay watersheds. However, its population grew from 250,332 in 1994 to 372,488 in 2000, making it one of the Bay's fastest-growing watersheds (Commonwealth of Virginia, 2005; VA DCR, 2008). The 140-mile York River originates at West Point, where the Mattaponi and Pamunkey rivers converge, and continues to Yorktown where it drains into Chesapeake Bay. The watershed thus includes the drainage areas for the Pamunkey, Mattaponi, and York Rivers (Figure 10; HUCs 02080105, 02080106, 02080107). Land use/land cover is predominantly rural, with approximately 73 percent forested, 19 percent in agricultural use, and 8 percent designated as urban (VA DCR, 2008).

Based upon C-CAP results, the York River watershed lost approximately 900 acres of wetlands between 1996 and 2006 (see Appendix D for more information on C-CAP methodology). This constituted a loss of 0.5 percent of all of the wetlands present in 1996. The losses were associated primarily with freshwater wetlands

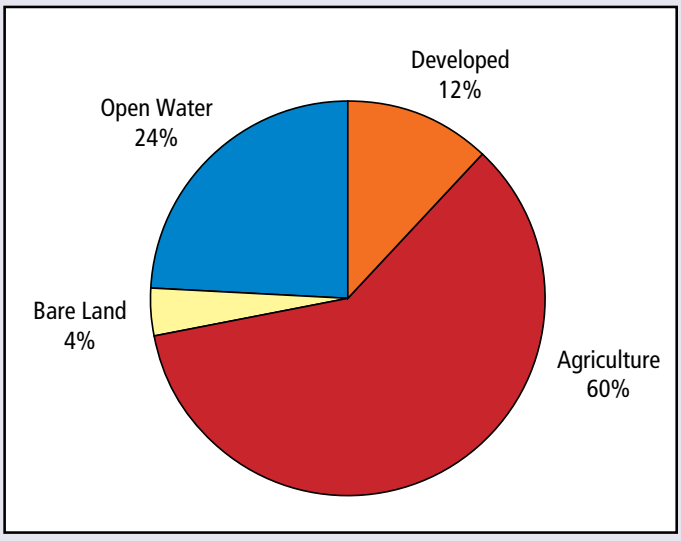


Figure 11. Post-loss land use for coastal wetlands lost between 1996 and 2006: York River watershed. *Source: NOAA, 2010b.*

Figure 10. York River watersheds.

(approximately 95 percent), with the majority being forested wetlands. Approximately 3 percent, or 30 acres, of salt marsh wetlands were lost during the same time period. The losses experienced were primarily due to conversion of land for agricultural uses, including both cultivated crops and pasture areas (approximately 60 percent), but there was also significant loss to open water (approximately 24 percent), development (approximately 12 percent), and some loss to bare land (approximately 4 percent) (Figure 11).

Stressors

Discussion at the review focused on key issues contributing to coastal wetland loss. Overall, it was observed that inconsistent regulation and regulatory exemptions may be the most common drivers of coastal wetland loss within the York River watershed, particularly with respect to agriculture and forestry practices within non-tidal wetlands. In addition, rapid urban development has been cited as being a key contributing factor. Stakeholders indicated these are the three most important stressors:

- **Inconsistency in state regulations** Several possible reasons for or examples of inconsistent regulation were noted:
  - » Participants felt that the existence of two separate wetland protection programs may hinder wetland protection due to inconsistent policies and jurisdictional determinations. Primary authority for issuing state non-tidal wetland permits rests with the Virginia Department of Environmental Quality (VA DEQ). Tidal wetland permits are the purview of the Virginia Marine Resources Commission (VMRC) under the Tidal Wetlands Act. Local wetland boards have the option of regulating their own tidal wetlands with

VMRC oversight (most wetland boards adopt the "model wetland zoning ordinance" set forth in Virginia Code Section 28.2-1302).

- » Participants believed project proponents may be using the fact that they have obtained local building permits as entitlement to bypass "avoidance and minimization" requirements of state and federal wetland regulations.
- » The Chesapeake Bay Preservation Act designates tidal wetlands and an adjoining 100 foot buffer as components of Resource Protection Areas (RPAs). Participants indicated that not all counties require wetland delineation before approving development plans near RPAs, and therefore may not be consistently limiting development within RPAs. Requiring delineations would also provide greater consistency with state/federal regulations.
- » Participants did not believe there was political will for local wetland boards administering the Tidal Wetlands Act to require less damaging alternatives to shoreline hardening projects.
- » Virginia's wetland programs do not consistently require avoidance of wetland impacts, and instead settle for modest minimization and compensation schemes (Wetlands Watch, 2006).

- **Regulatory exemptions.** Examples include:
  - » Similar to CWA Section 404, Virginia wetland laws exempt certain activities from permit requirements, such as those related to existing agriculture and silviculture; construction and maintenance of farm or stock ponds; or farm roads, forest roads, and temporary roads for mining activities (subject to BMPs). Participants believed these exempt activities were a significant cause of wetland loss. For example, there is a belief among some participants that large wetland areas are being timbered and later converted to other uses, such as residential subdivisions. Speculative landowners may be taking advantage of a silviculture exemption to install permanent roads and bridges for access, remove trees, and then convert the land for development.
  - » Virginia also exempts from regulation "isolated wetlands of minimal ecological value," which are defined as non-forested wetlands less than one-tenth of an acre located outside the 100 year floodplain and not containing endangered species habitat or other sensitive aquatic communities including vernal pools. In total, it is estimated that there are more than 180,000 acres of isolated wetlands statewide (Hershner et al., 2000). Participants believe exempted and unmitigated impacts have resulted in significant losses on a cumulative basis of isolated wetlands of "minimal ecological value."

It should be noted that the information below is based on the opinions and observations of participants, who provided feedback on draft versions of this document and supplemented statements with documentation, where available.

- **Commercial and residential development.** Conversion of open space and agricultural lands to commercial and residential development is viewed as a major stressor in the York watershed. In addition to direct impacts associated with construction, this development requires supporting infrastructure along with its associated impacts (e.g., stormwater runoff from roads and impervious surfaces). Stormwater runoff was identified as a major stressor associated, generally, with growth and development.

As well as the "top three" listed above, other major stressors include:

- **Shoreline erosion and shoreline hardening.** Shoreline hardening is a major stressor in this watershed due to its adverse effects upon natural coastal processes, including sediment transport, water quality improvement, flood events, and wildlife habitat. As stated above, the Tidal Wetlands Act may not be working as well as it should because of pressures on local wetland boards. Armoring is a common response of coastal landowners to stabilize their waterfront properties in response to observed or anticipated erosion (Figure 12). This aggressive response may be exacerbated by the prospect of sea level rise (Titus et al., 2009). Approximately 11 percent of the York River's shoreline has been armored and 7.5 percent of the York-Pamunkey-Mattaponi's collective shoreline has been armored.

Figure 12. Armored shoreline. *Source: VA CZM, n.d.*

  - » Studies by VIMS have shown significant ecological impacts of shoreline hardening. In one study, the placement of erosion control structures on the shoreline was associated with reduced fish community integrity. Fish community integrity was lowest along bulkheaded shorelines. In another study, the benthic index of biological integrity was found to be significantly reduced in circumstances where more than 10 percent of the shoreline was developed. Reduction in benthic invertebrates is directly related to the health of the fisheries community (Bilkovic et al., 2006; Bilkovic and Roggero, 2008).

- **Cumulative impacts.** The Wetlands Program at VIMS maintains a database of state permitted tidal wetland losses in order to assess the cumulative impacts of these permits. According to this data, while 132 acres of tidal wetland fill were permitted by state permits between 1993 and 2004, only 20.3 acres of compensatory wetland mitigation was required (Duhring, 2005). Eighty acres of this loss was the result of permits for erosion control structures. Additional, untracked losses occur due to exemption of impacts less than 1,000 square feet in isolated wetlands of minimal ecological value (Wetlands Watch, 2006).

  In addition, participants cited general permits issued for non-tidal wetlands impacting less than a half acre as another possible source of cumulative wetland loss. Concerns were expressed that these areas were not consistently reviewed for impacts and mitigation. It should be noted, however, that the general permits in Virginia are designed to provide a streamlined process without reducing the level of protection.

- **Climate change and subsidence impacts.** Climate change impacts have been noted as a stressor, particularly in low-lying areas and may not be receiving adequate attention or public visibility. Effects of climate change may include sea level rise, more severe coastal storms, salt water intrusion, and climate change's contribution and relationship to other stressors such as drought and increased demand for ground water withdrawals. These processes are expected to continue. It was noted that tectonic rebound of the earth's crust upon melting of glaciers and subsidence from the Chesapeake Bay Impact Crater (VIMS, 2010) may be accounting for about a third of the sea level rise. Landward migration of coastal wetlands can reduce the magnitude of these impacts upon coastal populations and natural areas.

Tools and Strategies

The discussion of tools and strategies revealed a rich array of coastal wetland protection and restoration programs, technological applications, and outreach initiatives, many of which are directly linked to addressing major stressors in the watershed.

- **Wetland monitoring and assessment strategy.** In 2000, the Virginia legislature amended the State Water Control Law by authorizing VA DEQ to implement a state non-tidal wetland program in support of a "no net loss of wetlands" policy. The program augments the state's 401 certification of 404 permits and includes protection of isolated wetlands (except those smaller than 1/10 acre). The range of responsibilities assigned to VA DEQ included a comprehensive monitoring and assessment strategy, which was adopted in 2005. VIMS, VA DEQ, and others are working in concert to implement the strategy by developing protocols and guidance and applying them in the field in order to answer the following questions (VA DEQ, 2005):
  - » What is the overall quality of wetlands?
  - » To what extent is wetland quality changing over time?
  - » What are the wetland problem areas and areas needing attention?
  - » What level of protection is needed?
  - » How effective are wetland programs in protecting wetlands?

- **Outreach and training.** Coastal wetland education, outreach, and training programs are innovative and strategic, targeting diverse user groups such as realtors, contractors, and school children. Some training sessions can be funded to a limited extent by fines from violators, who may be required to (anonymously) attend the training program as part of their penalties.

- **Roundtables.** Watershed-based discussion forums, called roundtables (e.g., the York River and Small Coastal Basin Roundtable and the York River Use Conflict Roundtable), are useful for stakeholder problem-solving, natural resource education, and technical training. Roundtables generally involve a diversity of participants, and their activities address common water quality and water resource concerns. Each major watershed in Virginia has a watershed roundtable (see http://www.dcr.virginia.gov/sw/wsheds.htm). The York River and Small Coastal Basin Roundtable website can be found at http://www.yorkwatershed.org.

- **Restoration.** Consistent with the Chesapeake Bay 2000 agreement, the state committed to aggressive wetland restoration goals. The wetland restoration program is a key component of the state's no net loss policy. The state recently updated its wetland restoration goals, which now call for restoration of more than 70,000 acres statewide, including more than 26,000 in the York River watershed alone. Stakeholders viewed these goals with a certain degree of skepticism, and cited the lack of a statewide wetland restoration tracking database.
- **Strong science base.** A notable and productive partnership exists between the state's wetland programs and VIMS. VIMS is legislatively mandated to provide scientific assistance to the Commonwealth of Virginia's wetland regulatory and management programs, and has developed a number of assessment tools that have been implemented throughout the region. VIMS is a major asset for the state's wetland programs. Among other duties, staff at the Center for Coastal Resources Management (CCRM) reviews all tidal permit applications in Virginia's 22 tidewater counties, providing objective and scientific advice to permitting authorities.

Figure 13. Newly planted marsh with fiber logs allowing plants to establish root system and stabilize shoreline. *Source: VIMS, 2006.*

Tool Highlight: Living Shorelines

Among the many tools and strategies available in this watershed, "Living Shorelines" holds great promise in addressing shoreline hardening, and has the potential for transferability to other states and regions. Living Shorelines is a scientific methodology that allows users to choose the most appropriate means of shoreline stabilization (Figure 13), and is intended to help implement shoreline management plans.

The Living Shorelines model and guidance developed by VIMS (see http://ccrm.vims.edu/livingshorelines) are used to determine the suitability of shoreline areas for various stabilization approaches, which range from no action to armoring, depending on a combination of risk factors. The model contains parameters such as fetch, water depth, vegetation, height of bank, and existing erosion condition, and produces the most effective shoreline stabilization method given a site's characteristics.

The Maryland Department of Natural Resources has been the primary user of this tool, having completed shoreline management plans for its entire Chesapeake Bay shoreline, but the tool is receiving the attention of coastal managers throughout the region. Maryland's regulations require the use of the Living Shorelines model when permitting shoreline work. Local governments in Matthews County, Virginia, have piloted the tool, and local wetland boards are using the guidance. The state of Virginia is now considering ways to institutionalize this tool, such as training contractors and others who are in decision-making roles, providing incentives such as expedited/streamlined permit processes for projects following Living Shorelines guidance, and coordinating among all regulatory programs to promote the guidance early on in the planning process (VIMS, 2009).

Tool Highlight: Non-Tidal Wetlands Condition Assessment—Wetlands Data Viewer

This online tool was developed to help VA DEQ meet its year 2000 amendments to inland wetland laws. The data viewer helps determine the quality/condition of non-tidal wetlands. Wetlands are categorized as high, medium, and low value for habitat and for water quality. The Virginia DEQ uses the data viewer to assist in permit review, develop mitigation ratios, and guide responsible siting of development. No performance standards currently exist for conditioning (or denying) permits based on the value of the wetlands as indicated in the data viewer. The data viewer is available for use now in non-tidal wetlands (see http://ccrm.vims.edu/wetlands/nontidal_gis_products/index.html). The tidal application is currently under development, with the York River watershed being the focus of initial assessment and mapping efforts.

Tool Highlight: Tidal Wetlands Inventory and Assessment Protocol

The "Development of a Tidal Wetlands Inventory and Assessment for the York River, Virginia Watershed" dataset (O'Brien et al., 2006) provides the basis for a Level I, II, and III wetland

assessment of the Mid-Atlantic region. As a prototype for this assessment, 2,188 tidal wetlands have been assessed in the York River watershed. The protocols developed under this study are transferable to other tidal watersheds in Virginia and beyond to other states of the Mid-Atlantic region. (For more information, see http://ccrm.vims.edu/gis_data_maps/interactive_maps/disclaimer_yorktidalwetlands.html.)

What's Needed? What's Missing?

Despite the above array of tools, stakeholders identified several gaps.

- Improved coordination between state and federal regulatory agencies will be necessary in order to ensure reductions in coastal wetland loss and protection of remaining coastal wetlands. A state-federal interagency group existed in the 1980s but was dissolved because of lack of funding. Such an entity is needed to ensure a coordinated state-federal wetland protection program, and is a logical next step given the resources dedicated towards wetland inventory, assessments, and mapping within the state.
- Improved collaboration between state agencies and VIMS, including more widely accepted use of their inventory, assessments, and mapping tools, is expected to benefit both permitting and enforcement programs through a more comprehensive and consistent approach.
- A centralized state database and qualified support staff are needed to track wetland permitting, loss, and restoration to better identify where losses are occurring from the direct, indirect, and cumulative impacts of the stressors identified in this report.
- Shoreline management plans are needed in Virginia to address coastal erosion and to respond to sea level rise. The state of Maryland has developed management plans for its shorelines and is developing statewide regulatory maps that will designate where property owners can use hard shore protection structures and those areas where only nonstructural and living shoreline approaches will be allowed. By contrast, Virginia has developed plans for some select locations.
- Coastal development needs to be designed to enable wetland migration and reduce the demand for shoreline hardening. Under its Critical Areas Act, the state of Maryland limits development to one home per 20 acres in most rural areas that were not developed prior to the mid-1980s. Two counties in the state of Delaware prohibit development in coastal floodplains (Hudgens et al., 2010). Virginia, by contrast, has no statewide restrictions for development along Chesapeake Bay.
- Stronger enforcement presence by state and federal agencies in tidal wetlands is needed to increase the effectiveness of regulatory programs. Participants at the York River watershed review suggested that a reduction in federal agency field presence is creating a "domino effect:" when there is a strong, effective federal agency presence in the field, there is a disincentive to violate the wetland regulatory requirements—but with a reduced field presence, this disincentive is not there.
- Access to GIS tools is needed by state and local officials for displaying wetland losses, inventory, stressors, and condition, and to provide greater opportunity for retention and dissemination of institutional knowledge. In addition, better-quality, high-resolution LiDAR data are needed to assist with accurately determining elevations and topography, particularly for low-lying areas. These are essential tools that should be shared between state and federal regulatory permitting and enforcement agencies in order to better assess and protect coastal wetlands.

Conclusion

The Mid-Atlantic coastal wetland review is the first in a series that the EPA Coastal Wetlands Team conducted. The team has been able to gain a greater understanding of coastal wetland loss in the region, including important insights into the causes of these losses. Several common themes have emerged from the focal watershed reviews:

Figure 14. PDE's Delaware Estuary Living Shoreline Initiative pilot project at Matt's Landing, New Jersey. *Photo courtesy of PDE.*

- Development pressures continue to result in incremental direct and indirect impacts on coastal wetlands, and may lead to cumulatively significant adverse effects.
- Consistent coordination between state agencies, federal regulatory agencies, and non-regulatory programs is necessary in order to ensure persistent reductions in coastal wetland loss and to secure additional protections for remaining coastal wetlands. Further, stronger enforcement presence by state and federal regulatory and resource agencies is needed in order to increase the effectiveness of wetland protections.
- Coastal erosion, exacerbated by sea level rise, is a stressor that is likely to increase in the future and for which the region needs to develop new strategies such as allowing landward migration of coastal wetlands.

A number of tools and strategies were suggested that could effectively address the major stressors discussed on the previous pages, and could be transferred to other watersheds and regions:

- Incremental wetland losses: **The VIMS tidal wetland inventory and assessment protocol** is tool that could be used to systematically assess coastal wetlands and measure incremental losses over time.
- Regulatory program coordination and strengthening: Collaborative strategies such as **the Mid-Atlantic Wetlands Work Group** and the **Partnership for the Delaware Estuary** are excellent examples of ways to enhance the effectiveness of regulatory programs. In addition, the **Wetlands Data Viewer tool,** developed by VIMS, promises to provide regulators with critical information about wetlands in which development is proposed, allowing more protection to be applied for wetlands exhibiting high values.
- Strategies to address shoreline erosion: The region has two potentially transferable strategies; one is more conceptual in nature and the other is already being applied in the Mid-Atlantic region. The first is allowing **landward migration of coastal wetlands** in anticipation of sea level rise impacts, for example by implementing **rolling easements.** This strategy was highlighted in the Delaware watershed review. The second strategy is **"Living Shorelines,"** which is the preferred method for shoreline stabilization and is implemented throughout Maryland's coastline and in other parts of this region (Figure 14). This tool, along with the permitting incentives being contemplated to implement it (e.g., streamlining permit review), has high potential for transferability to other coastal watersheds.

Key gaps were identified that need to be filled to reduce the stressors and more effectively use these tools and strategies. The most commonly cited among them included funding, monitoring and assessment data (both obtaining and managing the data), higher-resolution imagery and elevation data, increased interagency collaboration, improved state programs, and increased public/stakeholder outreach.

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Appendix A: Delaware Estuary Watershed and York River Watershed Participant Lists

MID-ATLANTIC FOCAL WATERSHED REVIEW PARTICIPANTS

Delaware Estuary Wetland Review Participants (June 2009)

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Appendix B: Background Documents

Document/Study Title	Author (Date)
MID-ATLANTIC AND CHESAPEAKE BAY	
Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region	U.S. Climate Change Science Program (2009)
Mid-Atlantic Wetlands: A Disappearing Natural Treasure	Tiner, R.W.—USFWS (1987)
Status and Recent Trends of Wetlands in Five Mid-Atlantic States: Delaware, Maryland, Pennsylvania, Virginia, and West Virginia	Tiner, R.W., and J.T. Finn—USFWS (1986)
Wetlands Status and Trends in the Conterminous United States: Mid-1970's to Mid-1980's	Dahl, T.E., and C.E. Johnson (1991)
Mid-Atlantic Wetlands State Profiles	U.S. EPA (2009) (Web site)
State Wetland Programs	ASWM (2004)
State Wetland Protection: Status, Trends, and Model Approaches; Appendix: State Profiles.	Environmental Law Institute (2008)
State Wetland Program Evaluation: Phase III	Environmental Law Institute (2007)
Status and Trends of Wetlands in the Coastal Watersheds of the Eastern United States: 1998–2004	Stedman, S., and T.E. Dahl (2008)
State of the Beach Report	Surfrider Foundation (2009)
Development Growth Outpacing Progress in Watershed Efforts to Restore Chesapeake Bay	Office of Inspector General (2007)
Draft Report on Chesapeake Bay Watershed Climate Change Impacts	U.S. Department of the Interior, U.S. Department of Commerce (2009)
Sea-Level Rise and Coastal Habitats of the Chesapeake Bay: A Summary	National Wildlife Federation (2008)
Common Reed *Phragmites Australis* Occurrence and Adjacent Land Use Along Estuarine Shoreline in Chesapeake Bay	Chambers R.M., et al. (2008)
Chesapeake Bay Agreement—Preamble	Chesapeake Bay Program (2000)
Effects of Coastal Development on Nearshore Estuarine Nekton Communities	Bilkovic, D.M., and M. Roggero (2008)
Influence of Land Use on Macrobenthic Communities in Nearshore Estuarine Habitats	Bilkovic, D.M., M. Roggero, C.H. Hershner, and K.H. Havens (2006)
Recent Wetland Status and Trends in the Chesapeake Watershed (1982 to 1989)	Tiner, R.W.—USFWS (1994)

DELAWARE ESTUARY WATERSHED	
Delaware Wetlands Conservation Strategy	Delaware DNREC (2008)
Delaware Wetland Monitoring Strategy	Delaware DNREC (2008)
Delaware Wetlands Reserve Program	Delaware DNREC (Web site)
White Paper on the Status of Sudden Wetland Dieback in Saltmarshes of the Delaware Inland Bay	Bason, C., et al., Delaware Center for the Inland Bays (2007)
The Delaware Estuary: Discover Its Secrets: Management Plan for the Delaware Estuary	Delaware Bay Estuary Project (1996)
The Delaware Estuary: A Watershed of Distinction (fact sheet)	Partnership for the Delaware Estuary (2006)
State of the Delaware Estuary. Report #08-0	Partnership for the Delaware Estuary (2008)
Wetland Conservation and Restoration Along Delaware Bay: The Edge Effect	Strait, K., and J.H. Balletto (2005)
The Scientific Characterization of the Delaware Estuary. The Delaware Estuary Program (DRBC Project No. 321, HA File No 93.21)	Sutton, C.C., J.C. O'Herron II, and R.T. Zappalorti (1996)
Wetland Trends in Delaware (1981/2 to 1992)	Tiner, R.W., J. Swords, and S. Schaller—USFWS (1999)
Wetlands: Status and Recent Trends	Tiner, R.W. (2001) (prepared for Delaware DNREC, Watershed Assessment Section, Division of Water Resources)
Maryland Climate Action Plan Final Report	Maryland Commission on Climate Change, Maryland Department of the Environment (2008)
Wetlands of Maryland	Tiner, R.W, and D.G. Burke—USFWS (1995)
The Garden State in the Green House—Climate Change Mitigation and Coastal Adaptation Strategies for New Jersey	Princeton University, Woodrow Wilson School of Public and International Affairs (2007)
Pennsylvania's Wetlands: Current Status and Trends	Tiner, R.W.—USFWS (1990)
Wetlands of Pennsylvania's Coastal Zone: Wetland Status, Preliminary Functional Assessment and Recent Trends	Tiner, R.W., et al.—USFWS (2002)

YORK RIVER WATERSHED	
Created Versus Natural Wetlands: Avian Communities in Virginia Salt Marshes	DesRochers, D.W., J.C. Keagy, and D.A. Cristol (2008)
Recent Wetland Trends in Southeastern Virginia: 1994–2000	Tiner, R.W.—USFWS (2005)
2007 Virginia Outdoors Plan (Appendix J)	VA DEQ-DCR (2007)
2006–2010 Virginia Coastal Needs Assessment and Strategies (Enhancement Area Assessments)	VA DEQ-CZM (2005)
Zoning, Subdivision, and Site Planning: What Coastal Communities can do to Address Sea Level Rise (presentation)	Chesapeake Bay Foundation (undated)
Invasive Species in Virginia—News and Events	Commonwealth of Virginia (2008) (Web site)
Living Shores…The Natural Approach to Controlling Shoreline Erosion	VA DEQ-CZM
Virginia Invasive Species Management Plan	VA DEQ-DCR, Natural Heritage Program (2005)
Virginia Coastal Zone Management Program—Coastal GEMS	VA DEQ-CZM (2009)
Better Land Use Planning for Coastal Virginia	VA DEQ-DCR (2005)
Bay-Friendly Shoreline Solutions	Chesapeake Bay Foundation (Web site)
Coastal Manager's Toolbox	VIMS-CCRM (2004)
Local Wetlands Boards	VA DEQ-DCR (2005)
Restoring Virginia's Wetlands: A Citizen's Toolkit	VA DEQ and Alliance for the Chesapeake Bay (2005)
Salt-Tolerant Native Plants for Waterfront Landscapes: Outer Coastal Plain	VIMS-CCRM (Web site)
Assessing the Decision-Making Process in Wetlands Resource Management in Virginia	VIMS (2003)
Shoreline Erosion Problems? Think Green!	VIMS/DEQ/VMRC (2002)
Refinement and Validation of a Multi-Level Assessment Method for Mid-Atlantic Tidal Wetlands	VIMS-CCRM (2007)
Recommendations for Implementing the Tidal Wetlands Mitigation-Compensation Policy	VIMS-CCRM (2005)
Integrated Shoreline Management and the Wetlands Board (presentation)	VIMS-CCRM (2008)
Enhancement Area Assessments: Wetlands (2006–2010 Coastal Needs Assessment)	VA DEQ-CZM (2005)
Technical Report: Stormwater BMPs in VA's James River Basin: Assessment of Field Conditions and Programs	Center for Watershed Protection (2009)
Development of a Tidal Wetland Inventory Assessment for York River, Virginia Watershed	VIMS-CCRM (2006)
Technical Memorandum: Watershed Planning Needs Survey of Coastal Plain Communities	Center for Watershed Protection (2008)
Virginia Coastal Management Program—Chapter 6.6	VIMS (2008)
VA CZM Coastal Wetlands 309 Assessment	VA DEQ-CZM (2005)

YORK RIVER WATERSHED (continued)	
Commonwealth of Virginia's Wetland Assessment and Monitoring Strategy	VA DEQ (2005)
Financial and Technical Assistance Potential Sources for Voluntary Wetland Restoration Activities in VA	Alliance for the Chesapeake Bay, DEQ (2004)
Local Watershed Management Planning in VA: A Community Water Quality Approach	DEQ-DCR (Web site)
State of Virginia's Coast	VA DEQ (2001)
Summary of Natural Resources/Shoreline Adaptation Strategy Recommendations of the VA Commission on Climate Change	Skip Stiles—VA Commission on Climate Change (2008)
Final Report: A Climate Change Action Plan	Governor's Commission on Climate Change (2008)
Virginia Coastal Zone Map	DEQ-CZMP (Web site)
Draft Tidal Wetlands Guidelines	VIMS-CCRM, NOAA (2008)
Laws of Virginia relating to the marine resources of the Commonwealth of Virginia	VIMS-CCRM (Web site)
The Virginia Wetlands Report (Fall 2006, Vol. 11, Num. 3)	VA DEQ, VIMS (1996)
Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the York River and Lower Coastal Basins	Commonwealth of VA (Chesapeake Bay Program) (2005)
Grant Status Report: On-going Development of Non-tidal Wetland Inventory and Monitoring Strategy for Virginia	Commonwealth of VA (2009)
Virginia Wetlands Summary	VA DEQ (undated)
Final Report: Vulnerability of shallow tidal water habitats in Virginia to climate change	VIMS-CCRM (2009)
VA Code Ch. 13 § 28 (local wetland ordinance development)	Commonwealth of VA (1992)
Watershed Profile: York River Watershed	VA DEQ-DCR (2004) (Web site)
Get the Facts, Wetlands in Virginia	VA DEQ (2008)
No Net Loss—A Pledge Unfulfilled	Wetlands Watch (2006)

Appendix C: Section 404 of the Clean Water Act

Overview: Section 404 of the Clean Water Act establishes a permit program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for associated with development, water resource projects (such as dams and levees that are not part of the construction of federal projects specifically authorized by Congress), infrastructure development (such as highways and airports) and mining projects.

Under a rule promulgated pursuant to Section 404(b)(1) of the Clean Water Act, no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment so long as that alternative does not have other significant adverse environmental consequences or (2) the nation's waters would be significantly degraded. Section 404 permitting ensures that dredge and fill projects only proceed if an applicant first has shown that steps have been taken to avoid impacts to wetlands, streams, and other aquatic resources; that potential impacts have been minimized; and — only after the first two measures have been taken — that compensation is provided for all remaining unavoidable impacts.

Permits: Proposed activities are regulated through a permit review process. An **individual permit** is required for projects with more than minimal adverse effects. Individual permits are reviewed by the Army Corps, which evaluates applications under a public interest review, as well as the environmental criteria set forth in the Section 404(b)(1) Guidelines promulgated by EPA in conjunction with the Army Corps. However, for most discharges that will have only minimal adverse effects, a **general permit** may be suitable. General permits are issued on a nationwide, regional, or state basis for particular categories of activities. The general permit process eliminates individual review and allows certain activities to proceed with little or no delay, provided that the general, regional, and any special conditions for the general permit are met. For example, minor road activities, utility line backfill, and bedding are activities that can be considered for a general permit. For more information, see: http://water.epa.gov/lawsregs/guidance/cwa/dredgdis/ and http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx.

Jurisdiction: Though a number of activities may impact the nation's waters, Section 404 applies to **dredge and fill activities** only (Section 402 of the Clean Water Act regulates point source discharges of pollutants into waters of the United States). Additionally, the Clean Water Act only applies to "**waters of the United States**." EPA and the Army Corps have issued regulatory definitions of "waters of the United States" to include waters that are: traditionally navigable; interstate; could affect interstate commerce if used, degraded, or destroyed; territorial seas; impoundments of jurisdictional waters; tributaries of jurisdictional waters; and wetlands adjacent to jurisdictional waters. The agencies' regulatory definition of "waters of the United States" provides exclusions for waste treatment systems and prior converted cropland. U.S. Supreme Court decisions in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* and *Rapanos v. United States* and subsequent agency guidance have provided further interpretation of which waterbodies are protected by the Clean Water Act. For the most recent guidance on Clean Water Act geographic jurisdiction, see: http://water.epa.gov/lawsregs/guidance/wetlands/CWAwaters.cfm. Lastly, the **regulatory definition of wetlands**, "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions," may exclude some areas which are defined as wetlands for other purposes (e.g., under the Cowardin classification system).

Exemptions: In general, Section 404 of the Clean Water Act requires permits for the discharge of dredged or fill material into waters of the United States, including wetlands. However, certain activities are exempt from permit requirements under Section 404(f). These include dredge and fill activities related to established (ongoing) farming, silviculture, or ranching practices; certain temporary activities; and certain maintenance activities (e.g., of drainage ditches, farm ponds, or stock ponds). The exemptions are limited in their application. For example, a permit must be obtained for an activity whose purpose is to convert an area of the waters of the United States into a use to which it was not previously subject, where the flow or circulation of waters of the United States may be impaired, or the reach of such waters reduced (33 CFR 323.4). Some projects are also required to implement Best Management Practices in order to remain exempt. See http://water.epa.gov/type/wetlands/outreach/fact20.cfm for more information regarding Section 404 exemptions.

Mitigation: Compensatory mitigation involves actions taken to offset unavoidable adverse impacts to wetlands, streams, and other aquatic resources authorized by Section 404 permits and other Department of the Army permits. Compensatory mitigation can be carried out through four methods: the restoration of a previously existing or degraded wetland or other aquatic site, the enhancement of an existing aquatic site's functions, the establishment (i.e., creation) of a new aquatic site, or the preservation of an existing aquatic site. For impacts authorized under Section 404, compensatory mitigation is not considered until after all appropriate and practicable steps have been taken to first avoid and then minimize

adverse impacts to the aquatic ecosystem. For more information, see: http://water.epa.gov/lawsregs/guidance/wetlands/wetlandsmitigation_index.cfm.

Compensatory Mitigation Rule: In 2008, the Army Corps and EPA issued regulations governing compensatory mitigation for activities authorized by permits issued by the Department of the Army (see http://water.epa.gov/lawsregs/guidance/wetlands/upload/2008_04_10_wetlands_wetlands_mitigation_final_rule_4_10_08.pdf). The regulations establish performance standards and criteria for the use of permittee-responsible compensatory mitigation, mitigation banks, and in-lieu programs to improve the quality and success of compensatory mitigation projects for permitted activities. This rule improves the planning, implementation, and management of compensatory mitigation projects by emphasizing a watershed approach in selecting compensatory mitigation project locations, requiring measurable, enforceable ecological performance standards and regular monitoring for all types of compensation, and specifying the components of a complete compensatory mitigation plan, including assurances of long-term protection of compensation sites, financial assurances, and identification of the parties responsible for specific project tasks. Since a mitigation bank must have an approved mitigation plan and other assurance in place before any of its credits can be used to offset impacts, this rule establishes a preference for the use of mitigation bank credits, which reduces some of the risks and uncertainties associated with compensatory mitigation.

Mitigation Bank: Mitigation banking involves off-site compensation activities generally conducted by a third-party mitigation bank sponsor. A mitigation bank is a site, or suite of sites, where aquatic resources (e.g., wetlands, streams, riparian areas) are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for impacts authorized by Department of the Army permits. In general, a mitigation bank sells compensatory mitigation credits to permittees to meet their requirements for compensatory mitigation. The value of these "credits" is determined by quantifying the aquatic resource functions or acres restored or created. The bank sponsor is ultimately responsible for the success of the project.

In-lieu Fee Mitigation: In-lieu fee mitigation involves off-site compensation activities generally conducted by a third party in-lieu fee program sponsor. Through an in-lieu fee program, a governmental or non-profit natural resources management entity collects funds from multiple permittees in order to pool the financial resources necessary to build and maintain the mitigation site or suite of sites. The in-lieu fee sponsor is responsible for the success of the mitigation. In-lieu fee mitigation typically occurs after the permitted impacts.

Permittee-Responsible Mitigation: Permittee-responsible mitigation is the restoration, establishment, enhancement, or preservation of aquatic resources undertaken by a permittee in order to compensate for impacts resulting from a specific project. The permittee performs the mitigation after the permit is issued and is ultimately responsible for implementation and success of the mitigation. Permittee-responsible mitigation may occur at the site of the permitted impacts or at an off-site location within the same watershed.

Roles & Responsibilities:

Federal Agencies: The roles and responsibilities of the federal resource agencies differ in scope. The Army Corps administers the day-to-day aspects of the program, makes individual and general permit decisions, and makes determinations regarding the extent and location of jurisdictional waters of the United States. The Army Corps and EPA jointly develop policy and guidance, such as the environmental criteria used in evaluating permit applications. EPA determines the scope of geographic jurisdiction and applicability of exemptions; approves and oversees state and tribal assumption; reviews and comments on individual permit applications; has authority to prohibit, deny, or restrict the use of any defined area as a disposal site; and can elevate specific cases under Section 404(q). In addition to jointly implementing the Section 404 program, EPA and the Army Corps share Section 404 enforcement authority, which is delineated in a 1989 Memorandum of Agreement. The Army Corps acts as the lead enforcement agency for all violations of Corps-issued permits. The Army Corps also acts as the lead enforcement agency for unpermitted discharge violations that do not meet the criteria for forwarding to EPA. EPA acts as the lead enforcement agency when an unpermitted activity involves repeat violator(s), flagrant violation(s), where EPA requests a class of cases or a particular case, or the Army Corps recommends that an EPA administrative penalty action may be warranted.

The U.S. Fish and Wildlife Service (USFWS) and NOAA's National Marine Fisheries Service evaluate impacts on fish and wildlife of all new federal projects and federally permitted projects, including projects subject to the requirements of Section 404 (pursuant to the Fish and Wildlife Coordination Act), and can elevate specific cases or policy issues pursuant to Section 404(q).

Appendix C: Section 404 of the Clean Water Act

States and Tribes: States and tribes also have a role in Section 404 decisions, through state program general permits, water quality certification, or program assumption. Under Section 401 of the Clean Water Act, a federal agency may not issue a permit or license for an activity that may result in a discharge to waters of the United States until the state or tribe where the discharge would originate has granted or waived Section 401 certification. Pursuant to Section 401, a state or tribe may grant, grant with conditions, deny or waive 401 certification. States and tribes make their decisions to deny, certify, or condition permits or licenses based in part on the proposed project's compliance with EPA-approved water quality standards. Through 401 certifications, states and tribes can limit dredge and fill activities or require additional protective requirements.

State programmatic general permits (SPGPs) may be issued by the Army Corps in coordination with states or tribes to allow a state or tribe to review Section 404 permit applications and verify activities without additional Army Corps review, provided the activities have no more than minimal adverse effects individually and cumulatively. SPGPs are often limited to specific activities, geographic areas, resource types, and/or sizes of impacts and can provide a more streamlined permitting process for these activities.

In addition, the Clean Water Act gives states and tribes the option of assuming administration of the federal Section 404 permit program in certain waters within state or tribal jurisdiction. State/tribal assumed programs must be at least as comprehensive as the federal program.

Furthermore, more than a dozen states have developed their own permit programs, which they operate in coordination with the federal program. In some cases, state programs may protect a greater number of aquatic resources than fall under federal jurisdiction as waters of the United States. States may also have their own wetland mitigation, enforcement, and monitoring programs.

Data & Information:

Public Notice: The Army Corps issues public notices to alert the public to new applications for Section 404 permits. Contained in this notice is a project description including the location, the activity, the estimated impacted acres, and details on the conceptual mitigation plan. Subsequent to the release of a public notice, the Army Corps initiates a comment period, usually lasting about 30 days, where the public can submit written comments or request a public hearing. Public notices are posted on the website of the issuing Army Corps District.

Permits: Permit records can be used to summarize and track wetland losses and gains in an area of interest, and to confirm the compliance of a particular dredge and fill project. For this reason, final Section 404 permit information is stored in a database operated by the Army Corps ("Operation and Maintenance Information Business Link Regulatory Module 2," or ORM2). ORM2 has been in operation since 2007. Some states with permit programs operate similar databases which can supplement federal permit information.

Mitigation: The "Regulatory In-lieu fee and Bank Information Tracking System" (RIBITS) is an online database developed by the Army Corps with support from EPA and USFWS to provide better information on mitigation and conservation banking and in-lieu fee programs across the country. RIBITS allows users to access information on the types and numbers of mitigation and conservation bank and in-lieu fee program sites, associated documents, mitigation credit availability, service areas, as well as information on national and local policies and procedures that affect mitigation and conservation bank and in-lieu fee program development and operation. For access, see: http://geo.usace.army.mil/ribits.

Appendix D: NOAA Coastal Change Analysis Program

The Coastal Change Analysis Program (C-CAP) produces a nationally standardized database of land cover and land change information for the coastal regions of the United States. C-CAP products provide inventories of coastal intertidal areas, wetlands, and adjacent uplands, with the goal of monitoring these habitats by updating the land cover maps every five years.

C-CAP products are developed using multiple dates of Landsat (30-meter resolution) imagery and consist of raster based land cover maps for each date of analysis, as well as a file that highlights what changes have occurred between these dates and where the changes were located. C-CAP land cover is produced through documented, repeatable procedures using standard data sources, and includes extensive field sampling, validation, and standard quality control review procedures. It provides the "coastal expression" of the National Land Cover Database, a contribution to the Earth Cover layer of the National Spatial Data Infrastructure.

C-CAP data sets are not jurisdictional or intended for use in litigation. While efforts have been made to ensure that these data are accurate and reliable within the limits of current technology, NOAA cannot assume liability for any damages or misrepresentations caused by inaccuracies in the data, or as a result of the data to be used on a particular system. NOAA makes no warranty, expressed or implied, nor does the fact of distribution constitute such a warranty.

The intended use is in identifying regional landscape patterns and major functional niches (habitat), and for environmental impact assessment, urban planning, and zoning applications. C-CAP data will not identify individual species. This is a national and regional data set that should be used only as a screening tool for very local or site specific management decisions. Small features and changes should be verified with a higher resolution data source.

C-CAP Wetland Classifications

Wetlands are areas dominated by saturated soils and often standing water. Their vegetation is adapted to withstand long-term immersion and saturated, oxygen-depleted soils. Wetlands are divided into two salinity regimes: palustrine for freshwater wetlands and estuarine for saltwater wetlands; they are further divided into forested, shrub/scrub, and emergent wetlands. Unconsolidated shores are also included as wetlands.

Palustrine forested wetland: Includes all tidal and non-tidal wetlands dominated by woody vegetation at least 5 meters in height, as well as all such wetlands in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation coverage is greater than 20 percent.

Characteristic species: Tupelo *(Nyssa),* cottonwood *(Populus deltoides),* bald cypress *(Taxodium distichum),* American elm *(Ulmus americana),* ash *(Fraxinus),* and tamarack.

Palustrine scrub/shrub wetland: Includes all tidal and non-tidal wetlands dominated by woody vegetation less than 5 meters in height, as well as all such wetlands in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Total vegetation coverage is greater than 20 percent. The species present could be true shrubs, young trees and shrubs, or trees that are small or stunted due to environmental conditions.[1]

Characteristic species: Alders *(Alnus spp.),* willows *(Salix spp.),* buttonbush *(Cephalanthus occidentalis),* red osier dogwood *(Cornus stolonifera),* honeycup *(Zenobia pulverenta),* spirea *(Spiraea douglassii),* bog birch *(Betula pumila),* and young trees such as red maple *(Acer rubrum)* and black spruce *(Picea mariana).*

Palustrine emergent wetland (persistent): Includes all tidal and non-tidal wetlands dominated by persistent emergent vascular plants, emergent mosses, or lichens, as well as all such wetlands in tidal areas in which salinity due to ocean-derived salts is below 0.5 percent. Plants generally remain standing until the next growing season. Total vegetation cover is greater than 80 percent.

Characteristic species: Cattails *(Typha spp.),* sedges *(Carex spp.),* bulrushes *(Scirpus spp.),* rushes *(Juncus spp.),* saw grass *(Cladium jamaicaense),* and reed *(Phragmites australis).*

Estuarine forested wetland: Includes all tidal wetlands dominated by woody vegetation at least 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent. Total vegetation coverage is greater than 20 percent.

Characteristic species: red mangrove *(Rhizophora mangle),* black mangrove *(Avicennia germinans),* and white mangrove *(Languncularia racemosa).*

[1] Reference: Cowardin, L. M., V. Carter, F. C. Golet, and E. T. Laroe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. U. S. Department of the Interior, Fish and Wildlife Service.

Appendix D: NOAA Coastal Change Analysis Program

Estuarine scrub/shrub wetland: Includes all tidal wetlands dominated by woody vegetation less than 5 meters in height, and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent. Total vegetation coverage is greater than 20 percent.

Characteristic species: Sea-myrtle *(Baccharis halimifolia)* and marsh elder *(Iva frutescens).*

Estuarine emergent wetland: Includes all tidal wetlands dominated by erect, rooted, herbaceous hydrophytes (excluding mosses and lichens), and all such wetlands that occur in tidal areas in which salinity due to ocean-derived salts is at least 0.5 percent and that are present for most of the growing season in most years. Perennial plants usually dominate these wetlands. Total vegetation cover is greater than 80 percent.

Characteristic species: Cordgrass *(Spartina spp.),* needlerush *(Juncus roemerianus),* narrow-leaved cattail *(Typha angustifolia),* southern wild rice *(Zizaniopsis miliacea),* common pickleweed *(Salicornia virginica),* sea blite *(Suaeda californica),* and arrow grass *(Triglochin martimum).*

Unconsolidated shore: Unconsolidated material such as silt, sand, or gravel that is subject to inundation and redistribution due to the action of water. Characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves and currents produce a number of landforms representing this class.

Characteristic land cover features: Beaches, bars, and flats.

Barren land: Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits, and other accumulations of earth material. Generally, vegetation accounts for less than 10 percent of total cover.

Characteristic land cover features: Quarries, strip mines, gravel pits, dunes, beaches above the high-water line, sandy areas other than beaches, deserts and arid riverbeds, and exposed rock.

Open water: All areas of open water, generally with less than 25 percent cover of vegetation or soil.

Characteristic land cover features: Lakes, rivers, reservoirs, streams, ponds, and ocean.

Palustrine aquatic bed: Includes tidal and non-tidal wetlands and deepwater habitats in which salinity due to ocean-derived salts is below 0.5 percent and which are dominated by plants that grow and form a continuous cover principally on or at the surface of the water. These include algal mats, detached floating mats, and rooted vascular plant assemblages. Total vegetation cover is greater than 80 percent.

Characteristic vascular species: Pondweed, horned pondweed *(Zannichellia palustris),* ditch grass *(Ruppia),* wild celery, waterweed *(Elodea),* riverweed *(Podostemum ceratophyllum),* water lilies *(Nymphea, Nuphar),* floating-leaf pondweed *(Potamogeton natans),* water shield *(Brasenia schreberi),* and water smartweed *(Polygonum amphibium).*

Floating surface species: Duckweeds *(Lemna, Spirodela),* water lettuce *(Pista stratiotes),* water hyacinth *(Eichhornia crasspies),* water nut *(Trapa natans),* water fern *(Salvinia spp.),* and mosquito ferns *(Azolla).*

Floating below-surface species: Bladderworts *(Utricularia),* coontails *(Ceratophyllum),* and watermeals *(Wolffia).*

Estuarine aquatic bed: Includes tidal wetlands and deepwater habitats in which salinity due to ocean-derived salts is equal to or greater than 0.5 percent and which are dominated by plants that grow and form a continuous cover principally on or at the surface of the water. These include algal mats, kelp beds, and rooted vascular plant assemblages. Total vegetation cover is greater than 80 percent.

Characteristic species: Kelp *(Macrocystis and Laminaria),* rockweeds *(Fucus and Ascophyllum),* red algae *(Laurencia),* green algae *(Halimeda and Penicillus, Caulerpa, Enteromorpha and Ulva),* stonewort *(Chara),* turtle grass *(Thalassia testudinum),* shoal grass *(Halodule wrightii),* manatee grasses *(Cymodocea filiformis),* widgeon grass *(Ruppia maritime),* sea grasses *(Halophila spp.),* and wild celery *(Vallisneria americana).*

Appendix E: Federal Agency Programs That Support Coastal Wetland Protection, Restoration, and Management

AGENCY	PROGRAM	DESCRIPTION
EPA	Clean Water State Revolving Fund (CWSRF)	CWSRF programs fund water quality protection projects for wastewater treatment, non-point source pollution control, and watershed and estuary management via low-interest loans. SRF fundable projects include wetland protection and restoration, as well as creation of constructed wetlands for stormwater or wastewater treatment (which can include adequate capacity to ensure habitat values as well as treatment of effluents). http://water.epa.gov/grants_funding/cwf/cwsrf_index.cfm
EPA	Ecological Research Program	The Ecological Research Program in EPA's Office of Research and Development is studying ecosystem services to gain a better understanding of how to enhance, protect, and restore the services of nature. Scientists are providing the methods, models, and tools needed by policy decision-makers to make clear how our choices affect the type, quality, and magnitude of the services we receive from ecosystems. The primary objective in the wetland research focus area is to document the range and quantity of wetland services and determine how their position on the landscape alters the provision of ecosystem services. http://www.epa.gov/research/npd/ecoresearch-intro.htm
EPA	Five Star Challenge Grants Program	The purpose of the program is to support community-based efforts to restore wetlands, river streams/corridors, and coastal habitat; build diverse partnerships within the community; and foster local stewardship of resources through education, outreach, and training activities. http://www.nfwf.org/fivestar/
EPA	National Estuary Program (NEP)	This program works to restore and maintain the water quality and ecological integrity of estuaries of national significance. EPA provides funding and technical assistance to NEPs to create and implement a Comprehensive Conservation and Management Plan (CCMP) to address problems facing their estuary and surrounding watershed. NEPs involve community members and other key federal, state, and local partners/stakeholders to articulate goals and actions to address the wide range of issues in their CCMP. Key CCMP focus areas include protecting and restoring habitats such as wetlands. There are 28 NEPs along the coasts each guided by a director and staff. http://water.epa.gov/type/oceb/nep/index.cfm
EPA	Nonpoint Source Management Grants (Section 319 Grants)	Nonpoint source management grants support states, territories, and Indian tribes with a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of specific nonpoint source implementation projects, some of which include coastal wetland restoration projects. A state/territory/tribe's Nonpoint Source Management Program serves as the basis for how funds are spent. http://www.epa.gov/owow_keep/NPS/cwact.html

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AGENCY	PROGRAM	DESCRIPTION
EPA	Wetlands Program Development Grants (WPDG)	The Wetlands Program Development Grants give eligible applicants an opportunity to conduct projects that promote the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution. While WPDGs can be used by recipients to build and refine any element of a comprehensive wetland program, priority will be given to funding projects that address the three priority areas identified by EPA: developing a comprehensive monitoring and assessment program; improving the effectiveness of compensatory mitigation; and refining the protection of vulnerable wetlands and aquatic resources. States, tribes, local governments, interstate associations, intertribal consortia, and national nonprofit, non-governmental organizations are eligible to apply. http://water.epa.gov/grants_funding/wetlands/grantguidelines/index.cfm
FHWA	Project Funds	All federal highway projects require mitigation for unavoidable wetland impacts. FHWA mitigation regulations require a net gain of wetland acres for new project impacts as well as retroactive for past project impacts.
FHWA	Surface Transportation Environment and Planning Cooperative Research Program (STEP)	STEP is a federally administered research program authorized in the "Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFETEA-LU). It improves the understanding of the relationship between surface transportation, environment and planning. STEP implements a national research agenda reflecting national priorities based on input and feedback from partners and stakeholders. STEP funds identify, address, and reassess national research priorities for environment, planning and realty, and develop tools to support these areas. STEP environmental emphasis areas include air quality and global climate change; and water/wetlands/vegetation/wildlife habitat/brownfields. http://www.fhwa.dot.gov/hep/step/
FHWA	Transportation Enhancements	Transportation Enhancement (TE) activities offer funding opportunities to help expand transportation choices and enhance the transportation experience through 12 eligible TE activities related to surface transportation, including landscaping and scenic beautification and environmental mitigation. http://www.fhwa.dot.gov/environment/te/
FWS	Coastal Barrier Resources Act (CBRA)/ Coastal Barrier Resources System (CBRS)	CBRA discourages development on 3.1 million acres of coastal barrier and associated aquatic habitat by prohibiting most federal expenditures (e.g., flood insurance, road construction, new channel dredging). These areas are designated on maps adopted by Congress as the John H. Chafee Coastal Barrier Resources System. In addition to providing a level of protection to 3.1 million acres, CBRA is estimated to have saved taxpayers over $1 billion.
FWS	Coastal Program	Voluntary partnership program to protect, restore, and enhance priority coastal habitat that benefits federal trust species on public and private lands. It provides technical and financial assistance through partnerships with federal, state, local governments; tribes; organizations; academic institutions; and private landowners. The program is delivered through a network of field staff in 23 priority coastal watersheds around the country. Assistance instruments are primarily cooperative agreements but grant agreements and wildlife extension agreements are also used. Decisions regarding partnerships are made at the landscape level. Since 1994, the Coastal Program has executed over 2,000 agreements to restore 295,000 acres of coastal habitat and 1,700 stream miles, and protect close to 2 million acres of coastal habitat. http://www.fws.gov/coastal

Appendix E: Federal Agency Programs That Support Coastal Wetland Protection, Restoration, and Management

AGENCY	PROGRAM	DESCRIPTION
FWS	Cooperative Endangered Species Conservation Fund	The Cooperative Endangered Species Conservation Fund (CESCF; Section 6 of the Endangered Species Act) is the component of the FWS Endangered Species program that provides grant funding to states and territories for species and habitat conservation actions on non-federal lands, including habitat acquisition, conservation planning, habitat restoration, status surveys, captive propagation and reintroduction, research, and education. Many of these grants involve coastal areas and wetland habitat. http://www.fws.gov/endangered/grants/grant-programs.html
FWS	Endangered Species Conservation Grants	Provides financial assistance to states and territories to implement conservation projects for listed species and at-risk species. Funded activities include habitat restoration, species status surveys, public education and outreach, captive propagation and reintroduction, nesting surveys, genetic studies, and development of management plans. http://www.fws.gov/endangered/grants/grant-programs.html
FWS	Endangered Species HCP Land Acquisition Grants	Provides funding to states and territories to acquire land associated with approved Habitat Conservation Plans (HCP). Grants do not fund the mitigation required of an HCP permittee; instead, they support conservation actions by the state or local governments that complement mitigation. http://www.fws.gov/endangered/grants/grant-programs.html
FWS	Endangered Species Program	The Endangered Species Program conserves imperiled plant and animal species and the ecosystems upon which they depend, while promoting the voluntary conservation of other vulnerable wildlife and their habitat. The program strives to ensure a strong scientific basis for decisions on threatened and endangered species, facilitate large-scale planning to accommodate land use and wildlife habitat, and promote innovative public/private partnerships. Components of the program include technical assistance, outreach and education, grant assistance, and regulatory actions. Many activities involve efforts to conserve coastal areas and wetlands provide important habitat for threatened or endangered species, species at risk of becoming threatened or endangered. http://www.fws.gov/endangered/
FWS	Endangered Species Recovery Land Acquisition Grants	Provides funds to states and territories for acquisition of habitat for endangered and threatened species in support of draft and approved recovery plans. Acquisition of habitat to secure long-term protection is often an essential element of a comprehensive recovery effort for a listed species. http://www.fws.gov/endangered/grants/grant-programs.html
FWS	Migratory Bird Conservation Fund	Provides the DOI with financing for the acquisition of migratory bird habitat, including wetlands. Decisions regarding purchases of land and water areas by FWS are made by the Migratory Bird Conservation Commission based on recommendations from the Service. The Small Wetland Program allows the proceeds from the sale of Federal Duck Stamps to be used to protect waterfowl habitat in perpetuity through fee-title acquisition or easement. The habitat protected consists of small wetlands, and surrounding grassland habitat in the Prairie Pothole Region. Since its creation 50 years ago, the program has protected nearly 3 million acres of habitat. http://www.fws.gov/duckstamps/Conservation/mbcc.htm

Appendix E: Federal Agency Programs That Support Coastal Wetland Protection, Restoration, and Management

AGENCY	PROGRAM	DESCRIPTION
FWS	National Coastal Wetlands Conservation Grant Program	Authorized by the Coastal Wetlands Planning, Protection, and Restoration Act of 1990. Co-administered by the Coastal Program and the Wildlife and Sport Fish Restoration Program. Annually provides grants of up to $1 million to coastal states, including Great Lakes states, to acquire and restore coastal wetlands. Coastal states are eligible applicants. Program requires cost share of between 50 and 75 percent of the grant request depending on whether the state has an open-space conservation program. Ineligible activities include planning, research, monitoring, and construction or repair of structures for recreational purposes. A national ranking panel made up of FWS biologists recommends a list of projects for funding to the Director. http://www.fws.gov/coastal/CoastalGrants/
FWS	National Fish Passage Program	Voluntary program that provides technical and financial assistance to fish passage barrier removal or bypass projects. The goal of the program is to restore native fishes and other aquatic species to self-sustaining levels by reconnecting habitat that has been fragmented by barriers. Project applications are reviewed and prioritized on a regional basis. Financial assistance is delivered through the regional and local Fish and Wildlife Conservation Offices. The program strives to achieve a 50 percent match overall, including in-kind contributions. Non-federal funds are typically leveraged at a 3:1 ratio. The program uses the National Fish Passage Decision Support System, which catalogues fish passage barriers nationally. Fish passage projects are not eligible for funding if they are eligible for any federal or state compensatory mitigation or if fish passage is a condition provided by existing federal or state regulatory programs. Since 1999, the program has worked with over 700 different partners to remove 749 barriers, and reopen 11,249 miles of river and 80,556 acres to fish passage, benefitting over 85 federal trust fish and other aquatic species. http://www.fws.gov/fisheries/fwco/fishpassage
FWS	National Wetlands Inventory (NWI)	Provides information on the characteristics, extent, and status of U.S. wetlands and deepwater habitats and other wildlife habitats. NWI produces periodic reports on the status and trends of wetlands in the conterminous U.S., which is used for policymaking, assessment, and monitoring. NWI has developed a series of topical maps to show wetlands and deepwater habitats. This geospatial information is used by Congress; federal, state, and local agencies; academic institutions; and the private sector to inform natural resource planning, management, and project development. The NWI website provides a portal to the Wetlands Geodatabase and the Wetlands Mapper, which provide technological tools that allow the integration of large relational databases with spatial information and map-like displays. The Service's wetland data forms a layer of the National Spatial Data Infrastructure. http://www.fws.gov/nwi
FWS	National Wildlife Refuge System (NWRS)	180 of the 552 refuges in the NWRS manage 121 million acres of marine or coastal habitat. Approximately one-quarter of the 150 million-acre NWRS consists of wetlands. The NWRS protects, restores, maintains, and conducts research on these wetlands. The NWRS sustains wetlands to support healthy populations of federal trust species, including threatened and endangered species, migratory birds, interjurisdictional fish, some marine mammals, and many plants. Wetlands in the NWRS provide opportunities for research and outdoor recreational pursuits for the American public. http://www.fws.gov/refuges

Appendix E: Federal Agency Programs That Support Coastal Wetland Protection, Restoration, and Management

AGENCY	PROGRAM	DESCRIPTION
FWS	Natural Resource Damage Assessment and Restoration Program (NRDAR)	The NRDAR program restores wetland acres that have been harmed by the release of contaminants from hazardous waste sites, and oil and chemical spills. Where possible, FWS partners with other federal agencies, other FWS programs, states, tribes, or non-governmental organizations to enlarge these restoration efforts, which enhances the value of the restoration to fish and wildlife. In FY 2009, the NRDAR program was responsible for the restoration and enhancement of over 23,000 wetland acres and for the protection of nearly 41,000 wetland acres. In addition, the program restored or enhanced 186 riparian stream miles and managed or protected 383 riparian stream miles. The Division of Environmental Quality provides approximately $1.5 million in toxicology, ecology, and habitat restoration expertise to EPA and other federal and state partners to minimize impacts to wetlands during the cleanup of contaminated areas. http://www.fws.gov/contaminants/Issues/Restoration.cfm
FWS	North American Waterfowl Management Plan—Joint Ventures	Collaborative, regionally based partnership of U.S. and Canadian agencies, nonprofit organizations, corporations, tribes, or individuals that conserves habitat for priority bird species within a specific geographic area. Designed to achieve the regional conservation goals identified in the North American Waterfowl Management Plan. 18 habitat joint ventures and three species specific joint ventures. Activities include biological planning, conservation design, and prioritization; project development and implementation; monitoring, evaluation, applied research; communications, education, and outreach; funding support for projects. To date, joint ventures have invested $4.5 billion to conserve 15.7 million acres of waterfowl habitat. http://www.fws.gov/birdhabitat/nawmp
FWS	North American Wetlands Conservation Grants (NAWCA)	Supports activities under the North American Waterfowl Management Plan, an international agreement that provides a strategy for the long-term protection of wetlands and associated upland habitats needed by waterfowl and other wetland-associated migratory birds in North America. Provides competitive grants to non-governmental organizations, states, local governments, tribes, and individuals to carry out wetland conservation projects in the United States, Canada, and Mexico for the benefit of wetland-associated migratory birds and other wildlife. Projects must provide long-term protection, restoration, and enhancement of wetlands and associated upland habitats. Mexican partnerships may also develop training, educational, and management programs and conduct sustainable-use studies. Standard grants: From FY 1990 to June 2010, some 3,850 partners in 1,518 projects have received more than $1.03 billion in grants. They have contributed another $2.06 billion in matching funds to affect 25.5 million acres of habitat and $1.14 billion in non-matching funds to affect 230,900 acres of habitat. Small grants: From FY1990 to FY 2009, some 1,160 partners in 455 projects have received more than $22.9 million in grants. They have contributed another $101 million in matching funds to affect 172,600 acres of habitat and $57.4 million in non-matching funds to affect 7,400 acres of habitat. http://www.fws.gov/birdhabitat/Grants/NAWCA

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AGENCY	PROGRAM	DESCRIPTION
FWS	Partners for Fish and Wildlife Program	Voluntary partnership program to restore and enhance priority fish and wildlife habitat on private lands. Provides technical and financial assistance through partnerships with landowners. Delivered through locally based field biologists in each state. Assistance instruments are primarily cooperative agreements. Decisions regarding partnerships are made at the landscape level. Since 1987 the Program has worked with over 42,000 private landowners and restored 975,000 acres of wetlands, 3,000,000 acres of uplands, and 8,700 miles of stream habitat. Statutory authority: Partners for Fish and Wildlife Act of 2006. http://www.fws.gov/partners
NOAA	Coastal and Estuarine Land Conservation Program (CELCP)	CELCP, part of the Coastal Zone Management Program, was established in 2002 to protect coastal and estuarine lands considered important for their ecological, conservation, recreational, historical or aesthetic values. The NOAA Ocean Service program provides state and local governments with matching funds to purchase significant coastal and estuarine lands, or conservation easements on such lands, from willing sellers. Lands or conservation easements acquired with CELCP funds are protected in perpetuity so that they may be enjoyed by future generations. http://coastalmanagement.noaa.gov/land/welcome.html
NOAA	Coastal Zone Management Program	The Coastal Zone Management Program supports state planning and programs to protect coastal resources, including wetlands. The NOAA Ocean Service program is a voluntary partnership between the federal government and U.S. coastal and Great Lakes states that takes a comprehensive approach to coastal resource management by balancing the often competing and occasionally conflicting demands of coastal resources use, economic development, and conservation. http://coastalmanagement.noaa.gov/programs/czm.html
NOAA	Coastal Zone Enhancement Program (CZARA Section 309)	The Coastal Zone Enhancement Program, a part of the NOAA Ocean Service Coastal Zone Management Program, is designed to encourage states and territories to develop program changes in one or more of the nine coastal zone enhancement areas of national significance, including wetlands. Every five years, state coastal management programs conduct self-assessments of their programs' activities within the nine enhancement areas to help target the Section 309 funds toward program needs. http://coastalmanagement.noaa.gov/enhanc.html
NOAA	Coastal Zone Nonpoint Pollution Program (CZARA Section 6217)	The Coastal Zone Nonpoint Pollution Program, a part of the NOAA Ocean Service Coastal Zone Management Program, establishes a set of management measures for states to use in controlling polluted runoff from six main sources, including wetlands and vegetated shorelines. State policies and actions to develop coastal nonpoint pollution control programs ensure implementation of the program at the state level. http://coastalmanagement.noaa.gov/nonpoint/welcome.html
NOAA	Community-based Restoration Program	The Community-based Restoration Program, a part of the NOAA Fisheries Habitat Conservation Program, invests funding and technical expertise in high-priority habitat restoration projects that instill strong conservation values and engage citizens in hands-on activities. Through the program, NOAA, its partners, and thousands of volunteers are actively restoring coastal, marine, and migratory fish habitat across the nation. http://www.habitat.noaa.gov/restoration/programs/crp.html

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AGENCY	PROGRAM	DESCRIPTION
NOAA	Damage Assessment, Remediation, and Restoration Program (DARRP)	The NOAA Ocean Service Damage Assessment, Remediation, and Restoration Program collaborates with other agencies, industry, and citizens to protect and restore coastal and marine resources threatened or injured by oil spills, releases of hazardous substances, and vessel groundings. The program provides permanent expertise within NOAA to assess and restore natural resources injured by release of oil and hazardous substances, as well as by physical impacts such as vessel groundings in National Marine Sanctuaries. http://www.darrp.noaa.gov/
NOAA	Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Act	Marine fish depend on healthy habitats to survive and reproduce. Throughout their lives fish use many types of habitats including seagrass, salt marsh, coral reefs, kelp forests, and rocky intertidal areas among others. Various activities on land and in the water constantly threaten to alter, damage, or destroy these habitats. NOAA Fisheries, regional Fishery Management Councils, and federal and state agencies work together to address these threats by identifying EFH for each federally managed fish species and developing conservation measures to protect and enhance these habitats. http://www.habitat.noaa.gov/protection/efh/index.html
NOAA	Great Lakes Habitat Restoration Program	The Great Lakes Habitat Restoration Program, a part of the NOAA Fisheries Habitat Conservation Program, plans, implements, and funds coastal habitat restoration projects throughout the Great Lakes region. The program works to protect and restore coastal habitats through recovery of damages from natural resource damage claims, which are used to implement community-based restoration efforts. Much of NOAA's work in the region is focused on supporting community-identified restoration priorities in Areas of Concern, environmentally degraded areas within the Great Lakes basin. http://www.habitat.noaa.gov/restoration/programs/greatlakes.html
NOAA	Habitat Conservation Program	The Habitat Conservation Program, composed of the Habitat Protection Division, a Restoration Center, and the Chesapeake Bay Office, protects, restores, and promotes stewardship of coastal and marine habitat to support our nation's fisheries and preserve our coastal communities for future generations. The Program carries out various management and research efforts to develop national and regional policies, programs, and science to conserve wetlands. http://www.habitat.noaa.gov/index.html
NOAA	National Estuarine Research Reserve System (NERRS)	The NERRS is a network of 28 areas representing different biogeographic regions of the United States that are protected for long-term research, water-quality monitoring, education, and coastal stewardship. Established by the Coastal Zone Management Act of 1972, as amended, the reserve system is a partnership program between NOAA and the coastal states. NOAA's Ocean Service provides funding, national guidance, and technical assistance. Each reserve is managed on a daily basis by a lead state agency or university, with input from local partners. Reserve staff work with local communities and regional groups to address natural resource management issues, such as non-point source pollution, habitat restoration and invasive species. Through integrated research and education, the reserves help communities develop strategies to deal successfully with these coastal resource issues. http://www.nerrs.noaa.gov/

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AGENCY	PROGRAM	DESCRIPTION
NOAA	Pacific Coastal Salmon Recovery Fund (PCSRF)	The PCSRF was established by Congress in FY 2000 to protect, restore, and conserve Pacific salmon and steelhead populations and their habitats. Under the PCSRF, NOAA Fisheries manages a program to provide funding to states and tribes of the Pacific Coast region. http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm
Army Corps	Clean Water Act 404 Program	Army Corps manages the nation's wetlands through a regulatory program requiring permits for the discharge of dredged and fill material into jurisdictional water of the United States. This important regulatory program helps maintain the wetland base so other federal programs can achieve gains. EPA shares regulatory responsibility with Army Corps under this program.
Army Corps	Continuing Authorities Program (CAP)	Standing Authorities to study/build water resource projects for specific purposes and with specified federal spending limits and cost share requirement. CAP project funding varies by program and purpose. There are 10 commonly referenced nationwide programs. Three of these specifically involve ecosystem improvement: the 206 Program is for aquatic ecosystem restoration, the 1135 Program is for project modifications for improvement of the environment, and the 204 Program is for beneficial uses of dredged material. There are also several geographically restricted Regional Programs that relate to environmental infrastructure projects.
Army Corps	Engineer Research and Development Center (ERDC)	The Wetlands Research and Technology Center (WRTC) consolidates administrative, technological, and research skills in the area of wetland science and engineering that are available at the ERDC. The ERDC has long been recognized as a center for wetland expertise, conducting extensive environmental research in wetland systems. The WRTC provides a single point of contact for wetland research and development, guidance, support, and technology transfer. The WRTC provides access to an array of technical specialists and interdisciplinary teams in research areas that emphasize the interrelationships of biological, physical, and chemical environments in order to provide fundamental understanding of ecological processes and dynamics in wetland ecosystems. The WRTC serves the U.S. Army Corps of Engineers, other Department of Defense agencies, other government agencies, academia, industry and the general public. http://el.erdc.usace.army.mil/wetlands/wetlands.html#wrtc
Army Corps	General Investigations	Studies for project authorization that are undertaken in response to either a study-specific authority or a general authority; these are typically larger, complex projects. The reconnaissance phase is 100 percent federally funded, the feasibility phase is cost-shared 50/50, the preconstruction engineering and design phase is cost-shared 75/25, and the construction/implementation for Ecosystem Restoration Projects is cost-shared 65/35. The maximum cost limit per project is set for each phase. Major projects include the Florida Everglades Restoration, the Upper Mississippi River Restoration, the Louisiana Coastal Area project, the Missouri River Recovery, and the Lower Columbia River and Tillamook Bay Ecosystem Restoration.

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AGENCY	PROGRAM	DESCRIPTION
USDA FSA	Conservation Reserve Program (CRP)	CRP provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program is funded through the Commodity Credit Corporation. CRP is administered by the Farm Service Agency (FSA), with NRCS providing technical land eligibility determinations, conservation planning and practice implementation. CRP reduces soil erosion, protects the nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices. http://www.nrcs.usda.gov/programs/crp/
USDA NRCS	Conservation Technical Assistance Program (CTA)	Through conservation technical assistance, NRCS and its partners help land users address opportunities, concerns, and problems related to the use of natural resources and make sound natural resource management decisions on private, tribal, and other non-federal lands. This assistance may be in the form of resource assessment, practice design, resource monitoring, or follow-up of installed practices. Although the CTA program does not include financial or cost-share assistance, clients may develop conservation plans, which may serve as a springboard for those interested in participating in USDA financial assistance programs. CTA planning can also serve as a door to financial assistance and easement conservation programs provided by other federal, state, and local programs. http://www.nrcs.usda.gov/programs/cta/
USDA NRCS	Emergency Watershed Protection Program (EWP)	The purpose of the Emergency Watershed Protection (EWP) program is to undertake emergency measures, including the purchase of flood plain easements for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood, or any other natural occurrence is causing or has caused a sudden impairment of the watershed. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/ewp
USDA NRCS	Environmental Quality Incentives Program (EQIP)	EQIP provides a voluntary conservation program for farmers, ranchers, and owners of private, non-industrial forest land that promotes agricultural production, forest management, and environmental quality as compatible national goals. EQIP offers financial and technical assistance to help eligible producers install or implement conservation practices on eligible agricultural land. EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practice(s) and a maximum term of 10 years. Owners of land in agricultural production or persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. Program practices and activities are carried out according to a plan of operations, developed in conjunction with the producer, that identifies the appropriate conservation practice or measures needed to address identified natural resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. EQIP may provide payments up to 75 percent of the estimated incurred costs and income foregone of certain conservation practices and conservation activity plans. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip

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AGENCY	PROGRAM	DESCRIPTION
USDA NRCS	Farm and Ranchlands Protection Program (FRPP)	FRPP provides matching funds to help purchase development rights to keep productive farm and ranchland in agricultural uses. Working through existing programs, USDA partners with state, tribal, or local governments and non-governmental organizations to acquire conservation easements or other interests in land from landowners. USDA provides up to 50 percent of the fair market easement value of the conservation easement. To qualify, farmland must be part of a pending offer from a state, tribe, or local farmland protection program; be privately owned; have a conservation plan for highly erodible land; be large enough to sustain agricultural production; be accessible to markets for what the land produces; have adequate infrastructure and agricultural support services; and have surrounding parcels of land that can support long-term agricultural production. Depending on funding availability, proposals must be submitted by the eligible entities to the appropriate NRCS State Office during the application window. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/farmranch
USDA NRCS	Grasslands Reserve Program (GRP)	GRP is a voluntary conservation program that emphasizes support for working grazing operations, enhancement of plant and animal biodiversity, and protection of grassland under threat of conversion to other uses. Participants voluntarily limit future development and cropping uses of the land while retaining the right to conduct common grazing practices and operations related to the production of forage and seeding, subject to certain restrictions during nesting seasons of bird species that are in significant decline or are protected under federal or state law. A grazing management plan is required for participants. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/grassland
USDA NRCS	Swampbuster	The Highly Erodible Land Conservation and Wetland Conservation Compliance provisions (Swampbuster) were introduced in the 1985 Farm Bill, with amendments in 1990, 1996, and 2002. The purpose of the provisions is to remove certain incentives to produce agricultural commodities on converted wetlands or highly erodible land, unless the highly erodible land is protected from excessive soil erosion. It withholds federal farm program benefits from any person who converts a wetland by clearing, drainage, dredging, leveling, or any other means for the purpose of making agricultural commodity production possible, or who plants a commodity on a converted wetland. http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/alphabetical/camr/?&cid=stelprdb1043554
USDA NRCS	Wetlands Reserve Enhancement Program (WREP)	WREP is a voluntary conservation program which is a component of WRP. Under WREP, NRCS enters into agreements with eligible partners (states and local units of government, Indian tribes, and non-governmental organizations) to help enhance conservation outcomes on wetlands and adjacent lands. WREP targets and leverages resources to carry out high-priority wetland protection, restoration, and enhancement activities and improve wildlife habitat. Once NRCS selects a partner's proposal, landowners within the selected project area may submit an application directly to NRCS for participation in WRP. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands

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AGENCY	PROGRAM	DESCRIPTION
USDA NRCS	Wetlands Reserve Program (WRP)	This voluntary program restores and protects wetlands on private lands to cost-effectively maximize wildlife benefits and wetland functions and values that have been degraded or impacted as a result of the production of food and fiber. Since 1992, WRP has restored approximately 2.2 million acres on 11,758 properties. WRP enrollment options include permanent easement, 30-year easement, restoration agreement, 30-year contract on tribal lands, and reserve grazing rights pilot. The perpetual easement option pays landowners 100 percent of the WRP easement value and 100 percent of the costs to restore the wetlands and associated habitats on the land. The 30-year easement and 30-year contracts options provide 75 percent of the easement values and restoration costs. The restoration agreement only option provides 75 percent of the restoration costs and requires the restored habitat to be maintained for a period of 10 years. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands
USDA NRCS	Wildlife Habitat Incentives Program (WHIP)	WHIP is a voluntary program for conservation-minded landowners who want to develop and improve wildlife habitat on agricultural land, nonindustrial private forest land, and Indian land. NRCS administers WHIP to provide both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP cost-share agreements between NRCS and the participant generally last from one year after the last conservation practice is implemented but not more than 10 years from the date the agreement is signed. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/whip
USGS	National Wetlands Research Center	The National Wetlands Research Center is a source and clearinghouse of science information about wetlands in the United States and the world for fellow agencies, private entities, academia, and the public at large. Staff members obtain and provide this information by performing original scientific research and developing research results into literature and technological tools. They then disseminate that information through a variety of means. The Center solves wetland-related problems and conducts status and trends inventories of wetland habitats, evaluates wetland problems, and conducts field and laboratory research on wetland issues. Center research includes a broad array of projects on wetland ecology, values, management, restoration and creation, plus research on the ecology of a wide variety of plant and animal species and communities that are found in wetlands. http://www.nwrc.usgs.gov/
USGS	Other scientific research	USGS also conducts scientific studies on other areas related to wetland health, including carbon sequestration, long shore transport processes, water level fluctuations, climate change, and sea level rise. http://www.usgs.gov/

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AGENCY	PROGRAM	DESCRIPTION
EPA/ FWS/ NOAA/ USDA/ Army Corps	Coastal Wetlands Planning, Protection and Restoration Act (CWP PRA)	CWPPRA is funded by the Aquatic Resources Trust Fund, which was established in 1990 and is authorized until 2019. The fund is created from excise taxes on fishing equipment and on motorboat and small engine fuels. The Louisiana Coastal Wetlands Conservation and Restoration Task Force receives 70 percent of the funds; the North American Wetlands Conservation Act Program and the National Wetlands Conservation Grant Program receive 15 percent each. Funding distributed to the Louisiana Coastal Wetlands Conservation and Restoration Task Force is used to design and construct projects to preserve, re-establish, and enhance Louisiana's coastal landscape. http://www.lacoast.gov/new/About/Default.aspx http://www.fws.gov/birdhabitat/Grants/NAWCA/index.shtm http://www.fws.gov/coastal/coastalgrants/
EPA/ FWS/ NOAA/ USDA/ Army Corps	Estuary Restoration Act (ERA)	The purpose of ERA is to promote the restoration of estuary habitat; to provide federal assistance for estuary habitat restoration projects; to develop a national Estuary Habitat Restoration Strategy for creating and maintaining effective partnerships within the federal government and with the private sector; and to develop and enhance monitoring, data sharing, and research capabilities. Under ERA, NOAA developed and maintains a restoration project database, the National Estuaries Restoration Inventory, and established standards for restoration monitoring. http://www.era.noaa.gov/