Coastal Wetlands Initiative: North Atlantic Review

United States Environmental Protection Agency
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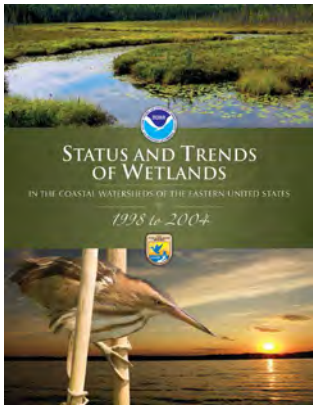
National Picture

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, 2010).

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

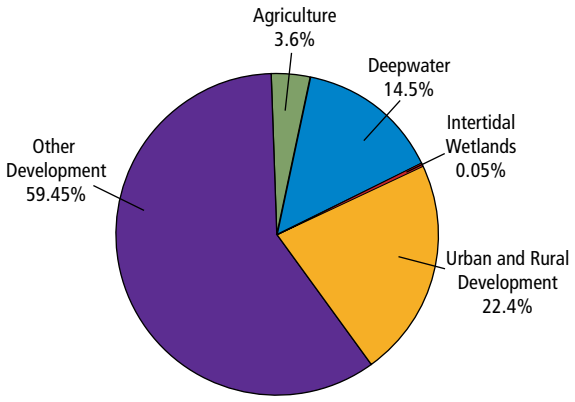


Figure 1. Wetland loss and changes in land cover, 1998-2004: Atlantic, Gulf of Mexico, and Great Lakes. *Source: Stedman and Dahl, 2008.*

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.

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 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 North 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 onsite discussions, and providing input on the reports.

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 and 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

* 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.

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:

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 subset 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., the 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

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.

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 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 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

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?**

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 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 was 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 North Atlantic review are summarized below, and are also presented in Table 1 and the "Conclusion" section of this report.

- Major stressors:
  - Continued development pressure.
  - Hydrologic alterations, most notably tidal restrictions.
  - Cranberry bog activities.
  - Other wetland losses occurring outside the regulatory system (e.g., exemptions, illegal activity).
  - Lack of adequate monitoring and enforcement of wetland mitigation requirements.
- Major tools and strategies:
  - Massachusetts' Wetlands Loss Mapping Project, which is effective at assessing, enforcing, and deterring losses that occur outside the regulatory programs. Approximately two-thirds less wetland loss has occurred since the project began.
  - The Conservation Assessment and Prioritization System (CAPS) and site-level assessment method (SLAM) models, which are effective tools for evaluating the ecological function and value of wetlands. The combination of area and functional loss tools will provide the ability to comprehensively assess wetland status and trends.
  - Removing dams and tidal restrictions—a key strategy for restoring coastal wetlands. Massachusetts' Dam Removal Guidance could be a model for other states.
  - State regulations that are stronger than federal wetland regulations, and local wetland bylaws that are more stringent than state wetland regulations; both are key to effective wetland protection in Massachusetts.
- Major gaps:
  - Additional training of conservation commissioners to ensure that state regulations and local bylaws are understood and properly enforced.

» A complete and centralized repository of wetland maps and permitting data.

» Development of additional site-level assessment methods for wetland community types currently not assessed.

» Streamlining restoration permitting for tidal restriction removal projects.

North Atlantic Review

From the rugged bluffs of the Maine coastline to the vast expanses of salt marshes in Massachusetts, the North Atlantic region (Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, and New York) is home to a sinuous network of estuaries, embayments, and salt ponds. The region's 8,700 miles of coastline are home to a wide variety of coastal wetland habitats due in part to its tidal range. South of Cape Cod, tides fluctuate only a few feet, but tidal range increases dramatically toward the Maine/Canada border. For example, in Narragansett Bay, Rhode Island, tides range only 3.5 feet, whereas in Passamaquoddy Bay, Maine, tides range up to 28 feet. Tides have significant impacts on the coastline, helping form vast mud flats, salt marshes, and sand bars. Common wetland types across the North Atlantic shoreline include salt marshes, forested and shrub/scrub swamps, bogs, and wet meadows. Freshwater wooded swamps, including red maple, hemlock, northern cedar and Atlantic white cedar, are the most common type of wetland in this region (EPA, n.d.).

Most salt marshes in the North Atlantic region can be found along the shorelines of Maine and Massachusetts. Maine contains the most wetlands of any state in the Northeast; one-quarter of Maine's land area is wetland. There are over 5 million acres of freshwater wetlands and approximately 150,000 acres of tidal wetlands along Maine's coast (Maine DEP, 1996; ELI, 2008). New Hampshire has the region's shortest coastline, which contains approximately 8,000 acres of estuarine wetlands, less than 3 percent of all wetlands statewide (Tiner, 2007). Coastal wetlands in the North Atlantic region provide productive nurseries for commercial and recreational finfish; a variety of shellfish, including soft shell clams, mussels, quahogs, scallops, and oysters; and abundant populations of anadromous fish, including alewife, herring, smelt, brook trout, and sturgeon. They also provide important habitat for breeding, migratory, and wintering waterfowl, and vital habitat for nationally threatened and endangered species, including the northern red-bellied cooter, roseate tern, piping plover, and bog turtle.

For hundreds of years, people in the North Atlantic region have relied on marsh-dependent fish species for their livelihood. For example, Narragansett Bay is home to more than 60 species of fish and shellfish and produces an average of 1.5 million pounds of quahogs each year (1994–2004), with a landed value of $7.5 million (EPA, 2008). Additionally, more than 200 species of birds depend on the bay's habitats (ANEP, 2001). One of the region's largest estuaries with an area of 1,320 square miles, Long Island Sound is home to over 200 finfish species and 50 species that spawn in the estuary (Long Island Sound Study, 2011). The activities that take place on and along the Sound—boating, fishing, tourism, and swimming—contribute an estimated $5.5 billion per year to the regional economy (CTDEP, 2011). In Massachusetts, the estuarine-dependent winter flounder commercial fishery was valued at over $7.25 million the last three years, more than all other commercial winter flounder landings across the Atlantic combined (NMFS, 2011). The North Atlantic has a lower density of wetlands than other parts of the United States, such as the southeastern and Gulf of Mexico regions. However, two North Atlantic watersheds have a high density of wetlands: the Piscataqua River/Great Bay estuary and the Lower Penobscot watershed in Maine (see Figure 4).

Figure 3. Rocky coast at Bass Harbor Head Light, Acadia National Park, Maine. *Source: IAN Image and Video Library.*

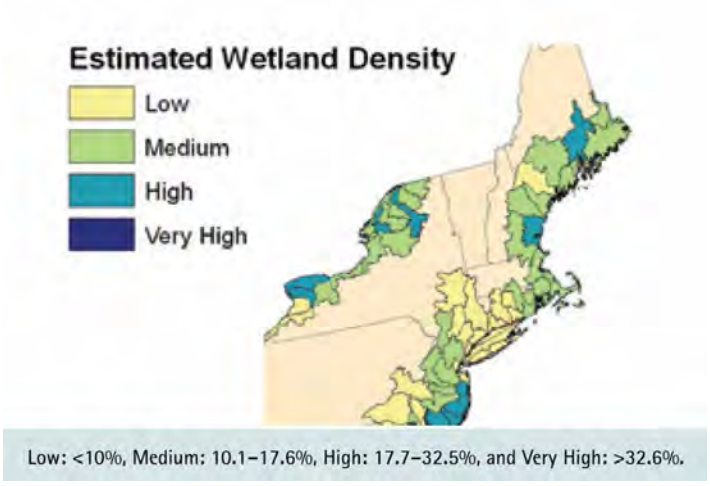


Figure 4. North Atlantic estimated coastal wetland density. *Source: Stedman and Dahl, 2008.*

North Atlantic Coastal Wetland Stressors

The impact of human development and agriculture and the subsequent acreage loss of coastal wetlands to upland due to drainage and fill over the last 400 years has been, and continues to be, the greatest contributor to coastal wetland losses in the North Atlantic region.

Historically, an overwhelming percentage of salt marshes throughout the northeastern United States were ditched for mosquito control purposes, and to a lesser extent for salt hay farming (Tyrrell, 2005; Taylor, 2008). Peat was historically excavated as a source of fuel, and later vast areas of salt marsh were filled for seaport development. For example, between 1630 and 1890, the city of Boston more than doubled its land area by filling over 1,000 acres (80 percent) of its salt marshes (Seasholes, 2003). Other historical stressors on wetlands in coastal watersheds include filling for agriculture and forestry uses. Except for cranberry bogs, which remain concentrated in southeastern Massachusetts, conversion from wetland to agricultural and forestry land uses has largely been replaced by residential and commercial development conversions.

The North Atlantic region is the most densely populated area in the nation. According to the U.S. Census (2000), Rhode Island, Connecticut, and Massachusetts are ranked second, third, and fourth for population density in the United States, respectively. More than 8 million people live in the Long Island Sound watershed alone. The North Atlantic region continues to experience annual coastal wetland losses despite strong regulatory and non-regulatory wetland protection efforts. Although wetland laws and regulations have significantly slowed wetland loss, EPA Region 1 recently estimated that approximately 250 acres of wetlands are lost or altered each year in each of the New England states for a total of 1,500 acres lost per year (EPA, 2002).

Numerous stressors contribute to coastal wetland loss in North Atlantic states. Some of the most common stressors mentioned in the literature are listed below:

- Development, including residential, commercial, infrastructure (roads, sewers, pipelines), and sand and gravel operations.
- Agriculture (alteration for agricultural use, nutrient runoff).
- Hydrologic alterations including dams, tidal restrictions (e.g., culverts), water withdrawals, and dredging.
- Invasive vegetation.
- Point and non-point pollution including sewage and stormwater runoff.
- Climate change (sea level rise, increased storm frequency and intensity).

In addition to data available in studies, data from NOAA's C-CAP were used to estimate acreage losses of coastal wetlands for the North Atlantic region from 1996 to 2006 (see Appendix D for more information on 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 852 acres were lost in the region during the 10-year period, for an annual average loss of approximately 96 acres. The causes of the wetland losses were essentially split among four categories: agriculture, development, conversion to open water, and conversion to upland for unknown purposes (bare land) (Figure 5). Army Corps' permitting data available for the New England states from 2006 through 2009 indicates that a total of 399 acres of wetland impacts (379 acres non-tidal and 20 acres tidal) were authorized, an approximately 100 acre annual average loss. Differences in loss rates between C-CAP and Army Corps permit data are expected because 1) they cover different time periods, 2) Army Corps permits only cover wetlands protected by the CWA (see Appendix C for information on CWA jurisdiction), and 3) C-CAP identifies both authorized and unauthorized wetland impacts.

Sprawling development patterns are an increasing concern in the region (Figure 6). This type of development requires the expansion of infrastructure and impervious surfaces, often resulting in increased stormwater runoff, incremental filling

of wetlands, and fragmentation of wetland habitat. A study conducted in 2002 showed a dramatic increase in the amount of land consumed per person between 1982 and 1997 (Wallace, 2002). Massachusetts was found to be developing land at 7.2 times the rate of population growth, the highest ratio in New England. In a region with a relatively stable population, the patterns of development are as important to coastal wetlands as raw population numbers, if not more important (Wallace, 2002).

In addition to wetland losses caused by direct alterations such as filling, hydrologic modifications have contributed to wetland acreage loss and habitat alteration. Hydrologic alterations include dams, culverts, channelization, and dredging. While the vast majority of dams were constructed long ago in this region, they continue to have impacts on coastal wetlands. (CTDEP, 2010; Maine DEP, 2005; NHCP, 2002; NYDEC, 2010). For example, 5,400 large dams have been built in Massachusetts, Rhode Island, Connecticut, New York, and New Jersey as well as thousands of low head dams and water control structures that currently restrict flow and prevent fish migration (USFWS, 2009).

Sea level rise is also a concern in the region—especially loss of salt marsh acreage, an issue of particular concern in Maine, which contains more salt marsh (19,500 acres) than any other North Atlantic state (Jacobson et al., 1987). Mean sea level rise trends range from 0.6 feet per 100 years in Portland, Maine, to 0.91 feet per 100 years in Montauk, New York, and have been steadily increasing over the last 60 years (NOAA, 2011b).

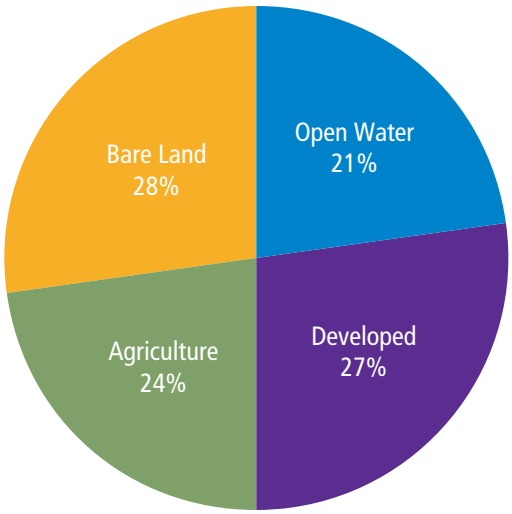


Figure 5. Wetland loss and changes in land cover, 1996-2006: North Atlantic region. *Source: NOAA C-CAP, 2011a.*

North Atlantic Tools and Strategies

The North Atlantic states manage the above stressors on coastal wetlands using a range of tools and strategies. Regulatory programs in the region are the primary wetland protection strategy, and include local and state wetland permitting programs, which typically exceed federal permitting requirements and include mapping, mitigation, compliance monitoring, and enforcement. Wetland assessment techniques are under development in the region through the New England Biological Assessment of Wetlands Workgroup. This group, which coordinates with the national Biological Assessment of Wetlands Workgroup, is composed of state and federal wetland managers and scientists. In addition, coastal restoration programs are actively underway in all North Atlantic states.

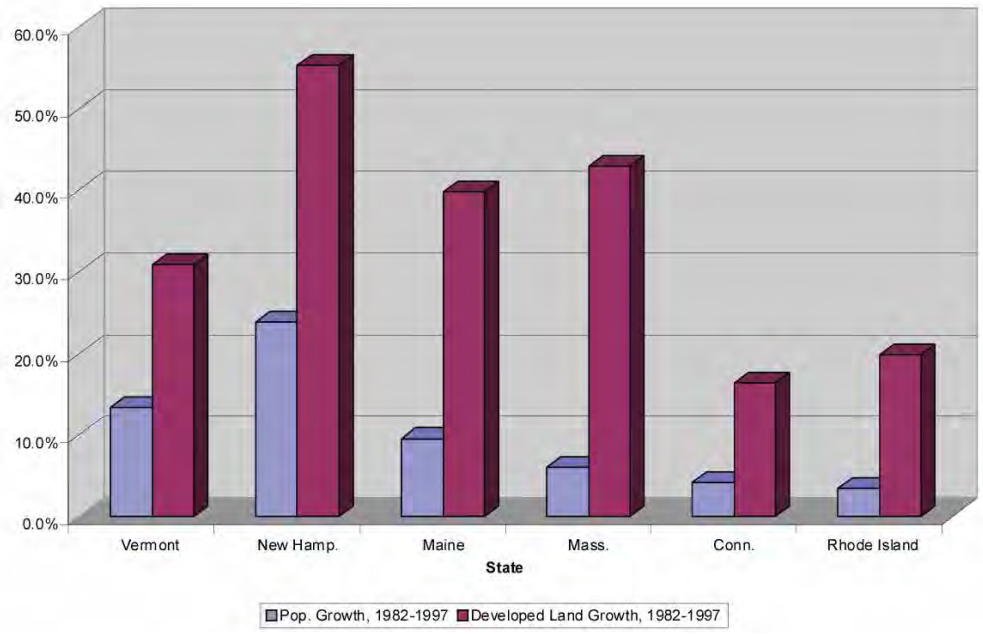


Figure 6. Change in rate of population and developed land in New England (1982-1997). *Source: Wallace, 2002.*

The North Atlantic region in general, and Massachusetts in particular, were leaders in wetland protection in the United States. With the passage of the Jones Act in 1963, Massachusetts became the first state in the nation to regulate activities in coastal wetlands; two years later legislation extended protection to inland wetlands. In 1972, these laws were combined into the Massachusetts Wetlands Protection Act (Massachusetts General Laws, Chapter 131, Section 40) and broadened to protect additional resource areas, including 100-year floodplains, isolated wetlands, beaches, dunes, and banks. Other states followed suit. Today, all of the North Atlantic states have state wetland protection laws and regulations protecting tidal as well as non-tidal coastal and inland wetlands. They also play a role in the CWA Section 404 program under the purview of State Programmatic

General Permits issued by the Army Corps (See Appendix C). Maine, Massachusetts, New Hampshire, and Rhode Island all have state-level "no net loss of wetlands" policies or regulatory provisions in place (ELI, 2008; ASWM, 2009). Mitigation banking in this region is limited. Most states focus on primarily mitigating losses on site (ELI, 2008). However, the Maine Department of Transportation is operating under an umbrella wetland mitigation banking program and Maine, New Hampshire, and Vermont have active in-lieu-fee (ILF) mitigation programs. In addition, in 2008, the Massachusetts Department of Fish and Game signed an agreement with the Army Corps for a limited ILF program focusing on essential fish habitat.

The region's states have a legislative history of granting local governments their own regulatory authority or "home rule." In 1957, Massachusetts passed the first law in the country allowing the establishment of community-based conservation commissions to protect local natural resources, including wetlands (Massachusetts General Laws, Chapter 40, Section 8c). Other states in the Northeast adopted similar enabling legislation shortly thereafter. Home rule can be tailored to the needs of an individual community and often includes wetland protection requirements that are stronger than state and federal wetland laws. Thus, many communities in North Atlantic states have adopted wetland bylaws to provide extra protection for their wetland resources. Massachusetts, Connecticut, New Hampshire, and Rhode Island have enabled municipal conservation commissions to protect natural resources to varying degrees (ELI, 2008). In Massachusetts, local conservation commissions are primarily responsible for implementation of state wetland regulations. The conservation commissions review projects and issue wetland permits for both freshwater and tidal wetlands (ELI, 2008), and 195 communities (out of 351) have adopted local wetland bylaws that are typically more stringent than state regulations (MACC, 2006). In Connecticut, municipal inland wetland commissions serve this role for non-tidal wetlands (Connecticut General Statutes, Chapter 440) while the state Department of Environmental Protection implements the tidal wetland permit program (CTDEP, 2009).

Figure 7. Watersheds of National Estuaries Programs in the North Atlantic region. *Source: U.S. EPA, National Estuaries Program.*

The North Atlantic region hosts numerous federal, regional, and state agency programs that protect, restore, and conserve coastal wetlands. This includes eight NEPs (Figure 7), five National Estuary Research Reserve System sites, and interstate agencies like the New England Interstate Water Pollution Control Commission (which includes all six New England states plus New York). This region is also home to numerous watershed organizations and the Association of State Wetland Managers, which provides information and assistance to state wetland program managers nationwide.

Restoration efforts in Northeast states have focused on salt marsh and dune restoration and on the removal or renovation of hydrologic modifications such as dams and culverts. In New Hampshire, the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), along with various private and nonprofit groups, restored 35 salt marshes in 12 years for a total of 700 acres, primarily through the removal of tidal restrictions (NHCP, 2002). The Connecticut DEP (CTDEP) has completed more than 70 tidal projects, which have restored 1,700 acres of tidal wetlands (CTDEP, 2010). The Gulf of Maine Coastal Program (2011) established by USFWS, restores and improves the biological productivity of salt marshes. In the last decade, they have carried out 75 projects and restored 2,560 acres of coastal wetlands. In December 2010, with the completion of a salt marsh restoration project in the town of Brewster on Cape Cod, Massachusetts celebrated 1,000 acres of wetland restoration projects across the state. The Massachusetts Department of Fish and Game's Division of Ecological Restoration (DER) has overseen more than 62 restoration projects since 1998.

The Wetlands Reserve Program (administered by NRCS) is actively involved in protecting wetlands in the North Atlantic region. It is a voluntary program that offers landowners the opportunity to protect, restore, and enhance wetlands on their property with technical and financial support from NRCS. NRCS seeks to achieve the greatest wetland functions and values, along with optimum wildlife habitat, through easements and

restoration projects (NRCS, 2011).

The small geographic area of the North Atlantic region has afforded it the opportunity to effectively incorporate aerial imagery into state regulatory programs. Wetland mapping based on high-resolution aerial imagery has been critical to successful enforcement in Massachusetts in particular. Wetland inventory efforts have also occurred in New York (NYDEC, 2010). In Rhode Island, the Army Corps used aerial photos and geographic information systems (GIS) to assess degraded or filled coastal wetlands between 1999 and 2008. As part of the project, over 13,000 acres of wetlands were mapped (Army Corps, 2008). GIS databases are used in several other North Atlantic states to track permitting and wetland impacts (NOAA, 2006).

In summary, tools and strategies identified by the Coastal Wetlands Team for the North Atlantic Region include:

- Strong state and local regulations.
- Use of aerial imagery to produce wetland maps for monitoring wetland acreage loss and compliance with wetland laws.
- Local wetland protection.
- Wetland restoration, including removal or renovations of tidal restrictions and dams.
- Partnerships (e.g., watershed associations, New England Biological Assessment of Wetlands Workgroup, the Corporate Wetlands Restoration Partnership, NEPs, NRCS' Wetlands Reserve Program).

North Atlantic Gaps and Needs

In addition to identifying coastal wetland stressors and the tools and strategies to address them in the North Atlantic region, the Coastal Wetlands Team gathered baseline information related to needs and gaps. In general, there appeared to be a need for:

- High-resolution aerial imagery coverage for entire region that can be used to produce wetland maps.
- Tools and strategies to help states adapt to wetlands threats from climate change impacts.
- Increase in resources (staffing and funding at both the state and local levels) to administer regulatory programs, conduct monitoring and assessment, ensure accurate wetland mapping, and conduct effective outreach programs to homeowners, real estate agents, developers, conservation commissions, etc.
- A comprehensive wetland permitting, mitigation, and restoration database, with a GIS interface, to enable permitted wetland acreage losses to be compared to aerial imagery.
- Local conservation commission training, standardization of procedures, record-keeping, and other local capacity-building to more effectively conserve coastal wetlands at the local level.

Focal Watershed Review: Cape Cod Watershed

Introduction

Compared to the other regions surveyed in the 2008 Status and Trends report, the North Atlantic region experienced the least amount of wetland loss from 1998 to 2004 (T. Dahl, personal communication, 2010). Nonetheless, losses continue to occur as the result of a variety of stressors as discussed above. The Cape Cod watershed (Figure 8), located in southeastern Massachusetts (HUC 01090002), was selected for the North Atlantic focal watershed review by the Interagency Coastal Wetlands Workgroup for several reasons. First, it appeared that effective tools and strategies were being employed to address wetland loss, including collection and organization of up-to-date wetland acreage loss maps developed by Massachusetts Department of Environmental Protection (MassDEP). Secondly, compared to the rest of the state, this watershed has a high percentage of wetlands and a relatively high rate of wetland loss. Lastly, there are two National Estuary Programs, Massachusetts Bays (MassBays NEP) and Buzzards Bay (BBNEP) in this watershed, as well as several active watershed groups with broad-based memberships that are engaged in a number of projects and programs to protect coastal wetlands.

The focal review watershed (Figure 8) includes the Elizabeth Islands, the islands of Nantucket and Martha's Vineyard, and the entire Cape Cod peninsula. The watershed drains into Buzzards Bay, Cape Cod Bay, Nantucket Sound, and Martha's Vineyard Sound. The area contains a variety of habitats, including pine barrens, bogs, wet meadows, wooded/shrub swamps, salt marshes, sand beaches, and coastal dunes. It is a dynamic landscape that has been altered over the years by erosion and accretion associated with wind, waves, and storm events. The area continues to experience population growth; the Cape Cod peninsula and nearby islands led the state in housing development between 2000 and 2005. Barnstable County, which encompasses the entire Cape Cod peninsula, was ranked the highest in population growth out of all Massachusetts counties from 1930 to 1980 (Cape Cod Commission, 2008). The unique natural surroundings continue to make the watershed a popular location to live, work, visit, and retire.

Coastal wetlands of the watershed support numerous fish species (e.g., river herring, smelt, shad, trout), which were formerly important components of commercial and sustenance fishing in Massachusetts. Several of these species have faced declining populations due to loss of habitat and/or migration obstacles such as dams (MassBays NEP, 2010). Additionally, several of the top commercial fishing landings

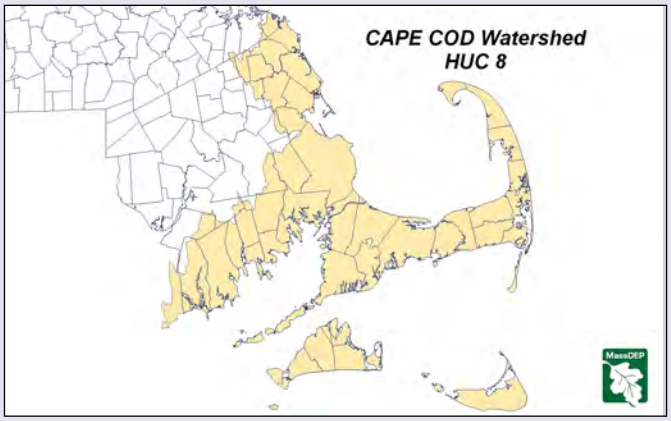


Figure 8. The Cape Cod HUC 8 watershed displayed with town boundaries. *Source: MassDEP, 2010.*

Figure 9. A piping plover next to a sign forbidding beachgoers from driving offroad vehicles near the plover's nesting grounds. *Courtesy Scott Hecker, Massachusetts Audubon Society.*

in value are species that spend some portion of their life cycle in estuaries (e.g., flounder, herring, haddock, clam) (NMFS, 2011). Beyond supporting fisheries, the coastal wetlands of southeastern Massachusetts are home to several federally protected endangered and threatened species, including the roseate tern and piping plover, state-protected species such as the diamondback terrapin, and 19 species of native orchids (MA Department of Fish and Game, 2008).

Focal Watershed Review: Cape Cod Watershed (continued)

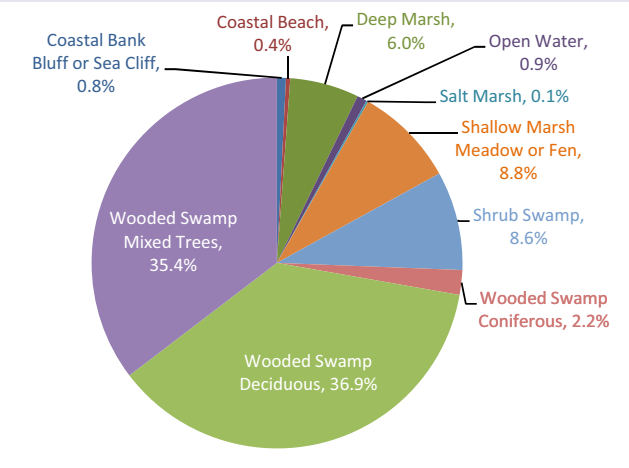


Figure 10. Wetland loss by wetland type, 2005–2009; total loss of 28.87 acres. *Data source: MassDEP, 2010.*

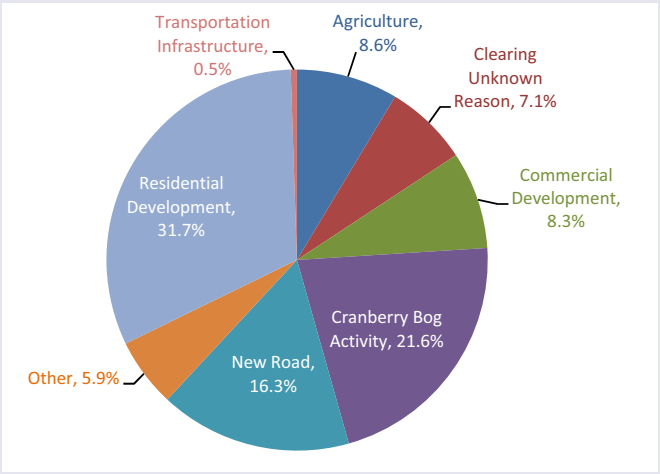


Figure 11. Wetland loss by change type, 2005–2009. *Data source: MassDEP, 2010.*

MassDEP has been systematically photographing and mapping wetland change since the early 1990s using 1:5,000 scale color infrared aerial photography. These maps have allowed the Department to quantify acreage losses and enforce illegal fills. Data provided by MassDEP for the focal watershed review indicate that freshwater deciduous wooded swamp has been the wetland type lost at the greatest rate (Figure 10) recently as well as in the last decade. Cranberry bog activity and residential development have been the main source (53.3 percent) of wetland loss between 2006 and 2009 (Figure 11).

According to MassDEP (MassDEP, 2005), the vast majority of the wetland acreage losses statewide have been less than a half acre in size, and nearly 60 percent of the losses between 1990 and 2001 occurred outside the state regulatory system (illegal or exempt activities). While investigations are still underway, it is likely, based on past experience, that a portion of the losses seen in this watershed continue to be unpermitted. While Massachusetts' data indicates a loss of 28.87 acres of wetlands within this watershed from 2005-2009, according to the available Army Corps' permitting data for the state of Massachusetts, the

Table 1. Stressors, Tools and Strategies, and Gaps Identified by Participants During the Cape Cod Watershed CWR

Stressors	Tools and Strategies	Gaps and Needs
Coastal watershed development	• Low impact development (LID) • Local zoning/wetland bylaws • Education and outreach (Circuit Riders) • Watershed-based management • Mitigation	• Additional outreach to homeowners • More education and training of conservation commissions
Agriculture	• Enforcement • High-resolution aerial imagery and mapping • Mitigation	• Training on farm plan and local bylaws • Strengthen exemption oversight and additional guidance to clarify exemptions
Unregulated alteration	• Enforcement • High-resolution mapping • Training of conservation commissions • Education and outreach	• Local jurisdiction mapping • More education and training of conservation commissions • More enforcement publicity and higher penalties
Hydrologic modifications	• High-resolution mapping • Restoration/priority setting through assessments and modeling	• Streamlined restoration process • Tidal restriction restoration prioritization • Funding
Nutrient enrichment	• LID • Watershed-based management	• Point source data in CAPS • Funding • More publicity and higher penalties
Water withdrawals	• Watershed-based management	• Assess impacts on coastal wetlands

total permitted wetland impacts were 21.2 acres (16 acres of non-tidal and 5.2 acres of tidal wetlands) between 2006 and 2009. The MassDEP dataset differs from CWA Section 404 permit data because it covers a different time frame, and because it captures unauthorized losses and losses outside CWA jurisdiction (see Appendix C).

Table 1 summarizes key stressors, tools, and strategies to address them and remaining gaps and needs for the focal watershed review conducted for this region in southeastern Massachusetts.

Stressors

The coastal wetlands of the Cape Cod watershed in southeastern Massachusetts, like coastal wetlands across much of the North Atlantic region, have experienced anthropogenic manipulation for hundreds of years. Discussion at the CWR identified five primary contributors to coastal wetland loss:

- Development
- Hydrologic modifications
- Agriculture
- Unregulated wetland loss
- Nutrient enrichment

Coastal watershed development. Almost one-third of Massachusetts' residents live in coastal communities (Mass CZM, 2004). Although the Cape Cod watershed has seen a slight decrease in population density since 2000, land development has continued to impact coastal wetlands.

- **Land conversion to residential/commercial development** (Figure 12). In addition to the demand for these land uses, local zoning requirements can sometimes promote sprawl and increase pressure on wetlands. Setbacks from lot lines, streets, and other setback requirements (e.g., septic systems, onsite wells) can push development toward wetland areas, particularly at the rear of land parcels. Local zoning bylaws can also promote sprawl development by requiring large lots and wide road frontage.
- **Infrastructure.** Participants noted that bridges, roadway crossings, railroads can modify coastal wetland hydrology, increase stormwater runoff, increase erosion and sedimentation, and impede wildlife movement.
- **Stormwater runoff.** Stormwater runoff is directly connected to coastal development. Over 10 percent of the land area in southeastern Massachusetts is impervious surface (Massachusetts Bays Program, 2010), which results in changes to wetland hydrology. Stormwater runoff also carries pollutants into wetlands and water bodies, including nutrients, sediment, metals, and bacteria.

Note 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.

Hydrologic modifications. These modifications include tidal restrictions (usually affecting estuarine wetlands) and dams (usually affecting freshwater wetland systems). Flooding and sediment accumulation commonly occurs upstream of the restrictions, while water flows are reduced to wetlands downstream of the restriction. Changes in plant community can occur due to the changes in hydrology, which can create opportunities for invasive species to establish and spread.

- **Tidal restrictions.** Engineering structures such as roads, railroads, berms, dikes, and tide gates cause hydrological change to coastal wetlands by reducing maximum flooding levels and lowering salinity (Cape Cod Commission, 2001). Reductions in water levels and salinity may lead

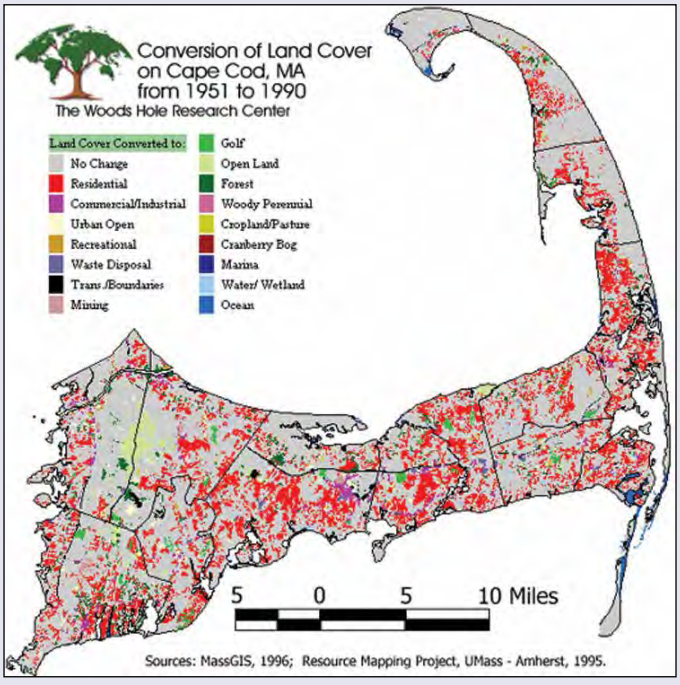


Figure 12. Map of Cape Cod land conversion, displaying the large amount of residential development in the area over a 40-year period. *Source: Woods Hole Research Center, 1999.*

to replacement of native vegetation with more tolerant invasive species. Additionally, tidal restrictions are responsible for fragmenting wetland ecosystems, which reduces their capacity to store floodwaters (Cape Cod Commission, 2001).

- **Dams.** There are over 3,000 dams in Massachusetts (Figure 13; MassDEP, 2007). Dams impede water flow, decrease oxygen levels, obstruct movement of silt and nutrients, and change river bottom characteristics (MA EEA, 2007). Dams alter the natural flow patterns according to which plants and animals have evolved. For example, the reproductive cycles of many aquatic organisms are timed according to naturally occurring annual flood cycles. Dam construction also impedes migration of anadromous fish populations, preventing them from spawning, dramatically reducing their numbers. By reducing flow velocity and creating relatively stagnant bodies of water, dams can change the wetland habitat from riverine to more of a lacustrine environment, and organisms adapt or die out according to their tolerance to such changes. Dams also cause increases in water temperature, threatening the survival of highly desirable coldwater fisheries, such as brook trout (MassDEP, 2007). Although more dams have been removed in Massachusetts than any other Northeast state (MA EEA, 2011), and many more have been slated for removal, participants noted that dam removal projects may gain some attention due to increasing interest in hydropower as a form of renewable energy.

Agriculture. Massachusetts ranks second in the country for cranberry production, and the majority of the state's cranberry bogs are located in southeastern Massachusetts.

- **Direct impacts.** Cranberry bog farming has been a major cause of wetland alteration in southeastern Massachusetts, responsible for approximately 21.6 percent of all impacts between 2005 and 2009 (Figure 11), down from nearly 50 percent of all losses from 1993 to 2005 (MassDEP, 2010). According to MassDEP, direct wetland impacts due to cranberry bog activity typically involve conversion of wooded or shrub swamp to cultivated bog and the incremental filling of wetlands when squaring-off bogs (a term in MassDEP's wetlands regulations (CMR 10.04(c)(1)(d)), which refers to straightening irregular boundaries). The Army Corps has not issued any permits for cranberry bog expansions recently (they cite a decline in the industry). However, it is also possible that losses have continued due to unauthorized activities.

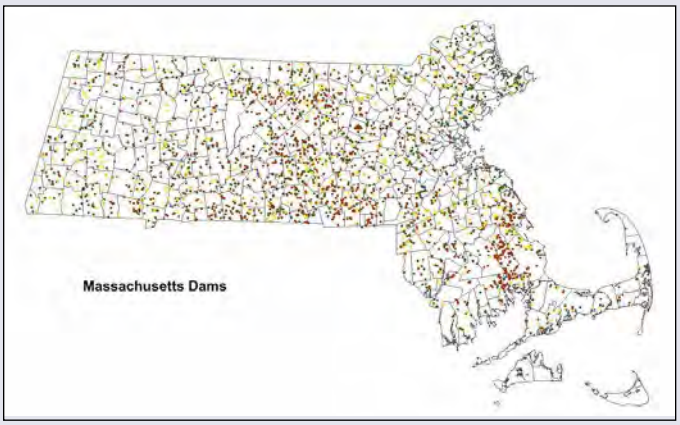


Figure 13. There are over 3,000 dams in Massachusetts. *Source: MA EEA, 2007.*

- **Indirect impacts.** Fertilizers used in cranberry production contain nitrogen, a key nutrient needed for cranberry growth. Nitrogen dissolves into the bog irrigation water and enters streams and wetlands as the water leaves the bog. Different types of bogs have different nitrogen loading rates. A small percentage of bogs in southeastern Massachusetts are "flow-through" bogs, which are not physically separated from streams or rivers. Unlike other bogs, which are separated from water bodies by berms or roads and often have adjacent recovery ponds to collect runoff, flow-through bogs release the greatest amount of nitrogen compared to more modern bog systems that implement practices such as laser leveling, automated irrigation systems, and tailwater recovery systems (BBNEP, 2010a).
  - » The Massachusetts Estuary Project's nutrient loading model assumed that the annual net loading rate of nitrogen from cranberry bogs is about 20.5 pounds of nitrogen per acre of bog. This compares to an average of 15 pounds annually per septic system, about 5 pounds per acre of residential lawn, and about 13.5 pounds per acre of impervious surface, including roads, driveways and parking lots (BBNEP, 2009). Thus, communities working to address eutrophication are looking carefully at all sources, and fertilizer from cranberry bogs can be a significant one.

Unregulated alteration. In 2005, the State of Massachusetts determined that 59 percent of wetland alterations in the MassDEP's Southeast Region (including the CWR watershed) were due to unpermitted/illegal fills (MassDEP, 2005). These illegal fills were identified with MassDEP wetland loss maps. The amount of wetland acreage loss has significantly decreased compared to the first round of aerial photography in the 1990s, presumably as a result of

deterrence. MassDEP aggressively imposes fines against violators, publicizes the enforcement actions, and requires restoration and/or mitigation. MassDEP is in the process of field checking the most recent (2006–2009) data and, as of the publication date of this report, has not yet determined what percentage of the losses are attributable to illegal fills, exempt activity, or are permitted losses.

Nutrient enrichment. Estuaries are particularly susceptible to nutrient enrichment from fertilized lawns, septic systems, and other sources due to low flushing rates. Nutrients discharged to the aquatic environment can lead to eutrophication and overall decline in ecosystem health, including loss of eelgrass (important nurseries for bay scallops), fisheries habitat and spawning grounds, and shellfish beds (Massachusetts Estuaries Project, n.d.). Major sources of nutrients in the watershed include septic systems, agriculture, and runoff from lawns and impervious surfaces.

- **Septic systems.** Much of the developed land within the Cape Cod watershed is not sewered and residences, as well as some commercial sites, rely on onsite septic systems to dispose of wastewater to the ground. Septic systems, each of which contains a holding tank (where solids settle) and a leach field (which disperses the effluent into the ground, typically along trenches), are major nutrient sources, even when they are properly installed, maintained, and inspected on a regular basis. The subsurface geology of southeastern Massachusetts consists of sand and gravel deposits, through which water flows quickly with little pollution attenuation. As noted above, the average septic system discharges 15 pounds of nitrogen annually. Collectively, these systems, especially where they are concentrated on small lots near coastal water resources, can contribute significantly to eutrophication.
- **Agriculture.** Participants believe the main agricultural concern in southeastern Massachusetts is discharges from currently operating cranberry bogs and retired bogs.
- **Lawns.** Excessive fertilizer usage on residential and commercial lawns and golf courses leads to nutrient runoff during storms. More widespread use of lawn and landscaping companies may be resulting in more fertilizer applied to lawns, but participants noted that commercial applicators might actually have better practices than individual homeowners since businesses have a financial incentive not to over-apply.

Figure 14. Major Buzzards Bay embayments and impaired waters. *Source: BBNEP, 2010c.*

Other stressors:

- **Water withdrawals.** Drinking water and irrigation water are largely supplied by groundwater wells in the Cape Cod watershed that tap into sand and gravel buried valley aquifers. These aquifers are hydrologically connected to surface waters. Groundwater withdrawals, especially during summer and early fall when water tables are typically at their lowest, can reduce streamflow and lake levels, and can affect wetlands that border them by lowering the water table and drying out soils.
  - » Coastal plain ponds, which occur in kettle-hole depressions throughout southeastern Massachusetts, naturally fluctuate and are inhabited by unique and diverse plant and animal communities. The Massachusetts Natural Heritage Program has listed over 40 plant and animal species that occur predominantly in coastal plain ponds, including a number of very rare and quite striking wildflowers. Groundwater withdrawals may interfere with natural pond fluctuations and be detrimental to the distribution and presence of naturally occurring shoreline vegetation. In particular, Mary Dunn Pond, located in the Cape Cod watershed, has been the subject of concern as well as scientific study. McHorney and Neill (2007) investigated how changes to water levels caused by water withdrawals affect the distribution and persistence of shoreline plants.
  - » Participants noted that since 1999, a combination of municipal water withdrawals, cranberry bog diversions, and drought has led to the Mattapoisett River

in Buzzards Bay running dry on several occasions. In 2007, over one thousand feet of the river were dry. The reduced flow causes impacts to riparian habitats, including bordering wetlands. These municipal withdrawals are all within sub-watersheds of the Buzzards Bay watershed, so the state's Interbasin Transfer Act (1984) does not apply (BBNEP, 2010a).

- **Riparian alterations.** The Rivers Protection Act (1996) established 200-foot riverfront protection areas around most perennial rivers and streams in the state. Many riverfronts were already historically developed, however, which altered riparian corridors.
- **Boating.** There are impacts to eelgrass beds from recreational boating and fishing in Buzzards Bay and other areas of the focal watershed. Boats and particular fishing methods may damage eelgrass beds directly (via propellers, moorings, etc.) and indirectly by stirring up sediment that blocks sunlight (Costa, 1988, n.d.). The Mass Bays National Estuarine Program is conducting a project to replace conventional moorings with helical anchors and elastic ropes to begin to address some of the stress put on eelgrass from boaters (Baker and Evans, 2010).

Tools and Strategies

A wide array of regulatory and non-regulatory tools and strategies for addressing each of the five top stressors were discussed.

State regulatory programs. The Massachusetts Wetlands Protection Act (Massachusetts General Laws, Chapter 131, Section 40, 1960) was the first wetland protection law in the country. It protects banks, freshwater wetlands, coastal wetlands, beaches, dunes, tidal flats, marshes or swamps bordering on the ocean, any estuary, creeks, rivers, streams, ponds, lakes, and certified vernal pools. The act has broad jurisdiction, including land subject to flooding (100-year floodplains), the riverfront area (added by the Rivers Protection Act, 1996), and land under water bodies.

The act is the backbone of wetland regulation in Massachusetts. It cites eight statutory interests for which protection of wetlands is critically important: public and private water supply, groundwater protection, prevention of pollution, prevention of flooding, prevention of storm damage, wildlife habitat, fisheries, and shellfisheries. Under the act, no one may "remove, fill, dredge, or alter" wetlands without obtaining a permit, called an "Order of Conditions." The act's regulations also apply to activities in the "buffer zone" of any vegetated wetland, measured 100 feet from the edge of the wetland. Jurisdiction also extends to river corridors within 200 feet of nearly all (except in the most heavily urbanized areas) perennial rivers and streams.

Participants noted the following critical aspects of the state regulatory program that are needed to address all of the primary stressors:

- **Wetland mapping and permit database** (see "mapping and assessment"). MassDEP uses a permit-tracking database to crosswalk wetland acreage losses observed on aerial ortho-photographs to actual permitted losses noted in the wetland permit database. Any losses not tracked in the database are immediately flagged as potentially illegal alterations, which can then be investigated. All permit applications (called "Notices of Intent") have been entered into the database; with a few exceptions, though, only applications filed since the system was completed (i.e., late 2008) have been geolocated.
- **Mitigation.** Any amount of vegetated wetland alteration must be mitigated according to mitigation requirements, with a few exceptions (i.e., exemptions, limited projects). The state regulations require at least 1:1 replication (on site and in kind) for permitted wetland impacts. A ratio greater than 1:1 is required for variances. (Note: this policy differs from the federal mitigation rule. See Appendix C.) No wetland mitigation banking is allowed (except for one pilot mitigation bank authorized by special legislation in one watershed of the state) due to concerns about how to fully account for and ensure replacement of all wetland functions, and concerns that banking could facilitate circumvention of the avoid-minimize-mitigate protocol. Wetland impacts and associated mitigation are

allowed only after demonstration is made that project impacts cannot be further minimized.

» The maximum allowable alteration of bordering vegetated wetland is 5,000 square feet, unless the project qualifies for a variance (i.e., it must serve a proper public purpose, an alternatives analysis must be completed to demonstrate the absence of viable alternatives, and impacts must be fully mitigated). Zero alteration of salt marshes is allowed and a "no adverse impact" standard applies to any alteration of a coastal dune. The performance standard for salt marshes states: "A proposed project in a salt marsh, in lands within 100 feet of a salt marsh, or in a body of water adjacent to a salt marsh shall not destroy any portion of the salt marsh. Alteration in growth, distribution and composition of vegetation shall be considered in evaluating adverse effects on productivity." (310 CMR 10.32(2))

» Conservation commissions are supposed to issue Certificates of Compliance that certify a project has been successfully mitigated according to the engineering plans, calculations, and Order of Conditions. However, MassDEP estimates that less than half of all Certificates of Compliance are issued due to lack of staff resources needed to conduct inspections (see "What's Needed, What's Missing?").

Wetland restoration: removing tidal restrictions.

The Massachusetts Division of Ecological Restoration (MADER) is responsible for wetland and river restoration projects in the state. It and its partners facilitate projects, including dam removal and culvert replacement, with the goal of restoring aquatic habitats and ecosystems across the state (MA DER, 2011). DER serves as a facilitator for wetland restoration projects by bringing together partners, identifying sites, providing technical assistance, and securing funding. Through January 2010, DER has completed 62 coastal wetland projects, restoring over 800 acres (MA DER, 2011). See the "Eel River Headwaters Restoration Project" highlight box for an example of a DER project currently underway.

- **Cape Cod Atlas of Tidally Restricted Salt Marshes.** The Atlas was designed for use by municipalities, state and federal agencies, and other organizations and individuals seeking to prioritize and undertake salt marsh restoration projects (Cape Cod Commission, 2001).
-

- **Dam removals.** Since dam removal projects can help improve flood management and overall natural capacity of rivers, they are routinely permitted under the Wetlands Protection Act. Because of the number of dams slated for removal and the number of groups interested in seeking permits to remove them, MassDEP developed a guide for permitting dam removals. The guide clarifies and streamlines the regulatory review process so that the wetland regulations are not an impediment to projects that will benefit wetland and riparian ecology (MA EEA, 2007).
- **Removing or renovating tidal restrictions.** A culvert is a channel or drain that is installed under an embankment, roadway, railroad, or recreational trail, usually to drain water from one side of the embankment to the other. Culverts are most often constructed of corrugated metal

Highlight: Eel River Headwaters Restoration Project.

Once completed, this collaborative restoration effort in Plymouth, Massachusetts, will restore approximately 40 acres of former cranberry bogs to wetlands, including two miles of stream channel. The project requires a variety of restoration techniques including dam removal, culvert replacements, habitat creation (e.g., stream channel construction, native plantings) and habitat enhancement. The American eel and river herring, in particular, will benefit from improved passage and habitat. Additionally, restoration activities will improve resiliency of the local ecosystem and offer additional recreational opportunities to local residents. Almost $2 million has been raised for the project, the majority from a U.S. Fish and Wildlife grant. Project partners include the Town of Plymouth, USFWS, NRCS, DER, MassDEP, The Nature Conservancy, American Rivers, and the Corporate Wetlands Restoration Partnership.

Images of Eel River before restoration (top) and to date. *Source: MA DER, 2010.*

pipe or pre-cast concrete (box culverts). If improperly sized or installed at the wrong elevation, culverts can impede tidal flows. If not installed properly, they restrict natural flows in tidal (as well as non-tidal) wetlands, leading to changes in hydrology, salinity, and plant composition (often allowing invasive species such as Phragmites to become established and spread). Once restrictions are removed or corrected, vegetation and wildlife can return to their natural state (Cape Cod Commission, 2001). Participants noted that removing tidal restrictions addresses both sea level rise (by allowing wetlands to migrate inland) as well as invasive species (by eliminating conditions conducive to their spread).

» Winsegansett Marsh, in the southwestern part of the focal watershed, is one of many marshes affected by a transportation infrastructure project. A road and several footpaths divided the 30-acre marsh. To restore it, four small culverts were replaced with larger ones. Once tidal flow to the upper marsh improved, salinity increased, causing invasive species to die off. According to a survey by the Buzzards Bay NEP and local volunteers, within just three years of project completion, the native salt marsh grass Spartina patens increased from 20 percent to 32 percent of vegetation coverage (BBNEP, 2007).

» Partners for Fish and Wildlife's Dam Removal and Restoration Program is a collaborative USFWS program that works with private landowners, conservation organizations, and state and federal agencies. The Program seeks to identify, prioritize, and provide funding for the removal or renovation of selected barriers. In conjunction with dam removals or culvert replacements, stream channels are being restored with the appropriate physical dimensions, bed features, and instream habitat. Completed projects benefit a variety of fish, including diadromous Atlantic salmon, American shad, alewife, blue-backed herring, and American eel, as well as resident species, including brook trout, land-locked Atlantic salmon, freshwater mussels, and other non-game aquatic species.[1]

  – One example of a Partners restoration project is the Stony Brook project in Brewster, Cape Cod. Stony Brook supports a large coastal wetland and nearly 400 acres of habitat for river herring and American eels. Roads, culverts, and a former mill site downstream divided the salt marsh and constricted water flow into Cape Cod Bay. In 2006, NOAA awarded the Town of Brewster and local and state partners $1.65 million of Recovery Act funds to begin the restoration of 20 acres of salt marsh and 3,000 feet of stream habitat. Once completed, the project will allow herring greater access to nearly 400 acres of prime spawning habitat and hopefully encourage re-establishment of native marsh grasses.[2]

Local wetland protection: bylaws and conservation commissions. In 1957, the Conservation Commission Act (Massachusetts General Laws, Chapter 40, Section 8C) authorized municipalities in Massachusetts to establish conservation commissions through a vote of the local legislative body. These conservation commissions, consisting of volunteers who live in the community, administer the state Wetlands Protection Act (over 6,000 Orders of Conditions annually) and also enforce local wetland protection bylaws, among other duties. About one-third of all communities in Massachusetts have adopted local wetland bylaws that are more stringent than Massachusetts' wetland laws/regulations.

1 For more information, see http://www.fws.gov/newengland/Partners-Restoration-Dam_Removal_and_River_Restoration.htm.

2 See http://www.town.brewster.ma.us/index.php?option=com_content&view=article&id=841:stony-brook-salt-marsh-restoration&catid=72:natural-resources-a-shellfish&Itemid=98.

- The Town of Marshfield, located in the northern part of the Cape Cod watershed, has bylaws in place that are more stringent than the state's Wetlands Protection Act. The success of these bylaws is attributed to a 20-year history of well-informed and well-educated local commissioners who have worked to maintain a high retention rate and mentor new members (see the "What's Needed? What's Missing?" section, which notes high turnover among conservation commissioners as an issue of concern). Review participants confirmed that the town regulations are very effective and have been tested through litigation. They further noted that it is important to keep the town counsel well informed, seek legal advice when needed, and quickly notify town counsel of any potential challenges.
- The Town of Falmouth worked with the Buzzards Bay NEP to update their wetland regulations in the late 1990s. The process required 14 meetings over two years. The town next made major updates in the late 2000s.[3] Resource areas protected include: "…any freshwater or coastal wetland; marshes; wet meadows; bogs; swamps;

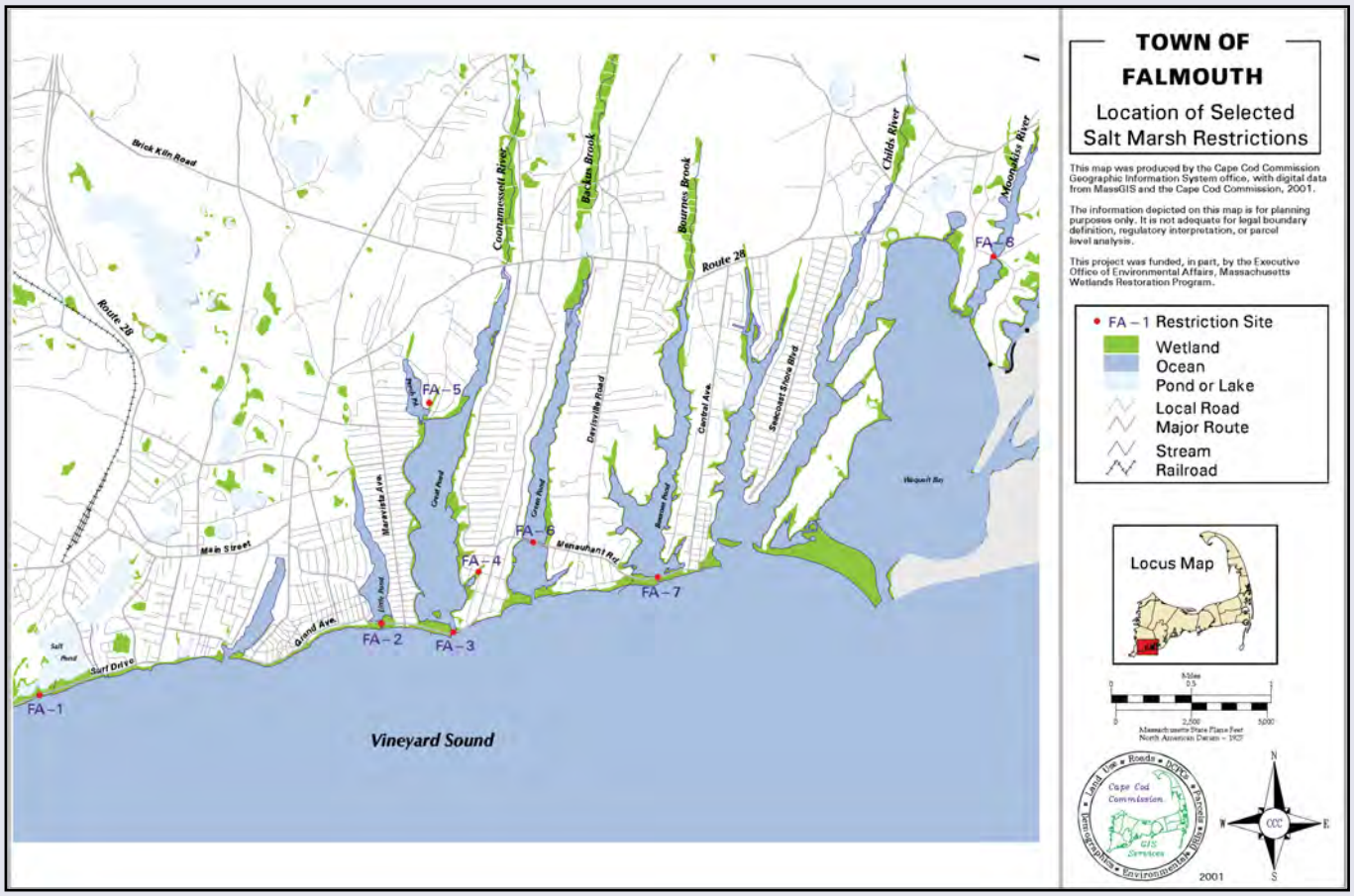


Figure 15. Location of tidal restrictions in Falmouth, Massachusetts. *Source: Cape Cod Commission, 2001.*

3 Current regulations are available at http://www.ecode360.com/?custId=FA1385.

vernal pools; banks; reservoirs; lakes; ponds; streams; creeks; beaches; dunes; estuaries; oceans; lands under water bodies; lands subject to flooding or inundation by groundwater or surface water; lands subject to tidal action, coastal storm flowage or flooding; lands within one hundred (100) feet of any of the aforesaid resource areas" (Section 235-2, "Jurisdiction," amended AFTM 11-18-1996, Article 61, approved 4-30-1997).

Mapping and assessment. The mapping of wetlands in Massachusetts is considered advanced for both the region and the nation. Massachusetts systematically and regularly collects data on coastal wetland acreage losses occurring outside of the regulatory system (see the "Wetland Loss Mapping and Enforcement" highlight box).

- **Unregulated fills.** Once aerial photography has been completed and interpreted, the next step is to categorize and prioritize wetland losses that are observed and refer them to one of MassDEP's four regional offices for follow-up (Note: MassDEP contacts EPA to investigate any suspected Section 404 violations). Further investigation requires researching permitting databases to see if any of the observed fills have been permitted. If no permit information is found in the state permitting database, MassDEP contacts the local conservation commission to see if they are aware of the activity (local Orders of Conditions are sent to MassDEP). MassDEP then conducts a site visit and proceeds as it would with any other suspected illegal wetland activity. MassDEP had funding for one year to compare mapped wetlands to local permit records and was able to quickly identify suspected areas of unpermitted fills. Since exemptions are not reflected in state or town records, a site visit is required to confirm whether an unpermitted fill is exempt or illegal.
- **Deterrence.** Enforcement cases were published in newspapers in an effort to alert and deter others who may have intended to alter wetlands without a permit. Recently, publicity has slowed because the majority of illegal fills are less than half an acre in size. Some communities have developed their own detailed wetland maps, which have helped inform commissions of all wetland resources within the community and have helped developers avoid wetland areas when designing development plans.
- **Data management.** Wetland mapping itself does not reveal whether a wetland alteration is permitted or unpermitted. The ability to connect map information to permit data (both state and federal permitting databases) is critical to making mapping a useful enforcement tool.

  » Wetland Information Resource (WIRe) is MassDEP's data management system, which integrates permitting and enforcement records with wetland acreage loss maps and other GIS maps.[4] The integration of wetland maps and permitting databases was made possible by a three-year, $600,000 EPA grant.

Highlight: Wetland Loss Mapping and Enforcement

MassDEP has mapped wetlands across the entire state and, in conjunction with permitting databases, has developed a well-respected, highly credible system for tracking wetlands and conducting enforcement against illegal fills.

Land cover changes detected by comparing aerial maps from 1993 and 2000 led MassDEP to pursue criminal investigation into cases where large wetland areas had been filled or altered without a permit. In 2004, MassDEP determined that approximately 59 percent of wetland loss across the entire state was due to illegal fill (MassDEP, 2005). Starting in 2004, MassDEP began to map each municipality in order to identify illegal large-scale alterations (BBNEP, n.d.). Between 2003 and 2010 over $3 million in penalties from illegal fills have been collected and 62 acres of wetlands have been restored. The production of statewide wetland maps from digital imagery cost about $85 per square mile and took about four years to complete.

The Wetlands Loss Mapping Project is a major component of the state's wetland protection program. In 2010, however, enforcement of wetland loss cases decreased to the lowest number since the program began. This could be attributed to a number of factors, including fewer cases warranting enforcement (suggesting deterrence of illegal fills) and state resource constraints limiting site visits needed to ground-truth mapping and pursue enforcement cases.

These deep marshes (left) in Westport, Massachusetts, near Charlotte White Road were filled in for homes and lawns (right). *Source: BBNEP, n.d.*

4 For more information on WIRe, see http://www.mass.gov/dep/water/resources/wiremacc.htm.

- **Local mapping.** The Town of Acushnet, Massachusetts, received a $7,500 grant from the Buzzards Bay NEP in 2008 to hire a consultant to digitize wetland boundaries for parcels where the conservation commission has considered a permit application during the past five years. This will allow the town to provide accurate information on wetland boundaries to homeowners, realtors, and developers. The conservation commission is requiring that all future site plan submissions be in digital format to facilitate routine updates of their wetland boundary maps (Massachusetts Executive Office of Energy & Environmental Affairs, 2008).

Training/education. Although many communities have more stringent wetland protection bylaws than the state, enforcement of these bylaws, as well as enforcement of the state Wetlands Protection Act (which is also the responsibility of local conservation commissions), can be hampered if conservation commission members are not properly trained and educated. There are no educational or training requirements to be a conservation commissioner, although the Massachusetts Association of Conservation Commissions (MACC), the Massachusetts Audubon Society, the Massachusetts Association of Wetlands Scientists, and other groups offer several effective training programs, including reading engineering blueprints, understanding stormwater runoff models, writing effective Orders of Conditions, and delineating wetland boundaries in the field.

- **Guidance documents.** Guidance documents are a very important tool to local conservation commissions. Coastal Wetland Review participants mentioned that the state guidance documents on dam removal (*Dam Removal and the Wetland Regulations, 2007,* and *Dam Removal in Massachusetts, 2007*) are very effective. MACC has produced a conservation commission manual and model wetland bylaws. MACC also offers regular training sessions and workshops for conservation commissioners, including an annual meeting every March that attracts more than 1,000 attendees, the largest annual environmental gathering in the state. In addition to MACC's guidance and training, MassDEP has an active technical assistance and training program to help conservation commissions understand and implement state wetland regulations. For example, MassDEP produced a wetland mitigation (replication) manual in 2002. The manual is primarily intended for conservation commissions, MassDEP staff, and consultants. It provides specifications (hydrology, soils, slope, and vegetation) for designing and monitoring successful wetland replication projects. The intent of the guide is to improve mitigation success and ensure that these projects function as designed (MassDEP, 2002).

  » Participants generally thought that how-to manuals and guidance documents were very important and MassDEP should produce more of them. It was also noted that they could be more user-friendly, concise, and aimed at the educational level of most conservation commissioners.

- **Delineation.** Wetland mapping is an effective tool to ensure that permits do not allow alteration of wetlands that were inadvertently excluded from protection due to mapping errors, to help identify where illicit fill may be occurring, to support enforcement actions, and to discourage potential future violations. Knowing how to identify wetland boundaries in the field requires knowledge of plant identification, soil interpretation, and other delineation methods. Wetland delineation can be particularly challenging during the winter months, when the ground is frozen and covered with snow. This requires education and training of local officials.

  » The MassDEP wetland conservancy maps, though detailed, are at a scale of 1:5,000 feet, and show only the larger core wetlands. They do not show all Wetlands Protection Act jurisdictional boundaries, and for permitting, wetlands are always delineated based on

Before and after photographs of dam removal in Massachusetts. *Courtesy of Russ Cohen, MA DER. Riverways Program.*

field surveys and soil evaluations. A participant noted one example of a particular area slated for development that, upon examination, turned out to be 90 percent wetland when jurisdictional lines were determined on site, compared to 50 percent wetlands as determined from the map that was provided.

  - » Marginal wetlands (such as wetland areas within a wide transition zone from wetland to upland and intermittent headwater streams) are more difficult to delineate without an onsite inspection and in-depth training. The MACC conducts wetland delineation courses but they are optional, and not all conservation commissioners attend.

- **Wetland circuit riders.** MassDEP's Wetland Circuit Rider Program has been a very popular program for conservation commissioners because it offers personalized service between local commissions and state wetland professionals. The idea for wetland circuit riders came from the days when judges used to "ride circuit" from town to town. Understanding that unpaid conservation commissions are the state's front lines of wetland protection, and that fewer wetland permits are appealed if they are properly drafted (about 10 percent of all local Orders are appealed to MassDEP), MassDEP obtained funding from the Massachusetts Environmental Trust to hire circuit riders for each of its four regional offices. The circuit riders are available for phone consultation, but also attend evening commission meetings to assist commissioners in understanding and administering the state wetland regulations. Some towns have formed regional commission meetings, where the circuit riders can address several towns all experiencing the same problems. In the western part of the state in particular, where many smaller towns cannot afford to hire staff, circuit riders are highly valued for their technical assistance. Unfortunately, budget cuts have reduced the number of circuit riders to only three statewide.

- **Developer pays.** Participants mentioned some town bylaws require the developer to pay the conservation commission to hire its own wetland consultant to help review and condition development plans to protect wetlands. Consultant fees are usually based on total project costs.

  - » For example, a Falmouth bylaw states: "The Commission, at its discretion, is authorized to require the posting of a consultation fee by an Applicant. This fee shall be used to hire an independent, expert consultant to investigate the site for the proposed project and to examine the Plans or other information submitted by the Applicant to assist the Commission in evaluating potential adverse impacts upon a Resource area by the proposed project. This fee will be required in those cases where the complexity of the activity, the difficulty in determining the threat to the Resource areas or the size of the request or project involves and requires more information and analysis than can reasonably be supplied to the Commission without independent technical professional assistance" (Falmouth Wetland Regulations, 10.09, "Fees").

- **Hotlines.** MACC has a hotline and Web forum to help connect conservation commissioners to experts.

Collaborative partnerships. Collaborative partnerships are strong and active throughout Massachusetts. The Massachusetts Estuary Project, Cape Cod Commission, Compact of Cape Cod Land Trusts, Partners for Fish and Wildlife (mentioned above), local land trusts, watershed associations, Provincetown Center for Coastal Studies, Buzzards Bay Coalition, National Estuary Programs (MassBays and Buzzards Bay) and National Estuary Research Reserve (Waquoit Bay), Massachusetts Audubon Society (with 12 wildlife sanctuaries in the watershed), Association for the Preservation of Cape Cod, Woods Hole Oceanographic Institution, Cape Cod Cranberry Growers and Cape Cod Cranberry Experiment Station, University of Massachusetts (UMass) (with campuses in Dartmouth and New Bedford), and many other organizations have a strong presence in the Cape Cod watershed and challenge each other to better understand and more effectively protect the coastal wetlands.

- **National Estuary Program.** The Buzzards Bay and Massachusetts Bays NEPs are actively engaged with their partners to protect and restore coastal wetlands in the Cape Cod watershed. Each NEP provides technical

support to local towns and partners in a variety of ways. For example, the Buzzards Bay NEP has trained area conservation commissions and new conservation agents in coastal wetland protection. The MassBays NEP has been actively involved in monitoring coastal wetland conditions and particularly addressing invasive wetland plants. Both programs have helped their partners develop grant applications for funding major land restoration projects.

- The NRCS helps cranberry farmers comply with wetland regulations. Through the development and implementation of farm plans, the NRCS helps give farmers a roadmap for improving production while managing the natural resource base that supports their operation in compliance with applicable wetland regulations (NRCS, 2008a). Plans have helped identify wetland impacts from cranberry operations and aided farmers in voluntarily restoring them.
- Participants cited the Southeastern Regional Wetland Restoration Team as a newly formed group that is an excellent example of interagency collaboration. It was formed to better coordinate restoration project reviews. The team consists of state and federal agency officials (MassDEP, DER, Massachusetts Division of Marine Fisheries, NEPs, Massachusetts Office of Coastal Zone Management as needed, EPA Region 1, and the Army Corps' New England District). This review process can help facilitate a streamlined permitting process and identify any issues early in the process so redesign can occur before major investments have been made.

Strategies for nutrient removal. Watershed-based management and TMDLs (Total Maximum Daily Loads) were a few of the many tools and strategies discussed by review participants.

- **The Massachusetts Watershed-Based Plan (WBP).** EPA issued new guidelines in 2003 promoting the use of CWA Section 319 funding for developing and implementing Watershed-Based Plans to protect unimpaired waters and restore impaired waters. MassDEP's approach has been to develop the WBP statewide. WBP is an interactive, Web-based tool that presents sub-watershed information in a format that will enhance the development and implementation of projects that restore water quality and beneficial uses in the state.[5]
- **Massachusetts Estuaries Project.** This is a collaborative

effort between MassDEP and University of Massachusetts' School of Marine Science and Technology to provide water quality, nutrient loading, and hydrodynamic information for 89 estuaries in southeastern Massachusetts. This information will be combined using a linked watershed/estuary model that will predict the water quality changes that will result from land use management decisions.

- **TMDLs.** MassDEP has developed a TMDL strategy that prioritizes all listed water bodies, establishes TMDLs for degraded waters, and plans for implementation of best management practices to clean up polluted water bodies.[6] Overarching strategy in the state is to develop nitrogen TMDLs for coastal waters and phosphorous TMDLs for coastal ponds.
  - » The Buzzards Bay NEP developed a TMDL strategy—contained in the 1991 Buzzards Bay Comprehensive Conservation and Management Plan—to manage anthropogenic nitrogen inputs to coastal embayments. This work set the stage for DEP to adopt TMDLs based on more elaborate models more than a decade later. Today, a major focus of the Buzzards Bay NEP is helping municipalities comply with recommended nitrogen loading limits.

What's Needed? What's Missing?

Despite the above-described array of tools and strategies for addressing stressors to coastal wetlands in southeastern Massachusetts, participants identified several gaps

5 See the Massachusetts WBP website: http://public.dep.state.ma.us/Watershed/Intro.aspx.

6 See the Massachusetts TMDL website: http://www.mass.gov/dep/water/resources/tmdlfs.htm.

in resources and regulations. They expressed the need to address these gaps to enable more effective application of tools and strategies to protect and restore the watershed's wetlands.

Increase deterrence. MassDEP's Wetlands Loss Mapping Project and follow-up enforcement actions are designed to be an effective deterrent to illegal wetland alterations, but two gaps need to be filled to keep deterrence strong:

- **Publicity.** In the first few years of the Wetlands Loss Mapping Project, some high-profile enforcement cases received a lot of publicity through major media outlets (television news, the *Boston Globe*, etc.). Participants believed that such high-visibility reporting served as a major deterrent and suggested that renewed publicity of enforcement cases, even lower-profile cases in local papers, could help act as a deterrent.

Highlight: Conservation Assessment and Prioritization System (CAPS)

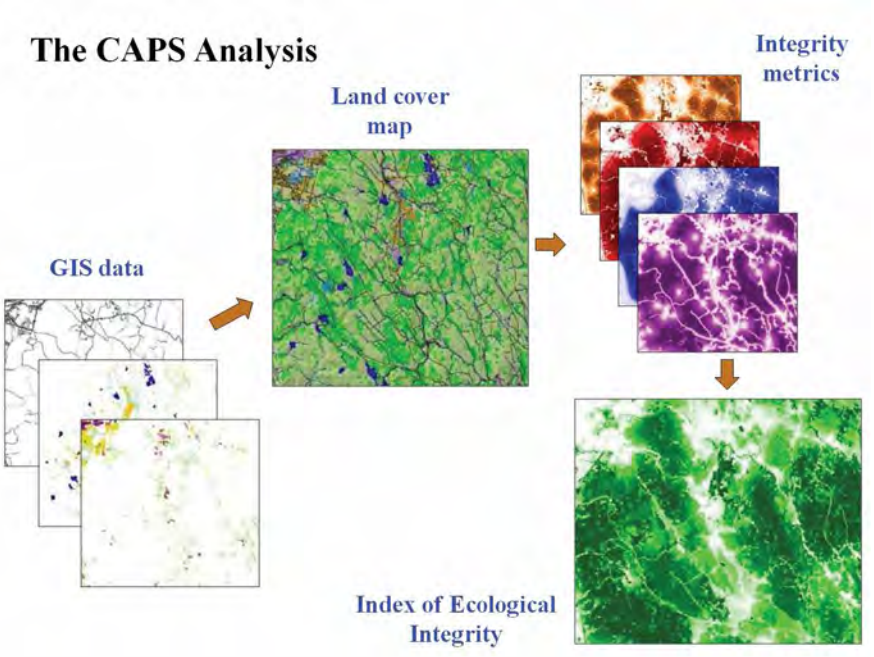
CAPS is a landscape-level model that predicts ecological integrity based on GIS-driven metrics representing stressors on the landscape (e.g., habitat loss, buffer zone impacts, road traffic intensity, non-native invasive plants) or resiliency (e.g., connectedness, aquatic connectedness, and similarity). The output of CAPS is the Index of Ecological Integrity (IEI), a weighted combination of metric outputs yielding a score ranging from 0 to 1 for each 30-square-meter point on the landscape for purposes of:

- Assessing wetland condition and better understanding the causes of stress.
- Reporting to EPA under Section 305(b) of the Clean Water Act.
- Developing tiered or continuous aquatic life use models to better monitor resource improvement.
- Developing policy guidance and regulation.

In 2006, MassDEP adopted CAPS to identify potentially important wildlife habitat. High-quality habitat areas are defined as the top 40 percent of CAPS-identified sites.

Recently, CAPS metrics were developed to characterize coastal stressors, including tidal restrictions, tidal ditching, human disturbance, and beach hardening, allowing for coastal IEI assessment.

As part of the Massachusetts wetland monitoring and assessment effort, site-level assessment methods (SLAMs) have been developed for forested wetlands and salt marshes. Additional SLAMs will be developed if funding is available. Data collected in accordance with the SLAMs are being used to correlate site condition with the CAPS stressor gradient to develop Indices of Biological Integrity (IBIs). These IBIs represent individual taxa or assemblages of taxa that are most responsive to environmental degradation. Wetland assessment of a site's biological condition relative to its landscape context is then based on the relationship between the CAPS IEI (i.e., constraints on biological condition from the surrounding landscape) and IBI (i.e., actual condition of a site based on field assessments).



CAPS data and maps can be found online at http://www.umass.edu/landeco/research/caps/caps.html.

- **Higher penalties.** Currently, penalties for wetland violations average between $5,000 and $15,000. Participants felt that increased penalties would provide more effective deterrence. In addition, participants felt some or all of the penalties collected should be dedicated revenue to support the wetland-mapping program, as opposed to the state's general fund.

Improve data and mapping tools. Participants identified a number of data needs and mapping tools needed to improve coastal wetland protection.

- **Permitting databases.** Ability to access the Section 404 permit database would be highly valuable to the public as well as government agencies, so they can cross-check permits issued with wetland losses identified on MassDEP's maps. Participants noted this as critical to tracking losses and suggested that more effort be put into ensuring accessibility of the information. In addition, MassDEP has a new and innovative wetland permitting database called the WIRe. MassDEP developed new electronic permit forms that will allow data to auto populate the database. However, not all communities in Massachusetts have been using the WIRe because of performance problems that are plaguing the larger DEP system. Those issues are currently being addressed and it is anticipated that the WIRe database will be more fully functional in the near future.
- **Virtual site visits.** Participants emphasized the importance of site visits conducted by conservation commissions. It was suggested that a tool be developed to enable virtual site tours, considering that many commissioners are not inclined to do field work, especially in winter conditions.
- **Mapping.**
  - » **CAPS.** CAPS and SLAMs continue to be developed for coastal wetland ecosystems; however, there are currently gaps in the metrics, including data on point sources (sewer, septic, etc.) and toxic contamination zones.
  - » **LiDAR.** In the future, MassDEP should look into partnering with USGS as they conduct LiDAR flights. This could help gather and map wetland data at the regional level. Additionally, successful restoration revolves around good topography data that can be developed from LiDAR.
- **Tidal restrictions.** Participants felt there was a need for more research and data to assess impacts of tidal restrictions. Restrictions and associated indicators are difficult to identify from aerial imagery and comprehensive assessments are hampered by lack of accurate digital elevation models (DEMs). LiDAR data would help improve DEMs and subsequent modeling.

Improve wetland mitigation. Mitigation is referred to as "replication" in Massachusetts, because state regulations require wetland mitigation to replace the type of wetland lost (onsite, in-kind mitigation). A study conducted on replication success found over 50 percent of projects permitted between 1983 and 2004 were not in compliance with the mitigation requirements in their permits for a number of reasons, including insufficient areal extent and lack of appropriate hydrology (Brown and Veneman, 2001). More recently, the Army Corps' New England District reported that, based on its compliance inspections of activities permitted under CWA Section 404 (2007–2011), approximately 73 percent of all projects that included compensatory mitigation requirements were in compliance with the permit conditions. Replications can fail for a variety of reasons, including lack of long-term monitoring and maintenance as well as difficulty in holding developers accountable once projects are complete and subdivision lots are sold to individual owners. Mitigation sites can be difficult to identify from aerial images because they are either too small relative to the resolution of the imagery or have not yet developed pronounced enough wetland hydrology signatures to be detected remotely. Comprehensive tracking requires site visits, such as those conducted for the above examples, making enforcement of mitigation requirements time-consuming.

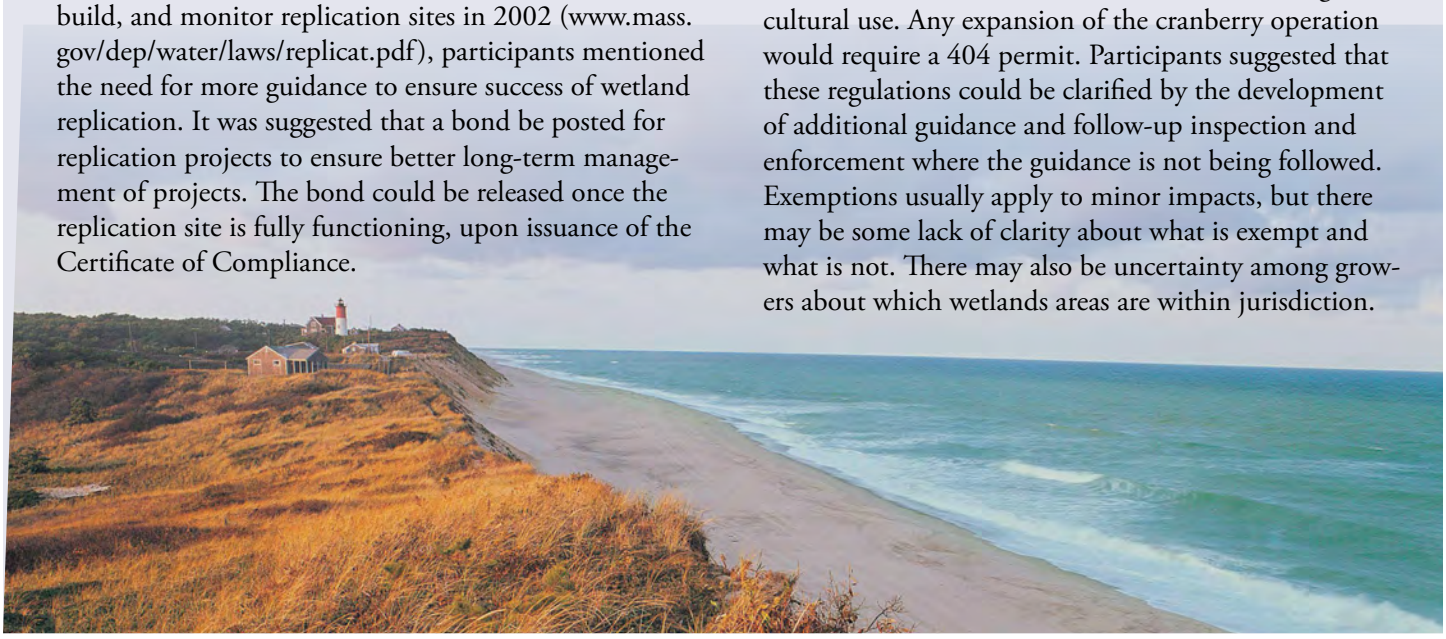
On-site replication often results in loss of wetland function because small, created wetlands rarely perform the variety of functions that natural wetlands perform. The Army Corps' New England District has been working with the state to

develop a broader watershed approach to compensatory mitigation that will encourage the strategic selection of mitigation site locations and the implementation of mitigation plans that are most likely to improve or sustain aquatic resource functions in the watershed. Additional compensatory mitigation is often required to comply with the requirements of the CWA Section 404 program.

- **Few Certificates of Compliance issued.** According to the Massachusetts Wetlands Protection Act, "No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds." However, these orders are not always recorded at the Registry and some towns do not have mechanisms to track the recording. To release the recording of the order and clear the property title, a Certificate of Compliance is required. If the order was never recorded, a Certificate of Compliance may never be sought. Certificates of Compliance are supposed to involve a post-construction site inspection. Without a process for conducting those inspections and issuing Certificates of Compliance, it is not clear whether or not projects are complying with all of the conditions in the Orders of Conditions. A recommended process is needed to ensure that project proponents file their permits with the Registry of Deeds, which is the primary incentive for filing a request for a Certificate of Compliance. It was noted that some towns take responsibility for filing the Order of Conditions with the Registry of Deeds, and require filing fees from the applicant as part of the permit application process.
- **Lack of wetland replication monitoring guidance.** Although MassDEP issued guidance on how to design, build, and monitor replication sites in 2002 (www.mass.gov/dep/water/laws/replicat.pdf), participants mentioned the need for more guidance to ensure success of wetland replication. It was suggested that a bond be posted for replication projects to ensure better long-term management of projects. The bond could be released once the replication site is fully functioning, upon issuance of the Certificate of Compliance.

Strengthen exemption oversight. Participants were concerned about confusion among both developers and local conservation commissions over whether certain activities are exempt from review and what level of review is required.

- **Federal program categories.** Participants indicated that project proponents may not know the difference between regulations for navigable (tidal) waters and inland (non-tidal) waters. Projects filling less than 5,000 square feet of non-tidal wetlands typically qualify for the Massachusetts General Permit under Category 1, which does not require pre-construction notification or written authorization. Participants expressed concern that project proponents doing work in tidal wetlands may be incorrectly assuming work is authorized under Category 1, when it actually requires a Category 2 permit application and written authorization or an individual permit. (See Appendix C for more information on individual vs. general permits.)
- **Agricultural exemptions.** Consistent with the normal farming activities exemption in Section 404, the Massachusetts Wetlands Protection Act exempts work performed for the normal maintenance or improvement of land in agricultural use provided the land in agricultural use retains its exemption status. (It is important to note that exemptions are limited; not all agricultural activities are exempt; and some exempt activities are subject to best management practices.) It should also be noted that agricultural exemptions for "normal farming" activities are defined in the 404 regulations as "plowing, seeding, cultivating, minor drainage and harvesting…" The exemption does not include conversion of wetlands to agricultural use. Any expansion of the cranberry operation would require a 404 permit. Participants suggested that these regulations could be clarified by the development of additional guidance and follow-up inspection and enforcement where the guidance is not being followed. Exemptions usually apply to minor impacts, but there may be some lack of clarity about what is exempt and what is not. There may also be uncertainty among growers about which wetlands areas are within jurisdiction.



In addition to clarifying exemptions, participants voiced support for adding a provision in the state regulations that would capture secondary impacts (e.g., erosion) from exempt activities.

- **Buffer zones.** There is a lack of consistent protection for the buffer zone (a 100-foot area bordering vegetated wetlands). Some conservation commissions make buffer areas jurisdictional under local wetland bylaw authority, but most do not have sufficient authority to protect buffers.

Increase education and training for local conservation commissions. Commissions, for the most part, are composed of citizens who need to be trained and educated on wetland issues in order to effectively enforce town bylaws. Review participants estimated that it takes new commissioners one to two years to "come up to speed" on town conservation matters, which is often difficult to achieve with high turnover rates. Given the degree of power the commissions hold to protect wetlands within each municipality, it is critical to have a trained conservation commission staff to help properly and effectively implement state and local wetland laws, especially as wetland regulations become more complex. Participants noted the increased efficiency of town-state interactions regarding wetland cases when conservation commissions have a professional conservation agent.

- **Survey of conservation commissions reveals gaps and needs.** UMass Extension, in cooperation with MACC and the Citizen Planners Training Collaborative, in anticipation of developing a technology-based land-use education program, surveyed almost 1,000 members of local planning boards, zoning boards, and conservation commissions across the state. The response rate for conservation commissioners was over 60 percent. The responses revealed some interesting challenges:
  - » 35 percent of conservation commissions have open seats and 28 percent of those have two or more seats open.
  - » 46 percent of commissioners indicated difficulty in finding people willing to serve.
  - » 15 percent reported that they have no members with expertise or experience relevant for the technical review of projects before their commissions.
  - » 15 percent reported that their commission has little or no understanding of key Wetlands Protection Act concepts and 11 percent reported they had little or no understanding of enforcement options available under the act.
  - » 27 percent of commissions report that they have little or no access to staff and rely on commission members for technical review and ensuring that proposed projects meet the regulatory requirements of the Wetlands Protection Act.
- **Targeted training.** Review participants recommended that several groups of people be provided with training in addition to conservation commission members: town attorneys, real estate agents, and selectmen were all noted as potential audiences. Town attorneys usually have broad knowledge due to the wide array of cases they litigate but are often are not well versed in environmental laws. Real estate agents are "on the front line" when it comes to developing land and an effort to help them understand the wetland regulations may help reduce illegal fill

Figure 16. NRCS provided funding to replace an undersized culvert with a new box culvert, restoring 65 acres of Sesuit Creek salt marsh in Dennis, Massachusetts. *Source: NRCS, 2008b.*

activity. Lastly, boards of selectmen are responsible for appointing conservation commissioners and therefore could benefit from a better understanding of the technical knowledge needed by those whom they appoint.

- **User-friendly guidance documents.** Participants mentioned several potential methods for training conservation commissioners including websites and webinars, but noted that these online resources are not always user-friendly. Some noted it would be very useful to have a basic primer and/or summary guidance document that a conservation commissioner could reference whenever there is uncertainty about state regulations and how federal regulations are triggered.
- **Conservation agents.** State regulators noted that towns with local conservation agents (paid professional staff) are more efficient and more likely to write effective and defensible wetland permits than towns without paid staff.
- **Streamline the restoration permitting process.** Participants agreed there is a need to streamline the entire regulatory process for restoration. Massachusetts Wetlands Protection Act and 401 Water Quality Certification regulations include provisions for expedited review of restoration projects (i.e., 310 CMR 10.32(6) and 314 CMR 9.06(8)), but permitting of restoration projects can be delayed by flooding issues, sediment analysis, and completion of design components that were not final when the permit application was filed. Additional recommendations for streamlining permitting while maintaining the same or better protection would be helpful. Restoration grant funding often will not cover the cost of conducting feasibility studies, which are required for permitting.
  - » As a part of this Coastal Wetland Review, EPA Region 1 committed to convening key federal and state agencies to make progress on streamlining permitting for salt marsh restoration.
- **Tidal restrictions.** The analyses required for restoration projects involving tidal restrictions are time-consuming and costly (e.g., MassDEP verifies culvert engineering, NRCS needs approval/sign-off from abutting land owners, and up to five separate wetland permits may be required). The state's strict standards limiting salt marsh alteration can also be a stumbling block, even though restorations are usually designed to improve and increase salt marsh habitat.
  - » Information and data for planned transportation projects are not being shared with the public far enough in advance. It would be helpful to know before the design phase even begins whether tidal restrictions will need to be addressed or if the project could provide an opportunity for redesigning an existing tidal restriction.
  - » The analyses needed to determine if there will be flooding from a restoration project upstream of the structure require a lot of time and money and typically attract a high level of participation from abutting landowners who perceive that their land may be more subject to flooding after removal of a tidal restriction. This type of analysis can often be more expensive than the cost of removing the restriction. Transportation improvement projects could more routinely include the opening of numerous culverts if there were resources and expertise available. Analyses become more complicated in the headwaters of embayments and in tidally restricted salt ponds, where there are not enough tidal gauges to get accurate surface water elevations.
  - » Participants felt that the Federal Emergency Management Agency (FEMA) should be more involved with the tidal restriction restoration program. FEMA's involvement would be beneficial in some of the larger projects including retrofitting old tidal restrictions. Flood zones in coastal areas in Massachusetts may need to be remapped to consider restriction restorations.
  - » The threat of sea level rise complicates restoration projects. The estimates the state is using now (1 to 3 feet by the end of the century) should be translated to more specific projected increases along the coast so that those elevations can be taken into account during project design.
- **Guidance document.** There is a need for a guidance document on removing tidal restriction, similar to the existing guidance document created for dam removal. A point of contact has been established at MassDEP to help address tidal restriction issues, but a simple, step-by-step process and suggested permit conditions would facilitate review and approval of these projects.
  - » There is a need to have expertise available to help expedite the hydrologic studies needed to properly evaluate these projects and ensure there are not adverse effects on the public.
- **Bundling permits.** Larger restoration projects may present

an opportunity to bundle restoration project permits together for concurrent review and a consolidated set of conditions. The Massachusetts Environmental Policy Act has a special expedited review process for particular restoration projects. This process might be used to jointly develop all of the wetland permits required for a restoration project.

» The Army Corps' general permits program has been revised to include restoration activities in category 2 (optional individual permit) provided that they result in net increases of function (Army Corps, 2010). Participants suggested that the concept of a general permit for restoration might be potentially transferable outside of New England.

More cross-program integration. Participants made several suggestions for improving cross-program integration.

- **Regional collaboration.** Participants highlighted the need for collaboration at all levels and with all available parties to arrest the trend in acreage loss and degradation, especially in light of severe constraints on funding and staff resources. As noted in the "Tools and Strategies" section, participants felt that the Southeastern Regional Wetlands Restoration Team is a good model for regional collaboration. It would be useful to convene a group of this type in the northeast regional office, which covers the Boston-area coastline north to the New Hampshire border.
- **Watershed-based management.** The need for watershed-based management approaches is made clear when water diversions and withdrawals from rivers lead to fish kills and other negative ecological impacts. There is a pressing need to consider the impact of upstream activities on downstream resources and manage impacts more comprehensively. Participants felt that this approach would need to be expressly authorized before communities and agencies would begin to use it.
- **Wastewater planning.** Onsite septic systems and cesspools continue to be major sources of nutrient impacts on coastal wetlands.
- **Wetlands as best management practices.** Debate is currently underway within the Massachusetts Estuaries Project to determine whether wetland attenuation of pollution is a tool that should be used as part of a TMDL implementation strategy.

  » Wetlands play an important role in nutrient cycling, and constructed wetlands might be able to attenuate pollution without compromising natural wetland systems.[7] More research is needed to fully understand the nutrient assimilative capacity of constructed wetlands in New England as well as the uptake capacity and associated impacts of nutrients on restored wetland systems (i.e., those with treatment cells or constructed wetlands built anterior to entry of the discharge into the natural wetland).
- **State revolving fund (SRF).** Although participants thought that coastal wetland restoration projects would be eligible for SRF loans because of their potential to improve water quality and habitat, it was noted that, due to other demands for these funds, this would require public and political support.

7 Use of lakes, streams, wetlands, and other waters for treatment of pollution is prohibited (40 CFR 131.10(a))

Conclusion

The North Atlantic coastal wetland review is the third in a series that the EPA Coastal Wetlands Team conducted. The team has gained a greater understanding of coastal wetland loss in the region, including important insights into the causes of these losses. Several themes emerged during the Cape Cod focal watershed review:

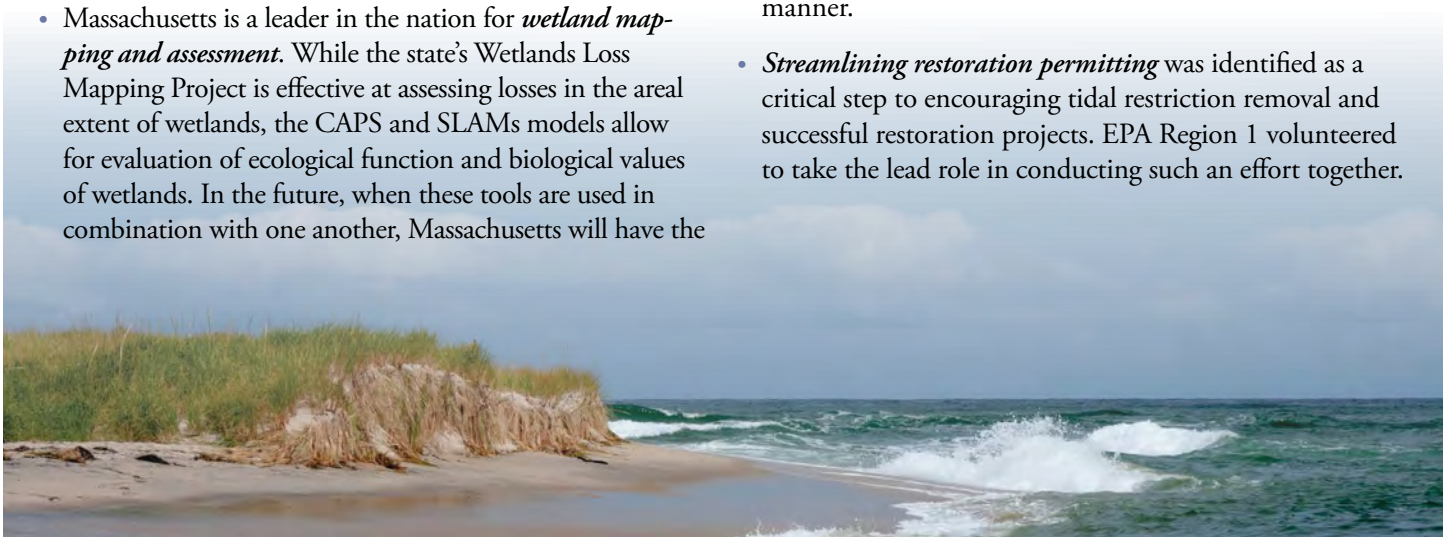
- Development pressures are a growing concern for directly and indirectly causing coastal wetland loss.
- Hydrologic alterations, including dams and tidal restrictions are also major stressors, for which concerted restoration efforts are underway, though much remains to be done.
- Agriculture, specifically cranberry bog activities, continues to be a major source of wetland conversion, although the rate of loss due to this stressor is declining.
- MassDEP's Wetlands Loss Mapping project has proven to be an effective deterrent to wetland losses, and has likely contributed to the approximately two-thirds less wetland loss annually in recent years compared to when the project first started.
- Even with very stringent state and local wetland laws, most of the wetland losses are occurring outside the regulatory programs.
- Wetland mitigation needs to be better monitored and mitigation requirements need to be enforced at the local, state and federal levels of government to avoid losses due to ineffective or non-functional wetland mitigation.

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:

- Massachusetts is a leader in the nation for ***wetland mapping and assessment***. While the state's Wetlands Loss Mapping Project is effective at assessing losses in the areal extent of wetlands, the CAPS and SLAMs models allow for evaluation of ecological function and biological values of wetlands. In the future, when these tools are used in combination with one another, Massachusetts will have the ability to comprehensively assess the status and trends of wetlands in the state including functionality of wetlands.
- Restoring wetlands that have been restricted by structures such as dams and tidal culverts is another practice that could be transferred to other regions, with similar beneficial impacts to coastal wetlands. Massachusetts's ***Dam Removal Guidance*** could be a model for other states, which can modify the guidance as appropriate to address state-specific regulations.
- ***State and local regulatory protection*** of wetlands has existed in Massachusetts and other states of the North Atlantic for more than 50 years. Local conservation commissions are responsible for ensuring that local bylaws are followed and enforced. These commissions have developed local tools and strategies that could be transferable to other states that grant local environmental authority to their counties, cities, or towns.

The participants identified key gaps that need to be filled to reduce the stressors and more effectively use these tools and strategies. Most commonly, they cited the following:

- ***Training of conservation commission*** members necessary in order to ensure that local bylaws are understood and properly enforced. Training, aided by the ***Circuit Rider*** *Program*, has been substantially reduced due to funding cuts.
- Updating the ***WIRe database*** with past permit data and encouraging local communities to use the online system will allow the state to have a robust ***central repository*** of wetland maps and permit data.
- Development of additional ***SLAMs*** for wetland community types such as shrub swamp and emergent so that all wetland types can be assessed in a scientifically sound manner.
- ***Streamlining restoration permitting*** was identified as a critical step to encouraging tidal restriction removal and successful restoration projects. EPA Region 1 volunteered to take the lead role in conducting such an effort together.



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Appendix B: Background Documents

Document Title	Author/Agency (Year)
CONNECTICUT	
Connecticut Coastal Habitat Restoration Programs	CTDEP (2010)
Connecticut	Association of State Wetland Managers (2004)
State Wetland Protection: Status, Trends, and Model Approaches	Environmental Law Institute (2008)
Partners for Fish and Wildlife Program in Connecticut	Private Landowner Network (2006)
Human Impacts on Tidal Wetlands: History and Regulations	Connecticut College (1997)
Brief History	Nonpoint Education for Municipal Officers
Coastal America 10 Year Report	Coastal America Partnership (2001)
Education	CT River Coastal Conservation District
Connecticut Sea Grant	Connecticut Sea Grant (2009)
Tidal Wetland Restoration	CTDEP (2010)
Twenty-Five Years of Tidal Wetland Restoration in Connecticut	Ron Rozsa (2005)
Ocean and Coastal Management in Connecticut	NOAA (2010)
Final Evaluation Findings Connecticut Coastal Management Program: April 2003 through August 2006	NOAA (2007)
MAINE	
Maine's Wetlands	MDEP (2005)
State Wetland Protection: Status, Trends, and Model Approaches	Environmental Law Institute (2008)
Gulf of Maine Coastal Program	U.S. FWS
Maine's Coastal Wetlands	Alison Ward (1999)
S.O.S. Maine: Save Our Shores	S.O.S. Maine (2010)
Protecting Coastal Wetlands	Dave Grant (2003)
Kennebec Estuary Project	The Nature Conservancy (2010)
Maine Coastal Plan	NOAA (2006)
Beginning With Habitat	Beginning With Habitat (2003)
Land For Maine's Future	ME SPO (2006)
Wetland Volunteer Monitoring Programs	EPA (2009)
Online Educational Materials	Maine Geological Survey (2009)
Workshops and Classes	Maine Association of Wetland Scientists (2010)
Salt Marshes in the Gulf of Maine: Human Impacts, Habitat Restoration, and Long-term Change Analysis	Taylor (2008)
Gulf of Main Marine Habitat Primer	Tyrell (2005)

Document Title	Author/Agency (Year)
NEW HAMPSHIRE	
New Hampshire	Association of State Wetland Managers (2009)
Salt Marshes: Restoring New Hampshire's Coastal Wetlands	New Hampshire Coastal Program (2002)
A Land Conservation Plan for New Hampshire's Coastal Watershed	The Nature Conservancy (2010)
Environmental Monitoring	Piscataqua Region Estuaries Partnership (2008)
State Wetland Protection: Status, Trends, and Model Approaches	Environmental Law Institute (2008)
Coastal Program	NHDES
NEW YORK	
Tidal Wetlands	NYDEC (2010)
New York Wetlands Reserve Program	NRCS
New York City Wetlands: Regulatory Gaps and Other Threats	Plan NYC (2009)
Wetlands At Risk	Sierra Club (2005)
New York	Association of State Wetland Managers (2004)
State Wetland Protection: Status, Trends, and Model Approaches	Environmental Law Institute (2008)
Exploring the Estuary: a Teacher's Guide to the New York New Jersey Estuary Region	Harbor Estuary Program (2009)
Focus On…Education	New York Sea Grant
Long Island Sound Coastal Management Program	NYS DOS (2004)
Ocean and Coastal Management in New York	NOAA (2010)
New York City Wetlands: Regulatory Gaps and Other Threats	Plan NYC (2009)
Common Questions: Local Government Wetland Protection Programs	Jon Kusler
Wetlands Status and Trend Analysis of New York State Mid 1980's to Mid 1990's	Huffman & Associates (2000)
Target Ecosystem Characteristics for the Hudson Raritan Estuary: Technical Guidance for Developing a Comprehensive Ecosystem Restoration Plan	Bain, Lodge, Suszkowski, Matuszeski (2007)
RHODE ISLAND	
State Wetland Protection: Status, Trends, and Model Approaches	Environmental Law Institute (2008)
Rhode Island	Surfrider Foundation (2010)
Climate Change and Sea Level Rise	RICRMP (2008)
Rhode Island	U.S. FWS (2001)
Background & Origins of Restoration	Rhode Island Habitat Restoration
Ocean and Coastal Management in Rhode Island	NOAA (2010)
Rhode Island's Salt Pond Region: A Special Area Management Program	RICRMP (1999)
Rhode Island Coastal and Estuarine Land Conservation Plan	RICRMP (2005)
Rhode Island Salt Pond Special Area Management Plan - Case Study	Coastal Portal (2009)
Rhode Island Coastal Wetland Inventory Report	U.S. Army Corps of Engineers (2008)

Document Title	Author/Agency (Year)
MASSACHUSETTS	
State Wetland Protection: Status, Trends, and Model Approaches	Environmental Law Institute (2008)
Protecting Wetlands in Massachusetts	MassDEP
Wetland Loss Maps	MassDEP
Eelgrass	MassDEP
100 Years of Estuarine Marsh Trends in Massachusetts (1893 to 1995): Boston Harbor, Cape Cod, Nantucket, Martha's Vineyard, and the Elizabeth Islands	Carlisle et al. (2006)
Potential Impacts of Sea-Level Rise in Massachusetts	Giese (1997)
A Model of Natural and Man-Induced Changes in Open Freshwater Wetlands on the Massachusetts Coastal Plain	Larson, Mueller, and MacConnell (1980)
Environmental Stress and Recovery: The Geochemical Record of Human Disturbance in New Bedford Harbor and Apponagasett Bay, Massachusetts (USA)	James S. Latimer, Warren S. Boothman, Carol E. Pesch, Gail L. Chmura, Vera Pospelova, Saro Jayaraman (2003)
Survey of Potential Marsh Dieback Sites in Coastal Massachusetts	Smith and Carullo (2007)
Cape Code Salt Marsh Assessment Project: Developing Measures of Conditions	Mass CZM (2004)
Massachusetts Estuaries Project: Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Three Bays, Barnstable, Massachusetts	Howes et al. (2006)
Long Term Consequences of Residual Petroleum on Salt Marsh Grass	Culbertson et al. (2008)
Introduction to the Special Issue: Natural and Anthropogenic Influences on the Mount Hope Bay Ecosystem	Rodney A. Rountree and Daniel G. MacDonald (2006)
Chapter 3: Northeast National Estuary Program Coastal Condition, Massachusetts Bays Program	EPA (2007)
Sea Level Rise Implications: An Action Plan for Buzzards Bay	IEP, Inc.
Estuarine and Marine Habitat From: The Massachusetts Ocean Task Force Technical Report	Mass CZM (2004)
Charting the Course: A Blueprint for the Future of Aquatic Habitat Restoration in Massachusetts	Mass CZM (2008)
Wetland Losses in the Buzzards Bay Watershed	Buzzards Bay
Buzzards Bay	EPA (2010)
Comprehensive Conservation and Management Plan: The 1991 CCMP	Buzzards Bay (1991)
Managing anthropogenic nitrogen inputs to coastal embayments: Technical basis and evaluation of a management strategy adopted for Buzzards Bay.	Costa et al. (1999)
Buzzards Bay: Its Watershed, Living Resources, and Governance	Buzzards Bay National Estuary Program (2010)
Managing Nitrogen Sensitive Embayments	Buzzards Bay
Massachusetts Wetland Monitoring Assessment Project	Lisa Rhodes (2010)
Development of a Comprehensive State Monitoring and Assessment Program for Wetlands in Massachusetts	Jackson, McGarigal, Portante, and Compton (2010)

Document Title	Author/Agency (Year)
Coastal Wetland Resource Areas Under the Wetlands Protection Act	MassDEP
Massachusetts Wetland Monitoring and Assessment	MassDEP
Massachusetts Wetland Monitoring and Assessment Prepared for the Integrated List of Waters (305(b)) Report	Lisa Rhodes (2009)
The Wetlands Protection Act: Fundamentals, Process, and Procedures	MassDEP (2005)
Recent Wetland Trends in Southeastern Massachusetts	Tiner and Zinny (1998)
Wetlands of Cape Cod and the Islands, Massachusetts: Results of the National Wetlands Inventory and Landscape-level Functional Assessment	Tiner (2010)
State of the Bays Report 2004	Massachusetts Bays Program
Massachusetts Year 2008 Integrated List of Waters Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 303(d) and 305(b) of the Clean Water Act	Division of Watershed Management Watershed Planning Program Worcester, Massachusetts (2008)
National Estuary Program: Massachusetts Bays Program Factsheet	Massachusetts Bays Program
MassDEP Wetlands Inventory Maps 329826 and 333826	MassDEP (1993 and 2005)
NEW ENGLAND	
Human Impact on Narragansett Bay	Thomas E. Kutcher
NOAA/USFWS Join Report on Coastal Wetland Trends 1998-2004	Stedman and Dahl (2008)
Coastal Wetland Trends in the Narragansett Bay Estuary During the 20th Century	Tiner et al. (2004)
Rapid Shoreward Encroachment of Salt Marsh Cordgrass in Response to Accelerated Sea-Level Rise	Donnelly and Bertness (2001)
Denitrification in Fringing Salt Marshes of Narragansett Bay, Rhode Island, USA	Davis, J.L. et al. (2004)
Current of Change: Environmental Status and Trends of the Narragansett Bay Region	Narragansett Bay Estuary Program (2009)
Relationships of Nitrogen Loading, Residential Development, and Physical Characteristics with Plant Structure in New England Salt Marshes	Wigand et al. (2003)
Chapter 3: Northeast National Estuary Program Coastal Condition, Narragansett Bay Estuary Program	EPA (2007)
A Scan of Smart Growth Issues in New England	Wallace (2002)
Status and Trends of the Nation's Biological Resources--Northeast	USGS, Porter, Hill
Regional Assessment: Wetland Geographic Information Systems Data Available in the New England States and New York	New England Interstate Water Pollution Control Commission (2006)
Monitoring Nitrogen and indicators of Nitrogen loading to support management action in Buzzards Bay	Costa, J.E., Howes, B.L, Giblin, A.E., and Valiela, I (1992)

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).

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.

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, nonpoint 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

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

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

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

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

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

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/

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

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.

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

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

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

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

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

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/

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

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/