

PECONIC ESTUARY PROGRAM

COMPREHENSIVE CONSERVATION AND MANAGEMENT

PLAN

2020

DRAFT FOR PUBLIC REVIEW

September 25, 2019

Comprehensive Conservation and Management Plan 2020: At a Glance

The Peconic Estuary Program Comprehensive Conservation and Management Plan 2020 is a strategic framework for protecting and restoring the Peconic estuary of eastern Long Island, New York. The bays, beaches, marshes, seagrasses, and other habitats of the Peconic estuary provide food and shelter for a rich diversity of fish, birds, and shellfish, and generate valuable economic and recreational opportunities for people who live, work, and visit on the East End.

Government and non-government partners of the Peconic Estuary Program (PEP) developed the Comprehensive Conservation and Management Plan (CCMP) 2020 by consensus over a two-year period with public input and support from PEP staff. Established in the early 1990s, PEP is dedicated to working locally—in the six towns that surround the Peconic estuary—to find and implement solutions to key environmental challenges.

CCMP 2020 focuses on four Goals:

- Strong Partnerships and Engagement
- Resilient Communities Prepared for Climate Change
- Clean Water
- Healthy Ecosystem with Abundant, Diverse Wildlife

For each **Goal**, PEP's partners identified a set of **Objectives and Actions** (see next page). They will implement the Actions over the next decade to advance toward the long-term Goals and Objectives. The Actions in the CCMP 2020 build on the success of work completed under PEP's previous CCMP released in 2001, and they reflect the changing conditions in the estuary, as well as advances in scientific understanding and technical capabilities brought about in part by PEP's work.

CCMP 2020 marks the start of an exciting **new phase in the estuary program's evolution**, as PEP's partners **refocus and revitalize their collaboration in support of the Peconic estuary ecosystem**. Their collective efforts will enhance quality of life for people on the East End and **boost the local "blue economy" through the 2020s and beyond**.

GOAL: Strong Partnerships and Engagement

OBJECTIVE A: Enhance PEP's organizational structure, operational practices, and financial position to support successful implementation of CCMP Actions
(Overarching Priority Objective)

ACTION 1: Finalize and implement the updated PEP Organizational Plan

ACTION 2: Develop and implement a tracking system for CCMP Actions

ACTION 3: Secure increased funding as part of a final Financial Plan to ensure successful implementation of all CCMP Actions

OBJECTIVE B: Empower local communities to support estuary health, including underrepresented groups (Overarching Priority Objective)

ACTION 4: Increase community members' awareness of the Peconic estuary, key issues relating to **the CCMP's Goals, and PEP as a resource to help them address the issues**

ACTION 5: Involve community members in citizen science programs to cultivate personal connections to the estuary and inspire positive behavioral change to support estuary health

ACTION 6: Conduct outreach events and programs that engage community members in learning about the estuary and taking action to support estuary health

ACTION 7: Incorporate environmental justice considerations into public education and outreach materials and events

GOAL: Resilient Communities Prepared for Climate Change

OBJECTIVE C: Help local communities to take meaningful, well-informed action to prepare for and adapt to climate change impacts in the Peconic estuary

ACTION 8: Incorporate climate change considerations into new and existing projects of PEP and partner organizations, including providing tools and assistance to local governments to mitigate and adapt to the impacts of climate change

ACTION 9: Increase public awareness of anticipated impacts of climate change on the estuary and practical ways to mitigate and prepare for them

ACTION 10: Recognize the sovereignty of the Shinnecock Indian Nation and work with them to implement a Climate Ready Assessment and Action Plan

GOAL: Clean Waters

OBJECTIVE D: Protect areas with clean water from degradation

ACTION 11: Identify areas of good water quality and deliver information that local governments and others can use to protect those areas

OBJECTIVE E: Increase understanding of nitrogen pollution in groundwater and surface water, and decrease negative impacts from historical, current, and future pollution inputs

ACTION 12: Plan science-based approaches for monitoring and reducing nitrogen pollution

ACTION 13: Implement science-based approaches for monitoring and reducing nitrogen pollution

ACTION 14: Facilitate monitoring of harmful algal blooms (HABs) and deliver findings to support management decision making

OBJECTIVE F: Reduce current and future inputs of pathogens, toxics, and plastics into groundwater and surface waters, and minimize their impacts

ACTION 15: Conduct data analysis to understand hydrologic transport of toxic contaminants and implement measures to reduce their impacts

ACTION 16: Expand non-point source subwatershed management plans to all pathogen TMDL and future TMDL waterbodies and continue to use existing plans

ACTION 17: Assess micro- and macro-plastic pollution in the estuary and develop plans to address problems that are found

GOAL: Healthy Ecosystem with Abundant, Diverse Wildlife

OBJECTIVE G: Expand scientific understanding of the estuary ecosystem and deliver information that supports management decision-making

ACTION 18: Conduct studies of ecosystem function and economic valuation of ecosystem services, and updated surveys of rare, protected, and endangered species

ACTION 19: Review previous research and conduct new studies to quantify the impacts of fishing, aquaculture, boating, navigational dredging, and hardened shoreline structures on habitats and vulnerable species, to foster sustainable recreational and commercial uses of the estuary that are compatible with protection of biodiversity

ACTION 20: Facilitate spatial planning of the estuary to help mitigate resource-use conflicts and ensure the protection of critical habitats

OBJECTIVE F: Restore and protect key habitats and species diversity in the estuary and its watershed

ACTION 21: Monitor and protect existing eelgrass beds; where appropriate, restore and expand eelgrass beds

ACTION 22: Use available habitat quality assessment and climate change resiliency tools to prioritize projects identified in the 2017 PEP Habitat Restoration Plan, and implement the top priority projects

ACTION 23: Implement living shoreline projects, monitor for ecological and financial benefits, and use model projects to educate planners and homeowners on the benefits of living shorelines over hardened shorelines

ACTION 24: Review existing wetland and shoreline protection regulations and draft model laws for towns to strengthen protections and increase resiliency to climate change

ACTION 25: Maintain, restore, and enhance viable diadromous fish spawning and maturation habitat in the Peconic estuary watershed

ACTION 26: Protect critical natural resource areas and high-priority lands in the Peconic estuary watershed

ACTION 27: Monitor results of shellfish restoration efforts, share findings, and encourage creation of shellfish spawner sanctuaries

Acknowledgements

Hundreds of individuals and dozens of organizations participated in developing the Peconic Estuary Program Comprehensive Conservation and Management Plan 2020. Their contributions of ideas, information, and recommendations during meetings, workshops, and public comment periods immeasurably strengthened the plan and set the stage for continued successful collaboration to **protect and restore the Peconic estuary. PEP's staff and committee members express their gratitude** for the hard work and dedication of all who participated in the CCMP 2020 development process.

A list of government and non-government partners in the Peconic Estuary Program is available at www.peconicestuary.org.

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INTRODUCTION

Over the past few decades, people of eastern Long Island have witnessed tremendous changes in the Peconic estuary, the expansive network of bays and waterways nestled between the North and South Forks. This ecosystem, where salt and fresh waters mingle, represents the geographic, ecological, and cultural heart of the East End of Long Island. For thousands of years, Native Americans have fished these waters and made their homes on its shores, their culture rooted in the unique natural character of this place. When Europeans settled here, they found fertile land for farming and plentiful fish and shellfish for harvesting. Suburban growth and improved transportation systems brought more residents and visitors to the East End. To this day, each of the towns around the estuary retains its own identity, reflecting its particular characteristics and history.

Through it all, the estuary has been here—remaining the same in some ways, but also changing endlessly with currents, tides, species, and other influences. Today, the Peconic estuary continues to be the local economic engine, supporting fishing, recreation, tourism, and aquaculture. Baymen still earn their livelihood harvesting wild shellfish, increasingly joined by oyster farms as the aquaculture industry expands. Anglers hook bluefish and striped bass, while tourists and locals swim at beaches and explore the waterways in kayaks and paddleboards. Scenic views of the estuary draw homebuyers and vacation renters, and agriculture continues to thrive on the lands that drain into the estuary.

As is often the case, all this activity has placed the Peconic estuary at risk. It is the eternal challenge: how to balance new and traditional uses to reap benefits from nature without overtaxing it. Indeed, worrying signs have appeared in the Peconic, but now—following decades of decline—the health of the estuary has begun to improve in important ways, giving reason for optimism.

River herring and other diadromous fish populations plummeted during the last century as dams and road culverts blocked their migratory routes to freshwater spawning areas. Today, newly built fishways will enable adult fish to swim upstream past dams and their young to swim downstream. As fish numbers increase, the ospreys, eagles, and other animals that feed on them benefit.

The estuary has been severely polluted with excessive nitrogen from fertilizers, septic systems, and other sources. This has led to harmful algal blooms, low dissolved oxygen, and degraded aquatic habitats, but the concerted efforts of many people have brought nitrogen loads down to healthier levels in some parts of the estuary.

Major progress has also been made in protecting the lands that surround the Peconic estuary. More than two thousand acres of the watershed have been protected since 2006. The most significant

source of funding for land protection is the Community Preservation Fund administered by the East End towns, supplemented by county and state governments, and not-for-profit organizations.

Despite those successes and others accomplished through the cooperative, persistent work of numerous organizations and individuals, the Peconic estuary faces critical challenges.

- Nitrogen pollution still plagues many areas, especially the smaller embayments.
- Groundwater carries pollutants such as pesticides, nitrogen, PFOS, PFOA, and pharmaceutical compounds into the estuary.
- Seawalls, bulkheads, and other shoreline structures are constructed at a rapid pace, eliminating vital habitats for many species.
- Although brown tides have not hit the Peconic estuary since the 1990s, other kinds of harmful algal blooms are more frequent.
- Eelgrass beds—which serve as nurseries for scallops and fish—have diminished dramatically and are vulnerable to further decline with climate change.
- Growth of the human population and associated land development are pressuring the ecosystem and habitat connectivity, affecting terrestrial, aquatic, and avian species.
- Although scientific monitoring and research occur in the estuary, ongoing and evolving challenges mean that data gaps need to be filled, accessible reporting of findings is needed, and cohesion among these efforts is crucial for confident management decision making.
- Many people in local communities are not aware of the importance of the estuary and what they can do to support estuary health, particularly non-English speakers and others who are often underrepresented in community outreach efforts.

That’s the bad news. The good news is that the people who live and work on the East End have the power to determine the Peconic estuary’s future. Do they want clean water? A healthy ecosystem with abundant and diverse wildlife? A local “blue economy” that is resilient to climate change?

Resoundingly, the answers are yes, yes, and yes. Local decisions and actions in the coming years will be critical to address the challenges.

From 2017 through 2019, the Peconic Estuary Program (PEP) convened public meetings and **workshops around the watershed to listen to people’s concerns, priorities, and ideas for the estuary.** PEP committees and work groups analyzed scientific information to clarify the problems and potential solutions. Government and non-government partners collaborated to identify a path toward achieving the future that people want for the estuary.

The PEP Comprehensive Conservation and Management Plan (CCMP) 2020 is the product of that hard work. CCMP 2020 presents a collective vision for restoring and maintaining the water quality and

ecological integrity of the Peconic estuary in the face of climate change. Implementing CCMP 2020 will build on the important progress to protect the Peconic estuary over the past two decades (see box) and will help ensure a bright future for the East End—a future with strong estuary-wide partnerships, thriving populations of fish and wildlife, intact habitats, a functioning ecosystem, clean waters, and a robust local economy.

Selected Milestones in Peconic Protection: 2000 to 2019

- Habitat Restoration: Since 2000, more than two dozen projects have restored shorebird habitat, wetlands, grasslands, beaches, shellfish, diadromous fish habitat, and eelgrass beds.
- Vessel Waste No Discharge Zone (2002): Federal designation of the entire Peconic estuary as a Vessel Waste No Discharge Zone protects water quality by prohibiting all untreated or treated discharges from boat toilets.
- Fertilizer Reduction Law (2007): This Suffolk County law decreases nitrogen pollution in the estuary by reducing use of fertilizers in the watershed.
- Total Maximum Daily Load for Nitrogen (2007): New York State established a limit for nitrogen pollution discharges in the watershed, leading to major upgrades in wastewater treatment plants.
- Bullhead Bay Eelgrass Sanctuary (2009): **The sanctuary protects the estuary's** westernmost eelgrass bed, which provides habitat for fish and shellfish.
- Shellfish Restoration (2013): More than one million clams and 500,000 oysters were grown and seeded into the estuary.
- Homeowner Rewards Program (2014): More than thirty homeowners have received funding for sustainable landscaping to help protect water quality.
- Intermunicipal Agreement (2015): PEP and the East End municipalities partnered to reduce stormwater runoff and pollution from septic systems, agricultural and residential fertilizer, groundwater flows, illegal dumping, debris, and boat waste.
- Sewage Treatment Plant Upgrade and Reuse Project (2016): After upgrades to the Riverhead plant, highly treated wastewater is now used to irrigate the Indian Island Golf Course, reducing nitrogen pollution and overall water use.
- Critical Lands Protection Strategy (2004, 2019): The strategy supports coordinated efforts of many partners with more than four thousand acres protected to date.
- Living Shoreline Project (2019): Plantings and construction of a new beach and dune in Greenport provide greater habitat value and resiliency to erosion.

Peconic Estuary: Heart of Long Island’s East End

The Peconic estuary is located at the eastern end of Long Island, New York, approximately 80 miles from New York City. The East End is defined by two long peninsulas—the thirty-mile-long North Fork and the longer South Fork—shaped by the advance and retreat of glaciers some ten thousand years ago. Between the Forks lies the Peconic estuary, where water from streams and aquifers mingles with salty ocean water.

The 250-square-mile estuary comprises Great Peconic Bay, Little Peconic Bay, Gardiners Bay, and a hundred other distinct bays, harbors, and tributaries. Most of the estuary is relatively shallow, **becoming somewhat deeper to the east where it joins Long Island Sound. Altogether, the estuary’s** numerous necks, islands, bluffs, tidal creeks, and marshes have a shoreline totaling more than 450 miles. People use the Peconic River and the bays extensively for recreational boating, swimming, and fishing, and the bays also support commercial fisheries including bay scallop, weakfish, and winter flounder, along with a growing shellfish aquaculture industry.

Nearly two hundred square miles of land drains into the estuary, including areas in the towns of Brookhaven, East Hampton, Southampton, Riverhead, Southold, and Shelter Island and in the villages of Greenport, North Haven, and Sag Harbor. Predominant land uses in the watershed are residential (suburban), recreational (tourism), and agricultural. Some of the lands are protected habitats, including maritime red cedar and maritime oak forests, coastal oak-holly forests, pitch-pine oak, and the rare dwarf pitch-pine plain communities, as well as maritime grasslands and heathlands. The Peconic River—the longest river on Long Island—flows into Flanders Bay at the western end of the Peconic estuary.

Find more information about the geography, ecology, and cultural heritage of the Peconic estuary at peconicestuary.org.



The Peconic Estuary Program Study Area extends from the headwaters of the Peconic River in the west to Block Island Sound between Plum Island and Montauk Point in the east. Darker brown indicates the Peconic estuary's watershed, or the land area that drains into the estuary.

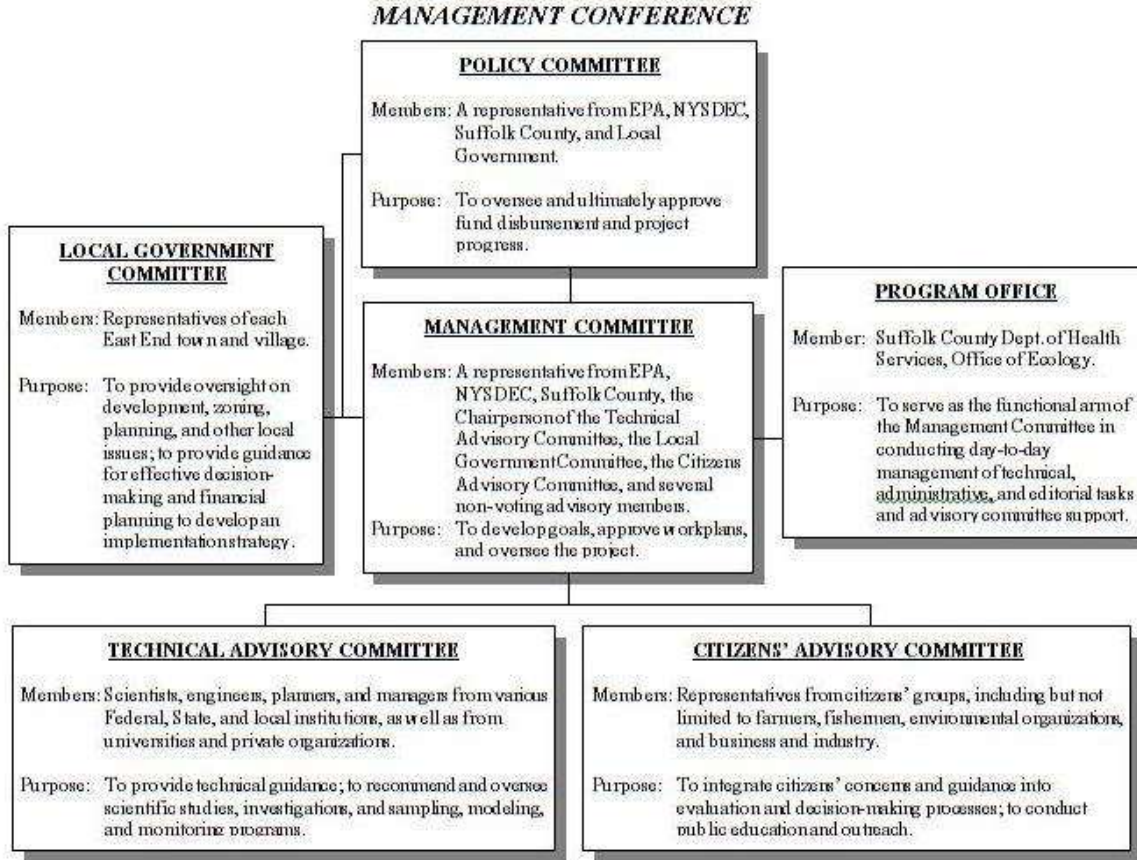
Peconic Estuary Program: A Place-Based Partnership

The [National Estuary Program](#) (NEP) is a voluntary, non-regulatory initiative administered by the US Environmental Protection Agency. It was established in 1987 under the Clean Water Act to restore and maintain the water quality and ecological integrity of estuaries of national significance. Twenty-eight National Estuary Programs have been established nationwide, each unique in its goals, institutional setting, and partners. In overseeing and managing the national program, EPA provides annual funding, national guidance, and technical assistance to the local NEPs. Each NEP hosts locally based, stakeholder-driven programs that are non-regulatory and empower communities to protect, manage, and restore estuaries according to local values and needs.

In 1992, Congress designated the Peconic estuary as an estuary of national significance, leading to creation of the Peconic Estuary Program as a National Estuary Program. PEP is a partnership of towns **and villages, citizens' groups, local and regional non-government organizations, and county, state, and federal government agencies.** The PEP Management Conference consists of the **Citizens' Advisory Committee, Local Government Committee, Management Committee, Policy Committee, Technical Advisory Committee, and Program Office.** **With support and guidance from PEP's director and staff,** the partners collaborate on actions to protect and improve ecosystem health in the Peconic estuary and its watershed.

During 2020, the organizational structure of PEP will be expanded to strengthen the partnership **and enable maximum visibility and effectiveness of the program.** This partnership will be PEP's greatest asset and will facilitate increased funding to carry out the Actions identified in CCMP 2020.

A list of government and non-government partners in the Peconic Estuary Program is available at www.peconicestuary.org.



The PEP Management Conference includes the Citizens' Advisory Committee, Local Government Committee, Management Committee, Policy Committee, Technical Advisory Committee, and Program Office.

Collaborative Planning for the Peconic’s Future

Like the other 27 National Estuary Programs, PEP has a Comprehensive Conservation and Management Plan (CCMP) that serves as its blueprint for addressing locally important environmental issues. Each NEP operates autonomously to develop its CCMP based on scientific information and extensive input from partners and stakeholders. PEP released its first CCMP in 2001. In 2017, PEP initiated a process to revise the CCMP to reflect changing environmental conditions, scientific understanding, conservation concerns, and management priorities.

Throughout the two-year revision process, PEP convened meetings and workshops to reach a diversity of people with an interest in the Peconic estuary and held public comment periods to receive written comments on drafts of the revised CCMP. Members of the Shinnecock Nation, tourism business owners, farmers, aquaculturists, non-profit groups, scientists, resource managers, elected officials, and staff from local, county, and state agencies are among those who contributed their perspectives on priority issues facing the Peconic estuary and potential solutions.

Lighthouse Consulting Group provided support to PEP for organizing and conducting the meetings and workshops. Waterview Consulting supported PEP on writing and editing the CCMP document.

CCMP 2020 Development Process

- 2017: Public Education and Outreach
- 2017–2018: Strategy, Planning, and Initial Draft Outline
- 2018: Stakeholder Workshops and Meetings
- 2018–2019: Initial Draft CCMP 2020
- 2019: Internal Review and Revision
- Public Review and Comment
- Finalization and Submission of CCMP to EPA

Summaries of public comments:

www.peconicestuary.org/protect-the-peconic/the-ccmp-revision

Building on Success and Responding to Change

Participants in the CCMP 2020 planning process identified four Goals:

- **Strong Partnerships and Engagement**
- **Resilient Communities Prepared for Climate Change**
- **Clean Waters**
- **Healthy Ecosystem with Abundant, Diverse Wildlife**

Recognizing that fully attaining the Goals will take decades, CCMP 2020 establishes a framework of **Objectives and Actions to guide PEP’s work over approximately the next ten years. For each Action, Performance Measures** indicate key steps for implementation.

Shifts in Focus: CCMP 2001 to CCMP 2020

While the Goals and Objectives in CCMP 2020 are broadly consistent with CCMP 2001, the Actions in CCMP 2020 reflect changing conditions in the estuary along with new scientific knowledge about environmental issues and solutions. The following are the most noteworthy changes:

- Severe harmful algal blooms (HABs) known as brown tides that occurred in the 1980s and 1990s were a major impetus for establishing PEP. Accordingly, CCMP 2001 placed a strong emphasis on brown tide management. Because brown tides have not happened here since the 1990s while other types of HABs increasingly occur, CCMP 2020 addresses harmful algal blooms (HABs) more broadly.
- CCMP 2001 emphasized reduction of pathogenic and toxic pollutants as the main threats to water quality. A PEP Strategic Planning session in 2013 and subsequent research by an expert working group found that nitrogen has become one of the most important pollutants in the Peconic estuary, particularly nitrogen in groundwater. CCMP 2020 reflects these findings with a greater focus on reduction of nitrogen.
- CCMP 2001 focused on stormwater runoff and sewage treatment plants as key sources of pollution. Because research now shows that groundwater is the leading contributor of pollution to the estuary, CCMP 2020 shifts the focus to addressing pollution from sources such as on-site septic systems and fertilizers.
- **Extensive work by PEP’s partners, including numerous stakeholder meetings and consultations with municipalities, resulted in the Peconic Estuary Program Habitat Restoration Plan released in 2017. CCMP 2020 incorporates goals, objectives, actions from the Habitat Restoration Plan, including priority habitat restoration projects.**

- Climate change was not incorporated into CCMP 2001. In CCMP 2020, climate change resilience is one of the four Goals, and climate change is considered in all aspects of the plan. A 2012 report on climate change adaptation in the Peconic estuary, other related studies, and a recent Climate Ready Assessment informed how climate change was incorporated into CCMP 2020.
- CCMP 2020 calls for a new level of engagement with local communities and municipal governments, where many of the decisions for the estuary are made. PEP wants to work **closely with local governments, citizens’ groups, and NGOs to deliver accurate, useful, science-based information to support local decision-making and action.**

Comparison of CCMP 2001 and CCMP 2020

| CCMP 2001 | CCMP 2020 |
|--|---|
| 1. Overview | CCMP 2020 AT A GLANCE |
| 2. Brown Tide Management Plan | INTRODUCTION |
| 3. Nutrients Management Plan | Peconic Estuary: Heart of Long Island’s East End |
| 4. Habitat and Living Resources Management Plan | Peconic Estuary Program: A Place-Based Partnership |
| 5. Pathogens Management Plan | Collaborative Planning for the Peconic’s Future |
| 6. Toxics Management Plan | Building on Success and Responding to Change |
| 7. Critical Lands Protection Strategy | Planning for Climate Change Is Imperative |
| 8. Public Education and Outreach Management Plan | GOAL: STRONG PARTNERSHIPS AND ENGAGEMENT |
| 9. CCMP Financing | GOAL: RESILIENT COMMUNITIES PREPARED FOR CLIMATE CHANGE |
| 10. Post-CCMP Financing | GOAL: CLEAN WATERS |
| | GOAL: HEALTHY ECOSYSTEM WITH ABUNDANT, DIVERSE WILDLIFE |

Revitalizing PEP for the 2020s

In addition to Goals that focus on clean water, a healthy ecosystem, and climate change resilience, the participants in the CCMP 2020 planning process identified a need for a Goal dedicated to Strong Partnerships and Engagement, with two Overarching Priority Objectives:

- **Enhance PEP’s organizational structure, operational practices, and financial position to support successful implementation of CCMP Actions**
- **Empower local communities to support estuary health, including underrepresented groups**

The Overarching Priority Objectives are cross-cutting and will enhance implementation of the CCMP as a whole. They encompass seven Actions, including producing new organizational and financial plans for PEP, creating a robust tracking system for CCMP Actions, increasing PEP’s financial resources for implementing the CCMP, and strengthening PEP’s engagement with local communities.

These Actions will help to maximize the CCMP’s benefits for the Peconic ecosystem and the people who rely on it.

Planning for Climate Change Is Imperative

Recognizing that climate change is affecting the Peconic estuary now and its impacts will increase far into the future, participants in the CCMP 2020 development process carefully considered how to incorporate climate change into the plan. CCMP 2020 has a Goal focused specifically on climate change resilience, and the topic of climate change is also threaded throughout the entire plan. Climate change influences virtually everything that PEP does. To achieve each Goal, Objective, and Action in the CCMP, PEP recognizes that it is imperative to understand the potential impacts of climate change and adapt accordingly. As new information on climate change becomes available in the coming years, PEP will adjust its Actions as needed to accomplish the CCMP 2020 Objectives.

A Guide to the CCMP

The following chapters present overviews of the four long-term Goals and descriptions of Objectives and Actions. For each Action, a list of Performance Measures indicates specific steps to be accomplished in approximately the next decade. For each Performance Measure, one or more lead partner organizations are listed in alphabetical order; additional partner organizations will often be involved, too.

Anticipated costs for Performance Measures are indicated as follows:

| | |
|----------|---------------------|
| \$ | \$0-\$25,000 |
| \$\$ | \$25,000-\$100,000 |
| \$\$\$ | \$100,000-\$500,000 |
| \$\$\$\$ | \$500,000+ |

ACRONYMS

| | |
|--------|---|
| BMPs | Best Management Practices |
| CCMP | Comprehensive Conservation and Management Plan |
| GIS | Geographic Information System |
| LINAP | Long Island Nitrogen Action Plan |
| NYDOS | New York Department of State |
| NYS | New York State |
| NYSDEC | New York State Department of Environmental Conservation |
| NRCS | Natural Resources Conservation Service |
| PEP | Peconic Estuary Program |
| PEPC | Peconic Estuary Protection Committee |
| SCSWCD | Suffolk County Soil and Water Conservation District |
| USFWS | US Fish and Wildlife Service |
| USGS | US Geological Survey |

GOAL: STRONG PARTNERSHIPS AND ENGAGEMENT

Overview

PEP is truly a partnership effort. The main role of the Program Office is to facilitate collaboration among numerous government bodies and non-government organizations (NGOs) with an interest in **the estuary and its watershed**. **PEP's partners play many different roles in accomplishing the CCMP Actions**, which have been identified and prioritized through consensus.

With CCMP 2020, PEP is rededicating itself to cultivating relationships with new and old partners, focusing particularly on strongly engaging with the local governments and NGOs, as their on-the-ground work influences the estuary most directly. In addition, PEP is re-envisioning its organizational and financial structure and how it operates, including pursuing increased funding and developing a robust tracking system to accomplish the vital work that needs to be done for a healthy estuary.

Engagement with the people who live, work, and recreate in the Peconic estuary and watershed is essential so that they act as stewards in support of estuary health. To enable community members to take action toward improving and maintaining the health of the Peconic estuary, PEP's **education and outreach** efforts focus on helping people answer four main questions:

- Why is the health of the Peconic estuary important to me? (Understanding)
PEP helps individuals understand that the estuary's health matters to them because it fuels the East End's economy and ensures clean beaches and waters for recreational activities, abundant and safe seafood, ecotourism, wildlife, and resilient shorelines that help protect coastal properties. Understanding how people benefit from the estuary motivates community members to be protective of the estuary.
- How do my actions impact the Peconic estuary? (Knowledge)
PEP helps people know about the consequences of their actions for estuarine health. Examples of topics include the effects of cesspools, fertilizers, pet waste, marine debris, toxins, and hardening shorelines. Instilling knowledge about their negative impacts enables community members to avoid behaviors that harm the estuary.
- What can I do to improve the health of the Peconic estuary? (Action)
PEP helps people find solutions and perform positive actions for the estuary. Examples include citizen science programs, Peconic-friendly landscaping, Peconic-friendly boating and fishing, living shorelines, and elevating programs like the Suffolk County Septic Improvement

Program.

By taking action, community members become stewards and bring about changes that ultimately improve the health of the estuary.

- Who is the Peconic Estuary Program?

PEP's programs and outreach activities raise awareness of PEP's role as a resource for the community and as a facilitator for work to protect and restore the Peconic estuary. Community members learn about who we are, what our mission is, what we do, what tools we can provide, how we can work with them, and how we can provide support for community partnerships to benefit the estuary.

The Objectives and Actions for this Goal are cross-cutting. They provide critical support for all of PEP's work toward the other three Goals.

OBJECTIVE A: Enhance PEP's organizational structure, operational practices, and financial position to support successful implementation of CCMP Actions *(Overarching Priority Objective)*

Key Partners: The Peconic Estuary Program Office and voting members of the PEP Management Committee and Policy Committee will lead the Actions toward Objective A, with active involvement of all PEP partners.

ACTION 1: Finalize and implement the updated PEP Organizational Plan

PEP underwent program evaluations by EPA in 2012 and 2017. In both evaluations, EPA noted a **need to reassess PEP's organizational structure. As of fall 2019, PEP is developing an organizational plan** to be added to this CCMP document by adoption of voting members of the Management and Policy Committees by December 2020. An important change in the organizational structure will be ensuring the Management Conference is representative of the Peconic estuary stakeholders.

PERFORMANCE MEASURES

Short-term & Ongoing

- Addition of the updated Organizational Plan to this CCMP document by December 2020 outlining the recommendations adopted by the Policy and Management Committees (\$)

- Implementation of the updated Organizational Plan (\$)

ACTION 2: Develop and implement a tracking system for CCMP Actions

The PEP Program Office and our partner organizations developed the CCMP to be a living document that guides our collective work in the coming years. The Program Office and partners have agreed to be responsible for carrying out the Actions in the CCMP in either leading or supporting roles. In order to do this successfully, PEP needs to develop an accurate and viable tracking system.

PERFORMANCE MEASURES

Short-term & Ongoing

- Workplan developed for each Action, with partners held accountable annually for those Actions that they agreed to carry out (\$)
- Tracking system developed and deployed before one-year anniversary of CCMP's release (\$\$)
- Every CCMP Action updated at least annually in the tracking system (\$\$)

ACTION 3: Secure increased funding as part of a final Financial Plan to ensure successful implementation of all CCMP Actions

The finalization of a Financial Plan as specified in the EPA 2017 Program Evaluation to provide robust funding must be in place for PEP to carry out the CCMP Actions. Recognizing that the Program Office and partner organizations have varying funding streams, PEP will pursue new and expanded initiatives to obtain increased funding in support of CCMP implementation. The funding will support PEP operations and project costs, as agreed on by the Management Committee through the annual workplan.

PERFORMANCE MEASURES

Short-term & Ongoing

- Release of a final Financial Plan by December 2020 that includes potential sources of new and increased funding, as well as a strategic outline to securing such funding (\$)
- Implementation of the Financial Plan (\$)

OBJECTIVE B: Empower local communities to support estuary health, including underrepresented groups (*Overarching Priority Objective*)

PEP employs multiple communication, outreach, and engagement approaches to reach a diversity of local people representing different ages, interests, and socioeconomic backgrounds to enable and inspire them to support estuary health.

Key Partners: Many of the Actions toward Objective B include opportunities for interested organizations to be involved as lead entities or partners; if your organization is interested, please **contact PEP's Program Office. Current leads and partners are listed with Performance Measures** below where applicable.

ACTION 4: Increase community members' awareness of the Peconic estuary, key issues relating **to the CCMP's Goals, and PEP as a resource to help them address the issues**

PEP will cultivate public awareness of the importance of the estuary and key estuary issues and **solutions, as well as raise PEP's public profile as a resource for addressing the issues, by increasing** targeted communications and engagement, including new venues, channels, and events. We will focus on consistent, multi-channel messaging on CCMP goals and issues in a voice that engages and inspires local communities to take action.

PERFORMANCE MEASURES

Short-term & Ongoing

- Outreach to municipal governments (East Hampton, Southampton, Riverhead, Southold, Shelter Island, Brookhaven) and Suffolk County Legislature, including at least one meeting or presentation annually (PEP) (\$)
- **Strategic dissemination of key messages related to PEP's CCMP goals through multiple channels** (e.g., local newspapers, PEP newsletter, PEP website, video production, and social media), with periodic analysis of communication effectiveness and modification as appropriate (PEP) (\$\$)
- Participation in relevant meetings and events of partner organizations (PEP) (\$)
- Creation and installation of permanent exhibit, signage, and outreach materials at Riverhead Aquarium and incorporation of key messages into Peconic River boat tours, conveying PEP's CCMP Goals and providing opportunities for people to take local action (PEP, PEPC, Riverhead Aquarium, Town of Southampton) (\$\$)

- Establishment of biennial public Peconic Estuary Conference, bringing together interested organizations and individuals to share the latest data and information on water quality, habitats and wildlife, and climate change resiliency in the Peconic estuary and to foster partnerships and engagement around addressing those issues (PEP) (\$\$\$)
- Production of State of the Peconic Estuary Report every four years with updates every two years and release at biennial Peconic Estuary Conference (PEP) (\$\$\$)
- Strengthened partnership with the Central Pine Barrens Joint Policy and Planning Commission whose area overlaps the watershed of the Peconic River (PEP, Pine Barrens Commission) (\$)
- Strengthened partnerships with other estuary-related programs in the region to share information and collaborate on regional projects and outreach (Long Island Sound Study, Narragansett Bay Estuary Program, PEP, South Shore Estuary Reserve) (\$)

ACTION 5: Involve community members in citizen science programs to cultivate personal connections to the estuary and inspire positive behavioral change to support estuary health

PEP will provide community members with opportunities to learn and carry out scientific data collection methods, leading to increased appreciation for the estuary and understanding of environmental issues and potential solutions.

PERFORMANCE MEASURES

Short-term & Ongoing

- **Increased public participation in PEP's citizen science monitoring programs (i.e., horseshoe crab, terrapin, and alewife), increased visibility for other related citizen science programs, and initiation of new programs for additional species (e.g., otters, birds, invasive species), as needed (Audubon New York, Cornell Cooperative Extension, Long Island Invasive Species Management Area, NYSDEC, PEP, Pine Barrens Commission, Seatuck Environmental Association) (\$\$)**
- Compilation and distribution of information about citizen science monitoring programs in the Peconic watershed through annual reports and online tracking of results when possible (Cornell Cooperative Extension, PEP, Pine Barrens Commission, Seatuck Environmental Association) (\$)
- Collaboration with educators and other community members to translate data from citizen science programs into stories that engage students and the community, and that enable them

to take action to support estuary health (Cornell Cooperative Extension, PEP, Pine Barrens Commission, Seatuck Environmental Association) (\$\$)

- Partnerships with local schools and colleges to integrate citizen science data, information, and activities into curriculum, including continued involvement in the annual Day in the Life of the Peconic Estuary (Brookhaven National Lab, Local School Districts, PEP, Pine Barrens Commission) (\$)

ACTION 6: Conduct outreach events and programs that engage community members in learning about the estuary and taking action to support estuary health

PEP will reach new audiences and strengthen relationships with existing audiences through varied events and programs that engage people to be interested in estuary issues and motivated to participate in addressing them.

PERFORMANCE MEASURES

Short-term & Ongoing

- **Increased participation in the PEP Citizens' Advisory Committee and expanded membership** (e.g., baymen, business owners, industry, local environmental groups) to advocate for program goals and provide input to the Management Committee on public priorities and concerns (PEP) (\$)
- Community members engaged when appropriate in implementation of PEP projects and related science-based events (e.g., salt marsh workshops, living shoreline projects, beach cleanups, educational tours of PEP projects), and in estuary-themed events and activities that are recreational, entertaining, and art based to reach and educate far-removed audiences (e.g., paddling tours, scavenger hunts, competitions, craft events, trivia games, Estuary Day) (Environmental Partners, PEP) (\$\$)
- Increased coordination and collaboration among partners on efficient and unified outreach and messaging on estuary issues (Environmental Partners, PEP) (\$)

ACTION 7: Incorporate environmental justice considerations into public education and outreach materials and events

PEP will expand its efforts to be inclusive of under-represented members of local communities.

PERFORMANCE MEASURES

Short-term & Ongoing

- Outreach and educational materials provided in both English and Spanish (PEP) (\$)
- Outreach venues and scheduling that are accessible to under-represented communities (PEP) (\$)

GOAL: RESILIENT COMMUNITIES PREPARED FOR CLIMATE CHANGE

Overview

The influence of climate change on the Peconic estuary and the communities around it will grow profoundly far into the future, but scientifically informed, proactive efforts can reduce the negative impacts.

Projected changes in precipitation patterns, in particular increases in extreme rain events, will likely cause greater runoff of nutrients and other pollutants from land into the estuary and may also increase atmospheric deposition of pollutants. Rising sea levels are expected to result in increasingly frequent inundation of drinking water wells and septic systems on coastal properties, leading to more nitrogen and pathogens entering groundwater, surface waters, and the estuary. In turn, greater nitrogen loading of the Peconic estuary can be expected to result in more frequent harmful algal blooms, reduced water clarity, and a general degradation of coastal habitats. Excessive pathogens may lead to more frequent closures of bathing beaches and shellfish harvesting areas, while herbicides and pesticides are increasingly being linked to losses of seagrasses and other marine habitats that serve as important feeding and nursery areas for recreationally and commercially important fish species.

As temperatures increase, sea levels rise, and precipitation occurs with increasing intensity, estuarine species and habitats may move or change. Where there is significant coastal development and shoreline hardening, important habitats such as salt marshes could be blocked from migrating landward as sea levels rise. Changes in air and water temperatures may lead to shifts in the relative abundance of fish and other estuarine species. Species once thought to be more southerly or warm-adapted may become more common, while those adapted to cooler climatic conditions may decline. Ocean and coastal acidification due to increased atmospheric carbon dioxide could negatively affect **shell-building creatures and many other types of estuarine life. The dynamic nature of the estuary's** natural resources will require protection of critical habitats both where they exist today and where they may exist in the future.

Completed in 2019, the Peconic Estuary Program Climate Vulnerability Assessment and Action Plan, as well as other scientific resources, informed the CCMP 2020 development process. This chapter

presents Objectives and Actions to help PEP and local communities prepare for climate change and to be resilient to its impacts.

OBJECTIVE C: Help local communities to take meaningful, well-informed action to prepare for and adapt to climate change impacts in the Peconic estuary

The Peconic Estuary Program completed an update to the Peconic Estuary Critical Lands Protection Strategy and conducted a risk-based climate change vulnerability assessment to develop **an Adaptation Action Plan consistent with USEPA's Climate Ready Estuaries Program. The resulting Climate Adaptation Action Plan identified the tasks presented below to foster resilient estuary communities prepared for climate change.**

Key Partners: Lead entities and partner organizations for Objective C Actions are listed with Performance Measures below. Additional partners may be added over time.

ACTION 8: Incorporate climate change considerations into new and existing projects of PEP and partner organizations, including providing tools and assistance to local government to mitigate and adapt to the impacts of climate change

PEP and partner organizations, including local governments, need to (1) identify approaches that are environmentally sustainable and protective of Peconic estuarine resources and (2) prioritize projects, considering all aspects of habitat restoration and water quality improvement, that will remain viable into the future with anticipated changing coastal conditions related to climate change. Comprehensive plans in municipalities around the Peconic estuary need to incorporate the potential impacts of climate change on human communities and natural resources, and to align cohesively with other municipal comprehensive plans around the estuary.

PERFORMANCE MEASURES

Short-term

- Implementation of Actions and Strategies of the Peconic Estuary Climate Ready Action Plan (Municipalities, NYSDEC, Suffolk County) (\$\$)
- Incorporation of the Peconic Estuary Critical Lands Protection Strategy into current, planned, and future projects (Municipalities, NYSDEC, Peconic Land Trust, Suffolk County) (\$\$\$\$)

- Plans for local implementation of zoning and other land use tools in The Climate Adaptation Toolbox for Land Use and Municipal Planning identified in the Climate Ready Action Plan (Municipalities, PEP) (\$)
- Implementation of actions identified in the Peconic Estuary Water Quality Monitoring Assessment (Cornell Cooperative Extension, Long Island Farm Bureau, LINAP, Municipalities, NRCS, NYSDEC, USGS, Suffolk County, SCSWCD) (\$\$)
- Use of the Peconic Estuary Solute Transport Model to understand nitrogen transport in groundwater considering climate change (Cornell Cooperative Extension, Long Island Farm Bureau, LINAP, Municipalities, NRCS, NYSDEC, USGS, Suffolk County, SCSWCD) (\$\$)
- Meetings with the New York Ocean Acidification Task Force to monitor and address ocean acidification regionally (NYSDEC) (\$)

Long-term

- Periodic review and updating of the Climate Vulnerability Assessment and Climate Ready Action Plan (Municipalities, NYSDEC, Suffolk County) (\$\$)
- Local implementation of zoning and other land use tools in The Climate Adaptation Toolbox for Land Use and Municipal Planning identified in the Climate Ready Action Plan (Municipalities, PEP) (\$)
- Development of a nitrogen nonpoint source control plan, pathogen nonpoint source control plan, and toxic contamination management plan for the East End towns incorporating information about potential impacts of climate change (Municipalities) (\$)
- Adoption of Climate Smart Community principles across the Peconic estuary watershed (Municipalities, Suffolk County) (\$\$)
- Impacts of climate change incorporated into the identification, monitoring, and modelling of loadings of nitrogen, pathogens, and toxic contaminants (e.g., pesticides, herbicides, hazardous materials, hazardous chemicals) sources (Cornell Cooperative Extension, Long Island Farm Bureau, LINAP, Municipalities, NRCS, NYSDEC, USGS, Suffolk County, SCSWCD) (\$\$)
- Monitoring and review of the health of the Peconic estuary ecosystem, analysis of the outcomes of climate adaptation projects, and adjustments to adaptation and management strategies accordingly (Municipalities, NYSDEC, Suffolk County) (\$\$)

ACTION 9: Increase public awareness of anticipated impacts of climate change on the estuary and practical ways to mitigate and prepare for them

To complement efforts by local governments (Action 8), PEP will help build public awareness and support for climate-ready principles and activities in communities of the Peconic watershed.

PERFORMANCE MEASURES

Short-term

- Public outreach campaign about likely climate change impacts and practical implications for towns and individuals, providing information on climate change, guidance and incentives to use BMPs through targeted outreach, inclusion in school curriculum, and outreach materials (Municipalities, PEPC, Suffolk County) (\$\$)
- Use of climate-ready habitat restoration projects to educate the public on the impacts of climate change and the importance of accommodating natural adaptation of the Peconic estuary ecosystem (Municipalities, PEPC, Suffolk County) (\$\$)

Long-term

- Periodic review and updating of the Outreach and Education strategies identified in the Climate Vulnerability Assessment and Climate Ready Action Plan to ensure strategies are effective, and adjust strategies accordingly (Municipalities, PEPC, Suffolk County) (\$)

ACTION 10: Recognize the sovereignty of the Shinnecock Indian Nation and work with them to implement a Climate Ready Assessment and Action Plan

The Shinnecock Indian Nation is located on the South Fork of eastern Long Island. The Nation was recognized by the federal government on October 1, 2010. Its territory consists of 800 acres of ancestral land adjacent to Southampton that supports homes, community facilities, and businesses, and a pristine woodland called Westwoods in Hampton Bays that serves as a tribal gathering place for spiritual and recreational purposes. **The Nation's lands are particularly vulnerable to sea level rise and major storms and associated flooding, as the 800-acre area is located on a low-lying, south-facing peninsula in Shinnecock Bay, and Westwoods includes beach and bluffs bordering the Peconic Bay.** The Nation is closely tied to the marine and coastal environment; fish and shellfish have been staples of the Shinnecock diet for thousands of years. Additionally, several native coastal plant species, such as sassafras, are used in cultural practices. The Shinnecock Indian Nation has identified climate change-related sea level rise, storm intensification, and water quality issues, such as higher temperature, salinity, and acidification, as potential threats to their lands and lifestyle.

In 2019, the Shinnecock Indian Nation in partnership with the Peconic Estuary Program and the U.S. Environmental Protection Agency (USEPA) Climate Ready Estuaries Program completed a Climate Vulnerability Assessment and Action Plan. During the process of developing this Plan, the Nation identified priority risks and potential actions for various climate change scenarios.

PERFORMANCE MEASURES

Short-term:

- Officially recognition of the Shinnecock Indian Nation as a legal jurisdiction that is reflected in the PEP Management Conference so that climate-ready decision-making can be fully comprehensive of their interests and lands (Shinnecock Indian Nation, PEP Management Conference) (\$)

Long-term and On-going:

- Based on the high risks identified in the Climate Vulnerability Assessment and Action Plan, funding secured and projects implemented that align with PEP objectives including habitat creation and restoration, green infrastructure, land conservation, and education (Shinnecock Indian Nation, USEPA, Local Governments, NYS) (\$-\$\$\$\$)

GOAL: CLEAN WATERS

Overview

Fishing, shellfishing, recreation, and tourism on the East End are closely tied to the Peconic estuary, meaning the estuary's health can affect the local economy. Expansion of land development and population, however, threatens to impair water quality. The most serious issue affecting water quality in the Peconic estuary is excess [nitrogen loading](#), which can cause harmful algal blooms, low dissolved oxygen, and degraded aquatic habitats. [Pathogens](#) and [toxic contaminants](#) also contribute to water pollution in the estuary and can make fish and shellfish unsafe to eat.

Poor water quality is linked to **people's actions on land**. In the Peconic estuary, pollution tends to come from non-point [sources](#) like septic systems and agricultural fertilizer, rather than point sources like sewage treatment plants. The pollution enters groundwater or surface waters, which carry it to the estuary.

- [Excess Nitrogen](#): Nitrogen is a commonly occurring element that is present in air, water, and soil. It is an essential nutrient for healthy ecosystems, supporting growth of algae and aquatic plants, which provide food and habitat for fish, shellfish, and invertebrates. However, excess nitrogen from human activities can cause detrimental impacts such as coastal acidification, harmful algal blooms, low levels of dissolved oxygen in the water, and loss of critical eelgrass and wetland habitats. Over the past two decades, nitrogen pollution has become recognized as one of the the greatest threats to the Peconic estuary. The western part of the estuary is particularly susceptible to nitrogen pollution because of multiple pollution sources and low levels of tidal flushing. Toward the eastern end of the estuary, deeper waters and greater tidal flushing lessen the potential for severe impacts from nitrogen pollution.
- [Harmful Algal Blooms \(HABs\)](#): Some HABs produce toxins that cause severe illness or death in humans, wildlife, or fish. Others do not pose a direct threat to human or animal health but cause poor water quality and foul odors. Decades ago, brown tide plagued the Peconic estuary, but more recently other HABs have been prevalent. Excessive nitrogen entering the estuary from sources such as fertilizer and human and animal waste contributes to HABs.
- [Pathogens](#): Pathogens are viruses, bacteria, fungi, and protozoans that can cause diseases in humans, other animals, or plants. Pathogens responsible for gastroenteritis, salmonellosis, and

hepatitis A are among those that may be found in estuaries. Untreated or partially treated human sewage and wild and domestic animal waste are major pathogen sources. People may become infected through direct contact with or ingestion of contaminated water, or by eating raw or partially cooked bivalve shellfish harvested from contaminated waters. In the Peconic estuary, the New York State Department of Environmental Conservation monitors shellfish harvest areas for pathogens, and the Suffolk County Department of Health Services monitors bathing beaches.

- **Toxic Contaminants:** Toxic contaminants are manmade or naturally occurring substances that, when found in certain concentrations, can cause adverse ecosystem or human health effects. The Peconic estuary system generally has low levels of toxic materials in its water, sediments, and living organisms, when compared to other regional coastal areas. However, the use of pesticides, other industrial and household chemicals, pharmaceuticals, and personal care products can lead to toxic substances entering the environment. Long Island’s **legacy of** agriculture and industry means that groundwater may contains toxic chemicals that were used in the past but are now banned.
- **Plastics:** Plastics in the aquatic environment are of increasing concern because of their persistence and effects on the environment, wildlife, and human health. Plastic pollution typically enters the ocean along the coastline, often delivered by streams and rivers into estuaries, and can eventually accumulate in vast garbage patches at sea. Marine mammals and birds may mistake plastic in the water for food, which can cause bodily damage and lead to starvation, or they may become entangled in the plastic debris. Further, plastic can break down into microscopic pieces that are consumed by marine life and accumulate in the food web.

OBJECTIVE D: Protect areas with clean water from degradation

Some places in the Peconic estuary and watershed currently have good water quality. Establishing protections that will keep those areas from being polluted is critical.

Key Partners: Lead entities and partner organizations for Objective D Actions are listed with Performance Measures below. Additional partners may be added over time.

ACTION 11: Identify areas of good water quality and deliver information that local governments and others can use to protect those areas

PEP and partners will analyze data from water quality monitoring to identify areas of the estuary that currently have clean water and determine whether those areas are adequately protected. They will collaborate with the East End towns and others on effective ways to protect any areas that are not.

PERFORMANCE MEASURES

Short-term & Ongoing

- Identification of areas with good water quality and their current level of protection; findings communicated to local stakeholders and decision makers (PEP, Suffolk County) (\$\$)
- Development of strategies with partners to increase local and regional stewardship of areas of good water quality (PEP) (\$)
- Unimpaired waterbodies kept off of the 303d list (Municipalities, NYS, Suffolk County) (\$-\$\$\$\$)

Long-term

- Model legislation developed collaboratively with Suffolk County and East End towns to use for planning purposes (Municipalities, PEP, Suffolk County) (\$\$)

OBJECTIVE E: Increase understanding of nitrogen pollution in groundwater and surface waters, and decrease negative impacts from legacy, current, and future nitrogen inputs

Nitrogen has been established as the leading nutrient pollutant in the Peconic estuary. Groundwater that seeps into the estuary can carry high loads of nitrogen arising from insufficient **wastewater treatment and/or excess fertilizer. In 2017, Suffolk County labelled nitrogen as “public water enemy number one” and has since launched an ambitious plan to combat nitrogen loading.** New York State under the leadership of the Department of Environmental Conservation has launched the Long Island Nitrogen Action Plan (LINAP), which has led the state in developing plans and creating funding sources for the reduction of nitrogen in our waterways. These two plans converge in the Peconic watershed for a strong, partner-led plan to reduce and abate nitrogen in our watershed while providing access to funding for numerous water quality-related projects for both individual homeowners and local governments. A comprehensive understanding of past nutrient loads within the estuary is essential. Understanding of groundwater pathways and travel times is key to highlighting priority areas and creating strategies for the reduction of historical loads.

In 1992, at the inception of the Peconic Estuary Program, brown tide was a plague in the Peconic region. Since then, a plethora of other types of HABs have emerged. These varying organisms, which affect marine and freshwater systems, have different drivers, and each requires a unique understanding to control them. For many HABs, the driver is related to nitrogen pollution. For that reason, efforts to reduce HABs are intertwined with efforts to lower nitrogen in our waterways. Other HABs are driven, in part, by warming waters as a result of climate change, and some are brought by offshore currents. Extensive work has been carried out by Stony Brook University in the Peconic watershed to understand these variations. Researchers at Stony Brook University, in conjunction with The Nature Conservancy, track HABS in the Peconic estuary on a yearly basis.

Through Actions 11, 12, and 13, PEP and partner organizations will address the issues of nitrogen pollution and harmful algal blooms by using a suite of complementary approaches. Several waterbodies in the Peconics have achieved an increase in water quality or have maintained good water quality over the past two decades, and PEP aims to sustain and enhance that level of quality well into the future. This means providing accurate information to all local governments so everyone is aware and planning boards and others can make informed decisions.

Key Partners: Lead entities and partner organizations for Objective E Actions are listed with Performance Measures below. Additional partners may be added over time.

ACTION 12: Plan science-based approaches for monitoring and reducing nitrogen pollution

PEP and partners will collect and analyze water quality data to identify problem areas, and they will investigate potential solutions.

PERFORMANCE MEASURES

Short-term & Ongoing

- Completion of Peconic Estuary Water Quality Monitoring Strategy (PEP) (\$)
- Completion of the Peconic Estuary Solute Transport Model analysis to understand historical nitrogen loading and to develop management strategies (PEP, USGS) (\$\$\$)
- Completion of BMP cost-analysis study to develop cost-effective subwatershed-specific strategies to achieve target nutrient load reductions (Suffolk County, Local Governments) (\$\$)
- Development of BMPs and recommended regulations for residential and municipal fertilizer application (LINAP, NYSDEC) (\$\$\$)

- Engagement with East End farms to complete the Agricultural Stewardship Plan and to develop BMPs for water-related farming issues (Cornell Cooperative Extension, Long Island Farm Bureau, LINAP, NRCS, Suffolk County, SCSWCD) (\$\$)
- Development of strategies with municipalities and water districts to manage water use, conserve water, and maintain existing and protect future buffers to prevent saltwater intrusion into the groundwater, such as irrigation BMPs that guide the amount and frequency of irrigation (Municipal Water Districts, NYSDEC, Suffolk County Water Authority) (\$\$)

Long-term

- Development of BMPs and model local laws for sustainable landscaping for all six East End towns (Municipalities) (\$\$)

ACTION 13: Implement science-based approaches for monitoring and reducing nitrogen pollution

PEP and partners will use findings from Action 11 and other sources to enable municipalities and property owners to implement solutions to nitrogen pollution such as improved septic treatment systems, ordinances, and innovative nitrogen removal technologies.

PERFORMANCE MEASURES

Short-term & Ongoing

- Progress toward compliance with existing nitrogen TMDL for the western estuary and future nutrient load reduction targets (PEPC, NYSDEC, Local Governments) (\$-\$\$\$\$)
- Initiation of the Suffolk County Subwatersheds Wastewater Plan to abate septic-related current and future nitrogen loading (Suffolk County) (\$\$\$)
- Use of existing legal framework and county and town grant and loan opportunities to assist homeowners in upgrading to Innovative and Alternative On-Site Wastewater Treatment Systems (I/A OWTS) (Suffolk County) (\$\$)
- **Increased funding and expanded outreach for PEP's Homeowner Rewards Program, which provides financial incentives for homeowners to install raingardens, native plantings, and/or rain barrels on their properties that benefit the environment (PEP, EPA) (\$\$)**
- Pilot projects to evaluate innovative technologies and practices (e.g., permeable reactive barriers, bioextraction, living shorelines, hydromodification) and determine their usefulness for reducing impacts of existing contaminated groundwater on the estuary (Municipalities, NYSDEC, Suffolk County) (\$\$\$)

Long-term

- Implementation of the Subwatersheds Wastewater Plan – Phase II (NYS, Suffolk County) (\$\$\$\$)
- Implementation of wastewater re-use initiatives (Greenport, Municipalities, NYS, Shelter Island) (\$\$\$\$)
- Additional lands protected using the Peconic Estuary Critical Lands Protection Strategy as a guide (Municipalities, NYS, Peconic Land Trust, Suffolk County) (cost estimate)
- Completion of a suite of projects using living shorelines, permeable reactive barriers, and bioextraction measures; creation of a guide for public and towns to use these methods; and collaboration with entities to implement the methods (Municipalities, NYS, NY Sea Grant, Suffolk County) (\$\$\$\$)

ACTION 14: Facilitate monitoring of harmful algal blooms (HABs) and deliver findings to support management decision making

PEP and partners will collect key data on HABs and translate the data into information for decision making on a local level.

PERFORMANCE MEASURES

Short-term

- Identification of funding sources to carry out recommendations in the Suffolk County Harmful Algal Bloom Action Plan (PEP) (\$)
- Implementation of the Suffolk County Harmful Algal Bloom Action Plan (PEP, Suffolk County) (\$-\$\$\$)
- Communication of accurate and sound science to local decision makers (PEP, Stony Brook University, Suffolk County) (\$)

Long-term

- Development of a HABs reporting system that streamlines the efforts of partner organizations (PEP, Stony Brook University, Suffolk County) (\$\$)

OBJECTIVE F: Reduce current and future inputs of toxics, pathogens, and plastics into groundwater and surface waters, and minimize their impacts

Some toxic contaminants are well known, while others have been identified only recently. Contaminants newly identified as hazardous to human and ecological health have been found in

Peconic groundwater systems, most notably 1,4-dioxane and perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). While regional studies have linked agricultural herbicides to eelgrass loss, widespread use of pesticides against mosquitoes and ticks has continued throughout the Peconic estuary. In the decades **since PEP's inception, it has become clear that the Peconic estuary is fed by a** complicated network of groundwater pathways and sub-aqueous discharge zones forming a direct link between the health of the estuary and contaminants in groundwater. While groundwater testing for human health and drinking-water wells has continued throughout the watershed, a network of groundwater wells dedicated to supporting estuarine health does not currently exist.

Plastic pollution has long been an eyesore in coastal waterways. Large plastic products such as balloons can maim and kill sea turtles, birds, and marine mammals, while microplastics can accumulate in the bodies of a wide range of estuarine organisms. Recent legislation passed in East Hampton and Southampton prohibiting the intentional release of balloons signals the growing concern of local communities and law makers.

Key Partners: Lead entities and partner organizations for Objective F Actions are listed with Performance Measures below. Additional partners may be added over time.

ACTION 15: Conduct data analysis to understand hydrologic transport of toxic contaminants and implement measures to reduce their impacts

Hydrodynamic modeling will provide new information about the movements of toxic contaminants in the watershed, while a range of practical steps will be taken to reduce inputs and impacts of toxics.

PERFORMANCE MEASURES

Short-term

- Establishment of hydrodynamic modeling of the estuary that links with other relevant models (e.g., solute transport model) (Suffolk County, USGS) (\$\$\$)
- Implementation of Integrated Pest Management Plans and the Suffolk County Agricultural Stewardship Plan (Cornell Cooperative Extension, Suffolk County, SCSWCD) (\$\$)
- Establishment of mosquito breeding surveys and control plans in East End communities, using the East Hampton pilot project as a model (Cornell Cooperative Extension, East Hampton, PEP) (\$)
- Promotion of Stop Throwing Out Pollutants (S.T.O.P.) days (PEP) (\$)

Long-term

- Research into the types, sources, and impacts of toxic contaminants existing in and entering the Peconic estuary and development of recommendations for reducing toxic contamination (National Atmospheric Deposition Monitoring Program, Suffolk County, Suffolk County Water Authority, USGS, Water Districts) (\$-\$\$\$\$)
- Development of sustainable landscaping BMPs and model legislation for municipalities to curb pesticide and herbicide use on residential properties (Municipalities, PEP) (\$\$)
- Development of a marina management plan for the Peconic estuary, using the NYSDEC Marina Operations for Existing Facilities document as a guide (Association of Marine Industries, Municipalities, PEP) (\$\$\$)
- Reduction in pesticide usage in marsh habitat and implementation of alternative pest control methods (East Hampton, Suffolk County) (\$-\$\$)

ACTION 16: Expand non-point source subwatershed management plans to all pathogen TMDL and future TMDL waterbodies and continue to use existing plans

Building on recent subwatershed planning efforts at the county level, PEP and partners will take steps to reduce pollution in the Peconic watershed.

PERFORMANCE MEASURES

Short-term

- Implementation of the Peconic Estuary Intermunicipal Agreement to reduce stormwater runoff and pollution from septic system discharges, agricultural and residential fertilizer, groundwater flows, illegal dumping, floatable debris, and boat waste (Municipalities, PEP) (\$-\$\$\$\$)
- Implementation of the twelve subwatershed plans for the Peconic estuary, which identify cost-effective strategies to help reduce stormwater runoff pollution and improve water quality (Municipalities, PEP) (\$\$\$\$)
- Development of a Quality Assurance Management Plan (QAMP) to enable the future sampling and analysis and reporting of ground and surface water by municipalities for use in NYS, Suffolk County, and East End decision making and management actions (Brookhaven, East Hampton, PEPC, Riverhead, Southold, Shelter Island, Southampton) (\$\$)

- Identification of implemented stormwater management projects and green infrastructure needs for East End towns to guide current and future pathogen management actions (Municipalities, PEPC, Suffolk County) (\$\$)

Long-term

- Updating of pathogen TMDL waterbodies within the Peconic estuary and watershed (NYSDEC, PEP) (\$\$\$)
- Implementation of pathogen TMDL plans (Municipalities, PEP) (\$-\$\$\$\$)
- Reporting and monitoring of vessel pump-out facilities (Municipalities, NYSDEC, PEP) (\$)
- Establishment of an additional FDA-certified lab (EPA, FDA, NYSDEC, PEPC, Suffolk County) (\$\$\$\$)

ACTION 17: Assess micro- and macro-plastic pollution in the estuary and develop plans to address problems that are found

A microplastics assessment will be used to gauge the importance of this type of pollution in the Peconic estuary. Public outreach efforts and local government initiatives will help reduce plastic pollution.

PERFORMANCE MEASURES

Short-term & Ongoing

- Initiation of a microplastics assessment of the Peconic estuary (Local Partners, PEP) (\$\$)
- Deployment, maintenance, and promotion of monofilament fishing line collection receptacles (Marinas, PEP) (\$)
- Annual coastal clean-ups (PEP) (\$)

Long-term

- Development of local government initiatives to reduce plastic pollution (Municipalities) (\$)
- Engagement of local communities with the national Plastic Free Waters Partnership (PEP) (\$)

Clean Waters: Priorities for Research and Monitoring

PEP and partner organizations identified the following priorities for research and monitoring to help achieve the goal of clean waters. While the CCMP Actions will help advance some of these priorities, initiatives by other entities are necessary to fully address them.

- Implement the Peconic Estuary Water Quality Monitoring Strategy
- Produce an annual water quality report to allow for widespread use of the data for planning and targeted clean-up efforts by all partners and local communities
- After completion of the solute transport model currently in development, produce a new hydrodynamic model to link results of the solute transport model and other relevant models, and use the model to understand water dynamics of the Peconic estuary
- More fully understand atmospheric deposition of ammonia to the Peconic estuary watershed and how it affects total nitrogen loads
- Develop better information about mercury deposition by precipitation in the Peconic estuary watershed and its implications for human and ecological health
- Expand pathogen monitoring to include identification of sources on a subwatershed scale to enable the comprehensive management of inputs into the watershed
- Collate and make available information about wastewater outfalls and sources to enable comprehensive management of inputs into the watershed
- Increase understanding of how wildlife management influences pathogen loading, nutrient uptake, and associated impacts on cover crop reduction
- Investigate the impacts of nutrient loading on coastal and ocean acidification and establish a set of tools to help offset negative impacts in the Peconic estuary

GOAL: HEALTHY ECOSYSTEM WITH ABUNDANT, DIVERSE WILDLIFE

Overview

Physical alterations to the estuary and its watershed such as navigational channel dredging, hardening of the shoreline with bulkheads and other erosion control structures, and clearing of land for roads and buildings all harm the habitats and living resources within and around the estuary. At the headwaters of the Peconic River, the sensitive pine barrens ecosystem protects important drainage areas to the aquifer, which eventually outfall into the main estuary system. These alterations, along with pollution and climate change, have led to the loss and degradation of critical habitats such as the pine barrens, eelgrass beds, marshes, and diadromous fish habitat.

Key threats to habitats of the Peconic estuary include the following.

- Development and other human activities have resulted in habitat loss, fragmentation, and degradation, and remaining open space is under increasing development pressure.
- Dams built on streams flowing into the Peconic estuary prevent the movement of diadromous fish into freshwater.
- Invasive species often outcompete native plants and animals, threatening biodiversity and reducing habitat value.
- The interacting effects of rising seas and lack of sediment threaten to drown tidal wetlands and shoreline habitats, especially if they cannot migrate inland due to natural or manmade barriers.
- Nitrogen pollution, warmer water temperatures, and human disturbance are contributing to the loss of eelgrass beds within the Peconic estuary.

Dramatic Declines in Eelgrass Beds and Tidal Wetlands

Once bountiful throughout the Peconic estuary, eelgrass has declined significantly over the last century. In 1930, there were more than 8,700 acres of eelgrass beds in the estuary. In 2014, less than 1,000 acres remained—a decline of more than 85 percent. Aside from a meadow in Bullhead Bay, no eelgrass persists in the Peconic estuary west of Shelter Island. Loss of eelgrass beds affects the many fish and invertebrate species that rely on them for food and shelter.

An eelgrass disease epidemic along the Atlantic seaboard in the 1930s and a series of harmful algal blooms in the Peconic estuary in the 1980s and 1990s were major factors. Globally, seagrasses have decreased dramatically in the last few decades, and climate change is believed to play a major role. Warmer water temperatures stress eelgrass and may render historical locations of eelgrass beds no longer suitable for eelgrass growth. Long-term monitoring in the Peconic estuary indicates that water temperatures in the western section of the estuary no longer fall within the optimal range for eelgrass. Rising sea level is another important climate-related threat to eelgrass survival in locations where seawalls and other types of shoreline hardening make it impossible for eelgrass beds to shift landward to remain in a favorable water depth. In addition, nutrient enrichment, algal blooms, water quality, boating and fishing practices, and shoreline stabilization structures are all collectively affecting the health and extent of eelgrass.

Tidal wetlands are among the most productive and ecologically valuable habitats on earth. Between 1974 and 2005, the Peconic estuary lost approximately ten percent of its vegetated tidal wetlands, with the greatest losses occurring in East Hampton and Shelter Island. Eighty-six marsh complexes, out of 159 identified in the Peconic estuary, have been categorized as at risk. Tidal wetland loss means reduced feeding, breeding, and nursery habitats for waterfowl, wading birds, shorebirds, fish, and invertebrates. It also means a reduction in important ecosystem services, such as sediment retention, nutrient and organic matter recycling, and storm and flood buffering.

Land use activities adjacent to wetlands such as developments, dredging, and hardening of the shoreline have degraded wetland habitats in the estuary. Rising sea levels due to climate change also pose a threat to coastal marshes. In many places, tidal marshes can naturally shift gradually landward when sea level rises. However, future rates of sea level rise may be so rapid that some marshes may drown and disappear because they cannot shift landward quickly enough. Additionally, natural or manmade barriers such as seawalls and roadways may block marshes from migrating inland. Other threats to marsh habitat include excess nitrogen, the introduction of pollutants, and [invasive plants](#) such as *Phragmites* that outcompete native marsh plants.

Restoring Habitat for Diadromous Fish

The Peconic River **and the other streams, creeks, and lakes in the Peconic estuary's watershed** provide critical spawning and maturation habitat for diadromous fish species. Diadromous fish are those that spend part of their life cycle in freshwater and part in the ocean.

In the late 1800s and early 1900s, dams were built on nearly all of Long Island’s freshwater tributaries for grist mills, cranberry bogs, and other industrial uses, and as property line demarcations. These dams cut off historic migratory routes for diadromous fish, namely river herring and American eels, blocking access to hundreds of acres of habitat. Other physical structures such as road culverts can also block access to freshwater habitats. River herring and American eel populations have declined over the past century, in part due to this loss of freshwater habitat.

OBJECTIVE G: Expand scientific understanding of the estuary ecosystem and deliver information that supports management decision-making

Key Partners: Lead entities and partner organizations for Objective G Actions are listed with Performance Measures below. Additional partners may be added over time.

ACTION 18: Conduct studies of ecosystem function and economic valuation of ecosystem services, and updated surveys of rare, protected, and endangered species

An improved understanding of species, habitats, and human activities in the Peconic estuary ecosystem is necessary to inform local decision-making that affects the ecosystem. Updated surveys and strategies for rare, protected, and endangered species and their habitats are needed, along with studies of recreational uses of the estuary. Targeted data analysis and modeling will support an ecosystem-based approach to management.

PERFORMANCE MEASURES

Short-term

- Characterization of the estuarine food web using modelling, and identification of vulnerable species, critical habitat areas, and ecosystem changes through spatial and temporal analysis of estuarine species (NYSDEC, Stony Brook University) (\$\$\$)
- Research to quantify recreational uses of the natural resources in the Peconic estuary and watershed, and to determine economic value of the estuary for recreation (PEP, Suffolk County) (\$\$)
- Compilation of existing data and information to define conservation goals within the watershed (PEP, Pine Barrens Commission) (\$)

Long-term

- Updated data and protection strategies for rare, protected, and endangered species in the estuary and New York State Significant Coastal Fish and Wildlife Habitats (Municipalities, New York Natural Heritage Program, NYSDEC, Pine Barrens Commission, Suffolk County, USFWS) (\$-\$\$\$)
- Expanded research partnerships to facilitate collection of additional data on species and ecological communities in the estuary (Cornell Cooperative Extension, NY Sea Grant, Pine Barrens Commission, Stony Brook University, SCSWCD, USGS) (\$\$\$\$)

ACTION 19: Review previous research and conduct new studies to quantify the impacts of fishing, aquaculture, boating, navigational dredging, and hardened shoreline structures on habitats and vulnerable species, to foster sustainable recreational and commercial uses of the estuary that are compatible with protection of biodiversity

PERFORMANCE MEASURES

Short-term

- Small-scale research studies of local impacts; reports summarizing the results along with relevant findings from studies in other locations (Association of Marine Industries, Baymen, Municipalities, NY Sea Grant, NYSDEC, SCSWCD, Suffolk County) (\$-\$\$\$)

Long-term

- Development of BMPs to reduce negative impacts; communication of BMPs to local stakeholders and decision makers (Association of Marine Industries, Baymen, Municipalities, NY Sea Grant, NYSDEC, SCSWCD, Suffolk County) (\$-\$\$\$)

ACTION 20: Facilitate spatial planning of the estuary to help mitigate resource-use conflicts and ensure the protection of critical habitats

PERFORMANCE MEASURES

Short-term

- Final revised Suffolk County Aquaculture Lease Program Management Plan and Aquaculture Lease Map, using best available science to make ecologically sound decisions (PEP, Suffolk County) (\$\$\$)

- GIS-based map for the watershed that includes information on natural resources and uses of natural resources to support planning decisions in the estuary (Association of Marine Industries, Baymen, LINAP, Municipalities, NYSDEC, Pine Barrens Commission, Suffolk County) (\$)

OBJECTIVE H: Restore and protect key habitats and species diversity in the estuary and its watershed

Key Partners: Lead entities and partner organizations for Objective H Actions are listed with Performance Measures below. Additional partners may be added over time.

ACTION 21: Monitor and protect existing eelgrass beds; where appropriate, restore and expand eelgrass beds

PEP and its partners recently developed a Seagrass Bio-Optical and Habitat Suitability Model to better understand the specific light and temperature requirements for eelgrass in the Peconic estuary. Results from this model will be used to identify potential sites for eelgrass restoration or enhancement. To protect existing eelgrass, BMPs and management areas will be developed and implemented.

PERFORMANCE MEASURES

Short-term & Ongoing

- Identification of sites where eelgrass restoration or enhancement is feasible and sites where water quality improvements could potentially increase habitat suitability for eelgrass, and implementation of projects (Cornell Cooperative Extension, LINAP, Municipalities, NYSDEC, Stony Brook University, The Nature Conservancy) (\$\$\$\$)
- Tracking of changes in eelgrass density and extent (Cornell Cooperative Extension) (\$\$)

Long-term

- BMPs developed for eelgrass protection, such as conservation moorings and other low-impact boating and shellfish harvesting practices (Municipalities, NYSDEC) (\$\$)
- **Collaboration on implementation of New York’s Seagrass Protection Act and toward creation of Seagrass Management Areas with associated Management Plans (Municipalities, NYSDEC) (\$\$\$\$)**

ACTION 22: Use available habitat quality assessment and climate change resiliency tools to prioritize projects identified in the 2017 PEP Habitat Restoration Plan, and implement the top priority projects

Numerous habitat restoration projects were identified in the 2017 Habitat Restoration Plan. The projects largely seek to restore/recreate lost marsh habitat, remove barriers to tidal flow and sediment supply, enhance the habitat by increasing native wetland communities, and allow for natural marsh migration necessitated by rising seas. The prioritization of projects will be updated annually.

PERFORMANCE MEASURES

Short-term

- Prioritization of habitat restoration projects for which completed conceptual designs are available, where such projects are viable; assistance in accessing funding to implement the projects (Municipalities, NYSDEC, Non-Profit Partners, Suffolk County) (\$\$\$\$)

Long-term

- Completed design and construction of suitable habitat restoration projects identified through the short-term Performance Measure (Municipalities, NYSDEC, Suffolk County) (\$\$\$\$)
- Completion of five additional conceptual designs (Municipalities, Suffolk County) (\$\$\$\$)

ACTION 23: Implement living shoreline projects, monitor for ecological and financial benefits, and use model projects to educate planners and homeowners on the benefits of living shorelines over hardened shorelines

Two pilot living shoreline projects have been completed in the Peconic estuary. Post-project monitoring will occur to determine success and benefits. PEP will work with partners to implement additional living shoreline projects and create user-friendly tools for homeowners who want to construct living shorelines on their properties.

PERFORMANCE MEASURES

Short-term

- Dissemination of monitoring results from two pilot living shoreline projects (Cornell Cooperative Extension, Municipalities, NY Sea Grant, NYSDEC, Peconic Land Trust, Suffolk County) (\$\$)
- Identification of additional sites to carry out living shoreline projects (NY Sea Grant, NYSDEC, PEP, Suffolk County) (\$\$\$)

Long-term

- Development of user-friendly living shoreline tools for homeowners (Cornell Cooperative Extension, Municipalities, NY Sea Grant, NYSDEC, Peconic Land Trust, Suffolk County) (\$\$\$)

ACTION 24: Review existing wetland and shoreline protection regulations and draft model laws for towns to strengthen protections and increase resiliency to climate change

NYDOS and NYSDEC have recently created model local laws for towns and villages to increase resilience. PEP will work the East End municipalities to review these model local laws and adapt them to the East End.

PERFORMANCE MEASURE

Short-term

- Meetings with municipalities to develop and share draft model policies (Municipalities, Non-Profit Partners, NY Sea Grant, NYSDEC) (\$)

ACTION 25: Maintain, restore, and enhance viable diadromous fish spawning and maturation habitat in the Peconic estuary watershed

Three diadromous fish connectivity projects are in progress on the Peconic River (Woodhull, Forge and Upper Mills). The completion of those three projects, combined with two connectivity projects that have already been completed, will result in the restoration of three hundred acres of diadromous fish habitat on the Peconic River.

PERFORMANCE MEASURES

Short-term

- Identification of funding for and completion of the Woodhull diadromous fish connectivity project on the Peconic River (NYSDEC, Riverhead, Southampton, Suffolk County) (\$\$\$\$)
- Completion of culvert improvements on Alewife Creek to enhance the largest alewife run on Long Island (Peconic Baykeeper, Seatuck Environmental Association, Southampton, Suffolk County, The Nature Conservancy) (\$\$\$\$)
- Development of an alewife stock assessment and fish pass survey for alewife populations based on existing and new fish pass projects (Academic Partners, Municipalities, Peconic Baykeeper) (\$\$)

Long-term

- Completion of diadromous fish habitat connectivity projects in other areas of the Peconic watershed to restore additional acreage to be determined in the tracking plan of diadromous fish habitat (Municipalities, NYSDEC, Seatuck Environmental Association, Suffolk County) (\$\$\$\$)
- Completion of Forge and Upper Mills diadromous fish connectivity projects on the Peconic River (NYSDEC, Riverhead, Southampton, Suffolk County) (\$\$\$\$)

ACTION 26: Protect critical natural resource areas and high-priority lands in the Peconic estuary watershed

The 2019 Critical Lands Protection Strategy used three classes of criteria to prioritize land parcels (undeveloped, developed, agricultural) for protection: 1) Habitat and Water Quality Protection, 2) Inundation Areas, and 3) Groundwater Protection. The resulting map products can be used by East End municipalities for land-use planning and zoning, and to identify potential developed or agriculture lands that should be targeted for conversion back to a natural state to increase resiliency to climate change. PEP will work with partners to protect the high-priority lands identified in the Critical Lands Protection Strategy and to update the Strategy every three years.

PERFORMANCE MEASURES

Short-term

- Meetings with all relevant partners to discuss Critical Lands Protection Strategy and garner support for implementation (Municipalities, Peconic Land Trust, Pine Barrens Commission) (\$\$\$\$)
- Target for number of protected acres agreed on and incorporated into PEP CCMP tracking system (Municipalities, Peconic Land Trust, Pine Barrens Commission) (\$)

Long-term

- Assistance provided to municipalities in land use planning and conversion of high-priority developed areas back to a natural state (Long Island Farm Bureau, Municipalities, Peconic Land Trust, Pine Barrens Commission, Suffolk County, The Nature Conservancy) (\$\$\$\$)
- Critical Lands Protection Strategy updated every three years (Long Island Farm Bureau, Municipalities, Peconic Land Trust, Suffolk County, The Nature Conservancy) (\$\$)

ACTION 27: Monitor results of shellfish restoration efforts, share findings, and encourage creation of shellfish spawner sanctuaries

Several shellfish restoration efforts are underway in the Peconic estuary, primarily for bay scallops, hard clams, and eastern oysters, all of which are regularly harvested here. Information about the outcomes of these efforts is needed to guide future restoration efforts. Establishing shellfish spawner sanctuaries will help propel shellfish restoration efforts and protect biodiversity.

PERFORMANCE MEASURES

Short Term

- Initiation of stock assessment of bay scallops, eastern oysters, and hard clams in the estuary (Academic Partners, Cornell Cooperative Extension) (\$\$\$)

Long-term

- Dissemination of **information about the estuary’s shellfish resources, restoration efforts, and designation of shellfish spawning sanctuaries** (Cornell Cooperative Extension, Municipalities, NYSDEC) (\$\$\$)
- Collaboration among all PEP partners to develop a marine spatial planning tool for the Peconic estuary (PEP and all partners) (\$\$\$)

Healthy Ecosystem: Priorities for Research and Monitoring

PEP and partner organizations identified the following priorities for research and monitoring to help achieve the goal of a healthy ecosystem with abundant, diverse wildlife. While the CCMP 2020 Actions will help advance some of these priorities, initiatives by other entities are necessary to fully address them.

- Research on eelgrass habitat in the Peconic estuary, including studies of eelgrass traits, population genetics, and groundwater influences on eelgrass health, including potential positive (cooling effect) and negative (pesticide/herbicide) impacts
- Characterization of subaqueous freshwater discharge zones in the Peconic Bays
- Research on the distribution and value of submerged aquatic vegetation (SAV) habitats other than eelgrass, such as widgeon grass (*Ruppia*)
- Monitoring of amounts and types of natural, hardened, and living shorelines in the Peconic estuary, repeated every three to five years, and analyzed for trends in shoreline changes
- Monitoring to track changes in marsh extent and condition, and to evaluate the success of wetland and shoreline restoration projects, based on wetland and shoreline monitoring efforts of New York State (e.g., Unvegetated to Vegetated Marsh Ratio Analysis, Tidal Wetland Rapid Assessments, Protocol for Monitoring Nature-based Shorelines)
- Alewife monitoring for the Peconic estuary to track population status and the success of fish passage projects
- Zooplankton surveys to monitor spatial and temporal trends in abundance of zooplankton taxa
- Annual reporting of alterations in fish communities to detect changes in species abundance and species composition
- Creation of a marine spatial plan for the Peconic Bays that includes establishment of baseline data for conservation goals and assessment of changes over time

APPENDICES

This section contains selected Peconic Estuary Program reports that helped inform the development of the Comprehensive Conservation and Management Plan 2020. Additional reports that are not yet finalized, such as the Organizational Plan, Financial Plan, and Water Quality Monitoring Strategy, will be appended when they become available.

Appendices to be included in initial release of CCMP:

- Habitat Restoration Plan
- Climate Ready Assessment