National Estuary Program (NEP) Success Stories

Barataria-Terrebonne National Estuary Program

Habitat Restoration and Conservation

Grand Isle is Louisiana's biggest and only inhabited barrier island. The forests, back barrier marshes, and sandy beaches of Grand Isle are considered one of the premiere birding destinations in North America.

Restoration efforts have been conducted to restore and enhance bird habitat on the barrier island. BTNEP partnered with The Nature Conservancy for an Arbor Day tree giveaway in Grand Isle. Over 100 trees were planted in the yards of homeowners of this barrier island in the Mississippi Flyway.

BTNEP constructed a shade house at the Nicholls State University Farm to grow out woody species beneficial to Neotropical songbirds utilizing the Mississippi Flyway by establishment on a man-made ridge in Fourchon and Grand Isle. Seeds were collected from trees around the state that were thought to exhibit growth and survival attributes beneficial to growing in coastal restoration sites with highly disturbed soils with high salinity and pH values.

Habitat Restoration

The unparalleled disappearance of Louisiana's coast can only be surmounted by large scale projects accomplished through partnerships that bring together the knowledge and resources necessary to address this overwhelming crisis. BTNEP partnered with several organizations in a multiyear effort entitled "**Maritime Forest Ridge and Marsh Restoration Project."** This project is designed to establish a chenier ridge and adjacent coastal marsh habitats just north of Port Fourchon. The project involved pumping earthen material via hydraulic dredge, and placing this material in shallow open water. The second leg of this project (3,000 feet) was shaped during the spring and summer of 2008 to establish a ridge with sloping sides and flanking marsh habitats. These areas were planted through numerous volunteer events since the site was established including the planting of native herbaceous grasses and wood plants.

Hydrologic Reintroduction

BTNEP supported and engaged in public outreach for the Mississippi River Water Reintroduction in Bayou Lafourche Project, which was a project designed to increase the flow of water from the Mississippi River into Bayou Lafourche. This project protects the drinking water supply for over 300,000 residents and provides wetland restoration.

BTNEP's focus has been working on the re-introduction of Mississippi Water into the bayou to improve water quality by increasing flows from 250 cubic feet per second to 1100 cubic feet per second. BTNEP significantly contributed to the completion of the initial phase of this hydrologic restoration project. The first five miles of the Bayou were dredged, removing sediment that was restricting flows in this stream. This effort helped the southernmost water plant which suffers from periodic increased chloride concentrations due to reduced flow from the Mississippi River on the northern end and the loss of wetlands to the south.

Long Island Sound

Nutrient Reduction

Long Island Sound's watershed is home to almost 9 million people with an area that includes most of Connecticut and portions of New York, Rhode Island, New Hampshire, Massachusetts, and Vermont. Pollutant sources associated with increased urbanization, including sewage treatment plants and stormwater runoff, have discharged excessive levels of nitrogen to the Sound leading to increased algal blooms and decreased dissolved oxygen (DO) levels.

Years of research, monitoring, and modeling helped the Long Island Sound Study (LISS) identify nitrogen sources in the Long Island Sound and levels of nitrogen control necessary to improve DO levels and meet water quality standards. The analysis conducted by the LISS led to the adoption of a 58.5 percent nitrogen reduction target to reduce the extent and duration of hypoxic conditions in the Long Island Sound. Through the TMDL development process, the Connecticut Department of Environmental Protection (CTDEP) and the New York State Department of Environmental Conservation (NYSDEC) were able to incorporate the 58.5 percent nitrogen reduction target into a regulatory and legal framework.

The Clean Water Act (CWA) requires implementation of pollutant load reductions through point source permits issued under the National Pollutant Discharge Elimination System (NPDES) Program. As a result, CTDEP and NYSDEC point source permit writers must develop permit requirements to implement the nitrogen reduction target. Without the TMDL, the nutrient reduction target established by the LISS after years of research and analysis would not have an enforceable implementation mechanism. In addition, the nitrogen TMDL for the Long Island Sound recommends flexible, innovative implementation approaches, including nitrogen trading.

Implementing innovative nitrogen reduction approaches, including nitrogen trading and nitrogen load reallocation under bubble permits, has helped point sources in Connecticut and New York make significant progress toward achieving the 58.5 percent nitrogen reduction goal for 2014. It is anticipated that these improvements, coupled with nitrogen reductions from out-of-basin sources, will improve DO levels and reduce hypoxic conditions in Long Island Sound over time. Stakeholders also benefitted from the TMDL process through increased cost savings while achieving nitrogen reductions, improved water quality for recreation activities important to the regional economy, increased access to funding, and increased local, state, and regional partnerships.

Water Quality Monitoring and Sentinel Monitoring for Climate Change

The Sentinel Monitoring for Climate Change in Long Island Sound Program (sentinel monitoring) is a multidisciplinary scientific approach to provide early warnings of climate change impacts to Long Island Sound (LIS) estuarine and coastal ecosystems, species, and processes to facilitate appropriate and timely management decisions and adaptation responses. These warnings will be based on assessments of climate-related changes indicators and sentinels. The sentinel monitoring is a novel approach in that it combines available regional-scale predictions and climate drivers with local monitoring information to identify candidate sentinels of change.

<u>Barnegat Bay Partnership</u>

Fertilizer ordinance

The BBP supported passage of the Nation's toughest statewide fertilizer ordinance. In support of this effort, the BBP hosted several statewide and regional meetings, including a "fertilizer nutrient management" symposium which featured nationally recognized experts on a variety of critical topics, such as fall application and waterbody buffer width, to reduce nutrient loadings to aquatic ecosystems. The BBP has also supported fertilizer legislation at the local level and promoted fertilizer BMPs to the general public through its participation in the NJDEP's Healthy lawns-Healthy Waters Initiative.

The BBP and its partners supported passage of a soil health ordinance, which requires the State Soil Committee and its partners to establish post-construction infiltration standards to mitigate for soil compaction on all new residential development. Partners feel that this legislation may be as important as the fertilizer regulations in its effect on new construction in reducing nutrient runoff from residential properties.

Albemarle-Pamlico National Estuary Program:

Nitrogen reduction

The agricultural community implemented best management practices (BMPs) such as buffers, contour planting, no-till planting, and creek fencing that resulted in a 42 percent decrease in nitrogen loading to the estuary, exceeding the 30 percent reduction goal called for in the total maximum daily load (TMDL). This reduction, combined with additional point source reductions, resulted in a 27 percent instream nitrogen reduction in the Neuse River just above the estuary.

Indian River Lagoon National Estuary Program:

Algal bloom investigation — A multi-year, multi-million dollar program led by Dr. Charles Jacoby, IRLNEP Program Scientist, will enhance scientific underpinnings for sustainable management of the lagoon through sampling, experimentation and modeling. The efforts of staff from the St. Johns River Water Management District and outside experts are supported by funding from the district and the IRLNEP. The Indian River Lagoon Protection Initiative, which includes the algal bloom investigation, seeks to employ construction, operations, regulations and communication to minimize algal blooms, enhance growth of seagrass and protect the lagoon's diversity.

Wetland restoration: The IRLNEP has supported two efforts to restore damaged wetlands. Brevard's Environmentally Endangered Lands Program leveraged IRLNEP funds to restore an additional 13 acres of marsh at the Pine Island Conservation Area on western Merritt Island. In addition, the IRLNEP's local sponsor, the St. Johns River Water Management District, has partnered with the Merritt Island National Wildlife Refuge, NASA, Canaveral National Seashore, and Volusia and Brevard Mosquito Control Districts to reconnect impounded wetlands in the central and northern IRL and restore ditched marshes along Mosquito Lagoon. Since the early 1990s, 31,146 acres of impounded wetlands have been reconnected or fully restored, and 320 acres of ditched marshes have been rehabilitated. The IRLNEP support represents vital matching funds for grants and stimulus funding.

Hydrologic restoration: The IRLNEP's sponsor, the St. Johns River Water Management District, continues to restore natural flows of water to the Indian River Lagoon (IRL) and the St. Johns River. Recently, Phase 1 of the C-1 Re-diversion Project was completed in the 100-square mile basin of the Melbourne-Tillman Water Control District. This project diverts 28% of the freshwater and associated pollutants away from Turkey Creek and the IRL to treatment wetlands in the upper St. Johns River basin, which is where the

water flowed prior to creation of the water control district's canals. Phase 1 included replacing bottom-opening, radial gates in the primary control structure with top-over gates, installing pumps to move water westward, and changing the water elevation in the canal to 10 feet year-round so that the pumps can function. Phase 2 will create an additional 1,500-acre retention area that will hold up to 35% of the annual discharge. In addition, the Fellsmere Water Management Area in northwest Indian River County is under construction. This project creates a 10,000-acre treatment area and a restored freshwater wetland. The management area will store enough water to reduce the occurrence of freshwater discharges through the C-54 Canal to the St. Sebastian River and IRL from a 1 in 25 year to a 1 in 50 year storm event. Thus, the project virtually eliminates harmful discharges from a large drainage canal while providing additional water for agricultural irrigation and the St. Johns River.

Lower Columbia River Estuary Partnership:

Public involvement and education

The Estuary Partnership is committed to providing hands-on opportunities to students of all backgrounds and includes classroom and field programs for grades K-12, service learning projects for grades 4-12, volunteer projects, and more. The Partnership hosts an annual "Science to Policy" Forum that brings together regional researchers, stakeholders, and policymakers to discuss key regional environmental challenges, such as toxics.

Stormwater management

The Estuary Partnership secured grants to initiate Schoolyard Stormwater Projects at five schools to reduce stormwater run-off; three projects have been completed, engaged corporate partners to design stormwater facilities and outdoor classrooms, and coordinated all permitting and construction. The projects engaged students and contractors in project construction and ongoing maintenance activities. Schoolyard Stormwater projects integrated multiple stormwater focused class visits and field trips with service learning projects in each school's schoolyard.

In 2003, the Partnership developed a web-based field guide to highlight local examples of effective, innovative stormwater management techniques. Web pages include local examples, with methods and contact info, as well as 24 stormwater management technique fact sheets developed by the City of Portland. Stormwater management assistance was provided to help two communities meet federal Phase II stormwater requirements.

Habitat restoration

The Estuary Partnership has funded projects that have restored 16,235 acres of habitat with more than 100 regional partners at 45 sites. These projects have:

- Opened 57.2 miles of stream habitat to fish passage
- Acquired 2516 acres for protection and future restoration
- Reconnected 570 acres of historic floodplain to tidal fluctuation, with dike breaches and tidegate removals
- Secured funding from Council and BPA to support salmon habitat restoration projects.
- Secured six years funding through NOAA 2004-2010 to support restoration projects to benefit multiple marine and anadromous species
- Secured EPA Targeted Watershed grant 2003 for restoration

• Developed an online interactive map, in 2010, to showcase 21 restoration projects and a hard copy publication showcasing 10 restoration projects to demonstrate techniques and lessons learned in restoration funded through the Estuary Partnership
• Planted over 33,000 native trees and shrubs at riparian restoration sites in the Estuary Partnership study area through student service learning projects and weekend volunteer plantings; the majority were along streams listed impaired for temperature

Estuary-friendly landscape education

The Estuary Partnership education projects have provided:
• 130,541 student learning experiences region-wide and 92,312 student contacts through classroom visit programs. Frequently requested classroom lessons include the Stream Table, What is a Watershed, Food Web, and Native and Invasive Plants
• 15,608 student contacts since 2000 in service learning projects. Service learning projects include native tree and shrub plantings, invasive species removals, and schoolyard stormwater projects. Involved over 10,000 citizen volunteers since 2000 in a variety of Estuary Partnership organized volunteer and community projects throughout the study area
• More than 9,800 youth and adults have participated in on-river educational trips since 2001. Trips have taken place on a variety of vessels, including a refurbished tug, jet boats, small canoes, kayaks, and big 34-foot canoes
• Held annual youth summer camps, involving 122 students with partners in lower river communities.
• Delivered summer programs, including on-river programs through Portland Public Schools SUN Schools, Vancouver-Clark Parks and Recreation, Portland Parks, homeschool networks, and Americorps summer programs

San Francisco Estuary Partnership:

Public involvement and education

SFEP uses a variety of media to increase its stakeholders' knowledge of estuary issues and engagement in SFEP activities. Through its Bay Youth for the Environment wetland education program, disadvantaged high school students planted 5,000 native plants in the Yosemite Slough.

Toxics

SFEB collaborated with the San Francisco Estuary Institute (SFEI) to conduct annual water quality monitoring and water quality trends analysis in the SF Bay. SFEP worked with SFEI to develop protocols for surface water quality monitoring, such as its toxicity identification evaluation (TIE) procedures for pyrethroid-caused toxicity. TIE procedures are now routinely used in toxicity testing laboratories throughout California.

Invasives

SFEP completed the Aquatic Invasive Species Early Detection Program that assists watershed volunteer groups in identifying new invasions of aquatic species. The State Aquatic Invasive Species Management Plan provides a framework for responding to aquatic invasive species in California and protecting native plants and animals.

NY-NJ Harbor and Estuary Program:

Public Involvement

HEP promoted the concept of citizen science and helped individuals acquire skills to generate high-quality, credible water quality data. HEP funded a citizen science effort that involved monitoring of pathogen indicators and the program is regarded as a model for future citizen science efforts that can be adopted by other NEPs looking to augment limited monitoring resources.

Toxics

HEP's Toxics Work Group initiated a PCB monitoring project in partnership with the Linden Roselle Sewage Authority in 2001. In 2012, water quality managers identified a significant source of PCBs and remediated the site polluted by those toxic compounds.

Delaware Center for the Inland Bays Estuary Program:

Restoration

CIB produced the very comprehensive and accessible *State of the Inland Bays Report* in 2011 which includes a very useful set of 31 indicators. These indicators can be used to track and report on environmental conditions and to evaluate progress made achieving restoration goals.

Stormwater

CIB and partners constructed wet-swale bioretention areas and a series of infiltration pits along South Pennsylvania Avenue. These retrofits are estimated to have reduced 48 lbs of nitrogen and 7 lbs of phosphorus to date.

Santa Monica Bay Restoration Project:

Habitat Restoration

In 2013, The Bay Foundation and their partners completed the Malibu Lagoon Restoration and Enhancement Project, which restored a wetland that was previously on the USEPA list of impaired water bodies for over a decade due to excess nutrients and low oxygen levels. The Project's core goals included improving the ecological health of the lagoon's system by enhancing habitats for native wildlife, creating several acres of new wetlands, and increasing tidal flushing and water circulation to improve water quality and eliminate the "dead zones" and oxygen-deprived areas. Based on the first two years of a five-year monitoring program, the Project shows that it is on track to meet or exceed the documented criteria for success, with significantly improved water quality and circulation results, and improving condition scores over time. The Lagoon also now functions as nursery habitat for juvenile estuarine fish, and shows a shifting trend from a pre-restoration pollution-tolerant benthic invertebrate community to a more diverse, sensitive invertebrate community.

The Palos Verdes Kelp Forest Restoration Project endeavors to offset the 75% losses of giant kelp communities associated with the Palos Verdes Peninsula. In the past two years over 5,500 hours have been spent reducing sea urchin densities on the shallow rocky reefs, <40 feet in depth, by teams of SCUBA divers including community volunteers and commercial fishermen. Since 2013, 33 acres have been restored crushing 1.4 million sea urchins to enable the natural recruitment and regrowth of the giant kelp forest; the project may encompass more than 150 acres when completed. The ecological response had been direct, giant kelp has returned to the reefs forming a canopy and increases in fish

species richness and biomass have been described. More significantly the remaining sea urchins, valuable to the red sea urchin fishery, are recovering quickly and within 2 years are of value to the fishery, at a modeled benefit of 883% for every unit restored.

Climate Change Impact Assessment and Adaptation Planning

The *Study of Potential Climate Change Impacts on Coastal Wetlands* was funded by EPA via a Climate Ready Estuary grant. In collaboration with researchers from Loyola Marymount University, the study integrated multiple climatic and hydrological models to simulate the impacts of various sea level and precipitation scenarios on future conditions of coastal wetlands in Los Angeles. Notably, the results of these models are being applied to the alternatives in the EIR/EIS for the Ballona Wetlands Ecological Reserve. This 600 acre reserve was purchased in 2003 by the State of California for 130 million. The restoration of this reserve will help offset the 97% loss of coastal wetlands in Los Angeles, and is of importance regionally as a stop-over for the Pacific Flyway. The ecological restoration is being conducted with an expected 3 foot rise in sea level by the end of the century. The contours and other features of the project will allow for the transgression of habitats as the complex experiences greater inundation while providing flood protection for the neighboring communities of Venice and Marina Del Rey.

The SMBNEP helped to convene a partnership of eleven local coastal jurisdictions and organizations to launch the regional AdaptLA Project. Funded by a grant from the State Coastal Conservancy and Coastal Commission, this multi-year project will gather data and model future coastlines. The application of this work is to determine coastal vulnerability to; sea level rise, increase storminess (i.e. increased wave heights and more intense precipitation), in addition to storm surges and ENSO. The outputs of this work are intended to inform coastal municipalities and related agencies via a series of webinars, workshops and outreach to their constituents.

In the coming year, with a grant award from the U.S. EPA, the SMBNEP will install high-precision, high-frequency pH and pCO_2 sensors with project partners. These sensors will gather much-needed non-stop measurements of ocean acidification (OA), helping us understand the intensity and trend of OA in Santa Monica Bay compared to other locations along the West Coast. With this information we can start to explore how OA is affecting the amount, health and distribution of marine life. Lastly, these findings will support further examination as to the need for the continued reduction of nutrients into Santa Monica Bay, from sources such as sewage treatment plants, urban runoff and aerial deposition.

Outreach

The Clean Bay Restaurant Certification Program is a partnership between The Bay Foundation and participating cities to promote storm water pollution prevention through a restaurant certification program. Restaurants get inspected by the cities at least once a year and if they meet 100% of the program requirements they receive a certificate to display in their window and are included in The Bay Foundation's list of certified restaurants. Currently there are seven cities participating in the program; Malibu, Santa Monica, Manhattan Beach, Hermosa Beach, Redondo Beach, Torrance, Rancho Palos Verdes. The Bay Foundation promotes participating cities and certified restaurants through social media, press releases, and on our webpage. There are approximately 400 restaurants currently certified however that number fluctuates with each cities' inspections.

The Boater Education Program was designed to reduce boat generated non-point source pollution by funding and monitoring needed infrastructure e.g. sewerage pumpouts. The program works directly with boat owners, marina and harbor officials and trains volunteers to distribute materials to inform and implement clean boating practices. Several of this year's highlights include:

- In Southern California, 120 new Dockwalker volunteers were trained in non-point pollution prevention techniques and serve as the Boater Program's volunteer base for face-to-face outreach. There are over 500 Dockwalkers statewide who have distributed more than 80,000 Boater Kits since 2000.
- With a grant from California State Parks, a new recreational vessel sewage management guide, "When Nature Calls" was published. This guide will be distributed in Boater Kits and available on line, it provides information on proper boat sewage management.
- The Changing Tide is our eco- friendly boating quarterly, currently distributed to 7,800 readers.
- To decrease the discharge of oily bilge water into waterways, the first bilge pumpout in Southern California will be installed in Oceanside Harbor in 2015.
- Quarterly monitoring of publicly funded vessel sewage pumpouts (76 facilities in Southern California and publication of the results in partnership with San Francisco Estuary Partnership.

Urban Watersheds- Low Impact Development

The Santa Monica Bay NEP has implemented numerous LID and green infrastructure projects that are not only designed to improve water quality, but improve the quality of life in our urban environment by protecting public health, providing much needed green space, and increasing wildlife habitat. Examples of our work include: Westside Neighborhood Park, where the City of Los Angeles has transformed an underutilized utility easement into a multi-benefit project that captures, treats, and reuses all dry- and some wet-weather runoff from a highly urbanized 5,000-acre watershed to irrigate a rehabilitated community park that includes native vegetation, walking paths, and an all-access playground in an underserved area in the Ballona Creek watershed. Torrance Stormwater Basin Enhancements were developed to help the City of Torrance meet multiple TMDLs, including the Santa Monica Bay Beaches wet and dry-weather bacteria TMDLs. This project entailed the construction of two treatment wetlands and two infiltration basins to retain, treat, and infiltrate urban runoff from 1,400 acres. The project includes more than 6-acres of enhanced native habitat along with educational and passive recreational features. Legacy Park, transformed a vacant 15-acre parcel in Malibu's Civic Center, into a multiuse central park that is capable of capturing up to 2.6 million gallons per day of stormwater and dry weather runoff for treatment, disinfection and reuse to help the city comply with bacteria TMDLs. Legacy Park also restored and developed a variety of important native coastal habitats, while creating open space for passive recreation and environmental education.

<u>Puget Sound Partnership:</u>

Public involvement and restoration

Clean Samish Initiative worked with local farmers and dairy owners to implement agricultural best management practices, train local residents to serve as volunteer monitors, educate homeowners about how to effectively maintain septic systems, and use a chemical tracing tool to identify sources of fecal

coliform loadings to Samish Bay. The goal was to re-certify for harvest 4,000 shellfish bed acres that were downgraded in 2008 due to fecal coliform pollution of Samish Bay.

Green Infrastructure

Kitsap County completed nine culvert replacement and habitat restoration projects, which resulted in the conversion of 176 acres of runoff area to a higher level of water quality treatment. Projects included the construction of stormwater facilities, installation of green streets in existing neighborhoods, incorporation of green stormwater systems into transportation and capital facility projects, naturalizing stormwater ponds, and converting grass swales to infiltrate biologically-treated runoff.

Stormwater management

The Puget Sound Partnership, the state Department of Ecology and a consortium of 57 cities and counties – called STORM (Stormwater Outreach for Regional Municipalities), led a successful and significant education and outreach campaign called *Puget Sound Starts Here!* dedicated to improving water quality in Puget Sound and local lakes, rivers and streams. *Puget Sound Starts Here*! mission is to change the behavior of citizens and businesses in ways that make these improvements. The program was launched in 2009.

Invasive species

EPA invested $250,000 to support and implement key recommendations for the Puget Sound region to prevent the introduction of new invasive species as identified in the Invasive Species Council "Invaders at the Gate" Strategic Plan. One project conducted an assessment of the top 15 high priority invasive species in the Puget Sound basin to determine the extent and distribution of these species and to identify current management practices and any gaps in their management.

Tools

The Puget Sound Characterization is a regional-scale tool that highlights the most important areas to protect and restore, and those most suitable for development. The Watershed Characterization project is a collaborative effort between Department of Ecology, the Puget Sound Partnership, and the Washington Department of Fish and Wildlife. The goal of the project is to create a relatively complete watershed characterization for all of Puget Sound that can provide scientific information on which landscape areas and processes are the most important to protect. This new tool can be used by local planners and decision-makers to inform land use planning, policy and permit decisions, and help minimize negative environmental impacts from changes in land uses.

In addition, the Puget Sound Partnership continues to support the development and piloting of innovative compensatory mitigation tools including market-based techniques and other approaches. Two pilot projects were funded to test an in-lieu-fee mitigation program. Individuals, businesses, or other organizations with authorized impacts to wetlands and other habitats may be allowed to pay into a restoration fund instead of completing their own mitigation project. Funds collected through the in-lieu-fee program are used to develop a mitigation site that can provide compensation for multiple impacts. Similar to a mitigation bank, an in-lieu-fee program sells mitigation credits to permit recipients whose obligation to provide compensatory mitigation is then transferred to the sponsor of an approved in-lieu-fee program.

Ecosystem monitoring

The Puget Sound Partnership is building the infrastructure for a coordinated and cooperative ecosystem-monitoring program for the region that assesses status and trends of key environmental indicators; evaluates the effectiveness of major management programs and strategies; and provides data that supports evidence-based decision-making. Cooperators include federal, state and local government agencies.

The ultimate goal of this task is to implement a strategic ecosystem monitoring program that provides the information needed for the many partners working with the PSP to support decision-making through adaptive management, assess progress towards implementation and goals, and assess the effectiveness of actions to restore the health of Puget Sound.

Existing monitoring efforts are the building blocks for a coordinated and integrated monitoring and assessment program. The existing programs include the Puget Sound Assessment and Monitoring Program (PSAMP); a "Stormwater Monitoring" Work Group; as well as other efforts at all levels of government, tribes, business, academia and citizen-science organizations that exist throughout the Puget Sound region.

The assumption for this task is that data collection, management, and analysis at local and regional scales and for individual monitoring topics will be supported by a variety of sources, including grants awarded to Lead Organizations, as well as new, coordinated mechanisms for funding monitoring program elements such as permit requirements.

Charlotte Harbor National Estuary Program:

Non-Point Sources

The CHNEP continues to work with citizens, local governments and partners to identify funding sources for water treatment of impaired neighborhood lakes and ponds. In 2012, CHNEP partnered with Lee County Department of Natural Resources, Lee County PondWatch, Lake Candlewood Association, Caloosa Yacht and Racquet Club, HSA, Inc., and Sarasota County to initiate the development of a stewardship program for neighborhood stormwater ponds. Since 2005, the CHNEP conducts at least one Conservation Landscaping workshop for residents of Hardee and DeSoto counties to introduce homeowners to landscaping techniques.

Living Resources

There is a need for oyster restoration in the Charlotte Harbor National Estuary Program (CHNEP) study area. Based on the limited amount of data available on historic oysters, estimates show a 90 percent loss of oyster habitat in the CHNEP study area. The loss is commonly thought to be a result of dredging, oyster mining for road beds, sedimentation and coastal development, and to a lesser extent commercial harvest. In 2012, the CHNEP in partnership with The Nature Conservancy developed an Oyster Habitat Restoration Plan to provide a technically sound, consensus-based approach for identifying oyster habitat restoration goals, methods, and partnerships for the estuaries within the CHNEP. The plan provides guidelines for native oyster habitat restoration within the CHNEP study area. The plan also provides guidance on permitting, success criteria, monitoring, funding opportunities, and incorporating

community stewardship opportunities into restoration projects. A Restoration Suitability Model (RSM) was developed as part of the plan to help guide future restoration decisions within the CHNEP study area. The RSM uses the best-available GIS data to map the locations of suitable restoration areas. Estimates provide that the CHNEP study area should have 1,000-6,000 acres of oyster habitat under ideal restoration conditions. By 2020, the Program expects to design, implement, and monitor the success of pilot oyster restoration projects in a variety of habitats in 50 percent of the estuary segments. The CHNEP already obtained permits to start its first pilot project during the Fall of 2015.

Climate Change

With EPA Climate Ready Estuaries (CRE) support, CHNEP and partner Southwest FL Regional Planning Council developed an extensive report evaluating comprehensive climate change vulnerabilities in southwest FL using up-to-date, state-of-the-art science information. CHNEP produced a shortened summary document of the vulnerability assessment for a less technical audience. Also with EPA CRE support, CHNEP and Southwest FL Regional Planning Council worked with the City of Punta Gorda to develop a climate change adaptation plan, based on citizen input and communities priorities. Model climate change adaptation language for local governments' comprehensive plans was also developed, as well as a list of climate change environmental indicators and a climate change conceptual ecological model, with input for the CHNEP technical community and partners.

Water Quality

In 2005, CHNEP developed and adopted interim water quality targets for conditions that limit light available for seagrass growth. A target of 25% light at the deep edge of seagrasses was used to determine water quality targets for Color Dissolved Organic Matter, chlorophyll, and turbidity. In 2009, CHNEP refined the targets based on updated field data and modeling tools. Subsequently CHNEP adopted updated seagrass protection and restoration (66,000 acres), water clarity and chlorophyll targets, and is developing associated nitrogen and phosphorus targets. A water clarity evaluation tool was developed which allows assessment of progress towards meeting the water clarity targets.

Coastal Charlotte Harbor Water Quality Monitoring Network

CHNEP coordinates a monthly inter-agency water quality monitoring program throughout the local estuaries. The Coastal Charlotte Harbor Monitoring Network samples 60 randomly selected locations each month for over 25 essential water quality parameters. Field sampling, laboratory analyses, and data entry are cooperatively conducted by FL Department of Environmental Protection, FL Fish and Wildlife Conservation Commission, Charlotte County, Lee County and Cape Coral, with assistance from Southwest FL Water Management District. Data is entered into FL and EPA STORET, analyzed regularly by CHNEP and will soon be available to the public through the web-based CHNEP Water Atlas.

Seagrass

Since 1998, CHNEP partners Southwest and South FL Water Management District have been mapping seagrass acreage every 2 to 3 years using aerial photography. Long and short term trends in seagrass coverage are determined by comparing recent aerials to historic (1950s) black and white photos and 1982 photography from the FL Fish and Wildlife Commission. Current region-wide seagrass extent is over 90% of the original acreage, with localized loses in the Tidal Caloosahatchee River, Matlacha Pass and Estero Bay, primarily due to dredging the Intracoastal Waterway and changes in regulated river

discharges. Since 1999, CHNEP partner FL Department Environmental Protection (Charlotte Harbor and Estero Bay Aquatic Preserves) has been monitoring seagrass species, abundance, and maximum depth of growth along 50 fixed transects throughout the estuaries. Ten year trends show a significant increase in both the abundance and maximum depth of seagrasses throughout the region, especially in Gasparilla Sound and San Carlos Bay.

Seagrass Propeller Scar Mapping

In 1993 and 2003, CHNEP partner FL Fish and Wildlife Conservation Commission conducted low level aerial photography analysis of the extent, location and severity of boat propeller scarring of seagrasses throughout the estuaries in the watershed. Acres of light, moderate, and severe propeller scarring were mapped and quantified. Results showed that Charlotte Harbor is one of the most severely scarred areas in FL and ten year trends show an overall 38% increase in the acres of scarred seagrasses The most impacted areas include the shallows of Charlotte Harbor, Pine Island Sound, Matlacha Pass, San Carlos Bay and Estero Bay. The study emphasizes the need for enhanced boater education, navigation marking, enforcement of boating regulations and the designation of No Internal Combustion Motor Zones (NICMZ) or ""pole and troll"" zones. The results are used by many agencies and organizations to increase propeller scar awareness among boaters.

Stormwater Management

Throughout the CHNEP watershed, partners have implemented a variety of effective urban stormwater management projects. The Southwest FL Regional Planning Council hosted a Managing Wet Weather with Green Infrastructure Workshop in 2009. The South FL Water management District adopted updated stormwater regulations. The City of Fort Myers improved stormwater management, filtration, and habitat along Billy's Creek and in its downtown redevelopment. The City of Punta Gorda incorporated improved stormwater treatment during its recovery from Hurricane Charlie. The Cities of Bonita Springs and Fort Myers beach included extensive filter marches with recent roadway improvement projects, including additional catch basins. The City of Sanibel conducted hydrologic restoration along the Sanibel River, acquired additional conservation lands, and combined their Water Resources Divisions of stormwater, wastewater, and water supply, resulting in a project that uses vacated spray fields for stormwater treatment.

<u>San Juan Bay Estuary Program:</u>

Outreach and Education

Excellent outreach and education such as producing the documentary *Discover Our Coral Reef Trails* to raise coral reef awareness. SJBEP has developed integrated media campaign on TV and in newspapers and has a very active Corp of Volunteers with a list of over 1,500 participants. SJBEP initiated an effort called *Only Rain to the Stormwater* that educates the public about appropriate use of storm sewage collection systems and pollution prevention. SJBEP launched a Stormwater Best Management Practices Media Campaign.

Toxics

Toxics recovery project at Condado Lagoon, which had become a giant cesspool due to high concentrations of fecal coliform SJBEP, worked with partners to eradicate the sewage discharge and

improve water quality. In 2009, the last large-scale infrastructure work done in the area eliminated a sanitary water pump station with a long history of sewage bypass.

Invasive Species

The Capeyut tree (*Melaleuca quinquenervia*), native to the South Pacific, was introduced to Puerto Rico as an ornamental species, becoming one of the most popular species for urban areas over the last decade. The Capeyut tree is known to aggressively invade freshwater herbaceous wetlands outside its natural range, disrupting the ecology of those areas that become infested. This tree species grows very near to each other, eventually displacing shorter native species by blocking available sunlight. Moreover, once the trees have been established, they continuously shed an impressive quantity of leaves and small branches, helping to gradually fill the surrounding wetland in a relatively short period of time by creating an elevated island of litter. The Program enhanced four acres of freshwater wetland by removing 10,000 mature Melaleuca trees in 2009. Approximately, 2,000 seedlings were removed afterwards through four site maintenance visits.

Habitat Restoration

Forty-five artificial reefs structures were deployed in the Condado Lagoon in 2008. This included the creation of the first underwater interpretative trail in the San Juan Bay Estuary and adjacent watersheds. The structures increased fish diversity by 90%. Moreover, approximately 2,500 new coral colonies are growing over the artificial reef surfaces. This project created and enhanced one acre of benthic habitat in the Condado Lagoon.

Shoreline restoration

Approximately four acres of mangrove fringe have been restored in the Condado Lagoon and San Juan Bay through volunteer planting of 2,000 red mangroves seedlings. In addition, the Municipality of Carolina, completed an erosion control project in the Carolina Public Beach. They deployed a series of devices to capture sediments in the water column without affecting the habitat of several species, such as the leatherback turtle. Furthermore, through the planting of 2,000 red mangroves seedlings and the creation of four acres of mangroves forest, SJBEP has created a natural green barrier that will reduce coastal erosion and protect the coast from the effect of sea level rise.

For over ten years, the SJBEP and its partners have been promoting several targeted plantings in the watershed to increase vegetative cover. These include wetland, riparian corridor, and coastal planting projects. For example, during 2008-2011 the SJBEP completed eleven cleanups and fifty-one plantings with the participation of 965 volunteers in areas such as the San José Lagoon, the Condado Lagoon, and the San Juan Bay. A total of 4,760 plants and trees were planted and 15,000 pounds of debris were removed from the ecosystem. This effort included the planting of 200 hundred native trees in riparian areas surrounding major creeks of the SJBE watershed and the planting of 3,500 wetland's native trees in the Cucharillas Marsh, one of the freshwater herbaceous wetland within the SJBE system. In total, approximately 220 acres were enhanced through this effort for the same time period.

<u>Peconic Estuary Program:</u>

Nutrients

PEP completed its system-wide nitrogen TMDL in 2007 and has been involved with its implementation. PEP's current initiatives include an overall nitrogen TMDL implementation assessment and other efforts aimed at nitrogen load assessment and reduction. PEP funded CCE's Agricultural Stewardship Program's Controlled Release Nitrogen Fertilizer pilot project to address nutrient pollution.

Increased fish spawning areas

The PEP is involved with numerous fish passage projects throughout the Peconic Estuary. The Grangebel Park Fish Ladder project in the Town of Riverhead was completed and a significant accomplishment. Nearly 10 years and over $1 million of funding was invested in planning and construction to allow alewives and American eels permanent access to 24 acres of spawning, feeding and rearing habitat previously unreachable by these species. Scoy Pond and Staudinger's Pond Alewife Access and Habitat Enhancement projects in the Town of East Hampton have been selected as one of the 10 "Waters to Watch" for 2011 by The National Fish Habitat Action Plan.

Invasive plants

The PEP has organized and participated in a monitoring and removal program to control the invasive aquatic plant Ludwigia peploides from the Peconic River system. Ludwigia poses a major threat to the Peconic River as it acts as unsuitable fish habitat; out-competes native plants; blocks sunlight to oxygen producing submerged plants; and impedes recreational uses of the river. Populations of this invasive plant were first detected by a local waterfront resident in 2007. Since then numerous stakeholders have come together to eradicate the population of this plant from the Peconic River. From 2008-2012, 13 volunteer "Ludwigia Eradication" events were held where 438 volunteers spent 2360 hours hand pulling 130 cubic yards of the invasive plant. Annual monitoring and periodic maintenance pulls are held to ensure this invasive plant does not re-establish in the Peconic River.

Water quality monitoring

Suffolk County, the hosting agency of the PEP has conducted an extensive surface water quality monitoring program in the Peconic Estuary for over 30 years. Parameters analyzed include total and fecal coliform bacteria, nitrate+nitrite-nitrogen, ammonia-nitrogen, total and dissolved nitrogen, total and dissolved phosphorus, total suspended solids, and chlorophyll-a. Salinity, temperature, dissolved oxygen, and secchi depth measurements are also taken. Harmful algal bloom monitoring is performed for brown tide (*Aureococcus anophagefferens*), *Cochlodinium polykrikoides* (a form of red tide), and Cyanobacteria (a potentially toxic blue-green algae). These monitoring efforts and the extensive data gathered are the centerpiece of many technical investigations and studies performed by both government and university researchers concerning the health of our bays.

<u>Maryland Coastal Bays Program:</u>

Outreach and Public Involvement

MCBP provides a wealth of current scientific information and education materials through newsletters, education TV shows, presentations, water festivals, and the website. The book *Shifting Sands* provides a rich history of the study area. The *Minority Outreach and Involvement Strategy* aims to expand outreach and education efforts to minority populations. MCBP created a Diversity Advisory Committee to increase environmental awareness and promote job training.

Education and Outreach

Through Delmarva City Partners, MCBP annually trained 500 teachers on the physical properties of water, water chemistry and watersheds. MCBP coordinated 50 clean-ups that resulted in the removal of seven tons of trash from the Coastal Bays watershed. MCBP has been an exemplary stewardship program focused on low-income minority students. MCBP partnered with the Maryland Department of Natural Resources and Chesapeake Bay to bring the *Marylanders Grow Oysters* effort to the Coastal Bays watershed.

Shoreline restoration

The Maryland Coastal Bays Program helped organize or fund 12 natural shoreline restoration projects PDE also provided funding to partners in the Schuylkill Action Network for two abandoned mine drainage passive treatment systems in the upper Schuylkill River watershed that had demonstrated effective trapping of sediment and the metals. The work created more than 50 acres of marsh and slowed erosion at the sites(300 lbs/day), to prevent their discharge to streams.

Monitoring

MCBP and partners conducted an Ecosystem Health Assessment in 2004 which compiled and summarized all known chemical, biological and physical conditions of the Coastal Bays. Topics of interest included stream health, water and sediment quality, habitat conditions, HAB levels, and living resources (benthics, fish, shellfish, vegetation). This baseline information allowed targeted goal development for potential SAV acreage, chlorophyll and nutrient concentrations, and water clarity. A Water Quality Index has been approved using these parameters. Additionally, indicators have been chosen for living resources, habitat, stream waters, and land use which are used in an overall Ecosystem Health Index. Subsets of these are used for an annual Coastal Bays Report Card to provide feedback to stakeholders and policy-makers.

Sarasota Bay Estuary Program:

Photo Credit: Cross and Cross Inc.

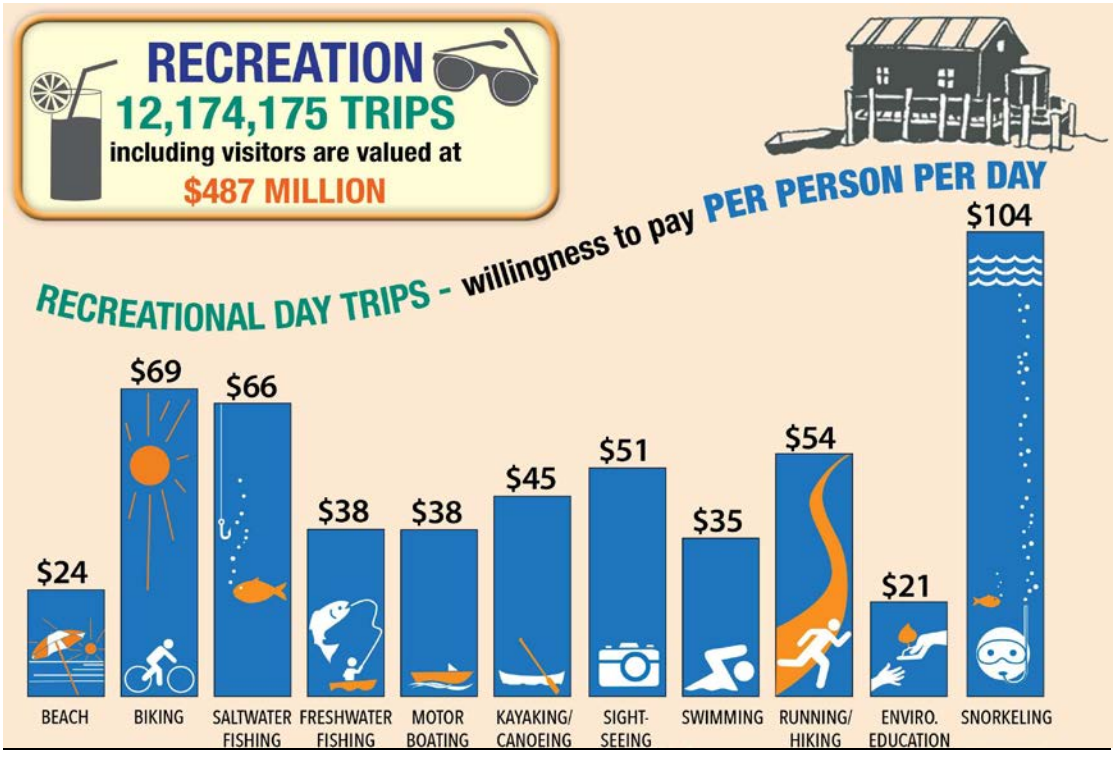

Photo Credit: Cross and Cross, Inc.

Excess Nutrients and Seagrasses

The Sarasota Bay Estuary Program has been instrumental in reducing water pollution throughout the watershed, which resulted in dramatic water quality improvements and a significant increase in seagrass coverage throughout the Bay over the course of the last three decades.

In 1989, nitrogen, the principle pollutant of concern in Sarasota Bay, was 680% above pristine levels. The SBEP led a community effort to reduce nitrogen, which included the removal of 10,000 septic tanks, the consolidation of 19 wastewater plants and the reconstruction of regional storm water systems by 2000. By 2014, the total nitrogen load reduction was estimated at 64%. In May 2015, SBEP partner, the City of Sarasota, ceased discharge resulting in an additional 20% load reduction—approximately 50,000 pounds—in total nitrogen to central Sarasota Bay. The SBEP worked with the City of Sarasota staff and consultants promoting the deep well injection option as a viable alternative to direct discharge, and provided funding for a project with the City addressing positive impacts on the Bay resulting from removal of the discharge. The output of this analysis was presented to the City Commission as a part of the decision making process and expenditure of capital improvement funds.

In response to increasing fertilizer sales and a severe red tide event in 2006, the SBEP supported community efforts to reduce fertilizer usage during the summer months, when excess nutrients are most likely to drain into the Bay. As a result, local governments across the region enacted bans on the application of fertilizer (with nitrogen and phosphorous) during the wet season, possibly resulting in an additional 6% reduction in total nitrogen.

The consistent and successful efforts of SBEP and its partners to reduce water pollution have directly augmented seagrass coverage in the Bay, providing critical habitat that strengthens the Bay ecosystem. Since 1989, seagrass coverage has increased 4,000 acres to levels 29% above 1950 acreage. All segments of the Bay have declining chlorophyll trends; and were delisted as impaired in 2010 by FDEP with the establishment of numeric nutrient criteria (developed and recommended by the SBEP) by EPA for protection in 2012.

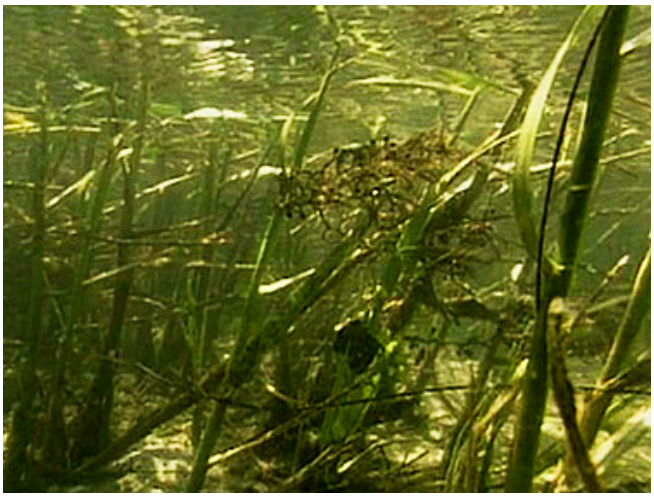

Photo Credit: Sarasota Bay Estuary Program

Habitat Restoration

Since 1993, nearly 70 habitat restoration projects have been completed under the direction of the SBEP, with the participation of many program partners, agencies, conservation groups and volunteers. The SBEP managed two major wetland restoration projects between 2014-15, which were completed with the help of several key partners.

The first project took place at Oscar Sherer Park, an urban State park in south Sarasota County. This project consisted of three unique elements: 1) restoring the shoreline along Lake Osprey, which lies adjacent to the Park's Nature Center and gets the concentration of Park visitors, 2) restoring an isolated wetland and creating new "frog ponds" adjacent to one of the Park's hiking trails, and 3) rehabilitation of Big Lake, an historic borrow pit that needed extensive shoreline and shallow water work to restore habitat for wading birds.

The other major project, completed just this past April, took place at the FISH Preserve in the Village of Cortez, Manatee County. This 100-acre parcel was acquired for its historically important coastal habitats, but had seen a lot of abuse over the decades and was in need of major restoration. Here, SBEP focused on saltwater wetland restoration and creating improved tidal circulation throughout half of the available upland acreage. Extensive native vegetation was planted along the wetland edges and upland islands.

The SBEP has also completed two exciting subtidal habitat projects in the past few years. The first of these is the creation of over four acres of oyster habitat. These oyster reefs took three years to completely build, and now support thriving fish and invertebrate communities. These newly created oyster reefs mimic very closely in form and function natural oyster reefs located nearby.

In 2013, the SBEP rejuvenated its artificial reef program within Sarasota Bay. Nearly a dozen "bay reefs" had sat idle since material was last placed on them in 2004. With the help of Reef Innovations of Sarasota, we designed several new reef modules to attract juvenile gag grouper, which use the bay early in their life cycle. In 2013, several dozen modules- including "deep covers", "Lincoln logs" and "layer cakes"- were deployed at three Sarasota County reefs. Preliminary monitoring of these reefs later that summer observed a variety of pelagic and reef fish using these habitats, as well as highly economically valuable stone crabs. The SBEP's comprehensive study of the Bay's artificial reefs found up to 30 different species of fish and invertebrates utilizing these structures as habitat.

Figure 1. Aerial view of FISH Preserve after excavation and wetland creation. Photo Credit: Sarasota Bay Estuary Program

Figure 2. Shoreline and bird colony island restoration at Big Lake, Oscar Sherer Park in Osprey, FL. Photo Credit: Sarasota Bay Estuary Program

Figure 3. Created oyster reef in Sarasota Bay; three years after initial shell deployment. Photo Credit: Sarasota Bay Estuary Program

Figure 4. Deployment of "deep cover" module at one of the three Sarasota County artificial reefs in Sarasota Bay. Photo Credit: Sarasota Bay Estuary Program

Public Education & Outreach

SBEP's Public Education & Outreach programs build intergenerational awareness of the link between human activity and Bay impacts, as well as the ecological, recreational and economic value of the Bay. In 2014, SBEP managed and funded the development and publication of an Economic Valuation Study, which found that the regional value of Sarasota Bay Estuarine Resources was $57.9 billion, with estuarine-related recreation valued at $487.7 million per year. As recreational uses such as fishing, swimming and wildlife viewing are highly dependent on healthy estuarine ecosystems, the Economic Valuation study is a powerful tool in sending the message that Bay restoration and protection is a sound long-term investment and garnering support for SBEP's restoration work.

Through SBEP's Protection, Involvement, Education & Restoration (PIER) program, K-12 students throughout the Sarasota Bay watershed are given free, hands-on experiential education about the estuary including activities about watersheds, habitats, wildlife, native and non-native plants, stormwater runoff and pollution. The PIER program has reached over 38,000 students since its inception in 2003 and PIER funding was leveraged to serve over 9,700 local students and adults in the 2014-15 school year alone. Through SBEP's Bay Guardians Program, community volunteers contribute to the health of the Bay through hands-on activities including invasive species removal, native plantings and

oyster shell bagging. Almost 500 volunteers participated during the first half of 2015, and successfully removed over 6,000 pounds of invasive species from centrally-located North Water Tower Park, planted 1,000 native dune plants on Siesta Beach, and bagged approximately 25 tons of oyster shell for reefs at Robinson Preserve. Through these hands-on experiences, community members are engaged in creating tangible benefits for the Bay ecosystem, while simultaneously learning firsthand and strengthening their commitment to become ambassadors for the Bay.

Photo Credit: Sarasota Bay Estuary Program

Photo Credit: Sarasota Bay Estuary Program

Climate Change

In 2014, EPA's Climate Ready Estuaries Program prompted SBEP to collaborate with Mote Marine Lab in funding and publishing a Sea Level Rise Adaptation Planning Guide, providing information to local community leaders, planners, resource managers and concerned individuals about basic considerations and tools to adapt to climate-related sea level rise. SBEP also managed the creation of a regional Sea Level Rise Visualization Tool, which demonstrates projections of flooding associated with varied levels of sea level rise, in addition to storm surge effects. SBEP continues to engage with the local community on sea level rise adaptation and resiliency planning.

Partnership for the Delaware Estuary:

Climate change

PDE engaged experts to conduct an assessment of vulnerabilities and adaptation options for tidal wetlands, drinking water, and bivalve shellfish. Their report Climate Change and the Delaware Estuary includes three case studies on climate change impacts on habitat, human/water use, and living resources.

Living Shoreline

The PDE with Rutgers University has developed a pilot project designed to stabilize eroding shorelines of tidal marshes known as the Delaware Estuary Living Shoreline Initiative (DELSI). The DELSI initiative

uniquely uses a combination of native wetland plants, natural structures, and intertidal shellfish to trap sediment and absorb waves. The DELSI initiative provides an economical approach to communities in the Delaware Estuary that are struggling to combat the erosion of tidal marshes.

Buzzards Bay:

Restoration

Over the life of the program, the Massachusetts Division of Marine Fisheries and Buzzards Bay municipalities have reduced permanently closed shellfish resource areas by more than 70% or nearly 10,000 acres. A major focus of the NEP has been to support these efforts through grants and technical assistance for the design or construction of stormwater treatment systems that reduce bacteria levels, fund monitoring to identify upstream sources, and to help municipalities adopt more stringent stormwater management regulations. The NEP also assists municipalities in developing grant applications to implement stormwater treatment designs and in developing local stormwater plans to comply with new federal stormwater permit requirements. In one project, the Buzzards Bay NEP helped fund the elimination of a combined CSO discharge, which together with other efforts, led to the opening of 1,100 acres in outer New Bedford Harbor that had been closed for decades.

Nutrient reduction

Buzzards Bay NEP has had success in nitrogen related water quality improvements. Two of their most important case studies are focused around the City of New Bedford and in the Wareham River estuary. In New Bedford, upgrade of the wastewater facility and elimination of dry weather CSO discharges greatly improved water quality and led to eelgrass recovery. Buzzards Bay advocated for a more stringent nitrogen discharge permit for the Wareham Wastewater facility in order to meet their CCMP recommended goals. This resulted in the most stringent nitrogen discharge standard to date in Massachusetts with a discharge of no more than 4 ppm Total Nitrogen from March to October. Dramatic reductions in nitrogen concentrations in the Agawam River estuary and even the first signs of eelgrass recovery in the Wareham river estuary followed from the permit.

Galveston Bay Estuary:

Oyster Reef restoration

Galveston Bay had approximately 17,000 acres of consolidated public oyster reef, and 50% was loss during Hurricane Ike in 2008. Approximately, 3000 acres have been restored through bag dredging to remove sediment and uncover existing reefs and through placement of cultch (river rock) to create new reefs.

Habitat Restoration

Since 2000, GBEP and partners, through the management committee, created, protected, and enhanced over 20,585 acres of important coastal habitats, leveraging $78 million in local, industry, state, and federal contributions. GBEP's habitat conservation partnership plans, leverages, and executes restoration through the programs committee structure. USFWS, CIAP and other federal sources are leveraged during the annual habitat conservation planning process.

Conservation

GBEP has a Conservation Assistance Program (CAP) that plans, prioritizes, and executes conservation through acquisition or easements to preserve wetlands and important coastal habitats that will protect the long-term health and productivity of Galveston Bay. Project sites are identified, funding strategies developed, and negotiations with landowners initiated, conservation transaction secured, due diligence carried out, and purchase and transfer of title to the appropriate land conservation entity is executed, through this program. 700 acres of wetlands and coastal prairie at Savannah Oaks in the West Bay watershed were protected in 2011 through this program. This event marked the first time that a Purchase of Development Rights agreement had been issued through the State's Texas Farm and Ranch Lands Conservation Program. It is also the first conservation easement purchased by the Estuary Program and the TCEQ.

Casco Bay Estuary Partnership:

Fecal coliform/bacteria source reductions

CBEP funded installation of rain gauges at six municipalities, allowing state shellfish sanitation program officials to base closures on local rainfall rather than rainfall at the Portland, Maine jetport. By allowing local closures to be based on local rainfall, the rain gauges both better protect public health and reduced unnecessary closures.

CBEP has worked extensively to reduce fecal contamination of coastal waters through (1) support for shoreline surveys to identify potential sources of contamination, (2) support for programs to eliminate "overboard discharges" – minimally treated waste discharges, mostly from seasonal residences, (3) support for the Casco Bay recreational vessel no discharge zone and pumpout law (including partial funding of Friends of Casco Bay's pumpout boat), and (4) work to support remediation of combined sewer overflows (CSOs).

CBEP funded a pilot study using new approaches to monitoring for red tide (from buoys rather than from shore) which led to more accurate tracking of red tide risk. This has dramatically reduced shellfish bed closures; closures are both less common and of shorter duration than previously.

Urban/residential stormwater treatment

CBEP is a major partner in the Long Creek Watershed Management District, which manages stormwater control efforts in the Long Creek watershed. Street sweeping and catch basin cleanouts in the Long Creek watershed last year alone reduced sediment delivery to surface waters by many tens of tons. Improved stormwater control devices installed at several locations in the watershed further increase sediment capture. Information on best management practices for landscape and winter maintenance help reduce soil erosion and limit overuse of salt and sand in the winter, further reducing delivery of sediment to the Creek.

CBEP works extensively on urban stormwater through funding of demonstration projects; outreach and education efforts; participation in the "Interlocal Stormwater Working Group" (originally funded by CBEP, now independently funded); and through work on the Long Creek Watershed Management District.

Dam removal

CBEP provided partial funding for removal of the Smelt Hill Dam on the Presumpscot River and for construction of a fish ladder at Highland Lake. Maine DOT, working in collaboration with CBEP and state agencies, improved fish passage at two road crossings along Mill Brook between the Presumpscot River and Highland Lake. These projects increased access of anadromous fish to tens of miles of river and stream habitat and to several hundred acre Highland Lake. Recovery of alewife populations in Highland Lake has been significant, with thousands of adult fish now returning to the lake annually.

LID/stormwater ordinances

CBEP serves on the Interlocal Stormwater Working Group, which is a key group for discussion of local LID and stormwater efforts. CBEP provides partial funding to support local stormwater management efforts, including funding for development of "stormwater manual" tied to South Portland's recently revised stormwater ordinances.

Mobile Bay Estuary Program:

Restoration

MBNEP partnered with the Baldwin County Commission to prevent on-site erosion and to restore wetland, riparian, and stream habitat in Magnolia Springs Park. Project was part of the MBNEP's Habitat Incentives Program which promotes the acquisition and/or restoration of particularly sensitive, rare, or high-value sites within the MBNEP study area.

Bacteria

Several Mobile Bay NEP efforts have resulted in measurable decreases in bacteria concentrations. Mobile Bay NEP supported outreach efforts and funding for projects in the Big Creek Lake Watershed (the source of drinking water for most Mobile County residents) to reduced bacterial loadings. Main culprits targeted for education and financial support were a local dairy and property owners with failed septic tanks. MBNEP supported technical assistance and community workshops conducted by the Mobile County Soil and Water Conservation District, resulting in pathogen loading reductions in the creek. MBNEP supported the Alabama Department of Environmental Management in the process leading to Juniper Creek being TMDLed for pathogens. Three Mile Creek in the City of Mobile, a primary focus of MBNEP outreach activities, has been de-listed for pathogen-related impairment as they are within acceptable levels within their use classification. MBNEP will continue to play a primary role in the development and implementation of a watershed management plan for Three Mile Creek that results in restoration of the hydrology in this watershed.

Oyster restoration

Mobile Bay NEP and Auburn University established the Mobile Bay Oyster Gardening Program to enhance the stock and restore reefs for improved harvest opportunities. This program, through the thousands of oysters planted on existing reefs offsets problems related to drought and oyster drill predation.

Living shoreline

Mobile Bay NEP plays a primary role in the development and implementation of Watershed Management Plans (WMPs) for priority 12-digit HUCs. These plans provide strategies for decreasing

stream bank erosion and sedimentation. In addition, Mobile Bay NEP is working with a group of cooperating property owners to install a living shoreline that will be used to develop State Guidelines that support this type of technology as an alternative to shoreline hardening. Mobile Bay NEP is a significant supporter of sea oats and sea grass plantings. Mobile Bay NEP's development and implementation of WMPs, promotion of storm water management practices, and development of outreach materials (e.g., the educational video, A Redfish Tale) have contributed to decreased nutrient concentrations in the Mobile Bay estuarine system.

Coastal Bend Bays & Estuaries Program:

Education

CBBEP has a comprehensive effort to raise the scientific literacy of all study area school children by bringing them to its environmental education center, utilizing multimedia outreach to the general public to raise awareness of the study area's natural resources, and increasing public access to and stewardship of those natural resources.

Restoration

One of CBBEP's highest priorities is the protection and restoration of habitat for critical species. CBBEP has an intensive focus on the purchase of major parcels of land that provide increased high-quality acreage for waterbird nesting and shorebird habitat.

Narragansett Bay Estuary Program:

Nutrients

Water quality monitoring and interpreting data on hypoxia helped prompt State legislation requiring a 50% reduction in nitrogen loads from major wastewater treatment plants

Delaware Center for the Inland Bays:

Outreach and Education

The Delaware Center for the Inland Bays partnered with the Indian River School District in 1999 to run a formal education program for elementary school age children in the local region. The James Farm Middle School Program at the James Farm Ecological Preserve provides 7th and 8th grade students the opportunity to learn about water quality, wetlands, and other watershed ecosystems through outdoor learning opportunities to reinforce their classroom instruction. These extension activities serve approximately 1000 children a year. The staff, who consist mostly of retired, certified teachers, have developed lesson plans for each grade level from pre-school to 6th grade.

Tillamook Estuaries Partnership:

Habitat restoration

TEP facilitated 26 partner organizations in the Miami River Wetlands Enhancement project. Across the 58-acre restoration area, 4,500 feet of new channels were created, 183 pieces of large woody debris were placed, and 19,000 native species planted. More than 51 acres were purchased by The Nature Conservancy and set aside as a protected reserve.

Tillamook Estuaries Partnership utilized its programs and partnerships to make improvements to the region's water quality. Through Tillamook Estuaries Partnership's Backyard Planting Program (BYPP) and the Department of Environmental Quality's 319 grant program, approximately 20 local land owners on the lower Wilson agreed to remove invasive species and plant native vegetation in an effort to establish healthy riparian areas. TEP's Backyard Planting Program engages with agricultural landowners for riparian enhancement projects such as fencing livestock out of riparian zones and installing off channel watering facilities. To contribute to this effort in building healthy riparian areas, the Tillamook Soil and Water Conservation District (SWCD) installed 11 wet and dry manure storage systems, 4 off-channel watering stations, and 9 buried manure lines in the lower Wilson.

Morro Bay National Estuary Program:

Habitat Restoration

The MBNEP and its partners have improved fish passage by removing man-made structures impeding fish migration upstream. This resulted in enhanced access for 6.29 miles of stream for steelhead and other species. This work is in addition to the habitat protection measures put in place by the program's land conservation purchases and easements.

Reduced shoreline erosion and increased sediment capture

Sediment capture in the Morro Bay Watershed has markedly improved by re-establishing historic floodplains that had been levied for agricultural use. The MBNEP has been involved with several projects to acquire these low lying parcels and removing levies. MBNEP played a significant role by partially funding restoration of floodplains through the Los Osos Wetland Reserve and the Chorro Flats Enhancement Project. By removing levees and allowing creeks to flood, water velocity slows in these vegetated areas, which allows sediment to settle out and be deposited there instead of in Morro Bay. It is estimated that the Chorro Flats project has prevented over 225,000 tons of sediment from reaching the bay and will continue to function well into the future.

Bacteria Monitoring

As a result of MBNEP's riparian fencing efforts, there has been a reduction in observed bacteria levels throughout the watershed. MBNEP monitors bacteria concentrations at 2,618 surface water sites and eight sites in the bay. In one area where 10,000 feet of creek were fenced to exclude cattle, the summer bacteria concentrations were between 54 to 91% lower than pre-project summer concentrations. On another site where fencing was installed to exclude cattle from the creek, bacteria measured at a site downstream of the project area had mean concentrations that were 69 to 91% lower than at the site upstream of the project area.

Stormwater Treatment

The MBNEP has played a primary role in funding two "how-to" guides for local residents – a Low Impact Development (LID) Guide and a greywater construction and use guide. These guides, which are two in an ongoing series, explain how to install rainwater gardens, greywater systems, and other LID practices. In addition, MBNEP has provided funding to bring guest speakers to the area to discuss water conservation and rainwater harvesting.

MBNEP has taken a significant role by partially funding the creation of a Morro Bay GIS storm drain atlas. The National Pollution Discharge Elimination (NPDES) guidelines under the Clean Water Act mandate the City of Morro Bay to manage non-point pollution entering Morro Bay through the storm drain system. The first step in implementing this was the creation of this atlas by the City of Morro Bay. The MBNEP is working with the city of Morro Bay to update their TMDL Wasteload Allocation Attainment Plan. This plan identifies the sources of bacteria, lays out BMPs to address them, and describes monitoring efforts to track their success.

Estuary Program staff consulted with the City of Morro Bay's effort to create an interpretive sign focused on tourist and resident population covering marine debris and runoff. Two of the signs were installed in late 2010. In 2007, the program teamed up with the City of Morro Bay and a local Eagle Scout candidate to mark more than 300 stormdrains with ""no dumping"" plaques.

The MBNEP has worked with the City of Morro Bay, LOCSD, and County of San Luis Obispo to help them implement the education and outreach components of the Stormwater Management Plans by consulting on the efforts, funding projects through our grants program, and participating in the county's Central Coast Partners for Water Quality. Additionally, the MBNEP funds an annual newspaper ad and television PSA campaign which helps underscore the message that small changes in behavior including picking up after pets, avoiding over fertilizing lawns and residential landscaping and repairing automotive oil leaks add up to big improvements in water quality. The Bayside Guide (mentioned elsewhere) also reinforces this message.

Tampa Bay Estuary Program:

Among the recent scientific and technical accomplishments are: 1) progress of TBEP and its partners toward goals and targets of the CCMP, including water quality and seagrass restoration targets; 2) an update to the Tampa Bay Nitrogen Management Strategy; 3) completion of the Master Plan for the Protection and Restoration of Freshwater Wetlands ; 4) Old Tampa Bay Integrated Model; 5) Critical Coastal Habitat Assessment Monitoring; and 6) Salinity Barrier Removal project.

Tampa Bay continues to be recognized in a number of international scientific publications for the successful trajectory towards recovery from eutrophic conditions and as a model of effective collaborative approaches to environmental management. TBEP Science/Technical Staff (Executive Director Holly Greening, Senior Scientist Ed Sherwood, and Science and Policy Manager Lindsay Cross) published in several scientific journals in 2014-2015, including an Invited Feature Article in the scientific journal *Estuarine, Coastal and Shelf Science* and an article assessing potential effects on Tampa Bay habitats from climate change in the journal *Environmental Management*. TBEP's science staff members serve on more than 40 local and national advisory groups.

Public outreach accomplishments continued emphasis on the Be Floridian fertilizer education campaign; the production of a 3-year Progress Report for the Public; the launch of a major revision of the CCMP; continuation of community education about pet waste, sea level rise and other priority issues; and expanded use of social and digital media to connect with citizens of all ages and backgrounds.

TBEP Public Outreach and Education staff (Public Outreach Coordinator Nanette O'Hara and Project Manager Misty Cladas) serve on numerous local and regional outreach and education coordination

groups, including promotion of bay-friendly landscaping, invasive species control, sea-level rise visualization methods, manatee protection and pet waste campaigns.

Seagrass Recovery Goals met in 2015

Seagrass restoration – Tampa Bay Estuary Program has not only met but exceeded its goal of restoring Tampa Bay seagrasses to 1950s levels. More than 5,000 new acres of seagrasses have grown from 2012-2014. Tampa Bay now harbors 40,295 acres of seagrass which exceeds their goal of 38,000 acres baywide. This achievement was made even as the bay region grew by more than one million people in the last 15 years. TBEP director Holly Greening attributes this success to the collective effort of cities, counties, the private sectors, and citizens working together.

Progress toward Water Quality Targets

Each year the Estuary Program compares bay water clarity and chlorophyll-*a* monitoring results with established targets for those water quality indicators to determine if average annual light levels are adequate to sustain seagrass recovery. Results from 2015 indicate that all major bay segments were meeting both management targets and regulatory thresholds.

Tampa Bay Nitrogen Management Strategy

The remarkable recovery of the Tampa Bay ecosystem after decades of decline is unprecedented among urban estuaries worldwide. The rebound in water quality and ecological health of the bay is even more remarkable in light of the strong population growth during the recovery period. FDEP, EPA, the Consortium and other partners in the Estuary Program are continuing this effort, while recognizing the duties of FDEP and EPA to administer the environmental regulations for which they are responsible. This has been a successful approach to bay management that continues the successful baywide approach and may also avoid a potential free-for-all of administrative challenges and lawsuits.

To help ensure continued recovery of vital seagrass habitat and the successful nitrogen management strategy that makes it possible, local governments, agencies, and industry members of the Nitrogen Management Consortium have proactively developed nitrogen load allocations in 2009. This effort will ensure that state and federal water quality criteria for nutrients will continue to be met in the bay.

In April 2013, the FDEP approved the 2012 Reasonable Assurance Update and concluded that there has been reasonable progress towards the attainment of designated uses for waterbody segments in the Tampa Bay basin that were previously identified as impaired for nutrients (chlorophyll-a) pursuant to Chapters 62-303, FAC. The TBEP, in partnership with the Tampa Bay Nitrogen Management Consortium, will submit the third compliance assessment report for the 2012-16 Reasonable Assurance (RA) Period to the FDEP in March 2015. To date, all bay segments are meeting regulatory thresholds and maintaining RA compliance over the 2012-16 period. Consortium participants continue to input load reduction projects into the Action Plan Database which was ported to an online, web-based reporting system. Planned and budgeted projects for the 2012-16 Reasonable Assurance Implementation period are expected to reduce TN loading by about 77 tons/yr in the future.

Master Plan for the Protection and Restoration of Freshwater Wetlands

The Master Plan for the Protection and Restoration of Freshwater Wetlands in the Tampa Bay Watershed, Florida (Master Plan) presents results and recommendations from an innovative, multi-

entity project to improve restoration and mitigation of freshwater wetlands within the Tampa Bay watershed. Building upon the approach of the Tampa Bay Habitat Master Plans (1999, 2010), it is the first plan to develop protection and restoration targets for freshwater wetlands in the Tampa Bay region.

The project examined where wetlands existed in the 1950s and 2007 using aerial photography and sophisticated Geographic Information Systems (GIS) tools, documenting the loss of more than 100,000 acres during that period. Taking into account the relative proportional impacts to specific wetland types within six basins in the watershed, the group developed restoration and protection targets for six categories of freshwater wetlands that were approved by the TBEP Policy Board. The project team then developed a suite of screening criteria that identifies where restoration, protection or mitigation may be the most ecologically beneficial.

This project is unique in that it brought together and actively engaged permitting agencies and mitigation bankers to find creative ways to integrate the targets and recommendations into future permitting and mitigation of freshwater wetlands. The Master Plan will be used by public agencies, such as cities, counties and the Southwest Florida Water Management District, for prioritizing the acquisition, restoration and protection of freshwater wetlands. Private mitigation bankers can utilize the tools as guidance for locating and designing future mitigation banks. And permitting agencies will have additional options to use in the permitting process to make mitigation recommendations with the greatest ecological benefit for the Tampa Bay region, while also meeting the needs of regulated entities, such as land developers and industry.

Old Tampa Bay Integrated Model

A comprehensive assessment of Old Tampa Bay and its watershed was initiated in 2010 to develop specific management actions for this bay segment. Part of this project will include the development and application of an integrated watershed loading, hydrodynamic/water quality response, bay circulation, and biological/ecological response model. The integrated model system and management scenario runs were completed in 2014. Final deliverables and model codes are available for use by any entity.

Critical Coastal Habitat Assessment Monitoring Framework to detect potential impacts of Climate Change and other factors

The Critical Coastal Habitat Assessment is a project to detect changes to critical coastal habitats from climate change and indirect anthropogenic impacts through a long-term monitoring program. The project purpose is to "develop a long-term monitoring program to assess the status, trends and ecological function of the mosaic of critical coastal habitats to detect changes due to natural and indirect anthropogenic impacts including sea level rise and climate change, and improve future management of habitats." A long-term fixed transect program was developed by TBEP consultant, Atkins North America, with input from the Tampa Bay Habitat Restoration Partnership. The monitoring will characterize the baseline (2014/2015) status of the mosaic of critical coastal habitats and can be used to detect trends in those habitats over time and assess changes in ecological function of habitats over time. Monitoring locations have been selected in each of the major bay segments and two tidal river locations that have a full complement of emergent tidal wetland communities including mangrove, salt marsh, salt barrens and coastal uplands. A pilot assessment was conducted at Upper Tampa Bay Park in August 2014 and the methods were then refined by the Habitat Partnership. This project is part of a larger effort to

manage, restore and protect the mosaic of coastal habitats critical to the ecological function of the Tampa Bay estuary.

Economic Valuation of Tampa Bay

The Tampa Bay Regional Planning Council, in partnership with TBEP, completed an economic evaluation of Tampa Bay to the region in 2014. The TBRPC evaluated both the economic value of the presence of the Bay and the added value of a clean Tampa Bay to assess the economic impacts of the Bay's restoration. Results show that one in every five jobs in the Tampa Bay watershed depends on a healthy Tampa Bay. A clean bay also contributes an impressive 13%, or $22 billion, of the total economic activity over the larger, 6-county Tampa Bay region.

Model fertilizer ordinance

The Tampa Bay Estuary Program (TBEP) developed a draft model fertilizer ordinance for Tampa Bay regulating the use of fertilizers containing nitrogen and/or phosphorus within Tampa Bay. This Ordinance regulates the proper use of Fertilizers by any applicator and requires proper training of Commercial and Institutional Fertilizer Applicators. The Ordinance also regulates proper use of fertilizers by establishing a Restricted Season, fertilizer content and application rates, fertilizer-free zones, low maintenance zones, exemptions, training, and licensing requirements. The Ordinance requires the use of Best Management Practices which provide specific management guidelines to minimize negative secondary and cumulative environmental effects associated with the misuse of Fertilizers. Each local government has used this model ordinance and adopted ordinances specific to each city/county (sales and/or use ban), thus 100% of the Tampa Bay Watershed has some fertilizer ordinance in place. There is an ongoing study by the TBEP to quantify the effectiveness of the ordinance. The results of this study will help to refine the adaptive management strategy/options for nutrients.

In 2010, Pinellas County passed the most restrictive local urban fertilizer regulation in the State of Florida. The ordinance required that residential fertilizer contain at least 50% slow-release nitrogen, it required that a soil test be conducted to understand if phosphorus was needed before it could be applied; it established a 10-foot setback from the water, and it defined a restricted season from June 1 to September 30 during which nitrogenous fertilizer could not be applied to the lawn or sold at a retail establishments. Fertilizer distributors have to remove nitrogenous fertilizer from the shelves during the restricted season. The Pinellas County ordinance has since been exempted such that no other local government can implement a sales restriction, thus making the Pinellas County ordinance unique in the State of Florida.

TBEP attempted to evaluate the effectiveness of the fertilizer ordinances by examining the linkages between resident ordinance awareness, behavior change, community nutrient inputs, and associated loading potential form residential communities. In Pinellas County where the most restrictive fertilizer ordinance and extensive ordinance awareness campaign had been in place for the longest period of time, homeowner ordinance awareness, knowledge, and implementation were significantly higher than in the other two counties. Based on their social survey outcomes, TBEP concluded that the Pinellas County fertilizer ordinance effectively changed behavior with the caveat that they were not able to evaluate behavior prior to the ordinance being enacted.

<u>Massachusetts Bay NEP:</u>

Invasives

MassBays was very active managing salt marsh invasive species and continues to be a leader in onging Phragmites control and pepperweed eradictation.