New Jersey Wetland Program Plan 2019-2022

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***Cover photographs listed from left to right, used with permission**: Glacial Bog on the Kittatinny Ridge (photo by Kathleen Strakosch Walz), Pine Barrens Tree Frog (photo by Bob Cunningham), Coastal salt marsh in Great Bay (photo by Ernest Cozens at Photoutback.com), Swamp Pink (photo by Bob Cunningham), and Canoeing on tidal freshwater marsh (photo by NJ Audubon).*

New Jersey Wetland Program Plan
2019-2022

New Jersey has taken a multi-faceted, comprehensive, approach to managing and protecting freshwater and coastal wetlands. This four-year Wetland Program Plan is an update of the first Wetland Program Plan the Department of Environmental Protection (NJDEP) developed in 2013. It provides a framework for the State of New Jersey to strengthen the core elements of its wetland program and to continue to reach the goals listed herein. The steps outlined will serve to direct current and future wetland protection and management efforts along a coordinated path to the benefit of New Jersey's wetland resources and the quality of life for future generations.

OVERALL GOAL

The NJDEP's core mission is and will continue to be the protection of the air, waters, land and natural and historic resources of the State to ensure continued public benefit. The NJDEP's mission is advanced through effective and balanced implementation and enforcement of environmental laws to protect these resources and the health and safety of our residents. Paramount to meeting the intent of this mission is to guide our many programs toward a collective goal of comprehensive natural resource management.

In 1979, the New Jersey Pinelands Commission was established as a political subdivision of the State of New Jersey and the regional planning and regulatory agency which oversees development in the Pinelands Area in accordance with the Pinelands Protection Act. The agency mission is to preserve, protect, and enhance the natural and cultural resources of the Pinelands and to encourage compatible economic and other human activities consistent with that purpose.

The Highlands Water Protection and Planning Council (Highlands Council) is a regional planning agency that works in partnership with municipalities and communities in the Highlands Region to encourage a comprehensive regional approach to the implementation of the 2004 Highlands Water Protection and Planning Act, (the Highlands Act). The Highlands Act established the Highlands Council and charged it with the creation and adoption of a Regional Master Plan to protect and enhance the resources within the New Jersey Highlands.

The development of the first Wetland Program Plan in 2013 served to integrate the diverse efforts of the NJDEP's multiple programmatic efforts to analyze, assess, preserve and protect freshwater and coastal wetland resources. To this end, the NJDEP's intent is to update this second comprehensive Wetland Program Plan with new information from the Pinelands Commission and Highlands Council, as well as include a new core element addressing adaptation, resiliency and mitigation in a changing climate so that it continues to focus New Jersey's public and private resources toward a unified goal of:

> *Improving and protecting the significant ecosystem services and functions provided by wetlands including flood control, shoreline stabilization, coastal storm surge protection, water purification, nutrient cycling, carbon sequestration, sediment retention, provision of habitat for plants and wildlife, reservoirs of biological diversity supporting food webs, as well as providing meaningful recreation, sustainable economic benefits from tourism and excellent opportunities for environmental education.*

The six core elements addressed in this four-year plan are:

1) Monitoring and Assessment
2) Regulation
3) Voluntary Wetland Restoration, Creation, Enhancement and Protection and Improved Coastal Shoreline Resiliency
4) Wetlands Water Quality Standards
5) Adaptation, Resilience and Mitigation in a Changing Climate
6) Public Outreach and Education

The first four core elements are defined in the United States Environmental Protection Agency (USEPA) 2009 Core Elements Framework. The fifth core element is added to this iteration to address the NJDEP focus on the critical issue of climate change and resiliency as it relates to wetland resources. The sixth core element (formerly core element 5) was added to elevate the importance of cross-program coordination with wetland monitoring, assessment, regulation, restoration and protection in efforts regarding public outreach and education. The status of the six core elements in New Jersey is detailed below in a narrative followed by tables of goals, objectives and actions for the four-year period 2019-2022.

Core Element 1: Monitoring and Assessment

The NJDEP has been engaged in wetland monitoring and assessment for more than four decades. Mapping of tidal wetlands was completed for the first time in the 1970's and freshwater wetlands were first mapped in the 1980's. Since 1986 the State has classified land use/land cover and produced maps based on aerial photography. These NJDEP Bureau of Geographic Information Systems (GIS) map products are available as NJDEP Digital Data Downloads and interactive GeoWeb mapping online. The GIS data have allowed the State and academia to evaluate changes in land use and wetlands over time. The Rutgers University Center for Remote Sensing and Spatial Analysis (CRSSA) and Rowan University Geospatial Research Lab have used this NJDEP land use land cover data to document changes in land use between 1986 and 2012[1]. Finer scale wetland mapping efforts by the NJDEP Division of Land Use Regulation Program began in 2014.

Since 1996, the USEPA's Wetland Program Development Grants (WPDG) have been utilized by the NJDEP to conduct inventory, classification, mapping, condition assessment and baseline monitoring for freshwater and coastal wetland types throughout the State. Additional research has been conducted since 2000 to develop a wetlands mitigation rapid assessment tool[2], a wetland quality and function assessment tool[2], a multi-tiered ecological integrity assessment protocol[3], a floristic quality assessment tool for vascular and moss species, a tool to define reference conditions for tidal wetlands using diatoms as indicators[2] and wetlands biological indicators for forested riparian wetlands in the Highlands[2]. One current grant funds the NJDEP's Division of Science and Research and Natural Heritage Program to add monitoring data from New Jersey's tidal wetlands to a Wetland Reference Database, conduct additional monitoring to fill data gaps in reference standard tidal wetlands, develop an identification guide for diatoms of tidal wetlands, and hold trainings on the Ecological Integrity Assessment method. Through another current USEPA grant, the Division of Science and Research is working with university partners to study the relationship of watershed condition to tidal wetland productivity in Great Bay, New Jersey as a nursery for fisheries and is developing a method to use remotely sensed data to predict productivity. The NJDEP, National Estuary Programs, Rutgers University, the United States Fish and Wildlife Service, and

[1] https://crssa.rutgers.edu/projects/lc/
[2] https://www.nj.gov/dep/dsr/wetlands/
[3] http://www.natureserve.org/conservation-tools/projects/ecological-integrity-assessment-wetlands

others have established long-term tidal wetland monitoring sites with Surface Elevation Tables to monitor accretion rates, sediment chemistry, water quality and vegetation. In 2018 the New Jersey Tidal Wetland Monitoring Network formed. Composed of more than fifteen entities that collect long-term monitoring of tidal wetlands in New Jersey, the Network will focus on improving the resilience of coastal communities and ecosystems by identifying current conditions and trends of tidal wetlands in New Jersey to help prioritize restoration efforts and inform management decisions. While all wetlands are valued under State law regardless of value and function, these assessments and assessment tools will help evaluate condition of wetlands at various scales as well as set restoration targets.

Beginning in 2002, the USEPA required states to integrate their 305(b) and 303(d) water quality monitoring reports. These reports are used by Congress and the USEPA to establish program priorities and funding for federal and state water resource management programs. New Jersey's Integrated Water Quality Monitoring and Assessment Reports for 2002, 2004, 2006, 2008, 2010, 2012 and 2014 have provided data on wetlands acreage and updates on the Department's activities in wetlands research, protection, wetlands mitigation and wetlands program development, and support the required integration of the 305(b) and 303(d) water quality monitoring reports. New Jersey has employed a rotating regional approach to integrated water quality assessment since 2014. Under this approach, New Jersey conducts a streamlined assessment of statewide water quality along with a more comprehensive, detailed assessment of water quality in one of the state's five water regions - Atlantic Coastal, Raritan, Lower Delaware, Upper Delaware and Northeast. This rotating regional approach will produce a comprehensive assessment of the entire state every ten years.

New Jersey participated in the first National Aquatic Resource Surveys for Wetlands in the 2011 National Wetland Condition Assessment (NWCA) as well as the second NWCA in 2016. Both USEPA surveys were supported through USEPA monitoring initiative NCWA grant funding to the NJDEP's Division of Water Monitoring and Standards and were conducted by wetland scientists in the NJDEP. The Division of Water Monitoring and Standards provided field and lab support for these scientists. Wetland assessment tools developed for the NWCA using the USEPA 3-tiered multi-scale approach (landscape remote sensing, rapid field and intensive field assessment) were used in conjunction with NatureServe's Ecological Integrity Assessment Protocol by the Natural Heritage Program to assess the condition of freshwater and tidal wetlands statewide and by watershed utilizing a Region 2 intensification Wetland Program Development Grant to supplement the NWCA for New Jersey. Results from these studies will continue to be presented at New Jersey Water Monitoring Council meetings and USEPA national and regional wetland conferences. Scientists at the Pinelands Commission completed an Ecological-Integrity Assessment of the New Jersey Pinelands in 2008. Wetland habitat monitoring is also occurring as part of the United States Fish and Wildlife Service's Section 6 grant projects to monitor and assess Federally-designated endangered, threatened and candidate plant and animal species that depend upon wetlands. Inter- and intra-agency collaboration between State and Federal partnerships has strengthened this wetland monitoring and assessment work.

The NJDEP continues to participate in national and regional wetland monitoring and assessment forums including the Mid-Atlantic Wetland Work Group, the Mid-Atlantic Coastal Wetland Assessment, the National Wetland Monitoring and Assessment Work Group, the National Water Quality Monitoring Council conferences and meetings, The New Jersey Tidal Wetland Monitoring Network and the New Jersey Water Monitoring Council. Cooperation between the NJDEP and USEPA National Estuary Programs including the Barnegat Bay Partnership, Partnership for the Delaware Estuary, New York-New Jersey Harbor Estuary Program and the Jacques Cousteau National Estuarine Research Reserve (a National Oceanic and Atmospheric Administration program administered through Rutgers University) on coastal wetland monitoring and assessment projects continues to improve our data and understanding of these critical natural resources, particularly in the context of catastrophic storms like Superstorm Sandy.

The AmeriCorps Watershed Ambassador Program is an environmental community service program funded by the Corporation for National and Community Service through a grant to the NJDEP to raise public awareness about water and watershed issues and to promote watershed stewardship through direct community involvement. The watershed ambassadors work with local governments and watershed groups on volunteer projects including water quality monitoring, wetland assessment and restoration, and provide a crucial educational service about water, wetlands and watersheds to the public.

The Natural Heritage Program housed within the NJDEP Division of Parks & Forestry State Forest Service, and the Endangered and Non-Game Species Program housed within the Division of Fish and Wildlife maintain the Biotics Database on occurrences of elements of biodiversity in the State, including rare wetland and water-dependent plant and animal species, as well as wetland ecological communities and wildlife habitat systems. Both programs, as well as the Pinelands Commission, conduct monitoring and assessment of selected rare species and associated wetland habitats in the State. The Pinelands Commission provides data on the location of rare plants to the Natural Heritage Program and rare and more common animals to the Endangered and Non-Game Species Program and maintains a data sharing agreement with the Endangered and Non-Game Species Program to share data on rare animal species for regulatory purposes.

Wetland hydrology monitoring has been conducted by the Office of Natural Lands Management, Natural Heritage Program, in several rare wetland types in the Kittatinny Valley, Pine Barrens and coastal wetlands. Scientists at the Pinelands Commission have conducted long-term hydrology monitoring in selected wetland habitats including natural and created ponds in the Pine Barrens[4]. They have also developed vegetation models to predict the effect of groundwater withdrawals on forested wetlands as part of the larger Kirkwood-Cohansey project[5]. Rutgers University Center for Remote Sensing and Spatial Analysis (CRSSA) also conducted landscape level modeling to understand the potential effect of groundwater-level declines on forested wetlands[6]. The Division of Fish and Wildlife, Bureau of Freshwater Fisheries, is monitoring native brook trout (the state's only salmonid) populations and classifying and identifying streams with high groundwater influence in watersheds in northwest New Jersey. The cold-water streams and associated spring-fed headwater riparian habitat serve as resilient strongholds to protect this fish species.

The NJDEP Office of Coastal and Land Use Planning and National Estuary Program partners have been conducting a number of innovative coastal marsh monitoring and assessment projects including Mid-Atlantic Coastal Marsh Assessments by the NJDEP, Partnership for the Delaware Estuary and Barnegat Bay Partnership; the Marsh Futures project using scientific survey tools to assess local salt marsh vulnerability and chart the best management practices and interventions; Marsh Migration Index is a series of maps representing an analysis that will assist in showing where coastal marshes will retreat in response to rising sea levels; Citizen Science Monitoring Projects funded by the National Fish and Wildlife Foundation; Coastal Resiliency and Community Assessments by township; a Coastal Vulnerability Index Mapping Tool with layers of geomorphology, slope, flood data, storm surge, soils-drainage and erosion; a Building Ecological Solutions to Coastal Community Hazards guide addressing coastal hazards in four NJ ecosystems: developed lands, beaches and dunes, coastal forests and shrublands and tidal marshes, with an overview of the ecosystems, protective values, key vulnerabilities and ecological solutions to hazards; Coastal Vulnerability Assessments; and Mapping Shoreline Change to Inform Coastal Restoration Projects.

[4] https://www.nj.gov/pinelands/science/complete/wetlands/
[5] https://www.nj.gov/pinelands/science/complete/kc/
[6] https://crssa.rutgers.edu/projects/kc/Model_Final_Report.pdf

The State of New Jersey has been monitoring mosquitos and practicing mosquito control in wetlands and waters of the state since the early 1900's, working with government agencies at the municipal, county and state level. The State Mosquito Control Commission was established in 1956 and is responsible for the monitoring of mosquito control activities in the state. The NJDEP Division of Fish and Wildlife, Office of Mosquito Control Coordination, established in 1976, has developed standards and best management practices for mosquito control in freshwater wetlands[7] and Open Marsh Water Management[8] for salt marsh mosquito control. A study on the effect of Open Marsh Water Management on sedimentation, hydrology, and porewater chemistry in salt marshes in Barnegat Bay is being conducted by wetland scientists at the Academy of Natural Sciences of Drexel University.[9] Other studies on the ecological function of tidal wetlands in Barnegat Bay, including Open Marsh Water Management sites, have been conducted for the NJDEP.[10]

The NJDEP Division of Science and Research is currently working with Drexel University and United States Geological Service to investigate nutrient/carbon fluxes along salinity gradients in Barnegat Bay marshes. The goal of the project is to provide additional data for the United States Geological Service Water Quality Analysis Simulation Program and determine how marsh creeks impact nutrient loading into Barnegat Bay. The Division of Science and Research is working on a study to identify coastal wetland diatoms and develop a calibration set for salinity and nutrient models based on these diatom species. This data is being used to reconstruct reference conditions and evaluate the impact of natural and anthropogenic disturbances on New Jersey coastal wetlands. A forthcoming guide for the identification of diatoms in New Jersey coastal ecosystems will help ensure accurate identification of diatom species for use in monitoring and assessment of reference conditions in New Jersey coastal wetland sites. Other work on freshwater wetland diatoms[11] used to develop nutrient criteria may be useful in determining indicators of water quality for wetlands.

Barnegat Bay:

The Barnegat Bay Restoration, Enhancement and Protection Strategy is built upon the data, modeling results and research generated by the Barnegat Bay Ten-Point Plan (Phase One) announced in 2010. This strategic plan identifies objectives and actions aimed at restoring areas of concern (Restoration), enhancing areas wherever possible (Enhancement) and protecting healthy areas (Protection) of the Barnegat Bay and its watershed. NJDEP will also continue monitoring throughout this process to assess the effectiveness of implementation on water quality and biodiversity within Barnegat Bay and the Barnegat Bay watershed (Assessment). Phase Two of the strategy is Moving Science into Action which includes 1) Restoration to develop Watershed Restoration/Protection Plans for Barnegat Bay Tributaries, 2) Enhancement of Submerged Aquatic Vegetation Restoration and 3) Protection to Preserve and Restore Wetlands to Provide Nutrient Reductions and Resiliency & Protect Environmentally Sensitive Areas in the Bay. One of the core goals of the strategy is "Assessment and Effectiveness Monitoring: Develop Biological Indices for Barnegat Bay and Establish Routine Biological Monitoring Program."

The NJDEP Division of Science and Research is working with partners to monitor the Sedge Island Conservation Zone, one of 16 environmentally sensitive areas in Barnegat Bay identified by the NJDEP and Rutgers University Center for Remote Sensing and Spatial Analysis in 2011[12] as part of the Barnegat Bay Ten-Point Plan. The goal of this monitoring effort is to assess long-term trends in aquatic species/resource types, abundance and distribution within and outside of the Sedge Island Conservation

[7] https://www.nj.gov/dep/mosquito/docs/bmp_complete.pdf
[8] https://www.nj.gov/dep/mosquito/docs/omwm_full.pdf
[9] https://ansp.org/research/environmental-research/sections/wetlands
[10] https://www.nj.gov/dep/dsr/barnegat/final-reports/ecosystem-services-tidal-wetlands-year2.pdf
[11] https://www.nj.gov/dep/dsr/wq/TDI%20Nutrient%20Criteria.pdf
[12] https://nj.gov/dep/dsr/barnegat/final-reports/#Sedge_Island

Zone, as well as record changes to habitat over time. Estuarine submerged aquatic vegetation habitat mapping in Barnegat Bay and along the coast was conducted in 1979 and 1986/87, with Little Egg Harbor Bay eelgrass beds updated in 2001 and 2011.[13] Seagrass beds in the Barnegat Bay-Little Egg Harbor Estuary were mapped in 2003 and 2009 by Lathrop and Haag at Rutgers University Center for Remote Sensing and Spatial Analysis.[14] Efforts are needed to implement a consistent submerged aquatic vegetation resource assessment and monitoring strategy including quantitative evaluation of submerged aquatic vegetation distribution and abundance of the Barnegat Bay and Great Bay - Little Egg Harbor estuaries.

Pinelands:
In the early 1990's, the Pinelands Commission initiated a long-term environmental-monitoring program[15] to characterize the effect of existing land-use patterns on aquatic and wetland resources and to monitor long-term changes in these resources. Components of the program are water-level monitoring in wetland forests and coastal plain ponds; tracking water-quality conditions at a network of representative stream sites; monitoring calling frogs and toads; and using vegetation[16], fish[17] and frog and toad assemblages[18] to assess the ecological integrity[19] of streams and impoundments throughout the Pinelands. The Division of Fish and Wildlife, Bureau of Freshwater Fisheries, is assessing fisheries in lakes and Pineland streams to identify those waters supporting entirely native fish species.

Since 1993, the Pinelands Commission has utilized USEPA WPDGs to augment its environmental-monitoring program by conducting individual studies to characterize and better understand the composition of wetland-dependent and aquatic plant and animal assemblages and the potential impacts of land use on these assemblages. Specifically, research has been conducted to compare community attributes of Atlantic White Cedar swamps between watersheds with and without development and agriculture[20]; assess pond-breeding frog and toad[21]; and dragonfly and damselfly assemblages in relation to surrounding land use, and characterize breeding bird assemblages in upland and wetland forest complexes. Studies have also been completed to evaluate water quality and diatom, vegetation, fish, and frog and toad assemblages in stream impoundments along a watershed land-use gradient[22] and to assess the potential impacts of wetland cranberry agriculture on stream hydrology[23], wetland landscapes[24], and various wetland and aquatic communities[15].

More recent research funded by WPDGs has focused on mapping, surveying and determining the vulnerability of open-water, off-stream wetlands[15]. On-ground and aerial photograph surveys have been conducted to determine the physical impacts of off-road vehicles to both natural coastal plain ponds and human excavated ponds in the region. Both types of wetlands are protected in the Pinelands. Models were developed to estimate the vulnerability of these wetlands to future off-road vehicle impacts. The Pinelands Commission and NJDEP have worked together to directly protect some of the more heavily damaged ponds by installing wooden barriers across vehicular access points[25]. The vulnerability of

[13] https://www.nj.gov/dep/landuse/sav.html
[14] https://crssa.rutgers.edu/projects/sav
[15] https://www.state.nj.us/pinelands/science/
[16] https://www.jstor.org/stable/2996598
[17] https://doi.org/10.1890/1051-0761(1998)008[0645:UORSFA]2.0.CO;2
[18] https://www.jstor.org/stable/1565417
[19] http://dx.doi.org/10.1016/j.ecolind.2005.08.027
[20] https://doi.org/10.1007/BF03161731
[21] https://www.jstor.org/stable/1447594
[22] https://doi.org/10.1016/j.ecolind.2009.06.001
[23] https://doi.org/10.1111/j.1752-1688.2010.00432.x
[24] https://doi.org/10.1007/s10980-008-9235-6
[25] https://www.nj.gov/dep/newsrel/2017/17_0013.htm

natural and excavated ponds to future development was assessed by comparing current land-use conditions surrounding these wetlands to conditions at buildout. Other recent research conducted by the Pinelands Commission in collaboration with scientists from the United States Geological Survey, NJDEP Division of Science and Research and Division of Water Monitoring and Standards Bureau of Freshwater and Biological Monitoring includes investigating nutrient and pesticide concentrations in natural ponds, excavated ponds and stormwater basins[26] and characterizing diatom, phytoplankton, zooplankton, vegetation, fish and frog and toad communities found in these three wetland types[15].

Highlands:
The Highlands Regional Master Plan Goal 1D: Protection, Restoration and Enhancement of Highlands Open Waters and Riparian Areas charges the Highlands Council to establish and maintain inventories of all Highlands Open Waters and Riparian Areas and their integrity. Regional Master Plan Goal (2F) regarding Assessment and Restoration of Surface and Ground Water Quality of the Highlands Region and Regional Master Plan Goal (2G) regarding the Protection, Restoration and Enhancement of the Water Quality of the Highlands Region both charge the Highlands Council to not only monitor and assess surface water quality but also to provide ways to improve and restore quality and quantity. This includes determinations on where development is best suited to reduce stressors on aquatic resources. Water quantity protection is a core standard of the Regional Master Plan. Stormwater planning is a major Regional Master Plan component written to be protective of Regional water quality and quantity.

Core Element 2: Regulation

Under Section 404 of the Federal Water Pollution Control Act (also known as the Clean Water Act), 33 U.S.C. §§ 1251 et seq., the Federal wetlands permitting program, also known as the "Federal 404 Program," implemented by the United States Army Corps of Engineers (USACE), was established. Since March 2, 1994, in accordance with Section 404(g) of the Clean Water Act, 33 U.S.C. §§ 1344(g), New Jersey's freshwater wetlands program has operated in place of the Federal wetlands permitting program in most of New Jersey. While New Jersey's freshwater wetlands program operates in place of the Federal 404 program throughout most of the State, the USACE has retained responsibility for the Federal 404 Program in certain waters in New Jersey. These are all interstate and navigable waters (including adjacent wetlands), the entire length of the Delaware River within the State of New Jersey, Greenwood Lake and areas under the jurisdiction of the New Jersey Sports and Exposition Authority (formerly the New Jersey Meadowlands Commission). Projects in these "non-delegable" waters remain subject to USACE jurisdiction, as well as to the State wetlands program. The USEPA oversees the NJDEP's wetlands program in accordance with the Federal Clean Water Act and a Memorandum of Agreement between NJDEP and the USEPA. To protect waters of the United States, including wetlands, the Clean Water Act requires a state assuming the Federal permitting authority to implement regulatory standards equally stringent as those currently in place for the Federal 404 Program.

New Jersey has passed laws and regulations specifically designed to protect both coastal wetlands (Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq., Waterfront Development Act N.J.S.A. 12:5-3, Coastal Area Facility Review Act, N.J.S.A. 13:19, Coastal Zone Management Rules, N.J.A.C. 7:7) and freshwater wetlands (Freshwater Wetlands Protection Act N.J.S.A. 13:9B-1 et seq.). While New Jersey continues to share permitting authority with the USACE for coastal wetlands, our freshwater wetland protection program has been identified as one of the most stringent in the country and deemed of sufficient quality that the USEPA continues to approve New Jersey as an "assumed program." As one of only two "assumed programs" in the United States, USEPA has made the finding that New Jersey's regulation of activities in and around freshwater wetlands is consistent with the Federal 404b(1) Rule and

[26] https://pubs.er.usgs.gov/publication/ofr20181077

acknowledges that New Jersey has implemented a regulatory process of wetland delineating and permitting that is comparable to or more stringent than that found at the Federal level.

The State's In Lieu Fee Program has been amended to ensure continued compliance with the Federal Mitigation regulations. A final In Lieu Fee Program Instrument was approved by the USEPA on August 6, 2015. One of the fundamental ideas in the In Lieu Fee Program Instrument is the continuation of the concept of creating, enhancing and restoring wetlands for mitigation using intra-agency cooperative agreements among the NJDEP's Green Acres Office of Ecological Restoration, State Parks, State Forest Services and Division of Fish and Wildlife programs.

In addition to regulating wetlands, New Jersey places buffers around certain wetlands, which far exceed the federal protection levels, to further protect them from degradation. Wetlands that are classified as intermediate or exceptional resource value are associated with a 50- and 150-foot buffer, respectively. In addition, all on-stream and off-stream wetlands in the Pinelands Area are protected with a 300-foot buffer. Under the State's Freshwater Wetlands Protection Act and implementing regulations, wetlands that discharge to trout-production waters or which are present or documented habitat for threatened or endangered species are considered exceptional resource value wetlands and are therefore associated with a 150-foot buffer. Most trout production waters are also designated as Category One waters pursuant to the State's Surface Water Quality Standards rules (N.J.A.C. 7:9B). Such waters are also protected through the implementation of the State's Flood Hazard Area Control Act Rules, which require a 300-foot riparian zone immediately adjacent to Category One waters and upstream waters within the same HUC14 sub-watershed. In addition, when unavoidable disturbances to coastal and freshwater wetlands occur as a result of permitting, these losses are generally mitigated at a ratio of 2:1 for creation/restoration and at various ratios for enhancement and preservation of wetlands.

In addition to the laws listed above, wetlands and waters receive coincident and supplemental protection from NJDEP regulations that apply to flood protection (Flood Hazard Area Control Act, N.J.S.A. 58:16A et seq., Flood Hazard Area Control Act Rules, N.J.A.C. 7:13 et seq.), Regional Planning and Management (Pinelands Protection Act, N.J.S.A. 13:18A-1 et seq., Highlands Water Protection and Planning Act, N.J.S.A. 13:20-1 et seq., Coastal Zone Management Rules, N.J.A.C. 7:7 -1 et. seq.) and Water Quality (Stormwater Management Rules, N.J.A.C. 7:8; Surface Water Quality Standards, N.J.A.C. 7:9B). The NJDEP Division of Land Use Regulation in cooperation with the Office of Compliance and Enforcement ensures that activities permitted in and around wetlands are conducted in accordance with their approved plans, while actions that have impacted wetland resources without a permit are held to permitting standards for minimized impacts and appropriate mitigation. As a result, New Jersey finds itself in the unique position of satisfying USEPA core elements for regulatory protection when compared to other programs in the country. NJDEP laws and regulations can be found at http://www.nj.gov/dep/landuse/lawsregs.html.

New Jersey wetlands are further protected pursuant to the Technical Requirements for Site Remediation, N.J.A.C. 7:26E. Under this regulation, the NJDEP's Site Remediation and Waste Management Program (SRWMP) has been proactive in the investigation and remediation of wetlands within or impacted by contamination from known contaminated sites. An ecological evaluation is required to be conducted for all listed contaminated sites pursuant to N.J.A.C. 7:26E-1.16, during which wetlands are identified and evaluated for the presence of contaminants of potential ecological concern. To ensure that site remediations are protective for environmentally sensitive natural resources, including wetlands habitat and wetlands ecological receptors, SRWMP has prepared the Ecological Evaluation Technical Guidance. Direction is provided on how to conduct an Ecological Evaluation and an Ecological Risk Assessment and, if remediation is required, for the derivation of site-specific ecological risk-based remediation goals and Risk Management Decisions. The guidance devotes an entire section to investigation and remediation in wetlands, including the NJDEP Land Use Regulation Program's restoration and mitigation

requirements for impacts to wetlands from site discharges and remedial construction. The primary reference for this document is USEPA's Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments, USEPA 540-R-97-006, Office of Solid Waste and Emergency Response, Washington, DC (ERAGS - USEPA, 1997). Cross-program coordination occurs within the NJDEP between the Site Remediation and Waste Management Program and programs involved with monitoring, assessment and restoration.

New Jersey Wetland-related Laws (N.J.S.A.) https://www.nj.gov/dep/landuse/lawsregs.html
Coastal Area Facility Review Act (CAFRA), N.J.S.A. 13:19
Waterfront Development Act, N.J.S.A 12:5-3 et seq.
Flood Hazard Area Control Act, N.J.S.A. 58:16A et seq.
Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1 et seq.
Highlands Water Protection and Planning Act, N.J.S.A. N.J.S.A 13:20-1 et seq.
Pinelands Protection Act, N.J.S.A. 13:18A-1 et. seq.
Tidelands Act, N.J.S.A. 12:3
Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq.

New Jersey Wetland-related Rules (N.J.A.C.) https://www.nj.gov/dep/rules/nj_env_law.html
Coastal Zone Management Rules, N.J.A.C. 7:7 -1 et. seq.
Flood Hazard Area Control Act Rules, N.J.A.C. 7:13
Freshwater Wetlands Protection Act Rules, N.J.A.C 7:7A
Stormwater Management Rules, N.J.A.C. 7:8
Surface Water Quality Standards Rules, N.J.A.C. 7:9B
Technical Requirements for Site Remediation, N.J.A.C. 7:26E
Highlands Water Protection and Planning Rules, N.J.A.C. 7:38
Pineland Comprehensive Management Plan (CMP)

Core Element 3: Voluntary Wetland Restoration, Creation, Enhancement and Protection and Improved Coastal Shoreline Resiliency

The State of New Jersey has active programs in place for ecological restoration and for protection of wetlands through land acquisition and watershed planning. Restoration is accomplished both by the NJDEP and in partnership with federal and local governments and non-profit and watershed organizations. NJDEP considers wetlands restoration, creation and enhancement to be voluntary unless it is required to satisfy a regulatory requirement. The legal definitions for wetland creation, enhancement and restoration can be found in the Freshwater Wetlands Protection Act Rules, N.J.A.C. 7:7A.

Natural Resource Restoration is administered by the NJDEP's Office of Natural Resource Restoration, which was established in the 1990s to restore natural resources for environmental injury caused by multiple oil spills and discharges. The authority for addressing injuries to the public's natural resources is derived from the Public Trust Doctrine[27]. This common law provides that public lands, waters and living resources are held in trust by the government for the benefit of its citizens. Examples of recent and on-going ecological restoration, creation and enhancement projects by the NJDEP Office of Natural Resource Restoration include the removal of landfill material and restoration of a tidal freshwater wetland, open water, upland habitat and park amenities in Camden City; wetland restoration designs in

[27] https://www.nj.gov/dep/landuse/download/13_20.pdf

Cape May and Salem Counties; funded dam removals that have the effect of increasing water quality; and wetlands quality along the Raritan River, Millstone, Paulins Kill and Musconetcong River[28].

The NJDEP's Division of Fish and Wildlife has been involved in the restoration of tidal wetlands for over 50 years. Programs to restore tidal flow to salt hay impoundments along the Delaware Bay and to convert *Phragmites*-dominated marshland along the entire coast to native *Spartina* species have been actively and successfully pursued since the 1960's. In 2014, NJDEP's Division of Fish and Wildlife partnered with USACE, New Jersey Department of Transportation and several environmental nonprofit organizations to implement three beneficial use of dredged material pilot projects to enhance salt marsh and other coastal habitats. The Division of Science and Research assisted with and continues to monitor these pilot projects as part of a current Wetland Program Development Grant. This monitoring includes the use of drone images collected by NJDEP's new drone program to track changes in vegetative cover. NJDEP Division of Fish and Wildlife's dam removal programs, which restore anadromous fish runs and native aquatic habitats have also been active for many decades. In recent years, the NJDEP Division of Fish and Wildlife has actively cooperated with the NJDEP Division of Parks and Forestry Bureau of Forest Management to restore Atlantic White Cedar wetlands in the Pinelands and has cooperated with the NJDEP Office of Natural Resource Restoration to create and restore a variety of tidal and freshwater wetland ecosystems throughout the State.

Throughout the past several decades the NJDEP Forest Service has restored Atlantic white-cedar in freshwater wetland habitats in the Pinelands and assisted in the development of an Atlantic white-cedar best management practices manual. Typical Atlantic white-cedar restoration efforts include wetland site preparation, competition management and fencing to prevent deer browse on young trees. Atlantic white-cedar stands have important ecological value in New Jersey and the associated wetland restoration work is critical to maintaining those functions. A new landscape scale effort is being used to focus restoration and regeneration management projects and meet a Forest Service goal to increase the acreage of Atlantic White Cedar wetland forest by 10,000 acres by 2028.

Additionally, New Jersey has an active land acquisition program that is overseen by the NJDEP Green Acres Program, which seeks to acquire both uplands and wetlands. New Jerseyans have long supported open space preservation, as demonstrated through the approval of thirteen (13) statewide Green Acres ballot initiatives since 1961, when the Green Acres Program was created to meet New Jersey's growing recreation and conservation needs. Green Acres funding is also used to leverage federal funding made available to preserve wetlands. For example, the Green Acres Program has preserved wetlands with federal funding such as the Cooperative Endangered Species Conservation Fund Land Recovery Acquisition Grants Program (authorized under Section 6 of the Endangered Species Act), Wetlands Reserve Program, Wetlands Reserve Enhancement Program, North American Wetlands Conservation Act, Land and Water Conservation Fund and the Forest Legacy Program. Together with public and private partners, the Green Acres Program has protected more than 650,000 acres of open space throughout the State. The Green Acres, Farmland, Blue Acres, and Historic Preservation Bond Act of 2007 authorized $12 million for acquisition of lands in the floodways of the Delaware River, Passaic River or Raritan River, and their respective tributaries, for recreation and conservation purposes. An additional $24 million was approved by the voters in the Green Acres, Water Supply and Floodplain Protection and Farmland and Historic Preservation Bond Act of 2009. The Pinelands Conservation Fund, which was established in 2004 as part of an agreement between the Pinelands Commission and the Board of Public Utilities, has provided matching grants to private partners and the Green Acres Program for the acquisition of uplands and wetlands located in the Pinelands.

[28] https://www.nj.gov/dep/nrr/restoration/completed.html

A tool for strategic wildlife habitat protection called the NJDEP Division of Fish and Wildlife Landscape Map of Habitat for Endangered, Threatened and Other Priority Wildlife (commonly referred to as the NJDEP Landscape Maps[29]) provides wildlife habitat mapping for community land-use planning and species conservation. The NJDEP's Office of Natural Lands Management's Natural Heritage Program Database is a continuously updated inventory of rare plants and representative ecological communities. Natural Heritage Priority Sites coverage identifies critically important areas to conserve New Jersey's biological diversity, with emphasis on rare plant species and ecological communities in both upland and wetland ecosystems.

The NJDEP's Division of Fish and Wildlife has initiated a project to develop a Statewide Habitat Connectivity Plan. The Connecting Habitat across New Jersey project, being developed by a multi-partner multi-disciplinary working group consisting of over 40 different agencies across the state, represents a strategic plan for wildlife conservation that will identify key areas and actions needed for preserving and restoring critical habitat linkages for terrestrial wildlife in New Jersey. The outcome of this effort will be a statewide analysis depicting areas crucial for habitat connectivity and provide a menu of implementation actions, relating to each identified wildlife corridor that will provide guidance on how to secure, or restore each corridor, including mitigating the impacts of roads on wildlife and habitats. This effort by experts in science, policy and communication will incorporate riparian habitat and other hydrologically connected wetland corridors in New Jersey's fragmented landscape.

As part of the Statewide Nonpoint Source Management program[30], The NJDEP Bureau of Environmental Analysis, Restoration and Standards administers the Water Quality Restoration Grant Program. The NJDEP, in partnership with local and regional stakeholders, has invested significant resources in characterizing the causes and sources of water quality impairment in several priority watersheds and has found that reducing non-point source pollution is key to meeting water quality objectives in those watersheds. Most recently, the NJDEP has focused the grant program on non-point source pollution control projects that can address water quality impairment in priority regions of the State through the rotating basin approach to comprehensive regional assessment of water quality. Projects such as ecological restoration that implement approved watershed plans to improve water quality through the prevention and mitigation of non-point source. Recent projects have included the creation of riparian buffers, living shorelines and installation of stormwater measures to improve the quality of waters and wetlands. Education and outreach are also important elements of this program.

The Highlands Regional Master Plan includes several programs designed to identify categorize, assess and thereby effectively manage the natural resources of the region. One such program, entitled Restoration of Streams and Riparian Areas, addresses Highlands Open waters which include all springs, streams, including intermittent streams, wetlands and bodies of freshwater (including reservoirs). Each Highlands Open Water as designated in the Regional Master Plan is protected by a 300-foot buffer. Subprograms include evaluation, monitoring, planning and restoration of Highlands Open Waters as goals, policies and objectives of the Regional Master Plan. While the NJDEP regulates freshwater wetlands, the Regional Master Plan seeks to improve resources including wetlands across the Highlands Region, in a cooperative effort with municipalities and counties. Specific Goals, Policies and Objectives of the Regional Master Plan apply in each of the core elements of the Wetland Program Plan.

The NJDEP has assisted the United States Department of Natural Resource Conservation Service by providing information on freshwater and tidal wetland ecological communities, including plant species, soils, hydrology and ecological dynamics, for their provisional concepts related to Ecological Site

[29] https://www.state.nj.us/dep/fgw/ensp/landscape/index.htm
[30] https://www.nj.gov/dep/grantandloanprograms/eps_nspc.htm

Description projects[31] in Major Land Resource Areas of New Jersey. Ecological Site Designs provide land managers the information needed for evaluating the land as to suitability for various land-uses, capability to respond to different management activities or disturbance processes, and ability to sustain productivity over the long term.

The NJDEP Office Coastal and Land Use Planning reviews and administers New Jersey's federally-approved Coastal Management Program and is responsible for development and implementation of a number of planning activities including Municipal Public Access Planning, sustainable and resilient coastal community planning[32], ocean resource planning and NJ Fostering Regional Adaptation through Municipal Economic Scenarios (NJ FRAMES). The NJDEP Office of Policy Implementation coordinates the Department's Living Shoreline program[33] that addresses the loss of vegetated shorelines, beaches, and habitat in the littoral zone by providing for the protection, restoration or enhancement of these habitats[34].

NJDEP and an extensive network of partners have formed the New Jersey Coastal Resilience Collaborative to support comprehensive coastal resilience planning and implementation based upon the best available science and technical tools. Where possible, the Collaborative will identify and leverage funding opportunities to implement mitigation and adaptation projects and activities at the community and regional level. This will include, but not be limited to, the development of coastal resilience protocols and best practices; support for needed vulnerability and risk assessments; development of tools and identification of available resources; and technical assistance to identify and implement land use planning techniques, living shorelines and other ecologically-based coastal hazard mitigation and adaptation strategies.

Additional new mapping tools and reports on ecosystem resiliency are now available to assist in identifying potential restoration sites and research supporting methods used to get to the goal of greater resiliency. Examples include The Nature Conservancy's 2017 report on "Resilient Coastal Sites for Conservation in the Northeast and Mid-Atlantic US." The University of Massachusetts Conservation Assessment and Prioritization System (CAPS) created a method to assess aquatic connectivity (critical linkages) for 13 states in the North Atlantic Region. NatureServe, utilizing a National Fish and Wildlife Foundation grant, has created tools for assessing coastal resilience and identifying restoration projects in estuarine watersheds including the Delaware Bay[35].

Core Element 4: Wetland Water Quality Standards

The USEPA guidance for states and tribes developing Wetland Water Quality Standards indicates that water quality standards for wetlands may differ from other traditional surface water standards. They can be derived and supported using measurements of wetland function or condition and rely less on water chemistry parameters and more on a suite of measures such as ecological services and vegetation or macroinvertebrate diversity to identify and protect the full range of wetland functions and/or ecological condition.

The effort to develop meaningful and defensible Wetland Water Quality Standards is occurring nationwide and is well reported in publications and other resources by EPA and the Association for State

[31] https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/ecoscience/desc/
[32] https://www.nj.gov/dep/oclup/resilientnj/index.html
[33] https://www.nj.gov/dep/oclup/ls/index.html
[34] https://www.nj.gov/dep/oclup/case-studies-projects/living-shorelines-projects.html.
[35] http://www.natureserve.org/conservation-tools/projects/nfwf-coastal-resilience-assessments

Wetland Managers[36]. For example, guidelines[37,38] and templates[39] are available to assist states in the process of developing narrative or numeric wetland water quality standards. To date, 14 states[40] have developed narrative or numeric Wetland Water Quality Standards and information from these states would be used to inform New Jersey's approach in considering the feasibility of developing Wetland Water Quality Standards. The Association for Clean Water Administrators[41] focal area of Monitoring, Assessment and Standards will also be an important information resource during this process.

The State of New Jersey has been a national leader in developing robust state water quality standards based on monitoring and assessment data. Similarly, as New Jersey considers the possibility of developing Wetland Water Quality Standards, wetland monitoring and assessment data collected by wetland scientists in the state would provide critical information on wetland condition and function using a reference-based approach along a gradient from high to low ecological integrity. Ecological integrity assessment data on landscape and buffer condition, vegetation, soil and hydrology metrics and environmental stressors has been collected during statewide and USEPA National Wetland Condition Assessments. This rich data set includes sediment chemistry and water quality information that could be used to build a foundation for development of wetland water quality standards in the future. Additional work is needed to better understand the effects of biogeochemical exchanges between groundwater and wetlands and the effects of wetlands on downstream water quality. New Jersey could also build on its aquatic biological assessment research and expertise from benthic macroinvertebrates, amphibians, fish and diatoms for developing wetland condition metrics. Quantitative reconstructions of historic water quality and sediment nutrients can be used to determine reference condition based on sediment core diatoms. The utility of wetland diatom/algae and nutrient data is being tested to see if a Tiered Aquatic Life Use or Index of Biological Integrity models can be used in defining wetland water quality standards. The New Jersey Floristic Quality Assessment Index based on floristic diversity has proved to be a good predictor of wetland condition, and further tests are being conducted on a variety of freshwater and coastal wetland types along the condition gradient to confirm the utility of this tool in developing wetland water quality standards.

Wetland functional assessments evaluate how well a wetland may perform ecological services such as water purification, nutrient transformation, carbon sequestration, flood protection, groundwater recharge and stream flow maintenance, shoreline stabilization, sediment deposition, fish and wildlife habitat and conservation of biodiversity. Many tools have been developed and tested for assessing wetland function; the NJDEP and Rutgers University conducted an evaluation of functional assessment methods in a 2004 report Development of Wetland Quality and Function Assessment Tools and Demonstration.

Existing wetland condition and functional assessment tools as well as continued efforts in wetland monitoring and assessment in New Jersey will provide an important nexus as the state considers water quality standards for wetlands. Options for wetland specific quality standards (narrative and numeric) will be evaluated through collective exploration involving NJ DEP Natural and Historic Resources, Science and Research, Land Use Management and Water Resources Management, as well as the Pinelands Commission and Highlands Council.

[36] https://www.aswm.org
[37] https://www.epa.gov/cwa-404/national-guidance-water-quality-standards-wetlands
[38] https://www.aswm.org/pdf_lib/wwq_standards_for_states.pdf
[39] https://www.epa.gov/wqs-tech/templates-developing-wetland-water-quality-standards
[40] https://www.aswm.org/wetland-programs/water-quality-standards-for-wetlands/2780-states-with-wetlands-and-water-quality-standards
[41] https://www.acwa-us.org/focus-areas/monitoring-standards-and-assessment

Core Element 5: Adaptation, Resilience and Mitigation in a Changing Climate

NJDEP Commissioner Catherine McCabe has identified the reduction of and response to climate change as one key goal for the Department. It is recognized that the State of New Jersey has an urgent need to lead the way in addressing climate change from threats to its coastline to rising temperatures. To address and mitigate climate change, the NJDEP will work to foster a robust public dialog about the impacts of climate change, enable a clean, renewable energy economy (100% by 2050) and work to achieve resilient coastlines and flood-prone areas.

On January 29, 2018, Governor Phil Murphy signed Executive Order 7 (EO 7) directing the NJDEP and the Board of Public Utilities to take all necessary regulatory and administrative measures to ensure New Jersey's timely return to full participation in the Regional Greenhouse Gas Initiative (RGGI). The RGGI is a multi-state, market-based program that establishes a regional cap on carbon dioxide (CO_2) emissions and requires fossil fuel power plants providing 25 megawatts (MW) or more to the grid to obtain an allowance for each ton of CO_2 emitted annually. Power plants may comply by purchasing allowances from quarterly RGGI auctions, secondary markets, or through projects that offset CO_2 emissions[42]. States use the revenue generated from these auctions to increase investment in energy efficiency and other greenhouse gas reduction strategies, rate payer assistance and advance innovation in clean energy economy[43]. Currently, nine Northeast and Mid-Atlantic states participate in RGGI to limit GHG emissions generated by fossil fuel-fired power plants[44]. Launched in 2005, RGGI was the first mandatory greenhouse gas "cap-and-trade" program in the United States. After working with the other RGGI states to determine how best to re-engage in the RGGI program, New Jersey's DEP proposed two rulemakings. The CO_2 Budget Trading Program rule proposal establishes New Jersey's portion of the overarching RGGI program, including the regional cap and applicability requirements for regulated entities. The Global Warming Solutions Fund Act rule proposal establishes a framework, including the guidelines and the priority ranking system, that the DEP, Economic Development Authority and BPU will use to select eligible program and projects to receive RGGI auction proceeds. Both proposals are subject to public hearings on January 25, 2019, and the comment period for both ends on February 15, 2019.

The New Jersey Global Warming Response Act, enacted in 2007, requires the State to reduce economy-wide greenhouse gas to 1990 levels by 2020 and to 80% below 2006 levels by 2050. The Global Warming Solutions Fund Act authorizes the State to implement a market-based CO_2 emissions trading program, such as RGGI, and directs where New Jersey's proceeds from the auctions are deposited and how that money must be used. Ten percent of New Jersey's proceeds shall be allocated to the NJDEP to support programs that enhance the stewardship and restoration of the State's forests and tidal marshes that provide important opportunities to sequester or reduce greenhouse gases.

In 2018, Commissioner Catherine McCabe announced that the NJDEP is launching work on a comprehensive plan to make coastal areas more resilient to the impacts of severe storms and sea-level rise. The Coastal Resilience Plan will become a blueprint for protection of property, lives, infrastructure and natural environments by guiding policies, regulations, resources and funding. NJDEP coastal resilience planning is currently being implemented on a project – site specific, municipal and regional basis, the Coastal Resilience Plan will tie the current resilience planning efforts together in a comprehensive and effective manner. This resilience planning is being developed in part under the New Jersey's Coastal Management Program which is part of the National Coastal Zone Management Program which addresses some of today's most pressing coastal issues, including sustainable and resilient coastal community planning, climate change, ocean planning and planning for energy facilities and development.

[42] https://www.rggi.org/allowance-tracking/offsets
[43] https://www.rggi.org/investments/proceeds-investments
[44] https://www.state.nj.us/dep/aqes/oce-ghges.html

As explained under core element 4, the New Jersey Coastal Resilience Collaborative was formed by the NJDEP and an extensive network of state, federal, academic and conservation partners to support comprehensive coastal resilience planning and implementation based upon the best available science and technical tools. Where possible, the Collaborative will identify and leverage funding opportunities to implement mitigation and adaptation projects and activities at the community and regional level.
The Office of Coastal and Land Use Planning has funded creative initiatives to help land owners and managers plan and build resiliency in the face of a dramatically changing coastal landscape, many of these have been described in the narrative for Core Elements One and Three. The NJDEP Blue Acres Program acquires lands in the floodways of the Delaware River, Passaic River or Raritan River, and their respective tributaries, for recreation and conservation purposes. Additional funding under Green Acres, Water Supply and Floodplain Protection and Farmland and Historic Preservation Bond Act of 2009 is being used to purchase flood-prone land to help prevent catastrophic flooding during extreme storm events driven by climate change.

Core Element 6: Public Outreach and Education

While public outreach and education are addressed in several of the Core Elements in this Wetland Program Plan, it is highlighted here because of its integral importance to successful efforts in wetland assessment, regulation, restoration and protection. Public outreach and stakeholder involvement has been critical to the success of the NJDEP's initiatives. The NJDEP is aware that the public values wetlands for the many ecological services they provide such as flood control, shoreline stabilization and storm protection, water purification, recreation and tourism. The NJDEP has developed innovative education and learning tools such as the Bureau of Environmental Analysis and Restoration's Stewardship Programs (e.g. AmeriCorps NJ Watershed Ambassador and Volunteer Monitoring[45]), interactive mapping (e.g. NJ-GeoWeb[46], Landscape Project[47]), guidance documents (e.g. wetland mitigation, vernal pool certification), and reports (e.g. New Jersey Integrated Water Quality Assessment Reports[48]) that are posted on various NJDEP websites and thus readily available to the public. The NJDEP, in cooperation with the Rutgers University Office of Continuing Education provides wetlands training and information for a wide range of audiences. Environmental education opportunities and water-dependent public recreation (e.g. birding, fishing) and access (e.g. trails and boardwalks, boat launches) for the citizens of and visitors to our State are critical if our precious wetland resources are to be valued and protected.

A "Lessons Learned" paper based on the first four years of NJDEP's pilot beneficial use of dredged material for salt marsh and other habitat enhancement is being drafted to inform the development of future projects and initial findings from the monitoring of these projects have been presented at conferences, meetings and workshops.

New Jersey's post-Sandy focus on coastal resiliency has resulted in excellent outreach products including:

- National Fish and Wildlife Federation Grant - Building Ecological Solutions to Coastal Community Hazards: A Guide for NJ Coastal Communities addressing coastal hazards in four NJ ecosystems: developed lands; beaches and dunes; coastal forests and shrublands; and tidal marshes, with an overview of the ecosystems, protective values, key vulnerabilities and ecological solutions to hazards

[45] https://www.state.nj.us/dep/wms/bears/americorps.htm
[46] https://www.nj.gov/dep/gis/geowebsplash.htm
[47] https://www.state.nj.us/dep/fgw/ensp/landscape/index.htm
[48] https://www.nj.gov/dep/wms/bears/generalinfo.htm

- Training for professionals/contractors in ecological goals, assessments, projects and monitoring[49]
- Development of high school curriculum module for ecological assessment and solutions, with 6 National Fish and Wildlife Federation project case studies, for in class and field activities. Initial phase engaged 700 students. (Scholars, Educators, Excellence, Dedication, Success); and
- 2017 American Planning Association New Jersey Excellence Award for Outstanding Community Outreach and Education

[49] http://www.sustainablejersey.com/nc/events-trainings/

CORE ELEMENT 1: MONITORING AND ASSESSMENT

GOAL: To define ways to evaluate wetland condition and understand wetland functions in order to preserve the important functions that wetlands provide including surface-water and ground-water quality, flood control, coastal storm surge detention, nutrient transformation, sediment and particulate retention, shoreline stabilization and provision of plant and wildlife habitat (fish, shellfish, amphibian, waterfowl, shorebird and other wildlife).

OBJECTIVE 1: Develop a monitoring and assessment strategy consistent with Elements of a State Water Monitoring and Assessment Program for Wetlands (USEPA, 2006) using a 3-tier approach and testing innovative new wetland condition assessment protocols.

Action 1: Identify program decisions and long-term environmental outcome(s) that will benefit from a wetland monitoring and assessment program				
ACTIVITY	2019	2020	2021	2022
Update program's long-term environmental goals	X			X
Continue to identify programs that will ultimately use monitoring data (e.g., track trends, restoration, permitting) and meet with those State programs periodically to share information about progress and components of the strategy	X	X	X	X
Collaborate with wetland condition/function and wetland water quality monitoring programs in Natural and Historic Resources, Science and Research, Water Resources Management, Pinelands Commission, Highlands Council and USGS	X	X	X	X
Identify how wetland data can be used to implement watershed planning, coastal resiliency planning, and wetland restoration projects	X	X	X	X
Action 2: Define wetlands monitoring objectives and strategies				
ACTIVITY	2019	2020	2021	2022
Coordinate with most relevant partners, in federal, state, tribal, and local agencies, universities, conservation organizations, National Estuary Programs, USEPA Regional and National wetland work groups	X	X	X	X
Participate in the development of a formal long-term monitoring network for tidal wetlands	X	X	X	X
Continue to develop a long-term monitoring and reference network for freshwater wetlands	X	X	X	X
Examine other sources for monitoring information within the state and develop data sharing agreements as needed	X	X	X	X
Identify wetland monitoring objectives and strategy	X	X		
Define data needs and applications, including statistical analysis	X	X	X	X
Coordinate with Division of Science & Research; Water Monitoring Program; New Jersey Geologic and Water Survey; and Land Use Management to identify shared goals and activities related to wetlands	X	X	X	X
Examine how to integrate wetlands monitoring strategy into existing and developing water quality monitoring efforts (e.g., headwaters and other on-stream habitat types natural and excavated ponds, stormwater basins, estuarine tidal systems)	X	X	X	X
Action 3: Develop monitoring design, or an approach and rationale for site selection that best serves monitoring objectives (e.g., census, probabilistic survey, rotating basin)				
ACTIVITY	2019	2020	2021	2022
Determine appropriate level for classification of wetlands (e.g., USNVC, HGM, Cowardin, Anderson) in monitoring project designs	X	X	X	X
Determine site selection process (probabilistic survey, rotating basin, census)	X	X	X	X
Define wetland resources from which sites could be selected	X	X	X	X
Determine appropriate use of existing relevant data	X	X	X	X

Action 4: Select a core set of indicators to represent wetland condition or a suite of functions				
ACTIVITY	2019	2020	2021	2022
Identify indicators that are relevant for established monitoring objectives and confirm that they are scientifically defensible	X	X		
Develop/select field method(s) for functional wetland assessments	X	X	X	X
Explore the development of new indicators of wetland condition that include wetland-dependent wildlife	X	X	X	X
Calibrate condition ranking for wetland ecosystems and community types by utilizing Floristic Quality Assessment and Ecological Integrity Assessment tools	X	X	X	X
Add supplemental indicators of condition and/or function as needed	X	X	X	X
Augment existing condition and functional assessment methods for tidal wetlands	X	X	X	X

OBJECTIVE 2: Implement a sustainable monitoring program consistent with the wetlands monitoring strategy.

Action 1: Ensure the scientific validity of monitoring and laboratory activities				
ACTIVITY	2019	2020	2021	2022
Participate in wetlands science and technical advisory team representing NJDEP programs and external research institutions, and explore options for convening a formal Wetlands Council	X	X	X	X
Review NJ DEP Department Quality Management Plan for compliance with the USEPA	X			X
Draft and update Quality Assurance Project Plans for wetland monitoring projects	X	X	X	X
Update New Jersey Ecological Integrity Assessment Field Operations Manual	X			
Select, prioritize and peer review candidate assessment indicators for tidal wetlands	X	X		
Action 2: Monitor wetland resources as specified in strategy				
ACTIVITY	2019	2020	2021	2022
Evaluate components necessary to implement a sustainable wetland monitoring and assessment program	X	X	X	X
Participate in USEPA National Wetland Condition Assessments (NWCA)		X		
Identify and train staff to monitor wetland assessment indicators	X	X	X	X
Utilize monitoring strategy developed through wetland studies implementing NatureServe's Ecological Integrity Assessment, USEPA NWCA and Mid-Atlantic Coastal Wetland Assessment protocols	X	X	X	X
Develop a schedule for monitoring wetland resources including repeat sampling at long-term monitoring sites	X	X	X	X
Monitor streams for Stream Classification Upgrades, identify streams with groundwater influence for freshwater fisheries in headwater streams of northwest NJ watersheds, and monitor native fish species in lakes and rivers in the Pinelands	X	X	X	X
Encourage AmeriCorps NJ Watershed Ambassador Program volunteers to include wetlands in water monitoring projects as feasible	X	X	X	X
Work with NJDEP, New Jersey Pinelands Commission, Highlands Council and Meadowlands Environmental Research Institute scientists to coordinate wetland monitoring and assessment efforts	X	X	X	X
Work with National Estuary Programs (Barnegat Bay Partnership, Partner for the Delaware Estuary, New York-New Jersey Harbor Estuary Program) and National Estuary Research Reserves (Jacque Cousteau) to coordinate wetland monitoring and assessment efforts	X	X	X	X
Work with Federal agencies (USEPA, USFWS, National Park Service, Natural Resource Conservation Service, Army Corps of Engineers, NOAA) to coordinate wetland monitoring and assessment efforts	X	X	X	X
Work with academic scientists to coordinate wetland monitoring and assessment efforts	X	X	X	X
Develop research projects to fill knowledge gaps not covered by existing monitoring programs	X	X	X	X

Action 3: Establish reference condition				
ACTIVITY	2019	2020	2021	2022
Define reference gradient condition (gradient from unimpaired to impaired) for tidal and non-tidal wetlands	X	X	X	X
Define reference standard condition by wetland type (e.g., Best Attainable Condition, Least Disturbed Condition, Minimally Disturbed Condition, Historical Condition, Best Professional Judgement)	X	X	X	X
Determine process for identifying reference standard condition (e.g., reference sites, historical data, sediment core diatoms) for tidal and non-tidal wetlands	X	X	X	X
Select reference sites using a systematic approach	X	X	X	X
Continue to add monitoring data to the Riparia Reference Wetland Database and NatureServe EcoObs Database and use this data for determining reference condition	X	X	X	X
Action 4: Track monitoring data in a system that is accessible, updated on a timely basis, and integrated with other state water quality data				
ACTIVITY	2019	2020	2021	2022
Design a data management system that supports program objectives		X	X	X
Administer and update data system so that state or tribe can use it for analysis		X	X	X
Coordinate data metric definitions and data management system with wetland monitoring research in-state and cross-state with collaborators and partners	X	X	X	X
Ensure that data system is compatible with wetland metrics that may be collected and used in Water Quality Standards for Wetlands		X	X	X
Integrate wetland data with other water quality data systems (e.g., state watershed planning databases) as possible	X	X	X	X
Geo-reference all wetland monitoring data as it is gathered	X	X	X	X
Develop a network of wetland sites that can be used in trends analyses	X	X	X	X
Action 5: Analyze monitoring data to evaluate wetlands extent and condition/function or to inform decision-making				
ACTIVITY	2019	2020	2021	2022
Document data analysis and assessment procedures	X	X	X	X
Develop assessment method to determine condition thresholds relative to reference standard condition	X	X	X	X
Evaluate changes in native vegetation over time utilizing maps and vegetation cover data on native versus invasive species in wetlands to track changes in aerial extent of *Phragmites australis* and other non-native species in freshwater and tidal wetlands	X	X	X	X
Use baseline statewide wetland condition assessment results to inform decision making	X	X	X	X
Analyze changes in wetland extent or condition/function relative to baseline conditions over time	X	X	X	X
Analyze changes in coastal wetland extent or condition/function in response to sea level rise and other climate stressors	X	X	X	X
Regularly report wetlands status and trends including the State Integrated Water Quality Assessment Reports to the EPA	X	X	X	X
Action 6: Public Education and Outreach				
ACTIVITY	2019	2020	2021	2022
Develop a wetland monitoring and assessment education program for state and local watershed groups	X	X		
Provide web-based information to the public on available wetland monitoring protocols and assessment tools		X	X	X
Present monitoring findings and new monitoring techniques at conferences and in peer-reviewed publications	X	X	X	X

OBJECTIVE 3: Conduct research to fill knowledge gaps not covered in existing wetlands monitoring and assessment programs

Action 1: Identify Data Gaps				
ACTIVITY	2019	2020	2021	2022
Keep track of data gaps identified by NJDEP Programs, Pinelands Commission, Highlands Council, the Science Advisory Board, New Jersey State Mosquito Control Commission and external partners	X	X	X	X
Action 2: Develop Research projects				
ACTIVITY	2019	2020	2021	2022
Conduct new research to inform wetland science based on data gaps	X	X	X	X
Design and implement a consistent monitoring and assessment strategy to evaluate estuarine submerged aquatic vegetation (SAV) distribution and abundance in the Barnegat Bay and Great Bay - Little Egg Harbor estuaries	X	X	X	X
Design and implement a study to determine the impact of groundwater withdrawal on wetland hydrology, vegetation, soils, water chemistry and other environmental parameters	X	X	X	X
Design and implement a hydrology study to better understand the relationship of tidal hydrology (amplitude, frequency and duration) on wetland vegetation, soils and water chemistry and resilience to sea level rise	X	X	X	X

OBJECTIVE 4: Incorporate monitoring data into agency decision-making.

Action 1: Evaluate monitoring program to determine how well it is meeting the state's monitoring program objectives				
ACTIVITY	2019	2020	2021	2022
Develop schedule to evaluate monitoring program	X	X	X	X
Cultivate new technology for monitoring and assessment (e.g., drones, remotely sensed data and diatom identification)	X	X	X	X
Ensure assessment methods are providing the necessary information and make changes if needed	X	X	X	X
Review other wetlands program elements with respect to monitoring and assessment (e.g., regulation, restoration, water quality standards, adaptation, resilience and mitigation in a changing climate)	X	X	X	X
Action 2: Share findings from NJDEP and other state monitoring programs				
ACTIVITY	2019	2020	2021	2022
Develop a status and trends report for wetlands of the state	X	X	X	X
Hold regular meetings of the Wetland Program Plan team	X	X	X	X
Continue to organize a brownbag lunch series on wetlands	X	X	X	X
Meet with other state partners to share monitoring data results	X	X	X	X
Present study results at NJWMC, NWMAWG, MAWWG, MACWA and other wetland related meetings[50]	X	X	X	X
Action 3: Evaluate the environmental consequences of a federal or state action or group of actions; modify programs as needed based on M&A data				
ACTIVITY	2019	2020	2021	2022
Modify mitigation reporting protocol and standards as needed based on tested monitoring and assessment tools	X	X	X	X

[50] NJWMC (New Jersey Water Monitoring Council), NWMAWG (USEPA National Wetland Monitoring and Assessment Work Group), MAWWG (Mid-Atlantic Wetland Work Group), MACWA (Mid-Atlantic Coastal Wetland Assessment)

Action 4: Improve the site-specific management of wetland resources				
ACTIVITY	2019	2020	2021	2022
Incorporate wetland monitoring and analysis into restoration plans	X	X	X	X
Establish ecologically-meaningful benchmarks for gauging restoration success	X	X	X	X
Evaluate the performance of compensatory mitigation sites as well as voluntary restoration and protection sites	X	X	X	X
Evaluate the functions provided by individual wetlands or types of wetlands to determine best management options	X	X	X	X
Evaluate the ecosystem services provided by individual wetlands or types of wetlands to determine best management options	X	X	X	X
Evaluate upland buffers to wetland habitats for wetland-dependent wildlife	X	X	X	X
Action 5: Develop geographically-defined wetland protection, resiliency, restoration and management plans				
ACTIVITY	2019	2020	2021	2022
Identify and prioritize management areas for restoration and enhancement (e.g., identify vulnerable wetlands, prioritize restoration potential)	X	X	X	X
Incorporate wetlands into comprehensive Watershed Management Plans that serves state water quality management needs	X	X	X	X
Incorporate wetlands into Coastal Resilience planning	X	X	X	X
Participate in the development of EPA Watershed Restoration Registry tool for New Jersey	X	X	X	X
Identify important wetlands valuable to vulnerable or rare wetland-dependent wildlife and plants	X	X	X	X
Use information obtained on wetland-dependent plants and animals to better inform the development of wetland management plans, such as state forest natural resource stewardship plans	X	X	X	X
Meet with wetland scientists at NJDEP, New Jersey Pinelands Commission, New Jersey Sports and Exposition Authority, Rutgers University Meadowlands Environmental Research Institute, Highlands Water Protection and Planning Council and New York-New Jersey Harbor Estuary Program to explore collaboration and cooperation opportunities in wetlands research, monitoring, assessment, protection, restoration and management	X	X	X	X

CORE ELEMENT 2: REGULATION

GOAL: To avoid and minimize wetland loss, preserve wetland function, replace unavoidable or un-authorized losses with healthy wetlands that are equivalent or greater in size and which function similar to or better than the lost wetlands and, where-ever possible, increase the quantity and quality of wetlands through creation and enhancement projects.

OBJECTIVE 1: Continue to improve upon existing wetland protection efforts under our assumed freshwater wetland program; develop more clearly definable coastal wetland protection standards; improve regulatory permit and data management processes to maximize efficiency and transparency; increase attention on mitigation processes, protocols and monitoring; strengthen coordination between permitting and enforcement programs and develop and implement public outreach services.

Action 1: Improve program efficiency, transparency and regulatory guidance				
ACTIVITY	2019	2020	2021	2022
Develop e-submission capabilities to allow for all permits to be electronically submitted	X	X	X	X
Improve and make changes to the e-LOI process to make it more functional and easier to use	X	X	X	X
Update wetland mitigation related data and incorporate other mitigation actions to create a comprehensive mitigation GIS resource	X	X	X	X
Continue review of all inter and intra-agency MOAs	X	X	X	X
Seek improvements to Department database reporting and data analysis capabilities	X	X	X	X
Develop and evolve Department programmatic websites	X	X	X	X
Develop a historical project review actions GIS layer for internal use by regulatory staff	X	X	X	X
Action 2: Improve wetland regulations, policies or guidelines				
ACTIVITY	2019	2020	2021	2022
Evaluate developing standard management units for watershed/ecoregion applications and assessments	X	X	X	X
Continue to make regulatory changes to improve the protection of wetlands	X	X	X	X
Develop more e-permits that can be approved more efficiently	X	X	X	X
Prepare and up-date Department listed species protocols and survey standards	X	X	X	X
Seek stakeholder feedback on coastal wetland and habitat mitigation and buffer policies and regulations	X	X	X	X
Determine the need to revise upland buffer distances to wetland based on habitat use of wetland-dependent species	X	X	X	X
Action 3: Evaluate regulatory activities and determine environmental results				
ACTIVITY	2019	2020	2021	2022
Monitor wetland mitigation sites for compliance and/or success rates	X	X	X	X
Evaluate integrating and coordinating Department habitat preservation and land acquisition activities	X	X	X	X
Assess values of wetland or riparian buffers to resource health based on water quality indicator research	X	X	X	X
Identify and document secondary impacts on wetland and floodplain resources	X	X	X	X
Storm damage assessments and sustainable developments using wetlands as buffers	X	X	X	X
Evaluate effectiveness of Coastal Wetlands Act of 1970 on protecting and restoring coastal wetlands	X	X	X	X
Identify properties statewide suitable for mitigation	X	X	X	X

Coordinate cross-program with other State and Federal Agencies	X	X	X	X
Study the effectiveness of built Living Shorelines and Beneficial Use of Dredged Material for salt marsh enhancement projects	X	X	X	X
Review and update past designations of sensitive areas within Barnegat Bay and explore the feasibility of designating unique protections and/or restriction on use for identified ecologically sensitive areas	X	X	X	X
Establish goals and needs to support intra- and inter-agency exchange of wetland research information	X	X	X	X
Annually evaluate wetland research results and reports relative to their application to regulatory needs and goals	X	X	X	X
Action 4: Public Education and Outreach				
ACTIVITY	2019	2020	2021	2022
Develop and implement a wetland regulatory public education program including formal workshops and public outreach	X	X	X	X
Continue development of Department website to improve information access and educational outreach	X	X	X	X

CORE ELEMENT 3: VOLUNTARY WETLAND RESTORATION, CREATION, ENHANCEMENT AND PROTECTION AND IMPROVED COASTAL SHORELINE RESILIENCY

GOAL: To prioritize and implement active programs for ecological restoration and protection of wetlands through land acquisition, watershed planning, and development of a coastal shoreline resiliency program with a focus on enhancing and increasing wetland resources statewide.

OBJECTIVE 1: Clearly and consistently define restoration and protection goals

Action 1: Establish goals that are consistent or compatible across relevant agencies				
ACTIVITY	2019	2020	2021	2022
Develop multi-agency body to coordinate restoration, creation, enhancement and protection efforts	X	X	X	X
Gather information on wetland location, class and condition/functions	X	X	X	X
Maintain list of existing and potential projects (e.g., dam removals, resilient shoreline projects, blue carbon, restoration, creation or enhancement)	X	X	X	X
Action 2: Consider watershed planning, wildlife habitat and other objectives when selecting restoration/creation/enhancement/protection sites				
ACTIVITY	2019	2020	2021	2022
Identify rare, vulnerable, or important wetlands and habitats important for wetland-dependent wildlife and prioritize for restoration/protection	X	X	X	X
Apply tools (GIS, color-infrared photography, mapping, modeling, field inspection of soil, vegetation and hydrologic conditions) to identify projects	X	X	X	X
Share priorities and approach with other organizations	X	X	X	X
Contribute information to NRCS for use in state Ecological Sites Description projects	X	X	X	X

Action 3: Provide clear guidance on shoreline resiliency and establish common success measures				
ACTIVITY	2019	2020	2021	2022
Maintain resilient coastal shoreline program, including establishment of a network of partners for the development and implementation of the statewide resilient coastal shorelines plan; coordination of living shoreline practitioners; establishment of a website containing relevant information; and development of a shoreline inventory	X	X	X	X
Develop guidance for creation of resilient coastal shorelines	X	X	X	X
Establish common measures of success	X	X	X	X
Encourage establishment of resilient coastal shorelines	X	X	X	X

OBJECTIVE 2: Protect wetlands from degradation or destruction.

Action 1: Establish long term wetland protection through acquisition				
ACTIVITY	2019	2020	2021	2022
Continue to acquire conservation easements or acquire land in fee that includes wetlands as well as associated uplands for wetland-dependent wildlife	X	X	X	X
Continue to pursue grant opportunities for wetland acquisition	X	X	X	X

OBJECTIVE 3: Increase wetland acres and improve wetland condition and function.

Action 1: Increase wetland acreage through wetland restoration and creation and improve wetland conditions and functions through enhancement				
ACTIVITY	2019	2020	2021	2022
Develop site specific plans for wetland restoration, creation and enhancement projects and monitor completed projects	X	X	X	X
Evaluate tracking of 1) acres of wetlands restored, created and enhanced and 2) the level of or improvements in function/condition based on wetland indicators	X	X	X	X
Action 2: Improve resilience of coastal shorelines				
ACTIVITY	2019	2020	2021	2022
Develop site specific plans to improve coastal shoreline resiliency consistent with guidance and monitor completed projects	X	X	X	X
Develop methods to track length of shoreline improved and associated acres of wetlands restored, created and enhanced	X	X	X	X
Provide technical assistance for coastal shoreline resiliency projects as needed	X	X	X	X
Action 3: Establish partnerships to leverage more wetland restoration, creation and enhancement and more resilient coastal shorelines				
ACTIVITY	2019	2020	2021	2022
Share restoration, creation and enhancement priorities and resilient coastal shoreline approach with partners. Include projects that advance wetlands restoration, and meet funding eligibility requirements, as a priority for award of funds under 319(h)	X	X	X	X
Provide technical assistance to partners as needed	X	X	X	X
Action 4: Improve restoration, enhancement, creation, and protection project success				
ACTIVITY	2019	2020	2021	2022
Review monitoring results to take measures to improve project success as necessary and adapt techniques as necessary	X	X	X	X
Continue long-term monitoring of pilot projects that test new restoration and protection techniques	X	X	X	X
Collect monitoring results and lessons learned from projects in the region and use what was learned to inform the selection and development of future projects	X	X	X	X

Share monitoring results and lessons learned from projects within NJDEP and the public (e.g., papers, presentations, trainings, workshops)	X	X	X	X
Develop best management practices for wetland restoration, enhancement and creation projects	X	X	X	X
Share best management practices documents with public for identifying, designing, constructing and monitoring these restoration projects	X	X	X	X

CORE ELEMENT 4: WETLAND WATER QUALITY STANDARDS

GOAL: Improve the quality of New Jersey wetlands in accordance with the Clean Water Act by setting benchmarks for wetland condition and/or function. Options for Wetland Water Quality Standards will evolve as Monitoring and Assessment programs collect and analyze data using a reference-based approach to define wetland quality along a stressor and condition gradient.

OBJECTIVE 1: Develop wetland-specific water quality standards.

Action 1: Gather information that would inform standards development				
ACTIVITY	2019	2020	2021	2022
Gather information on wetland water quality standards utilizing guidance and templates developed by the USEPA and the Association of State Wetland Managers and existing standards developed by other states	X	X		
Participate in meetings, calls and webinars of interstate organizations including the Association for Clean Water Administrators and Association of State Wetland Managers	X	X	X	X
Evaluate hydrogeomorphic characterization as a potential tool to evaluate wetland ecosystem functions in New Jersey	X	X		
Develop wetland condition ratings by tidal and non-tidal wetland types using existing Floristic Quality Assessment tools	X	X	X	
Utilize diatom identification tools and site diversity assessments in coastal and freshwater wetlands to determine if there is a relationship between wetland condition and diatom diversity or species composition	X	X	X	X
Conduct research on the relationship between groundwater quality and wetlands, and influence of wetlands on downstream water quality	X	X	X	X
Define stressors to wetland water quality in the context of condition, function and ecosystem services	X	X	X	X
Develop new research projects as needed	X	X	X	X
Action 2: Begin to define wetland ecosystem functions and services by type				
ACTIVITY	2019	2020	2021	2022
Explore options for differentiating wetland types by their functions and ecosystem services	X	X	X	X
Explore the feasibility of developing maps related to wetland function (e.g., NWI Plus)	X	X	X	X
Action 3: Consider options for developing wetland water quality standards informed by a monitoring and assessment strategy utilizing available data				
ACTIVITY	2019	2020	2021	2022
Consider options for wetlands specific quality standards (narrative and numeric) through collective exploration involving NJ DEP Natural and Historic Resources, Science and Research, Land Use Management, Water Resource Management, as well as the Pinelands Commission and Highlands Council			X	X
Develop a monitoring and assessment strategy to help inform development of potential wetland water quality standards	X	X	X	X

CORE ELEMENT 5: Adaptation, Resilience and Mitigation in a Changing Climate

GOAL: To reduce and respond to climate change by improving wetland, and aquatic and riparian ecosystem resiliency, maximizing carbon sequestration in tidal marshes and wetland forests, and develop and implement a coastal resilience plan and policy that prioritizes effective use and protection of flood-prone areas and coastal ecosystems for habitat value and community resilience.

OBJECTIVE 1: To improve ecosystem resiliency and adaptation in the face of changes in precipitation, drought, storm events, sea level rise, and threats to natural infrastructure.

Action 1: Identify threats to wetlands posed by changing climate (sea level rise, precipitation, flooding, storm events, drought, fire, windfall)				
ACTIVITY	2019	2020	2021	2022
Identify areas susceptible to coastal edge loss and areas prone to flooding (inland and coastal)	X	X	X	X
Identify and establish long-term monitoring in legacy wetlands in excellent condition as benchmarks to evaluate change over time with a focus on metrics that address climate change impacts	X	X	X	X
Identify areas of greatest potential for wetland system resilience using tools such as The Nature Conservancy's 2017 "Resilient Coastal Sites for Conservation in the Northeast and Mid-Atlantic US" report and interactive map	X	X	X	X
Identify and establish long term monitoring in headwater streams influenced by groundwater for water quality, fisheries and other natural resources	X	X	X	X

OBJECTIVE 2: Develop a strategic initiative that identifies a prioritization methodology for tidal marsh and forest carbon sequestration projects.

Action 1: Identify the components of tidal marsh and forest systems that enhance carbon sequestration				
ACTIVITY	2019	2020	2021	2022
Summarize research on different wetland types capacity for carbon sequestration	X	X	X	X
Create a provisional map of aerial extent of potential carbon sequestration based on wetland types utilizing LULC and other GIS data including coastal wetlands mapping and FIA forest type data	X	X	X	X
Action 2: Identify by mapping tidal marsh and forest system features where restoration, enhancement and protection of these features maximizes carbon sequestration				
ACTIVITY	2019	2020	2021	2022
Using provisional map of existing carbon stock by coastal and forested wetlands, identify areas where future impacts may compromise the carbon sequestration potential and restoration, or enhancement are feasible	X	X	X	X
Identify areas best suited to wetland protection based on carbon sequestration value and climate model predictions of habitat change over time	X	X	X	X
Using the SLOSH and New Jersey FloodMapper tools, create a map of future wetlands by type based on climate scenarios for coastal zones predicted to be impacted by sea level rise and storm surge	X	X	X	X

OBJECTIVE 3: Develop and implement coastal resilience planning and actions that prioritize ecological-based community and habitat resilience.

Action 1: Identify threats to wetlands posed by sea level rise, changes in salinity, increased precipitation, coastal and inland flooding, stochastic and severe storm events, loss of trees to windfall, drought, increased fire				
ACTIVITY	2019	2020	2021	2022
Develop research projects as needed to fill data gaps on threats to wetlands and identify characteristics of wetland habitat resilience	X	X	X	X
Identify inland freshwater wetlands susceptible to coastal sea level rise, storm surge and changes in salinity	X	X	X	X
Action 2: Study the extent and condition of our changing wetlands and shorelines to further assess the relationships among local conditions, functions and stressor impacts in order to improve resource management strategies and enable the most effective use of ecologically based hazard mitigation strategies				
ACTIVITY	2019	2020	2021	2022
Refine Marsh Futures or other approach to rapidly assess tidal marsh vulnerability to sea level rise	X	X	X	X
Identify areas susceptible to coastal edge loss or elevation deficit	X	X	X	X
Identify and establish long-term monitoring in legacy wetlands in excellent condition as benchmarks to evaluate change over time with a focus on metrics that address climate change impacts	X	X	X	X
Participate in the development of a formal long-term tidal wetlands monitoring network	X	X	X	X
Analyze data from long-term tidal wetland monitoring sites and write a state-wide assessment of the New Jersey's tidal wetland's vulnerability to climate change	X	X	X	X
Action 3: Pilot ecologically based hazard mitigation strategies, develop guidance and monitor the success of these ecologically-based resiliency techniques.				
ACTIVITY	2019	2020	2021	2022
Develop a Coastal Resilience Plan as a blueprint for protection of property, lives, infrastructure and natural environments by guiding policies, regulations, resources and funding	X	X	X	X
Ensure that the best possible science on coastal and forested wetlands is used to inform the development of the Coastal Resilience Plan	X	X	X	X
Action 4: Develop tools to inform the Blue Carbon program (RGGI)				
ACTIVITY	2019	2020	2021	2022
Support and participate in NRCS's efforts to better map tidal wetland soils in New Jersey and evaluate blue carbon potential	X	X	X	X
Develop new tools to identify, design, construct and monitor blue carbon projects	X	X	X	X

OBJECTIVE 4: Increase the public awareness and knowledge of the value of wetlands for climate change mitigation and resilience.

Action 1: Develop an education and outreach program related to climate change mitigation and resilience				
ACTIVITY	2019	2020	2021	2022
Seek resources and partners to train professionals/contractors/local and regional officials in the relationship of wetland systems to climate resiliency	X	X	X	X
Encourage development of school curriculum modules for ecological values to climate change resilience	X	X	X	X
Develop and implement a public relations and education campaign for citizens of the state in value of ecological systems including wetlands to community and habitat resilience	X	X	X	X

CORE ELEMENT 6: PUBLIC OUTREACH AND EDUCATION

GOAL: To encourage and cultivate Departmental practices and programs that strives to increase public understanding, awareness and appreciation of wetlands through education, information, outreach and involvement.

OBJECTIVE 1: To improve and expand upon efforts to educate the general public on wetlands functions, benefits and values; increase opportunities for passive and active recreational interaction, raise awareness of the foundations and justification for regulatory practices and seek to develop a general appreciation of the role wetlands play in maintaining the health and stability of the existing and future landscape environment.

Action 1: Communicate the value of wetlands, in particular their functions and ecosystem services, and provide public education opportunities				
ACTIVITY	2019	2020	2021	2022
Invite stakeholder feedback on the New Jersey Wetland Program Plan	X	X	X	X
Coordinate communication and public outreach about New Jersey's work on the USEPA core elements (wetlands monitoring& assessment; regulation; voluntary restoration & protection; adaptation, resilience and mitigation; and wetland water quality standards)	X	X	X	X
Develop public education programs on wetlands that can be used in training workshops and as exhibits at local events	X	X	X	X
Develop web-based tools for the public to use in assessing and monitoring wetlands	X	X	X	X
Publicize the value of wetlands at wetland associated events, recreational and volunteer opportunities	X	X	X	X
Outreach, education and signage for the Sedge Island Conservation Zone and other Environmentally Sensitive Areas	X	X	X	X
Develop and maintain a Department webpage dedicated to wetlands that will share reports, tools and other work on wetlands that the Department has created	X	X	X	X
Develop an ESRI Story Map about wetlands in NJ	X	X	X	X
Action 2: Communicate the practices of wetland monitoring, restoration, enhancement, creation and protection in the state				
ACTIVITY	2019	2020	2021	2022
Sponsor workshops and training opportunities for the public on wetland restoration and best management practices	X	X	X	X
Publicize success stories in wetland restoration projects and volunteer monitoring opportunities	X	X	X	X
Develop an ESRI Story Map about wetland restoration and enhancement, particularly with respect to coastal resiliency in New Jersey	X	X	X	X
Write peer reviewed papers, white papers and brochures for the public about wetland restoration in New Jersey	X	X	X	X