Pennsylvania Department of Conservation and Natural Resources Wetland Program Plan

2026-2030

Version 1.0

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Pennsylvania Department of Conservation and Natural Resources
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Figure 1. Photo of Pitch Pine – Leatherleaf Palustrine Woodland at Algerine Swamp State Natural Area, Tiadaghton State Forest, Lycoming County, Pennsylvania (photo: D. Yeany, Western Pennsylvania Conservancy).

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Introduction

Wetland Program Plan Overview

The Pennsylvania Department of Conservation and Natural Resources Wetland Program Plan (DCNR WPP) is a wetland conservation strategy to guide monitoring and assessment, and restoration and protection, outreach and education, and other conservation activities pertaining to wetlands on lands managed by the DCNR – specifically Pennsylvania's 124 state parks and 20 state forest districts. This effort was completed by a steering committee composed of DCNR staff from the Bureaus of Forestry (BOF), State Parks (BSP), and Natural Heritage Program staff from the Western Pennsylvania Conservancy (WPC) and supported by a Region 3 Wetland Program Development Grant awarded by the U.S. Environmental Protection Agency (EPA).

The primary purpose of this document is to provide a set of agreed-upon goals and objectives for research, protection, management, and restoration of wetlands within Pennsylvania's 124 state parks and 20 state forest districts, in keeping with the core elements suggested by the EPA for inclusion in a comprehensive wetland program.

Implementation of these activities on other state and federal lands and lands managed by private landowners is encouraged, and this document provides a set of standard practices, agreed upon by wetland professionals, that may be applied to all wetlands to enhance the quality and function of wetlands in the Commonwealth as a whole.

In 2008, EPA, Tribes, and States collaboratively developed the Core Element Framework (CEF), based on decades of wetland program experience. The CEF for designing a wetland program uses the following core elements: Monitoring and assessment; Regulatory; Voluntary Restoration and Protection; Water Quality Standards for Wetlands. Tribes and States can use these core elements to protect their wetland resources and address critical issues, such as environmental justice, Indigenous Knowledge, and climate change. Additionally, Tribes and States may leverage EPA Wetland Program Development Grants (WPDG) to develop a program or address specific needs. The WDPG is a competitive wetland grant program designed for Tribes and States to pursue short and long-term program-building activities.

This plan focuses on two of the four core elements of a comprehensive wetland program as identified by the EPA and the goals, objectives, and actions to address these core elements:

- Monitoring and Assessment
    - Mapping
    - Assessment and Monitoring
    - Climate Adaptation
- Voluntary Restoration and Protection
    - Wetland Protection
    - Restoration

This Wetland Program Plan (WPP) describes specific actions for assessment and monitoring, and restoration and protection that will guide the Department's wetland-related activities for the next five years (2026-2030). This plan also includes actions that may contribute to the success of monitoring/assessment and restoration/protection actions including Research and Outreach/Education, which are core activities of DCNR and its partners.

Wetland regulation and water quality standards are established and administered by the Department of Environmental Protection. Thus, core elements regarding Pennsylvania's Regulatory Program and Water Quality Standards are not addressed directly within this WPP.

Background

Wetlands in Pennsylvania are defined as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs and similar areas" (*CHAPTER 105. DAM SAFETY AND WATERWAY MANAGEMENT* n.d. p. 105). The PA Department of Environmental Protection (DEP) recently completed a comprehensive wetland modeling effort, resulting in the mapping of nearly 9,080 km^2 of wetlands in PA (MacFaden et al. 2021).

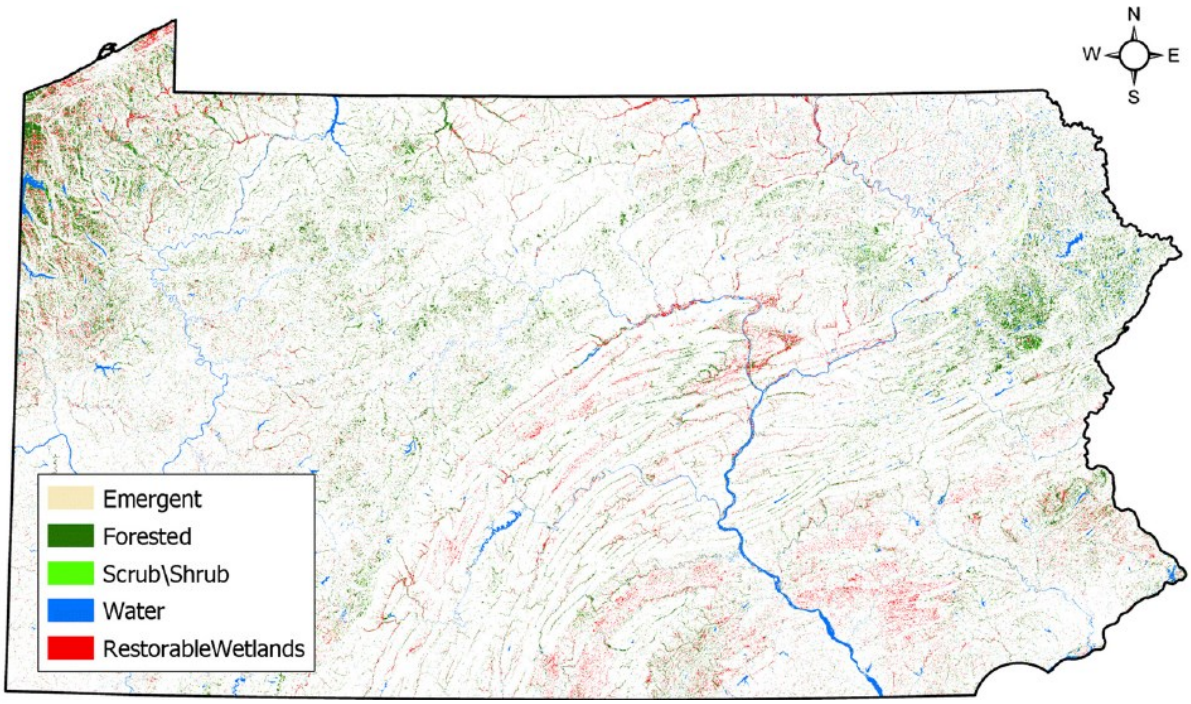

Figure 2. Map of wetlands on state lands in PA (Source: McFaden et al. 2021).

From this modeling effort, it is estimated that nearly 700 km^2 of wetlands (8% of the mapped wetlands in Pennsylvania) are situated within the network of public lands managed by DCNR, which includes 20 State Forests (BOF) districts and 124 State Parks (BSP). Additional wetlands are on lands management by the Pennsylvania Game Commission (PGC), Allegheny National Forest (ANF), US Department of Defense (Army Corps of Engineers) (DOD), and National Park Service units (NPS) in Pennsylvania (Figure 2). Thus, DCNR and other state and federal agencies play an important role in the conservation and stewardship of the Commonwealth's wetland resources.

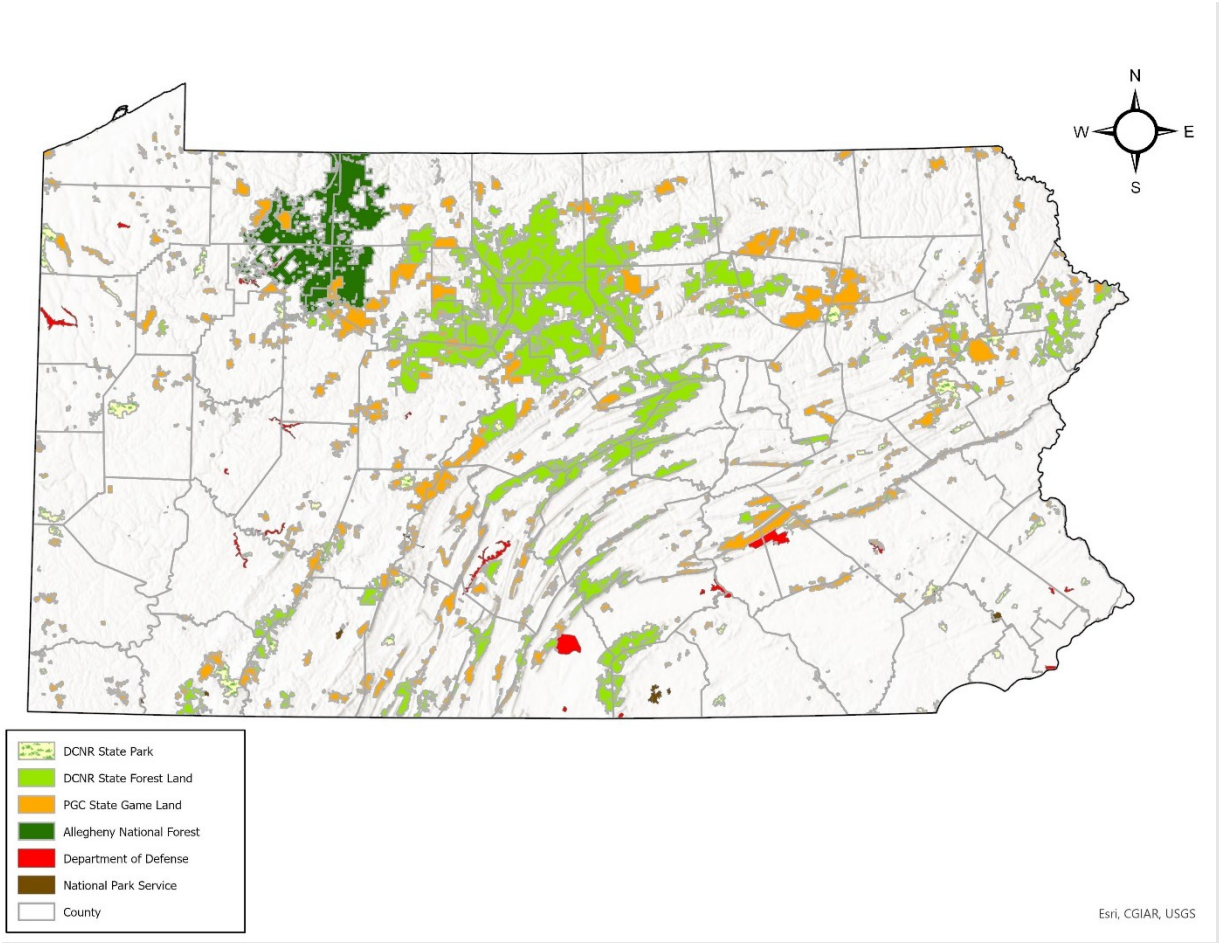

Figure 3. Map of state and federally owned lands in PA.

Values of Wetlands

Wetlands are important features on the landscape because they provide a number of beneficial services to people and wildlife including enhancing water quality, floodplain storage, habitat, aesthetics, and biodiversity conservation. These aquatic resources also provide recreational opportunities for visitors to Pennsylvania's state parks and forests.

Wetland Conservation

It is estimated that over half of Pennsylvania's wetlands (56%) have been lost to development and conversion to agriculture (National Association of Wetland Managers (NAWM) 2020) and thus, protection, restoration, and stewardship of the Commonwealth's remaining wetland resources is a major focus of activities at Pennsylvania's environmental protection and natural resource agencies. Understanding the quality and composition of different wetlands, their ecological significance, and resilience to climate change and other threats is critical to their conservation. One of many commitments for Pennsylvania under the Interstate Chesapeake Bay Agreement is no net loss of

wetlands and focus on achieving continued net gain of wetlands within the Commonwealth (National Association of Wetland Managers (NAWM) 2020).

Wetland Conservation and Regulation

In Pennsylvania Code, wetlands are defined as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs and similar areas." (*CHAPTER 105. DAM SAFETY AND WATERWAY MANAGEMENT* n.d.).

Currently, the Pennsylvania Wetland Code: 25 Pa. Code § 105.17 determines wetlands to be Exceptional Value if they support state listed threatened and endangered species or are hydrologically connected to a stream that supports threatened and endangered species. However, other ecosystem services or qualities that indicate "significance" have not been defined.

Pennsylvania's wetlands, including those on state lands are regulated by DEP through the Dam Safety and Encroachments Act and Dam Safety and Waterway Management Rules and Regulations (Title 25, Pennsylvania Code, Chapter 105 (*CHAPTER 105. DAM SAFETY AND WATERWAY MANAGEMENT* n.d.). The DEP focuses on direct impacts to wetlands as well as discharges to wetlands. Wetland and Waterways permitting in Pennsylvania is based on the Clean Streams Law and the Dam Safety and Encroachments Act, rather than Section §404 of the Clean Water Act.

The state regulates two tiers of wetlands: 1) "Exceptional Value Wetlands" and 2) "Other Wetlands." In accordance with 105.17, wetlands are Exceptional Value (EV) wetlands if they are:

- In an EV watershed or along the floodplain of a wild trout stream and the floodplain of its tributaries
- Within a designated National or State wild or scenic river corridor
- Along a drinking water supply and maintain the quality & quantity of the supply
- Threatened & Endangered species are present
- Hydrologically connected to or located within ½ mi. of wetlands that are habitat for flora or fauna and maintain the habitat of the threatened and endangered species

Rare Species and Natural Communities of Wetlands

Rare plant and animal species found in wetlands are regulated under (*Chapter 45. Conservation Of Pennsylvania Native Wild Plants* n.d. p. 95).

Wetland communities occurring within Pennsylvania have been described by the Pennsylvania Natural Heritage Program through several projects including those funded by the EPA Wetland Program Development Grants. Classification of plant communities has been, and continues to be, a focus of DEP's Aquatic Resource Program Plan. The existing plant community classification for Pennsylvania's wetlands can be found here: https://www.naturalheritage.state.pa.us/Wetlands.aspx

Partnerships and Organizational Roles

Pennsylvania DCNR inventories, monitors, protects, and manages wetland resources situated on lands managed by the agency guided by various management documents and strategies, pursuant to regulations set forth by the DEP.

Within Pennsylvania State Forests and Parks, ecosystem management activities are accomplished through partnerships between a diverse group of partner organizations including local, state, and federal government agencies, non-profit conservation organizations, and for-profit private organizations. A list of some of these organizations and their roles is presented in Table 1.

Table 1. Partner organizations related to wetland conservation, restoration, enhancement, and protection in Pennsylvania.

Organization/ Agency	Monitoring and Assessment	Restoration and Management	Land Protection	Development and Construction	Outreach and Education	Research	Regulation/ permitting
PA Department of Environmental Protection	X	X			X		X
PA DCNR Bureau of Forestry	X	X	X		X	X	X
PA DCNR Bureau of State Parks	X		X		X		X
PA DCNR Bureau of Facility Design				X			X
Western PA Conservancy	X	X	X		X	X	
Conservation Districts	X				X		
Trout Unlimited	X	X			X		
Penn State University	X	X			X	X	
Ohio University	X				X	X	
Bucknell University	X				X	X	
Watershed Organizations	X				X		
Natural Resource Conservation Service	X				X		
Environmental Consultants	X	X			X	X	

Wetlands on State Lands

For wetlands within the 20 DCNR Bureau of Forestry Forest Districts, the responsibility of management of wetlands is carried out by foresters at the district level and resource managers in each of the 124 state parks. These activities are addressed in several management plans and strategies developed to provide guidance to the agencies (e.g. Pennsylvania draft Aquatic Resource Protection and Management Plan for the Commonwealth of Pennsylvania 2021-2025, Pennsylvania Wildlife Action Plan 2015-2025, Pennsylvania Climate Action Plan (2021), DCNR Climate Change Adaptation and Mitigation Plan, Pennsylvania DCNR State Forest Management Plan, Chesapeake Bay Plan).

State Forests:

Wetlands take a prominent role as conservation targets in the DCNR BOF Forest Action Plan (BOF 2020). The Bureau's state objectives are to "continue to work with partners throughout the commonwealth to improve water quality and conserve aquatic ecosystems including headwaters, wetlands, and other aquatic habitats." Further, specific wetland communities are identified as possible targets for inventory and protection (e.g. Cotton Grass Poor Fen and Vernal Pools are identified globally as "vulnerable" (G3) communities in Pennsylvania).

Wetlands are also addressed in the Bureau of Forestry's 2016 State Forest Resource Management Plan (SFRMP), under Section 6. Water Resources (Pennsylvania Bureau of Forestry 2016) in which wetlands are combined with lakes and streams, and other aquatic resources. The SFRMP states that "water resources on state forest lands are managed to conserve or enhance water quality, water quantity, ecological function, and social values. Wetlands, therefore are largely treated under their Water Resource Goals. However, the focus of monitoring, assessment, and remediation/mitigation is primarily on streams and lakes.

DCNR Bureau of Forestry's Water Resources Goals:

- To conserve water resources for sustainable utilization for public benefit.
- To conserve and enhance riparian, wetland, and aquatic ecosystems and their ecological function.
- To manage lakes for their ecological and recreational values.
- To manage river islands throughout the state for their ecological and recreational values.
- To remediate impaired water resources due to point- and non-point source pollution.

Related DCNR Bureau of Forestry documents where wetlands are specifically addressed include the following:

- State Forest Typing Manual (2016). Describes the process for stand typing to the Pennsylvania Community Classification (Fike 1999) standard.
- Aquatic Resource Management Plan.
- Bureau of Forestry Strategic Plan (2024). Identifies wetland protection as one of seven strategies guiding stewardship on Bureau of Forestry land in light of climate change.
- Complete Silviculture Manual (2018).
- Erosion and Sedimentation Guidance for State Forest Management.
- Aquatic Habitat Buffer Guidance.
- DCNR Bureau of Forestry Environmental Review Policy. States that a formal written project review addressing the short term and cumulative effects of the environmental review must be completed by the district forester for activities potentially impacting to surface and ground water or encroaching on wetlands.
- DCNR Bureau of Forestry Forest Carbon Management Principles. Identifies the role of wetlands in carbon storage.

State Parks:

Wetlands are addressed within the Pennsylvania state park strategic plan: Penn's Parks for All, completed in 2021 (PA Bureau of State Parks 2021), which includes strategies for conserving natural and cultural resources. Specifically, identified statewide strategies for wetland conservation include:

- Expand research and collection of scientific data to guide resource management and planning that will assist in the conservation of critical habitat and protect species of special concern.
- Accelerate invasive species management planning and control to better address impacts of terrestrial and aquatic invasive species
- Expand education components for in-park resource restoration work to showcase best conservation practices for improving public and private lands.
- The Pennsylvania DCNR Bureau of State Parks requires a review of all work intruding on wetlands as part of the permit process.

Within each of the 124 state parks in Pennsylvania, Resource Management Plans address wetlands and wetland species of plants and animals. For state parks with prominent lakes and reservoirs, aquatic ecosystem and wetland-related management objectives (invasive plant species management) are also addressed through Lake Management Plans. Specific management activities vary considerably from one park to another based on the park's resources and management objectives. For example, specific activities to protect, maintain and enhance vernal pool wetland sites are included in the park Resource Management Plan for Gifford Pinchot State Park.

Educational activities are developed by state parks environmental education specialists and include both educational lessons and interpretive displays focusing on wetlands. For example, through a lesson plan at Keystone State Park, participants learn how to describe characteristics of a wetland and identify wetland types, including identifying wetland plants, animals, and threats to wetlands. At Nescopeck State Park, educators have developed a hands-on "Activity in a Box" activity to highlight wetland species and processes that are found within the state park exhibits at the nature center.

DCNR-wide Strategies

Bureau of Facility Design and Construction and Bureau of Recreation and Conservation

Wetlands are addressed through the DEP's permitting processes for infrastructure development projects. Identification of significant (high priority wetlands) would assist these bureaus and divisions during the design phase of project planning. DCNR's Bureau of Recreation and Conservation is committed to limiting negative impacts to wetland resources and takes significant wetlands into consideration when awarding grant funding for development and conservation activities. This includes awards for development of trails and recreational facilities.

Climate Change

Wetlands are identified in DCNR's Climate Change Adaptation Plan from 2018 (PA DCNR 2018), specifically where wetlands provide a service or function in climate change mitigation. Relevant examples from this Plan include protect and restore floodplain and riparian wetlands to maximize floodwater storage and groundwater recharge, enhance green infrastructure to lessen the impact of stormwater (i.e. wetlands), and restore hydrologic connectivity between riparian areas and the surrounding landscape.

Pennsylvania Natural Heritage Program

The Pennsylvania Natural Heritage Program (PNHP) is a partnership between the DCNR, the PFBC, the PGC, and the WPC in cooperation with the U.S. Fish and Wildlife Service. PNHP is a member of NatureServe, an international network of natural heritage programs that gather and provide information

on the location and status of important ecological resources (plants, vertebrates, invertebrates, ecological communities and geologic features). PNHP's purpose is to provide current, reliable, objective ecological data and analysis to help guide conservation work and land-use planning. Wetlands that provide critical habitat for rare species are of particular concern to the PNHP partners and activities to prioritize, inventory, assess, and manage habitats (including wetlands) for the needs of rare species are included in the PNHP strategic plan. The PNHP conducts inventories and assessments of public and private land beyond DCNR's ownership. Thus, PNHP may conduct wetland assessment, inventory, and prioritization activities on public and private lands beyond DCNR ownership.

Funding Sources

Funding for the work detailed in the plan comes from a variety of sources. Specific activities are be funded through a variety of sources, including DEP's Clean Water Funds, EPA Region 3 Wetland Program Development Grants, and core Natural Heritage Program funding (DCNR) from State Forest Operations and other discretionary and special funds that will address specific Core Elements, Objectives and Actions outlined in the EPA wetland program plan.

Purpose and Overall Goal

This plan represents a strategic WPP for DCNR to guide assessment, monitoring, protection and restoration activities within wetlands on state lands, for the next five years. This plan also proposes research and outreach/education actions that improve overall success of activities that address core elements of the EPA CEF for wetlands. Once developed, the WPP for DCNR can then be incorporated into DCNR's umbrella resource management plans. The primary purpose of this document is to provide a set of goals and objectives for research, protection, management, and restoration of wetlands on state-owned lands in keeping with the core elements suggested by the EPA for inclusion in a comprehensive wetland program.

Within the plan, we have identified general actions for study, ecological conservation, management/restoration, protection, and activities to monitor and improve water quality on lands owned and managed by PA DCNR, including the 20 state forest districts and 124 State Parks over the next 5 years (2026-2030).

The overall goal of the Wetland Program Plan (WPP) for DCNR to provide the agency with resources and tools to assess and monitor, and protect and restore wetlands on state lands, so that these important ecosystems are conserved and maintained as a priority public natural resource. The activities identified in this plan include development of assessment protocols and training materials/opportunities that will be implemented over the next five years (2026 – 2030). The outcomes of this work will benefit Pennsylvania's wetlands in light of multiple threats, including climate change. By implementing this WPP, DCNR will collect the needed assessment data to inform conservation and management of wetland resources on state forests and parks.

Wetland conservation activities on other state and federal lands and lands managed by private landowners is encouraged, and this document can be used to enhance the quality and function of wetlands in the Commonwealth as a whole. The contents of this document do not necessarily reflect the views and policies of the U.S. EPA, nor does the EPA endorse trade names or recommend the use of commercial products mentioned in this document.

Core Elements

1.0 Monitoring and Assessment

Wetlands on state lands are significant to biodiversity protection and climate change resilience.

Monitoring and assessment actions must include efforts to identify and map significant wetlands, as there currently are no reliably precise maps of wetlands in Pennsylvania. Mapping of significant wetlands on State Forest and State Park lands will take place through collaborative efforts with DCNR BOF and BOSP staff and PNHP, and other partners.

Goal: 1.1. Develop and Maintain Wetland Program Plan

Objective:

Identify program decisions and long-term environmental outcome(s) that will benefit from a wetlands monitoring and assessment program for wetland resources managed by the Commonwealth of Pennsylvania. Within this program plan, significant wetlands will be described, mapped, and assessed by DCNR and information used to guide management activities.

Schedule for Achievement:

DCNR Wetland Program Plan will be completed in 2025 and reviewed/revised every five (5) years by the Pennsylvania Natural Heritage Program and DCNR Bureaus of Forestry and State Parks.

Specific Activities

1. Define wetlands monitoring objectives and strategies
2. Document program's long-term environmental goals
3. Identify programs that will ultimately use monitoring data (e.g., track trends, 401 certification, restoration, permitting)
4. Collaborate with PA DEP's Bureau of Waterways Engineering and conservation partners to advance protection, regulation, and management of the state's wetland resources.
5. Identify how wetland data can be used to implement watershed planning.

Goal: 1.2. Mapping

Objective:

Identify and map high conservation opportunity areas where wetland conservation actions overlap with DCNR conservation and management activities on lands owned and managed by DCNR (State Parks and State Forests), other state lands (PA Game Lands), and private lands that support populations of rare wetland plants and animals.

Schedule for Achievement:

Specific activities to achieve this Action began in 2024 with the development of this Wetlands Plan, starting with determining what DCNR considers "significant" and will continue through 2030. Because of the need for on-the-ground mapping to determine wetland extent, specific actions will extend beyond the period of this plan and will be incorporated into future wetland program plans. The PNHP has completed a map of high value conservation sites based on the presence of significant populations of rare plant species within Pennsylvania, which includes both state and private land and will be used to guide inventory and assessment of wetlands at sites across the state.

Specific Activities

1. Develop definitions (criteria) of significant (e.g. high conservation value) wetlands.
2. Identify the intersection between mapped wetlands, DCNR Bureau of Forestry mapping, and other information, such as presence of rare plant species as identified in PNHP's database (Biotics).
3. Identify and prioritize wetlands on private land and lands managed by other state agencies for land protection and other conservation activities.
4. Identify stewardship needs on DCNR lands.

    a. Bureau of Forestry: Meet with DCNR planners, foresters, and DEP to determine solutions for stewardship needs. Determine management steps Forestry staff can follow for management of wetlands on their properties.
    b. Bureau of State Parks: Meet with state park resource managers and planners, and DEP to determine solutions for stewardship needs. Determine management steps state parks staff can follow for management of wetlands on their properties.
5. Use DEP wetland map (MacFaden et al. 2021), National Wetlands Inventory (NWI), PA wetland community classification (Zimmerman et al. 2012), DCNR stand maps, and other spatial data to identify and prioritize wetland protection and restoration opportunities (including riparian buffers) on DCNR lands.
6. Ground-truth DEP wetland map to determine accuracy on DCNR lands.
    a. Overlay modeled wetlands over habitat/stand mapping to identify percent of modeled wetlands on DCNR lands in agreement with modeled wetlands layer.
    b. Meet with DCNR planners, foresters, and DEP to determine solutions for mapping discrepancies to determine how DCNR values/manages these areas identified as wetlands by DEP.
7. Identify overlap between significant wetlands and other conservation planning resources, such as the State Wildlife Action Plan (PGC-PFBC (Pennsylvania Game Commission and Pennsylvania Fish & Boat Commission) 2015) the PA State Forest Resource Management Plan (Pennsylvania Bureau of Forestry 2016), the Climate Change Adaptation Plan (PA DCNR 2018), and the PNHP's high priority botany sites (PNHP 2024) to investigate synergies between wetland conservation and other conservation actions developed for these strategies.
8. Field mapping Incorporate wetland plant community types (Zimmerman et al. 2012) into Bureau of Forestry stand mapping.
9. Map upland stands on BSP properties using similar methods to map stand level composition and structure of forests on DCNR forest districts and incorporate wetland plant community types into stand maps.
10. Share location of significant wetlands across DCNR Bureaus through an integrated Forest Information Management Systems (FIMS) to guide proactive wetland conservation activities. Obtain wetland mapping (delineation) from development activities (BFDC) from project development. Integrate these data into wetland conservation prioritization map for each Forest District and State Park.

Goal: 1.3. Monitoring and Assessment

Objective: Procedural Development:

Develop a long-term implementation plan for a wetland monitoring and assessment program for wetlands on DCNR land that protects the physical, chemical, and biological integrity of the wetland resources.

The goal is to have an implementation plan for a wetland monitoring and assessment program with a comprehensive methodology for assessing wetlands on state lands. Many tools are available to assess wetland conditions, however, DCNR lacks a formal strategy for doing this. PNHP will develop and test a formal procedure for evaluation of wetlands on state lands by building on existing, validated assessment tools that meet the needs of DCNR.

Assessment and monitoring data are publicly available, except when rare and/or sensitive species information is included. Non-sensitive assessment and monitoring data can be acquired by request through an official data request to DCNR. A publicly available version of the Commonwealth's rare species information is found through the Pennsylvania Conservation Explorer tool: https://conservationexplorer.dcnr.pa.gov/ .

Schedule for Achievement:

Specific activities to achieve this Action began in 2023 with the initiation of a long-term ecological monitoring strategy for DCNR's significant wetlands. The plan and protocol will be completed in 2026 and site selection, ecological assessment activities will take place in 2026. A written wetland assessment manual and trainings for DCNR staff and partners will take place in 2026-2030. Because of the need for on the ground mapping to determine wetland condition, specific wetland field assessment actions will extend beyond the period of this plan and will be incorporated into future wetland program plans.

Specific Action Items

1. Develop and implement an assessment and monitoring framework to evaluate the physical, chemical, and biological integrity of the DCNR's wetland resources.
    a. Meet with DCNR staff, DEP, and others to determine the scope of the assessment activities and purpose of the wetland assessment program.
    b. Research existing data on wetland conditions and obtain existing protocols and tools relevant to wetland assessment in Pennsylvania. This will likely include data from prior PNHP efforts, including the riparian vegetation project, peatlands project, and others.
    c. Identify, define, and refine wetland monitoring objectives, strategies, data sources, and data collection methods that currently exist within applicable DCNR state forest and park resource management manuals, or if these materials need to be developed.
    d. Investigate, develop and refine a core set of indicators to represent condition, suite of functions, degradation cause and restoration to be included within applicable DCNR state forest and park resource management manuals.
2. Demonstrate use of a monitoring program for PA DCNR's wetland resources to evaluate the physical, chemical, and biological integrity of the DCNR's wetland resources over time.
    a. Identify wetland monitoring targets within state forest districts and state parks
    b. Establish clear baselines for wetland condition and track changes over time on an ecoregional and statewide basis
3. Incorporate monitoring data into agency decision-making. As assessments are completed, the findings will be utilized to modify existing or establish new management actions and policies as necessary to improve the condition of the state's wetland resources.
    a. Track monitoring data in a system that is accessible, timely, geo-referenced, and integrated where feasible with other relevant DCNR data.
    b. Analyze monitoring data to evaluate wetland extent and condition/function and/or to inform decision-making.
    c. Collect useful data in high priority wetlands that may overlap with construction and development projects.
    d. Engage BFDC to use maps and data to prioritize projects and avoid/mitigate impacts from development projects.

    e. Develop a "score card" to organize ecological data collected in the field and turn the data into a simple communication tool representing site conditions.
4. Assess and implement nature-based practices, such as large woody material additions to headwater streams, low head dam removal, and culvert replacement to improve resiliency of wetland ecosystems to climate change impacts.
5. Study and implement invasive species control activities to improve resiliency of wetland ecosystems to climate change impacts.
6. Integrate wetland protection, conservation, and stewardship principles into DCNR Climate Adaptation and Mitigation Plan.
7. Monitor restoration/protection sites to ensure that they are implemented and managed correctly and linked to relevant watershed planning efforts.
8. Support DEP and DCNR's efforts to collaborate in the EPA's Mid Atlantic Freshwater and Tidal Freshwater Regional Monitoring Network

2. 0 Voluntary Restoration and Protection

Goal: 2.1. Wetland Protection

Objective:

Development, refinement, and dissemination of best practices and protection mechanisms. This goal broadly encompasses all aspects of protection mechanisms.

Schedule for Achievement:

Between 2023 and 2025, DCNR will identify significant riparian habitats for development of best practices guides. By 2027, DCNR will develop a mechanism to support and promote all guidance projects across state lands in Pennsylvania.

Specific Action Items

1. Through partnerships, increase wetland acreage managed by DCNR through land protection activities and aquatic resource function using appropriate land protection practices.
2. Identify and prioritize wetlands on private land and lands managed by other state agencies for land protection and other conservation activities.
3. Identify properties that will become long term protection targets that will protect and maintain critical habitats and ecological function of wetlands.
4. Develop management guides for specific wetland types (i.e. vernal pools).
5. Using assessment and prioritization information as well as infrastructure plans to Identify potential conflicts between wetland conservation/management and development of infrastructure and help resolve issues and rectify past issues.
6. Use assessment information to identify potential management and restoration projects such as:
    a. Aquatic organism passage
    b. Wetland restoration
    c. Invasive species control
    d. High Conservation Value Areas management
    e. Riparian buffer management

Goal: 2.2. Restoration

Action:

Develop, refine, and disseminate best restoration practices and protection mechanisms. This action broadly encompasses all aspects of restoration practices.

Schedule for Achievement

Between 2023 and 2025, DCNR will identify significant riparian habitats in need of restoration. By 2027, DCNR will plan and implement specific restoration activities to restore wetland processes to alleviate degradation and improve wetland function. By 2027, DCNR will develop a mechanism to track all restoration projects across state lands in Pennsylvania

Specific Action Items

1. Significant wetlands identified in 1.1. and 1.2., above, will be evaluated for restoration need.
2. Identify significant wetland habitats in need of restoration within the following categories:
    a. Buffers for significant aquatic habitat
    b. Barriers to aquatic organism passage
    c. Stream channel restoration
    d. Opportunities for large woody debris additions
    e. Invasive species control/management
    f. Erosion/sedimentation control
    g. Brook trout conservation
    h. Forest hydrology
3. Protect areas around wetlands, vernal ponds, spring seeps, streams, lakes, ponds, and impoundments from management activities that might affect such ecosystems – additional recommendations will be developed to enhance these wetland resources.
4. Develop restoration guides for specific ecosystems (e.g. vernal pools)
5. Identify specific actions needed to Increase wetland acreage and aquatic resource function through remediation and site appropriate restoration practices (reestablishment).
6. Identify specific projects that result in increased wetland acreage or restoration of aquatic resource function through remediation and site appropriate restoration practices (reestablishment) and Give Bureau of Forestry district foresters specific sites to develop wetland-enhancement projects.
    a. Large wood material additions to headwater streams.
    b. Low head dam removal.
    c. Culvert replacement to improve wetland function and habitat quality and improve resiliency of wetland ecosystems to climate change impacts.
    d. Riparian plantings.
    e. Invasive species control.
7. Study and integrate nature-based practices, such as large wood additions to headwater streams, low head dam removal, culvert replacement to improve wetland function and habitat quality.
8. Study and integrate riparian buffers into assessment and land protection planning. The bureau works with partners to improve and restore stream habitat on state forest land. Some of these projects include instream habitat improvement, dam removal, and riparian plantings.

3.0. Assessing Impacts and Adapting to Climate Change

Goal: 3.1. Climate Change

Action:

Investigate and plan for the effects of climate change on wetland ecosystems on lands owned and managed by the Commonwealth as well as other state and private lands in Pennsylvania.

Schedule for Achievement:

Specific activities to achieve this Action began in 2023 with the inclusion of specific wetland goals discussed as possible inclusion into the update of DCNR's Climate Change Adaptation and Mitigation Plan. This work will be completed in 2025. Because of the need for continuous monitoring of wetland condition to determine impact of climate change, specific actions will extend beyond the period of this plan and will be incorporated into future wetland program plans.

Specific Action Items

1. Evaluate plant species and plant communities for their vulnerability to climate change impacts.
2. Develop a list of climate variables that will influence presence and condition of wetlands in Pennsylvania and identify specific action steps to assess and monitor them.
3. From Goal 4., Action 2. and Goal 1., above, identify specific wetland sites, located within each BOF District that are most threatened by climate change impacts, directly or indirectly.
    a. Research existing data on wetland conditions and obtain existing protocols and tools relevant to wetland assessment in Pennsylvania. This will likely include data from prior PNHP efforts, including the riparian vegetation project, peatlands project, and others.
    b. Identify, define, and refine wetland monitoring objectives, strategies, data sources, and data collection methods that currently exist within applicable DCNR state forest and park resource management manuals, or if these materials need to be developed.
4. Investigate, develop and refine a core set of indicators to represent condition, suite of functions, degradation cause and restoration to be included within applicable DCNR state forest and park resource management manuals.
5. Meet with BOF District Staff to discuss vulnerable sites on their districts and identify possible projects to mitigate/adapt to climate change. Use data to prioritize projects and make progress.

4.0 Education, Training, and Outreach

PA DCNR maintains a variety of partnerships with agency, academic, and private non-profit organizations and coordinates its efforts whenever possible to maximize the benefits of other research efforts from around the Commonwealth.

Goal: 4.1. Education, Outreach, and Training

Action:

Enhance education and outreach efforts to broaden understanding and strengthen wetland stewardship among all wetland stakeholders primarily through development of educational modules available through the PA DEP's Clean Water Academy and the development of ArcGIS Story Maps.

Schedule for Achievement:

Pennsylvania Natural Heritage Program will develop at least one training module each year for inclusion on the DEP Clean Water Academy website between 2026 and 2030. A story map will be developed for the major wetland-related projects with one story map completed in 2023. This work will be completed in 2030. Specific actions will extend beyond the period of this plan and will be incorporated into future wetland program plans.

Specific Action Items

1. Develop webinars for the DEP Clean Water Academy that will be used for training or as a public format for disseminating information gained through previous EPA funded projects
    a. Training for Plant Community Predictor Tool
    b. Commonly occurring wetland plants in Pennsylvania
    c. Bryophyte checklists for different wetland types in Pennsylvania
    d. Continue to develop and improve education on environmental review (how to us the online environmental review tool, PA Conservation Explorer)
2. Develop specific training modules for regulatory and management staff in the agencies, conservation district staff, and the public
    a. Plan and conduct field training sessions for partners (EPA, DEP, DCNR).
    b. Plan and conduct field training sessions for riparian wetland restoration.
    c. Plan and conduct training session on wetland conservation/sensitivities to limit potential impacts from existing and proposed infrastructure within parks and forests – targeting district forest staff and BFDC.
3. Develop GIS story maps for disseminating information gained through previous EPA funded projects, such as peatland studies, floodplain studies, and riparian restoration.
4. Educate foresters through centralized training on wetland identification, ecology and processes.

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Revisions

This is the initial wetland program plan. This version of the DCNR Wetland Plan is therefore Version 1.0. The plan will contain a revision history log to document changes to the plan. The DCNR Wetland Plan revisions will be documented here.

Version numbers will be incremented by a whole number (e.g., Version 1.3 to 2.0) when a change is made that significantly affects requirements or procedures. Version numbers will be incremented by decimals (e.g., Version 1.3 to Version 1.4) when there are minor modifications that do not affect requirements or procedures included in the protocol.

Lessons Learned

Each plan revision will include a narrative on changes made and lessons learned. The DCNR Wetland Plan "lessons learned" will be documented here.

This section will include the change and provide reasons for the change and suggestions for improvement.

Table 1. Pennsylvania DCNR Wetland Program Plan crosswalk to US EPA Wetland Program Core Element Framework.

PA DCNR WPP (2026)	WPP Goal Language	CEF Objective reference	CEF Objective #
Goal: 1.1	**Develop and Maintain a DCNR Wetland Program Plan**		
1.1.1	Define wetlands monitoring objectives and strategies	MA 1.a, MA 1.b	1, 2
1.1.2	Document program's long-term environmental goals	MA 1.a	1
1.1.3	Identify programs that will ultimately use monitoring data (e.g., track trends, 401 certification, restoration, permitting)	MA 1.a	1
1.1.4	Collaborate with PA DEP's Bureau of Waterways Engineering and conservation partners to advance protection, regulation, and management of the state's wetland resources.	MA 1.a	1
1.1.5	Identify how wetland data can be used to implement watershed planning	MA 1.a	1
Goal: 1.2	**Mapping**		
1.2.1	Develop definitions (criteria) of significant (e.g. high conservation value) wetlands.	MA 1.c	3
1.2.2	Identify the intersection between mapped wetlands, DCNR Bureau of Forestry mapping, and other information, such as presence of rare plant species as identified in PNHP's database (Biotics).	MA 1.c	3
1.2.3	Identify and prioritize wetlands on private land and lands managed by other state agencies for land protection and other conservation activities.	MA 3.d	13
1.2.4	Identify stewardship needs on DCNR lands.	MA 1.b	2
1.2.5	Use DEP wetland map (MacFaden et al. 2021), National Wetlands Inventory (NWI), PA wetland community classification (Zimmerman et al. 2012), DCNR stand maps, and other spatial data to identify and prioritize wetland protection and restoration opportunities (including riparian buffers) on DCNR lands.	MA 1.b	2

1.2.6	Ground-truth DEP wetland map to determine accuracy on DCNR lands.	MA 1.b	2
Goal: 1.2	**Mapping (con't)**		
1.2.7	Identify overlap between significant wetlands and other conservation planning resources, such as the State Wildlife Action Plan (PGC-PFBC (Pennsylvania Game Commission and Pennsylvania Fish & Boat Commission) 2015) the PA State Forest Resource Management Plan (Pennsylvania Bureau of Forestry 2016), the Climate Change Adaptation Plan (PA DCNR 2018), and the PNHP's high priority botany sites (PNHP 2024) to investigate synergies between wetland conservation and other conservation actions developed for these strategies.	MA 1.b	2
1.2.8	Incorporate wetland plant community types (Zimmerman et al. 2012) into Bureau of Forestry stand mapping.	MA 1.b	2
1.2.9	Map upland stands on BSP properties using similar methods to map stand level composition and structure of forests on DCNR forest districts and incorporate wetland plant community types into stand maps	MA 1.b	2
1.2.10	Share location of significant wetlands across DCNR Bureaus through an integrated Forest Information Management Systems (FIMS) to guide proactive wetland conservation activities.	MA 1.d, VRP 1.a	4, 32
Goal 1.3	**Monitoring and Assessment**		
1.3.1	Develop and implement an assessment and monitoring framework to evaluate the physical, chemical, and biological integrity of the DCNR's wetland resources.	MA 2.b, MA 2.e. MA 3.a	6, 9, 10

1.3.2	Demonstrate use of a monitoring program for PA DCNR's wetland resources to evaluate the physical, chemical, and biological integrity of the DCNR's wetland resources over time.	MA 1.c, MA 3.a	3, 10
1.3.3	Incorporate monitoring data into agency decision-making. As assessments are completed, the findings will be utilized to modify existing or establish new management actions and policies as necessary to improve the condition of the state's wetland resources.	MA 1.c, MA 2.e	3, 9
1.3.4	Study and implement nature-based practices, such as large woody material additions to headwater streams, low head dam removal, and culvert replacement to improve resiliency of wetland ecosystems to climate change impacts.	MA 3.c	12
1.3.5	Study and implement invasive species control activities to improve resiliency of wetland ecosystems to climate change impacts.	MA 3.c	12
Goal 1.3	**Monitoring and Assessment (con't)**		
1.3.6	Integrate wetland protection, conservation, and stewardship principles into DCNR Climate Adaptation and Mitigation Plan.	MA 2.e	9
1.3.7	Monitor restoration/protection sites to ensure that they are implemented and managed correctly and linked to relevant watershed planning efforts.	MA 2.e	9
1.3.8	Support DEP and DCNR's efforts to collaborate in the EPA's Mid Atlantic Freshwater and Tidal Freshwater Regional Monitoring Network	MA 2.c,	7
Goal 2.1	**Wetland Protection**		
2.1.1	Through partnerships, increase wetland acreage managed by DCNR through land protection activities and aquatic resource function using appropriate land protection practices.	MA 3.d	13
2.1.2	Identify and prioritize wetlands on private land and lands managed by other state agencies for land protection and other conservation activities.	MA 3.d, VRP 1.b, VRP 2.a	13, 33, 35
2.1.3	Identify properties that will become long term protection targets that will protect and maintain critical habitats and ecological function of wetlands.	MA 3.d	13
2.1.4	Develop management guides for specific wetland types (i.e. vernal pools).	MA 3.c, MA 3.d, VRP 1.c	12, 13, 34
2.1.5	Using assessment and prioritization information as well as infrastructure plans to Identify potential conflicts between wetland conservation/management and development of infrastructure and help resolve issues and rectify past issues.	VRP 2.b	36

2.1.6	Use assessment information to identify potential management and restoration projects such as: Aquatic organism passage, Wetland restoration, Invasive species control, High Conservation Value Areas management, and Riparian buffer management	MA 1.a, MA 1.b	1, 2
2.1.7	Protect areas around wetlands, vernal ponds, spring seeps, streams, lakes, ponds, and impoundments from management activities that might affect such ecosystems – additional recommendations will be developed to enhance these wetland resources	MA 3.d	13
Goal 2.2	**Restoration**		
2.2.1	Significant wetlands identified in 1.2. and 1.3., above, will be evaluated for restoration need.	MA 3.c	12
2.2.2	Identify significant wetland habitats in need of restoration	MA 3.c	12
2.2.3	Develop of restoration guides for specific ecosystems (e.g. vernal pools)	MA 3.c, VRP 1.c	12, 34
2.2.4	Identify specific actions needed to increase wetland acreage and aquatic resource function through remediation and site appropriate restoration practices (reestablishment).	VRP 3.a, VRP 3.b, VRP 4.a,	37, 38, 40,
2.2.5	Identify specific projects that result in increased wetland acreage or restoration of aquatic resource function through remediation and site appropriate restoration practices (reestablishment) and Give Bureau of Forestry district foresters specific sites to develop wetland-enhancement projects.	VRP 3.a, VRP 3.b, VRP 3.c,	37, 38, 39
2.2.6	Study and integrate nature-based practices, such as large wood additions to headwater streams, low head dam removal, culvert replacement to improve wetland function and habitat quality.	VRP 4.a, VRP4.b, VRP 4.c	40, 41, 42
2.2.7	Study and integrate riparian buffers into assessment and land protection planning. The bureau works with partners to improve and restore stream habitat on state forest land. Some of these projects include instream habitat improvement, dam removal, and riparian plantings.	VRP 4.a, VRP 4.b, VRP 4.c	40, 41, 42
Goal 3.1	**Climate Change**		
3.1.1	Evaluate plant species and plant communities for their vulnerability to climate change impacts.	MA 2.e	9

3.1.2	Develop a list of climate variables that will influence presence and condition of wetlands in Pennsylvania and identify specific action steps to assess and monitor them.	MA 2.e	9
3.1.3	From Goal 4., Action 2. and Goal 1., above, identify specific wetland sites, located within each BOF District that are most threatened by climate change impacts, directly or indirectly.	MA 2.e	9
3.1.4	Investigate, develop and refine a core set of indicators to represent condition, suite of functions, degradation cause and restoration to be included within applicable DCNR state forest and park resource management manuals.	MA 2.e	9
3.1.5	Meet with BOF District Staff to discuss vulnerable sites on their districts and identify possible projects to mitigate/adapt to climate change. Use data to prioritize projects and make progress.	MA 2.e	9
Goal 4.1	**Education, Outreach, and Training**		
4.1.1	Develop webinars for the DEP Clean Water Academy that will be used for training or as a public format for disseminating information gained through previous EPA funded projects	Reg 3.e	30
4.1.2	Develop specific training modules for regulatory and management staff in the agencies, conservation district staff, and the public	Reg 3.e	30
4.1.3	Develop ESRI GIS story maps for disseminating information gained through previous EPA funded projects, such as peatland studies, floodplain studies, and riparian restoration.	Reg 3.e	30
4.1.4	Educate foresters through centralized training on wetland… identification, ecology and processes boundaries, etc.	Reg 3.e	30

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