WEST VIRGINIA
WETLAND PROGRAM PLAN

2021-2025

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Division of Water and Waste Management
West Virginia Department of
Environmental Protection

Wildlife Resources Section
West Virginia Division of
Natural Resources

Contents

Figure 1. Silver maple swamp at Poppybean Farm easement (photo courtesy of WVLT).

Acknowledgements

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Introduction

West Virginia has approximately 66,200 mapped acres of wetlands, not including lakes and streams. The best available mapping is the National Wetlands Inventory, which was developed in the early 1980's. This dataset includes most of the wetlands on the wetter end of the gradient, but because of the technology limitations of the time, many of the smaller, drier, or forested wetlands are not included. The total acreage of wetlands in West Virginia today is probably closer to 100,000 acres. This represents less than one percent of the state's land surface but provides extraordinary benefits to the state. The most dramatic example of this is illustrated by the relationship between wetlands and biodiversity. Wetlands provide essential habitat for fish and wildlife, including a remarkable 23% of West Virginia's plant species, and 44% of its rare plants. Wetlands filter and purify water, capturing sediment and pollutants. Naturally-occurring bacteria in wetlands convert polluting nitrates into harmless nitrogen gas. Wetlands protect against flood damage by slowing flood flows, reducing flood peaks, and reducing bank erosion. Large headwater wetlands in the Allegheny Mountains and Meadow River provide particularly important flood protection services to the state. Boardwalks at Cranberry Glades, Canaan Valley, and other wetlands provide unique educational opportunities. Birders and hunters treasure wetland complexes in National Wildlife Refuges, Wildlife Management Areas, or their own backyards. Nature tourism, on the rise nationwide, is closely

linked to the rich flora and fauna and scenic landscapes of our state's wetlands.

Major West Virginia wetland complexes include high elevation Allegheny wetlands, Meadow River wetlands, Ohio River wetlands, rare marl wetlands of the eastern panhandle, extremely rare summit sinkhole wetlands in the east, alluvial wetlands associated with streams and rivers throughout the state, and vernal pools.

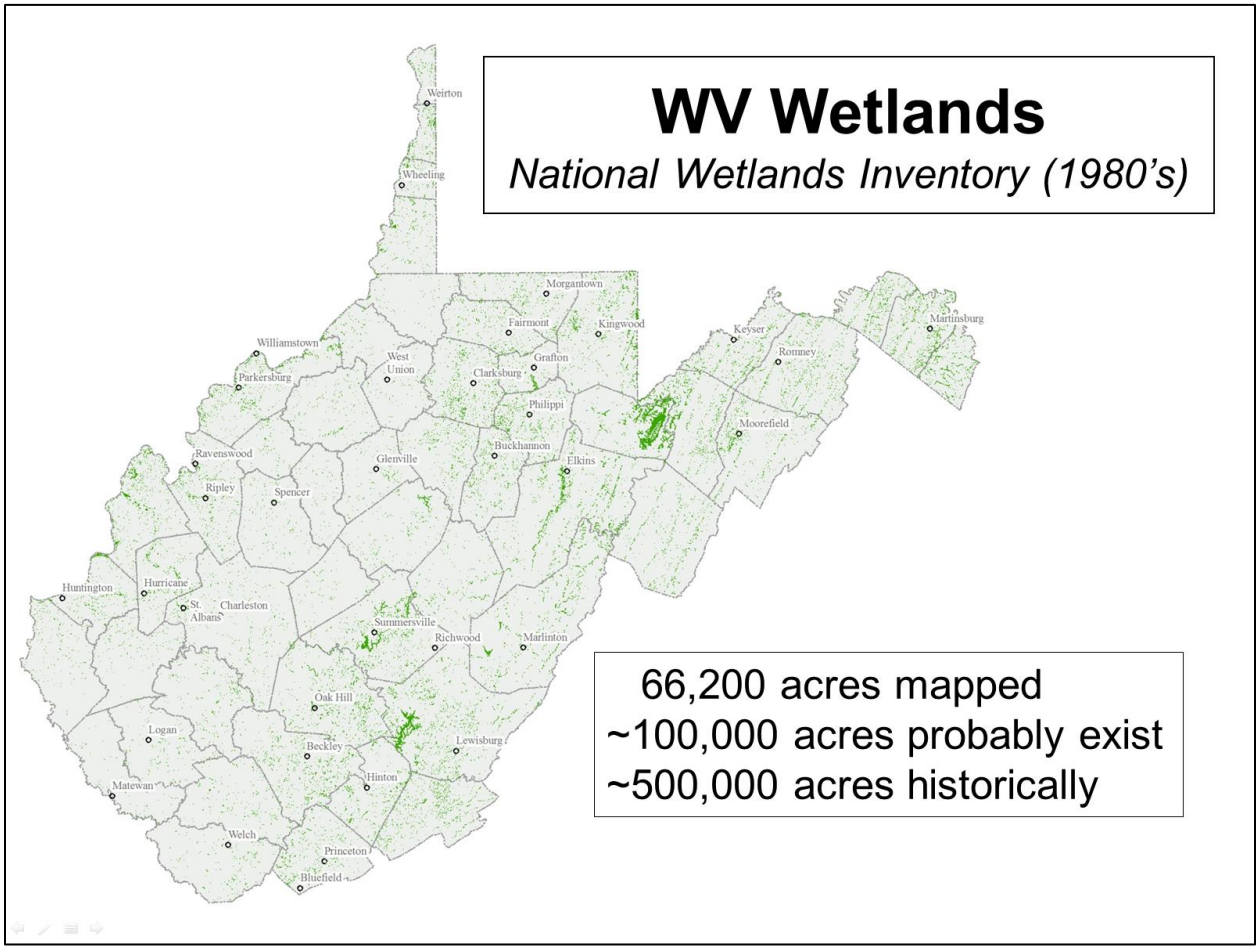

Figure 2. West Virginia Wetlands

The single most important threat to wetlands in West Virginia is land conversion from natural to developed land uses as part of general economic development. Construction, extractive industries, and floodplain development all contribute to wetland loss in the state. Pollution, artificial drainage, and invasive species degrade existing wetlands. Climate change, which is bringing an increased frequency of both drought and extreme storm events, threatens wetlands while at the same time underscoring their importance in helping to stabilize the hydrologic cycle.

Organizational Roles

Wetland conservation in West Virginia is carried out by many organizations including local, state, and federal government agencies, non-profit conservation organizations, and for-profit private organizations. A brief list of the roles of some of these organizations is presented in Table 1. Note that the heading "Restoration" includes both re-establishment and enhancement (rehabilitation) activities.

Table 1. Organizational Roles Related to WV Wetlands

Organization	Monitoring	Assessment	Regulation	Restoration	Preservation	Public Land Acquisition	Public Land Management	Education & Outreach	WQ Standards	Research
WVDEP	**X**	**X**	**X**	**X**				**X**	**X**	**X**
WVDNR	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**
CBP	X			X				X		
Conservation organizations	X	X		X	X			X		X
DU				X	X	X		X		
Environmental consultants	X	X		X				X		
Land trusts	X	X		X	X	X	X	X		
Local government				X		X	X	X		
Mitigation banks	X	X		X	X					
MNWV								X		
NRCS		X	X	X	X			X		X
OCHF					X					
PVAS				X	X	X	X	X		
TNC	X	X		X	X			X		X
TU				X	X			X		
USACE			X				X			X
USEPA	X	X	X					X		
USFS	X			X	X	X	X	X		
USFWS	X	X	X	X	X	X	X	X		X
Universities	X	X						X		X
USNPS	X	X			X	X	X	X		
Watershed associations	X	X		X	X		X	X		

Table 1. Organizational Roles Related to WV Wetlands										
Organization	Monitoring	Assessment	Regulation	Restoration	Preservation	Public Land Acquisition	Public Land Management	Education & Outreach	WQ Standards	Research
WVCA				X				X		
WVDA				X				X		
WVDOF							X			
WVDOH				X		X	X	X		
WVHC				X				X		
WVLT	X	X		X	X	X	X	X		
WVRC	X			X				X		
WVU	X	X					X	X	X	X

Much of the state government responsibility for regulation, management, and assessment of wetlands falls under two agencies in West Virginia, the Department of Environmental Protection and the Division of Natural Resources. Within the Department of Environmental Protection, the Division of Water and Waste Management contains three groups that have responsibility for various aspects of wetlands, as follows:

- Watershed Assessment Branch (monitoring, assessment, and TMDL development)
- Watershed Improvement Branch (In-lieu Fee program, Chesapeake Bay program, and outreach to the public)
- Water Quality Certification Program (regulatory)

The Division of Natural Resources includes wetland-related activities within the following administrative groups:

- Office of Land and Streams (acquisition of public lands)
- Wildlife Resources
    - Game Management (wetland restoration and management on WMA's for waterfowl and other water birds)
    - Coordination Unit (Clean Water Act review)
    - Wildlife Diversity Unit (inventory, monitoring, and assessment of species and natural communities, public outreach)
- Parks and Recreation (management of state park lands, including some of the highest-value wetlands in the state)

Summary of Progress 2016-2020

During the previous five-year period, progress was made toward better conserving and regulating wetland activities in West Virginia for each of four core elements: Regulation, Monitoring and Assessment, Restoration and Protection, Water Quality Standards. Two highlights of this period were building a sustainable wetland component of WVDEP's Watershed Assessment Branch and developing a wetland assessment protocol to serve state regulatory, monitoring, and land acquisition needs.

With funding from USEPA Wetland Program Development Grant # 96331301 (2014-2019), WVDEP's Watershed Assessment Branch was able to develop the West Virginia Wetland Rapid Assessment Method (WVWRAM), a GIS- and field-based tool. This assessment method includes both EPA level 1 (landscape assessment) and EPA level 2 (rapid assessment) approaches. Level 1 WVWRAM scores for all mapped wetlands in the state are now displayed on the newly created WVDEP wetlands web pages. Level 2 WVWRAM assessments have been completed at 174 sites, including 84 probabilistic randomly selected wetlands, 44 wetland restoration sites, and 10 reference sites. Customized reports showing mapped wetlands and wetland functions have been shared with major landholders throughout the state, and multi-day WVWRAM training events have reached 112 environmental professionals from 40 organizations. Exemplary wetlands have been identified and mapped statewide. WVWRAM was put out for public notice by WVDEP from December 2019 through February 2020 and has subsequently been accepted as a WVDEP-approved assessment tool.

Links to the key web pages related to WVWRAM and wetlands are:

- Wetland Assessment https://dep.wv.gov/WWE/watershed/wetland/Pages/default.aspx
- WVWRAM https://dep.wv.gov/WWE/watershed/wetland/Pages/WVWRAM.aspx
- WVWRAM Training https://dep.wv.gov/WWE/watershed/wetland/Pages/WVWRAM-Training.aspx
- Map of WVWRAM Level 1 Scores (DEP GIS Viewer, click on Wetland Function 2019), https://tagis.dep.wv.gov/wvdep_gis_viewer/
- Wetland Resource Guide https://dep.wv.gov/WWE/getinvolved/sos/Pages/Wetstudyguide.aspx

With assistance from USEPA Wetland Program Development Grant # 96362001 (2018-2022), WVDEP's Watershed Assessment Branch has begun developing a statewide wetland monitoring program based on a spatially representative probabilistic design with a 5-year cycle. The first season of test data has been collected.

The WVDNR Natural Heritage Biotics database was maintained and enhanced, with 188 wetland and floodplain community occurrences added in the last 5 years, for a total of 1034 of

such occurrences. WVDNR completed the state classification of wetland associations to the standard of the US National Vegetation Classification. New fact sheets describing several natural wetland communities have been placed on the DNR website, and new research was published on pin oak swamps and rare wetland butterflies. The WVDNR Ecology plots database now holds 1789 palustrine plots, which represents an increase of 122 wetland plots in the last five years.

Continued monitoring of rare or threatened animal and plant species in wetlands was carried out by the WVDNR Wildlife Diversity Unit. Data collection and analysis for a new Lepidoptera Atlas was completed, including revision of state conservation rankings. Long-term monitoring of spotted turtle populations was initiated in 2017.

WVDEP, NRCS, and USEPA participated in the National Wetland Condition Assessment in 2016, resulting in field data for 12 sites, including five national reference sites.

NRCS continued the use of two wetland compliance teams to conduct Food Security Act compliance activities in the state, and also published and distributed a landowner fact sheet on wetland compliance provisions. NRCS provided key technical support in the development of soil metrics for the WV Wetland Rapid Assessment Method. NRCS contributed expert soil scientists to the National Wetland Condition Assessment and to 6 state-sponsored wetland training workshops for environmental professionals.

The Inter-Agency Review Team (WVDEP, WVDNR, USEPA, USACE, NRCS, USFWS) provided regulatory services for impacts to wetlands under the Clean Water Act from 2016-2020. WVDEP's Water Quality Certification program and WVDNR's Coordination unit provided state certification and review of wetlands that came into the regulatory process under the Clean Water Act. WVDEP's In-Lieu Fee program provided mitigation services including several wetland restoration projects with WVWRAM baseline and post-construction monitoring. WVDEP's Watershed Improvement Branch continued with outreach activities related to wetlands.

Wetland education and outreach activities were carried out by numerous agencies and organizations, as detailed (in part) in Appendix A. Wetland fact sheets were developed by WVDEP and NRCS during this period and are presented in Appendix B. Our knowledge of wetland education and outreach activities is incomplete, and one of the goals of the next 5-year period is to increase collaboration between organizations and better capture our collective impact.

Wetland restoration and protection were accomplished by numerous agencies and organizations. This Wetland Program Plan represents the first statewide effort to begin capturing data on wetland restoration and preservation. Our knowledge is still incomplete.

Known projects from 2016-2020 are listed in Appendix C, but older projects are also of importance, especially as we begin to develop monitoring indicators to aid in restoration success. Appendix D includes information (in part) on wetland restoration projects completed prior to 2016. One of the goals of the next 5-year period is to increase collaboration between organizations and better capture our collective progress.

WVU initiated two key research studies with support from USEPA Wetland Program Development Grants. The first study (EPA # 96362401) is evaluating water quality conditions in wetlands across the state, pairing intensive water sampling with WVWRAM assessments. The second study (EPA # 96383001) is evaluating woody growth indicators to better capture trends in wetland restoration projects. In addition, WVU completed research on NRCS wetland easements, amphibian metamorphosis and reproduction, deer herbivory in wetlands, spotted salamanders, vernal pools, and bird use of created wetlands. Marshall University and Concord University also completed wetland-related research. A list of publications and on-going wetland research initiatives is presented in Appendix E.

Plan Overview 2021-2025

The West Virginia Wetland Program Plan provides a framework and direction to WV Department of Environmental Protection, WV Division of Natural Resources, and their partners, in order to build, strengthen, and improve the ability of the state to protect and conserve its wetlands. The plan includes current wetland initiatives and identifies actions that the state and its partners plan to implement from 2021-2025 to improve the state wetland program and wetland conservation across all sectors.

Important outcomes of the actions in this plan are expected to include:

(a) increased understanding of the condition and quality of WV wetlands, allowing state agencies and other organizations to better direct regulatory and conservation resources toward restoring and protecting wetlands,

(b) increased capacity of agencies and conservation organizations to apply robust scientific methods to understanding and protecting wetlands,

(c) increased ecological success of wetland compensatory mitigation banks and wetland restoration initiatives, and

(d) no net loss of wetland acreage or wetland functions statewide.

Tangible products expected to be produced 2021-2025 include:

(a) adoption of WVWRAM into the Stream and Wetland Valuation Metric (SWVM) for Clean Water Act wetland assessment and mitigation requirements,

(b) engagement with NRCS regarding the potential use of WVWRAM to determine minimal effects for Food Security Act wetland assessments and regulation,

(c) development and testing of a state wetland monitoring program including Field Operations Manual, Data Analysis Manual, database, website, and 5 years of monitoring data,

(d) 10 wetland assessment training events for environmental professionals,

(e) 40 educational or volunteer events to build public support for wetland conservation,

(e) enhanced guidance and monitoring indicators for wetland restoration and mitigation banks including woody growth indicators,

(f) updated Restoration Planting Tool for wetlands,

(g) successful completion of the National Wetland Condition Assessment field activities,

(h) recommendations for water quality standards for wetlands,

(i) increased collaboration among organizations working in wetlands,

(j) increased voluntary protection and voluntary restoration of wetlands,

(k) continued inventory and monitoring of rare, threatened, and endangered wetland species and high-quality natural wetland communities, and

(l) continued research on wetland topics of importance to restoration and conservation success.

Funding Sources

Funding for the work detailed in the plan comes from a variety of sources, as indicated in the table below.

Table 2. Funding Sources for the West Virginia Wetland Program

Activity	Source
Clean Water Act review by state agencies	WVDEP, WVDNR
In-Lieu Fee program	CWA Section 404 compensatory mitigation fees
Inter-Agency Review Team activities	Each agency funds its own participation (WVDEP, WVDNR, USEPA, USACE, NRCS, USFWS)
Long-term research on spotted turtles	NEAFWA
National Wetland Condition Assessment	USEPA, NRCS (in-kind), WVDEP
National Wetlands Inventory updates	Possible future sources include FEMA, USFWS, or USEPA. A small percentage of this work will be done annually by WVDEP to incorporate WVWRAM field

Table 2. Funding Sources for the West Virginia Wetland Program	
Activity	**Source**
	mapping under USEPA WPDG 96362001
Natural Heritage & Threatened Species monitoring and databases	USFWS (State Wildlife Grant, Endangered Species Act), Vehicle License Plates, Wildlife Calendars, WV Division of Highways
Recommendations for water quality standards for wetlands	USEPA WPDG 96362401, WVU, WVDEP
Revise mitigation performance standards including woody growth indicators	USEPA WPDG 96383001, WVDEP, WVU
State wetland database & website development	USEPA WPDG 96362001, WVDEP
State wetland monitoring protocol development	USEPA WPDG 96362001
Update Restoration Planting Tool	USEPA WPDG 96362001, WVDEP
Wetland preservation, creation, restoration and enhancement	NRCS Wetland Reserve Program, WV Stream Partners Program, USEPA's Chesapeake Bay Implementation Grant administered through WVDEP, National Fish and Wildlife Foundation's Chesapeake Bay Stewardship Fund, CWA Section 319 Nonpoint Source Program, and many others
WVWRAM minimal effects determinations in support of Food Security Act	NRCS, WVDEP

Core Elements

Four core elements are identified by the U.S. Environmental Protection Agency as part of their Enhancing State and Tribal Wetlands Program. These elements have been adopted as an organizing framework for the West Virginia plan. The core elements for West Virginia are:

1. Monitoring and Assessment
2. Regulation
3. Voluntary Restoration and Protection
4. Water Quality Standards

Tables listing the goals, objectives, actions, and activities under each core element are below.

Core Element 1: Monitoring and Assessment

Goal: Develop and maintain a program to monitor the status and trends in wetland condition, assess the functions of wetlands, and update the inventory of wetlands at the watershed, landscape, and site level scales consistent with EPA's three-tiered approach, in order to provide decision-makers and the public with the best possible information on the extent, type, and health of West Virginia's wetlands and the ecosystem services they provide.

An accurate and up-to-date inventory of wetlands is essential to establishing baseline condition. In West Virginia, current mapping dates largely to the early 1980's and is urgently in need of revision.

Objectives:

A. Develop a **monitoring and assessment strategy** consistent with *Elements of a State Water Monitoring and Assessment Program for Wetlands* (EPA, 2006).
B. Implement a **sustainable monitoring program** consistent with the wetlands monitoring strategy.
C. Incorporate monitoring data into **agency decision-making**.

Benefits: Monitoring and assessment activities establish a baseline in wetlands extent and condition, detect change, assess function, and characterize trends over time. Restoration and mitigation sites can be compared to reference conditions to determine whether they are meeting performance standards. Regulatory programs rely on monitoring to detect whether unauthorized actions are occurring, evaluate alternatives to avoid and minimize impacts, determine whether permit holders comply with conditions in CWA Section 401 certifications or in Section 402, 404, or state permits, and evaluate the cumulative impacts of permitted actions. Monitoring and assessment can also inform planning, prioritization, and decision-making for individual wetlands and entire watersheds. Monitoring and assessment of wetlands will eventually help West Virginia to evaluate progress toward its goal of no net loss of wetland acreage or wetland functions.

Effective wetland monitoring and assessment of wetlands enables West Virginia to meet federal Clean Water Act requirements

under Section 305(b) including "A description of the water quality of all waters of the United States and the extent to which the quality of waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allows recreational activities in and on the water" (40 CFR 130.8). In addition, the 2008 Compensatory Mitigation Rule calls for the use of scientifically valid functional and condition assessments for determining the amount and location of compensatory mitigation.

Status: West Virginia is in the beginning stage of wetland program development in terms of monitoring and assessment. Methods are currently being developed and tested.

Table 3. Monitoring and Assessment Actions, Activities, Success Measures, Lead Organizations, and Timeline

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
Core Element 1, Objective A: Develop a monitoring and assessment strategy consistent with *Elements of a State Water Monitoring and Assessment Program for Wetlands* (EPA, 2006).								
1.A1. Identify program decisions and long-term environmental outcome(s) that will benefit from a wetlands monitoring and assessment program.	1.A1.a. Consult, update, and disseminate WV Wetland Program Plan, WV Wildlife Action Plan, and Statewide Comprehensive Outdoor Recreation Plan.	Wetland Program Plan, Wildlife Action Plan, and SCORP complete & distributed.	WVDEP, WVDNR, WVDO	X				X
	1.A1.b. Seek out opportunities to develop citizen science programs to monitor wetlands.	citizen science programs to monitor wetlands (many organizations).	Many organizations	X	X	X	X	X
1.A2. Define wetlands monitoring objectives and strategies.	Draft and peer review WVDEP Wetland Monitoring Manuals.	Field Operations Manual and Data Analysis Manual complete.	WVDEP	X	X			

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
1.A3. Develop monitoring design, or an approach and rationale for site selection that best serves monitoring objectives (e.g., census, probabilistic survey, rotating basin).	Develop and refine statistical framework for spatially balanced probabilistic sampling.	Statistical framework complete.	WVDEP	X				
1.A4. Select a core set of indicators to represent wetland condition or a suite of functions.	Same as 1.A2 above.	Field Operations Manual and Data Analysis Manual complete.	WVDEP	X	X			
Core Element 1, Objective B: Implement a sustainable monitoring program consistent with the wetlands monitoring strategy.								
1.B1. Ensure the scientific validity of monitoring and laboratory activities.	Draft and peer-review Field Operations Manual based on Quality Assurance Project Plan.	Field Operations Manual complete.	WVDEP	X	X			
1.B2. Monitor wetland resources as specified in strategy.	1.B2.a. Collect WVWRAM field data and revise methods as appropriate.	WVWRAM field data collected.	WVDEP	X	X	X	X	X
	1.B2.b. Monitor federally listed wetland species and WVDNR Priority 1 wetland species as resources permit; species are likely to include eastern spadefoot toad, eastern cricket frog, upland chorus frog, Virginia spiraea, harperella, and northeastern bulrush.	Federally listed species and Priority 1 species monitoring data available.	WVDNR	X	X	X	X	X
	1.B2.c. Continue long-term monitoring of spotted turtles, including survey of potential habitat for new populations and conservation status re-assessment.	Spotted turtle monitoring data available.	WVDNR	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
	1.B2.d. Continue to inventory, map, classify and rank wetland community and rare wetland species occurrences.	Natural Heritage database updated & available.	WVDNR	X	X	X	X	X
	1.B2.e. Monitor wetland restoration in the Chesapeake Bay watershed.	Chesapeake Bay wetland data available.	Wetland Workgroup of CBP, WVDEP	X	X	X	X	X
	1.B2.f. Conduct study of small mammal communities and pollinator communities in wetlands.	Small mammal & pollinator data available.	WVU	X	X			
1.B3. Establish reference condition.	Define reference standard condition.	Reference standard condition defined.	WVDEP	X	X			
1.B4. Track monitoring data in a system that is accessible, updated on a timely basis, and integrated with other state water quality data.	Maintain and improve relevant state databases including WABBASE, WVWRAM, and NWI-WV.	WABBASE, WVWRAM, and NWI-WV available.	WVDEP	X	X	X	X	X
1.B5. Analyze monitoring data to evaluate wetlands extent and condition/function to inform decision-making.	1.B5.a. Perform exploratory analysis of test data and propose meaningful presentation metrics.	Presentation metrics available.	WVDEP	X	X			
	1.B5.b. Draft and peer-review Data Analysis Manual.	Data Analysis Manual compete.	WVDEP	X	X			
	1.B5.c. Analyze data and report synthesized results to public and partners in WVDEP annual reports and on WVDEP website.	Annual reports and updated website available.	WVDEP	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
	1.B5.d. Complete breeding bird atlas and Lepidoptera atlas, including status updates on wetland species.	Breeding bird atlas and Lepidoptera atlas available.	WVDNR	X	X	X	X	X
1.B6. Increase state capacity to sustain wetland monitoring activities.	Provide training to WVDEP staff and summer interns in monitoring methodology.	4 or more WVDEP staff able to lead WVWRAM team.	WVDEP	X	X	X	X	X
1.B7. Participate in the National Wetland Condition Assessment.	1.B7.a. Plan, conduct field work, follow-up to ensure data integrity.	NWCA sites sampled.	WVDEP, NRCS, USEPA	X				
	1.B7.b. Integrate results into state databases.	NWCA results available to state decision-makers.	WVDEP	X	X	X	X	X
1.B8. Improve wetland mapping statewide.	1.B8.a. Obtain statewide Q2 LiDAR & spring leaf-off imagery.	Q2 LiDAR & spring leaf-off imagery available.	WVDEP, USFWS, FEMA, others	X	X	X	X	X
	1.B8.b. Capture existing field mapping data as verification dataset.	Field mapping data available.	WVDEP	X	X	X	X	X
	1.B8.c. Seek funding to support mapping updates.	Funding proposals or discussions held; hopefully funding obtained!	WVDEP, EPA. USFWS, FEMA, others	X	X	X	X	X
	1.B8.d. Coordinate with NWI to optimize data exchange.	Data exchanged with NWI.	WVDEP	X	X	X	X	X
Core Element 1, Objective C: Incorporate monitoring data into agency decision-making.								
1.C1. Evaluate monitoring program to determine how well it is meeting a state's monitoring program objectives.	Future planning	Future planning	WVDEP, WVDNR	Future planning				

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
1.C2. Evaluate the environmental consequences of a federal or state action or group of actions; modify programs as needed based on monitoring and assessment data.	Future planning	Future planning	WVDEP, WVDNR	Future planning				
1.C3. Improve the site-specific management of wetland resources.	Future planning	Future planning	Many organizations	Future planning				
1.C4. Develop geographically-defined wetland protection, restoration, and management plans.	Complete WVDNR Conservation Focus Area plans with region-based strategies to conserve wetland habitat/species.	Conservation Focus Area plans complete.	WVDNR, TNC	X	X	X	X	

Figure 3. Monitoring wetland soils at Russell Creek swamp.

Core Element 2: Regulation

Goal: Protect West Virginia's highest quality wetlands and achieve no net loss of wetland acreage, functions, or values statewide. Wetland losses should be avoided or minimized, and unavoidable or unauthorized losses must be replaced with an adequate level of sustainable, functioning wetlands.

Objectives:

A. Clearly **define the jurisdictional scope** of the program.
B. **Administer regulatory activities** efficiently and consistently.
C. **Evaluate regulatory activities** to ensure environmental results.

Benefits: West Virginia's regulatory program allows the state to manage aquatic resource protection and require restoration of acreage and function/condition. Three laws inform most of the regulation of wetlands in West Virginia:

- Clean Water Act of 1972, including the 2008 Mitigation Rule: prohibits the release of any dredged or fill material into wetlands.
- West Virginia Water Pollution Control Act (CSR 22-11).
- Food Security Act of 1985: Swampbuster provision discourages the conversion of wetlands to cropland use.

Status: West Virginia is in the established stage of wetland program development in terms of regulation. West Virginia currently has established methods and regulatory administrative systems, with improved wetland credit-debit methods anticipated in 2021-2025. The Inter-Agency Review Team (IRT) for the Clean Water Act is comprised of WVDEP, WVDNR, USACE, USEPA, USFWS, and NRCS. WVDEP and WVDNR provide state 401 certification of the Clean Water Act. The Food Security Act is administered by NRCS.

During 2020, WVDEP clarified issues related to Nationwide Permits and 401 Water Quality Certification (WQC) re-issuance. Wetland impacts of greater than 1/10 acre will require compensatory mitigation regardless of whether that is achieved through the 401 WQC / 404 permit or through the Water Pollution Control Act and use of a State Waters Permit.

Jurisdictional coverage includes all discharges regulated under the Clean Water Act. Also, those wetland features considered to be non-federally jurisdictional are still subject the state authority under West Virginia Water Pollution Control Act (22 CSR 11), for which the definition of "waters" clearly indicates all wetlands except farm ponds, industrial settling basins and treatment facilities.

Regarding the scope of regulated activities: activities resulting in temporary impacts to wetlands will comply with appropriate BMPs and restoration protocols to ensure no permanent loss of aquatic resource function. For activities resulting in permanent impact of wetlands, compensatory mitigation will be required for wetland impacts exceeding 1/10 acre cumulatively.

Wetlands subject to WVDEP authority must meet the three criteria identified in the 1987 USACE Delineation Manual with regional supplements. These criteria include hydric vegetation dominance, hydric soils, and wetland hydrology.

Table 4. Regulatory Actions, Activities, Success Measures, Lead Organizations, and Timeline

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
Core Element 2, Objective A: Clearly define the jurisdictional scope of the program.								
2.A1. Provide clear and comprehensive jurisdictional coverage of aquatic resources.	Specify jurisdictional coverage of Water Quality Certification and Nationwide Permits.	Jurisdictional coverage specified (see "Status" on the preceding page)	USACE, WVDEP	Completed				
2.A2. Clearly identify a comprehensive scope of activities to be regulated.	Identify scope of regulated activities.	Regulatory activity scope specified (see "Status" on the preceding page).	USACE, WVDEP	Completed				
2.A3. Provide clear guidance to the public on how to identify jurisdictional waters and activities.	Provide guidance on identifying jurisdictional waters and activities.	Guidance on jurisdictional waters and activities available (see "Status" on the preceding page).	USACE, WVDEP	Completed				
2.A4. Evaluation.	Continue on-going evaluation.	IRT minutes.	IRT	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
Core Element 2, Objective B: Administer regulatory activities efficiently and consistently.								
2.B1. Adopt regulations or rules to implement state and/or federal water quality statutes.	Revise as necessary if jurisdiction changes.	State & federal statutes implemented.	USACE, WVDEP	X	X	X	X	X
2.B2. Develop and operate according to a clear and effective set of criteria for reviewing and responding to applications.	On-going review & response.	Applications reviewed.	USACE, WVDEP, NRCS	X	X	X	X	X
2.B3. Actively review proposed impacts to waters of the state.	2.B3.a. Review Clean Water Act & Water Pollution Control Act impacts to state wetlands.	Impacts to state wetlands reviewed.	USACE, WVDEP, WVDNR	X	X	X	X	X
	2.B3.b. Re-structure NRCS Food Security Act compliance teams into one expert to cover the state; review impacts.	Impacts to state wetlands reviewed.	NRCS	X	X	X	X	X
2.B4. Adopt and apply comprehensive project review criteria.	2.B4.a. Public notice of revised SWVM (including WVWRAM).	Public notice completed.	USACE, WVDEP	X				
	2.B4.b. Facilitate adoption of WVWRAM & new SWVM by the regulated community, including supplemental documentation as needed.	WVWRAM & new SWVM in use.	USACE, WVDEP, WVDNR, USEPA, USFWS	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
	2.B4.c. Enhance available tools for Food Security Act (Swampbuster) compliance through collaboration regarding the concept of minimal effects and the use of WVWRAM on disturbed wetlands in agricultural lands.	WVWRAM in use to inform Food Security Act compliance.	WVDEP, NRCS	X	X	X	X	X
	2.B4.d. Provide WVWRAM training to environmental professionals, the regulated community, and agency personnel.	At least 2 WVWRAM training events held each year.	WVDEP	X	X	X	X	X
	2.B4.e. Revise and improve existing mitigation performance standards and disseminate to the regulated community.	Mitigation performance standards available.	WVDEP	X	X			
2.B5. Coordinate among agencies, programs, and industry groups to reduce duplicative efforts by the programs and the regulated public.	Provide regular presentations on new wetland tools and assessment protocols to IRT.	Presentations provided.	Many organizations	X	X	X	X	X
2.B6. Require effective mitigation for authorized impacts.	2.B6.a. Maintain and build the capacity of WVDEP In-Lieu Fee (ILF) program through adaptive learning.	In-Lieu Fee program functioning well.	WVDEP (ILF)	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
	2.B6.b. Establish, enhance, and preserve wetlands on public and private land through ILF.	ILF projects completed in Mason County (Lakin establish 0.546 acres, enhance 8.244 acres), Barbour County (Teter Creek establish 0.66 acres, enhance 4.68 acres, preserve 0.03 acres), and other sites to be determined.	WVDEP (ILF)	X	X	X	X	X
2.B7. Track permit & certification program activity.	On-going tracking.	WVDEP reports; IRT minutes; other reports.	USACE, WVDEP, NRCS	X	X	X	X	X
2.B8. Track/evaluate all regulatory activities.	On-going evaluation.	WVDEP reports; IRT minutes; other reports.	USACE, WVDEP, NRCS	X	X	X	X	X
Core Element 2, Objective C: Evaluate regulatory activities to ensure environmental results.								
2.C1. Monitor the implementation of permit/certification conditions.	On-going monitoring.	Monitoring reports.	USACE, WVDEP, WVDNR	X	X	X	X	X
2.C2. Enforce aquatic resource protections.	On-going enforcement.	IRT minutes; WVDEP reports; other reports.	WVDEP, USEPA, USACE	X	X	X	X	X
2.C3. Ensure impact assessments and mitigation crediting lead to replacement of aquatic resources with similar structural, functional, or condition attributes.	2.C3.a. Evaluate credits and debits using WVWRAM & new SWVM.	WVWRAM & SWVM results available for mitigation sites.	WVDEP, IRT		X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
	2.C3.b. Collaborate to improve the usefulness of soil survey data for wetland identification, protection, and restoration.	Soil survey data regularly used for wetland identification, protection, and restoration.	WVDEP, NRCS	X	X	X	X	X
	2.C3.c. Update the Restoration Planting Tool to increase restoration success.	Updated Restoration Planting Tool available.	WVDEP, WVDNR	X	X	X	X	X
2.C4. Incorporate the watershed approach into the regulatory decision-making process.	Continue to use watershed approach.	Watershed approach remains in use.	IRT, WVDEP, NRCS	X	X	X	X	X
2.C5. Perform public education and outreach about wetland protection, regulated waters and activities, and authorization process.	2.C5.a. Disseminate fact sheets about compliance with wetland regulations.	Fact sheets disseminated at WVDEP training events and via WVDEP website.	WVDEP	X	X	X	X	X
	2.C5.b. Provide information to the public and to agency staff not involved in regulatory activities about identifying and reporting violations.	Reporting information disseminated at WVDEP training events and via WVDEP website.	WVDEP	X	X	X	X	X
2.C6. Measure environmental results.	Future planning	Future planning	IRT, WVDEP, NRCS	Future planning				

Core Element 3: Voluntary Restoration and Protection

Goal: Increase wetland acreage and functions through effective restoration action and promote sound wetland stewardship by agencies, land managers and citizens of West Virginia.

Voluntary restoration and protection refer to activities not required by statutes or regulations. Examples include land trusts purchasing titles or easements to wetland areas, community groups removing invasive species and planting native vegetation, and conservation programs that pay landowners to change practices such as cultivation or grazing that alter wetland areas. While voluntary protection is not required by regulations, it can be secured through legally binding agreements such as conservation easements.

Objectives:

A. Clearly and consistently **define restoration and protection goals** throughout West Virginia.
B. **Protect wetlands** from degradation or destruction.
C. **Restore wetland acres, condition, and function.**
D. **Monitor** and track progress over time, document results, and **modify practices** as appropriate.

Benefits: Wetland restoration and protection promotes important ecosystem services, including flood attenuation, water quality protection, provision of wildlife habitat, protection of biodiversity, and educational or recreational opportunities to benefit the citizens of West Virginia.

Wetlands provide critical habitat, breeding grounds, and sources of food for fish, birds, amphibians, and other organisms. More than one-third of the threatened and endangered species in the U.S. live exclusively in wetlands and nearly half use wetlands at some point in their life cycle. Within West Virginia, 44% of our rare plant species are found in wetlands.

Wetlands also limit flooding, moderate groundwater levels and base flow, assimilate nutrients, protect drinking water sources, and

protect stream and lake shores from erosion.
Wetland restoration can improve water quality to comply with Total Maximum Daily Load (TMDL) pollutant allocations in impaired waters and watersheds.

Status: West Virginia is at the beginning stage of wetland program development in terms of voluntary restoration and protection of wetlands. While many agencies and organizations are involved in wetland conservation either individually or with a small group of partners, West Virginia does not yet have a state wetland association or other body that supports collaborative efforts, identifies opportunities, seeks out resources, builds a statewide strategy, or tracks progress across organizations.

Table 5. Voluntary Restoration & Protection Actions, Activities, Success Measures, Lead Organizations, and Timeline

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
Core Element 3, Objective A: Clearly and consistently define restoration and protection goals throughout West Virginia.								
3.A1. Establish goals that are consistent or compatible across relevant agencies and organizations.	Explore the creation of a state wetland association to build collaboration and exchange best practices regarding land stewardship, invasive species control, and land management activities that impact wetlands.	At least three exploratory meetings held with at least 10 agencies or organizations.	WVDEP, other organizations			X	X	X
3.A2. Consider watershed planning, wildlife habitat, and other objectives when selecting restoration & protection sites.	3.A2.a. Disseminate WVWRAM scores including Site Biodiversity Rank to the public and to land managers.	WVWRAM scores disseminated in reports and on WVDEP website.	WVDEP	X	X	X	X	X
	3.A2.b. Disseminate WVDEP's Wetland Restoration Site Prioritization Tool to the public and to agencies.	Wetland Restoration Site Prioritization Tool actively in use.	WVDEP	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
	3.A2.c. On former mined lands of the Mower Tract, select wetland restoration sites that will intercept and retain precipitation and groundwater, trap sediment, provide habitat for amphibians and other wildlife species, and provide suitable conditions for native wetland plants.	Mower Tract wetland sites selected and restored.	USFS	X	X	X	X	X
	3.A2.d. Include wetlands explicitly in "Healing Waters" 2020-2025 strategic plan.	Wetlands included in "Healing Waters" 2020-2025 activities.	CLRLT	X	X	X	X	X
3.A3. Provide clear guidance on appropriate restoration and management techniques and success measures.	3.A3.a. Provide updated Restoration Planting Tool with easy-to-use public web interface.	Updated Restoration Planting Tool website available.	WVDEP, WVDNR	X	X			
	3.A3.b. Maintain and improve websites with information about wetlands, including WVDEP Wetland Resource Guide, WVDEP GIS Viewer, WVDNR Wildlife Diversity pages, WVDNR WMA pages, & WV GIS Tech Center clearinghouse.	WVDEP Wetland Resource Guide, WVDEP GIS Viewer, WVDNR Wildlife Diversity pages, WVDNR WMA pages, & WV GIS Tech Center clearinghouse updated.	WVDEP, WVDNR, WVU	X	X	X	X	X
	3.A3.c. Initiate research on plant communities of Jefferson & Berkeley Counties.	Research underway.	PVAS, Shepherdstown U.	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
3.A4. Educate the public about wetland functions, values, and restoration opportunities to build support for wetland conservation	3.A4.a. Teach WVWRAM workshops for environmental professionals.	10 multi-day WVWRAM workshops held (2 per year).	WVDEP	X	X	X	X	X
	3.A4.b. Provide wetland presentations to schools, 4-H clubs, community groups, and watershed groups.	30 wetland presentations provided.	WVDEP (WIB)	X	X	X	X	X
	3.A4.c. Provide advice on wetland enhancement and signage to watershed groups, landowners, and local government.	Advice on wetland enhancement and signage provided to at least 10 groups.	WVDEP	X	X	X	X	X
	3.A4.d. Install signage and walking trail at Marlinton Wetland Park.	Signage and walking trail installed.	WVCA, WVRC, GRWA, WVDEP	X	X	X	X	X
	3.A4.e. Build trail & hold educational events at created wetland.	Trail completed & educational events held.	Ohio River NWR	X	X	X	X	X
	3.A4.f. Provide volunteer opportunities to enhance wetlands and wetland education through planting, invasive plant pulls, boardwalk construction, citizen science initiatives, and other activities.	10 or more wetland education, planting, invasive plant pulls, boardwalk construction, citizen science initiatives, and other activities held.	Many organizations	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
Core Element 3, Objective B: Protect wetlands from degradation or destruction.								
3.B1. Establish partnerships to leverage additional protection.	Seek projects that include more than one organization or group and pursue funding opportunities that promote wetland protection in partnership with other agencies/organizations.	5 multi-partner wetland protection projects initiated.	Many organizations	X	X	X	X	X
3.B2. Establish and institutionalize long term protection, using mechanisms such as incentives, purchase of land title or easements to protect wetlands.	3.B2.a. Protect approximately 25,000 acres of land with 250 acres of embedded wetlands.	25,000 acres of land with 250 acres of embedded wetlands protected.	TNC	X	X	X	X	X
	3.B2.b. Protect source waters for public drinking water supplies through protection of riparian forest, floodplain forest, and wetlands.	Public drinking water supplies protected through protection of riparian forest, floodplain forest, and wetlands in the Cheat and Potomac watersheds in 2021 and in the Greenbrier and New River watersheds in 2022-2025.	WVLT	X	X	X	X	X
	3.B2.c. Continue implementation of NRCS Wetland Reserve Program and WV Outdoor Heritage Conservation Fund.	Continue implementation of NRCS Wetland Reserve Program and WV Outdoor Heritage Conservation Fund.	NRCS, OHCF	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
	3.B2.d. Provide conservation easements and other legal protections to wetlands.	5 conservation easements or other legal protections to wetlands completed.	Land trusts, Conservation organizations	X	X	X	X	X
Core Element 3, Objective C: Restore wetland acres, condition, and function.								
3.C1. Increase wetland acreage through restoration (re-establishment, creation).	3.C1.a. Create additional acres of wetland in Taylor County.	1.25 additional acres of wetland created on Pleasant Creek WMA in Taylor County.	WVDNR, DU	X				
	3.C1.b. Restore or create wetlands in the Potomac Basin, with emphasis on water quality (nutrient reduction), habitat provision and other wetland functions.	One or more wetlands restored or created in the Potomac Basin of WV as part of the Watershed Implementation Plan for the Chesapeake Bay TMDL.	WVDEP, others	X	X	X	X	X
	3.C1.c. Continue wetland creation activities on former mined lands.	One or more additional wetlands created on former mined lands of the Mower Tract.	USFS	X	X	X	X	X
	3.C1.d. Create wetland and signage in Beaver, WV.	Wetland created and signage installed at Woodrow Wilson High School in Beaver, WV.	WVDEP 319 funding	X	X	X	X	X
	3.C1.e. Create/restore wetland in Raleigh County.	Wetland created or restored at Shady Spring Library, Raleigh County.	PCWA, Beckley Beautification Commission, WVDEP	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
	3.C1.f. Create wetlands as part of AMD restoration in the Cheat River watershed.	Wetlands created at Beaver Creek, Sovern Run, Little Sandy Creek, North Fork Greens Run, and/or Muddy Creek.	FOC	X	X	X	X	X
3.C2. Improve natural wetland conditions and functions through restoration (rehabilitation).	3.C2.a. Collect native tree/shrub seed, propagate, distribute, and organize/assist with volunteer plantings of locally sourced seedlings to support wetland restoration.	Native germplasm collected, propagated, distributed, and planted.	WVHC	X	X	X	X	X
	3.C2.b. Enhance (plant native species) riparian and wetland areas in Canaan Valley State Park.	Native species planted on 300 acres in Canaan Valley State Park.	TNC, WVDNR	X	X	X	X	X
	3.C2.c. Enhance wetlands (reduce acid loads) in Upper Deckers Creek watershed.	Acid loads reduced to wetlands at Slabcamp Run (1.2 acres) and possibly other sites.	FODC	X	X	X	X	X
	3.C2.d. Enhance (improve connection to Blackwater River) Elder Swamp in Tucker County.	Elder Swamp re-connected to Blackwater River.	FOB	X	X	X	X	
	3.C2.e. Enhance wetlands (treat invasive cattails) in Jefferson & Berkeley Counties.	Invasive cattails treated at Cool Spring Preserve & Stauffer's Marsh.	PVAS	X	X	X	X	X
	3.C2.f. Continue rehabilitation of sediment ponds on former mined lands of the Mower Tract.	3bvi. Former sediment ponds rehabilitated.	USFS	X	X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
	3.C2.g. Additional rehabilitation of Widmeyer wetland in Berkeley County.	Widmeyer wetland enhanced.	WSWA	X				
	3.C2.h. Work with farmers to create & maintain Nutrient Management Plans to protect wetlands on agricultural lands.	Nutrient Management Plans created & maintained.	WVDA	X	X	X	X	X
	3.C2.i. Restore wetland functions and values through restoring hydrology, re-connecting to streams, restoring altered topography, exposing buried wetland soils, excluding cattle, removing stressors, treating invasive species, re-vegetating with native species, protecting buffers, and other restoration actions.	Wetland functions and values restored at multiple sites.	Many organizations	X	X	X	X	X
3.C3. Establish partnerships to leverage more restoration.	Exchange best practices and pursue funding opportunities that promote wetland restoration and conservation, in partnership with other agencies/organizations.	Multiple wetlands restored and conserved through partnerships.	Many organizations	X	X	X	X	X
Core Element 3, Objective D: Monitor and track progress over time, document results, and modify practices as appropriate.								
3.D1. Track restoration/protection projects.	Collect and analyze WVWRAM data at restoration sites from pre-construction to 10+ years post-construction to determine realistic WVWRAM score ranges.	Data-driven WVWRAM score ranges available for restoration sites.	WVDEP	X	X			

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
3.D2. Monitor restoration/protection sites to ensure that they are implemented and managed correctly and linked to relevant watershed planning efforts.	3.D2.a. Develop improved monitoring indicators for restoration projects, including woody growth metrics.	Improved monitoring indicators available for restoration projects, including woody growth metrics.	WVU, WVDEP	X	X	X		
	3.D2.b. Collect baseline data on vegetation, macroinvertebrate, fish & wildlife community assemblage data on a riparian wetland restoration/mitigation project at the WVU Ruby Farm.	Baseline data on vegetation, macroinvertebrate, fish & wildlife communities available for wetland at the WVU Ruby Farm.	WVU	X	X	X	X	X
3.D3. Modify restoration/protection techniques as needed.	3.D3.a. Modify restoration/protection techniques used by In-Lieu Fee program based on adaptive learning and new research.	Updated ILF restoration/protection techniques available.	WVDEP ILF	X	X	X	X	X
	3.D3.b. Modify recommendations for restoration techniques based on newly developed woody growth indications and WVWRAM score ranges.	Recommendations available in WVWRAM implementation guidance.	WVDEP	X	X	X	X	

Core Element 4: Water Quality Standards

Goal: Restore, maintain, and enhance the water quality of West Virginia's wetlands.

Objectives:

A. Ensure that **wetlands are treated as waters within state water quality programs**.
B. Develop **wetland-specific water quality standards.**
C. Incorporate wetland-specific water quality standards into **agency decision-making.**

Benefits: Water quality standards for wetlands have the potential to provide a rigorous foundation for protecting and enhancing wetland resources. They can provide the basis for actions leading to an overall increase in wetland function and condition. They can also provide a scientific basis for actions to protect and restore wetlands, including:

- Permitting under CWA Sections 402 and 404,
- Water quality certification under CWA Section 401 programs,
- Monitoring, assessment and reporting on wetlands function and/or condition, e.g., 303(d)305(b) integrated reports, Total Maximum Daily Loads, and nonpoint source pollution control programs
- Guiding restoration and protection efforts

Status: West Virginia is at the beginning stage of wetland program development in terms of water quality standards for wetlands. Wetlands are defined in WVDEP legislative rule §47CSR2 "Requirements governing water quality standards", section 2.22, as follows: "Wetlands" are those 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. Wetlands generally include swamps, marshes, bogs and similar areas.

Table 6. Water Quality Standards Actions, Activities, Success Measures, Lead Organizations, and Timeline

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
Core Element 4, Objective A: Ensure that wetlands are treated as waters within state water quality programs.								
4.A1. Adopt an appropriate definition of wetlands.	Define wetlands in WVDEP legislative rule.	Wetlands are defined in WVDEP legislative rule §47CSR2 (see "Status" on preceding page)	WVDEP	Completed				
4.A2. Ensure the appropriate wetlands definition is included in water quality standards.	Same as 4.A1. above.	Same as 4.A1. above.	WVDEP	Completed				
Core Element 4, Objective B. Develop wetland-specific water quality standards.								
4.B1. Gather and analyze monitoring data and other information that will become basis of water quality standards.	4.B1.a. Complete WVU research project on wetland water quality.	WVU Final Report on wetland water quality.	WVU	X	X	X		
	4.B1.b. Compile/analyze WVWRAM water quality data.	WVDEP Annual Reports.	WVDEP	X	X	X	X	X
4.B2. Establish and adopt appropriate wetland-specific designated uses to be achieved and protected.	Future planning	Future planning	WVDEP	Future planning				
4.B3. Establish and adopt narrative criteria that qualitatively describe the condition or suite of functions that must be achieved to support a designated use.	Future planning	Future planning	WVDEP	Future planning				

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
4.B4. Establish and adopt numeric criteria representing wetland specific values for chemical, physical, and biological parameters that may not be exceeded, must be exceeded, or some combination to protect or restore designated uses.	Future planning	Future planning	WVDEP	Future planning				
4.B5. Better define state antidegradation policies for wetlands, requiring full protection of existing uses (functions and/or condition), maintenance of functions/condition in high quality wetlands, and a prohibition against lowering functions/conditions in outstanding national resource waters.	Future planning	Future planning	WVDEP	Future planning				
Core Element 4, Objective C: Incorporate wetland-specific water quality standards into agency decision-making.								
4.C1. Use water quality standards as basis for regulatory decisions.	Future planning	Future planning	WVDEP	Future planning				
4.C2. Use water quality standards as basis for evaluating restoration/ protection projects and mitigation/compensation projects.	Include WVWRAM water quality scores in project assessments.	WVWRAM scores available in project assessments.	WVDEP		X	X	X	X

Action	Activity	Success Measure	Lead	2021	2022	2023	2024	2025
4.C3. Incorporate water quality standards into monitoring and assessment program.	Assess relationship of wetland water quality samples to WVWRAM water quality scores and revise WVWRAM metrics as needed.	Updated WVWRAM metrics in use.	WVDEP			X	X	X

Figure 4. New interpretive sign, Elkins City Parks.

Acronyms

ACEP	Agricultural Conservation Easement Program, NRCS
ACP	Atlantic Coast Pipeline
AMD	acid mine drainage
BSA	Boy Scouts of America
CBP	Chesapeake Bay Program
CLRLT	Cacapon & Lost Rivers Land Trust
CREP	Comprehensive Reserve Enhancement Program
CWA	Clean Water Act
Dow	Dow Chemical Company
DU	Ducks Unlimited
EBX-EM	EBX-EM: wholly owned subsidiary of Resource Environmental Solutions, LLC
EIP	Ecosystem Investment Partners
FCI	Federal Correctional Institute
FEMA	Federal Emergency Management Agency
FODC	Friends of Deckers Creek
FOB	Friends of Blackwater
FOC	Friends of the Cheat
FPB	Farmland Protection Board
FGDC	Federal Geographic Data Committee
GIS	Geographic Information System
GRWA	Greenbrier River Watershed Association
IRT	Inter-Agency Review Team
MNWV	Master Naturalists of West Virginia
MSMCC	Mountain State Mitigation Credits Company
NEAFWA	Northeast Association of Fish & Wildlife Agencies
NRCS	Natural Resources Conservation Service
NWCA	National Wetland Condition Assessment
NWI	National Wetlands Inventory
NWI-WV	National Wetlands Inventory - West Virginia version with state updates
OHCF	Outdoor Heritage Conservation Fund
PCWA	Piney Creek Watershed Association
PVAS	Potomac Valley Audubon Society
SWVM	Stream and Wetland Valuation Metric
TMDL	Total Maximum Daily Load
TMI	The Mountain Institute
TNC	The Nature Conservancy

TU	Trout Unlimited
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
USNPS	United States National Park Service
WAB	WVDEP Watershed Assessment Branch
WABBASE	WVDEP Watershed Assessment Branch Water Quality Database
WIB	WVDEP Watershed Improvement Branch
WMA	Wildlife Management Area
WOTUS	Waters of the United States
WPDG	Wetland Program Development Grant
WRP	Wetland Reserve Program
WSWA	Warm Springs Watershed Association
WVBG	West Virginia Botanic Garden
WVCA	West Virginia Conservation Agency
WVDA	West Virginia Department of Agriculture
WVDO	West Virginia Development Office in WV Department of Commerce
WVDEP	West Virginia Department of Environmental Protection
WVDNR	West Virginia Division of Natural Resources
WVDOF	West Virginia Division of Forestry
WVDOH	West Virginia Division of Highways
WVHC	West Virginia Highlands Conservancy
WVLT	West Virginia Land Trust
WVRC	West Virginia Rivers Coalition
WVSU	West Virginia State University
WVU	West Virginia University
WVUERC	West Virginia University Environmental Research Center
WVWRAM	West Virginia Wetland Rapid Assessment Method

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Figure 5. Common yellowthroat welcoming the day in Jefferson County (photo courtesy of Evan M. Raskin).

Appendices

Appendix A. Wetland Education and Outreach Activities 2016-2020

Wetland education and outreach activities were carried out by numerous agencies and organizations, as detailed (in part) in Table A below.

Table A. Wetland Education and Outreach Activities 2016-2020

Lead	Type	Date(s)	County
Brooks Bird Club	Nature Sorties & Forays	2016-2020	Statewide
Canaan Valley NWR	Visitor Center, Friends of the 500th + public events, wetland boardwalk, signage	2016-2020	Tucker
Canaan Valley State Park	Events at Nature Center & wetland boardwalk	2016-2020	Tucker
Coal River Group, WVDEP, WVSU	New signage and wetland trail at Meadowood Park	2020	Kanawha
Elkins City Parks	New signage at Glendale Park	2020	Randolph
Master Naturalists of WV	Half-day wetland classes	2016-2020	8 chapters statewide
Monongahela National Forest	Events at Cranberry Mountain Nature Center, wetland boardwalk	2016-2020	Pocahontas
Monongahela National Forest	Mower Tract restoration planting & wetland outreach with volunteers & local school groups	2016-2020	Randolph, Pocahontas
New River Birding & Nature Center	Educational events at wetland boardwalk & outdoor classroom	2016-2020	Fayette
NRCS	Landowner fact sheet on wetland compliance published & distributed	2019	Statewide
Potomac Valley Audubon Society	Cool Spring Preserve Nature Center classes & events	2017-2020	Jefferson
Town of Romney	Signage for bioswale wetland	2018	Hampshire
White Grass Ski Touring Center	Winter Discovery Ski Tours, often featuring wetland destinations & lore	2016-2020	Tucker
Widmeyer	Volunteer days, constructed kiosk & wetland boardwalk	2016-2020	Berkeley
WV Botanic Garden	Wetland loop trail, events	2016-2020	Monongalia
WV Native Plant Society	Botanical wetland walks	2016-2020	Statewide + 2 chapters

Table A. Wetland Education and Outreach Activities 2016-2020			
Lead	**Type**	**Date(s)**	**County**
WVDEP WAB	7 multi-day wetland training events for environmental professionals, reaching 112 people from 40 organizations.	2018-2019	Statewide
WVDEP WIB	40 wetland presentations to schools, 4-H clubs, and watershed groups, reaching > 2500 people. Regular advising on wetland enhancement and signage to watershed groups, landowners, and local government.	2016-2020	Statewide

Figure 6. WVDEP wetland workshop in Berkeley County.

Appendix B. Wetlands Restored, Enhanced or Preserved 2016-2020

Wetland restoration, enhancement, and protection were accomplished by numerous agencies and organizations, as detailed (in part) in Table A below.

Table B. Wetlands Restored, Enhanced or Preserved 2016-2020					
Project	**Lead**	**Type**	**Acreage**	**Date**	**County**
Allegheny Front Preserve	TNC/OHCF	Preservation	20	2016-2020	Grant
Auman Road Passive AMD Beaver Creek	FOC	Establishment	0.1	2020	Preston
Bear Knob Offsite Mitigation	AllStar Ecology LLC, Antero Resources	Restoration	0.93	2020	Upshur
		Enhancement	1.71		
Bearwallow Run Mitigation Bank	WV Bunrootis	Restoration	2.54	2018	Ritchie
Beverly Mitigation Bank Site #1	Green Rivers	Establishment	4.76	2020	Randolph
Brushy Fork Mitigation Bank	EIP	Establishment	5.72	2020	Harrison
		Enhancement	7.66		
Bunnells Run Bat Conservation Site	AllStar Ecology LLC, Antero Resources	Establishment	0.03	2017	Ritchie
		Preservation	0.19		
Canaan Valley NWR	USFWS, WVHC	Enhancement	multiple locations at CVNWR	Continuous	Tucker
Canaan Valley State Park	TNC	Enhancement	80	2018-2020	Tucker
Cheat River/Big Sandy riverscour	WVLT, OHCF	Preservation	1/8 mile or ~0.1 acre	2020	Preston
Clearwater Bat Conservation Site	Antero Resources, AllStar Ecology LLC	Establishment	0.06	2018	Ritchie
Cline Run Mitigation Bank	EBX-EM	Establishment	1.28	2017	Tyler
		Rehabilitation	0.83		
		Preservation	0.42		

Table B. Wetlands Restored, Enhanced or Preserved 2016-2020					
Project	**Lead**	**Type**	**Acreage**	**Date**	**County**
Clover Creek Conservation Site	AllStar Ecology LLC, ACP	Establishment	0.03	2019	Pocahontas
Cool Spring Marsh	PVAS, WVLT	Preservation	12	2020	Jefferson
Cranesville Swamp	TNC	Enhancement	100	2016-2019	Preston
Crow Run Mitigation Bank	EIP	Preservation	0.07	2019	Wetzel
Deckers Creek	FODC	Establishment	~2	2016-2020	Preston, Monongalia
Elk River Quakers Landing	WVLT	Preservation	6	2020	Clay
Foster Run Mitigation Bank	EBX-EM	Establishment	1.65	2017	Tyler
		Rehabilitation	1.53		
		Preservation	0.77		
Frozen Camp WMA ILF	WVDEP ILF	Establishment	0.96	2020	Jackson, Roane
		Enhancement	2.4	2020	
Gandy Creek ILF	WVDEP ILF	Establishment	0.507	2018	Randolph
Glade Farms Mitigation Bank	Decota Consulting Co.	Establishment	29.2	2019	Preston
		Enhancement	94.4		
		Preservation	9.8		
Greenbottom WMA ILF	WVDEP ILF	Establishment	12.08	2020	Cabell
Hackers Creek Mitigation Bank	Allstar Ecology LLC	Restoration	4.0	2017-2018	Upshur, Harrison
		Enhancement	1.38		
		Preservation	0.53		
Hillcrest WMA ILF	WVDEP ILF	Establishment	22.75	2016	Hancock
		Enhancement	3.47		
Indian Creek Mitigation Bank	MSMCC	Establishment	0.06	2018	Ritchie
Kanawha-Sapsucker Run Mitigation Bank	EIP	Establishment, Enhancement	0.77	2019	Mason
Kanawha-Yeager Fork Mitigation Bank	EIP	Establishment, Enhancement	0.29	2019	Mason
		Preservation	0.04		
Kincheloe Mitigation Bank	WV Bunrootis	Restoration	5.59	2016	Lewis
Little Clear Creek	WVDEP ILF	Establishment	0.55	2019	Greenbrier

Table B. Wetlands Restored, Enhanced or Preserved 2016-2020					
Project	**Lead**	**Type**	**Acreage**	**Date**	**County**
		Enhancement	34.61		
Margery Run Bat Conservation Site	AllStar Ecology LLC, Antero Resources	Establishment	0.04	2016	Tyler
		Preservation	0.01		
McClintic WMA	WVDEP ILF	Establishment	8.22	2019	Mason
		Restoration	1.71		
Mower Tract (former surface mine)	USFS	Establishment	785 wetlands scattered over 453 acres	2016-2019	Randolph, Pocahontas
Native tree/shrub seed collection, propagation, distribution, and planting events	WVHC	Enhancement	Many sites	2016-2020	Statewide
Nutrient management plans	WVDA	Enhancement	90,000 agricultural acres w/ scattered wetlands	2016-2020	Statewide
Ohio River Islands NWR	USFWS	Establishment	2	2020	Wood
Oxbow Mitigation Bank	EIP	Establishment, Enhancement	4.18	2020	Ritchie
Peddlar WMA/Dixon Lake	WVDNR, Allstar Ecology LLC	Establishment	0.5	2018	Monongalia
Poppybean Farm Addition	WVLT	Preservation	4	2018	Hardy
Randolph I Mitigation Bank	EBX-EM	Establishment	2.12	2019	Randolph
		Rehabilitation	0.34		
		Preservation	0.84		
Second Creek Headwaters	WVLT, Monroe County FPB, NRCS	Preservation	8	2017	Monroe
Seven Pines	EBX-EM	Establishment	3.64	2018	Marion

Table B. Wetlands Restored, Enhanced or Preserved 2016-2020					
Project	**Lead**	**Type**	**Acreage**	**Date**	**County**
Mitigation Bank		Rehabilitation	0.26		
Shavers Fork riverscour	WVLT, OHCF	Preservation	1 mile or ~0.7 acres	2019	Randolph
Spruce Mountain Conservation Site	TC Energy, AllStar Ecology LLC, TNC	Restoration	0.03	2018	Pendleton
		Preservation	0.01		
Walnut Fork Bat Conservation Site	JB Oil and Gas, AllStar Ecology LLC	Establishment	0.11	2016	Tyler
Yellow Creek Preserve	WVLT/OHCF	Preservation	300	2016-2020	Tucker

Figure 7. In-Lieu Fee wetland restoration year 1, at McClintic WMA.

Appendix C. Wetlands Restored, Enhanced, or Preserved Prior to 2016

This Wetland Program Plan represents the first statewide effort to begin capturing data on wetland restoration and preservation. Our knowledge is still incomplete. Known projects from 2016-2020 are listed in body of this report, but older projects are also of importance, especially as we begin to develop monitoring indicators to aid in restoration success. The table below includes information (in part) on wetland restoration projects completed prior to 2016.

Table C. Wetlands Restored, Enhanced or Preserved Prior to 2016

Project	Lead	Type	Acreage	Date	County
Barrackville mitigation	Mining company	Establishment	3.8	~2008	Marion
Beverly Mitigation Bank Site #1	Green Rivers	Enhancement	13.78	2015	Randolph
Blister Swamp	NRCS CREP, USFWS, TNC, TMI, USFS	Enhancement	54.5	1998-2012	Pocahontas
Buckhannon mitigation	WVDOH	Establishment	7	~1995	Upshur
Colonial Estates	Colonial Estates	Enhancement	16	2012	Randolph
Davis Branch Mitigation Bank	EBX-EM	Restoration	1.22	2014	Raleigh
Enoch Branch mitigation	WVDOH	Establishment, enhancement	39	~2000	Nicholas
Frazier's Bottom mitigation	Putnam County Business Park	Establishment	18	~2000	Putnam
Furnace Run	WVDNR, DU	Establishment, enhancement	0.8	Pre-2010	Jefferson
Gottschalk Causeway mitigation	BSA	Establishment, enhancement	1	~2010	Fayette
Grave Creek PRM	RES/Timmons Group/Allstar Ecology LLC	Restoration	2.41	2013	Marshall
		Enhancement	0.31		
Guano Creek	WVDNR	Establishment, enhancement	6.6	Pre-1997	Putnam
Hayes Run Mitigation Bank	WV Bunrootis	Restoration	0.97	2012	Roane
Hazelton Federal Correction	FCI, Hensel Phelps, AllStar Ecology LLC	Restoration	2.43	2012	Preston
		Enhancement	0.89		

Table C. Wetlands Restored, Enhanced or Preserved Prior to 2016					
Project	**Lead**	**Type**	**Acreage**	**Date**	**County**
Institute PRM					
Hazelton mitigation	WVDOH	Establishment, enhancement	5	2007	Preston
Lake Louise Grantham Farm	WVDOF	Enhancement	5	~2015	Jefferson
Lake Louise Morgan ILF	TNC, WVDEP	Establishment, enhancement	1.49	2013	Jefferson
Leetown	USGS	Establishment, enhancement	20	Pre-1997	Jefferson
Meadow River Mitigation Bank	WVDNR	Restoration	19.07	2008	Greenbrier
		Enhancement	27.39		
		Buffer Preservation	34.39		
Mill Run mitigation	WVDNR	Establishment	2.4	2014	Tucker
Montrose mitigation	WVDOH	Establishment, enhancement	8	Pre-1997	Randolph
Mower Tract	Monongahela NF	Establishment	489 wetlands scattered over 311 acres	2011-2015	Randolph, Pocahontas
North Fork Hughes River Bat Conservation Site	AllStar Ecology LLC, Antero Resources	Establishment	0.06	2015	Ritchie
		Preservation	0.05		
North River Wetland Mitigation	Potomac Conservancy, CLRLT, Hampshire County FPB	Establishment		2006-2007	Hampshire
Paige Jackson Elementary School	CVI	Establishment	0.25	2010	Jefferson
Pleasant Creek WMA	WVDNR, WVUERC, DU, AllStar Ecology LLC	Restoration	4	2013	Taylor, Barbour
Pleasant Creek	WVDOH	Establishment,	43	2001	Barbour

Table C. Wetlands Restored, Enhanced or Preserved Prior to 2016					
Project	**Lead**	**Type**	**Acreage**	**Date**	**County**
mitigation		enhancement			
Queens	Monongahela NF	Establishment, enhancement	6.7	~2009	Tucker
Railroad Refuse Greens Run 319	FOC	Establishment	0.1	2015	Preston
Rehe ILF	TNC, WVDNR, WVDEP ILF	Preservation	14	2013	Preston
Roane Jackson Tech Center	Roane Jackson Tech Center	Establishment	0.5	2009	Jackson
Slab Camp Tributary	Friends of Deckers Creek	Enhancement	5.4	2015	Preston
Spanishburg Mitigation Bank	WV Bunrootis	Restoration	9.8	2013	Mercer
Stauffer's Marsh Preserve	NRCS WRP	Establishment	29	~1992	Berkeley
	PVAS	Preservation		2011	
Sugar Creek mitigation	WVDOH, WVDNR	Establishment, enhancement	71	~1995	Barbour
Tygart Valley Mitigation Bank	EBX-EM	Establishment	13	2011	Randolph
		Enhancement	2.9		
		Buffer Enhancement	9.1		
Valley Bend	WVDNR	Establishment, enhancement	5.4	~1995	Randolph
Walnut Bottom mitigation	WVDOH	Establishment	16.3	1997	Hardy
Ward Hollow mitigation	Dow	Establishment	0.6	2006	Kanawha
Wetlands of Winfield	Appalachian Power, WVDNR, WVCA	Enhancement	~10	2003	Putnam
White Sulphur Springs Hatchery	USFWS, WVDEP	Enhancement	0.8	2012	Greenbrier
Widmeyer	WSWA	Establishment, enhancement	0.8	2010	Morgan
Williamstown Marsh	Women's Club Williamstown	Enhancement	2.8	2010	Wood
WV Botanic Garden	WVBG	Enhancement	17	2014	Monongalia

Appendix D. Wetland Research & Publications 2016-2020

Research projects focusing on West Virginia wetlands provide key information to organizations involved in wetland conservation in West Virginia. A list of these projects and the publications that have resulted from them to date is presented below.

Restoration Site Assessment and Trajectories

Stem area at groundline as an indicator of restoration trajectory in WV wetland mitigation (WVU)

Project recently initiated.

24 NRCS Agricultural Conservation Easement Program wetlands in West Virginia (WVU)

Lewis, K. A., C. T. Rota, and J. T. Anderson. 2020. A comparison of wetland characteristics between Agricultural Conservation Easement Program and public lands wetlands in West Virginia. *Ecology and Evolution* 10:3017-3031.

Survival of native wetland plants in vernal pools in West Virginia (University of Kentucky, USFS)

Branduzzi, A. M., C. D. Barton, and A. Lovell. 2020. First-year survival of native wetland plants in created vernal pools on an Appalachian surface mine. *Ecological Restoration* 38(2):70-73.

Mitigation Banking Assessment in West Virginia (AllStar Ecology LLC)

Cunningham, D., W. Veselka, and R. Ward. 2018. The West Virginia Stream and Wetland Valuation Metric (WVSWVM) crediting procedures and assessments in developing a stream and wetland mitigation banking site, Chapter 4.2.1 (pp. 305-315) in *Wetland and Stream Rapid Assessments*, Academic Press.

Vegetation Communities

Wild Vegetation of West Virginia (WVDNR)

Vanderhorst, J. 2016+. Wetland community fact sheets including bottomland oak swamps, high floodplain forests and woodlands, and riverscour prairies. http://www.wvdnr.gov/Wildlife/Factsheets/default.shtm

Pin oak swamp dynamics in West Virginia (Concord University, WVDNR)

Saladyga, T., J. Vanderhorst, and J. Cline. 2020. Successional dynamics of an Appalachian pin oak (*Quercus palustris* Münchh.) swamp forest. *The J. of the Torrey Botanical Society*, 147(1):22-37.

Historic disturbances & wetland vegetation in Canaan Valley (USGS, American Public University)

Young, J. D. Welsch, and S. Deacon. 2019. Assessing the hydrologic impact of historical railroad embankments on wetland vegetation response in Canaan Valley, West Virginia: the value of high-resolution data. *Restoration Ecology* 28(1):51-62.

Water Quality

Assessment of wetland water quality & development of standards for WV wetlands (WVU)

Project underway: collected water samples quarterly from 100 wetlands across West Virginia as part of US EPA Grant #CD-96362401-0 and conducted associated rapid assessments and invertebrate samples from subset

Wetland Functional Assessment (WVDEP)

West Virginia Department of Environmental Protection. 2020. User Manual for the West Virginia Wetland Rapid Assessment Method. Version 1.02. Watershed Assessment Branch, Division of Water and Wastewater Management, West Virginia Department of Environmental Protection, Charleston, WV.

West Virginia Department of Environmental Protection. 2020. Reference Manual for the West Virginia Wetland Rapid Assessment Method. Version 1.0. Watershed Assessment Branch, Division of Water and Wastewater Management, West Virginia Department of Environmental Protection, Charleston, WV.

Wetland Fauna

American Black Duck wintering habitat use in Central Appalachia (WVU)

Yannuzzi, S. 2018. Wintering American black duck ecology of central Appalachia. M.S. Thesis, West Virginia University

Amphibian metamorphosis in created and natural wetlands in West Virginia (WVU)

McPherson, L. A., I. Holásková, and J. T. Anderson. 2020. Functional equivalence of created wetland water quality: a comparison of amphibian metamorphic success. *Open Journal of Ecology* 10:418-439.

McPherson, L. A., I. Holásková, and J. T. Anderson. 2017. Improved retention of visible implant alphanumeric tags in green frog (*Rana clamitans*) tadpoles. *Herpetological Review* 48:53-57.

Amphibian reproduction in created wetlands across West Virginia (WVU)

Strain, G. F., P. J. Turk, A. N. Tri, and J. T. Anderson. 2017. Anuran occupancy of created wetlands in the Central Appalachians. *Wetlands Ecology and Management* 25:369-384.

Strain, G. F., P. J. Turk, J. Helmick, and J. T. Anderson. 2017. Amphibian reproductive success as a gauge of functional equivalency of created wetlands in the Central Appalachians. *Wildlife Research* 44:354-364.

Amphibians in road-rut pools in West Virginia (Marshall University)

Sinclair, A. L. 2018. Amphibians among road-rut pools in West Virginia. M.S. Thesis, Marshall University.

Anuran callback surveys in West Virginia (Marshall University)

Grisnik, M. S. 2016. Testing the efficacy of anuran callback surveys. M.S. Thesis, Marshall University.

Avian and turtle populations in 24 NRCS ACEP wetlands in West Virginia (WVU)

Gulette, A. 2018. Habitat suitability of restored wetlands and an investigation of sampling bias for freshwater turtles in West Virginia. M.S. Thesis, West Virginia University.

Lewis, K. 2018. Wetland characteristics and wintering Passerellidae occupancy on Agricultural Conservation Easement Program wetlands in West Virginia. M.S. Thesis, West Virginia University.

Gulette, A. L., J. T. Anderson, and D. J. Brown. 2019. Influence of hoop-net trap diameter on capture success and size distribution of comparatively large and small freshwater turtles. *Northeastern Naturalist* 26:129-136.

Lewis, K. E., C. T. Rota, C. M. Lituma, and J. T. Anderson. 2019. Influence of the Agricultural Conservation Easement Program wetland practices on winter occupancy of Passerellidae sparrows and avian species richness. *PLoS ONE* 14(1): e0210878.

Avian use of two created wetlands in West Virginia (WVU)

Clipp, H. L., M. L. Peters, and J. T. Anderson. 2017. Winter waterbird composition and use at created wetlands in West Virginia, USA. *Scientifica* 2017. Article ID 1730130. 13 pp. doi:10.1155/2017/1730130.

Deer herbivory in West Virginia wetlands (WVU)

Flaherty, K. L., P. J. Turk, and J. T. Anderson. 2019. Comparing stakeholder attitudes toward white-tailed deer and rare plant management in Canaan Valley, West Virginia. *Global Ecology and Conservation* 16(2019) e00519.

Flaherty, K. L., W. N. Grafton, and J. T. Anderson. 2018. White-tailed deer florivory influences the population demography of *Polemonium vanbruntiae*. *Plant Biosystems* 152:453-463.

Flaherty, K. L., J. S. Rentch, W. N. Grafton, and J. T. Anderson. 2018. Timing of white-tailed deer browsing affects wetland plant communities. *Plant Ecology* 219:313-324.

Flaherty, K. L., J. S. Rentch, and J. T. Anderson. 2018. Wetland seed dispersal by white-tailed deer in a large freshwater wetland complex. *AoB PLANTS* 10(1):plx074.

Rare wetland butterflies of the Mid-Atlantic (Wildlife Management Institute, WVDNR)

Selfridge, J., B. Leppo, S. Olcott, R. Somes, C. Tracey, and P. Woods. 2018. Conservation and Management of Rare Wetland Butterflies: Strategies for Monitoring, Modeling and Wetland Enhancement in the Mid-Atlantic Region. Final report for Regional Conservation Needs Grant 2015-02 to the Wildlife Management Institute.

Spotted salamander vernal pool ecology study in West Virginia (WVU)

Millikin, A., S. K. Woodley, D. R. Davis, and J. T. Anderson. 2019. Habitat characteristics in created vernal pools impact spotted salamander water-borne corticosterone levels. *Wetlands* 39:803-814.

Millikin, A. R., S. K. Woodley, D. R. Davis, I. T. Moore, and J. T. Anderson. 2019. Water-borne and plasma corticosterone are not correlated in spotted salamanders. *Ecology and Evolution* 24:13942-13953.

Millikin, A. 2019. Population health of spotted salamanders (*Ambystoma maculatum*) in created vernal pools: an integrative approach. PhD Dissertation, West Virginia University.

Turtle sampling methods in West Virginia wetlands (WVDNR, WVU, USFS)

Oxenrider, K. J., B. M. Heres, and D. J. Brown. 2019. Influence of bait type on capture success of *Clemmys guttata* and *Chrysemys picta* using small hoop nets in shallow wetlands. Herpetological Reivew 50(3):490-492.

Wetland Flora

Faulkner, P. L. and E. A. Byers. 2019. Field Guide to the Common Wetland Plants of West Virginia. West Virginia Department of Environmental Protection. Charleston, WV.

Wetland Mapping

Mapping wetlands with spectral and terrain data using machine learning (WVU)

Maxwell, A.E., and T.A. Warner. 2019. Is high spatial resolution DEM data necessary for mapping palustrine wetlands? *International Journal of Remote Sensing*, 40(1): 118-137.

Maxwell, A.E., T.A. Warner, and M.P. Strager. *2016*. Predicting palustrine wetland probability using random forest machine learning and digital elevation data-derived terrain variables, *Photogrammetric Engineering & Remote Sensing*, 82(6): 437-447.

Figure 8. Buttonbush with tiger swallowtail at Sleepy Creek WMA.

Appendix E. Wetland Fact Sheets from WVDEP (2020) and NRCS (2019)

Wetlands of West Virginia

What is a wetland?

Wetlands are areas where the land is covered by shallow water or the soil is saturated to the surface for at least two weeks during the growing season. Wetlands are wet enough to affect the types of soils and plants that can occur, but they may also be dry at certain times of the year. Plants and many animals found in wetlands are specially adapted to live in these wet conditions. Wetlands can be found in every county in West Virginia. Some common names for different types of wetlands are swamp, marsh, and bog. The words "glade" or "glady" appear in many place names in West Virginia and indicate an historically open area that is often a wetland.

Why are wetlands important?

Wetlands are part of the foundation of our nation's water supply and are vital to the health of our communities. Wetlands feed into rivers, lakes and streams, reduce flooding, recharge groundwater supplies, remove pollution and provide fish and wildlife habitat. Wetlands improve water quality by capturing sediment, removing pollutants, and cycling nutrients through their productive ecosystems. They slow floodwaters, reduce flood peaks, and help protect downstream communities.

Wetlands are comparable to rainforests and coral reefs when it comes to productivity. Wetlands in West Virginia account for less than one percent of the total area of the state, yet they provide essential habitat for a remarkable 23% of West Virginia's plant species, and for an even higher 44% of its rare plants. Wetlands are home to many migratory birds, amphibians, insects, fish, and mammals. Wetlands also provide recreational opportunities such as hunting, fishing, canoeing, photography, and wildlife observation.

Why should we be worried about our wetlands?

In the historic past, wetlands were often regarded as wasted land. It was a widely accepted practice to drain or fill wetlands for other uses, or to use them as dumping grounds. As a result, more than half of the wetlands that existed in the U.S. at the time of European settlement have vanished. In mountainous West Virginia, where level land is at a premium, we have lost 80-90% of our wetlands.

Wetlands across West Virginia are still under threat as land is converted from natural to developed land uses as part of economic development, construction, and extractive industries. Pollution, artificial drainage, and invasive species also degrade existing wetlands.

How are wetlands legally protected in West Virginia?

West Virginia has the goal of no net loss of wetlands and wetland functions in the state. West Virginia wetlands are protected by the Clean Water Act of 1972 and the Food Security Act of 1985. The Clean Water Act regulates dredge and fill activities on wetlands and is under the jurisdiction of the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency. DEP and DNR provide state certification of certain wetland sites under the Clean Water Act. The Food Security Act is administered by the U.S. Department of Agriculture and protects wetlands on agricultural land by withholding federal farm benefits if wetlands are converted to agricultural uses.

What is the role of DEP's Watershed Assessment Branch?

The purpose of DEP's Watershed Assessment Branch is to collect and analyze data to determine the quality of waterbodies in West Virginia in relation to the Clean Water Act. In 2019, a new protocol was initiated to rapidly assess the water quality, flood attenuation, wildlife habitat and ecological integrity functions of wetlands statewide. All mapped wetlands in the state have been scored using preliminary remote sensing data. Rapid field assessments providing more accurate scores are conducted at a much smaller number of sites as part of the state's watershed monitoring activities, and as part of Clean Water Act permitting.

Resources

DEP Division of Water and Waste Management, Watershed Assessment Branch, 601 57th Street SE, Charleston, WV 25304. Phone: 304-926-0495.
https://dep.wv.gov/WWE/watershed/wetland/Pages/default.aspx

DEP Data Viewer https://tagis.dep.wv.gov/wvdep_gis_viewer/ (Click on Layer List / Watershed Assessment / Wetlands) This website shows the functional scores and location of mapped wetlands in West Virginia. Note that many forested wetlands and smaller wetlands have not yet been mapped.

DEP Wetland Resource Guide https://dep.wv.gov/WWE/getinvolved/sos/Pages/Wetstudyguide.aspx This website provides links to wetland resources of interest to West Virginians.

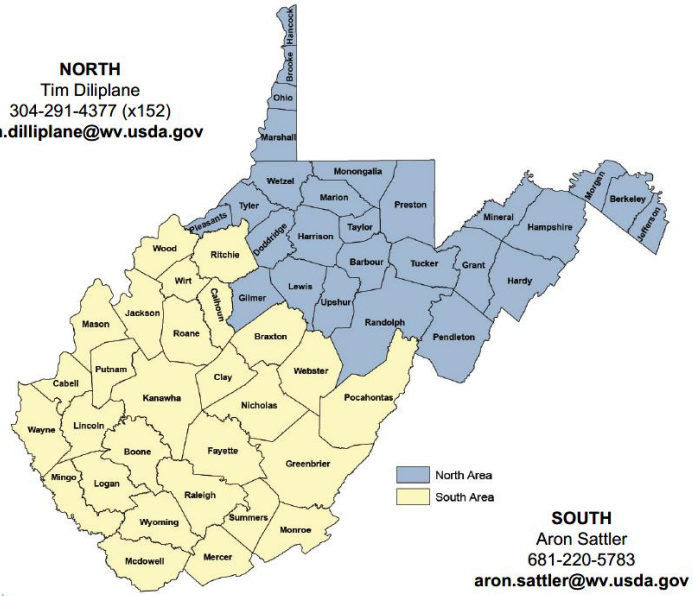
National Wetlands Inventory https://www.fws.gov/wetlands/ This website shows the location of mapped wetlands in the United States. Note that many forested wetlands and smaller wetlands have not yet been mapped.

U.S. EPA Wetlands Protection and Restoration https://www.epa.gov/wetlands This website provides links to a broad set of information about wetlands.

A USDA NRCS soil scientist assigned to your area will make the determination and answer specific questions about your land. Consult the map below to find your local contact.

To find the nearest West Virginia NRCS office visit our website at www.wv.nrcs.usda.gov

West Virginia Wetland Conservation Compliance Responsibility Areas



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West Virginia • December 2018

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USDA United States Department of Agriculture

Wetlands and Conservation Compliance

What Every West Virginia Farmer Needs to Know

Note: *This document is intended to be a quick reference on USDA Natural Resources Conservation Service (NRCS) wetland determinations and does not cover all possible situations.*

Wasted Space or Critical Ecosystems?

Throughout our nation's history, landowners have perceived wetlands to be wasted space, and converted many high-quality acres to agricultural, urban, and industrial uses. West Virginia is thought to have lost 80-90 percent of its original wetland area since colonization by Europeans.

Although the term "wetland" brings to mind areas of shallow water, cattails, and landing ducks, many of our wetlands are open or forested, and seasonally saturated, and may only hold surface water temporarily.

Why Protect Wetlands?

Wetlands perform many beneficial functions, including:

- Improving water quality
- Flood and sediment control
- Nutrient cycling
- Providing critical wildlife habitat
- Groundwater recharging

High rates of wetland conversion and increased national awareness of their associated environmental benefits prompted Congress to enact the legislation to protect them.

Farm Bill Wetland Provisions (Wetland Conservation Compliance)

Wetland conservation has been an integral part of West Virginia agriculture since the passage of the Food Security Act of 1985. The Wetland Conservation Compliance provision introduced in the 1985 Farm Bill states that those who convert wetlands to agricultural uses will be ineligible for USDA benefits until the converted wetlands functions are mitigated or restored.

To maintain eligibility for USDA farm program benefits, participants must certify that they have not produced crops on wetlands converted after December 23, 1985, and that they did not convert a wetland to make agricultural production possible after November 28, 1990.

Wetland Conversion activities may include:

- Filling
- Draining through surface ditching or subsurface tiling
- Dredging
- Land leveling
- Clearing woody vegetation including stump removal
- Building a diversion to runoff water

Participants who plant crops on wetlands converted after December 23, 1985 will not be eligible for certain benefits in years the crop is planted. Similarly, participants who altered a wetland (i.e. removal of woody vegetation and stumps) to make crop production possible after November 28, 1990, will also be ineligible for benefits until the previous functions are restored or mitigated. **This ineligibility remains with the person who converted the wetland, even if the owner later sells the property in question.**

In most cases, drainage systems and other conversions in place prior to December 23, 1985 can be maintained to the extent they existed at that time.

REMEMBER:

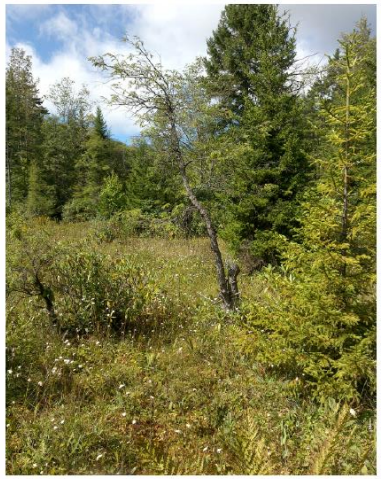
All wetlands, including those converted for non-agricultural activities, fall under U.S. Army Corps of Engineers' (COE) jurisdication per Section 404 of the Clean Water Act.

If you intend to discharge dredged or fill material into wetlands or other waters like lakes, streams or ponds, you must first request a jurisdictional determination from the U.S. Army Corps of Engineers.

Wetland Determinations

It is the landowner's or program participant's responsibility to comply with the wetland conservation provisions. NRCS can assist you by completing a certified wetland determination to determine if and where your property contains wetlands subject to the provisions of the Food Security Act of 1985, as amended.

NRCS employees have been trained to identify, delineate and certify wetlands.



West Virginia wet meadow wetland

Certified NRCS wetland determinations stay in effect as long as the land is used for agricultural purposes. If you disagree with a NRCS determination, you can request a reconsideration or appeal the determination before it becomes final.

Wetland Conservation Exemptions

Numerous variances and exemptions are included in the wetland conservation provisions. Those common to West Virginia include:

Prior Converted (PC):

Wetland converted to agricultural use prior to December 23, 1985, where an agricultural commodity was produced at least once prior to this date and, as of this date, did not support woody vegetation.

(After confirming the NRCS PC determination, land-owners can complete planned activities with no further delay, as long as adjacent wetlands are unaffected.)

Farmed Wetland Pasture (FWP):

A wetland used for pasture or haying that was manipulated before December 23, 1985, but still meets the inundation or saturation criteria. These areas may be farmed and maintained as documented before December 23, 1985, as long as they are not abandoned.

Manipulated Wetlands (WX):

Wetlands that have been manipulated but did not make production of an agricultural commodity possible.

Maintenance:

Drainage may be maintained to the extent as it was prior to December 23, 1985. No improvement to drainage systems in or near wetlands may be completed after this date.

Non-Agricultural Activities:

Wetland Conservation Compliance does not regulate non-agricultural activities such as road or home site construction.

Frequently Asked Questions

What constitutes a wetland?

To be considered a wetland, an area must exhibit the following:

1. Predominance of hydric soils (soils formed under wet conditions).
2. Prevalence of hydrophytic vegetation (vegetation adapted to wet soil conditions).
3. Surface or groundwater inundation or saturation for a sufficient duration to support hydrophytic vegetation.

Can I clear trees from a wetland area?

Wetland conservation provisions do not generally affect normal timber harvesting if the site remains in timber production and stumps remain above ground level. Land clearing involving stump grinding or stump removal which makes agricultural production possible is prohibited.

When purchasing or renting a farm, what questions should be asked about wetlands?

Have certified wetland determinations been completed? What types of wetlands are present and what restrictions are in place? Did any wetland conversions occur on the property after December 23, 1985? If so, what options are available to resolve the situation?

Can I install subsurface drain tile or surface drainage ditches on an existing crop field

In most cases, drainage systems that existed prior to December 23, 1985 can be maintained. Installing a drainage system in or adjacent to a wetland is restricted. Contact NRCS before you install or realign any drainage system.

Is there a minimum wetland size exemption?

No. If a site of any size meets wetland criteria, it is subject to wetland conservation provisions.

Who is responsible for completing a USDA NRCS wetland determination on my property?

Call or visit your local USDA Service Center to determine whether these or other exemptions apply to your farm. Then, work through your NRCS office to submit a request for a required wetland determination.

Most of West Virginia's wetlands are open or forested and only seasonally saturated.