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Update
2022

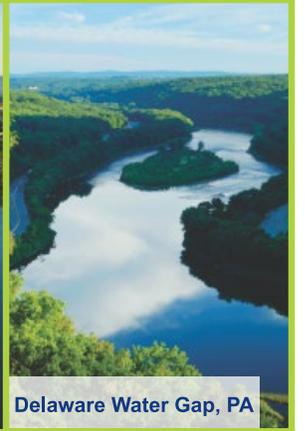
Pennsylvania State Water Plan



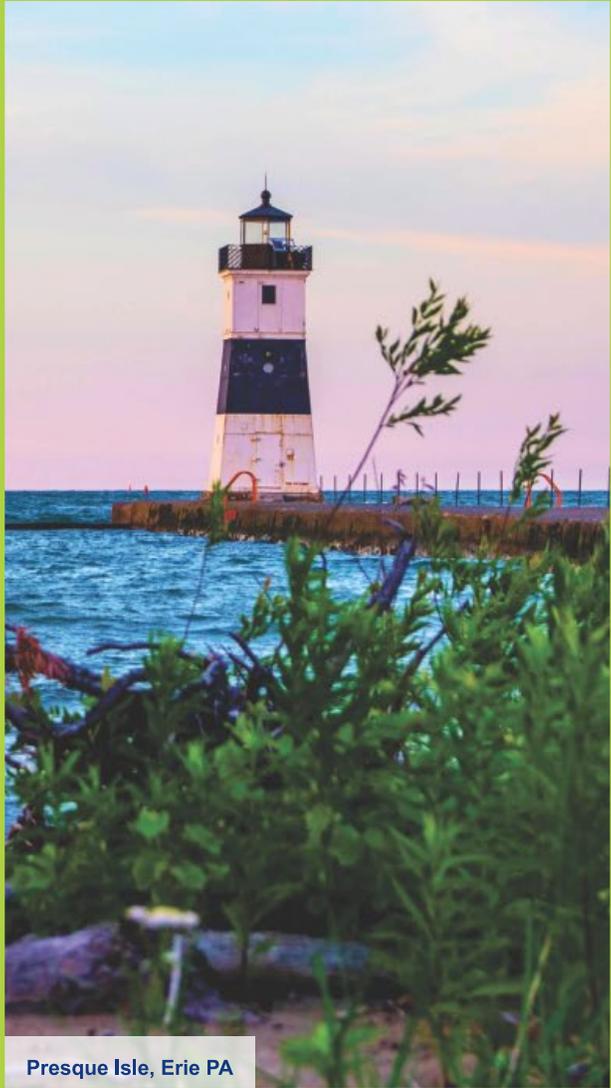
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PROTECTION



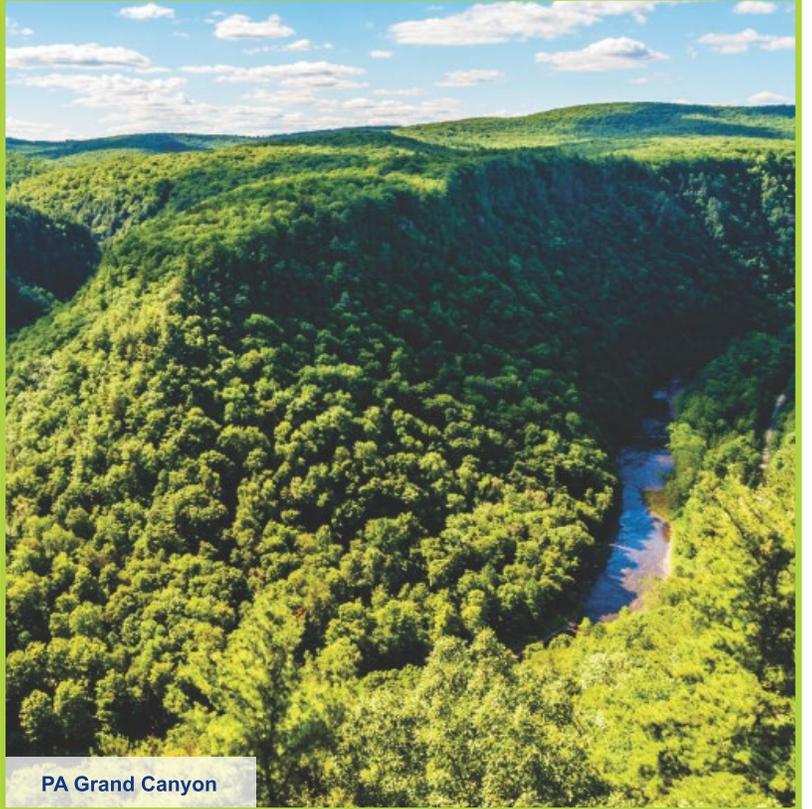
Harrisburg, PA



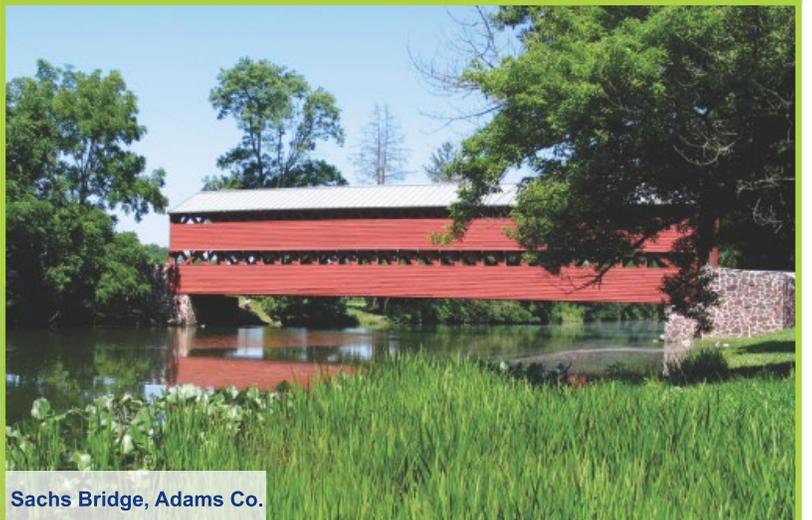
Delaware Water Gap, PA



Presque Isle, Erie PA



PA Grand Canyon



Sachs Bridge, Adams Co.



Pittsburgh, PA

PENNSYLVANIA STATE WATER PLAN UPDATE 2022

An update of the State Water Plan under the Water Resources Planning Act,
Act 220 of 2002

January 2023

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Commonwealth of Pennsylvania



December 15, 2022

STATEWIDE WATER
RESOURCES COMMITTEE

DEPARTMENT OF
ENVIRONMENTAL PROTECTION

Dear Readers:

As Chair of the Statewide Water Resources Committee and Acting Secretary of the Department of Environmental Protection, we are pleased to present you with the 2022 update to the Pennsylvania State Water Plan. This plan is the result of more than 10 years of work undertaken by a combination of Department staff, other state and interstate agencies, and more than 100 water resources experts who served on the statewide committee and six regional water resource committees. Those efforts included updating and reviewing data, assessing key priority water resources issues, and developing recommendations for actions that will serve to improve the conservation, efficient use, and management of our Commonwealth's water resources.

Without question, water resources are critical to our state's economy, environment and society. As reflected in this State Water Plan, effective management of those resources (both in terms of quantity and quality) is a shared responsibility. As envisioned by the Water Resources Planning Act (Act 220 of 2002), which mandates preparation of this plan, the State Water Plan seeks to provide the commonwealth's citizens and leaders, in both the public and private sectors, with important data, evaluations of key challenges, and specific recommendations for actions so that we may, together, more effectively manage these resources to serve current needs and future generations.

The following report highlights the State Water Plan priorities and challenges, providing recommendations for actions, including a ***path forward*** for the next five years of actionable steps for implementation of the recommendations identified within the plan. The plan in its entirety, including the on-line Water Atlas and other tools providing access to useful data, is available on the Department's website at: www.dep.pa.gov/statewaterplan. We hope you will find all of this information helpful to make more informed decisions and take actions that will continue to make this Commonwealth a great place to live, work, recreate, and enjoy a bountiful and diverse environment for generations to come. Water is truly a shared resource and without a doubt a shared responsibility – ***we all have an important role in the path forward.***

Sincerely,

Handwritten signature of R. Timothy Weston in black ink.

R. Timothy Weston
Chair
Statewide Water Resources Committee

Sincerely,

Handwritten signature of Ramez Ziadeh in black ink.

Ramez Ziadeh, P.E.
Acting Secretary
Department of Environmental Protection

Preface

This 2022 State Water Plan Update (updated State Water Plan or 2022 Update) was prepared under the Water Resources Planning Act, which was adopted by the Act of December 16, 2002, P.L. 1776, No 220 (Act 220 of 2002).¹ Act 220 of 2002 requires the Department of Environmental Protection (DEP), in consultation and with the guidance of the Statewide Water Resources Committee (Statewide Committee) and Regional Water Resource Committees (Regional Committees), to conduct a periodic review of the State Water Plan.

The goal for the updated State Water Plan was to evaluate the outcomes from the work performed for the 2009 State Water Plan Update (2009 Update) through the interim period to the beginning of the updated State Water Plan. This evaluation was used to form a policy-level report providing a fresh assessment of issues and revised recommendations, and an appraisal of new climate action strategies. Tasks included:

- Evaluations of previous regional and statewide water resources priorities
- Appraisals of the previous plan's goals
- Development of improved online public access to data
- An expansion of educational and outreach opportunities
- Evaluations of climate action strategies related to water resources
- Continuation of work with previously started Critical Area Resource Plans

Under the provisions of Act 220 of 2002, a collaborative approach was taken to the updated State Water Plan. A host of statewide and regional stakeholders serving on the Statewide Committee and six Regional Committees advised and guided DEP toward an understanding of today's evolving priorities and needs across each of Pennsylvania's six unique water resource planning regions.

This updated State Water Plan consists not only of this summary report, but also includes the following additional components to meet a wide range of water resource planning and educational needs:

- A collection of web-based tools for access to water withdrawals data

Since the 2009 Update, several significant improvements in data management were developed. Funding assistance received since 2015 from the United States Geological Survey has improved the process of collecting, managing, and sharing water use data, a priority of state water planning efforts. DEP has developed several web-based products to readily share water use data and information with the public that are essential components of the 2022 Update. These products include water use report viewers and water use summary reports, which can be accessed on DEP's website².

- An updated digital water atlas

Utilizing technologies that combine text with interactive maps and multimedia content, a new updated digital atlas complements the Pennsylvania Water Atlas from the 2009 Update with updated information and maps to educate the public and help water resource managers make informed decisions, avoid conflicts, and employ effective management practices to protect water resources.

¹ 27 Pa.C.S.A. §§ 3101 et seq.

<https://www.legis.state.pa.us/CFDOCS/LEGIS/LI/uconsCheck.cfm?txtType=HTM&yr=2002&sessInd=0&smthLwInd=0&act=0220>

² Department of Environmental Protection, Water Use Reports

<https://www.dep.pa.gov/DataandTools/Reports/Pages/Water.aspx>

- A platform for educational materials on water resources

The Pennsylvania Clean Water Academy³ serves as a digital training library for DEP, conservation district staff, and sewage enforcement officers, with some limited training content available to the public. The Pennsylvania Clean Water Academy contains a wide range of water-related webinars, eLearning, and other resources including but not limited to stormwater, water quality, stream encroachments, and water quality data. DEP's State Water Plan Program will take advantage of this platform to expand outreach and educational opportunities by posting water resource-related content.

The State Water Plan is to be reviewed every five years as per the provisions of Act 220 of 2002. Although the Act calls for reviews every five years, the initiation of a comprehensive update on the plan was not undertaken until 2019. To avoid this in the future, a continuous, nimble planning process has been introduced as part of an implementation plan known as "Path Forward" that will continue the guidance and advice of the statewide and regional committees who will meet periodically on an ongoing basis.

With these tools, the Statewide Committee is hopeful that Pennsylvania's water resources can be managed collaboratively by government at all levels and that Pennsylvanians will reap the benefits of clean, sustainable water long into the future.

³ Pennsylvania Department of Environmental Resources, Clean Water Academy
<https://pacleanwateracademy.remote-learner.net/>

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Executive Summary

Purpose

The purpose and objective of the State Water Plan is to provide the public and decision-makers at all levels (in government and the private sector alike) with essential information and assessments of priority issues relevant to all aspects of Pennsylvania’s water resources. The importance of clean water to the Commonwealth, our citizens and the environment cannot be underestimated. This plan recognizes that water resources (both in terms of quantity and quality) form a critical foundation to our Commonwealth’s economy, environment and society, and that appropriate management of those resources is a shared responsibility. Accordingly, the State Water Plan seeks to provide the commonwealth’s public and private leaders and its citizens with access to important data, evaluations of key challenges, and specific recommendations for actions so that we may, together, more effectively conserve, develop, utilize, and manage these resources to serve current needs and generations yet to come. This plan contains links and references to water uses, and water studies, and recommended strategies to help watershed groups, local and county governments and the state government manage this resource responsibly. The current plan is a snapshot in time that can be updated and revised to continue to guide Pennsylvania in effective water management in the future.

This report provides the results of the most recent review and update of the Pennsylvania State Water Plan, as required by the Water Resources Planning Act (Act 220 of 2002). It provides a policy-level evaluation and updated assessment of critical issues, including an evaluation of what work has occurred and progress made since the last iteration of the State Water Plan in 2009. As part of that process, the report includes an appraisal of new climate action strategies that would help guide Pennsylvania at all levels towards a goal of sustainable water resource management.

Questions addressed by this update included:

- What are the current water resources priorities statewide and regionally?
- How do the current priorities compare with the 2009 State Water Plan Update?
- What work towards addressing priorities have been accomplished since the last update?
- What needs to be done going forward?

As a primary product, this report reflects a series of assessments and priority recommendations for legislative, policy and other actions that address a wide range of water resources topics of statewide (Table 1.) and regional importance as designated by citizens across the Commonwealth from various perspectives and backgrounds. In addition, this updated States Water Plan includes a “Path Forward” that outlines a phasing of proposed actionable steps for implementation of the recommendations identified within this report. Regulations promulgated under the authority of Act 220 of 2002 are limited to those pertaining to the registration of water users and recordkeeping, and the reporting of water withdrawals and use information under 25 Pa. Code Chapter 110 Water Resources Planning regulations;⁴ and implementation of the State Water Plan’s recommendations are voluntary and may require further actions by the General Assembly or relevant agencies. Water is a shared resource and a shared responsibility—**we all have an important role in the Path Forward.**

Statewide Water Resources Priorities

- Floodplain and stormwater management
- Link land use management and water resources -Integrated Water Resources Management
- Climate Change adaptation
- Water withdrawal and use
- Drinking Water/Waste Infrastructure
- Legacy Impacts
- Contaminants of emerging concern
- Water efficiency
- Navigation and transportation by water
- Agricultural nonpoint source

Table 1. Statewide Water Resources Priorities as described in Chapter 2.4

Background

The previous update of the State Water Plan (2009 Update) was completed in 2009. The 2009 Update provided insight and recommendations into water resources priorities reflecting that planning period. The inspiration for developing the principal priorities from the 2009 Update was the close relationship between land development, flooding, irrigation, and water supply and withdrawals and the need for deeper consideration of those relationships in all water resources management decisions. See Table 2 below.

During the intervening years between 2009 and the start of this update, organizational restructuring and budget reductions directed the focus of implementing the 2009 Update recommendations primarily towards one of its three 2009 principal priorities: continuing in the collection, interpretation and dissemination of water resources information. A conclusion of this report confirms that the connection of land use to water resources remains, among others, as a statewide priority under this 2009 Update and is reflected under recommendations for “Integrated Water Resources Management” (IWRM).

Of note is that during this interim period, successes by DEP in streamlining data acquisition processes and refining other data system functions have substantially improved compliance by public water suppliers in reporting water withdrawal and use reports, increased data accuracy and extended its access to the public; all of which benefit those who rely on the water data to make informed water resources decisions.

Additional details on the background of the State Water Plan and the 2009 Update are described in [Chapter 1](#).

Process

As required by Act 220, this review was a collaborative effort by DEP in consultation with the Statewide Water Resources Committee (Statewide Committee) and six Regional Water Resources Committees (Regional Committees) with diverse memberships representing various water use sectors, state and federal agencies, and river basin commissions. As part of the public participation process, a range of opportunities and approaches were taken to inform the public, solicit input, and respond to input during the update's development.

Assessments of the 2009 Update were accomplished at both regional and statewide levels. DEP, with the assistance of regional committees compiled assessments and revised lists of priorities and recommendations for issues important within each of the Pennsylvania water resources planning regions. Concurrently, with the Statewide Committee's assistance, DEP completed assessments and compiled a revised set of priorities and recommendations for statewide issues. Complementing those assessments were several internal DEP-assembled reports.

Details on the collaborative approach may be viewed in [Chapter 1.6.2](#).

Results in Brief

The updating process revealed that although there are new or emerging water resources issues, the priorities and recommendations under this update are generally similar to those presented in the 2009 Update. However, the challenges considered over a decade ago are still challenges today: flooding, stormwater management, infrastructure, agricultural nonpoint source pollution, legacy impacts of mining, and oil and gas development, among others.

While many of the challenges from 2009 remain, a success story of the 2009 Update was the development of water withdrawal and use data management systems that provided effective and efficient ways of registering water withdrawals and acquiring periodic reporting of those uses. These systems have given Pennsylvania improved capability in, for example, understanding the trends of water use for varying uses, an invaluable asset for proper water resources planning and management. During the interim period between updates, significant improvements have been made in the systems for the acquisition of data, and the dissemination of water use data to the public, commonwealth agencies, and federal and interstate agencies.

A consistent message during this update was for DEP to confidently execute the priorities and recommendations from this update and avoid lags in addressing issues. To this end, a “Path Forward”

implementation plan is offered. The “Path Forward” is envisioned as a phased approach in taking action on the priority recommendations through accountability and realistic work planning. Over the next five year State Water Plan iteration, Path Forward will have reinvigorated committees to be engaged regularly in continuous planning (that is, not having cyclical stop-start planning) to achieve education goals, facilitate communications and coordination, prioritize and execute recommendations and develop specific workplans.

Summary of Assessments and Recommendations

Table 2 summarizes each chapter's content describing this update's findings and recommendations.

Table 2. Summary of Chapter Content

Chapters	Content
<u>2.1 Assessment of Principle Priorities (Priorities from 2009 Update)</u>	Status of the top three statewide priorities identified in the 2009 Update and how each are addressed through this State Water Plan Update recommendations.
<u>2.2-Assessment of Regional Water Resources Priorities</u>	Updated listing of specific regional priorities and recommendations.
<u>2.3-Recommended Legislative Priorities of the Statewide Water Resources Committee</u>	Legislative initiatives extracted from statewide and regional assessment recommendations.
<u>2.4-Assessment and Update of Statewide Priorities and Recommendations for Action</u>	Series of assessment and recommendation papers for topics currently viewed as having the highest statewide significance.
<u>2.5-Critical Water Planning Areas</u>	Background and status of efforts in finalizing Critical Area Resource Plans for three Critical Water Planning Areas.
<u>3.0-Assessment of Climate Change and Adaptation Strategies</u>	Cross-reference tables showing alignment between Pennsylvania Climate Action Plan adaptation strategies with State Water Plan Priority Action Recommendations
<u>4.0-Data Access and Collaboration</u>	A report of past and ongoing initiatives by DEP and partnering agencies in maintaining and improving Pennsylvania’s water use data program.
<u>5.0-Path Forward</u>	A multi-year, phased implementation plan includes education to the public, committee engagement, legislative initiatives facilitation, a continued planning process, and evaluation of long-term studies such as water availability.

Assessment of Principal Priorities from 2009 Update

The 2009 Update recognized the close relationships of land development, flooding, irrigation, and water supply and withdrawals and the need for deeper consideration of those relationships in all water resources management decisions. Table 3 summarizes the three principle priorities that formed a foundation for the 2009 Update and important points from their assessment. Details of the assessment and revised recommendations to address the priorities are found in [Chapter 2](#).

Table 3. Status of 2009 Update Priorities

Priority	Status
Continue in the collection, interpretation, and dissemination of water resources information	<ul style="list-style-type: none"> • Water resources data continue- to be an essential component. • DEP will continue exploring opportunities to improve water resource data access and utility.
Encourage and sustain an integrated approach to managing water resources	<ul style="list-style-type: none"> • Constraints hindered the implementation of Integrated Water Resources Management planning after the 2009 Update. • A framework for integration of water resources planning is still imperative. • Recommendations in Chapter 2 and activities under Path Forward call for DEP to identify and understand challenges and opportunities to implement an integrated water resources management framework.
Adopt policies that encourage technological advances designed to conserve and enhance water resources	<ul style="list-style-type: none"> • Challenges in establishing a nonprofit “Water Resources Technical Assistance Center” following the adoption of the 2009 Update prevented implementation. • Recommendations in Chapter 2 on Water Efficiency call for dissemination of technical information, addressing climate change adaptation, managing public water supply, and improving efficiency by municipal and industrial water users. Posting of educational content regarding water conservation and efficiency is proposed for the Pennsylvania Clean Water Academy.

Assessment of Regional Water Resources Priorities

Act 220 of 2002 subdivides the state water planning effort into six major drainage basins with regional committees representing them. This subdivision highlights the unique nature and needs of these geographical regions. Some core themes emerged throughout these committee meetings, such as strengthening the link between land use and water resources management, particularly regarding land development and stormwater control measures. The Delaware regional committee and several other committees felt that an integrated planning approach (considering all aspects of water resources together, in conjunction with land use considerations both within the appropriate state agencies and at the municipal level where most land use decisions are made) was an appropriate solution with a focus on inter-agency coordination and sharing information with local governments and planning agencies. This was especially true in the Great Lakes region, where international coordination is critical. Act 167 stormwater management plans were also frequently referenced as a potentially valuable tool, if expanded to include consideration of other water issues and if adequate funding to the Act 167 program is restored, to facilitate such holistic planning. In response to this discussion, a workgroup dealing specifically with IWRM was

established. The recommendations from that group are discussed in detail in [Chapter 2.4.2 Integrated Water Resources Management](#). Though these were expressed in the context of statewide considerations, it's important to note that these needs are acutely felt locally.

Table 4 summarizes each regional committee's assessment and update of the regional water resources priorities developed under the 2009 Update to reflect ongoing and new challenges that have impacted Pennsylvania in the interim since the previous update of the State Water Plan. This assessment at the regional level further included descriptions of each region's uniqueness, a listing of stormwater and flood management concerns and cataloging of impacts of climate change and adaptation ideas. Click on each region link for details of the priorities and descriptions.

Table 4. Summarization of Regional Priorities

Region	Priorities
<u>Delaware</u>	<p><i>Strengthen the Link Between Land Use and Water Resources Management</i></p> <ul data-bbox="378 396 1336 495" style="list-style-type: none"> • Develop and distribute water resource information and data • Help counties and municipalities strengthen the link between land use, soil, and water resources management among multiple stakeholders.
	<p><i>Regional Planning and Land Use Coordination and Collaboration</i></p> <ul data-bbox="378 686 1308 842" style="list-style-type: none"> • Think regionally and act locally • Conduct Integrated Water Resource Planning on a holistic watershed basis • Coordinate between local, state, interstate, and federal entities
<u>Great Lakes</u>	<p><i>Protect Water Quality and Quantity in the Basin</i></p> <ul data-bbox="378 974 1352 1251" style="list-style-type: none"> • Take a larger role in federal legislation and other measures that may impact Lake Erie and Lake Ontario • Have northwestern Pennsylvania take larger role in state legislation impacting Lake Erie and Lake Ontario • Protect water quality throughout the region’s watersheds by assessing biology, analyzing contaminants, evaluating the impact of stormwater management and implementing agricultural best management practices
	<p><i>Coordinate with Partners</i></p> <ul data-bbox="378 1379 1276 1566" style="list-style-type: none"> • Engage with other states, provinces, and other stakeholders • Collaborate towards a regional approach with the support of the DEP for communication and incentivized cooperation through grant funding • Coordinate through education and outreach
<u>Lower Susquehanna</u>	<p><i>Identify and Target Solutions for Potential Protection Priority Water Resources to Reduce or Prevent Point and Nonpoint Source Pollution with a Focus on Currently Impaired Water Resources</i></p> <ul data-bbox="378 1757 1036 1915" style="list-style-type: none"> • Identify “protection priority” water resources • Identify targeted solutions • Reduce existing point and nonpoint source pollution

- Prevent new water pollution from all sources
- Broaden support and advocacy for water resources

Enable Continued Responsible Economic Growth by Ensuring Adequate Water Resources

- Prioritize resiliency solutions to address increased stormwater runoff and flooding, including restoration and expansion of green infrastructure
- Include proactive management of land development and land expansion
- Provide support to local governments and municipalities through training and model ordinance development and enlisting non-governmental organizations, watershed groups and riverkeepers

Ohio

Inter-Agency Water Resource Planning

- Support holistic approaches to water quality, quantity, and availability
- Develop plans that identify water resources needed to promote and facilitate economic development while maintaining watershed integrity and recreational benefits
- Develop plans that evaluate the impacts of resource extraction from the Marcellus Shale
- Take the initial step of interagency water resources planning through Act 167 stormwater planning

Water Quality and Quantity

- Institute integrated approach to quality and quantity challenges
- Increase data collection to inform community input and watershed planning
- Prioritize natural systems, man-made infrastructure, and water treatment
- Prioritize multi-municipal planning and funding projects, including best management practices that use integrated approaches to maximize pollution reduction and mitigate flooding
- Address acid mine drainage, orphaned wells, inter-basin transfers, agricultural activities, sanitary sewer overflows (SSOs), combined sewer overflows (CSOs), municipal separate storm sewer systems (MS4s), unsustainable forest management and larger-scale industrial water users

Potomac

Promote Programs and Practices that Protect Water Quality and Quantity and Preserve the Ecological Integrity of Groundwater and Surface Water

- Encourage municipal programs to collaborate and plan regionally, address land use planning, provide domestic water well construction standards, and implement the best management practices

Climate Change Resiliency Especially with Regard to Stormwater Management, Flooding, and Drought

- Promote stormwater management with the use of riparian buffers, rain gardens and stream restoration
- Identify protection priority water resources trending towards impairment

Upper/Middle Susquehanna

Protect Important Headwater Habitats, Enhance Recharge Areas, and Minimize Stormwater Runoff of the Upper/Middle Susquehanna Basin

- Focus on forested land use practices by minimizing large-scale forest cutting, preservation of forested ecosystem services and reduction of sedimentation
- Address legacy infrastructure in acid mine drainage areas
- Reuse degraded/abandoned industrial or commercial lands
- Strive to protect forest lands, preserve recreation areas and greenways, and protect critical habitat areas in rural areas
- Address stormwater in suburban and urban areas with green infrastructure through zoning ordinance changes
- Promote municipal ordinances to protect public water supply recharge areas
- Implement statewide water well construction standards

Multi-Municipal Planning and Coordination

- Expand land use planning with county-wide action plans and integrated water resources management
- Take a regional approach of education and outreach to water resource stakeholders
- Prioritize upgrading existing aging water infrastructure
- Optimize use of funding dollars through multi-municipal planning

Recommended Legislative Priorities of the Statewide Water Resources Committee

Following are statewide, funding, and regional legislative priority recommendations directed at the Pennsylvania General Assembly. These were extracted from workgroup papers referenced in the previous section created by the Statewide Committee and from regional components of the plan. Details on the recommendations may be found in [Chapter 2.3](#).

Table 5. Legislative Priorities for Pennsylvania General Assembly

Priority	Rationale	Recommendation
<u>Sustainable Funding of Water Resources Programs</u>	Though generally plentiful in Pennsylvania, water is a critical resource and requires ongoing care, protection, and sustainable management to ensure its continuing availability and quality. Programs that support the stewardship of this valuable resource should be given sufficient and consistent funding.	See section on Funding Priorities. A series of specific recommendations are listed concerning sustainable funding priorities identified by the State Water Plan committees and workgroups.
<u>Well Construction Standards</u>	Pennsylvania has the second highest number of private wells in the country. However, in the absence of well construction standards and some cases, installer training and proficiency, many wells are not adequately constructed to prevent contamination of the well and groundwater, thereby putting Pennsylvanians at risk.	Enact legislation to require proficiency-based licensing and certification of water well drillers and establish statewide water well construction standards. To avoid landowner concerns, legislation should make clear that the legislation applies to those who install wells, and that no tax, fee or restriction on water use will be applied to homeowner wells. The proposed legislation should be preceded by a strategic public educational outreach.
<u>Legacy Mining and Well Challenges - Reducing Barriers to Private Action</u>	A “Good Samaritan” law at the federal level and clarification of National Pollutant Discharge Elimination System (NPDES) Permit requirements would help remove barriers to nonprofit organizations and other private parties from undertaking remediation efforts by providing immunity from legal liability for mine and abandoned well discharges they did not cause.	Encourage Congress to enact Good Samaritan laws and other reforms that would release entities from being legally liable for discharges they did not cause while they attempt to treat said discharges and remediate abandoned mines and wells. Examples of similar laws include the Pennsylvania Good Samaritan Act and Community Relations Partnership Act.
<u>Ensuring Long-Term Operation of Treatment Plants</u>	Ensure Long-term treatment project O&M	Encourage Congress and OSMRE to allow the usage of Federal AML funds to be used to finance long-term treatment trusts ensuring funding is available to continue to operate the treatment plants constructed using the AML funds.

<p><u>Evaluating Pennsylvania's Water Rights</u></p>	<p>Pennsylvania's common law water rights are not well defined, unquantifiable, insecure, and difficult to enforce. Adoption of a more consistent and secure statutory water rights arrangement, like that enacted by other eastern states, could provide more predictable and better-defined water rights that would protect existing users and provide a more secure foundation for future economic investments.</p>	<p>The Statewide Water Resources Committee should work with DEP, basin commissions, a broad spectrum of stakeholders, and the General Assembly to evaluate the effectiveness of current water rights and withdrawal arrangements, evaluate options for improvements and develop recommendations for a more consistent, secure and holistic approach to water rights.</p>
<p><u>Amend Flood Control Act</u></p>	<p>Rainfall intensity is trending higher, putting more Pennsylvanians at risk of flooding. A mitigation approach that considers both non-structural and structural measures will be needed to protect lives and reduce flood damage.</p>	<p>Provide DEP and other state agencies authority to consider and implement all potential flood control solutions and provide funding through the capital budget process and other means for such structural and non-structural projects.</p>
<p><u>Sustainable Public and Private Stormwater Management Infrastructure</u></p>	<p>With increasing rainfall intensity stormwater becomes a key issue in urban centers. Therefore, having a plan to sustainably support that infrastructure is critical.</p>	<p>Authorize the creation and operation of local authorities, utilities, or management districts and/or other entities in all classes of counties and municipalities that can collect reasonable fees and generate sustainable revenues dedicated to improving, planning, constructing, monitoring, maintaining, expanding, and managing stormwater management infrastructure.</p>
<p><u>Water Resource Restoration</u></p>	<p>A holistic view of stormwater and flooding that considers the downstream impacts of such events is critical in addressing stormwater.</p>	<p>Fund, promote, and support water resource restoration projects, particularly projects that reestablish natural processes that support a broader aim of flood mitigation and stormwater control.</p>

<p><u>Facilitate Asset Management Planning</u></p>	<p>The most recent EPA Infrastructure Needs Survey projected a capital need for Pennsylvania drinking water systems of \$16.8 billion over the next 20 years; and with the legacy challenges of combined sewer systems and aging wastewater infrastructure, the projected needs for wastewater systems are comparable. Development and implementation of a sustainable asset management approach is needed to assure ongoing investment, maintenance, and rehabilitation of this essential infrastructure.</p>	<p>Maximize access to and utilization of funds made available from the 2021 Bipartisan Infrastructure and Jobs Act, in combination with state and system level investments.</p> <p>Pennsylvania Infrastructure Investment Authority (PENNVEST) funding for asset management plans should be increased from \$25,000 to \$50,000 with conditions and timeframes attached.</p> <p>Consider amendments to 25 Pa. Code Chapter 71 to require Act 537 plans to include periodic reviews and reporting on the sustainable management of wastewater systems. Reinvigorate an Act 537 process to help address sustainable infrastructure goals and reestablish and fund the Act 537 planning and enforcement reimbursement program.</p>
<p><u>Support Program for Agricultural Conservation Practices</u></p>	<p>There are many agricultural facilities which can contribute nutrient and pathogen runoff, soil erosion, and unrestricted livestock access to streams and surface waters. Though farmers and the agricultural community are ready and willing to do their part to reduce runoff while improving farm practices they can't do it without technical support.</p>	<p>Recommend that the General Assembly identify a long-term source of funding for the newly passed Agriculture Conservation Assistance Program (ACAP)⁴. Establishing dedicated and equitable funding for ACAP that will target funding for local farms to invest in conservation practices will guarantee its success beyond 2026 when the current funding expires⁵.</p>

⁴ ACAP was promulgated under Act of Jul. 11, 2022, P.L. 540, No. 54, Art.XVI-R, § 1601-R (see, also Art. XVII-A.2, Subarticle B, §§ 1711-A.2-1712-A.2.)

⁵ Funding for ACAP is currently provided by the Clean Streams Fund, established under Act of Jul. 11, 2022, P.L. 540, No. 54, Art. XVII-A.2, Subarticle B, §§ 1711-A.2-1712-A.2. Funding for the Clean Streams Fund is currently allocated through federal COVID-relief funding; Act of Jul. 8, 2022, P.L., No. 1A; Part LI, Subpart G., §5154.

<p><u>Reduce Livestock Access to Streams</u></p>	<p>Keeping animals and their waste out of streams reduces bacteria, nitrogen, and phosphorus that pollute waterways and helps prevent erosion by protecting stream banks.</p>	<p>Encourage voluntary participation in implementing restriction of livestock access to streams as there are new funding programs, such as ACAP, that may help farmers implement this practice. Boost participation and implementation of best management practices to streams where water quality is being impacted. Allow for enforcement of best management practices relating to livestock access to streams where water quality is being impacted.</p>
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Funding Priorities

- Assistance to conservation districts in hiring more staff and expanding capacity
- Increased funding for available Resource Enhancement and Protection (REAP) tax credits
- Dedicated and increased funding source for the Environmental Stewardship Fund (ESF)
- Additional funding for addressing inactive abandoned and orphan oil and gas wells
- Re-invigorated funding for Act 167 stormwater plans and Act 537 sewage facilities plans
- Funding multi-municipal planning efforts through a grant allowing for water infrastructure repair and maintenance provided that the proposed project can demonstrate it takes local and regional land use planning into account. Outreach and assistance to public water suppliers
- Funding for establishment of an emerging contaminants program
- Funding to enhance watershed-based flood forecasting and warning systems
- Increased efforts to enhance community preparedness and resiliency for flood events and recovery assistance following flood events
- Funding for Chapter 102 compliance
- Funding DEP to update for update of a stormwater management model ordinance

Assessment and Update of Statewide Priorities and Recommendations for Action

To begin their work in assessing the 2009 Update, the Statewide Water Resources Committee (Statewide Committee) utilized a questionnaire on integrated water resources management and an online survey to committee members. The responses helped gauge the current highest priority water resources problems and identify gaps, shortcomings, and deficiencies in the current water resources planning and management processes and programs. Engaging discussion resulted in the establishment of high priority topics for which eight work groups were formed to develop “white papers” for these priority topics.

- Stormwater and Flood Mitigation
- Water Supply
- Legacy Impacts
- Water Management and Land Use Management
- Drinking Water and Wastewater Infrastructure Sustainability
- Coordination among State Agencies
- Emerging Contaminants and Water Quality
- Agriculture

Table 6 summarizes each of the workgroup topics, relevant planning outcomes for priority topics and the recommended approaches to reach the outcomes. Click on bookmarks linking to the white papers providing detailed subject backgrounds and specific recommendations under the approaches.

Table 6. Statewide Committee Workgroups, Topics, Relevant Outcomes, and Recommended Approaches

Workgroup/Topic	Relevant Outcomes	Recommended Approaches
<p>Stormwater and Flood Mitigation Workgroup</p> <p>Floodplain and Stormwater Management</p>	<ul style="list-style-type: none"> • Addressing increased flooding risk due to climate change • Protecting Pennsylvania floodplains • Enhancing community recovery assistance following flood events • Improving commonwealth and local capabilities in preparing for and reacting to flooding events 	<ul style="list-style-type: none"> • Enhancing commonwealth agency capabilities with revised policies, authorities, and permitting changes • Encouraging financial opportunities for floodplain and stormwater projects • Directing support to local actions based on watershed approaches • Encouraging legislative funding to support programs in meeting goals • Providing technical guidance and educational training • Administrative changes to agencies and governments
<p>Water Management and Land Use Management Workgroup</p> <p>Integrated Water Resources Management (IWRM)</p>	<ul style="list-style-type: none"> • Identifying opportunities to improve coordination on water resources management within DEP • Improving coordination and data sharing across state agencies and throughout the federal, interstate, state, and local government levels • Solidifying the connection between land use and water resources management 	<ul style="list-style-type: none"> • Performing a baseline assessment of what IWRM may entail for DEP and other commonwealth agencies • Establishing an actionable workplan to identify programmatic, policy, or regulatory options and developing actions reflecting linkage of land use to water resources management • Improve water resources coordination across agency, basin, federal, and local levels • Assist in the adaptation and promotion of existing forms of county level integrated water resources planning

Workgroup/Topic	Relevant Outcomes	Recommended Approaches
<p>Water Supply Workgroup Water Withdrawal and Use</p>	<ul style="list-style-type: none"> • Evaluating a more consistent and secure statutory water rights arrangement than found under current common law • Achieving a better understanding of changing water use trends and future water demands • Protecting existing and future uses of private wells and other groundwater resources 	<ul style="list-style-type: none"> • Encouraging enactment of legislation to require proficiency-based licensing and certification of well drillers and to establish statewide private water well construction standards • Improving the collection, assessment and sharing of reported water use data including consumptive use in projecting future demand trends and managing and accessing water supply and water availability on a watershed scale. • Evaluating current effectiveness and shortcomings of Pennsylvania’s existing water rights and water withdrawal arrangements • Evaluating and improving DEP drought monitoring practices • Recommending all community water systems as well as self-supplied users evaluate the vulnerabilities of their respective sources to the impacts from expected increases in frequency and intensity of flooding and droughts
<p>Water Supply Workgroup Water Efficiency</p>	<ul style="list-style-type: none"> • Disseminating technical information on water efficiency technologies and practices • Addressing climate change adaptation • Managing public water supply assets • Improving efficiency by municipal and industrial water users 	<ul style="list-style-type: none"> • Development and incorporation of information on water efficiency technologies into the Pennsylvania Clean Water Academy. • Assessing expected need for increased irrigation in the face of climate change • Promoting/adopting/supporting appropriate technologies, policies, and practices, research opportunities, rebates, and grants for water suppliers, water users, and other interested parties

Workgroup/Topic	Relevant Outcomes	Recommended Approaches
<p>Legacy Issues Workgroup</p> <p>Legacy Impacts</p>	<ul style="list-style-type: none"> Improving upon existing programs to address water resources impacts from abandoned coal mines and abandoned oil and gas wells 	<ul style="list-style-type: none"> Supporting efforts that provide additional funding for addressing abandoned mine lands (AML) sites Continuation of grants for maintenance funding Developing sustainable funding for long-term treatment of abandoned mine drainage (AMD) Supporting legislation to protect Good Samaritans Supporting efforts including legislation to provide additional funding for identification and addressing inactive, abandoned, and orphaned oil and gas wells Generation of revenues associated with decommissioning of legacy wells Exploration of third parties for decommissioning of legacy wells
<p>Drinking Water/Wastewater Infrastructure Sustainability Workgroup</p> <p>Drinking Water and Wastewater Sustainable Infrastructure</p>	<ul style="list-style-type: none"> Addressing Pennsylvania's infrastructure investment and rehabilitation challenges 	<ul style="list-style-type: none"> Improving data on infrastructure capital needs Encouraging water and waste systems to plan for long term infrastructure needs Supporting legislation to promote and support development of asset management planning Evaluating alternatives for assuring systematic assessment of water system conditions Promoting PENNVEST Programmatic Financial Guidance Encouraging financially challenged systems to consider alternative arrangements to assure technical, managerial and financial capability
<p>Emerging Contaminants and Water Quality Workgroup</p> <p>Contaminants of Emerging Concern</p>	<ul style="list-style-type: none"> Strengthening the support to DEP in fulfilling its duties regarding emerging contaminants and encouraging the federal government to extend their responsibilities 	<ul style="list-style-type: none"> Supporting efforts to establish and fund a DEP emerging contaminants program including support expansion of DEP lab capabilities and liaison with the federal government on critical emerging contaminants issues

Workgroup/Topic	Relevant Outcomes	Recommended Approaches
<p style="text-align: center;">Internal DEP Assessment of Navigation Needs</p>	<ul style="list-style-type: none"> Restoring, developing, and improving transportation by water while addressing environmental risks and impacts 	<ul style="list-style-type: none"> Supporting commonwealth agency efforts in addressing hydrological, structural, and qualitative aspects associated with commercial and recreational navigation on waterways Supporting commonwealth participation in navigation related arrangement involving international federal, interstate, and regional governments and institutions
<p style="text-align: center;">Agriculture Workgroup Agriculture Nonpoint Source Pollution</p>	<ul style="list-style-type: none"> Addressing the impact of nonpoint source runoff from agricultural operations on the water quality of Pennsylvania's waterways through the support of commonwealth and federal agricultural programs 	<ul style="list-style-type: none"> Identification and establishment of long-term funding sources for programs that invest in agricultural conservation practices and for conservation district staffing Support for federal United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) programs such as the Chesapeake Resilient Farms initiative towards yielding greater amounts of funding for technical assistance and agricultural cost-share.

Critical Water Planning Areas and Critical Area Resource Plans

Act 220 of 2002 established a process to designate Critical Water Planning Areas (CWPAs). CWPAs are areas where existing or future water demands exceed or threaten to exceed water availability. Act 220 of 2002 also authorized the preparation of Critical Area Resource Plans (CARPs) for any watershed or watersheds within a CWPA. During the State Water Plan update in 2009, considerable work was done to "screen" the entire state for CWPAs.

For the development of the 2009 Update, GIS modeling was employed to compare net water withdrawals against designated criteria of a percentage of 7-day, 10-year low flows, and the measurement of the influence of net withdrawals on aquatic resources at 10,000 watershed points.

Work on designation of the Critical Water Planning Areas was still underway at the conclusion and adoption of the 2009 Update. But progress continued over the next few years. After a process of screening, and verifying with input from regional committees and recommendation from the statewide committee, four watersheds were officially designated in 2011 as CWPAs by the Secretary of DEP: Marsh and Rock Creeks, Adams County (Potomac Region); Back Creek, Fayette County (Ohio Region); and Laurel Hill Creek, Fayette and Somerset counties (Ohio Region). Descriptions of each of the watersheds and details on the designation of the Critical Water Planning Areas are found in [Chapter 2.5.1](#).

Shortly after, work commenced on development of the Critical Area Resource Plans for each of the four CWPA watersheds. However, organizational restructuring, and budget reductions during 2012 necessitated a hold on CARP development. With the startup of this current State Water Plan Update, some progress has continued on the CARP development.

All the following major components for the Marsh and Rock Creek, Laurel Hill Creek, and Back Creek CARPs have been drafted.

- Verification and Statement of Problems
- Existing and Future Reasonable and Beneficial uses
- Water Availability Evaluation
- Quantity of Water Available and Required for Future Water Uses
- Assessment of Water Quality Issues
- Stormwater and Floodplain Management
- Adverse Impacts and Conflicts
- Supply-side and Demand-side Alternatives
- Recommendations

Interactive maps showing all these watersheds' locations are available in the Water Use and Planning section of the updated State Water Plan Atlas⁶.

To view the status and actions of each process for draft CARPs, refer to DEP's State Water Plan⁷ website for this information.

Assessment of Climate Change Adaptation Strategies

The *Pennsylvania Climate Impacts Assessment 2021* provided the review of scientific findings and risks to inform priority climate change adaption needs. This assessment was followed by the *Pennsylvania Climate Action Plan 2021* that outlines strategic opportunities in reducing greenhouses gases and opportunities in adapting to the impacts of climate change, an area where state water planning objectives have commonality.

An assessment of Pennsylvania's Climate Action Plan 2021 (CAP 2021), and the previous Climate Action Plan 2018 (CAP 2018) revealed where water related strategies from both documents aligned with regional and statewide State Water Plan Priority Action Recommendations.

The CAP 2018 identified opportunities of using stormwater best management practices and promotion of IWRM and water conservation which correlate closely with the State Water Plan priority action recommendations related to floodplain and stormwater management and IWRM. Therefore, implementation of priority actions from this updated State Water Plan may complement other strategies to support the implementation of those CAP strategies.

The CAP 2021 contained an assessment of significant climate related impacts, to water resources and suggested approaches and strategies which similarly relate to several State Water Plan priority action recommendations and, thus, offer potential opportunities to satisfy both climate change adaption needs and other State Water Plan priority needs.

For example, suggested climate adaptation approaches and strategies to reduce the impacts of flooding on built infrastructure may be supported through investment in enhanced flood forecast and warning systems and updating of floodplain and flood insurance rate maps, priority action recommendations from the updated State Water Plan. It should also be noted that while total average rainfall will likely increase, this will be coming in less frequent but heavier rain events, and drought conditions may also be expected to occur more frequently.

Details on the assessment of climate adaptation strategies may be found in [Chapter 3](#).

⁶ DEP State Water Plan Digital Water Atlas

<https://storymaps.arcgis.com/stories/d945de2b227b44f5adad48faa36af929>

⁷ Pennsylvania Department of Environmental Protection, State Water Plan

<https://www.dep.pa.gov/Business/Water/PlanningConservation/StateWaterPlan/Pages/default.aspx>

Data Access and Collaboration

Pennsylvania has had the benefit of a water use data system for collecting water reports for several decades. With ongoing improvements to the system coupled with institution of registration regulations during the previous update of the State Water Plan, DEP now annually receives over 8,000 reports related to individual withdrawal sources (sub-facility) and over 2,000 reports (primary facility) related to the business entity or system that owns and operates sub-facilities.

In 2017, DEP launched a series of six water use report viewers to readily share users' registration and periodic reporting of water use information with the public. The project was fully funded by a United States Geological Survey (USGS) Water Use Data and Research (WUDR) grant. The report viewers are a web-based program using an SQL Server for Report Services (SSRS) server-based reporting platform.

In 2021, an additional viewer and data export tool was added to the DEP Water Reports webpage. The water use summary report⁸ summarizes total withdrawals by categories and source types using charts, maps, and tables at state, county, and watershed scales for the past five reporting years. The report also displays the locations of reported sources. However, the water use summary report excludes showing and providing the coordinates of PWS sources due to DEP's sensitive locational policy prohibiting readily sharing coordinates of these sources.

Data acquisition has significantly improved since the initial Act 220 of 2002 registrations were submitted in 2003. With support from a USGS grants program, further refinement in the collection of water data increased the accuracy and quality of data through quality assurance and control and other system functionality.

In 2021, a secure centralized site for sharing water use data was set up to exchange large amounts of water data between DEP and partner agencies. The site was designed to automate transferring of data for integration in a partner agency's own applications. This eliminates the labor-intensive manual processes involved with sharing large datasets or the need for a user to manually query and download data from a web-based application, such as DEP's report viewers.

See more detailed information on subject within [Chapter 4. Data Access and Collaboration](#).

Path Forward

A consistent message during this update of the State Water Plan was for DEP to execute the outcomes from this update that call for unifying programs and agencies together with local governments and stakeholders towards sustaining existing water resources programs, and form actionable and implementable steps towards the integration of programs and agencies to better manage the linkage of water resources management to land use issues.

To achieve this, a phased or incremental implementation plan or "Path Forward" has been developed. This element of the plan seeks to provide a high level of awareness to water resources needs through public education and participation, prioritize and initiate work on the most important issues identified within priority recommendations, establish levels of accountability by measuring success in quantifiable ways, and institute the framework for a continuous planning process for effective administration of the State Water Plan Program. It is summarized in Table 7 below.

⁸ Water Use Summary Report

http://cedatareporting.pa.gov/reports/powerbi/Public/DEP/WUDS/PBI/PA_Water_Use_Annual_Summary_Report

Table 7. Path Forward Phases and Tasks

Phase	Year	Tasks
One	One	<p>Public outreach, supporting legislation, educating the public, outreaching to stakeholder constituencies, improving Environmental Justice community engagement and participation, continuing and strengthening committees and workgroups, completing ongoing work on Critical Area Resource Plans, and prioritizing recommendations.</p>
		<ul style="list-style-type: none"> • Supporting legislative and funding priorities - coordinate with legislative office in developing briefing materials • Direct outreach to public on the facets of the State Water Plan • Continuing and strengthening statewide and regional committees - recruiting to fill vacancies, holding regularly scheduled meeting of statewide and regional committees • Establishing DEP agency groundwork for IWRM initiatives. • Convening stakeholder workgroups to work on identified key issues. • Completing and adopt critical area resource plans • Developing a continuous planning process to reach environmental goals, future State Water Plan updating cycles • Prioritizing recommendations • Developing educational and training content
Two	Two	<p>Defining strategies, tasks, activities, and projects for the prioritized recommendations developed by the statewide and regional committees and the development of measurable success indicators when possible. Identifying and completing needed assessments and evaluations of evolving water resources issues in establishing a long range and strategic workplan for the State Water Plan.</p>
		<ul style="list-style-type: none"> • Identifying and initiating assessments and evaluations of water resources issues • Convening stakeholder group to review and evaluate Pennsylvania’s existing water rights system and withdrawal arrangements and to make recommendations • Convening stakeholder groups to address other identified high priority issues • Developing implementation activities for recommendations • Developing implementation activities for recommendations • Identifying measurable outcomes to be achieved for the implementation activities • Develop the regional priorities identified by the regional committees to include specific activities that can be undertaken, specific resources to be tapped, and explicit results that are desired

Three	Three, Four, and Five	<p>Completing the required assessments and evaluations of evolving water resource issues, leading to development of recommended projects, actions, policies and legislation. A system of accountability and planning success will be pursued through quantifiable measures.</p> <ul style="list-style-type: none"> • Evaluation of activities initiated or completed by the statewide and regional committees and progress being achieved • Evaluation of need for major resource projects such as water availability studies and critical water resources assessments as well as the identification of new activities that can be initiated by committee or workgroups • Initiation of the process for producing the required 5-year report by DEP determining whether the State Water Plan and any ongoing revisions and updates reflect the objectives, policies, and purposes of Act 220 of 2002
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1.0 Introduction

1.1 How to use the State Water Plan Update

The 2022 State Water Plan Update (update of the State Water Plan or 2022 Update) was developed for decision makers at all levels to help make informed decisions, avoid conflicts, and employ effective management practices to protect water resources. The update of the State Water Plan may be used as a source for extensive water resource data, the latest information, and policy recommendations. Additionally, the update of the State Water Plan may be a helpful guide for the development and implementation of policies, programs, and projects on water availability, infrastructure investment, water resource protection, health and safety, and access to climate change adaptation strategies. It further serves all Pennsylvanians by extending environmental educational opportunities on water resource topics. A [glossary](#) of key terms, abbreviations, and acronyms is available at the end of the report.

1.2 History of the State Water Plan

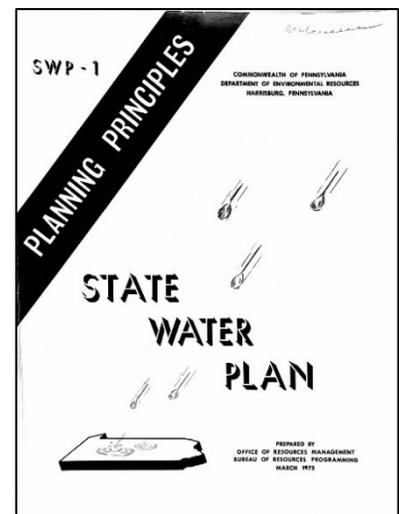
State water planning has existed as a concept in Pennsylvania for over a hundred years in various forms starting with several pieces of legislation in the early 20th century. These included the Purity of Waters Act of 1905 in response to outbreaks of typhoid and cholera. Additionally, the Controlling of Water Resources Act of 1913, which led to a large inventory to be taken of Pennsylvania's water resources, included records reaching as far back as the early 1800s.

Several laws were passed in Pennsylvania throughout the 1920s and 1930s that dealt with many concerns surrounding water quality, flooding, and water rights. In the 1960s, a severe drought in the northeastern United States led to broader federal water resources planning that allowed for the dispersal of grant monies to states to begin building their own water resource inventories and plans. Pennsylvania responded by forming an Interagency Water Resources Coordinating Committee that, in 1968, developed an outline of what would be the commonwealth's first water resources plan that was to be part of a broader statewide comprehensive plan. That 1968 document established plan components including objectives, what was to be inventoried, development needs, regional analyses of demands/needs, development solutions, and implementation actions.

It was not until the 1970s that the predecessor to the Pennsylvania Department of Environmental Protection (DEP), the Pennsylvania Department of Environmental Resources (DER), began a comprehensive state water plan based on the 1968 outline. The DER Division of Comprehensive Resources Programming coordinated among federal and other state agencies to produce what would be 20 sub-basin plan volumes⁹ (similar to that shown in Figure 2) completed periodically between 1975 and 1983. Each volume presented:

- Summary and recommendations
- Physical features and resources

Figure 1. 1970's and 1980's State Water Plan



⁹ Department of Environmental Resources, State Water Plan 1975-1983
<https://files.dep.state.pa.us/Water/Division%20of%20Planning%20and%20Conservation/StateWaterPlan1975/>

- Socio-economic features
- Water resource problems and solutions/alternatives
- Impacts of structural alternatives

Beginning in 1997, several inquiries would be launched over a period of four years that would gauge the need for revised water resources legislation and planning. At that point, 14 years had passed since the completion of the last State Water Plan volume.

The 21st Century Environment Commission was launched by Governor Tom Ridge in 1997 to determine Pennsylvania's 21st century environmental priorities. As the 21st Century Environment Commission was underway, a drought during 1998 and 1999 further underscored the critical need for updating of commonwealth-wide water resources management planning. That commission produced recommendations that promoted responsible land use, conservation of natural resources, making a healthy environment and promotion of environmental education, training, and stewardship.

As a follow-up to the *Report of the Pennsylvania 21st Century Environment Commission*¹⁰, Governor Ridge directed the establishment of a statewide sound land use outreach program. The *Sound Land Use Implementation Plan*¹¹ documented the high level of interest of Pennsylvania citizens in protecting the quality and quantity of water resources, including recognition of possible water shortages, and advocated for planning on a watershed basis through updating and implementing the State Water Plan. Of note in that plan was the critical need to understand groundwater resources.

A series of 15 water forums were convened across Pennsylvania in the spring of 2001, just months before initial county drought declarations were made later in August. During those meetings, agreement was reached on the need to manage water resources more effectively. With over 1,700 people participating in the water forums, citizens spoke to the need to update the State Water Plan (whose last volume was published then 18 years prior) and they offered other ideas on ways to address water resource needs through meaningful water resources legislation and administrative changes. The outcomes from those water forums highlighted the need for education on water resources, and for the integration of water quantity with quality.

By December of 2001, the commonwealth was about a half a year into drought, and with recent past water forums and studies calling for action, the conditions were right for initiation of new water resources legislation.

1.3 Legislative Foundation of the State Water Plan Update: Act 220 of 2002

Water resources legislation supported by Governor Mark Schweiker during the 2001-2002 Pennsylvania General Assembly session took the form of several bills – [HB 2230](#) , [HB 2302](#), and [SB 1230](#) – that would require updating the State Water Plan, promoting water conservation, and identifying Critical Water Planning Areas (CWPAs). The major elements of these bills were based on the water forums held during the spring of 2001.

¹⁰ Report of the Pennsylvania 21st Century Environment Commission
https://files.dep.state.pa.us/Water/Division_of_Planning_and_Conservation/StateWaterPlan/21stCenturyEnvironmentCommissionReport_Sept1998.pdf

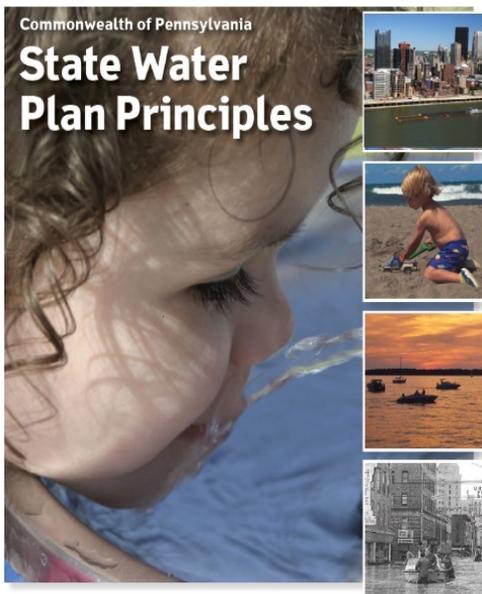
¹¹ Pennsylvania Department of Transportation, PENNDOT Sound Land Use Implementation Plan
https://www.dot.state.pa.us/public/bureaus/ProgCenter/REVISED_PennDOT%20Sound%20Land%20Use%20Implementation%20Plan%2011.pdf

With bipartisan and broad stakeholder support, HB 2302 was enacted as the Act of December 16, 2002, P.L. 1776, No. 220 ([Act 220 of 2002](#)), also referred to as Pennsylvania’s “Water Resources Planning Act.”

1.4 2009 State Water Plan Update

The initial State Water Plan under Act 220 of 2002 was to be developed within five years to help answer the basic questions: How much water do we have? How is the water being used? Where will the demand for water exceed the supply? What are our water resource challenges, and what opportunities should be pursued to improve our management of water resources? Between 2003 and 2009, the State Water Plan process involved the registration and reporting of certain water withdrawals, identification of CWPAs, and initiation of Critical Area Resource Plans (CARPs) for several watersheds identified as CWPAs. This work was completed by DEP with the input of 169 appointed people with a wide range of representation serving on six regional committees, a statewide committee, and subcommittees, as well as additional public input.

Figure 2. 2009 State Water Plan Principles Document



Early in what became the 2009 State Water Plan Update (2009 Update), the planning team identified three principal priorities:

- The efforts initiated in the plan to collect, interpret, and disseminate water resources information should continue.
- An integrated approach to managing water resources should be encouraged and sustained.
- The commonwealth should adopt policies that encourage technological advances designed to conserve and enhance water resources.

The framework for the 2009 Update fell into four tiers: **data** (collection, consolidation and analysis); **regional components** (key issues that reflected the priorities of each of the six planning regions); **marketing and engagement of the plan**; and an **action agenda (Shown in Figure 3 as State Water Plan Principles)** for the recommendations.

Notable accomplishments from the 2009 Update include:

- Water use registration and reporting
- United States Geological Survey GIS-based water availability screening
- Identification of CWPAs

The results of the 2009 Update were then distilled into four [components](#):

- A principles document highlighting the plan priorities, recommendations for action, and key components of the plan
- A marketing document also known as the “Touchstone Document” explaining the basis for water resources planning
- A coffee table-sized Water Atlas as an educational aid that laid out the landscape of Pennsylvania’s water resources and how they are managed
- A web-based system for water use registration and reporting

For more information on the 2009 Update, please visit DEP’s webpage for the [State Water Plan Update of 2009](#).

1.5 The Intervening Years

The previous update of the State Water Plan was completed in 2009. During the intervening years between 2009 and the start of this update, organizational restructuring, and budget reductions directed the focus of state water planning efforts primarily toward improvements in data reporting, access, and collaboration. Streamlining processes and refinements to its data system have substantially improved compliance by public water suppliers in reporting water withdrawal and use reports, increased data accuracy and extended its access to the public; all of which benefit those who rely on the water data to make informed water resources decisions.

Some other notable accomplishments for the State Water Plan Program during the intervening years include:

- **Development of Water Management Plans for Oil and Gas Operations.** The State Water Plan Program collaborated with the DEP Oil and Gas Management Deputate in the development and the implementation of water management plans required under the 2012 Oil and Gas Act (Act 13 of 2012)¹² for water sources to be withdrawn or utilized for drilling or hydraulic fracturing of unconventional gas wells. In 2016, Chapter 78a (Unconventional Wells) required all sources approved by a water management plan to submit daily water use to DEP. The GreenPort application (DEP's access to online applications) for submission of water use reports was revised in 2017 to collect these daily reports.
- **Launching of Water Use Data System Downloads and Viewers.** During this period, grants from USGS enabled the State Water Plan Program to develop six water report viewers to share registration and reporting of water use. As recently as 2021, an additional summary dashboard/viewer was added for public web access.

A full explanation of DEP's Water Use Data System (WUDS), data access and collaboration efforts is found in [Chapter 4](#).

1.6 2009 – 2022 State Water Plan Update Process

1.6.1 Goals and Outcomes

Building on Pennsylvania's rich history of water resource planning from the 1970s into the 2000s, DEP began working under the provisions of Act 220 of 2002 to review and update the 2009 Update. This review included revisions and updates to regional plan components as well as amendments and updates to the statewide components.

¹² Pennsylvania General Assembly, 2012 Act 13

<https://www.legis.state.pa.us/CFDOCS/LEGIS/LI/uconsCheck.cfm?txtType=HTM&yr=2012&sessInd=0&smthLwInd=0&act=0013>

Figure 3. Regional Water Resources Committee



This update of the State Water Plan followed the requirements within Act 220 of 2002 for the periodic review, amendment, and updating of a State Water Plan, which necessitated a balancing of considerations. Deliberations took place within DEP and in consultation with several State Water Plan committees on regional priorities, objectives, and recommendations of the regional committees to assure the regional and statewide components reflect federal, state, and interstate basin compact commission policies, plans, objectives, and priorities. Figure 4 shows a photo of an early meeting of the Ohio Regional Water Resources Committee.

Components of this update of the State Water Plan include the following:

- A reviewed and updated State Water Plan resulting from the input, guidance, and advice of a repopulated and reinstated statewide committee, six regional committees, and the public
- Work towards completion of CARPs within the Potomac and the Ohio planning areas that were incomplete at the time of the 2009 Update
- Enhanced web-based applications and tools to deliver improved access to water resources information, data, and statistics for educational and water planning purposes
- Plan provisions to implement applicable water resources related strategies outlined in both the 2018 and 2021 Pennsylvania Climate Action Plans
- A phased implementation plan or “Path Forward” to provide for a continued planning process with ongoing engagement of advisory committees and accountability in state water planning

1.6.2 Collaboration: Statewide and Regional Committees

The mandatory Act 220 of 2002 process necessitated the reconstitution of the statewide committee and the six regional committees. More information on the geographic extent of regional committees may be found within the State Water Plan Digital Atlas.

Act 220 of 2002 is prescriptive as to the roles and responsibilities of various parties in preparing and updating the State Water Plan. DEP has responsibility for developing and drafting the plan and regional components, receiving guidance, advice, and recommendations from the statewide committee and six regional committees comprised of representatives of agriculture, public water supply, wastewater, industrial, commercial, mining, and energy enterprises; environmental and conservation interests; and water resources management interests and local government.

The statewide committee was primarily responsible for making recommendations to the DEP Secretary for approval and adoption of the entire plan update, including approving regional components, resolving conflicts between regional plans or inconsistency with statewide laws and policies, assisting with public participation, recommending policies and guidelines, and reviewing and commenting on proposed regulations and policies. Statewide committee participants included appointments

from the regional committees, the same interest sectors of the regional committees, in addition to ex officio voting members made up of the secretaries, directors, chairs or designees of DEP, the Pennsylvania Department of Agriculture, the Pennsylvania Department of Conservation and Natural Resources, the Pennsylvania Fish and Boat Commission, and the Pennsylvania Emergency Management Agency.

Once reconstituted, the committees reviewed the 2009 Update's regional and statewide priorities and recommendations for action. These reviews, in conjunction with DEP program reviews, considered which of the priorities and recommendations for action had been addressed since the 2009 Update, and which should change with this update of the State Water Plan. Furthermore, these reviews evaluated whether to add any new or emerging issues to the lists of priorities and recommendations for action.

1.6.3 Public Process and Environmental Justice

Public Process

DEP believes public participation is an integral part of achieving its mission to protect Pennsylvania's air, land, and water from pollution and to provide for the health and safety of its citizens through a cleaner environment. Act 220 itself requires such a broad public participation process. Accordingly, the 2022 Update utilized a wide range of opportunities and approaches to inform the public, solicit input, and respond to input during the development of the update.

Public outreach, and participation efforts have included the following:

- Posting of regional and statewide committee information on the DEP website, including meeting agendas, meeting dates, and meeting minutes
- Utilization of a hybrid model for conducting meetings with both online and in-person participation options for the public, committee members, and agency staff
- Publishing notices of meetings in the *Pennsylvania Bulletin*
- Outreach for public input at the beginning of the process through a hearing held on January 6, 2021
- Availability of a public comment opportunity during each of the committee meetings
- Outreach for public comment on the regional priorities at a hearing held on March 11, 2022
- Invitation to the public to review and submit written comments regarding the draft plan

Environmental Justice

At the same time, the DEP has been committed to ensuring Pennsylvanians in the most vulnerable communities have a voice in the development, implementation and enforcement of environmental policies, regulations, and laws. To that end, implementation of this update to the State Water Plan will follow DEP Environmental Justice (EJ) public participation policy approaches¹³ by:

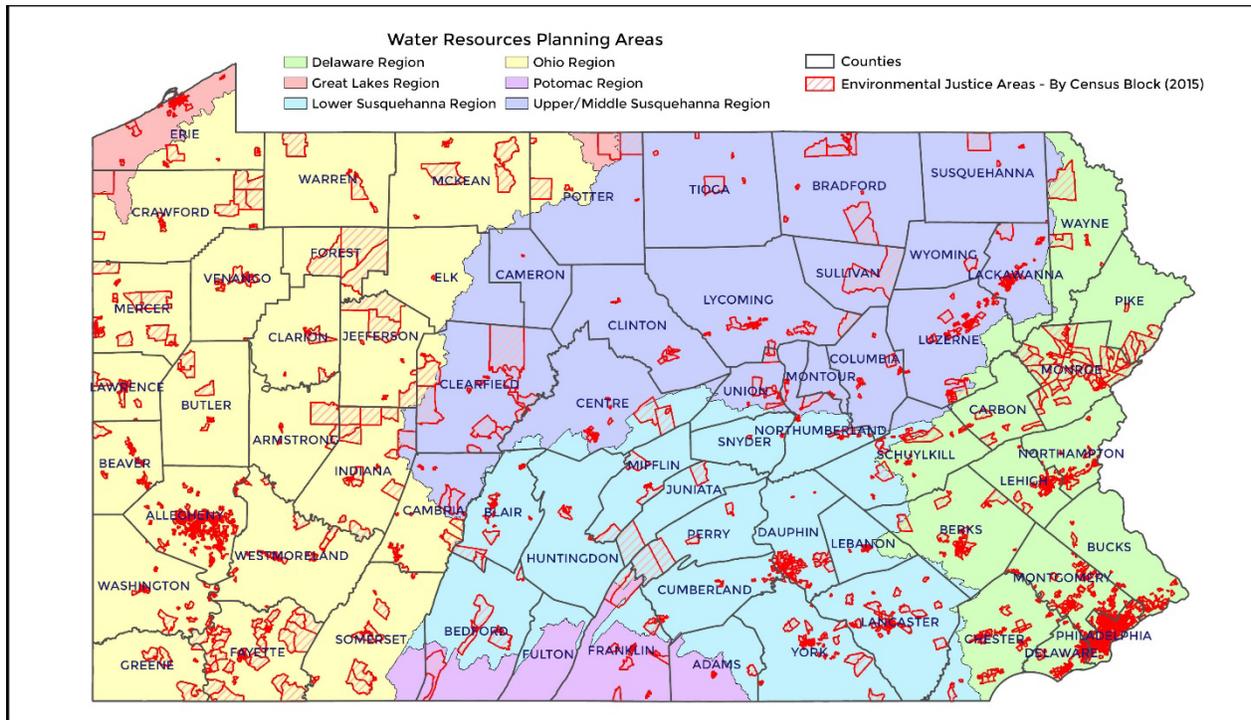
¹³ [Pennsylvania DEP Environmental Justice](https://www.dep.pa.gov/PublicParticipation/OfficeofEnvironmentalJustice/Pages/default.aspx)

<https://www.dep.pa.gov/PublicParticipation/OfficeofEnvironmentalJustice/Pages/default.aspx>

- Providing educational opportunities and solicitation of input and participation from EJ areas and regions throughout the state water planning processes.
- Implementing climate adaptation related statewide and regional priority recommendations consistent with the opportunities identified to address the climate change impacts to overburdened and vulnerable populations found in the *Pennsylvania Climate Action Plan 2021*¹⁴.

Figure 4 is a map showing an overlay of environmental justice areas overlaid over water resources planning areas used in the State Water Plan.

Figure 4. Environmental Justice Areas and Water Resources Planning Areas



¹⁴ Pennsylvania Climate Action Plan 2021

<https://www.dep.pa.gov/Citizens/climate/Pages/PA-Climate-Action-Plan.aspx>

2.0 Assessment of Pennsylvania Water Resource Priorities

2.1 Assessment and Status of Principal Priorities from the 2009 Update

The 2009 Update recognized the close relationships of land development, flooding, irrigation, and water supply and withdrawals and the need for deeper consideration of those relationships in all water resources management decisions. To that point, three principle priorities were identified that formed a foundation for the 2009 Update.

Priority: Continue in the collection, interpretation, and dissemination of water resources information.

The 2009 Update supported the need to maintain up-to-date information about the quantity, quality, and availability of water as well as the demands for water.

Status: Water resources data continues to be an important component for making water management decisions and remains an asset that should be available to the public and those making water resources decisions. To that end, DEP maintains a water use data program to collect water use reports on individual water withdrawal sources and the business entities or systems that own them. With decades of data behind it, the program remains an extensive resource of water use information for Pennsylvania. Ongoing development of new tools will continue to improve the access and utility of the information. Details on data access and collaborative use may be found in [Chapter 4](#).

Extensive screening to assess water availability was performed during the 2009 Update planning period that resulted in a process for identification and designation of CWPAs. As needs are identified, similar work will be considered for future state water plan updating. Among other key components, future updating may include Act 220 of 2002 provisions involving inventories of surface and groundwater water resources, assessments and projections of water use needs and withdrawal demands, and assessment of consumptive uses and related impacts on water availability. The data from such work will be collected, interpreted, and disseminated for decision making.

Priority: Encourage and sustain an integrated approach to managing water resources.

The 2009 Update recognized the need by the commonwealth and local government to consider withdrawals, wastewater discharges, flood control, and other water resources issues in conjunction rather than in isolation.

Status: Exploratory steps were taken by DEP after the adoption of the 2009 Update towards implementation of Integrated Water Resources Management (IWRM). However, funding, and regulatory structure among other factors made it difficult to adapt to a higher level of collaborative workflow. The statewide committee continues to believe that a framework of integration for water resources planning is imperative. As such, they have built upon the recommendations from the 2009 Update and offered a series of new recommendations within this 2022 Update for DEP to identify and understand related challenges and opportunities to address those challenges. [See Chapter 2.4.2](#) to explore the full spectrum of IWRM recommendations in combination with recommendations to improve inter-agency coordination.

Priority: Adopt policies that encourage technological advances designed to conserve and enhance water resources.

Under this priority, the 2009 Update made the case for advancing innovative water resource conservation, protection, and enhancement technologies for domestic use and for export to the international community. The concept was to encourage development of these technologies within Pennsylvania to not only benefit businesses within the commonwealth, but across the world.

Status: An important component of this priority related to the development of a “Water Resources Technical Assistance Center” as a statewide, nonprofit organization to promote voluntary water conservation and provide technical assistance on water use issues including reducing demand on water, improving water use efficiency, reducing water leakage and enhancing groundwater recharge. While the initial steps in establishing this center were successful, challenges in organizational structure and long-term funding halted its implementation.

DEP recognizes the importance of water resource conservation, protection, and efficiency. [Chapter 2.4.4](#) on Water Efficiency provides recommendations developed by the statewide committee’s Water Supply Workgroup to disseminate technical information, address adaptation of climate change, manage public water supply, and accomplish overall improvement in efficiency by municipal and industrial water users. In addition, DEP is planning on utilizing the [Pennsylvania Clean Water Academy](#) as a platform for future development and posting of educational content on water conservation and efficiency to meet related objectives.

2.2 Assessment of Regional Water Resources Priorities

Once reconstituted, the regional committees reviewed the 2009 Update regional components which consisted of regional Priorities and Recommendations for Action. These reviews in conjunction with DEP program reviews considered which, if any of the priorities and recommendation for action had been addressed since the previous 2009 Update, and which may have changed. Furthermore, the reviews evaluated whether any new or emerging issues be added should to the lists of priorities and recommendations for action.

Since the prior plan submitted in 2009 the commonwealth has undergone significant changes that have led to new priorities within each region. With higher intensity storms occurring due to climate change, storm water and flooding have become a more central issue to each of the state water plan regions. Other notable changes include the shift from coal to gas power plants, nuclear plant retirements, proliferation of pipelines, and the apparent leveling off of water demands in the Delaware Basin. The *Pennsylvania Climate Action Plan 2021*¹⁵ contains some resiliency strategies which have been adapted to water planning priorities that were adopted and tailored to each region through specific tools like IWRM which has been a consistent theme.

Economic changes from expanded access to online shopping has led to large areas of impervious ground, particularly parking lots surrounding malls, being unused and new logistics centers being constructed. This has led many regions to focus their attention on land usage and water linkages, riparian buffers, stormwater policy, runoff and aging infrastructure, and funding for projects addressing these concerns as the tide of land development shifts.

¹⁵ Pennsylvania Climate Action Plan 2021

<https://www.dep.pa.gov/Citizens/climate/Pages/PA-Climate-Action-Plan.aspx>

The various committees comprising the State Water Plan effort have adapted to the many changes that have impacted Pennsylvania in the last decade and have adjusted their planning efforts to meet these new challenges.

2.2.1 Delaware

Specific Regional Priorities

The Delaware region is the most populous region with [over 5.5 million \(43% of Pennsylvania's population\) people calling it home and](#) contains the only estuary in the state, which runs alongside Philadelphia. The large and growing population is going to require holistic coordination between all users to ensure the availability and quality of water as well as addressing stormwater and flooding. These varying and complex needs are partly addressed by entities like the Delaware River Basin Commission and the National Estuaries Program but a unified approach to land use and water management is a critical piece of the puzzle.

Strengthen the Link Between Land Use and Water Resources Management

Linking land use decisions and water resources management to sustain and enhance the quality of life in the Delaware River basin is a top priority of the committee. The development and distribution of water resource information and data will help strengthen the link between land use, soil, and water resources management among multiple stakeholders. These educational initiatives would improve how water resources management, soil and vegetation conservation, flood controls, stormwater management, and sewage management relate to land use decisions, infrastructure funding, construction decisions, and grant decisions. The goal of these efforts is to preserve, protect, restore, and enhance the quality, quantity, and availability of clean, sustainable water supplies for the people, businesses, and ecological needs of the commonwealth.

Regional Planning and Land Use Coordination and Collaboration

“Think regionally and act locally” is a priority for the committee. The committee’s solutions to the region’s water issues focus on developing regional coordination and planning to address stormwater management, climate change, water quality, water availability, water diversion, aquifers, healthy soils, and vegetation, protecting fish and wildlife habitats, and protecting recreation areas. Solutions are developed through regional planning efforts, education and outreach with policy makers and the community, along with adequate funding. Water planning should be considered on a holistic watershed basis considering both droughts and floods. A One Water concept can further educate the community and increase collaboration among stakeholders for integrated water resources planning. Growth in rural, urban, and suburban areas continues to place stress on water infrastructure; replacement and retrofitting of existing infrastructure and development of new infrastructure can be a challenge in both urban and suburban communities. Larger scale coordination efforts between local, state, interstate and federal entities can help ensure more of the region’s needs are being accounted for during the planning phase and available resources can be maximized.

Region’s Uniqueness

What are the Delaware region’s unique characteristics that are important considerations in the state’s water planning?

- This is the most populated region in the commonwealth and features a diverse population living in urban, suburban, and rural locations.
- The Delaware region has large areas of impervious surfaces, leading to a greater potential for polluted runoff.

- The region boasts abundant and varied natural and recreational resources.
- The main stem of the Delaware River remains undammed.
- The tidal Delaware region is the second largest in the country in terms of power production.
- The Delaware basin discharges into the Atlantic Ocean via the Delaware Estuary, which is comprised of a unique ecosystem and a variety of stakeholders, including federal programs like the National Estuary Program, water suppliers, and industrial users. This also means that tidal influences are a consideration in planning efforts for the basin.
- The basin is challenged by the demands of four states and multiple jurisdictions. In 1954, the United States Supreme Court entered a Decree that established certain rights and obligations for New York City and New Jersey concerning diversions of water out of the Delaware River Basin. Delaware, New Jersey, New York, Pennsylvania, and New York City are all parties to the Decree.
- The Delaware River Basin Commission plays a significant role in the management of water resources in the basin.
- County planning commissions play a significant role in land use and should be part of the linkage between land use and water resources.
- Philadelphia's port complex is one of the largest freshwater ports and is an economic hub of great value to the region.

Stormwater and Flood Management

What are the region's concerns and recommendations for stormwater and flood management to preserve water quality?

- Increased flooding can occur when floodplains are saturated by repeated storms, as well as during acute high intensity events.
- Stormwater management infrastructure often lacks proper maintenance, especially aging infrastructure.
- Strengthen local efforts, regional planning and watershed-scale planning of water resources to support and enhance recommendations and requirements laid out in the latest [Department of Environmental Protection's Stormwater Best Management Practices Manual](#) including an emphasis on nature-based stormwater control measures.
- State authorities should ensure adequate funding for Act 167 plans.
- Regional authorities should ensure that Act 167 plans and resulting model ordinances do not propose to alleviate flooding on tributaries at the expense of main-stem flooding in accordance with [Act's 167's provisions](#).
- Stakeholders should continue to actively support source water projects that minimize impacts downstream. It's vital that the connection between potential sources for pollution upstream and resultant water quality downstream are understood by the public.
- Water should be considered from a holistic perspective as with the "One Water" movement.
- Storm surge may become an issue in the lower Delaware River as winds and long fetches draw higher waters upstream into the Delaware Estuary Coastal Zone.

- Schuylkill headwaters have coal mine refuse piles that need to be properly managed or removed to minimize the potential for coal tailings runoff into the system.
- Encourage projects that enhance stormwater management on previously developed land.
- Educate the public about stormwater impacts, including the difference between localized flooding versus regional flooding.

Climate Change Adaptation for Water Resources

How are water resources within the region being impacted by climate change and what could we do to adapt?

- Encourage regional authorities to assess the ability of aging infrastructure to handle high-intensity storm events, which are increasingly likely to occur in face of a changing climate, and implement infrastructure maintenance, as necessary, to mitigate flooding impacts.
- There is an increased risk that changing rainfall patterns and increasing temperatures will likely lower the water table and damage upper soil layers; as a result, we must continue to promote healthy soil and groundwater infiltration to maintain aquifers and manage reservoir systems to abate these potential effects on water quality and quantity. Healthy soils absorb more water and are critical to reducing runoff and mitigating the effects of drought.
- Encourage stakeholders to mitigate impacts of sea-level rise, including the impact on port facilities' economic benefit provided to the region, and protect drinking water sources and infrastructure from salt front intrusion in the Delaware Estuary.
- Encourage development of additional scenario models so municipalities can proactively plan for potential outcomes of climate change, which is resulting in significant amounts of riverine and localized flooding. Promote data showing changes in rain frequency and intensity and focus on climate resiliency. Recognize that the increased precipitation and storm frequency will have effects on land use planning.
- Stakeholders should make use of all potential bodies of research and resources such as the Delaware Advisory Committee on Climate Change, which recently formed to develop ideas and tools.
- Climate change can have a number of water quality impacts including thermal impacts affecting dissolved oxygen and water use designations, an increase in both terrestrial and aquatic invasive species, increased erosion due to higher intensity storms resulting in higher turbidity, and changes in vegetation types affecting stream buffers.

2.2.2 Great Lakes

Specific Regional Priorities

Pennsylvania is fortunate to be a part of the Great Lakes region. The Great Lakes are the largest surface freshwater system in the world, contain the equivalent of 90% of North America's annual supply of freshwater, provide vital habitat to native species, and support diverse ecosystems and robust biodiversity. It provides drinking water to 40 million people in the U.S. and Canada and sustains a thriving \$6 trillion regional economy. Lake Erie directly connects northwestern Pennsylvania to this resource, underpinning the social identity of the region and fueling the tourism, recreation, port, and maritime sectors of its economy. Also, the headwaters

of the Genesee River flow through the forests and agricultural lands of northern Potter County into New York on their way to Lake Ontario. Many demands are placed upon the waters of the Great Lakes which require thoughtful protections to assure sustainability for future generations. Pennsylvania works diligently with the other U.S. states, Canadian provinces, and the two federal governments to eliminate the possibility of major diversions of water outside of the Great Lakes basin, improve water quality, enhance biodiversity and ecosystems, and provide cooperative, sturdy governance mechanisms for the resource.

Protect Water Quality and Quantity in the Basin

The Great Lakes are vitally important to the prosperity of northwestern Pennsylvania, serving regional domestic, commercial, agricultural, and industrial needs. They supply power, offer world-class recreational opportunities, and provide domestic and international transportation and trade access across the entire Great Lakes – St. Lawrence Seaway system. As a result, the committee believes that Pennsylvania should not only maintain current participation in interstate and international governance, but also play a larger role in federal legislation and other policy measures that may impact Lake Erie and Lake Ontario such as invasive species control, pollution reduction, agricultural practices, and stormwater management. In addition, northwestern Pennsylvania should have a larger role in state legislation that impacts Lake Erie and Lake Ontario.

One of the best ways to protect the water quantity of the Great Lakes is by coordinating with the other states and provinces to uphold the interstate compact and international agreement that prohibit the diversion of water out of the basin, regulate water withdrawals and consumptive use, and encourage increased conservation and efficiency measures across many jurisdictions.

Additionally, the committee recognizes that the region is not composed solely of Lake Erie and Lake Ontario, so efforts must be made to protect water quality throughout the larger regional watersheds. This can be accomplished by assessing biology, identifying potential sources of contaminants such as on-lot sewage treatment systems, evaluating the impacts of stormwater management, and assessing agricultural best management practices on a regional scale. This will also help inform how Pennsylvania and Great Lakes communities can build resiliency to the impacts of a changing climate in these unique watersheds.

Coordinate with Partners

One effective way to achieve the larger goals of the committee is for the commonwealth to actively engage with partners across multiple political strata. This includes other states, provinces, federal government agencies, and other stakeholders including governmental and non-governmental. The committee believes that bidirectional lines of communication between these diverse stakeholders, from locally focused to internationally focused agencies and interests, are critical. On a local level, counties and municipalities should collaborate toward regional approaches to water challenges with support from the Pennsylvania Department of Environmental Protection (DEP), whose role would be to encourage open and continual communication and incentivize cooperation through grant funding. Coordination should begin with education and outreach to communicate the impacts of land use choices to property owners and implement best management practices to better maintain the hydrologic integrity of the region.

Region's Uniqueness

What are the Great Lakes region's unique characteristics that are important considerations in the state's water planning?

- Lake Erie and Lake Ontario have large, but not unlimited supplies of water.
- Despite their relatively small land areas, Pennsylvania's Lake Erie and Lake Ontario watersheds are vital assets to the commonwealth.
- The quality and quantity of water in Lake Erie and Lake Ontario are impacted by Canada and other U.S. states bordering the Great Lakes.
- The region's economy is reliant on tourism and recreation related to water-based activities.
- The Great Lakes are utilized as navigational waters by international business and industry.
- Ship traffic from other parts of the world can potentially lead to the introduction and distribution of invasive species, which can impact the health and viability of native species and the efficiency of nutrient cycle processes.
- Agriculture, especially vineyards, play an important role in the northwest Pennsylvania economy.
- Localized sources of nutrients and nonpoint source pollutants can negatively impact Great Lakes tributaries and open waters and contribute to harmful algal blooms.

Stormwater and Flood Management

What are the region's concerns and recommendations for stormwater and flood management to preserve water quality?

- Municipal stormwater management is critical due to its beneficial impacts on water quality and the potential to reduce bluff recession and ravine erosion in the coastal zone. Best management practices will help control the volume, flow, and quality of stormwater coming from developed areas.
- Evaluate [Act 167](#) stormwater management plans to determine their long-term feasibility. Consider potential funding sources for counties to update Act 167 plans, and for large and small municipalities to update stormwater management ordinances. These activities should include an evaluation of municipal subdivision and land development ordinances, hazard mitigation plans, and integrated water resources management.
- Encourage regional solutions such as incentivizing municipal authorities to assess and, where possible, repair/retrofit aging infrastructure for the increasing frequency of severe storm events and the need for increased water quality, and erosion control, and infiltration measures.
- Develop asset management and capital improvement plans through digitizing municipal and private stormwater infrastructure and utilizing geographic information systems (GIS). DEP has provided grant funding to Erie County to conduct a Municipal Separate Storm Sewer System (MS4) assistance program which could be leveraged to help digitize this data for both urban and rural communities and lead to more informed and sustainable management.
- Highlight the role of public education and outreach to achieve community support for stormwater management.

- Continue to work toward the elimination of remaining municipal combined sewer overflows (CSOs) as part of an overarching stormwater plan.

Climate Change Adaptation for Water Resources

How are water resources within the region being impacted by climate change and what could we do to adapt?

- Consider the implications of flash flooding and potential decreased groundwater recharge on waterway flow. With the risk of potentially severe droughts and flash flooding brought on by climate change, continuing to promote surface water infiltration to recharge groundwater aquifers should be a high priority, while also understanding the unique susceptibility of lake bluffs and ravine systems to groundwater inputs.
- Participate in efforts to identify regional climate stressors and plan for economic and environmental resiliency actions.
- Stakeholders should assess the implications of climate change on water supply vulnerability and availability to build resiliency.
- Stakeholders should investigate impacts of extreme Lake Erie and Lake Ontario water levels (higher or lower than normal) and the associated impact on tourism, recreational activities, navigational, commercial and industrial activities, bluff and beach erosion, and lakefront residential communities.
- Municipalities should take a regional approach to evaluate aging stormwater infrastructure and its current capacity in an effort to develop mitigation strategies for increased storm intensity and frequency due to climate change.

Maintain focus on science and explicit data to follow demonstrable trends in climate change.

2.2.3 Lower Susquehanna

Specific Regional Priorities

The Lower Susquehanna basin is the hydrological gateway to Maryland where the mouth of the river system connects to the Chesapeake Bay. Rapid expansion of logistics centers and a quickly growing population in the region leads to increased risk to waterways. There is a need for the most critical areas to be identified and prioritized to minimize the potential for impact to these resources.

Identify and Target Solutions for Potential Protection Priority Water Resources to Reduce or Prevent Point and Nonpoint Source Pollution with a Focus on Currently Impaired Water Resources

Identify “protection priority” water resources that may be trending towards impairment for any use, through the collection and analysis of data. Priorities may be determined by looking specifically at emerging contaminants, declining water quality and/or quantity, evolving land use impacts, and flooding issues. Improve the region’s protection priority water resources through identified targeted solutions that may include education and outreach, asset management, resource improvement, and others.

Reduce existing point and nonpoint source pollution in the region’s significant number of impaired water resources. Focus added attention on currently impaired water resources. Prevent new water pollution throughout the region from all sources. Implement active solutions to reduce pollution by forming public-private partnerships (P3), engaging willing landowners, targeting funding, and others. Broaden support and advocacy for our water resources through enlisting

stakeholders, enhancing partnerships, and coordinating efforts. Improved water quality sustains drinking water supplies, preserves a healthy ecosystem that supports recreational use, and enables a viable economy.

Definition of "Protection Priority" - water resources prioritized for protection based on potential threats to water quality, for the purpose of setting long-term priorities for where focused efforts towards restoration, best management practices, and protection would provide the most benefit to the watershed.

Enable Continued Responsible Economic Growth by Ensuring Adequate Water Resources

The challenges associated with this region are water availability, flooding, aging stormwater infrastructure, water quality, and drought. Prioritized resiliency solutions to address increased stormwater and flooding that include restoration and expansion of green infrastructure to capture runoff would be beneficial to the region. Strategies may also include proactively managing land development and land management by expanding programmatic and policy flexibility to watershed boundaries to maximize effectiveness of multi-benefit best management practices. Broad support can be provided to local governments and municipalities through training and model ordinances to manage stormwater and flooding and enlisting the cooperation of non-governmental organizations, watershed groups, and riverkeepers.

Region's Uniqueness

What are the Lower Susquehanna region's unique characteristics that are important considerations in the state's water planning?

- The Susquehanna River is a unique feature of the region, which is shared with the Upper/Middle Susquehanna region.
- The basin is home to one of the [fastest growing populations](#) in Pennsylvania.
- This region has the highest concentration of agricultural land uses in the state, particularly in York and Lancaster Counties. The plain sect communities in Lancaster and York Counties require unique communication strategies.
- Due to the intersection of highways running through the basin and additional cargo shipping coming by land from the recently dredged Delaware ports, the region has experienced much growth and development, resulting in an abundance of logistics centers. This growth and development have facilitated the need to preserve more open space and agricultural land.
- This region hosts a large concentration of manufacturing in Pennsylvania. Manufacturing industries tend to consume more water than logistics and warehousing industries.
- Four significant run-of-river hydropower dams exist within the region, as the region is a center for power production. Listed from north to south along the Lower Susquehanna River are the York Haven Dam (1904), Safe Harbor Dam (1931), Holtwood Dam (1910), and Conowingo Dam (1928).
- There are many historical impacts to the region such as legacy sediments, [mill dams](#), and other water resource impairments linked to past land uses as well as collected sediment from more contemporary dam structures that impact water quality.
- There are [National Heritage Areas](#) in lower York and Lancaster Counties.

- The Susquehanna River contributes one-half of the freshwater flow to the Chesapeake Bay. Being a hydrological gateway into Maryland, the region faces the challenge of coordinating with multiple state entities, stakeholders, legal frameworks, and working to accommodate their differing objectives.

Stormwater and Flood Management

What are the region's concerns and recommendations for stormwater and flood management to preserve water quality?

- Improvements to stormwater management on a watershed scale could, via groundwater recharge and appropriate direction to surface water sources, increase access to fresh water in higher quantities throughout the region.
- Develop regional or watershed-scale planning of water resources, ensure management of stormwater at the source, enhance groundwater recharge, and work toward a more long-term strategic approach.
- There is a need for regional authorities to assess aging infrastructure for high-frequency storm events through monitoring and inspection. The first step would be to create an inventory of stormwater infrastructure including location and ownership.
- More floodplain restoration and removal of legacy sediment would be beneficial to the region.
- An enhanced water quality monitoring network could drive strategic investment in best management practices. Data sharing coordination could facilitate an enhanced water quality monitoring network throughout the watershed, targeting strategic locations for the most critical metrics.
- Stormwater compliance could be improved at the local level by providing education and outreach and increased financial resources.

Climate Change Adaptation for Water Resources

How are water resources within the region being impacted by climate change and what could we do to adapt?

- Flooding is the top hazard that municipalities are mitigating in the region. Municipal implementation of floodplain management ordinances along with providing education and outreach would be beneficial.
- With the potential for increased storm frequency and intensity, encourage enhancement of structural and non-structural strategies to reduce environmental impacts of these storm events.
- Engage stakeholders on the implications of intense rain events, degrading soil health, and increased temperatures and how these conditions not only cause flooding but can also lead to micro-droughts.
- Develop a map of areas most likely to be affected by climate change showing the nature and potential of those impacts.
- Stakeholders should develop a more effective approach to [floodplain restoration](#) projects by emphasizing the benefits of flood mitigation. Some of these strategies may include the removal of obstructions and encroachments such as buildings, legacy sediment or undersized bridges and culverts.
- Drought management for reservoir systems should be enhanced to account for a changing climate and plan for resiliency with an amplified drought of record to facilitate protection and conservation of water resources.

- Encourage continued coordination amongst agencies (state, federal, and local) and non-government organizations to help leverage resources to reduce the impacts of climate change.
- Continue to promote economic incentives to be more proactive than reactive, creating long-term resiliency. Climate change can cause increased surface water temperatures that can impact the ecosystem (e.g. harmful algal blooms) and destroy habitats, leading to treatment challenges for public water suppliers.

2.2.4 Ohio

Specific Regional Priorities

The Ohio region is geologically distinct from the other water planning regions. It is marked by varied elevations, cliffs, landslides, and high relief areas. This watershed contributes to the larger Mississippi basin and, as such, requires the involvement of several stakeholders to maintain water quantity and quality.

Inter-Agency Water Resource Planning

The committee supports a holistic approach to water quality, quantity, and availability. They believe watershed implementation plans (WIPs) and inter-agency water resources planning can address many water priorities. Organizations that should be involved in inter-agency water planning include federal, interstate, and state agencies, local municipalities, conservation districts, watershed districts, watershed authorities, nonprofit environmental organizations, and the Army Corp of Engineers. Plans should identify water resources needed to promote and facilitate economic development including source water protection while maintaining watershed integrity and recreation benefits. They should also evaluate impacts of resource extraction from the Marcellus Shale on water quality, emerging contaminants in water systems, reclaiming of water resources impaired by abandoned mines, and inter-basin transfers of water. Act 167 stormwater planning at the county level is an initial step toward inter-agency water resource planning.

Water Quality and Quantity

Regional solutions depend upon an integrated approach to water quality and quantity challenges. Water quantity can be defined as a spectrum from too much to too little. Quantity can also vary over time and location. There are CARPs for two watersheds (Back Creek and Laurel Hill Creek) within the region approaching final recommendation in their process. Quality, which is defined by water usage, can be impacted by quantity - either too high or too low. Increased data collection can inform community input and watershed planning. Planning will help to prioritize natural systems, man-made infrastructure, and water treatment to include creative, diverse, and strategic solutions that can maximize water supply and the quality of our drinking water.

Hazards to communities in the watershed originate from multiple sources.

Excessive amounts of stormwater runoff can cause flooding and damage the quality of the waterways through agricultural runoff, combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), and Municipal Separate Storm Sewer System (MS4) overflows. Stormwater is significantly impacted by climate change and aging infrastructure. Priority should be given to multi-municipal planning and funding projects that include best management practices referenced in the Pennsylvania Stormwater Best Management Practices Manual, and updates thereto, that use integrated approaches to maximize pollution reduction and mitigate flooding.

Additionally, legacy issues can produce significant contaminants. These issues include the historical coal mining and oil and gas extraction industries that played a key role in the region's development. Abandoned mine lands and drainage can dramatically change the ecology and dynamics of the stream, causing it to not meet its designated uses, harm drinking water and well water systems, and can destroy the economic vitality of the waterways. Orphaned wells that go unplugged cause long-term seeps of petroleum byproducts into the region's river systems, that cause additional ecological degradation. As well as the above issues, byproducts of prior industrial development can include but are not limited to brownfields, PFAS, PFOS, and slag from steel and glass production. Land use plans that address these unique contaminants should be developed for these sites so they do not adversely impact water resources and the land can be restored and gainfully reused.

Farms are vital to the region. The Ohio River valley is home to significant agricultural activities that sustain communities and provide food to the region. However, some agricultural activities come with environmental impacts, therefore conservation measures should be prioritized in a farm plan and through state regulations. Stakeholders within the region are working hard to promote conservation approaches which work alongside agricultural practitioners to create sustainable farming and a sustainable food cycle. The committee encourages the implementation of such practices.

In addition to stormwater management, legacy, and agricultural issues, planning efforts need to address inter-basin transfers, unsustainable forest management, and the introduction of larger-scale industrial water users, all of which have implications on both quality and quantity.

Region's Uniqueness

What are the Ohio region's unique characteristics that are important considerations in the state's water planning?

- The basin contains the headwaters of the Ohio River, having an impact on 1,000 miles of river downstream through multiple states. Water drains north from West Virginia and south through Ohio and New York before contributing to the larger Ohio River basin.
- The Ohio River basin contains organizations that are unique to the region with a focus on water quality: [The Ohio River Basin Alliance \(ORBA\)](#) and [The Ohio River Valley Water Sanitation Commission \(ORSANCO\)](#).
- Universities, colleges, municipalities, and local foundations within the basin often work together towards solutions to water resource related issues.
- Industry has played a significant economic role throughout the region including steel, coal, and glass and was a nationally significant source for all three resources, especially in the early 1900s.
- The Ohio region's French Creek plays host to the most diverse mussel population in the state.
- Clean water is vital for recreational activities in many watersheds of the basin and are major economic drivers.
- The Ohio River basin is a municipally dense region which can lead to difficulties in coordinating zoning and planning activities.
- The region contains the tribal lands of the Seneca Nation of Indians.

- [The Allegheny National Forest](#) is in the basin; these protected lands provide conservation and recreation.
- There are many locks and dams within the region including 16 multipurpose flood control dams and 23 navigable locks and dams.
- Rivers are extensively used for recreation and transportation with inland ports for sand, gravel, coal, and other commodities. The Port of Pittsburgh is the fourth largest inland port in the United States.
- The region is geographically distinct from the rest of the state due to the Appalachian Mountains. Geologically the Appalachian Mountains are an incised plateau which leads to the appearance of synclines and anticlines from glacial activities. Varying elevations, such as cliffs and high relief areas can be prone to landslides. This necessitates different planning and treatment requirements based on location.
- Hydraulic fracking and coal fired power plants in the region create additional water demands.

Stormwater and Flood Management

What are the region's concerns and recommendations for stormwater and flood management to preserve water quality?

- Stormwater management infrastructure often lacks proper maintenance, partly due to confusion about ownership and the associated responsible parties. Some agreements have been in place since the 1960s, but these can be difficult to enforce, especially as facilities change ownership, leaving some older facilities without maintenance for decades.
- Education and outreach are needed to tie the concept of stormwater management more closely to flooding, as poor stormwater management can lead to downstream flooding.
- Aging stormwater infrastructure should be assessed by regional authorities for high frequency, as opposed to high intensity storm events. Retrofitting aging best management practices and providing groundwater recharge areas for large impervious areas such as parking lots from vacant shopping malls would be beneficial.
- Contaminants from large impervious areas can be transported by stormwater, which can contribute to water quality issues.
- Planning should be completed on a watershed basis and priority should be given to planning upstream and/or at the headwaters.
- CSOs are common in the Ohio basin and their removals are ongoing. Impacts occur only during rain events, which makes CSOs both a stormwater concern and a water quality problem.
- Rivers, with their proximity to raw materials (lumber, coal etc.) and easy transportation served as an ideal location for development. This not only obstructed the flood plain but constrained the gradual geomorphic development of the waterway. Therefore, the redevelopment of older structures on floodplains, which were built prior to local ordinances that would have prevented their original construction, are a concern for the region.
- State guidance on flood plain development is released whenever a new Flood Insurance Rate Map (FIRM) is provided by the Federal Emergency Management Agency (FEMA). FIRMs are then enacted via municipalities

(through floodplain ordinances and collaboration with neighboring communities) and could benefit from regional planning.

Climate Change Adaptation for Water Resources

How are water resources within the region being impacted by climate change and what could we do to adapt?

- Flooding due to large amounts of impervious surfaces will continue to cause problems as precipitation intensity increases.
- Stakeholders should investigate climate change implications on water supply vulnerability, availability, and reliability.
- Climate change will likely increase the intensity of storms in Pennsylvania but could also extend dry periods. Stakeholders should investigate the implications of flash flooding and potential decreased groundwater recharge.
- Capturing water during high-intensity storm events and continuing to promote ground water recharge will help reduce drought events. Regional authorities should provide incentives for homeowners to utilize rain barrels or route downspouts to swales.
- The Army Corps of Engineers owns and operates locks and dams within the region which may help with resiliency, provided they are properly maintained. This will require additional infrastructure planning to enhance resiliency.
- There is a need to maintain riparian buffers, particularly in communities at the headwaters of the basin.

2.2.5 Potomac

Specific Regional Priorities

The Potomac region is comparatively small and each county in the region is split with at least one other watershed. Being composed of mostly smaller watersheds, the region is at risk from changing precipitation patterns due to climate change and groundwater recharge issues related to land use practices; these issues represent a primary focus of the regional committee.

Promote Programs and Practices that Protect Water Quality and Quantity and Preserve the Ecological Integrity of Groundwater and Surface Water

A major priority of the regional committee is to develop land use programs that protect water quality and quantity while preserving the ecological integrity of groundwater and surface water, including springs, streams, lakes, and wetlands. To ensure adequate water resources for present and future generations in the Potomac basin, the committee recommends an approach that encourages municipal programs to collaborate and plan regionally, address land use planning and growth, provide domestic water well construction standards, and implement best management practices to protect water quality and quantity. Completing Countywide Action Plans to support [Pennsylvania's Phase 3 Watershed Implementation Plan](#) is also a high priority under this objective.

Climate Change Resiliency Especially with Regard to Stormwater Management, Flooding, and Drought

From a water resources perspective, climate change impacts stormwater management, flooding, and drought. Large intense precipitation events and longer duration storms are increasing stormwater runoff and creating or exacerbating erosion issues. Areas in this region have low infiltration rates, leading to less

groundwater recharge and increased flooding. Varied storm frequencies may also lead to an increase in droughts. Promoting stormwater management with the use of riparian buffers, rain gardens, and stream restoration will reduce erosion and improve groundwater recharge.

As they would specifically relate to documented climate change, identify protection priority water resources that may be trending towards impairment for any use, through the collection and analysis of data. Priorities may be determined by looking specifically at declining water quality and/or quantity, and flooding issues. Improve the potential protection priority water resources through identified targeted solutions that may include education and outreach, asset management, resource improvement, and others.

Region's Uniqueness

What are the Potomac region's unique characteristics that are important considerations in the state's water planning?

- This region forms the headwaters to the Potomac River, which makes interstate coordination crucial, as the majority of the basin is located within Maryland.
- This region borders the Susquehanna and Delaware River basins. Each county in this region is split between at least two planning regions.
- Local geology and topography limits groundwater storage and recharge; water does not infiltrate into the soil well and may lead to flooding.
- Unique location along the I-81 corridor with a high amount of development, particularly warehouse expansion.
- The geography is unique in that it is predominantly farmland that is densely populated, but also has rugged mountains that are more sparsely populated.
- There has been increased residential growth throughout the basin as a result of urban sprawl from the Baltimore, Harrisburg, and Washington DC metropolitan areas, which will change the dynamics of water needs.
- Adams County within the region has, in conjunction with local well drilling contractors, developed a set of standards for well construction. They are the only county in the region to have accomplished this thus far.

Stormwater and Flood Management

What are the region's concerns and recommendations for stormwater and flood management to preserve water quality?

- Promote countywide action plans which are beneficial for facilitating coordination and addressing stormwater.
- Consider water quantity and quality when performing cost/benefit analysis for land development and infrastructure.
- Regional authorities should assess aging stormwater infrastructure for high frequency, as opposed to high intensity storm events. Retrofitting aging best management practices and providing groundwater recharge areas for large impervious areas such as parking lots from vacant shopping malls would be beneficial.
- The region's unique geology that limits groundwater recharge and storage should be taken into account for regional planning of stormwater and flooding events.

Climate Change Adaptation for Water Resources

How are water resources within the region being impacted by climate change and what could we do to adapt?

- With the potential for increased storm frequency and storm intensity, stakeholders should find ways to reduce safety risks, environmental impacts, and generally be more prepared for these types of storm events.
- Increasing resiliency for flash flooding events should be considered in regional planning. Riparian buffers and conveyance structures can help reduce the effects of flash flooding and promote groundwater recharge.
- Extremes in water availability requires regional authorities to plan for both flooding and drought, which creates difficulty in planning and coordination. Integrated water resource planning (IWRP) can help coordinate these efforts.
- Since there is increased risk of more severe droughts brought on by climate change, there needs to be greater resilience of water resources. Protection and conservation of groundwater sources can be accomplished through increased infiltration and aquifer maintenance.
- Stakeholders should investigate climate change implications on water supply and water quality. This can be accomplished by collecting data on both the high and low precipitation events.
- Stakeholders should explore ways to communicate climate change that won't alienate potential allies.
- Where possible, use 'on the ground' data collection, science, and regional data as opposed to global datasets. This data will provide more accurate forecasting, attract more stakeholders, and help with localized decisions. Additional types of data and sources would be beneficial in finding the best way to analyze and track local changes ([CoCoRaHS network](#)).

2.2.6 Upper/Middle Susquehanna

Specific Regional Priorities

The Upper/Middle Susquehanna operates as a headwaters region for the Susquehanna basin and contains the West Branch watershed. The region's challenges include a history of legacy mining, aging infrastructure, and a relatively low population making broad regional coordination and ecosystem protection critical.

Protect Important Headwater Habitats, Enhance Recharge Areas, and Minimize Stormwater Runoff of the Upper/Middle Susquehanna Basin

To care for the water resources in the Upper/Middle Susquehanna basin and ensure a sustainable supply of quality water, important headwater habitats and groundwater recharge areas must be protected. Because much of the basin is forested, the approach should focus on forested land use practices and their effect on area water supplies. Minimizing large scale forest cutting is a priority to mitigate downstream flooding, preserve forested ecosystem services, and reduce sedimentation. Addressing legacy infrastructure, including point source outfalls, in acid mine drainage areas is also critical to protecting important headwaters and streams. We strongly encourage reuse of degraded/abandoned land such as available industrial or commercial lands.

Marcellus shale is a large resource for natural gas in the basin that can require large quantities of water for hydraulic fracturing and has potential impacts to the

headwaters, wetlands, and the overall groundwater and surface water quality and quantity of the region. Committee members recognize a different approach must be taken to address water quantity and quality issues between rural and urban/suburban areas within the region. Rural areas strive to protect forest lands, preserve recreation areas and greenways, and protect critical habitat areas. Stormwater quality and quantity concerns in suburban and urban areas may be addressed with green infrastructure through zoning ordinance changes for underutilized and/or vacant commercial property, as well as their associated parking and paved areas.

Working collaboratively with stakeholders including state, county, and municipal government, municipal authorities, conservation districts, and watershed associations through education and outreach efforts is essential to advancing sound land use practices that are protective of these headwater areas. As part of a strategy to accomplish this, local governments can promote appropriate municipal ordinances in public water supply recharge areas, which is particularly important in areas with limited availability of quality water. The committee also recommends that statewide water well construction standards be implemented, particularly related to residential well drilling and geothermal bore holes, which will protect and sustain groundwater quality and availability.

Multi-Municipal Planning and Coordination

Land use planning and development are critical to protect headwater habitats, enhance recharge areas, and minimize stormwater runoff. Planning needs to expand with county-wide action plans and IWRM throughout a watershed. A regional approach of education and outreach to water resource stakeholders, emphasizing the value of coordinated water quality and quantity planning among municipalities, is critical to protecting all communities. Continue to prioritize upgrading existing aging water and sewer infrastructure to maintain water quality and quantity, recognizing that parts of the region have experienced a decline in population and as a result many communities are challenged economically. Multi-municipal planning coordination enhances success in preserving water quality and quantity and optimizes the use of funding dollars.

Region's Uniqueness

What are the Upper/Middle Susquehanna region's unique characteristics that are important considerations in the state's water planning?

- This region encompasses a large portion of the headwaters for the Susquehanna River.
- The Upper/Middle Susquehanna has complex geology and substantial topographical variation.
- Legacy mining in the region presents water quality problems such as source water contamination but also provides opportunities through mineral recapture and recycling.
- There is a vast number of diverse hydrologic features in the basin including wetlands, streams, lakes, and ponds as well as peatlands.
- The Upper/Middle Susquehanna basin is densely forested, which helps to filter groundwater.
- With a large number of state forests, state game lands, and public lands, recreation plays a big role in this region's economy.
- Marcellus shale is a large resource for natural gas in the basin.

Stormwater and Flood Management

What are the region's concerns and recommendations for stormwater and flood management to preserve water quality?

- Good forestry practices should be continued in order to support headwaters, as healthy forests help mitigate flooding downstream.
- Incorporate green measures, such as [green streets](#) and [green roofs](#) into municipal plans to better capture precipitation in urbanized areas.
- Retrofitting existing stormwater facilities, promoting groundwater infiltration and recharge areas with a focus on smaller-scale granular solutions instead of large basins would be beneficial. With consideration of climate projections and future changes in the regional climate, local authorities should assess aging infrastructure for high-frequency storm events, erosion control, and filtration.
- Vacant shopping malls and corporate properties designed parking lots for maximum occupancy, which can lead to excessive runoff. Since the advent of virtual workspaces and online shopping, there is less demand for such large parking lots. Methods to modify or reuse these parking lots by retrofitting them with new stormwater best management practices should be investigated first by accurately determining responsibility. Transferring development rights might be a tool to achieve stormwater improvements on these properties.
- Stakeholders should provide education and outreach to homeowners on the impacts of stormwater, including the differences between pervious and impervious surfaces and various mitigation techniques, such as rain gutters and rain barrels, etc.
- Stormwater best management practices should be properly maintained; pervious pavements vacuumed regularly, streets swept, and algae controlled. Maintenance provisions in Municipal Separate Storm Sewer System (MS4) requirements and credits can help ensure continued functionality of best management practices.
- Connecting multiple municipalities within counties to create MS4 or stormwater consortiums so communities can discuss how best to apply the regulations would be beneficial.
- Stormwater ordinances need to be kept up to date with stormwater infrastructure improvements considered alongside redevelopment projects.

Climate Change Adaptation for Water Resources

How are water resources within the region being impacted by climate change and what could we do to adapt?

- Increased storm frequency and high intensity events will create issues with groundwater recharge and flash flooding. With droughts having a more severe impact on groundwater, continue to promote groundwater recharge to increase water availability.
- An in-depth study of climate change implications on water supply, vulnerability, availability, and reliability would be beneficial.
- Stakeholders should promote flexibility and incremental practical steps in response to the changing climate, especially in smaller communities that may lack the necessary budgets.

- Stakeholders should provide education and outreach focusing on resiliency and scientific data to help guide climate change discussions.
- Emphasizing the benefits and co-benefits of climate adaptation projects to the public and stakeholders would be beneficial, such as general resiliency and health of the ecosystem.

2.3 Recommended Legislative Priorities of the Statewide Water Resources Committee

These recommendations are directed at the Pennsylvania General Assembly. They are extracted from the various workgroup papers created by the statewide committee and from regional components of the 2022 Update. Below is a table (Table 8) that briefly summarizes these recommendations. Additional context for these can be found by clicking the priority’s title, which hyperlinks to the place in this report that explores the concept in more detail.

Top Statewide Legislative Priorities

Table 8. Legislative Priorities for Pennsylvania General Assembly

Priority	Rationale	Recommendation
<u>Sustainable Funding of Water Resources Programs</u>	Water is a critical resource and, though generally plentiful in Pennsylvania, requires ongoing care, protection, and sustainable management to assure its continuing availability and quality. Programs that support the stewardship of this valuable resource should be given sufficient and consistent funding.	See section on Funding Priorities. Listed are a series of specific recommendations concerning sustainable funding priorities identified by the State Water Plan committees and workgroups.
<u>Well Construction Standards</u>	Pennsylvania has the second highest number of private wells in the country. In the absence of well construction standards and in some cases installer training and proficiency, many wells are not adequately constructed to prevent contamination of the well and groundwater, thereby putting Pennsylvanians at risk.	Enact legislation to require proficiency-based licensing and certification of water well drillers and establish statewide water well construction standards. To avoid landowner concerns, legislation should make clear that the legislation applies to those who install wells, and that no tax, fee or restriction on water use will be applied to homeowner wells. Proposed legislation should be preceded by strategic public educational outreach.
<u>Legacy Mining and Well Challenges - Reducing Barriers to Private Action</u>	A “Good Samaritan” law at the federal level and clarification of National Pollutant Discharge Elimination System (NPDES) Permit requirements would help remove barriers to nonprofit organizations and other private parties from undertaking remediation efforts by providing immunity from legal liability for mine and abandoned well discharges they did not cause.	Encourage Congress to enact Good Samaritan laws and other reforms that would release entities from being legally liable for discharges they did not cause while they attempt to treat said discharges and remediate abandoned mines and wells. Examples of similar laws include the Pennsylvania Good Samaritan Act and Community Relations Partnership Act.

<p><u>Ensuring Long-Term Operation of Treatment Plants</u></p>	<p>Ensure long-term treatment project O&M</p>	<p>Encourage Congress to allow the usage of Federal AML funds to be used to finance long-term treatment trust ensuring funding is available to continue to operate the treatment plants constructed using the AML funds.</p>
<p><u>Evaluating Pennsylvania's Water Rights</u></p>	<p>Pennsylvania's common law water rights are not well defined, unquantifiable, insecure, and difficult to enforce. Adoption of a more consistent and secure statutory water rights arrangement, like that enacted by other eastern states, could provide more predictable and better-defined water rights that would protect existing users and provide a more secure foundation for future economic investments.</p>	<p>The Statewide Water Resources Committee should work with DEP, a broad spectrum of stakeholders, and the General Assembly to evaluate the effectiveness of current water rights and withdrawal arrangements, evaluate options for improvements and develop recommendations for a more consistent, secure and holistic approach to water rights.</p>
<p><u>Amend Flood Control Act</u></p>	<p>Rainfall intensity is trending higher, putting more Pennsylvanians at risk of flooding. A mitigation approach that considers both non-structural and structural measures will be needed to protect lives and reduce flood damage.</p>	<p>Provide DEP and other state agencies authority to consider and implement all potential flood control solutions and provide funding through the capital budget process and other means for such structural and non-structural projects.</p>
<p><u>Sustainable Public and Private Stormwater Management Infrastructure</u></p>	<p>With increasing rainfall intensity stormwater becomes a key issue in urban centers. Therefore, having a plan to sustainably support that infrastructure is critical.</p>	<p>Authorize the creation and operation of local authorities, utilities, or management districts and/or other entities in all classes of counties and municipalities that can collect reasonable fees and generate sustainable revenues dedicated to improving, planning, constructing, monitoring, maintaining, expanding, and managing stormwater management infrastructure.</p>
<p><u>Water Resource Restoration</u></p>	<p>A holistic view of stormwater and flooding that considers the downstream impacts of such events is critical in addressing stormwater.</p>	<p>Fund, promote, and support water resource restoration projects, particularly projects that reestablish natural processes that support a broader aim of flood mitigation and stormwater control.</p>
<p><u>Facilitate Asset Management Planning</u></p>	<p>The most recent EPA Infrastructure Needs Survey projected a capital need for Pennsylvania drinking water systems of \$16.8 billion over the next 20 years; and with the legacy challenges of combined sewer systems and aging wastewater infrastructure, the projected needs for wastewater systems are comparable. Development and implementation of a</p>	<p>Maximize access to and utilization of funds made available from the 2021 Bipartisan Infrastructure and Jobs Act, in combination with state and system level investments. Pennsylvania Infrastructure Investment Authority (PENVEST) funding for asset management plans should be increased from \$25,000 to \$50,000 with conditions and timeframes attached. Consider amendments to 25 Pa. Code Chapter 71 to require Act 537 plans to include periodic reviews and reporting on the sustainable management of wastewater systems. Reinvigorate an Act 537 process to help address sustainable infrastructure</p>

	sustainable asset management approach is needed to assure ongoing investment, maintenance, and rehabilitation of this essential infrastructure.	goals and reestablish and fund the Act 537 planning and enforcement reimbursement program.
<u>Support Program for Agricultural Conservation Practices</u>	There are many agricultural facilities which can contribute nutrient and pathogen runoff, soil erosion, and unrestricted livestock access to streams and surface waters. Though farmers and the agricultural community are ready and willing to do their part to reduce runoff while improving farm practices they can't do it without technical support.	Recommend that the General Assembly identify and establish a long-term source of funding for the newly passed Agriculture Conservation Assistance Program (ACAP) ¹⁶ . Establishing dedicated and equitable funding for ACAP that will target funding for local farms to invest in conservation practices will guarantee its success beyond 2026 when the current funding expires ¹⁷ .
<u>Reduce Livestock Access to Streams</u>	Keeping animals and their waste out of streams reduces bacteria, nitrogen, and phosphorus that pollute waterways and helps prevent erosion by protecting stream banks.	Encourage voluntary participation in implementing restriction of livestock access to streams as there are new funding programs, such as ACAP, that may help farmers implement this practice. Allow for enforcement of best management practices relating to livestock access to streams where water quality is being impacted.

Funding Priorities

Sustainable funding of water resources programs, and sustainable investment in the management and maintenance of water, wastewater, and stormwater infrastructure, is essential to assuring Pennsylvanians have adequate, safe and reliable water supplies and that the quantity and quality of Pennsylvania's water resources are protected for the long-term. Unfortunately, over the past decade or more, funding of water management programs and infrastructure at the federal and state level have diminished even as challenges have increased.

With the recent passage of the Bipartisan Infrastructure Law, there has been renewed interest in funding critical water resources projects. The regional and statewide committees have considered and developed proposals for how some of that funding can be allocated to have the greatest possible impact on Pennsylvania's water resources and supporting infrastructure.

¹⁶ ACAP was promulgated under Act of Jul. 11, 2022, P.L. 540, No. 54, Art.XVI-R, § 1601-R (see, also Art. XVII-A.2, Subarticle B, §§ 1711-A.2-1712-A.2.)

¹⁷ Funding for ACAP is currently provided by the Clean Streams Fund, established under Act of Jul. 11, 2022, P.L. 540, No. 54, Art. XVII-A.2, Subarticle B, §§ 1711-A.2-1712-A.2. Funding for the Clean Streams Fund is currently allocated through federal COVID-relief funding; Act of Jul. 8, 2022, P.L., No. 1A; Part LI, Subpart G., §5154.

Below is a list of specific capital investments that could be made to protect and enhance Pennsylvania's water resources:

- **Assistance to conservation districts in hiring more staff and expanding capacity** by funding the following:
 - Chesapeake Bay Agricultural Source Abatement Fund
 - The Conservation District Fund Allocation Program
 - The Nutrient Management Fund, to provide additional funding for conservation district staff. More funds per Full Time Equivalent (FTE) as well as additional funds for expanding capacity are needed.
- **Increased funding for available Resource Enhancement and Protection (REAP) (under the Pennsylvania Farm Bill) tax credits.**
- **Dedicated and increased funding source for the Environmental Stewardship Fund (ESF):** The ESF provides funding for Pennsylvania's Growing Greener Plus grants as well as Pennsylvania's Chesapeake Bay Clean Water Coordinator and Countywide Action Plan Implementation block grant programs. These two grant programs invest in agricultural conservation practices as well as riparian corridor practices like stream restoration and riparian forested buffers as well as stormwater best management practices. ESF also funds Conservation District Watershed Specialists that help to administer and oversee project implementation.
- **Additional Funding for Abandoned Mine Land (AML) Sites:** In order to assure long-term funding for continued operation of AML water treatment projects, the state needs to facilitate use of "set aside" interest/growth accounts under which a portion of funds received from federal AML program grants are placed and held to underwrite future operation and maintenance of those projects.
- **Additional Funding for Addressing Inactive Abandoned and Orphan Oil and Gas Wells:** In addition to funding received from the Bipartisan Infrastructure Law, federal and state funding to address inactive, abandoned, and orphan oil and gas wells will be needed. One option meriting serious consideration would be a proposal to the voters for a state bond issuance similar to the Project 500 / Land and Water Reclamation Act, to help underwrite expanded efforts to tackle these legacy situations in a prioritized manner, thereby restoring Pennsylvania's impacted water resources to usable and sustainable condition.
- **Reinvigorated funding for Act 167 Stormwater Plans and Act 537 Sewage Facilities Plans:** Funding for both programs concurrently would help establish a coordinated, holistic way of relating land use and water resources management to meet program goals through Integrated Water Resources Management, or IWRM. There is broad support and demand for reinvigorating funding of these programs. For example, as part of Pennsylvania's Phase 3 Chesapeake Bay Watershed Implementation Plan, 20 Countywide Action Plans identified the Act 167 plan as a priority for urban/suburban stormwater. Revitalizing Act 167 program funding was also recently identified by the State Planning Board as a key recommendation for storm preparedness, flood hazard mitigation and community resiliency.
- **Funding multi-municipal planning efforts:** a grant should be created that will allow for water infrastructure repair and maintenance provided that the proposed project can demonstrate it takes local and regional land use planning into account.

- **Outreach and Assistance to Public Water Suppliers:** Funding to programs involved with outreach and assistance (technical, managerial, or financial) to water suppliers, especially smaller operations such as securing consistent funding and technical resources needed to effectively promote water use efficiency.
- **Funding for the Establishment of an Emerging Contaminants Program:** Establishing a contaminants of emerging concern program for collaborative engagement across DEP organizational structure and partnering organizations.
- **Funding Enhanced Flood Forecasting and Warning Systems:** Enhance the Flood Forecasting and Warning Systems Mesonet (or other applicable method) for all major river basins.
- **Increased Efforts to Enhance Community Preparedness and Resiliency for Flood Events and Recovery Assistance Following Flood Events:**
 - The Governor, General Assembly, and all state agencies, should evaluate and adjust state funding programs to ensure they offer a preference for locating or relocating structures outside the floodplain.
 - Provide adequate budget funding for agency (DEP, Commonwealth Flood Coordinator, Pennsylvania Emergency Management Agency (PEMA)) efforts and project funding and grants needed to meet the above floodplain goals and recommendations.
 - Provide adequate budget funding for DEP to provide grants to meet annually-required structural improvements to existing flood control project infrastructure.
- **Funding for Chapter 102 Compliance:** To encourage proper operation and maintenance of existing stormwater infrastructure to bring it in line with Chapter 102 compliance.
- **Funding DEP for Update of a Stormwater Management Model Ordinance:** Increased consideration to provisions for county and watershed special protection initiatives and watershed-based stormwater management technical reviews.

Figure 5. Workgroup “White Paper” Topics

- Floodplain and Stormwater Management
- Integrated Water Resources Management (IWRM)
- Water Withdrawal and Use
- Water Efficiency
- Legacy Impacts
- Drinking Water and Wastewater Infrastructure Sustainability
- Contaminants of Emerging Concern
- Assessment of Navigation Needs
- Agriculture Nonpoint Source Pollution

2.4 Assessment and Update of Statewide Priorities and Recommendations for Action

A major outcome of the previous update of the State Water Plan was a set of recommendations to DEP from the statewide committee that would improve water resources in the commonwealth. During the preparation of this update of the State Water Plan, the statewide committee examined whether the previous recommendations for action were still relevant to current discussions and considered what changes or new priorities would be recommended.

Surveys of members were utilized by the statewide committee to help understand what the current highest priority water resources problems may be and to help identify gaps, shortcomings or deficiencies in current water resource planning and management processes and programs.

From these surveys and subsequent discussions, the list of priorities were ranked, and work groups were established for each of the highest ranked priorities to develop “white papers” as shown in Figure 6 with background information and recommendations for action.

2.4.1 Floodplain and Stormwater Management

Stormwater and Flood Mitigation Workgroup

The 2009 State Water Plan Principles¹⁸ provided an in-depth assessment of floodplain and stormwater management in Pennsylvania as it stood during that time. The 2009 Principles presented a detailed examination of issues framing problems, programs addressing the problems, identification of gaps and roadblocks, and recommendations in addressing flood control and stormwater management, much of which remains valid today. While many of the challenges previously reported in the 2009 Principles report remain today, significant accomplishments were made during the interim years that have helped meet the life-threatening, environmental, and economic effects of flooding. Some examples include:

- Development of an update in 2018 to the All-Hazard Mitigation Plan¹⁹ by PEMA
- Construction of Flood Mitigation Projects provided through grants from the Department of Community and Economic Development (DCED) under Act 13 of 2012²⁰
- Since 2009, DEP initiated eleven flood control projects valued more than \$39.5 million with seven of the projects completed
- A transfer in 2019 of responsibilities for coordination of the National Flood Insurance Program from DCED to PEMA
- The completion in early 2020 by DEP of a statewide Probable Maximum Precipitation (PMP) study that updated the methodology for determining theoretical maximum rainfall amounts for dam design criteria

¹⁸ Department of Environmental Protection, State Water Plan Principles

<https://www.dep.pa.gov/Business/Water/PlanningConservation/StateWaterPlan/Pages/2009-Update.aspx>

¹⁹ Commonwealth of Pennsylvania, 2018 State Hazard Mitigation Plan, Annual Update: October 2019

<https://pahmp.com/wp-content/uploads/2020/01/PA-2019-SHMP-Update-October-2019-Update.pdf>

²⁰ Department of Community and Economic Development, Act 13 Programs

<https://dced.pa.gov/programs-funding/commonwealth-financing-authority-cfa/act-13-programs/>

For the 2022 Update, the Stormwater Management and Floodplain Management Workgroup of the statewide committee examined the prior background and action items from the 2009 Update as part of their understanding of the past, the present, and the future issues of floodplains and stormwater management. A primary part of this workgroup’s work was to determine which prior recommendations were already accomplished, identify those that have yet to be addressed, and present new recommendations whenever appropriate. Solutions formulated by the Stormwater Management and Floodplain Management Workgroup generally fell into categories such as:

- Enhancing commonwealth agency capabilities with revised policies, authorities, and permitting changes
- Encouraging financial opportunities for floodplain and stormwater projects
- Directing support to local actions based on watershed approaches
- Encouraging legislative funding to support programs in meeting goals
- Providing technical guidance and educational training
- Recommending administrative changes to agencies and governments to achieve a higher level of cooperation, and to refine the authorities, responsibilities, reviews, and enforcement of existing regulations

While the workgroup recognized and appreciated the valuable steps achieved since the last State Water Plan, the workgroup also emphasized that evolving effects of climate change on water resources have significantly added to ongoing problems.

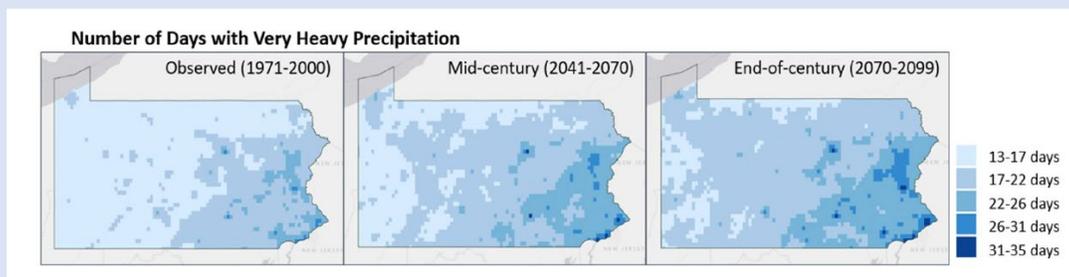
The Need for Climate Adaptation

*The Pennsylvania Climate Impacts Assessment 2021*²¹ provides valuable information about changes that have already occurred and projected into the future.

Increased flood risks

As illustrated in Figure 6, by this mid-century, compared with a 1971-2000 baseline, Pennsylvania could experience more total average rainfall, occurring in less frequent but heavier rain events. It is estimated there could be a 24% increase in the number of days with more rainfall than currently occurs on 95th percentile or “very heavy” rainfall days with an estimated 12% increase in precipitation on those days. Under this 2021 assessment, flooding is the highest risk hazard facing Pennsylvania, and flood risks are projected to increase.

Figure 6. The Pennsylvania Climate Impacts Assessment 2021



²¹ Pennsylvania Department of Environmental Protection, Pennsylvania Climate Impacts Assessment 2021 <http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=3667348&DocName=PENNSYLVANIA%20CLIMATE%20IMPACTS%20ASSESSMENT%202021.PDF%20%20%3cspan%20style%3D%22color:green%3b%22%3e%3c/span%3e%20%3cspan%20style%3D%22color:blue%3b%22%3e%28NEW%29%3c/span%3e%204/30/2023>

The workgroup recommends embracing a coalescence of approaches, such as IWRM, implementation of climate adaptation strategies, and use of green infrastructure. These combined strategies will ensure that stormwater management, floodplain management, and flood protection programs will be of sufficient strength and resilience to meet the challenges the commonwealth faces now and into the future.

It is for these reasons that the statewide committee offers the following recommendations.

Flood Control Recommendations

1. Request PEMA, with consultation of other state agencies, review and update elements of the Pennsylvania Enhanced All-Hazard Mitigation Plan that address flooding.
2. Encourage the General Assembly to fund an enhanced watershed-based Flood Forecasting and Warning Systems Mesonet, (or other applicable method) for all major river basins, utilizing a partnership of federal, state, and local governments.
3. Request PEMA, with consultation of other state agencies, to support FEMA efforts to update Flood Insurance Rate Maps and encourage FEMA to improve the process for communicating with affected property owners in the updating of floodplain maps.
4. Through executive action, appoint a Commonwealth Flood Coordinator (CFC) charged with coordinating flood prevention and recovery activities among state agencies. The CFC would also serve as the primary point of contact for federal, interstate, commonwealth, and local officials on flood-related matters. This coordinator should be autonomous from DEP and other agencies, and report directly to the Governor's office.
5. Increase efforts to protect Pennsylvania's floodplains.
 - The General Assembly should enact amendments to the Flood Control Act to provide authority to DEP and other appropriate state agencies to consider and implement all potential flood control solutions, including non-structural alternatives and preventive approaches to reduce the risk of flooding; and allow all types of flood control solutions to be funded through the capital budget process.
 - Pennsylvania should encourage Congress and FEMA to review and evaluate the Federal Flood Insurance Program to identify policies, such as the buy-out option, which can be enhanced with floodplain restoration to decrease the likelihood of future damage to communities.
 - DEP, in consultation with PEMA, should evaluate and provide recommendations to the General Assembly to enact amendments to Section 301(a) of the Flood Plain Management Act to consider expanding the list of floodplain obstructions that present a special hazard to public health and safety, that may cause significant pollution or that may endanger life and property. Additionally, such legislation should address rebuilding within the floodplain and should provide provisions for restoration and remediation of the floodplain to minimize future flood losses.

6. Increase efforts to enhance community recovery assistance following flood events.
 - All involved state agencies should ensure that existing programs are coordinated and provide incentives for floodplain protection and restoration. Public funds used for flood recovery and rebuilding should target floodplain and carrying capacity restoration and obstruction removal. Retrofitting existing development with facilities designed to minimize flood losses should be considered where appropriate.
 - To the maximum extent allowable under applicable law, FEMA, PEMA and other involved state agencies should prioritize flood recovery funds for activities that protect the flood carrying capacity of the floodplain, including stream, floodplain, and wetland restoration projects, inclusive of restoring riparian corridor herbaceous and forested cover and other green infrastructure. Invest funds effectively and reasonably to restore the floodplain and to reduce future losses.
 - FEMA and PEMA should cooperate in revising existing post-flood recovery funding programs to require post-disaster assessments and mitigation investigations and emphasize increased efforts on floodplain restoration and restoration of flood carrying capacity. (trees/vegetation within restorations)
 - The Governor, General Assembly and all state agencies should evaluate and adjust state funding programs to assure they offer a preference for locating or relocating structures outside the floodplain. Where this approach is not feasible, approval to build or rebuild within the floodplain should include provisions for restoration and remediation of the floodplain to minimize future flood losses.
7. Request PEMA, DEP, and DCED to establish an information center/clearinghouse providing education and training to local government officials, municipal solicitors, municipal engineers, and the design community that emphasizes the importance of embedding integrated stormwater and floodplain management considerations into related municipal decisions.
8. In connection with integrated water resources planning, local governments should be encouraged to include floodplain management and floodplain regulation into local integrated water resources planning. During their planning processes, county and local governments should consider provisions with preferences toward achieving floodplain restoration and relocations, where practicable.
9. Request DEP seek advisory (non-regulatory) comments from PEMA and the CFC for all Joint Permit (404/105) Applications, which have floodplain-limiting components, within the established review timelines. Request DEP provide notice of all Chapter 105 General Permit authorizations to the same for inventory and mapping.
10. Request DEP, in coordination with the Pennsylvania Fish and Boat Commission (PFBC), establish technical design guidance for new encroachments and obstructions including:
 - Aquatic Organism Passage (AOP) design standards
 - Construction materials and standards
 - Design storm sizing – including recommendations for the Department of Transportation, (PennDOT) and Municipal road crossings

- Stream simulation design standards
 - Other items deemed necessary for resilient safe conveyance of flood waters
11. Encourage county planning commissions, in consultation with local municipalities, county conservation districts, and DEP, to establish floodplain studies for surface waters with drainage areas greater than 100 acres, which are zoned for non-agricultural uses and not part of an existing detailed FEMA study. Additionally, enact local ordinances which require those engaged in development to provide such studies.
Provide adequate grant opportunities based on regional need and hazard potential for these studies.
 12. Encourage county planning commissions, in consultation with local municipalities, county conservation districts, and DEP, to map existing floodplain obstructions and encroachments within the statutory floodway of surface waters. Provide adequate grant opportunities based on regional need and hazard potential for these studies.
 13. Encourage county planning commissions, in consultation with DEP and PEMA, to incorporate existing floodplains, proposed floodplain management areas, stream restoration priorities, and riparian buffer corridors into overall comprehensive planning efforts and adopted plans for both county and municipal levels.
 - Consider density and use variances for projects which incorporate significant regional floodplain management/restoration within the subject tracts of land to incentivize public-private-partnerships.
 - Consider ways of addressing the “loss of tax base” for the municipality associated with floodplain restoration and relocations.
 - Encourage county planning commissions, in consultation with DEP and PEMA, to work with all municipalities to enact and enforce floodplain ordinances consistent with DEP, PEMA, and FEMA standards and requirements of the Pennsylvania Flood Plain Management Act.
 15. Encourage the General Assembly to provide adequate budget funding for agency (DEP, PEMA) efforts and project funding and grants needed to meet the above floodplain goals and recommendations.
 16. Encourage the General Assembly to provide adequate budget funding for DEP to provide grants to meet annually required structural improvements to existing flood control project infrastructure.

Stormwater Management Recommendations

1. Through appropriate administrative and structural changes within DEP, provide a streamlined and more efficient stormwater management program for the regulated community.
2. Request DEP establish an information center/clearinghouse (Pennsylvania Clean Water Academy or other as deemed appropriate) providing education and training to local government officials, municipal solicitors, engineers/designers, and the regulated community on related permitting, design, maintenance, reporting of stormwater infrastructure, and planning.
3. Encourage the General Assembly to authorize by legislation the creation and operation of local authorities, utilities, or management districts and/or other entities in all classes of counties and municipalities that are able to collect reasonable fees and generate sustainable revenues dedicated to planning, constructing, monitoring, maintaining, improving, expanding, operating, inspecting and repairing public and private stormwater management infrastructure. Fee arrangements should be structured to avoid being classified as a “tax,” and should provide appropriate exemptions or credits to entities who have implemented appropriate and effective stormwater control and management methods that address the impact of their lands and activities. Currently, Section 2705 of Act 62 of 2016²² provides some specificity as to the assessment of such fees for second class townships. Recent bills seek to amend the statutes governing other kinds/classes of local governments (e.g., first class townships, boroughs, third class cities) to authorize specifically/explicitly “stormwater fees.”
4. Encourage the General Assembly to fund, promote, and support water resource restoration projects through appropriate legislation. Water resource restoration projects to fund, promote, and support include, but are not limited to, the following:
 - Projects that reconnect streams to an active floodplain
 - Projects that remove anthropogenic impairments such as legacy sediments along streams
 - Projects that reestablish wetlands and restore degraded wetlands, especially in floodplains and in headwater areas
 - Projects that remediate actively eroding streambanks and use native woody and herbaceous vegetation best management practices to stabilize soils and trap sediments
 - Projects that restore riverine forms and processes while providing geomorphic stability, prevent head-cuts, bed scour, and other forms of channel degradation

Support for these types of projects should consider, but not be limited to, the following:

- Increased funding to support DEP’s in-lieu fee program, including funds to establish initial credit-generating projects and for additional staff needed to administer the program

²² Pennsylvania General Assembly, 2016 Act 62, Second Class Township Code- Storm Water Management Ordinances and Fees <https://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2016&sessInd=0&act=62>

- Expedited\prioritized review and permit authorization by county and state agencies
 - Increased density or Land Use zoning considerations at a local level
 - Longer term tax incentives or grant opportunities
5. Request DEP regularly evaluate permitting fees for Chapter 102 and 105 programs as they relate to the actual effort spent by staff for review authorization. Adjust permitting fees as needed to fund adequate staffing and infrastructure for efficient review.
 6. Adequately fund regular updates and addenda to the Pennsylvania Stormwater Best Management Practices Manual²³ to reflect changes to computational methodologies\processes, design\construction practices, proprietary products, maintenance needs, and the best available and current technologies. Technical design guidance should include, but not be limited to:
 - Resilient structural practices to accommodate changing precipitation patterns within the commonwealth
 - Special guidance on special projects such as large-scale energy projects, brownfields, oil and gas, mining, timber harvesting
 7. Encourage the General Assembly to adequately fund DEP to continue to maintain and update the Stormwater Management Model Ordinance to reflect Stormwater Best Management Practices Manual revisions and statutory amendments
 - Provide provisions for county and watershed level special protection initiatives, as deemed appropriate by the county's commissioners
 - Promote watershed-based stormwater management technical reviews for consistency with watershed planning efforts
 8. Encourage the General Assembly to fund DEP to enable adequate auditing and enforcement of municipalities such that proper operation and maintenance of existing and newly constructed post-construction stormwater management practices are assured for Municipal Separate Storm Sewer System (MS4) documentation and Chapter 102 compliance.
 9. Through appropriate structural and administrative changes within DEP and county administrations, to the greatest extent practical, continue opportunities for delegated county conservation districts to implement Chapter 102 and Chapter 105 permitting and to support watershed-based local technical reviews, authorizations, and enforcement. DEP through its regional offices should continue to provide technical assistance, oversight, and training for the county conservation districts to assure statewide standardization of Chapter 102/105 regulatory compliance.
 10. Encourage DEP through appropriate regulatory action to adopt technical safety standards for embankments of applicable stormwater facilities, not otherwise subject to Chapter 105 Dam Safety regulatory criteria, in accordance with technical recommendations outlined by the United States

²³ Department of Environmental Protection, Pennsylvania Stormwater Best Management Practices Manual 363-0300-002
<http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4673>

Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS).

11. Encourage the General Assembly to provide adequate budget funding for DEP efforts, project funding, and grants needed to address stormwater management goals and recommendations through Integrated Water Resource Planning by way of the Act 167 program.

2.4.2 Integrated Water Resources Management

Water Management and Land Use Management Workgroup

Introduction - Water Management in Pennsylvania

For the commonwealth, nothing could be more important than ensuring that there is an adequate supply of clean water for all Pennsylvanians with a sufficient quantity and quality to supply its many needs and uses. Fortunately, the commonwealth is rich in water resources, with about 85,500 miles of streams, nearly 4,000 lakes, reservoirs, and ponds, 80 trillion gallons of groundwater and 404,000 acres of wetlands. In addition, the commonwealth has 56 miles of coast along the Delaware Estuary and 77 miles along Lake Erie.

Water is essential to virtually all aspects of our economy and life, and an equally essential foundation to Pennsylvania's environment. In addition to residential drinking water for its 13 million people, water in the commonwealth is used for thermoelectric power generation, agriculture, industrial and commercial supply, navigation, wildlife habitats, and recreation.

Under the Pennsylvania Clean Streams Law, 35 P.S. §691.1²⁴, the commonwealth's official policy is to recognize that "clean, unpolluted streams are absolutely essential if Pennsylvania is to attract new manufacturing industries and to develop Pennsylvania's full share of the tourist industry," and DEP has the primary responsibility to "prevent further pollution of the waters of the commonwealth, but also to reclaim and restore to a clean, unpolluted condition every stream in Pennsylvania that is presently polluted." Concurrently, Act 220 of 2002, 27 Pa. C.S. §§3101-3136²⁵, provides for water planning that considers both quality and quantity, the assessment and projection of current and future uses, consideration of stormwater and floodplain management issues, and other important aspects of water management.

Within DEP, the Office of Water Programs coordinates policies, procedures, and regulations which influence public water supply withdrawals and quantity, sewage facilities planning, point source municipal and industrial discharges, encroachments upon waterways and wetlands, dam safety, earth disturbance activities, and control of stormwater and nonpoint source pollution. In addition, the Office of Water Programs coordinates the planning, design and construction of flood protection and stream improvement projects.

Pennsylvania is a party to the Delaware River Basin Compact, Susquehanna River Basin Compact, Interstate Commission on the Potomac River Basin Compact, Ohio River Valley Water Sanitation Compact, and the Great Lakes – St. Lawrence River Basin Water Resources Compact; interstate agreements that share the responsibility for the management of Pennsylvania's water resources in parts of the state. Within DEP, the Office of Compacts and Commissions Support coordinates with the interstate commissions, state governments, and interstate organizations in advancing partnerships and promoting multi-state cooperation to address shared issues.

²⁴ Pennsylvania General Assembly, Clean Streams Law, 1937 Act 394
<https://www.legis.state.pa.us/cfdocs/Legis/LI/uconsCheck.cfm?txtType=HTM&yr=1937&sessInd=0&smthLwInd=0&act=0394>.

²⁵ Pennsylvania General Assembly, 2002 Act 220
<https://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2002&sessInd=0&act=220>

Linkage of Land Use to Water Management

At the same time, how land is used, developed, redeveloped, or conserved also has a great effect on the availability and quality of the water in the commonwealth's creeks, rivers, lakes, ponds, and groundwater for all of water's uses in Pennsylvania. Under the Pennsylvania Municipalities Planning Code, 53 P.S. §10101²⁶, (MPC), most issues involved in regulating land use and development are delegated to Pennsylvania's more than 2,500 local governments (cities, townships, and boroughs), and counties. While the MPC requires local zoning as well as subdivision and land development ordinances to consider the availability of water for various uses and access to water, integrating land use planning and water resources management would be beneficial to both managing the commonwealth's water resources while enhancing efforts aimed to support wise land use and smart development.

As one example, the regulation, design, operation, and management of proposed stormwater management systems can have a dramatic effect on the quantity and quality of the water in nearby waterways and groundwater and as well as impact downstream neighbors. Similarly, the planning, siting, and functioning of sewage facilities to serve existing or new development can significantly impact both water quality in surface and groundwaters, and the way water is returned to streams or recharged to aquifers. An integrated approach brings surface water, groundwater, stormwater, wastewater and water supply issues into the land planning process and decision-making.

Importance of Coordination

Water resources management becomes incredibly complex when basins, watersheds, and geographic regions of interest are often overlapped by multiple municipal, county, or state boundaries each having varying governance and priorities. The multivariate nature of this problem means that success of a project could correlate directly with the level of coordination between involved parties. This becomes especially evident when work is done on a watershed scale in comparison with an individual permit site or small stream segment. Coordination is a commitment to bring different stakeholders together to work effectively.

Education, outreach, and data sharing with the local government regarding land use planning and land use decisions are coordination elements. These elements more effectively integrate water resources management into land use planning and decision-making but will require local acceptance by local governments.

An important example of coordination would be DEP continuing to lead in coordinating regular updates, and addenda to the *Pennsylvania Stormwater Best Management Practices Manual*²⁷ to reflect changes to computational methodologies\processes, design\construction practices, proprietary products, maintenance needs, and the best available and current technologies. This technical design guidance should include, but not be limited to, design criteria for resilient structural practices to accommodate changing precipitation patterns within the commonwealth, special guidance on certain projects with potentially significant impacts, such as large-scale energy projects, and brownfields redevelopment. Local

²⁶ Pennsylvania General Assembly, Municipalities Planning Code
<https://www.legis.state.pa.us/WU01/LI/LI/US/HTM/1968/0/0247..HTM>

²⁷ Department of Environmental Protection, Pennsylvania Stormwater Best Management Practices Manual 363-0300-002
<http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4673>

governments should be encouraged to consider and adopt these guidelines in local land use ordinances.

With state incentives, technical resources, and encouragement, the commonwealth can lead the way by aligning its regulatory responsibilities within state agencies and then by working together with local governments and planning commissions to integrate water resource planning and projects into land use planning and decisions.

Strategic Direction

IWRM is a holistic, coordinated approach to managing water, land, and related resources that offers a framework to identify and understand water related challenges and obligations and the opportunities to address those challenges efficiently and in consideration of watershed needs. Integration helps make practical and science-based decisions while considering water availability data, water resiliency (including considerations related to climate change), and water quality in the context of land use decisions.

Essential strategies for Pennsylvania may include but are not limited to:

- Looking for opportunities to improve coordination on water resources management within DEP.
- Improving coordination and data sharing across state agencies and throughout the federal, interstate, state, and local government hierarchy, including but not limited to PEMA and FEMA.
- Solidifying the connection between land use and water resources management by looking for more opportunities to actively involve local governments, county planning commissions, conservancies and watershed groups, private companies, and citizens within the watershed in integrated water resource planning education, and land planning projects and decisions.

Comprehensive planning at all levels should consider the entirety of the river basin as well as more granular watershed level management including regional planning, water quality regulation and enforcement, water allocation, low flow protection, drought preparedness, water use planning and regulation, flood mitigation and stormwater management, groundwater recharge, consumptive use management and mitigation, monitoring and data management (baseline and impact assessment), addressing climate change impacts, mining, land use/land cover issues (including supporting the protection of existing forest cover and appropriate use of floodplains/active river areas), education and outreach, and the development of tools, including model ordinances, county and regional plans, funding, and incentives. Environmentally effective and cost-efficient planning is best done on a watershed basis.

DEP should continue to administer its water resources management, watershed restoration and protection, and water quality management programs in a consolidated and coordinated fashion, seeking opportunities for improvement both when performing planning and during the process of reviewing individual development projects. The strong relationships among these programs should continue to be encouraged and used in guiding DEP's strategic policy choices and daily decision-making.

DEP should continually strive to improve coordination among state agencies, as well as throughout the hierarchy of governance in Pennsylvania. State agencies have an obligation to work toward common objectives so that statutes, regulations, and policies are mutually supportive, efficiencies are gained, and conflict and duplication

are avoided. A great example is DEP's coordination on floodplain management and planning in cooperation with FEMA and PEMA.

DEP and PEMA should engage with the PFBC and PennDOT to establish technical design guidance for new encroachments and obstructions including Aquatic Organism Passage (AOP) design standards, construction materials and standards for design storm sizing. Such guidance for incorporation into local land use ordinances should include recommendations for PennDOT and municipal road crossings, along with stream simulation design standards and other items deemed necessary for resilient safe conveyance of flood waters.

Similarly, DEP should further collaborate with federal, state, interstate, international, and local governments within a watershed to align their collective efforts to ensure consistency among water resources management initiatives and to take advantage of their combined wisdom, data, and capital. This will entail outreach and education to the private sector and non-profit organizations to build awareness and support for following a united course.

Land use has a profound influence on water resources planning and management. While federal, interstate, and state governments have broad mandates to manage and regulate water resources, Pennsylvania municipalities have authority to adopt comprehensive plans, zoning regulations, and subdivision and land development ordinances. Local land use decisions should integrate water resources management objectives in their watershed to sustain economic growth while also achieving environmental protection and water resources management goals. To the extent that local governments lack the resources to integrate their land use decisions with current science and available data, and up to date water resource planning and development, the commonwealth, through grant incentives and support to county planning agencies and conservation districts can encourage the development of model land use ordinances and offer the technical assistance that help them accomplish this.

Recommendations

Set Agency Groundwork for IWRM

1. **Perform a baseline assessment.** DEP, with assistance from the statewide committee, should develop a baseline assessment of what IWRM means under the current commonwealth governance and formulate a roadmap that establishes the roles that DEP and other agencies may have in IWRM. Applicable bureaus and offices within DEP include: Clean Water, Safe Drinking Water, Waterways Engineering and Wetlands, Chesapeake Bay, Compacts and Commissions, Mining Programs, and Abandoned Mine Reclamation. The scope will include, but not be limited to:
 - a. Facilitate discussions to educate statewide committee members on program functions and current coordination among DEP programs and agencies. This will help provide a better understanding of current coordination that will lead to more defined and applicable IWRM concepts for statewide committee recommendation to DEP and partnering agencies.
 - b. Identify specific current or emerging issues, opportunities for improved coordination and problems that may be addressed by IWRM. This can include areas where lack of coordination is leading to missed opportunities for existing programs or newer programs that address emerging environmental concerns and initiatives.
 - c. Explore case studies and assessments of projects that are IWRM related.

2. **Establish an actionable workplan.**

With the baseline assessment completed, DEP, with assistance from the statewide committee, should then begin to establish and take discrete, actionable steps that:

- a. Identify potential programmatic, policy or regulatory options along with their impacts and benefits.
- b. Assess options in developing specific implementable management actions that would reflect the linkage of land use to water resources management.

Improve Coordination

1. **Inter-agency coordination.** It is recommended that the Governor's office consider assuming the lead in establishing and continuing, by executive order and appointment, a single point of contact (SPOC) charged with persistent coordination of high level staff in convening meetings, and championing consistent planning, operations, and application of regulations and policies across programs and coordination across state agencies. These agencies should include DEP, DCNR, PENNVEST, PEMA and the Public Utility Commission (PUC), as well as the Game Commission, Fish and Boat Commission, Department of Agriculture and county conservation districts. This appointee would be responsible for evaluating existing interagency teams established under National Environmental Policy Act (NEPA)²⁸ requirements as to whether these requirements may be used for other planning/implementation issues or alternatively recommending establishment of a new interagency team as appropriate.
2. **Intra-basin coordination.** DEP should continue to support basin commissions leading coordination efforts on issues affecting basin-wide water planning and management, understanding that land use management lies largely at the local level. Existing basin commission committees are very helpful tools. In parts of the commonwealth without a basin commission or other authorized agency, DEP should continue to be actively involved.
3. **State-federal coordination.** A concentrated effort should be taken by DEP to maintain and strengthen the relationships with key federal agencies. These include USGS, FEMA, United States Army Corps of Engineers, EPA, United States Fish and Wildlife Service (USFWS), United States Forest Service, Natural Resources Conservation Service, and Office of Surface Mining Reclamation and Enforcement.
4. **Local government coordination.** Where the need and opportunities exist, DEP is encouraged to coordinate IWRM planning and education/outreach efforts with local governmental resources such as the Pennsylvania State Association of Township Supervisors (PSATS), Pennsylvania State Association of Boroughs, Pennsylvania Municipal League, professional organizations including the Pennsylvania Planning Association and Consulting Engineers Council, and local organizations including county conservation districts, planning departments, and watershed associations.

Initiate County IWRM Plans

1. Efforts should be made by DEP to identify and assess completed countywide, online integrated water resource plans which serve developers by allowing them to classify their projects and determine which permits or state resources are applicable to their

²⁸ The Council on Environmental Quality, NEPA.gov
<https://ceq.doe.gov/index.html>

project. These specific plans could be assessed for effectiveness by the State Water Plan section and proliferated using existing tools.

2. DEP should update current county integrated water resource plan templates as necessary for voluntary implementation and explore providing outreach and assistance to encourage widespread implementation of county wide plans.
3. County planning agencies should be encouraged to practice integrated water resources management and to educate local governments on its importance.

2.4.3 Water Withdrawal and Use

Water Supply Workgroup

The 2009 Update included a comprehensive treatise on Water Withdrawal and Use Management in Pennsylvania that described the common law and statutory basis for water allocations, and the roles of the federal, state, and local governments and compact commissions on water withdrawals and use. From this, the 2009 Update provided three primary recommendations centered on the:

- Advancement of water use registration and reporting
- Development of water use projections and water use trends
- Development of recommendations as to whether and how Pennsylvania's water rights system might be improved

For the 2022 Update, the Water Supply Workgroup of the statewide committee looked at the 2009 Update to ascertain which of the recommendations may be appropriately updated, to consider how water supply needs and priorities have evolved since 2009, and to offer new recommendations.

Of the three 2009 recommendations, DEP accomplished the development and implementation of water use registration regulations and an implementation program. From these registrations and subsequent periodic reporting, DEP created a comprehensive database and statistical information on water use in Pennsylvania²⁹ that is accessible to the public and other agencies for water planning purposes. This data is important in serving to inform the development of trends in water use over time.

With the benefit of water use data collected since the 2009 Update, total water use within the state has most likely peaked. This is primarily due to the declining trend in withdrawals from thermoelectric power generating facilities. Water withdrawn for cooling of thermoelectric facilities is the commonwealth's largest water use sector accounting for over 60% of all withdrawals at 3.1 billion gallons per day (BGD) in 2020. This sector, specifically coal-burning electric generating facilities, has been driving the overall decline in Pennsylvania. The next two largest water use sectors are public water supply and industrial. These two sectors account for an additional 38%, for a total of 98% of all reported withdrawals in the commonwealth from these three water use sectors. Public water supply use has been relatively steady at 1.3 BGD, while industrial use has been declining since 2008. This information is further summarized in the Water Use and Planning section of the updated State Water Plan Atlas³⁰.

The Susquehanna River Basin Commission (SRBC), the Delaware River Basin Commission (DRBC), and the Interstate Commission on the Potomac River Basin (ICPRB) have completed reports within their respective basins, including projected water needs. The SRBC, in assessing the 20-year planning horizon from 2020 to 2040 for its updated Comprehensive Plan³¹, projected an eight percent increase in

²⁹ DEP Water Use Reports webpage

www.dep.pa.gov/DataandTools/Reports/Pages/Water.aspx

³⁰ DEP State Water Plan Digital Water Atlas

<https://storymaps.arcgis.com/stories/d945de2b227b44f5adad48faa36af929>

³¹ Susquehanna River Basin Commission, Comprehensive Plan for the Water Resources of the Susquehanna River Basin (2021-2041)

<https://www.srbc.net/our-work/planning/comprehensive-plan.html>

domestic water use, from 418.0 mgd to 449.5 mgd. For all sectors of water use, the data show an overall 12% projected decrease in surface water withdrawals, 2% increase in groundwater withdrawals, and 0.2% increase in consumptive use over the 20-year planning horizon.

Recent water use observations shared with the statewide committee from SRBC include the following:

- Water use for existing power plants has been declining
- Public water supply requests for water use reduction at time of renewal
- Decrease in the number of natural gas wells developed, but the amount of water use per well has increased
- Slight increase in water use for agriculture has occurred but is projected to decrease in the future while consumptive use is projected to increase³².
- Relatively stable to slight increases in manufacturing water use
- Ski facilities asking for increased withdrawal rates to take advantage of shorter periods of snowmaking conditions

In the Delaware River region of Pennsylvania, peak water use has likely already occurred. According to a recent DRBC report titled *Water Withdrawal and Consumptive Use Estimates for the Delaware River Basin (1990-2017) with Projections through 2060*³³, water use trends are projected to continue to decrease by 2060, led by declines in withdrawals from thermoelectric facilities utilizing once through cooling. However, the DRBC report identifies projected increases in two sub basins (eight-digit hydrologic unit codes³⁴):

- Crosswicks-Neshaminy (Bucks County) for thermoelectric power, industrial and public water supply
- Lehigh (east-central Pennsylvania) for primarily public water supply

Unlike SRBC and DRBC, the ICPRB does not have authority to regulate water use or consumptive use in the commonwealth. The ICPRB is involved, however, with cooperatively managing drinking water supplies for the Washington, DC, metropolitan area during times of drought through its Section for Cooperative Water Supply Operations on the Potomac (CO-OP) and fostering clean, reliable, and resilient water resources for current and future generations through implementation of the Potomac Basin Comprehensive Water Resources Plan. To this end, analysis of water use in the Potomac basin conducted by the ICPRB include quantification of reported and unreported uses and projected future demands.

- According to the *Potomac Basin Unreported Water Use* and *Potomac Basin Reported Water Use* studies, the Pennsylvania portion of the Potomac basin had approximately 18.9 MGD of unreported water use in 2017, compared to the approximately 29.7 MGD of state-reported water use in the basin from all sectors that same year. Unreported water use, therefore, makes up

³² Susquehanna River Basin Commission, Comprehensive Plan for the Water Resources of the Susquehanna River Basin: 2021-2041

<https://www.srbc.net/our-work/planning/docs/comprehensive-plan.pdf>

³³ DRBC Water Withdrawal & Consumptive Use Estimates (1990-2017) & Projections Through 2060
www.nj.gov/drbc/programs/supply/use-demand-projections2060.html

³⁴ For explanation of hydrologic unit codes (HUCs), see the USGS Hydrologic Unit Maps webpage
<https://water.usgs.gov/GIS/huc.html>

approximately 39% of the total water use in the Potomac portion of the state. In addition, the interstate (Pennsylvania-Maryland) Conococheague-Opequon watershed is estimated to have the largest amount of unreported water use in the Potomac basin (as of 2017) at approximately 34.6 MGD, primarily for self-supplied domestic and livestock purposes.

- Every five years, Potomac basin demands are forecast 30 years into the future by ICPRB's CO-OP Section. The latest study found that Washington, DC, metropolitan area demands have remained "remarkably steady for almost three decades despite continuing population growth." Water use in the Washington metropolitan area is expected to increase 10% by 2040 and 16% by 2050, taking in account the competing impacts of significant expected population growth and increased adoption of water-saving fixtures and appliances. The latest study also considered the impacts of state management decisions on basin streamflows during periods of drought.

The Water Supply Workgroup recognized that, going forward into the next planning phase of the State Water Plan, the legacy issues from the previous update should be completed. The workgroup also identified potential future activities such as evaluating potential changes to the current common law system for a more consistent and secure statutory arrangement. The workgroup envisioned that such changes in law would consider DEP's water data system to achieve a better understanding of future water demands. Additionally, the workgroup envisioned that supporting legislation would be designed to protect existing and future uses of private wells and other groundwater resources. Finally, the workgroup believed it will be important to consider the effects of climate change and to plan for more resilient water supplies and improved drought and flood monitoring.

These considerations are the basis for the following 2022 State Water Plan Update recommendations.

Water Withdrawal and Use Recommendations

1. Encourage the General Assembly to protect existing and future uses of private wells and the groundwater resources upon which they rely, by enacting legislation to require proficiency-based licensing and certification of water well drillers, and to establish statewide private water well construction standards. Considering past significant adverse reactions to similar proposals, any proposed legislation should be preceded by a strategic campaign of educational outreach.
2. DEP should work with the river basin commissions, United States Geological Survey, and other partners to: improve the utilization of reported water use data in projecting future demand trends; to aid in managing and accessing water supply and water availability on a watershed scale; and to improve the collection, assessment and dissemination of consumptive use data. Consumptive use is a key component in understanding the impact of water use on sources and long-term water availability. Such efforts should include the following actions:
 - Maintain efforts to register and report withdrawals under the provisions of Pennsylvania's Water Resources Planning Act (Act 220 of 2002) and counterpart basin commission programs, and to encourage compliance with withdrawal and consumptive use reporting programs
 - Expand the current data analytic tools (e.g., water use summaries, report viewers) to focus on consumptive use/depletions on a watershed scale

- Prior to and during the next iteration of the State Water Plan, develop projections and trends in water withdrawal and consumptive uses by watershed
 - Prior to and during the next iteration of the State Water Plan, develop projections of the impacts of climate change on water availability by watershed
 - Explore opportunities for outreach to water supply purveyors and other self-supplied water users to focus on improved water supply planning to assure long-term, reliable supplies, including considerations of water resiliency, and to maintain accurate flow metering and data reporting
 - Reevaluate the processes for using reported data and projections to identify critical and potentially stressed or challenged watersheds and assign appropriate priority for focus on watersheds based on the degree of stress or challenge
3. The statewide committee should work with DEP, the broad spectrum of stakeholders, and the General Assembly to evaluate the current effectiveness and shortcomings of Pennsylvania's existing water rights and water withdrawal arrangements, and to develop recommendations for evolving those arrangements to a more consistent, secure, and holistic approach. Once shortcomings have been identified, an evaluation of programs used in other states and compact commissions should be conducted to determine if those practices may serve as recommendations for a secure and sustainable water supply statewide. Based on that process, a report developed by the statewide committee in consultation with DEP on the relative merits of the identified options should be developed, and appropriate recommendations should be made to the General Assembly as to whether and how Pennsylvania's water rights system might be improved and made more efficient, effective, predictable, and secure.
 4. DEP should evaluate and continue to improve its drought monitoring practices and encourage proactive monitoring among public water suppliers.
 - Add targeted groundwater wells with 20-year records to the monitoring network to increase county representation
 - Seek an alternative to the Palmer Drought Severity Index, which proved unreliable for Pennsylvania in recent droughts
 - Encourage the monitoring of groundwater well water level monitoring by public water suppliers and industrial facilities that are not already required to do so and consider incorporating data into statewide drought monitoring
 5. Increased average temperatures, heavy precipitation/inland flooding and increased frequency/severity of drought impact the operations of public water suppliers. Resulting problems include the proliferation of invasive species and harmful algal blooms due to increasing temperatures, increased turbidity from disturbed sediment, or higher water levels which could overwhelm a system and inundate or damage equipment.

Considering these anticipated effects of climate change, all community water systems (as well as self-supplied users) should evaluate the vulnerabilities of their respective sources to the impacts from expected increases in both the frequency and intensity of flooding and droughts as well as redundancy and resiliency of their systems.

New monitoring or treatment technologies may need to be explored and developed to handle potential poor source water quality that results from higher intensity storms and other impacts of climate change on the ecosystem.

Community water systems should follow their Uninterrupted System Service Plan (required under 25 Pa. Code § 109.708) to promote resiliency and redundancy and, where needed seek: (i) diversification of sources (e.g., avoiding reliance on a single surface source or well field tapping the same resource); (ii) interconnection with

neighboring systems; (iii) raw or finished water storage; (iv) development and implementation of conjunctive management plans for coordinated use of surface and groundwater sources; and (v) focused monitoring of source conditions, with contingency plans for implementing conservation measures and enhanced distribution system leakage reduction measures and adjustment of water withdrawals in order to preserve the ability to meet essential needs through drought conditions.

2.4.4 Water Efficiency

Water Supply Workgroup

While the 2009 State Water Plan Principles³⁵ provided a comprehensive overview of water conservation and efficiency issues pertinent to Pennsylvania, the water conservation and efficiency recommendations in the 2009 Update focused primarily on the establishment, funding, and operations of a Technical Assistance Center as required by Act 220 of 2002. Early phases of a contractor-organized, nonprofit-based center were completed. However, significant challenges related to the organizational structure and long-term funding to maintain and carry out its functions halted its implementation.

As an alternative, the State Water Plan will now be utilizing the existing Pennsylvania Clean Water Academy³⁶ as a digital training library to house educational and outreach resources on a wide range of water resource topics, including water efficiency.

For the 2022 Update, the Water Supply Workgroup of the statewide committee met to review the 2009 Update recommendations and to formulate suggestions focused primarily on meeting today's priorities and challenges related to water efficiency. The following recommendations recognize the opportunities under the State Water Plan to disseminate technical information, address adaptation of climate change, manage public water supply assets, and accomplish overall improvement in efficiency by municipal and industrial water users.

Water Efficiency Recommendations

1. Information and materials on water efficiency technologies and practices should be developed and incorporated into the Pennsylvania Clean Water Academy [and other state information dissemination vehicles] to promote their adoption. Recommendations for administration and operation of these forums are:
 - Secure consistent funding and technical resources needed to effectively promote water use efficiency through the dissemination vehicles
 - Improve marketing and expand the audience of the Pennsylvania Clean Water Academy and other vehicles while avoiding duplication with others offering technical assistance
 - Develop materials related to water audits, leakage management, and retrofits
 - Document and disseminate goals for water use efficiency
2. The expected need for increased irrigation in the face of climate change should be assessed. Best practices for irrigation, including minimizing impact to small

³⁵ Department of Environmental Protection, Pennsylvania State Water Plan of 2009

<https://www.dep.pa.gov/Business/Water/PlanningConservation/StateWaterPlan/Pages/2009-Update.aspx>

³⁶ Department of Environmental Protection, Clean Water Academy

<https://pacleanwateracademy.remote-learner.net/>

watersheds, should be developed by the Pennsylvania Department of Agriculture with assistance from DEP, Penn State, and agricultural stakeholder groups, and disseminated via county conservation districts and other agricultural liaison entities.

3. Additional aspirations for improved water efficiency associated with Pennsylvania's municipal and industrial water users:
 - Water suppliers:
 - Adopt technology and use policies that cut water resource uses and demands at peak times of drought or resource constraints
 - Incorporate time-of-use rates that encourage using water at times of less demand
 - Install 'smart meters' that enable detailed measurement of water use in buildings to detect water leaks and other wasteful water use practices
 - Employ use of conservation rate structures such as 'inclining block' rates under which higher rates are charged for higher tiers of water consumption
 - Water users:
 - Implement technologies that reduce overall base demand
 - Manage water consumption and avoid waste such as from plumbing leaks
 - Interested Parties:
 - Conduct research and promote innovative practices through marketing incentives, outreach, and educational efforts
 - Provide support and resources to entities that have implemented or wish to implement innovative water use efficiency practices
 - Link water use efficiency to the strong existing interest in energy efficiency and expand eligibility for energy efficiency grants to water use efficiency efforts

2.4.5 Legacy Impacts

Legacy Issues Workgroup

Two significant legacy issues for Pennsylvania are abandoned mine lands (AML) and abandoned oil and gas wells. For hundreds of years, coal was mined in Pennsylvania with little thought of environmental consequences and without robust regulation of environmental impacts. It is estimated that hundreds of thousands of oil and gas wells have been drilled in Pennsylvania since 1859. Both legacy activities have left Pennsylvania with environmental damage as well as health and safety risks as pollutants continue to enter the air, land, and water.

Pennsylvania's history of addressing abandoned coal mine issues extends back into the 1960s through legislation and programs to eliminate stream pollution from abandoned as well as active coal mining operations. DEP's Well Plugging Program³⁷ was established under the authority of Pennsylvania's Oil and Gas Act

³⁷ Department of Environmental Protection, Abandoned and Orphan Well Program
<https://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/LegacyWells/Pages/default.aspx>

(1984) which was succeeded by the Pennsylvania Oil and Gas Act (Act 13 of 2012)³⁸. Further information may be found on the DEP webpage entitled Laws, Regulations and Guidelines³⁹.

Although neither abandoned mines nor abandoned oil and gas wells were addressed as specific statewide priorities in the 2009 Update, the implications of these problems, among other legacy issues, spurred the 2022 Update statewide committee to form a Legacy Issues Workgroup to investigate the subjects.

During this 2022 Update, the Legacy Issues Workgroup narrowed their focus to these two legacy issues with a goal to offer recommendations to improve upon the efforts already underway at the Federal and commonwealth levels. The workgroup examined Pennsylvania's legacy of mining and oil/gas well development and considered past and current approaches in addressing the myriad of environmental problems these legacies continue to pose today. After reflecting on the status of programs and decades of cleanup efforts, the Legacy Issues Workgroup offers the following recommendations for DEP's consideration in support of federal and commonwealth efforts to sustain, extend, and improve abandoned mine drainage (AMD) treatment, other AML programs, as well as identify and plug abandoned and orphaned oil and gas wells.

Extended discussions on these subjects are available in [Appendix D](#) under the documents entitled "Overview of Pennsylvania's Coal Mining Legacy" and "Overview of the Oil and Gas Industry – the Legacy Well."

Consider the following sources for more information on Pennsylvania's mining legacy/AML and abandoned and orphan wells.

- PA's Mining Legacy and AML⁴⁰
- Rewriting Pennsylvania's Legacy – Abandoned and Orphan Well Program³⁷

Legacy Coal Mining Recommendations

The water quality impacts from coal mining are primarily attributable to mine drainage associated with abandoned mines and coal refuse sites. Long-term treatment of mine drainage through active and passive systems is essential to improve water quality in AMD affected streams, and sustainable funding is needed to maintain such treatment. Additionally, it is important to recognize the role nonprofit organizations play in the operation of treatment facilities and to continue to push for federal Good Samaritan legislation to prevent these organizations from becoming liable under law for mine discharges they are not responsible for causing.

1. DEP should continue to support efforts, including federal legislation, that provide additional funding, in a set-aside account, for addressing AML sites. It should be noted that DEP has been actively preparing for a prospective influx of funding from the federal level to support a set-aside account.

³⁸ Department of Environmental Protection, Oil and Gas, Title 58, Oil and Gas
<https://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/2012/act13.pdf>

³⁹ Department of Environmental Protection, Office of Oil and Gas Management, Laws, Regulations and Guidelines
<https://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Pages/Laws,-Regulations-and-Guidelines.aspx>

⁴⁰ Department of Environmental Protection, PA's Mining Legacy and AML
<https://www.dep.pa.gov/Business/Land/Mining/AbandonedMineReclamation/AMLProgramInformation/Pages/PA's-Mining-Legacy-and-AML.aspx>

2. DEP should continue to issue grants and develop maintenance funding for small treatment systems.
3. To the fullest extent possible, DEP should consider regionalization and consolidation of treatment systems, if economically feasible.
4. To the fullest extent possible, DEP should consider ways to develop sustainable funding for long-term treatment of AMD from any abandoned source.
5. DEP should support efforts to pass a Community Relations Partnership Act at the federal level, to protect Good Samaritans.
6. DEP should ensure that adequate funds are in the AMD set-aside account. These funds need to be:
 - Encumbered to provide for long-term water treatment for the mine drainage treatment facilities built.
 - Tied to interest or investment earning accounts where the revenues are equal to or more than the funds needed to provide the treatment requirements.

Legacy Well Recommendations

1. DEP should continue to support efforts, including federal legislation, that provide additional funding for identifying and addressing oil and gas wells (inactive, abandoned, and orphan) to expand the magnitude and scope of the work the agency is currently conducting. Examples of such legislation include bills that amend "Section 349 of the Federal Energy Policy Act of 2005 (42 U.S.C. 15907)" by providing funding for the states for the following purposes:
 - To identify and characterize undocumented orphan wells on state and private land.
 - To rank orphan wells based on factors including: (I) public health and safety; (II) potential environmental harm; and (III) other land use priorities.
 - To decommission orphan wells located on state-owned or privately owned land.
 - To make information regarding the use of funds received under the proposed federal bill available on a public website.
 - To measure and track: (I) emissions of methane and other gases associated with orphan wells; and (II) contamination of ground water or surface water associated with orphan wells.
 - To remediate soil and restore native species habitat that has been degraded due to the presence of orphan wells and associated pipelines, facilities, and infrastructure.
 - To remediate land adjacent to orphan wells and decommission or remove associated pipelines, facilities, and infrastructure.
 - To identify and address any disproportionate burden of adverse human health or environmental effects of orphan wells on communities of color, low-income communities, and tribal and indigenous communities.

It should be noted that DEP has been actively preparing for a prospective influx of funding from the federal level or other sources to take advantage of these potential opportunities.

2. DEP, as part of its Climate Change Program efforts, should look to generate revenues associated with the decommissioning of legacy wells by acquiring carbon credits and selling them. Pound for pound, the comparative impact of methane (CH₄) is 25 times greater than carbon dioxide (CO₂) over a 100-year period⁴¹ which should provide a means of generating carbon credits that can be sold in the marketplace.
3. In addition, DEP should continue to explore opportunities for third parties to decommission legacy wells and obtain carbon offsets for sale in the open carbon market.
4. DEP should continue to coordinate with third parties to decommission legacy wells and evaluate efficiencies that will lower costs for decommissioning without affecting long-term plug performance

⁴¹ U.S. Environmental Protection Agency, Overview of Greenhouse Gases
<https://www.epa.gov/ghgemissions/overview-greenhouse-gases>

2.4.6 Drinking Water and Wastewater Sustainable Infrastructure

Drinking Water/Wastewater Infrastructure Sustainability Workgroup

Discussion

At the time of the last iteration of the Pennsylvania State Water Plan, the Governor's Sustainable Infrastructure Task Force (Task Force)⁴² was engaged in a broad and comprehensive review of the state of the commonwealth's drinking water and wastewater systems, and the plan provided for subsequent review of the Task Force's final report prior to making specific recommendations related to ensuring the long-term sustainability of Pennsylvania's water infrastructure. The issues evaluated by the Task Force, detailed more than a decade ago, remain concerns today for the long-term viability and sustainability of our drinking water and wastewater systems to ensure clean, potable drinking water to all Pennsylvanians and to provide for adequate sewage disposal in clean efficient ways to protect water quality and the environment.

The Task Force's final report, entitled *Creating a Sustainable Solution for Pennsylvania*, was issued in November 2008, providing a sober assessment of the many challenges facing our water and wastewater infrastructure. As the Task Force aptly observed:

"Pennsylvania's drinking water and wastewater systems are critical to protecting public health, the environment, and the continuing economic vitality of the commonwealth; yet, many of these systems have been allowed to deteriorate, resulting in an urgent need for repairs and replacements. Leaking collection and distribution systems, poorly maintained treatment facilities, and combined sewer overflows (CSOs) are common throughout the state."

In 2008, the Task Force projected the then existing infrastructure capital needs to address drinking water system deficiencies and needed improvements, CSOs, costs of nutrient removal, total maximum daily loads, and other challenges, to be approximately \$11.5 billion for drinking water and \$25 billion for wastewater systems respectively (stated in 2007 dollars). With regard to drinking water systems, the long-term funding challenge (capital plus operation and maintenance, and debt retirement for the next 20 years) was projected at more than \$38.9 billion, with the greatest needs concentrated in the smallest systems (those serving a population of less than 3,300 and in the largest systems serving populations more than 50,000). As evaluated by the Task Force, wastewater systems faced even more daunting long-term financial challenges, with a projected 20-year total of \$74.4 billion, with the vast majority of that challenge facing the larger systems with flows exceeding 5 million gallons per day (MGD).

To address these challenges, the final Task Force report reviewed a number of options and offered cogent conclusions and recommendations on a variety of topics. Among those conclusions and recommendations were the following:

- Water and wastewater systems need to be maintained and managed, both fiscally and physically, to ensure the long-term efficacy of their plants, systems, and equipment to ensure clean water and safe and efficient disposal of wastewater in the future.
- The public, consumers and operators need to understand the true value and cost of the water and wastewater service and the true cost of providing a safe,

⁴² Created by Executive Order 2008-02.

adequate, and reliable water supply and a wastewater collection and treatment system protective of public health.

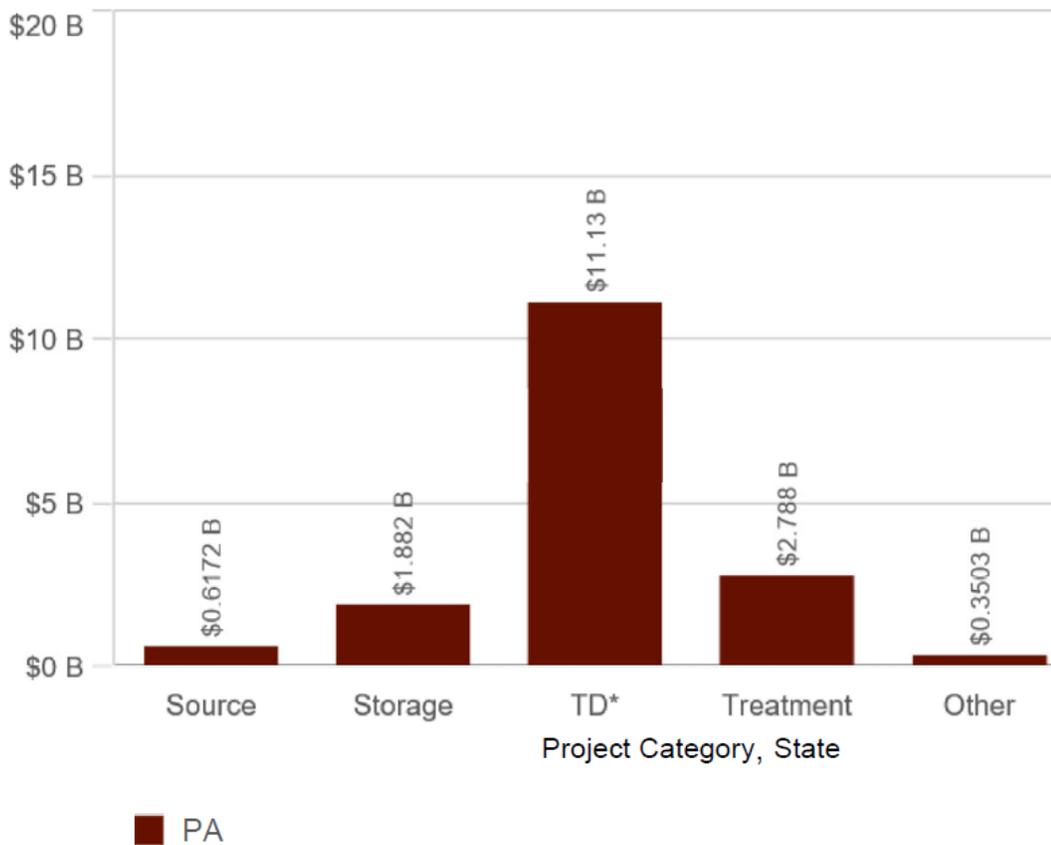
- Water and wastewater systems should be encouraged to regularly analyze the short and long-term costs of running their system and establish rates and efficient management strategies based upon the full cost of service to ensure long-term stability, clean and reliable drinking water supplies, and proper wastewater management.
- To assure that funds are available when upgrades or replacement is needed, all systems should be required to establish a repair and replacement fund.
- Where appropriate, regionalization and rightsizing of systems should be encouraged to consider interconnections for redundancy, as well as regional management and planning, shared purchasing, and potentially shared staffing, as well as encouragement of public-private partnerships and incentives for projects promoting regional cooperation.

These findings and recommendations provide a useful framing of challenges that have faced Pennsylvania's water infrastructure, and national trends and economic strains have led to further challenges, although the data on which they were based is somewhat dated. Among Pennsylvania's challenges are (1) the ongoing need for updated information concerning the physical and economic condition of our water and wastewater systems; (2) a number of older water and wastewater systems in financially-stressed communities (both large and small) needing significant rehabilitation and improvements; (3) challenges in encouraging and supporting smaller systems in their incorporation of long-term planning for improvements, maintenance, upgrades and new technology in their management and budget processes; and (4) concerns for identifying and implementing solutions that are affordable to communities and consumers (particularly in systems with lower income populations). The economic downturn resulting from the Great Recession of 2007-2009, coupled with reduced tax revenues, competing needs, and rising municipal pension costs have strained the finances of many Pennsylvania communities, leading in some cases to deferral of maintenance and infrastructure rehabilitation and upgrades. In addition, major new issues have come to the fore, including (1) the public realization after the Flint Michigan crisis of the need to address lead in drinking water, including replacement of lead containing service lines; and (2) recognition of risks associated with emerging contaminants including "forever chemicals" such as PFOS and PFOA in drinking water.

By law, the EPA with DEP's assistance conducts "needs assessments" of drinking water systems and wastewater systems every four years, utilizing a survey method to obtain information from individual system operators. For drinking water systems, the Drinking Water Infrastructure Needs Survey and Assessment Sixth Report to Congress, issued in March 2018, but based on 2015 data, is the latest available. The Sixth Report estimated a 20-year capital need for Pennsylvania drinking water systems of \$16.772 billion, broken down as depicted in Figure 7.

Figure 7. Estimated 20-year capital needs for Pennsylvania drinking water systems by project category.

Source: EPA⁴³



TD = Transmission and Distribution

With respect to wastewater systems, the latest available survey information is provided in EPA’s Clean Watersheds Needs Survey 2012 Report to Congress issued in January 2016. Based on the 2012 survey, EPA projected a total documented wastewater need for Pennsylvania of only \$6.950 billion (which represented a substantial reduction from the estimate derived from the 2008 survey of \$13.542 billion in 2012 dollars), but had no projection as to capital needs for Pennsylvania with respect to stormwater.

A notable point is that the EPA projections are based on data that is six to nine years old, from surveys that were conducted before some of the latest challenges came to be recognized. Updated needs surveys are underway and will hopefully provide a more recent picture of projected requirements. However, it should be recognized that those surveys are inherently dependent upon the candor and completeness of the individual system operators filling out the survey forms. This highlights the need for more granular and objective data collection.

One thing that is clear is that Pennsylvania has a very high infrastructure investment and renewal challenge, a large part of which is derived from three key factors:

⁴³ EPA’s 6th Drinking Water Infrastructure Needs Survey and Assessment
<https://www.epa.gov/dwsrf/epas-6th-drinking-water-infrastructure-needs-survey-and-assessment>

(1) the relative age of Pennsylvania's systems; (2) the relatively large number of small water and wastewater systems across the commonwealth; and (3) location of systems in financially strapped and distressed communities.

In part as a result of historic growth patterns, a large number of municipalities, and other factors, Pennsylvania has a very high number of drinking water and wastewater systems. DEP's most current data indicates a total of 8,085 public water supply systems in the state, of which approximately 1,900 are community water systems. Approximately 84% of the community drinking water systems are classified as being small and some have shortcomings in technical, managerial, and financial capacity.

Likewise, the commonwealth has a total of 1,994 sewage facilities having NPDES permits. Of those, 309 are considered "major" having design flows equal to or less than 1 MGD and 1,685 considered "minor" having design flows less than 1 MGD. As observed by the Task Force back in 2008, small systems can have some of the greatest management, financial and capital investment hurdles to achieving sustainability and meeting regulatory requirements.

To encourage both long-term planning and fiscal responsibility, existing DEP programs provide technical assistance to drinking water systems.

The DEP Bureau of Safe Drinking Water (BSDW) includes a Technical Assistance Section which is made up of seven Water Program Specialists who are highly trained and experienced staff that implement a variety of technical assistance programs for drinking water systems statewide. The primary goal is violation prevention and compliance assistance. EPA provides funding for some of these programs which are also referred to on a national level as capacity development activities. The primary technical assistance programs offered by BSDW include:

- Capability Enhancement – Reviews technical, managerial, and financial capabilities with recommendations for improvement to small drinking water systems.
- Distribution System Optimization – Assists community drinking water systems in evaluating and better understanding water quality and water age throughout their distribution system.
- Operator Outreach – Employs wage payroll staff who are experienced operators capable of providing peer to peer technical assistance that focuses on enhancing routine operational procedures.
- Partnership for Safe Water – Through an agreement with the Pennsylvania Section of the American Water Works Association, this national program is implemented at the state level to encourage voluntary self-assessment of all portions of treatment and voluntary development of action plans to improve performance.
- Professional Engineering Services – Assists small drinking water systems with feasibility studies and permit preparation for projects which are considered critical to maintain or return to compliance.

The above information is a short summary of the primary technical assistance programs. A full list of technical assistance programs that are offered by BSDW,

along with a detailed explanation for each, may be found on the DEP Safe Drinking Water website.⁴⁴

A yearly report on progress at Pennsylvania's public drinking water systems in achieving and enhancing their technical, managerial, and financial capability may be found on the DEP Capability Enhancement webpage.⁴⁵

The DEP Bureau of Clean Water also offers an Enhanced Technical Assistance Evaluation (ETAE) with the goal of assisting operators and permittees of wastewater treatment systems in reducing nutrients in their plant discharges while maintaining and/or surpassing the requirements of effluent limits established in NPDES permits.

DEP representatives utilize in-line process monitoring equipment and various bench top laboratory equipment to assist operators in gathering process control and performance information.

1. The equipment is capable of monitoring the waste treatment process for ammonia, nitrates, dissolved oxygen, pH, mixed liquor suspended solids (MLSS), oxidation-reduction potential (ORP), biological oxygen demand (BOD) (equivalent), and clarifier solids blanket levels.
2. Equipment provides operators with instantaneous visual monitoring of the waste treatment process allowing them to monitor process modifications firsthand and document positive or negative impacts.
3. DEP representatives managing the program and operating the equipment are fully trained and maintain current Pennsylvania Wastewater Operator Certification Licensing.
4. Projects occurring to date include working with facilities to accomplish nitrate reduction, nitrification optimization, energy conservation, microscopic evaluation of biomass, and solids management.
5. DEP representatives will work with operators to review process control testing and learn the value of using data trending to control and possibly predict plant operations.
6. The in-line process monitoring equipment provides operators with 24/7 access to their process monitoring data. Additionally, DEP representatives have the capability of providing graphical outputs to readily identify trends and optimum set points.

Results of ETAEs are summarized in reports. To learn more about what ETAEs have done for facilities across the commonwealth, visit our [Helping Facilities Succeed](#) page⁴⁶.

⁴⁴ Department of Environmental Protection, Bureau of Safe Drinking Water

<https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/Pages/default.aspx>

⁴⁵ Department of Environmental Protection, Governor's Report on the Capability Enhancement Program

<https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/CapabilityEnhancement/Pages/Governor%27s-Report.aspx>

⁴⁶ Department of Environmental Protection, Helping Facilities Succeed

<https://www.dep.pa.gov/Business/Water/CleanWater/WastewaterOps/Pages/Helping-Facilities-Succeed.aspx>

More information, including details on how to make a request for assistance can be found on the Wastewater Operations webpage.⁴⁷

Both DEP and PUC have encouraged existing water and wastewater systems under their jurisdiction to develop system assessments and business plans to forecast and plan for infrastructure renewal and investment. The PUC's regulations are most far reaching. Investor owned utilities who wish to utilize the distribution and collection system improvement charge ("DISC") option are subject to regulatory mandates to develop and submit to the PUC a Long Term Infrastructure Improvement Plan at minimum 5-year intervals, supplemented by annual reporting in what are referred to as Annual Asset Optimization Plans. DEP drinking water regulations require the submission of business plans for any new public water systems being permitted after 1996, but as per limitations in the federal Safe Drinking Water Act (SDWA), that mandate does not apply to the multitude of pre-existing water systems.

With regard to wastewater systems, the Pennsylvania Sewage Facilities Act (Act 537) requires municipalities to evaluate and address, in conjunction with land use and planning, long-term sewage needs within their jurisdictions to ensure the safe and effective disposal of sewage wastes. Act 537 plans are to provide comprehensive programs for disposal of sewage including programs for decentralized, on-lot, sewage facilities permitting, operation, and maintenance and the management of centralized collection and treatment of sewage. Although Act 537 does not specifically refer to asset management as a requirement, it does require that plans include an evaluation of financing methods to implement the proposed sewage service alternative, and an assessment of the ability to implement the proposed sewage service approach, including a designation of the institutional arrangements necessary for implementation of the plan.

In reviewing proposed Act 537 plans, DEP is required to consider whether the plan or plan revision is able to be implemented. This planning function is a good first step, but at the same time, after adoption of an Act 537 plan, the critical follow-up issue is whether and how those plans are actually implemented. The Act 537 planning program alone cannot assure that systems are operated on a sustainable basis. Municipalities responsible for 537 Plan adoption do not typically monitor the financial status and administrative performance of non-municipal systems; and apart from Ch. 94 wastewater reports focused on identifying potential overload issues, wastewater system operators are not required to submit information to an agency on their assessment of and methods of addressing infrastructure maintenance, repair and replacement needs.

Over the past decade, a number of municipal water and wastewater systems have been purchased by investor-owned public utilities regulated by the PUC. In part, this trend has arisen as municipalities have sought to sell their water or wastewater system assets to investor owned utilities, a process which has been encouraged by Act 12 of 2016, which allows utilities to establish rates based on the appraised "fair market value" of the water and wastewater systems they have acquired.

Asset management plans help systems manage and sustain their systems and services by better understanding near and long-term operational and capital needs. So, having all systems develop and implement sustainable asset management plans is a laudable long-term objective. At the same time, careful consideration needs to be given to the resources needed by systems (particularly smaller

⁴⁷ Department of Environmental Protection, Bureau of Clean Water
<https://www.dep.pa.gov/Business/Water/CleanWater/WastewaterOps/Pages/Enhanced-Technical-Assistance-.aspx>

systems) to prepare such plans, identifying who will review them, and establishing mechanisms to ensure that they are implemented.

PENNVEST supports the development and implementation of asset management. PENNVEST currently will provide up to \$25,000 for development of an asset management plan for project funding recipients. A question to be resolved is whether that amount is adequate. PENNVEST Programmatic Financing provides for funding multi-year cash flow needs of a utility, rather than the traditional project by project funding approach. A Programmatic funding package funds a Capital Improvement Plan (in entirety or in part) for a group of drinking water or wastewater projects if each individual project or phase of projects is eligible and in compliance with the PENNVEST program requirements. Shifting from short-term project financing to long-term program financing ensures long-term funding is available to facilitate timely replacement of deteriorating infrastructure and incentivizes funding to utilities that develop and implement asset management through long-term capital improvement plans.

Finally, we need to recognize that affordability is a challenge closely associated with the sustainability of our water and wastewater infrastructure. The funding required to rehabilitate and maintain our aging infrastructure and the investments needed for improvements are substantial. In many communities across the commonwealth – both urban and rural – those costs equate to per household charges that can be significant burdens for lower and some middle-income members of the community. EPA has developed “affordability” policies and guidance for assessing community affordability criteria (considering annual costs compared to household income and the financial capability of communities to raise required capital funding).⁴⁸ However, application of those policies is limited to consideration in negotiating the timeframes for completing certain water quality or drinking water improvement requirements (e.g., the timing of combined sewer overflow long term control plan projects). But in the broader context, the challenge of affordability in communities arises where high costs of necessary infrastructure repairs and improvements result in rates beyond the capability of low-income customers or a challenge for some middle-income customers to pay. Unpaid utility bills serve no customer’s or system’s interests. And deferral of system maintenance or improvements to meet water quality and drinking water safety standards is not a solution to “affordability” - as such deferrals both place public health at risk and often result in even greater rehabilitation and restoration costs down the road.

To a degree, the types of federal support provided via the US Department of Agriculture’s Rural Utilities Service Water and Environmental Programs⁴⁹ and measures such as the \$67 million awarded in 2022 to Pennsylvania in additional contributions to the clean water and drinking water state revolving funds and the 2022 Infrastructure and Jobs Act which has provided \$240 million to Pennsylvania in additional funding for wastewater and drinking water, can be helpful. But federal financial assistance is not a complete or particularly reliable long-term solution to sustainable infrastructure or affordability. Likewise, state programs, such as

⁴⁸ See, for example, USEPA, *2021 Financial Capability Assessment Guidance* (Prepublication Draft, January 2021), available at https://www.epa.gov/sites/default/files/2021-01/documents/2021_fca_guidance_-_january_13_2021_final_prepub.pdf; USEPA. *Combined Sewer Overflows - Guidance for Financial Capability Assessment and Schedule Development* (1997); USEPA, *Financial Capability Assessment Framework for Municipal Clean Water Act Requirements* (2014).

⁴⁹ <https://www.rd.usda.gov/programs-services/water-environmental-programs>.

PENNVEST low interest loans, can contribute to affordability, but PENNVEST programs are limited to amounts available in current state revolving funds.

Recommendations

1. DEP, under its State Water Plan Program, with the assistance of the Statewide Water Resources Committee and other DEP water programs is encouraged to investigate the feasibility of coordinating with PUC and other agencies in the collection and periodic updating of data related to infrastructure capital needs. This first step would facilitate the preparation needed for re-establishing a Sustainable Infrastructure Task Force to review the data and provide recommendations for the long-term sustainability of Pennsylvania's water infrastructure.
2. Water and wastewater systems (public and private) should be encouraged to evaluate and plan for their future and long-term infrastructure needs, including the inventory and assessment of the condition of their infrastructure assets and a plan to pay for needed maintenance, replacements, upgrades, and new regulatory requirements. Such efforts are essential to avoid catastrophic repair costs that can result from deferred maintenance and thus ensure that all Pennsylvanians have the ability to obtain clean, potable water and efficient, environmentally-safe sewage disposal, and the confidence in their provider's ability to sustain their water and wastewater systems in the future. With regard to sewage facilities, Municipal Sewage Facilities Plans required by Act 537 should periodically review the sustainable management and ongoing financially viable operation of systems within their jurisdiction. These reports should be shared with the affected local governments to coordinate their land use planning and zoning with the water and wastewater planning and to engage them in comprehensive planning for the future as well.
3. The General Assembly and Executive Branch should consider and adopt appropriate legislation and policies that promote the preparation and implementation of water and wastewater system asset management plans where feasible with adequate planning and lead time, taking into consideration affordability criteria, and which provide assistance to smaller systems to facilitate the development of such plans.
 - a. As noted above, PENNVEST currently supports the development and implementation of asset management plans through the provision of up to \$25,000 for development of asset management plans by project funding recipients. Consideration should be given to increasing the maximum assistance for such plans to \$50,000. To the extent it is not already the case, as a condition of obtaining grant or loan funding for water and wastewater infrastructure projects, project funding recipients should be required to develop such asset plans within a prescribed time frame, so that there is reasonable assurance that the infrastructure being assisted will be maintained in a sustainable manner going into the future.
 - b. To assist smaller systems, BSDW contracts with experienced operators to provide technical assistance and asset management strategies. Additional funding and resources to expand this program as well as education and outreach efforts to promote it could make this effort even more effective.
 - c. DEP should evaluate whether the Act 537 planning program can be adjusted to provide a more effective method for monitoring and assuring that wastewater systems are being properly managed and sustainably operated. Consideration should be given to amendments to 25 Pa. Code Ch. 71 to require municipalities as part of their Act 537 planning obligations

to conduct periodic reviews of the sustainable management of systems within their jurisdiction, and to submit reports indicating findings and recommendations for improvements to assure ongoing viability of system operations. Concurrently, in order to reinvigorate the Act 537 process to include ongoing evaluation of system sustainable management, the Governor and General Assembly should reestablish and fund the sewage facilities planning and enforcement reimbursement program to assist communities in more effectively performing this important function.

- d. The Governor and General Assembly should consider strengthening the Professional Engineering Services program with state general funds and/or increased DEP staffing levels to manage contracts and programs that works with public water supply systems and to expand their capability in outreach particularly to smaller water systems needing help in assessing technical, managerial, and financial challenges. Utilizing funds provided through the recently adopted federal infrastructure legislation, a similar focused Professional Engineering Services program and outreach and assistance effort should be established to address the challenges faced by small wastewater systems.
4. Federal and state drinking water regulations provide for the preparation and publication of “consumer confidence reports” on the quality of water distributed by drinking water systems, and DEP’s existing Chapter 109 rules governing community water systems require the submission of business plans for new community systems. However, currently there is no ongoing generally applicable process for evaluating, and providing to the public information on, the physical condition and sustainable management of public water supply systems. The Statewide Committee, DEP, and PUC should work together, in consultation with concerned stakeholders, to consider and evaluate potential alternative methods (whether through appropriate regulatory or program changes and/or legislative proposals) for assuring performance of systematic assessments of water system conditions and improvement needs, and providing the public with information regarding implementation of sustainable management programs.
5. PENNVEST is encouraged to promote its Programmatic Financing Guidance (ProFi)⁵⁰ which provides for funding multi-year cash flow needs of a utility, rather than the traditional project by project funding approach. A programmatic funding package funds a Capital Improvement Plan (in entirety or in part) for a group of drinking water or wastewater projects if each individual project or phase of projects is eligible and prepared in compliance with the PENNVEST program requirements. Shifting from short-term project financing to long-term program financing ensures long-term funding is available to facilitate timely replacement of deteriorating infrastructure and incentivizes funding to utilities that develop and implement asset management through long-term capital improvement plans.
6. Financially-challenged systems should be encouraged to examine and consider alternative arrangements for assuring technical, managerial, and financial capability. Such arrangements may include, where appropriate,

⁵⁰ PENNVEST programmatic Financing (ProFi) Guidance
<https://www.pennvest.pa.gov/Information/Funding-Programs/Pages/ProFi.aspx>

consideration of contracting for management services, shared management service arrangements, or public-public or public-private partnerships.

7. The Governor's Office should convene a committee to engage in a focused dialogue on affordability issues, including an assessment of the scope of affordability challenges, and develop recommendations for legislative, policy, funding and other measures. The recommendations should take into consideration the enhancement of water and wastewater service affordability for low income customers as part of a holistic approach to infrastructure sustainability.

2.4.7 Contaminants of Emerging Concern

Emerging Contaminants and Water Quality Workgroup

Not addressed in the 2009 Update, but of increasing concern for water quality today, are “emerging contaminants” or “contaminants of emerging concern” (CECs). CEC compounds are typically unregulated substances for which there is an emerging or evolving scientific understanding of the risk they pose to human health, aquatic life, or the environment. They are found in a wide range of products such as pharmaceuticals and personal care products as well as industrial, household, agricultural, and manufactured goods.

Since CECs are typically unregulated substances, they usually do not have any associated ambient water quality criteria or enforceable drinking water standards controlling or regulating the substances. However, continued research into CECs and development of regulations will help reduce adverse impacts on human and aquatic life.

The process to reduce or control a source of a new CEC is to:

- Develop a data-based process/methodology for naming a new CEC
- Create a pathway to analyze potential seriousness of impact, then develop a strategy to address
- Define a process for containment

In the recent past, DEP has taken steps to address a particular subset of CECs known as perfluoroalkyl and polyfluoroalkyl substances (PFAS). These actions include participation with other commonwealth agencies in a PFAS Action Team to assess the potential environmental and health effects of PFAS and recommend strategies to reduce or eliminate the impacts.

DEP collaborated with the United States Geological Survey and the Susquehanna River Basin Commission on a sampling study of PFAS at surface water quality network stations. Other DEP involvement in addressing CECs includes toxic contaminants research, policy, and prevention efforts under the Chesapeake Bay Program. Background information on CECs including PFAS, endocrine disrupting compounds, and DEP sampling studies involving sediment and neonicotinoid insecticides may be found at:

- The DEP Water Quality Division’s webpage on Contaminants of Emerging Concern⁵¹
- The DEP Safe Drinking Water Program’s Emerging Contaminants Frequently Asked Questions⁵² webpage

On October 12, 2022, Pennsylvania’s Environmental Quality Board (EQB), adopted a final rulemaking⁵³ that would set PFAS standards for public water systems.

⁵¹ Department of Environmental Protection, Contaminants of Emerging Concern (CECs)
<https://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/Pages/CECs.aspx>

⁵² Department of Environmental Protection, Emerging Contaminants, Frequently Asked Questions
<https://www.dep.pa.gov/Citizens/My-Water/PublicDrinkingWater/Pages/Emerging-Contaminants.aspx>

⁵³ Final-form Rulemaking Documents PFAS MCL Rule in Meeting Summary Documents of EQB Meeting on October 12, 2022
<https://www.dep.pa.gov/PublicParticipation/EnvironmentalQuality/Pages/2022-Meetings.aspx>

On the federal level, EPA is increasing its commitment to addressing CECs, especially for PFAS, through the development of a PFAS Strategic Roadmap⁵⁴.

From the 2021 Bipartisan Infrastructure Investment and Jobs Act, the EPA will be investing \$4 billion to address emerging contaminants through the Drinking Water State Revolving Funds, \$5 billion to address emerging contaminants in disadvantaged communities through Water Infrastructure Improvements for the Nation (WIIN) Grants and under Clean Water for Communities, and \$1 billion to address emerging contaminants through Clean Water State Revolving Funds⁵⁵.

DEP collaborates with EPA, shares data, and utilizes EPA funding for DEP water quality monitoring work generally, including CEC monitoring. Under certain circumstances, DEP may take the initiative in research and relevance of emerging contaminants as well as develop regulatory proposals.

Leadership at the federal, state, and local levels will continue to make the biggest impacts towards regulating, cleaning up, and preventing contamination from CECs. With this in mind, for the 2022 Update, the Emerging Contaminants and Water Quality workgroup under the statewide committee has developed the following recommendations to be implemented through the establishment of a statewide CEC program, to strengthen the support to DEP in fulfilling its duties regarding emerging contaminants and to encourage the federal government to extend their responsibilities.

General recommendations to expand the statewide Contaminants of Emerging Concern (CEC) program

DEP should expand and further coordinate its CEC program to include relevant program leads with a CEC nexus. DEP's CEC program should also be expanded by identifying and engaging partner organizations that are examining CECs, including sister commonwealth agencies and river basin commissions. The envisioned purpose of the expanded and further coordinated DEP CEC program is to establish collaborative engagement. This program would evaluate occurrence monitoring data/trends and would apply screening criteria to prioritize and assess CEC for state action. Through this screening process, the program would:

- Develop a list of candidate CECs including their source, routes, and effects
- Maintain a publicly accessible website that summarizes the status of each candidate CEC

Finally, DEP would develop strategies for monitoring, managing, and addressing specific CECs as well as developing a process for identifying next contaminants of concern.

Specific recommendations

1. The General Assembly should consider providing additional funding support for financing and establishment of an Emerging Contaminants program.
2. DEP labs should receive support for testing an expanded list of analytes. Additional dedicated funding would provide for needed staff and analytical

⁵⁴ United States Environmental Protection Agency, PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024 <https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024>

⁵⁵ United States Environmental Protection Agency, FACT SHEET: EPA & The Bipartisan Infrastructure Law <https://www.epa.gov/infrastructure/fact-sheet-epa-bipartisan-infrastructure-law>

equipment and would address any needed accreditation to assure data is defensible.

3. DEP should establish the impact and risk to the environment and human health in conjunction with having an in-house toxicologist to assist with risk assessments.
4. DEP should encourage the federal government to develop data and reports establishing the risk to the environment and human health followed by development of national Maximum Contaminant Levels and Water Quality Criteria for CECs.

2.4.8 Assessment of Navigation Needs and the Means for Restoration, Development, and Improvement of Transportation by Water

Introduction

Pennsylvania's commercial and recreational navigation assets provide significant economic benefit to the commonwealth. Navigational commerce offers direct employment and supports thriving businesses that depend on the availability of commercial ports and accessible waterways. Because commercial port activities on the Delaware Estuary, Lake Erie, and on the Allegheny, Monongahela and Ohio Rivers are vital to the economy of surrounding regions, recommendations are focused on these corridors.

Many Pennsylvanians and visitors to the commonwealth enjoy a diversity of recreational boating, fishing opportunities, and other water sports that further contribute to the economic strength and quality of life in Pennsylvania.

Commercial shipping offers advantages of larger bulk load capacities for the movement of goods. While improvements can be made to an aging fleet, it should be noted that within the Great Lakes System a seaway vessel loaded at 30,000 tons carries the equivalent of 301 rail cars or 963 trucks. A 1,000-foot Lake Freighters carrying 62,000 tons of cargo carries the equivalent of 564 railcars or 2,340 trucks.

The commonwealth has a legal obligation to preserve public rights in submerged lands of the commonwealth and navigation. Pennsylvania's water resources management decisions should support both commercial and recreational navigation opportunities but must also carefully consider public trust responsibilities as well as economic benefits, the needs of water-dependent uses, wetland and aquatic resources preservation, and private property rights.

Institutionally, there are numerous public and private organizations and programs that collectively manage and support commercial and recreational navigation. Examples include:

- Port authorities
- Private sector interests in shipping and support services
- U.S. Army Corps of Engineers' divisions and districts – dredging, infrastructure construction related to reservoir management, locks and dams and port facilities, and public access areas
- U.S. Department of Homeland Security
- Coast Guard districts and sectors, aids to navigation, ice breaking, and recreational boating safety program funding to states
- Water quality monitoring, ballast water management, and emergency response systems

- Interstate compact commissions and international treaty organizations
- State agencies, including the Departments of Environmental Protection, Conservation and Natural Resources, Transportation and the Fish and Boat Commission
- U.S. and Pennsylvania Geological Surveys, EPA, and the National Park Service
- Marina and other access owners and operators
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration – charting, weather services and planning support, coastal resources management and Sea Grant programs through state partnerships
- Pennsylvania Water Trail Partnership

Challenges

The environmental risks and impacts of commercial and recreational navigation differ by region in the commonwealth. Infrastructure needs also vary widely, extending from locks and dams, flood protection and flow management, navigational aids, and reservoir operations. Dredging equipment and dredged material disposal facilities, applied technological solutions for preventing the introduction and spread of invasive species (including ballast water discharge controls), short sea shipping, ferry boat support facilities and special structures related to tidal estuary, and marine shipping requirements present additional challenges. Vessel types capable of operating globally and using regional infrastructure vary broadly, as do sanitation needs for marine or freshwater environments. In addition, flow management, flooding, water quantity protection, and monitoring strategies are not regionally or internationally consistent.

Commercial shipping, international trade and maintenance of federal navigation channels and recreational boating harbors raise multifaceted management issues related to aquatic habitats and dredged material disposal.

Because of the importance of commercial and recreational navigation to the commonwealth, specific steps are needed to address these challenges.

Recommendations

1. Hydrology and channel configuration create the fundamental conditions for navigation in Pennsylvania's waters. Where appropriate, the commonwealth should build on prior efforts related to infrastructure construction, shipping channel maintenance, security, adequate flow management, and water quality protection to support commercial and recreational navigation. Also crucial are related mapping and dredging activities to allow safe passage. The commonwealth should work closely with the United States Army Corps of Engineers and other operators of dams and impoundments to maximize the benefits of multiple use management. The commonwealth should support bathymetric mapping of waterways used for navigation currently being conducted by the United States Geological Survey and the Pennsylvania Department of Conservation and Natural Resources. The federal Water Resources Development Act of 2020 provides special budgetary treatment for amounts appropriated from the Harbor Maintenance Trust Fund – up to a cap defined in law. This provision is meant to eliminate budget constraints and allow full use of Harbor Maintenance Tax revenue.

2. Safe and effective management of dredged material is important to navigation on rivers and lakes. The commonwealth, and other resource regulators and operators, should manage dredging and dredged material for multiple purposes such as enhanced navigation, beneficial uses, protection of watercourses and wetlands, and beach formation.
3. The commonwealth should support the Pennsylvania Department of Transportation, Bureau of Rail, Freight, Ports, and Waterways, as it works with federal agencies, to help regional port authorities develop strategic plans for the management of commercial navigation in Pennsylvania. The commonwealth should continue to promote the competitive position of the Ports of Philadelphia, Pittsburgh, and Erie.
4. The commonwealth should continue to address navigation-related water quality and quantity issues such as ballast water management, wastewater and trash disposal from commercial and recreational vessels, monitoring systems, emergency response, and security management.
5. The commonwealth should continue to manage public natural resources in the beds of navigable waterways, subject to the permitting and submerged lands license or legislative lease process provided under the Dam Safety and Encroachments Act, as well as the requirements of the Fish and Boat Code.
6. The commonwealth should continuously evaluate infrastructure needs for locks and dams, dockwalls, shore power, reservoirs, and intermodal transportation facilities. Where appropriate, the Pennsylvania Fish and Boat Commission should continue to fund or endorse dam removals where the dams no longer serve a useful purpose, thereby improving migratory fish passage and eliminating obstructions to recreational navigation. The commonwealth should periodically re-examine its institutional arrangements for evaluating infrastructure needs and their adequacy for achieving the commonwealth's goals.
7. The commonwealth should continue to participate in regional institutional efforts to manage water quantities, flows and flooding, which all affect navigation. Institutional arrangements and agencies that support Pennsylvania's navigation interests such as the Great Lakes Water Management Agreements, the interstate river basin compact commissions and the International Joint Commission, Council of Great Lakes Governors and Premiers, American Ports Association, American Great Lakes Ports Association, Inland Rivers, and Ports & Terminals Inc. should be continued and encouraged.
8. Where appropriate, the Pennsylvania Fish and Boat Commission and other agencies should encourage the development and improvement of boat launches, public access, transient boating facilities, and associated facilities that enhance recreational boating opportunities. A diversity of recreational boating facilities should be facilitated to accommodate the increase in non-powered watercraft use (i.e., kayaks, standup paddleboards, and canoes) to enhance safety and reduce congestion and user conflict on waterways. Diverse considerations may apply for different types of watercraft.
9. To enhance the reliability of the shipping system, attract new cargoes and foster employment in the maritime sector, the United States and Canada should harmonize the Seaway's opening and closing dates with those of the Soo Locks in northern Michigan. Doing so would establish a fixed navigation season for the entire Great Lakes navigation system from March 25th – January 15th. The commonwealth should advance and encourage these efforts.

2.4.9 Agriculture Nonpoint Source Pollution

Agricultural Workgroup

Nonpoint source runoff from agricultural operations impacts the water quality of Pennsylvania's waterways and water availability. Recognizing that impact, this section includes background information about stream impairments from agricultural operations, explains ongoing efforts by the agricultural community and of the Chesapeake Bay Program in addressing concerns, and outlines priority legislative and program recommendations to address agricultural nonpoint source pollution.

Background

Pennsylvania is lush in its 86,000 miles of streams and rivers. However, nearly one-third of our waters are impaired (approximately 28,000 miles of streams or rivers)⁵⁶. Agriculture is the leading source of impairments for aquatic life and the second-leading cause of impairments for potable drinking water in the commonwealth.

Drinking water resources, public health and safety, outdoor recreation, and our natural resources will remain impacted if we fail to improve, protect, and restore Pennsylvania's waters. Local communities will continue to be negatively affected by stormwater runoff and flood damage, contaminated drinking water sources, polluted streams, and lost recreation and tourism opportunities.

The commonwealth's 58,000 farms produce \$7.4 billion worth of crop and livestock products on 7.6 million acres.⁵⁷ What happens on this farmland directly impacts our communities and access to clean water. As the commonwealth continues to adapt, it is imperative that it restore streams that are impaired by the results of historic and ongoing agricultural activities – especially nutrient and pathogen runoff, soil erosion, and unrestricted livestock access to surface waters – and work to apply best management practices while supporting the critical need for agricultural production.^{58,3}

Further, according to DEP's Pennsylvania Phase 3 Chesapeake Bay Watershed Implementation Plan, amended December 2021⁵⁹ ("Phase 3 WIP"), "approximately half of Pennsylvania's land area drains into the Chesapeake Bay, primarily from the Susquehanna and Potomac River basins. - The Susquehanna is the largest tributary to the Bay, providing half of the total freshwater flow and 90% of the freshwater flow to the upper bay. Without the support of Pennsylvania, the Chesapeake Bay cannot be restored. Even more importantly, the water that feeds into the Chesapeake Bay

⁵⁶ Pennsylvania Department of Environmental Protection, Draft 2022 Pennsylvania Integrated Water Quality Report <https://storymaps.arcgis.com/stories/b9746eec807f48d99decd3a583eede12>

⁵⁷ USDA National Agricultural Statistics Service, 2017 State Agriculture Overview.

⁵⁸ Team Pennsylvania, Pennsylvania Department of Agriculture, Econsult Solutions and Temple University's Fox School of Business, May 2018, Pennsylvania Agriculture: [A Look at the Economic Impact and Future Trends.](#)

³ Penn State Agriculture & the Environment Center, March 2017, [Pennsylvania in the Balance: Harnessing Agriculture's Culture of Stewardship as a Solution to Clean Water.](#)

is local to Pennsylvania. It is crucial that the local waters of Pennsylvania be restored for use by our citizens.”⁶⁰

The Phase 3 WIP “describes the work to be done to reduce nutrient and sediment pollution within the Chesapeake Bay watershed. In 2018, the Chesapeake Bay Program Partnership completed a Midpoint Assessment of the 2010 Total Maximum Daily Load (TMDL) allocations for each state and re-established nutrient reduction planning targets for each jurisdiction within the watershed. The goal of the Chesapeake Bay TMDL is to have all practices to achieve these reductions in place by 2025. Each jurisdiction’s plan for meeting their phosphorus (P) and nitrogen (N) pollution reduction goals is outlined in WIPs.”⁶¹

The Phase 3 WIP outlines seven strategic areas in addressing nonpoint source agricultural runoff within the Susquehanna and Potomac River basins: agricultural compliance, soil health, expanded nutrient management, manure storage facilities, precision feeding, integrated systems for elimination of excess manure, and forest and grassed riparian buffers. But these opportunities cannot be achieved without the support of many partners, including those at the local, state, federal, legislative, private, and non-governmental organization levels. In total, the Phase 3 WIP requires over an additional \$300 million/year to be implemented by 2025 and currently has over 1,200 stakeholders fully engaged in the implementation of the Phase 3 WIP and 34 Countywide Action Plans.

Statewide, farmers and agricultural communities are ready and willing to do their part to reduce runoff while improving their farm practices, but they need support. For example, farmers are required to develop and implement management plans to reduce pollution from nutrient sources, mitigate sediment loss, and prevent erosion. These plans are often one of the critical first steps to set the framework for implementing conservation practices on farms. They promote a healthy farming economy, while providing local benefits to surrounding communities. If implemented according to schedule, these plans not only reduce water pollution, but also improve crop utilization of nutrients and keep topsoil in place to sustain long-term production. It is crucial that funding is available for planning and technical assistance to farmers, for the initial outreach and development of these plans, as well as for the implementation of best management practices.

Many farms have increased their focus on production systems that reduce tillage intensity to maintain soil structure, responsibly incorporate manure, and sustain a cover of living plants to improve soil health and reduce water pollution. This increases water infiltration, retains manure nitrogen for crop production, retains soil moisture for periods of drought, and reduces stormwater runoff and soil erosion during heavy rains. Soil and nutrients stay in agricultural fields for production rather than run off into local streams. When adopting new production methods, farms often need technical advice adapted to their specific agricultural operation, soil, terrain, climate, and production goals. Conservation district technicians and specialists, federal NRCS staff, Certified Crop Advisors, and other private and nonprofit Technical Service Providers are finite in number. They cannot currently meet the vast and varied needs of the thousands of agricultural producers in Pennsylvania.

⁶⁰ Department of Environmental Protection, amended December 2021, [Pennsylvania Phase 3 Chesapeake Bay Watershed Implementation Plan](#).

⁶¹ [Id.](#)

Nutrient pollution impacts are not the only threat to our local waters from agricultural activities. Pathogens such as *Cryptosporidium* are directly attributed to dairy and other animal farming operations. The Chapter 109 Safe Drinking Water regulations⁶² under the authority of the Pennsylvania Safe Drinking Water Act⁶³ require drinking water utilities to monitor and subsequently develop drinking water treatment and watershed management approaches to mitigate *Cryptosporidium* impacts on Pennsylvania's drinking water supplies. While challenging, it is imperative that farming practices take into consideration mitigation and best management practices to protect downstream water suppliers from regulated pathogens such as *Cryptosporidium*.^{64, 65}

Legislative Priorities

Responsible farming practices that provide clean water to downstream communities depend on technical and financial assistance. Implementing agricultural best management practices to address local water quality needs comes at high costs, making conservation investments difficult for family farmers to bear on their own, especially with market instability. Current federal and state conservation programs can meet only a fraction of the annual need, so additional resources are imperative to help farms invest in conservation.

1. Provide a dedicated and increased funding source for the Environmental Stewardship Fund (ESF). The ESF provides funding for Pennsylvania's Growing Greener Plus grants as well as Pennsylvania's Chesapeake Bay Clean Water Coordinator and Countywide Action Plan Implementation block grant programs. These two grant programs invest in agricultural conservation practices as well as riparian corridor practices like stream restoration and riparian forested buffers, as well as stormwater best management practices. ESF also funds Conservation District Watershed Specialists who help to administer and oversee project implementation.
2. Provide a dedicated and increased funding source for the Clean Streams Fund (CSF). The CSF provides funding to restore and protect waters of the commonwealth across the state.
 - a. Continue support of the Agricultural Conservation Assistance Program through additional state funding for the Agriculture Conservation Assistance Program (ACAP). Establishing dedicated and equitable funding for ACAP that will target funding for farms to invest in conservation practices will guarantee its success beyond 2026 when the current funding expires. This program would benefit the whole commonwealth. Additionally, having a dedicated agriculture funding program that

⁶² Pennsylvania Code, Chapter 109. Safe Drinking Water

<https://www.pacodeandbulletin.gov/Display/pacode?file=/secure/pacode/data/025/chapter109/chap109toc.html>

⁶³ Pennsylvania General Assembly, Pennsylvania Safe Drinking Water Act

<https://www.legis.state.pa.us/WU01/LI/LI/US/HTM/1984/0/0043..HTM>

⁶⁴ Sicho WM, Atwill ER, Lanyon LE, George J., Prev Vet Med., February 29, 2000, Cryptosporidia on dairy farms and the role these farms may have in contaminating surface water supplies in the northeastern United States,

<https://pubmed.ncbi.nlm.nih.gov/10718494/>

⁶⁵ Philadelphia Water Department, March 2011, Queen Lane LT2 Watershed Control Program Plan,

https://water.phila.gov/pool/files/PWD_Watershed_Control_Plan_final.pdf

compliments the CEG is an expectation from EPA regarding Pennsylvania implementing its Phase 3 WIP.

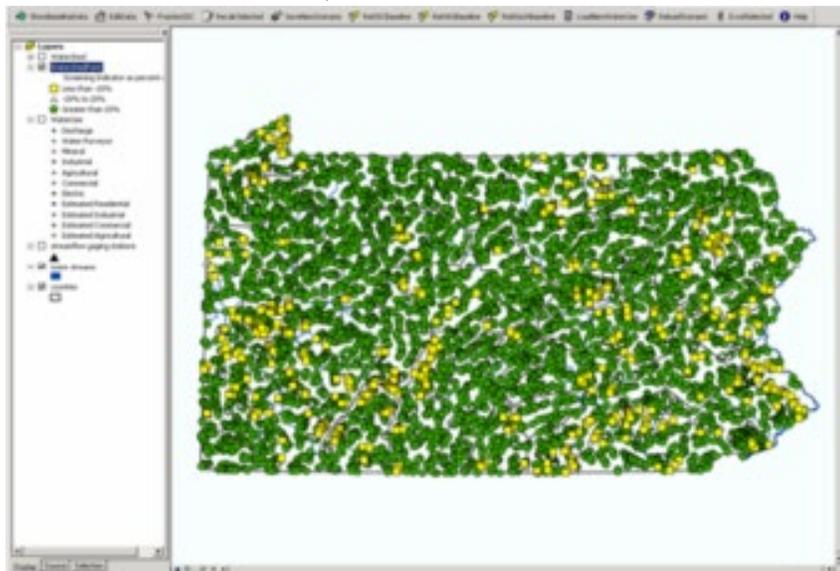
3. Increase funding for available Resource Enhancement and Protection (REAP) tax credits.
4. Encourage voluntary participation in implementing restriction of livestock access to streams as there are new funding programs, such as ACAP, that may help farmers implement this practice. Boost participation and implementation of best management practices to streams where water quality is being impacted. Allow for enforcement on livestock access to streams where water quality is being impacted.
5. Enhance existing state budget line items, such as the Chesapeake Bay Agricultural Source Abatement Fund, the Conservation District Fund Allocation Program, and the Nutrient Management Fund, to provide additional funding for conservation district staff. More funds per Full Time Equivalent (FTE) are needed, as are additional funds for expanding capacity.
6. Further investment in the USDA-NRCS, such as through the congressionally supported Chesapeake Resilient Farms Initiative, would yield greater amounts of funding for technical assistance and agricultural cost-share throughout the Chesapeake Bay watershed. Enhanced investments towards USDA-NRCS programs should strive to be inclusive to all of Pennsylvania's watersheds, recognizing that agricultural impacts on Pennsylvania waterways expand beyond the Chesapeake Bay watershed.

2.5 Critical Water Planning Areas

2.5.1 Designation of Critical Water Planning Areas

Act 220 of 2002 established a process to designate Critical Water Planning Areas (CWPAs). CWPAs are areas where existing or future water demands exceed or threaten to exceed water availability. Act 220 of 2002 also authorized the preparation of Critical Area Resource Plans (CARPs) for any watershed or watersheds within a CWPA. During the State Water Plan update in 2009, considerable work was done to "screen" the entire state for CWPAs.

Figure 8. Opening Screen of the WAST displaying over 10,000 Pour Points



A GIS model named the Water Analysis Screening Tool (WAST) as shown in Figure 8 was built for DEP by USGS to accomplish this screening. The WAST compares net water withdrawals (withdrawals minus discharges) against designated criteria (percentage of the 7-day, 10-year low flow (7Q10)). It measures the influence of net withdrawals on aquatic resources at over 10,000 mouth-of-the-watersheds or "pour-points" across the state.

The specific requirements for identifying a CWPA are outlined in a DEP Technical Guidance Document 392-2130-014, "Guidelines for Identification of Critical Water Planning Areas."⁶⁶

Results from the WAST and consultation with regional committees narrowed the potential CWPA candidates to 32 watersheds selected for verification of data and further technical review before continuing the process of CWPA designation. After the verifications, the regional committees nominated 23 watersheds to the statewide committee for designation consideration. More information on the screening process is available in the State Water Plan Principles document of 2009⁶⁷. From the 23 regional committee-selected watersheds, the statewide committee recommended four watersheds for CWPA designation. On December 20, 2010, these four watersheds were officially designated CWPA's by the Secretary of DEP: Marsh and Rock Creeks, Adams County (Potomac Region); Back Creek, Fayette County (Ohio Region); and Laurel Hill Creek, Fayette and Somerset counties (Ohio Region). - Interactive maps showing all these watersheds' locations are available in the Water Use and Planning section of the updated State Water Plan Atlas⁶⁸.

2.5.1.1 Marsh and Rock Creeks CWPA⁶⁹

The Marsh and Rock Creek watersheds are located in Adams County. They have a combined drainage area of approximately 143 square miles. The watersheds were combined into one CWPA because the populated area surrounding the Borough of Gettysburg lies in both Marsh Creek and Rock Creek watersheds. The major water supplier in the Gettysburg area has

⁶⁶Guidelines for Identification of Critical Water Planning Areas 392-2130-014
www.dep.state.pa.us/elibrary/GetFolder?FolderID=4670

⁶⁷ State Water Plan Principles, 2009
files.dep.state.pa.us/Water/Division%20of%20Planning%20and%20Conservation/StateWaterPlan/StateWaterPlanPrinciples/3010-BK-DEP4222.pdf

⁶⁸ DEP State Water Plan Digital Water Atlas
<https://storymaps.arcgis.com/stories/d945de2b227b44f5adad48faa36af929>

⁶⁹ Supporting Documentation Marsh Creek and Rock Creek, Adams County, Nomination for Critical Water Planning Area Under Pennsylvania State Water Plan, September 2009
files.dep.state.pa.us/Water/Division%20of%20Planning%20and%20Conservation/StateWaterPlan/CWPA/Marsh%20Rock%20Creeks%20Report.pdf

groundwater withdrawal wells in both watersheds and a surface water withdrawal on Marsh Creek.

The WAST identified a significant number of negative Screening Indicator Percentage (SIP) values within Marsh Creek. Negative SIP values indicate potential water imbalances (higher net withdrawals than streamflow) under extreme low flow conditions. Water is withdrawn from Marsh and Rock Creeks by the Gettysburg Municipal Authority and discharged outside the watershed in Rock Creek. In Rock Creek, negative SIP values were indicated in the upper third of the watershed, primarily driven by agricultural water withdrawal estimates and public water supply withdrawals. In 2003, withdrawals for estimated water users (groundwater and surface water) were 1.44 million gallons per day (MGD) and accounted for 47.9 percent of the total. Registered groundwater withdrawals accounted for 1.57 MGD (52.1 percent) of the total, and there were no registered surface water withdrawals.

2.5.1.2 Back Creek CWPA⁷⁰

Back Creek watershed has a drainage area of 11.4 square miles, located in Fayette County, and is a tributary of Indian Creek. This watershed was designated as a CWPA primarily due to the potential situations in which water demand exceeds supply. Three of the four negative SIP values in the Indian Creek watershed occur in the Back Creek watershed, partly due to public water supply withdrawals from groundwater sources totaling approximately 0.5 MGD in 2003.

2.5.1.3 Laurel Hill Creek CWPA⁷¹

Laurel Hill Creek is an approximately 125 square mile watershed located in Somerset and Fayette counties. The watershed is predominately undeveloped, with most of its area forested or within agricultural land use. Within the developed portions of the watershed are ski resorts and a quarry operation. As of 2009, there were 32 dams in the Laurel Hill Creek watershed, including two with a conservation release and one with a minimum pass-by requirement. All reported and estimated withdrawals in the Laurel Hill Creek watershed were 2.27 MGD in 2003. Nineteen of the 26 pour points in the watershed had negative SIP values, primarily due to water supply withdrawals exported outside the watershed.

2.5.2 Critical Area Resource Plans

Act 220 of 2002 requires that for each designated CWPA the regional committee shall form a critical area advisory committee (CAAC) which assists in guiding the development of a CARP. DEP is responsible for drafting the CARP although the

⁷⁰ Indian Creek, Fayette and Westmoreland Counties Nomination for Critical Water Planning Area Under Pennsylvania State Water Plan August 2009
files.dep.state.pa.us/Water/Division%20of%20Planning%20and%20Conservation/StateWaterPlan/CWPA/Indian%20Creek%20Report.pdf

⁷¹ Laurel Hill Creek, Somerset and Fayette Counties Nomination for Critical Water Planning Area Under Pennsylvania State Water Plan August 2009
files.dep.state.pa.us/Water/Division%20of%20Planning%20and%20Conservation/StateWaterPlan/CWPA/Laurel%20Hill%20Report.pdf

regional committee may recommend that DEP engage county or regional agencies or expert consulting firms to assist them.

A CARP shall be subject to review and adoption through the same process as a regional plan. However, before final recommendation by the regional committee to the statewide committee, a copy of the proposed CARP shall be submitted to each county's and municipality's official planning agency and governing body in the designated CWPA for comment, to evaluate consistency with other plans and programs that may be affected by the CARP. These planning agencies along with relevant state agencies, shall be provided 45 days to offer comments.

The review and adoption process is outlined in DEP Technical Guidance Document 392-2130-015 "Guidelines for Development of Critical Area Resource Plans." (CARP Guidelines) ⁷²

2.5.3 Status of Critical Area Resource Plans

All the following major components for the Marsh and Rock Creek, Laurel Hill Creek, and Back Creek CARPs (as described in Chapter 2, "Developing Critical Area Resource Plan Elements" of the above reference guidance) have been drafted.

- Verification and Statement of Problems
- Existing and Future Reasonable and Beneficial uses
- Water Availability Evaluation
- Quantity of Water Available and Required for Future Water Uses
- Assessment of Water Quality Issues
- Stormwater and Floodplain Management
- Adverse Impacts and Conflicts
- Supply-side and Demand-side Alternatives
- Recommendations

Below is an outline from Chapter 4 of the CARP Guidelines, "Process for Reviewing and Adopting a Critical Area Resource Plan" identifying the process steps. To view the status and actions of each process for draft CARPs, refer to DEP's State Water Plan⁷³ website for this information.

A. Review of CARP

1. In cooperation with the CAAC, the regional committee shall hold at least one combined public meeting and hearing within the watershed(s) to solicit input on the draft of the initial CARP. The regional committee should

⁷² Pennsylvania Department of Environmental Protection, www.depgreenport.state.pa.us/elibrary/GetDocument?docId=7902&DocName=GUIDELINES%20FOR%20DEVELOPMENT%20OF%20CRITICAL%20AREA%20RESOURCE%20PLANS.PDF

⁷³ Pennsylvania Department of Environmental Protection, State Water Plan <https://www.dep.pa.gov/Business/Water/PlanningConservation/StateWaterPlan/Pages/default.aspx>

provide for a public comment period to receive written comments, including soliciting comments from those entities identified in Paragraph 3 below.

2. A copy of the draft CARP shall be submitted to the official planning agency and governing body of each municipality in the watershed(s), the appropriate county planning agency(s), and regional planning agencies for review and comment as to consistency with other plans and programs affecting the watershed(s) and relevant state agencies. Each such agency and governing body shall be provided forty-five (45) days to provide comments.
 3. Following public participation and the combined public meeting and hearing required under Paragraph 1, above, and following the receipt of comments from appropriate planning agencies and municipal governing bodies of each municipality in the watershed, the regional committee, in consultation with the CAAC, shall select by a majority vote the planning alternatives and provisions to be recommended as part of the CARP.
- B. Recommendation of CARP to statewide committee and Secretary of DEP
1. Each regional committee may, by majority vote, recommend the CARP to the statewide committee.
 2. If the regional committee fails to transmit the CARP to the statewide committee, the statewide committee shall, after providing ninety days' written notice to the regional committee, proceed to act on the CARP per Section C, below.
- C. Approval of CARP and inclusion in State Water Plan
1. Upon receipt of the CARP, the statewide committee or the DEP Secretary may direct modification of the CARP, in whole or in part, upon finding:
 - a. The planning or management alternatives are inconsistent with the regional plan.
 - b. The CARP is inconsistent with the statute; federal or state laws or regulations, or officially adopted policies or plans; or compacts or other interstate agreements and plans.
 - c. The CARP is inconsistent with or conflicts with the provisions or objectives of the overall State Water Plan.
 - d. The CARP fails to conform to the CARP elements in Chapter 2 or other requirements established by this policy.
 2. Following consultation with the regional committee, the statewide committee shall, by majority vote, approve and recommend to the DEP Secretary approval and adoption of the CARP as a component of the State Water Plan.

3. Within ninety days of submission of the CARP, the DEP Secretary shall in writing either approve the CARP or disapprove the CARP if the DEP Secretary finds:
 - a. The planning and management alternatives are inconsistent with the regional plan.
 - b. The CARP is inconsistent with the statute; federal or state laws or regulations, or officially adopted policies or plans; or compacts or other interstate agreements and plans.
 - c. The CARP is inconsistent with or conflicts with the provisions or objectives of the overall State Water Plan.
 - d. The CARP fails to conform to the CARP elements in Chapter 2 or other requirements established by this policy.
4. Upon disapproval of the CARP, the DEP Secretary shall advise the statewide committee and the affected regional committee, in writing, of the reasons for disapproval.
5. Upon receiving notice of disapproval, the statewide committee, the affected regional committee, and DEP shall undertake expeditious and diligent efforts to confer and resolve the issues identified as the reasons for disapproval.
6. Within ninety days of receiving any disapproval notice, the statewide committee shall recommend a revised plan addressing and resolving the issues.
7. Upon adoption of the CARP, DEP shall publish notice of the amendment of the State Water Plan in the Pennsylvania Bulletin and on the DEP website.
8. The CARP shall be construed as a component of the State Water Plan and may be implemented voluntarily.

3.0 Assessment of Climate Change Adaptation Strategies

3.1 Pennsylvania Climate Change Initiatives

Under the commitments of the Pennsylvania Climate Change Act (Act 70 of 2008)⁷⁴, DEP in May 2021 released the *Pennsylvania Climate Impacts Assessment 2021*⁷⁵ that provided a review of scientific findings and relative risks to inform priority climate change adaptation needs.

In addition to environmental justice/equity considerations and continued research needs, the *Climate Impacts Assessment 2021* identified the following five priority considerations for climate adaptation:

- Reduce extreme heat risks to human health, particularly for vulnerable populations
- Support key sectors in the transition to a warmer climate, including agriculture, recreation, and tourism, as well as forests, ecosystems, and wildlife
- Reduce flood risks to infrastructure and communities
- Help low-income households cope with an increased energy burden
- Enhance tropical storm and landside risk mitigation

These five priority considerations formed a basis for developing priority adaptation needs as outlined in the *Pennsylvania Climate Action Plan 2021*⁷⁶ (CAP 2021) released in September of that year. The CAP 2021 outlines strategic opportunities in reducing greenhouse gases, a principal cause of climate change, along with the strategic opportunities in adapting to the impacts of climate change.

Examples of climate changes by mid-century⁷⁵:

- Increases in average annual temperature
- More frequent intense extreme heat events
- Increased total average rainfall with less frequent, but higher intensity rainfall events
- Tidal influenced flooding in the Delaware Estuary coastal zone
- Significant changes in water level, coastal erosion, and water temperature in Lake Erie

⁷⁴ Pennsylvania Climate Change Act

www.legis.state.pa.us/CFDOCS/LEGIS/LI/uconsCheck.cfm?txtType=HTM&yr=2008&sessInd=0&smthLwInd=0&act=0070.

⁷⁵ Pennsylvania Climate Impacts Assessment 2021

www.depgreenport.state.pa.us/elibrary/GetDocument?docId=3667348&DocName=PENNSYLVANIA CLIMATE IMPACTS ASSESSMENT 2021.PDF

⁷⁶ Pennsylvania Climate Action Plan 2021

www.depgreenport.state.pa.us/elibrary/GetDocument?docId=3925177&DocName=2021 PENNSYLVANIA CLIMATE ACTION PLAN.PDF

3.2 Implementing Climate Adaptation Strategies through State Water Plan Priority Action Recommendations

Specific water resources-related recommendations developed in the State Water Plan Update should align with the adaptation strategies from both the CAP 2021 as well as the Pennsylvania Climate Action Plan 2018⁷⁷ (CAP 2018). These recommendations provide opportunities to help achieve climate adaptation strategies through informed policy, planning, and program decision making under the State Water Plan.

The following sections help make the connection between the strategies within the CAP 2018 and CAP 2021 with the State Water Plan regional and statewide priority assessment through: 1) relational tables in Section 3.4 that correlate climate adaptation impacts, approaches, and strategies to specific recommendation topic sections previously described in Chapter 2; and 2) narratives in Section 3.4 for each of the regional water resources committees that describe the priorities reflecting each of their unique water resources needs and challenges.

⁷⁷ Pennsylvania Climate Action Plan 2018

www.depgreenport.state.pa.us/elibrary/GetDocument?docId=1454161&DocName=2018_PA_CLIMATE_ACTION_PLAN.PDF

3.3 Cross-referencing of Climate Adaptation with Statewide Priority Actions

Table 9. 2018 Pennsylvania Climate Action Plan Compared with State Water Plan Priority Action Recommendations

Water Resource Opportunities to Adapt to Climate Change	Related State Water Plan Priority Action Recommendation Topics	State Water Plan Priority Actions Recommendations
Use Stormwater Best Management Practices	Floodplain and Stormwater Management	<ul style="list-style-type: none"> • DEP establish an information center/clearinghouse to provide education and training on related permitting, design, maintenance, reporting of stormwater infrastructure • Funding of regular updates and addenda to the <i>Pennsylvania Stormwater Best Management Practices Manual</i> • Continued maintenance and update to the Stormwater Management Model Ordinance
Promote Integrated Water Resources Management and Water Conservation	Integrated Water Resources Management	<ul style="list-style-type: none"> • Development of a baseline assessment of IWRM for DEP, and formulation of guidance on roles of DEP and other agencies. • Identification and assessment of potential programmatic, policy or regulatory options for actions to reflect linkage of land use to water resources management.

Table 10. 2021 Pennsylvania Climate Action Plan Compared with State Water Plan Priority Action Recommendations

Adaptation Opportunities to Impacts of Climate Change			Related State Water Plan Priority Action Recommendation Topics	State Water Plan Priority Action Recommendations
Most Significant Impacts	Water Resource Related Approaches	Example Strategies		
Impacts of increasing heat and flooding on health – harmful algal blooms	<ul style="list-style-type: none"> State revise policies to support health given projected increased heat and flood risks 	<ul style="list-style-type: none"> Review zoning codes, create system to reflect climate projection data 	<ul style="list-style-type: none"> Floodplain and stormwater management 	<ul style="list-style-type: none"> Flood control recommendations involving reviewing and updating hazard mitigation plans, investment in enhanced flood forecasting and warning systems, updating flood insurance maps and communications with property owners, and establishment of information centers/clearing houses for education and training for municipal decisions
Impacts of increased heat and flooding on overburdened and vulnerable populations	<ul style="list-style-type: none"> Support vulnerable populations when integrating climate risks into key plans Improve infrastructure in vulnerable communities to reduce impacts 	<ul style="list-style-type: none"> Plant trees Increase flood mitigation grant funds and reduce application barriers 	<ul style="list-style-type: none"> Integrated water resources management Floodplain and stormwater management 	<ul style="list-style-type: none"> Identification and assessment of potential programmatic, policy or regulatory options for actions to reflect linkage of land use to water resources management. Increase efforts to enhance community recovery assistance following flood events Revise the state Flood Control Act to allow investment in the full range of flood control projects (nonstructural and structural)

Adaptation Opportunities to Impacts of Climate Change			Related State Water Plan Priority Action Recommendation Topics	State Water Plan Priority Action Recommendations
Most Significant Impacts	Water Resource Related Approaches	Example Strategies		
Impacts of increasing average temperatures on forests, ecosystems, and wildlife	<ul style="list-style-type: none"> • Identify and manage human stressors • Maintain and enhance genetic diversity • Ecosystem restoration • Ecosystem or species conservation • Improve connectivity 	<ul style="list-style-type: none"> • Develop and use ecological flow thresholds to manage water withdrawals so they do not increase thermal stress on sensitive species and habitats • Adopt regulations that provide streamflow levels necessary to ensure the resilience and ecological integrity of both warm-water and cold-water streams • Promote sustainable land use planning and development - Intelligent land use planning promotes practices that provide the critical elements for quality of life for residents as well as protects and restores naturally functioning ecosystems and agriculturally productive lands 	<ul style="list-style-type: none"> • Integrated water resources management • Water withdrawal and use 	<ul style="list-style-type: none"> • Identification and assessment of potential programmatic, policy or regulatory options for actions to reflect linkage of land use to water resources management. • Improvement to the use of water use data in projecting future demand trends

Adaptation Opportunities to Impacts of Climate Change			Related State Water Plan Priority Action Recommendation Topics	State Water Plan Priority Action Recommendations
Most Significant Impacts	Water Resource Related Approaches	Example Strategies		
Impacts of a warmer and wetter climate on agriculture	<ul style="list-style-type: none"> • Expand regional planning and coordination • Education and outreach • Improve research and analysis • Provide decision support tools and technical assistance 	<ul style="list-style-type: none"> • Promote sustainable land use planning and development. Intelligent land use planning promotes practices that provide the critical elements for quality of life for residents as well as protects and restores naturally functioning ecosystems and agriculturally productive lands • Establish an information clearinghouse for growers on water conservation technology 	<ul style="list-style-type: none"> • Integrated water resources management • Water efficiency 	<ul style="list-style-type: none"> • Identification and assessment of potential programmatic, policy or regulatory options for actions to reflect linkage of land use to water resources management. • Development of information and materials on water efficiency technologies and practices

<p>Impacts of flooding on built infrastructure</p>	<ul style="list-style-type: none"> • Harden, protect or relocate at-risk assets • Encourage utilities to assess vulnerable assets • Implement new or modified land use policies and practices • Education and outreach • Stakeholder engagement and collaboration • Improve preparedness and early warning systems • Encourage adoption of adaptive design and flood management practices • Provide decision support tools and funding opportunities 	<ul style="list-style-type: none"> • Improve the accuracy and technological capabilities of flood forecasting, early-warning, and emergency-preparedness systems • Update flood insurance rate maps and other regulatory tools that rely on FEMA maps to reflect evolving risks from climate change • Work with local jurisdictions to incorporate consideration of climate change into ongoing land use planning efforts (e.g., growth management, development planning) • Upgrade or implement design improvements for flood-control structures (e.g., levees, flood walls) that protect existing critical infrastructure • Require maps of areas vulnerable to future flooding in applications for new development • Preserve open space in flood hazard areas and channel migration zones 	<ul style="list-style-type: none"> • Integrated water resources management • Sustainability of Pennsylvania drinking water and wastewater infrastructure • Stormwater and floodplain management • Water withdrawal and use 	<ul style="list-style-type: none"> • Improvement to inter- and intra-agency coordination related to integrated water use planning to assure consistent planning, operations, and application of regulations and policies • Development and implementation of asset management plans for water and wastewater systems • Investment in enhanced flood forecast and warning systems • Updating of floodplain and flood insurance rate maps • Increase efforts to protect Pennsylvania floodplains • Increase efforts to enhance recovery assistance following flood events • Inclusion of floodplain management and floodplain regulations into local integrated water resource planning • Establishment of floodplain studies outside of detailed FEMA study areas • All community water systems (as well as self-supplied users) should evaluate the vulnerabilities of their respective sources to the impacts from expected increases in both the
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Adaptation Opportunities to Impacts of Climate Change			Related State Water Plan Priority Action Recommendation Topics	State Water Plan Priority Action Recommendations
Most Significant Impacts	Water Resource Related Approaches	Example Strategies		
				<p>frequency and intensity of flooding and droughts.</p> <ul style="list-style-type: none"> • Update technical design guidance for new encroachments and obstructions to reflect updated storm intensity and frequency data and projections • Amend the state Flood Control Act to allow for investment in the full range of flood control projects (nonstructural and structural)

3.4 Climate Change Adaptation Considerations within Regional Priority Assessments

3.4.1 Delaware River Region Climate Change Adaptation Considerations

The Delaware River regional committee assembled a series of priorities based on the unique needs and challenges which climate change presents for their region. With large population centers like Philadelphia and others in the region, there is increased risk from stormwater issues brought on by increased impervious surfaces in areas experiencing population growth and expanding development. The exacerbation of flooding problems by intensifying rain events brought on by climate change led the committee to focus on municipal infrastructure management and land development practices to adapt to these evolving conditions. The increased runoff from these events could also have a negative impact on water quality in the region, which will require further investigation. With temperatures on the rise, invasive species may also become more prevalent and disrupt the ecosystems of the region.

The committee advocates for leveraging the Delaware River Basin Commission's Advisory Committee on Climate Change, where possible, to assist with the research challenges of grasping this broad problem as well as creating needed tools. This emphasis on research and tool crafting leans into the creation and updating of scenarios and models that will give decision makers a clearer vision of their changing environment.

Even though it is predicted there will be increased annual precipitation, it is anticipated that this will mostly manifest in more frequent intense short-duration storm events. The spacing between those storms may still be long enough that periods of drought are possible. Additionally, healthy aquifers and soils are best served by consistent rain rather than isolated intense storm events. Therefore the committee advocates continuing to promote healthy soil and groundwater infiltration and reservoir management systems to abate these potential effects on water quality and quantity.

Finally, the Delaware Estuary's port infrastructure and drinking water sources present a unique challenge for the region. Saltwater intrusion is a concern for drinking water sources and the region could face potential problems if critical infrastructure is not adapted to climate change.

The region has several water resource challenges to meet in the coming years which can be mitigated by consolidating research, ensuring broad access to needed data, and adopting a holistic approach to climate change adaptation.

3.4.2 Great Lakes Region Climate Change Adaptation Considerations

Given the unique nature of the Great Lakes region's hydrologic complexity, relatively large economy given its land area, and vast number of potential stakeholders, the Great Lakes regional committee had a challenging task in establishing priorities and recommendations for climate change adaptation. The first consideration was the many hands that would be involved in implementing potential policies. The committee recognizes that there are multiple state and provincial governments as well as municipalities with some jurisdiction over the Great Lakes. It's essential that the commonwealth continue to play a role in interstate efforts to identify regional climate stressors and plan for economic and environmental resiliency efforts.

Due to its natural beauty and abundant fresh water, the Lake Erie coastline has also proven to be an attractive proposition to many industrial and commercial businesses (including a large tourism and recreation industry), as well as the many residents who call it home. The lake's surface elevation naturally fluctuates over time, but the changing climate has led to shorter intervals on these changes. The committee sees this as an opportunity to consider the potential impacts of these changes on bluff and beach erosion, industries, and coastal residences.

Present indicators show that climate change is increasing storm intensity, which poses an increased flooding risk. Climate change presents an opportunity to develop more robust resiliency strategies within the region's municipalities. These strategies may include broader consideration of flash flooding and stormwater management and should be developed with a regional strategy in mind.

While more intense storms are anticipated, the time intervals between these events are likely to increase. This means that there could be increased risk of both flood and drought, particularly where groundwater recharge is concerned. Though the coastal regions of the watershed have a large fresh drinking water supply in from Lake Erie, the Genesee River watershed in Potter County makes use of private wells. Water supply vulnerability in regions that are more reliant on groundwater should be considered a high priority as these impacts of climate change take effect.

3.4.3 Lower Susquehanna River Region Climate Change Adaptation Considerations

The Lower Susquehanna River regional committee crafted recommendations that would account for the unique impacts that climate change would have on their region. One of the primary concerns of the committee was the increased number of intense storms passing through the region. Due to population growth and the presence of major highways intersecting in the region, which have given rise to many logistics centers and other developments, the committee initially focused on flooding and stormwater management. The committee favored an approach which highlights floodplain restoration while considering obstructions and encroachments such as buildings, legacy sediment, undersized bridges, or culverts. Additionally, the committee recommended the development of floodplain management ordinances to keep these floodplains clear and encourage the enhancement of structural and nonstructural strategies to reduce environmental impacts. These are long-term changes that will require a system of incentives to promote a more proactive approach to climate change that favors planning and adaptation.

While flooding and stormwater are the obvious concerns stemming from intense rain events, there are other impacts that should be considered. With large run-of-the-river dams and reservoir drinking water sources, harmful algal blooms (HABs) may be exacerbated by increasing temperatures, creating conditions that are favorable to HAB growth. Storms not only flood developed areas but can also wash debris and pollutants into streams. Engaging stakeholders on the implications of intense rain events, their impacts on soil, and HABs is critical to establishing robust strategies with broad public support.

Despite predictions that annual precipitation will increase with intense short-duration storm events, increased time intervals between these storm events can potentially lead to droughts in the region. This could present some difficulty for the many manufacturers that are active in the region who need a lot of water to function. Therefore, the committee recommended proactive drought management for reservoir systems to facilitate protection and conservation of water resources.

All the above solutions will require continued cooperation and coordination amongst agencies at many levels to help effectively leverage resources to reduce these impacts of climate change.

3.4.4 Ohio River Region Climate Change Adaptation Considerations

The Ohio River region has a high municipal density with an inland port in Pittsburgh and receives water from southern New York and West Virginia before contributing to the broader downstream network that comprises the enormous Ohio River basin. The Ohio River regional committee sought to address climate change using a number a of strategies which focused on increased storm intensity and a concern for more frequent flash flooding. Floodplains are critical to containing and controlling floods; therefore, the committee recommended the maintenance and use of riparian buffers, especially surrounding headwaters.

Despite increased instances of high-intensity storms, the time intervals between these storms could increase, leading to longer dry stretches and potential drought. This can pose a problem for replenishing aquifers, as intense storms tend to lead to more runoff than infiltration. The committee therefore recommended that, where possible, rain barrels and swales can be utilized to capture the runoff from intense storms, mitigating stormwater runoff and allowing for more infiltration. Additionally, municipalities should consider water supply vulnerability, availability, and reliability going forward despite the overall increased annual precipitation.

The United States Army Corps of Engineers owns and operates locks and dams within the region, and with continued proper maintenance, may help toward the region's overall climate resilience. These adaptive measures will help to ensure that the Ohio River region continues to be well supported and resilient in the face of a changing climate.

3.4.5 Potomac River Region Climate Change Adaptation Considerations

The Potomac River region represents a headwater for the watershed, making interstate coordination vital. The region also has diverse topography and population densities with urban sprawl from Baltimore and Washington, D.C., farmland, and mountainous regions. This broad spectrum of natural and anthropogenic characteristics across the region compounds the challenge for the Potomac River regional committee to develop priorities for climate change adaptation.

Because of the region's uniqueness, the committee recommended a focus on local data collection such as using the Community Collaborative Rain, Hail and Snow Network)⁷⁸ and on-site assessment where possible, rather than relying exclusively on global data trends. In addition to these data tools, the committee recommends that stakeholders explore ways to communicate climate change that won't alienate potential allies. These methods should bring a diverse array of stakeholders to the table to help promote an adaptive approach to climate resiliency.

Climate change will likely continue to impact the region with increased frequency of intense storm events. Since local geology and topography make groundwater recharge challenging, there is a greater risk of drought if the region experiences longer time intervals between storm events. The committee recommends riparian

⁷⁸ Community Collaborative Rain, Hail and Snow Network
www.cocorahs.org

buffers and conveyance structures to help reduce the effects of flooding and promote groundwater recharge. Additionally, since much of the region is mountainous, the committee saw a need to draw attention to the risks of flash flooding and preparing for intense storm events. The dual problems of both flooding and drought represent a broad, far-reaching suite of challenges that will require a holistic solution. Therefore, the committee recommends an integrated water resource planning approach to help coordinate these efforts throughout the region.

These various strategies will contribute to a better prepared Potomac River watershed that can adapt to the diverse challenges presented by climate change.

3.4.6 Upper-Middle Susquehanna River Region Climate Adaptation Considerations

The Upper-Middle Susquehanna River region is densely forested and has large variations in both its topography and many rural communities. The Upper-Middle Susquehanna River regional committee's efforts on climate change adaptation focused on the major trends that are taking root in Pennsylvania, namely, more intense storms with larger time intervals between events, as well as seeking buy-in from the region's residents. Densely forested regions perform well at recharging ground water supplies, but intense rain events are less beneficial for infiltration and create more runoff. The committee chose to highlight water supply vulnerability, especially in smaller communities that rely on groundwater sources.

Due to the regional variance, the committee believes an in-depth study of climate change implications on water supply, vulnerability, availability, and reliability would be beneficial. There are some areas within the region that have steep topography, which means that flash flooding may become a central issue for communities located in those areas.

Stakeholder buy-in is a key issue in this region as well as funding and a long-term flexible outlook that allows for incremental steps, especially where tight budgets are a concern. Education and outreach are critical components of this effort, where adaptation strategies are promoted to boost a community's resiliency, and where scientific data is used to help guide climate adaptation discussions. Co-benefits, such as a healthier ecosystem, should be emphasized to help persuade stakeholders to take part in adaptation efforts.

The combined work of adapting to trends that are already understood, analyzing the problem from a regional perspective, and pursuing stakeholder buy-in are essential strategies toward a well-adapted Upper-Middle Susquehanna River region.

4.0 Data Access and Collaboration

4.1 Description of Pennsylvania's Water Use Data Program

Pennsylvania's water use data program has collected water use reports from users for several decades. Water use data was collected mainly through required reporting from public water suppliers (PWSs). Also, periodic mailings of water use survey forms to facilities using large quantities of water provided additional water use data.

Act 220 of 2002⁷⁹ required DEP to perform an initial registration and annual report from: any person who withdraws more than 10,000 gallons of water per day averaged over any 30-day period; all PWSs (which serve at least 15 service connections or at least 25 residents year-round); and hydropower facilities regardless of amount or type of withdrawal. Act 220 of 2002 led to the adoption of 25 Pa. Code Chapter 110 Water Resources Planning regulations⁸⁰ in 2008. These regulations established ongoing registration, reporting, and recordkeeping requirements, including user-specific content for PWSs, power generation facilities, manufacturing industries, mining, agriculture, golf courses, and ski resorts. Data from water use reporting is stored in DEP's enterprise Water Use Data System (WUDS) database.

Annually, DEP receives over 8,000 sub-facility (SF) reports and over 2,000 primary facility (PF) water use reports. A SF is a site-specific record of a water source, such as a groundwater well or surface water intake. In addition, a SF report contains information such as the monthly amount withdrawn, purchased, or sold (in the case of a PWS), days used per month, and how the source was measured (Figure 9).

Month	Total Gallons	Month	Days
* Jan Gallons	0	* Jan Use	0
* Feb Gallons	0	* Feb Use	0
* Mar Gallons	0	* Mar Use	0
* Apr Gallons	0	* Apr Use	0
* May Gallons	0	* May Use	0
* Jun Gallons	0	* Jun Use	0
* Jul Gallons	0	* Jul Use	0
* Aug Gallons	0	* Aug Use	0
* Sep Gallons	0	* Sep Use	0
* Oct Gallons	0	* Oct Use	0
* Nov Gallons	0	* Nov Use	0
* Dec Gallons	0	* Dec Use	0
Total Gallons	0	Total Days	0

Figure 9. Screen Capture of the Sub-facility (SF) Water Use Report Input Screen

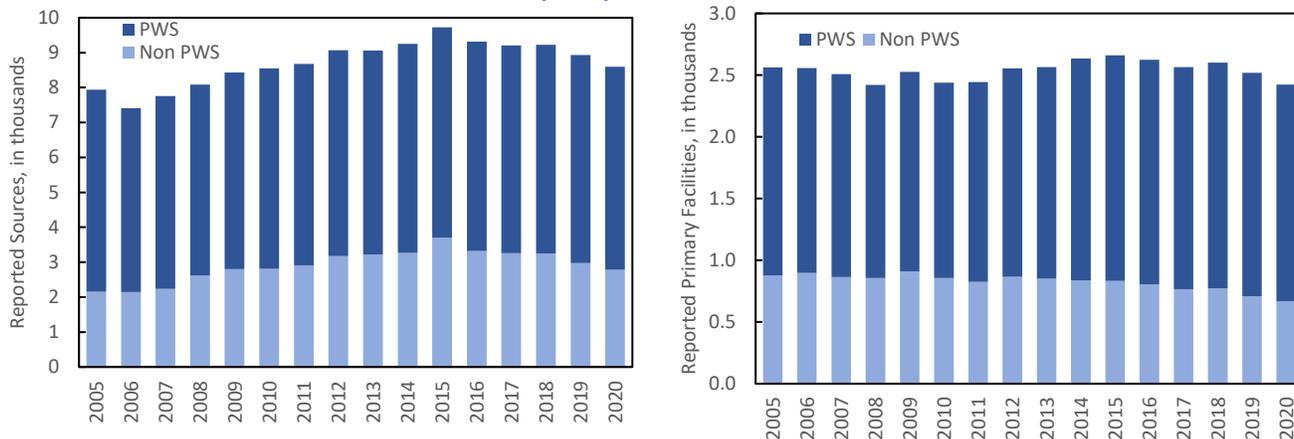
⁷⁹ Act 220 of 2002

www.legis.state.pa.us/CFDOCS/LEGIS/LI/uconsCheck.cfm?txtType=HTM&yr=2002&sessInd=0&smthLwInd=0&act=0220.

⁸⁰ Chapter 110 Water Resources Planning regulations

www.pacodeandbulletin.gov/Display/pacode?file=/secure/pacode/data/025/chapter110/chap110toc.html

Figure 10. Trends in Reported Sources (Sub-facilities, SFs) and Primary Facilities (PFs), 2005-2020



A PF is the business entity or system that owns and operates one or more SFs. A PF water use report contains system water use information and is divided into PWS PF and NonPWS PF reports. The PWS PF report is only for PWSs (which serve year-round at least 15 service connections or at least 25 residents); there are over 1,900 active PWSs within the commonwealth. The other PF report is the NonPWS PF report. This report is for all other facilities, such as industrial, commercial, and power generation. A notable change in reported facilities has been water use for unconventional natural gas extraction by hydraulic fracturing of shale formation, commonly known as the Marcellus Formation. Reporting for these SFs (oil and gas) started in 2007. The number of reported sources peaked in 2015 (Figure 10).

A PWS PF report includes the average daily water distributed to different connection types (domestic, industrial, institutional, commercial, bulk sales to other PWSs, oil and gas, other, and water losses). The report also includes the number of connections by type, number, and type of connections per municipality, total population served, percent population served by municipality, peak and minimum daily use, and other system information.

The NonPWS PF report contains information on returned water at the primary facility. The report identifies whether the amount of water is discharged to a receiving waterway, to a public sewage system, by another method of discharge, or a combination of all these. An example would be a power generating plant reporting the water discharged to a waterway after leaving the plant's cooling system. Another example is a golf course reporting no water discharged from the site when all water withdrawal was consumed for irrigation. The report preparer is instructed not to account for stormwater runoff in the discharge amounts and not to include consumptive use amounts (i.e., evaporation, incorporation in product, deep well injection, off-site disposal) as an "other" discharge method. By reporting the amount of water disposed at the primary facility, a mass balance equation (consumptive use = total withdrawal from SF reports - returned water from PF report) can be used to calculate the consumptive use for the facility.

DEP reviews all water use registrations and annual water use reports for completeness and accuracy before accepting and sharing with the public. Registrations and reports not meeting DEP's acceptance review are returned with comments to the report preparer to address before resubmission.

4.2 Data Access Tool – Downloads and Viewers

In 2017, DEP launched a series of six water use report viewers to readily share users' registration and periodic reporting of water use information with the public. The project was fully funded by the USGS Water Use Data and Research (WUDR) grant. The report viewers are a web-based program using an SQL Server for Report Services (SSRS) server-based reporting platform. The report viewers and instructions are available on DEP's Water Reports⁸¹ webpage. All report viewers have a function to export a dataset to various file formats, including XML, CSV, and Excel. The viewers are as follows:

1. **Water Source Registration Viewer** extracts Act 220 of 2002 registration data. Information includes identifying and describing the registrant's name, description, and location of water sources. In addition, the viewer will allow the user to define a specific facility by ID or filter/query by the following fields: water use type (commercial, industrial, livestock, irrigation, mining, hydroelectric power, public water supply, oil and gas, thermoelectric power, wastewater collection and treatment, and other); SF type (surface water withdrawal, groundwater withdrawal, and interconnection); status (active or inactive); county; and watershed levels (two-digit to ten-digit hydrologic unit codes⁸²). Due to DEP's sensitive information policy, PWS source locations will be limited to only municipality/county and watershed.
2. **Water Quantity Report by Source Viewer** extracts collected data from Chapter 110 annual SF reports. SF reports are relevant to all water use categories. They contain detailed source information, including monthly water withdrawals and days of use. Where applicable, SF reports include records of quantities purchased or sold, and days used through public water supply interconnections. Multiple fields can be used to filter the data in the viewer. Fields for filtering are: water use type, SF types, SF status, report years, counties, and watershed levels. An option to select a single facility requires an ID type and unique ID number.
3. **Water Use Report by Water Supplier Viewer** extracts Chapter 110 annual PF reports for PWSs. PF reports contain information about average daily water use by use type, number of connections by use type, connections by municipality by use type, total population served, percent of population served by municipality, peak and minimum amount and date, and other system information. In addition, the viewer contains filter/query boxes for the user to limit their search. Filters allow for searching by a system (PF) status, report year(s), watershed levels, and counties. The user can select an individual system using an ID type and unique ID number.
4. **Water Use Report by Facility Viewer** extracts data from the Chapter 110 annual PF reports from NonPWS PFs. The NonPWS PF report contains the amount and manner of water discharged after use. Currently, three forms of discharge are used: (1) direct discharge to receiving waterway, (2) discharge to a public sewage system, and (3) other. The viewer contains filter boxes for the user to limit their search; filters include facility status, report years, and counties. The user can select an individual system using an ID type and unique ID number.

⁸¹ DEP Water Reports webpage

www.dep.pa.gov/DataandTools/Reports/Pages/Water.aspx

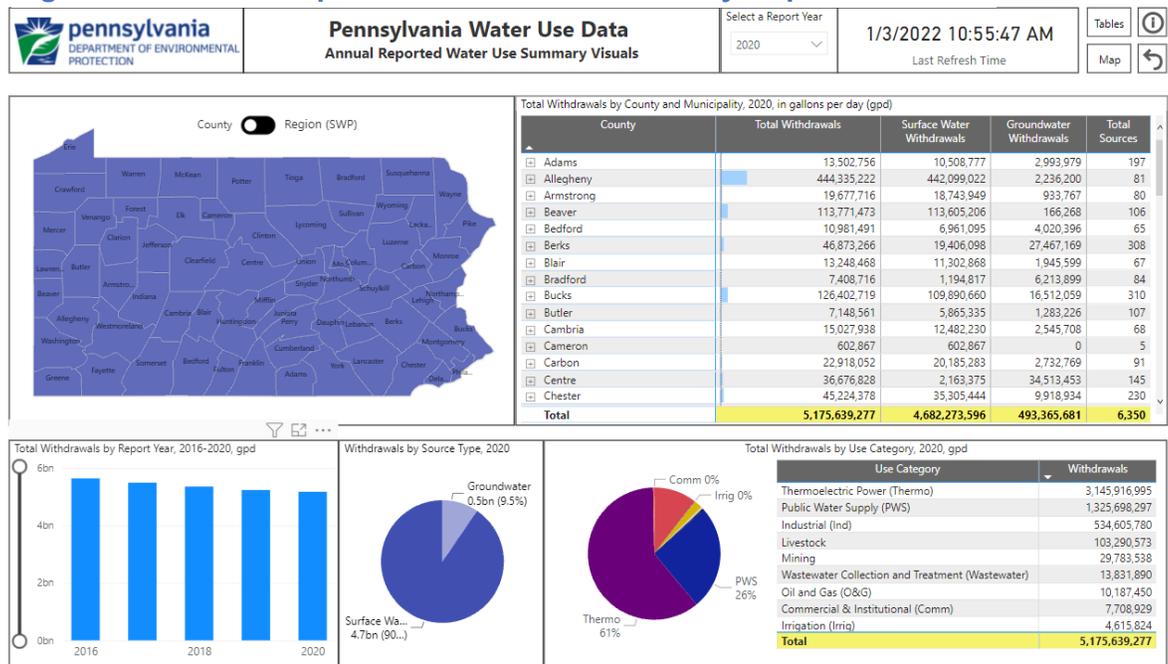
⁸² For explanation of hydrologic unit codes (HUCs), see the USGS Hydrologic Unit Maps webpage

<https://water.usgs.gov/GIS/huc.html>

5. **Water Allocation Daily Withdrawal Report Viewer** extracts data from daily water withdrawal reports submitted by PWSs monthly to DEP. The viewer contains filter boxes for the user to limit their search; filters include report years and counties. In addition, the user has the option to select an individual system using an ID type and unique ID number.
6. **Water Management Plan Daily Water Use Report Viewer** extracts data from daily water withdrawal reports submitted by oil and gas operators monthly to DEP. The viewer has filter boxes for the user to limit their search; filters include report years and counties. In addition, the user can select an individual system using an ID type and unique ID number.

In 2021, an additional viewer and data export tool was added to the DEP Water Reports webpage (Figure 11). The water use summary report⁸³ summarizes total withdrawals by categories and source types using charts, maps, and tables at state, county, and watershed scales for the past five reporting years. The report also displays the locations of reported sources. However, the water use summary report excludes showing and providing the coordinates of PWS sources due to DEP's sensitive locational policy prohibiting readily sharing coordinates of these sources. Also, the summary report does not presently provide data on the consumptive use component of water withdrawals (i.e., the amount of water that is withdrawn and not returned to the watershed due to incorporation into product, evapotranspiration, export or other means).

Figure 11. Screen Capture of Water Use Summary Report Viewer



4.3 Refined Acquisition of Water Use Data

Data acquisition has significantly improved since the initial Act 220 of 2002 registrations were submitted in 2003. Back then, paper forms were mailed to water users and sent back

⁸³ Water Use Summary Report

http://cedatareporting.pa.gov/reports/powerbi/Public/DEP/WUDS/PBI/PA_Water_Use_Annual_Summary_Report

to DEP. They were scanned and checked for errors before the information was uploaded into WUDS. Act 220 of 2002 also provides a periodic reporting requirement established by regulation for water users subject to the registration requirements as aforementioned. Act 220 of 2002 also states that the reporting frequency shall not be more frequent than annually. Annual reporting of monthly water use was initiated for the 2004 reporting for NonPWS water users and the 2005 reporting year for all PWSs. The collection of these reports was accomplished with the combination of "paper" and "paperless" reporting. Like the registrations, paper reports were scanned and checked for errors before uploading into WUDS. To accept electronic reporting, a web application was developed accessible from DEP's GreenPort⁸⁴.

The decision to require only electronic submission of all water use reports for the 2012 report year resulted in significant improvement in data accuracy and submission rates. It reduced the staff time necessary to process and upload data from paper reports to WUDS. For example, the percentage of unreported withdrawals from the industrial sector improved from nearly 20% in 2011 to less than 10% in 2012.

With support from USGS via grants from the WUDR program, further refinement in the collection of water use data focused on increasing the accuracy and quality of the data reported to DEP. Making these refinements was essential to maintain the data with reduced staff and resources over the years. Specifically, the following is a list of improvements made to the report application since 2018:

Chapter 110 report application improvements

- Internal completion checks
- Added user functionality
- Additional validation, acceptance, and verification checks

- Linking SF and PF reports and requiring the report preparer to complete and submit at least one SF report before starting a PF report were added. Establishing this link eliminates the chance of only receiving an SF report(s) without a PF report and vice versa.
- Filtering functionality was added to the user interface screen.
- The SF report(s) values are totaled within the application. They are then used to compare the total values submitted in the PF report to validate values between SF and PF reports.
- The application's PWS PF report checks whether the reported values for minimum and maximum daily water use are acceptable based on their average daily water use.
- In the NonPWS PF report, the previously submitted method(s) of reported discharge or return automatically populates on the form. Therefore, the report preparer cannot remove the method(s) until they provide a reason for the change.
- The application checks the previous value (from the most recent prior accepted report) when any water quantity amount is entered. For example, if the new amount is less than half or one and a half times greater than the previous value, the field will be flagged as a possible error. Population served by a public water system is checked against the previously accepted reported value.

⁸⁴ DEP's GreenPort

<https://greenport.pa.gov>

Lastly, to improve the process of collecting water use registrations and encouraging compliance with registering new and existing water use sources, three remaining Chapter 110 forms were converted from paper to online forms for electronic submission. The remaining Chapter 110 forms were water use registration, termination of the registration, and SF revision. These forms were developed into separate applications within GreenPort and made available in 2021.

4.4 Data Collaboration

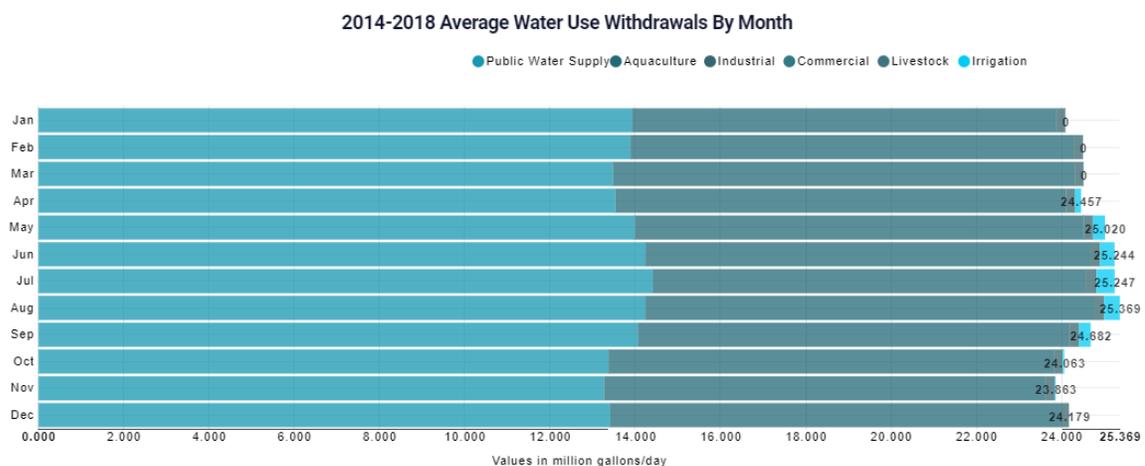
In 2021, a secure centralized site for sharing water use data was set up to exchange large amounts of water data between DEP and partner agencies. The site was designed to automate transferring of data for integration in a partner agency’s own applications. This eliminates the labor-intensive manual processes involved with sharing large datasets or the need for a user to manually query and download data from a web-based application, such as DEP’s report viewers described above in Section 4.2.

4.4.1 USGS

The centralized data sharing site allows DEP to electronically deliver water use data to USGS. USGS has prioritized improving data delivery from states, which was beneficial in securing a 2019 WUDR grant to develop this centralized data sharing site.

DEP will continue to support USGS's StreamStats⁸⁵ application by providing monthly water withdrawals and point source discharge flow data reported to DEP's Electronic Discharge Monitoring Report (eDMR) System⁸⁶. StreamStats is a national GIS-based application useful for water resources planners and engineers. The application allows a user to delineate a drainage area on streams and deliver basin characteristics and flow statistics estimates. An additional function was added to the

Figure 12. StreamStats Water Use Data in Yellow Breeches Creek Watershed, New Cumberland, Pennsylvania



⁸⁵ USGS StreamStats

<https://streamstats.usgs.gov/ss/>

⁸⁶ Electronic Discharge Monitoring (eDMR) System

www.dep.pa.gov/Business/Water/CleanWater/WastewaterMgmt/eDMR/Pages/default.aspx

Pennsylvania version of StreamStats⁸⁷ to compute total withdrawals and returns for a delineated drainage area from the water use provided by DEP (Figure 12).

4.4.2 River Basin Commissions

Within Pennsylvania, DEP, the Susquehanna River Basin Commission (SRBC), and the Delaware River Basin Commission (DRBC) routinely collect water use reports from users and the regulated community. In some cases, due to permitting and/or regulation requirements, users are reporting the same or similar data to these multiple agencies. As previously noted, a secure centralized location for sharing water use data was developed in 2021. The water use data tables from DEP and SRBC are currently updated every week using overnight automated batch loads and uploaded into each other's enterprise databases.

The development of the centralized data sharing site has made it easier for DEP to exchange data with partner agencies on a more frequent basis. Because similar reporting requirements within the basin commissions and DEP result in some duplicated water use data being collected, a project is planned to develop an application to identify identical sources stored within the agencies' databases. These sources will be identified with a unique reference number shared between agencies' datasets.

DEP provides water use summary data for the Great Lakes portions of the state for uploading to the Great Lakes Regional Water Use Database⁸⁸. Specifically, the data uploaded is summarized by withdrawals and consumptive use by use categories within the Lake Erie and Lake Ontario basins. A report of this database has been provided by the Great Lakes Commission each year since 1987.

⁸⁷ Pennsylvania StreamStats Information

www.usgs.gov/centers/pennsylvania-water-science-center/science/pennsylvania-streamstats

⁸⁸ Great Lakes Regional Water Use Database

<https://waterusedata.glc.org/index.php>

5.0 Path Forward

5.1 Introduction

Water affects nearly every aspect of everyone's lives and managing it properly is necessary for the continued health and well-being of the commonwealth's people, forests, waterways and its enviable quality of life. The Statewide Committee, recognizing the value water provides, voiced a consistent message that DEP should confidently execute the priorities and recommendations from this update. Many of these priorities center around a call for integrating the efforts of DEP programs and other commonwealth agencies with local governments and stakeholders, sustaining existing water resources programs, and forming actionable and implementable steps towards a better consensus and understanding of the linkage of water resources management to land use issues.

To achieve this, a phased or incremental implementation plan or "Path Forward" has been developed that will:

- Purposefully engage the public on water resources priorities identified in the plan
- Prioritize and begin work on the most important issues
- Establish levels of accountability by measuring success in quantifiable ways
- Advance a continuous planning process for effective administration of the State Water Plan Program and strengthen the means to address evolving water resource needs.

5.2 Phase One (Year One)

Phase One tasks will focus on supporting legislative and funding priorities, educating the public on the findings and recommendations provided in the 2022 Update and instituting outreach efforts to engage key stakeholder constituencies with the plan's implementation. Under this phase, DEP will work with community liaisons within Environmental Justice (EJ) communities and improve local engagement by providing information about the State Water Plan, soliciting participation on committees or workgroups and establish opportunities for ongoing public feedback on state water planning activities. More information on State Water Plan EJ actions are found in [Chapter 1.6.3 Public Process and Environmental Justice](#). Activities may include but are not limited to:

- Supporting legislative and [funding priorities](#) identified within this plan. This will involve the development of briefing materials in coordination with the DEP legislative and communications offices.
- Directing outreach to the public on the facets of the State Water Plan including the availability and usefulness of water resources data, the identification of water resources issues facing the commonwealth, and the proposals in this update for addressing them.
- Continuing and strengthening the statewide and regional committees through scheduled meetings and the establishment of workgroups. This would involve establishing paths for recruiting and maintaining interested and experienced individuals for participation in the State Water Plan statewide and regional committees. Principal work will include:
 - Establishing a framework for IWRM initiatives lead by DEP including the evaluation of existing efforts of intra- and inter agency coordination, and examining alternative approaches for optimum agency, programs, and stakeholder engagement with committees and workgroups.
 - Convening stakeholder workgroups to work on identified key issues.

- Completing any outstanding CARPs, and ranking priority recommendations for implementation. During this time, stakeholders will be consulted, fundamental questions will be answered, and programmatic solutions assessed.
- Establishing a consistent committee meeting schedule throughout the five-year planning cycle required under Act 220 of 2002 which will facilitate a continuous planning process with fewer stops and starts. DEP will collaborate with the statewide committee in formulating institutional and process arrangements to identify and prioritize evolving short-term and long-term environmental needs and to implement practical proposals to address them.
- With the help of workgroups and committees, organizing, prioritizing, and identifying responsible parties to carry out the recommendations identified throughout this report for implementation.
- Developing education and training content for Pennsylvania Clean Water Academy learning modules.

5.3 Phase Two (Year Two)

Phase Two will focus on defining and implementing strategies, tasks, activities, and projects for the prioritized recommendations developed by the statewide and regional committees and the development of measurable success indicators when possible. Activities may include:

- Proceeding with implementation activities for the recommendations developed by the workgroups of the statewide committee. Specific elements will include:
 - Identify and initiate needed assessments and evaluations of evolving water resource issues in establishing a long-range and strategic workplan for the State Water Plan.
 - Convening a group of knowledgeable experts and stakeholders to review and evaluate Pennsylvania's existing water rights system and water withdrawal arrangements, and to develop recommendations for evolving those arrangements to a more consistent, secure, and holistic approach.
 - Convening stakeholder groups to address other identified high priority issues requiring evaluation and assessment.
 - Developing implementation activities for recommendations.
 - Identification of measurable outcomes (metrics) to be achieved for the implementation activities.
 - Developing the regional priorities identified by each of the regional committees to include specific activities that can be undertaken, specific resources to be tapped, and evaluation of results.

5.4 Phase Three (Years Three, Four and Five)

Phase Three activities will focus on executing assessments and evaluations of evolving water resources issues and on establishing a long range and strategic workplan for the State Water Plan. In addition, a system of accountability and planning success will be pursued through quantifiable measures.

- Evaluation of activities initiated or completed by the statewide and regional committees and progress being achieved.

- Evaluation of need for major water resource projects such as water availability studies and critical water resources assessments as well as the identification of new activities that can be initiated by committee or workgroups.
- Initiation of the process for producing the required 5-year report by DEP determining whether the State Water Plan and any ongoing revisions and updates reflect the objectives, policies, and purposes of Act 220 of 2002.

Appendix A - Acknowledgements

The Department of Environmental Protection would like to thank everyone who participated in the 2022 Update of the State Water Plan:

- Those who served on the statewide and regional committees as listed below
- DEP staff as well as other commonwealth and federal agency staff
- Monica Gould and Bob Whitmore of Strategic Consulting Partners, consultants on the project; and
- All the individuals and organizations who provided input into the project

Regional Committee Members

D= Delaware, G= Great Lakes, L= Lower Susquehanna,

O= Ohio, P= Potomac, U= Upper/Middle Susquehanna

D- Anderson, Kelly	G- Whitney, Dennis	P- Bennett, Charles
D- Boscola, Ed	G- Wolford, Matthew, Esq	P- Best, Barry, P.L.S.
D- Bowen, Mark, P.E.	G- Wright, David	P- Blosser, Andrea
D- Bradley, Becky, AICP	G- Wyrosdick, Kathy	P- Bowling, Patrick, P.G.
D- Buczynski, Joseph, P.E.	L- Blosser, Andrea	P- Chant, Phyllis
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D- Frankenfield, Andrew	L- Erb, Tyler	P- McClain, Adam
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G- Fronzoli, Joy	O- Halloran, Kevin	U- Manning, Rhonda
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G- Gold, Daniel	O- Kelly, Sheryl	U- Mitra, Prasenjit
G- Greco, Joe	O- Lange, Deb	U- Rossman, Shannon, AICP
G- Hosack, Rebecca	O- McCabe, Jason T.	U- Shannon, Robert D.
G- Lyon, Melissa	O- Musser, Ronald L., P.G.	U- Stoughton, Stephanie
G- McClure, Tom	O- Quinn, Annie	U- Walls, Jerry
G- Moyer, Susan	O- Ramage, Mary Ellen	U- Walter, Wendy
G- Murdock, Amy	O- Rohall, Ron	U- Weaver, Jim
G- Norwood, Zachary	O- Simko, Deb	U- Weikel, Doug, P.E.
G- Palmer, Craig	O- Softcheck, Robert	U- Whisner, Jennifer
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G- Sandberg, Brenda	O- Stanton, Jasun	U- Yeakel, Cathy
G- Wachter, Timothy	O- Walliser, John	
	O- Zofcin, Donna Lynn	

Statewide Water Resources Committee

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Dehoff, Andrew – Susquehanna River Basin Commission
Donnelly, Sean, P.E. – Pennsylvania Public Utility Commission
Eberly, Theresa – Borough of Hummelstown
Eckert, Brian – Pennsylvania Department of Community and Economic Development
Elkis, Patty – Delaware Valley Regional Planning Commission
Fetter, Jennifer – Penn State Extension
Genchur, Matthew – Township of White
Gold, Daniel – Great Lakes Commission
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Jumper, Jeff – Pennsylvania Emergency Management Agency
Merritt, Gary – Northern Star Generation Services Company, LLC
Moltz, Heidi, Ph.D. – Interstate Commission on the Potomac River Basin
Moore, Kevin, P.E. – Pennsylvania Aggregates and Concrete Association
Peacock-Jones, Kristina, P.E. – Pennsylvania Department of Environmental Protection
Rossman, Shannon, A.I.C.P. – Lycoming County Planning & Community Development
Roth, Michael – Pennsylvania Department of Agriculture
Salvia, Trisha, Esq. – Chesapeake Bay Foundation
Simko, Deb – Chestnut Ridge - Trout Unlimited
Smiles, Heather – Pennsylvania Fish and Boat Commission
Suter, Simeon, P.G. – Pennsylvania Geological Survey
Tambini, Steven – Delaware River Basin Commission
Trimble, Jessica – Pennsylvania Department of Community and Economic Development
Weaver, Susan, P.E. – Pennsylvania Department of Environmental Protection
Weston, R. Timothy, Esq. – K&L Gates, LLP
Wolford, Matthew, Esq. – Presque Isle State Park Complex Advisory Committee
Zuzzio, Tree – Pennsylvania Department of Community and Economic Development

Appendix B - Glossary, Abbreviations, and Acronyms

Glossary

CARP (Critical Area Resources Plan): A water resources management plan established for a Critical Water Planning Area that identifies practicable supply-side and demand-side alternatives for assuring an adequate supply of water to satisfy existing and future reasonable and beneficial uses.

CEC (Contaminates of Emerging Concern): Increasingly detected chemicals including nanoparticles, pharmaceuticals, personal care products, estrogen-like compounds, flame retardants, detergents, and some industrial chemicals with potential significant impact on human health and aquatic life.

CFC (Commonwealth Flood Coordinator): A proposed appointment that would be charged with coordinating flood prevention and recovery activities among state agencies.

CWPA (Critical Watershed Planning Areas): Any significant hydrologic unit where existing or future demands exceed or threaten to exceed the safe yield of available water resources.

CSO (Combined Sewer Overflow): Intermittent overflows or other untreated discharges from a combined sewer system (CSS) to surface waters prior to reaching a sewage treatment facility.

EDCs (Endocrine Disrupting Compounds): Agents that affect the endocrine system.

EJ (Environmental Justice) Areas: Any census tract where 20 percent or more individuals live at or below the federal poverty line, and/or 30 percent or more of the population identifies as a non-white minority, based on data from the U.S. Census Bureau and the federal guidelines for poverty.

GIS (Geographic Information System): A computer system that analyzes and displays geographically referenced information.

GREENPORT: DEP's access to online applications.

IWRM (Integrated Water Resources Management): An approach to managing water that looks holistically at the planning and management of water supply, wastewater, and stormwater systems. IWRP (Integrated Water Resources Planning/Plan) is another acronym frequently paired with or used in place of IWRM. For the purposes of this document IWRP is considered a discrete plan whereas IWRM is understood to be the broader concept on which those plans are based.

Mesonet: A network of collectively owned and operated automated weather stations.

MS4 (Municipal Separate Storm Sewer Systems): An MS4 is a conveyance or system of conveyances that is owned by a state, city, town, village, or other public entity that discharges to waters of the commonwealth, that is designed or used to collect or convey stormwater (e.g., storm drains, pipes, ditches), that is not a combined sewer, and is not part of a sewage treatment plant, or publicly owned treatment works.

PFAS (perfluoroalkyl and polyfluoroalkyl substances): man-made chemicals, are resistant to heat, water, and oil, and persist in the environment and the human body.

PFC (Perfluorochemicals): a group of chemicals used to make fluoropolymer coatings and products that resist heat, oil, stains, grease, and water.

PFOA (Perfluorooctanoic Acid): a manufactured perfluorochemical and a byproduct in producing fluoropolymers.

PFOS (Perfluorooctanesulfonic Acid): a manufactured perfluorochemical and a byproduct in producing fluoropolymers.

RGGI (Regional Greenhouse Gas Initiative): RGGI is an initiative of 10 New England and Mid-Atlantic states, to reduce greenhouse gas emissions from the power sector while generating economic growth.

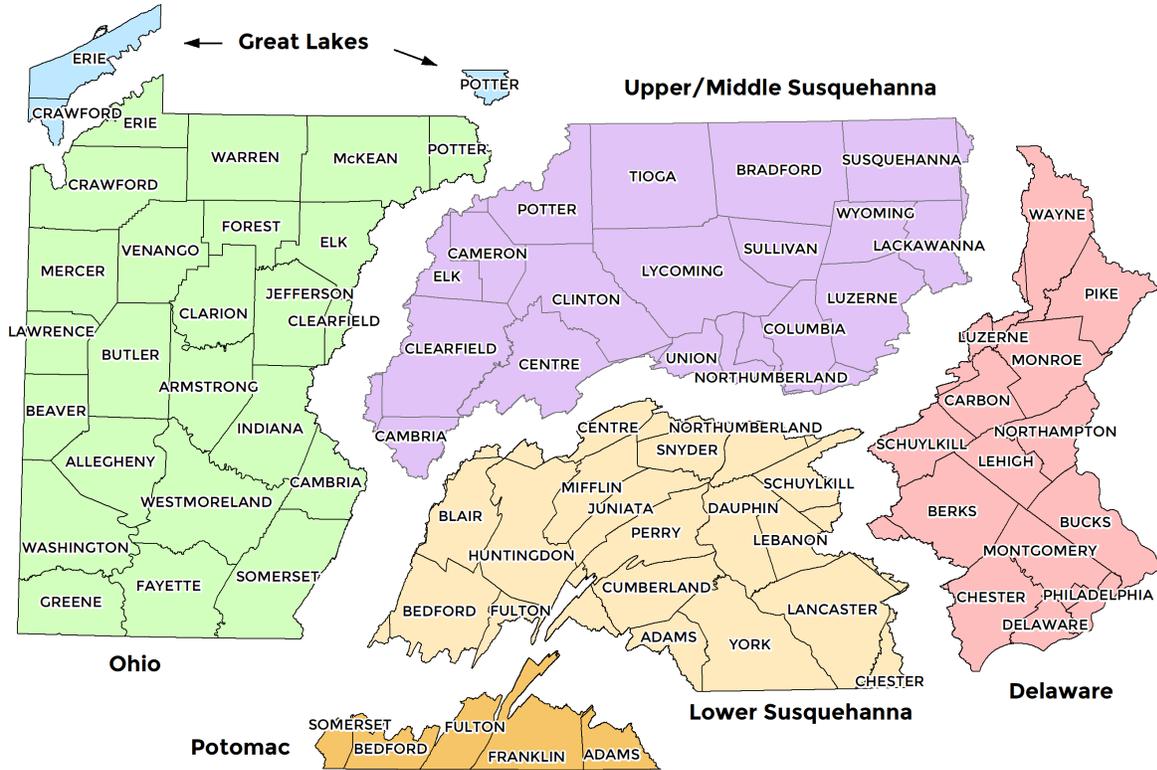
WUDS (Water Use Data System): The Department of Environmental Protection database of water withdrawals and uses collected from self-monitoring records submitted from public water supply agencies, hydropower facilities and each person whose total withdrawal exceeds an average rate of 10,000 gallons per day in any 30-day period.

Abbreviations and Acronyms

AML	Abandoned Mine Lands
AOP	Aquatic Organism Passage
CAP	Pennsylvania Climate Action Plan
CARP	Critical Area Resource Plan
CWPA	Critical Water Planning Area
DCED	Department of Community and Economic Development
DCNR	Department of Conservation of Natural Resources
DEP	Department of Environmental Protection
DRBC	Delaware River Basin Commission
EPA	Environmental Protection Agency
EQB	Pennsylvania Environmental Quality Board
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HU	Hydrologic Unit
HUC	Hydrologic Unit Code
ICPRB	Interstate Commission on the Potomac River Basin
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
OSMRE	Office of Surface Mining Reclamation and Enforcement
ORSANCO	Ohio River Valley Water Sanitation Commission
PEMA	Pennsylvania Emergency Management Agency
PENNVEST	Pennsylvania Infrastructure Investment Authority
PFBC	Pennsylvania Fish and Boat Commission
PSATS	Pennsylvania Association of Township Supervisors
PUC	Pennsylvania Utilities Commission
SPOC	Single Point of Contact
SRBC	Susquehanna River Basin Commission
USGS	United States Geological Survey
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
WAST	Water Analysis Screening Tool
WIIN	Water Infrastructure Improvements for the Nation grants

Appendix C - Pennsylvania State Water Plan Regions

Pennsylvania State Water Plan Regions



Appendix D - Legacy Histories

Appendix D-1 - Overview of Pennsylvania's Coal Mining Legacy

Introduction

Pennsylvania's coal mining legacy includes past, present, and future issues that need to be assessed and have plans developed to address these issues. The efforts toward net decarbonization of the grid and industrial sector is placing a strain on coal mining within Pennsylvania. As the remaining coal-fired power plants are decommissioned, the thermal coal market in Pennsylvania is impacted, resulting in a consolidation of the industry with smaller markets to sell coal. This resulted in the largest remaining market being metallurgical coal.

This push for decarbonizing the grid, as well as regulatory restrictions, coupled with the "shale gas" industry has resulted in coal moving from baseload facilities to seasonal operations, acting more like a peaking plant. Thus, it is essential to view coal mine land reclamation in terms of past, present, and future. Each of these areas have unique issues to be considered.

The Past

The past is defined as the abandoned mine lands in existence as of August 3, 1977, based on the date the federal Surface Mining Control and Reclamation Act (SMCRA) was signed into law (PL-95-87).

With the \$1.26 billion in grant funds, Pennsylvania's Abandoned Mine Land (AML) Program under the Department of Environmental Protection (DEP) has operated since 1980 and has reclaimed thousands of dangerous sites left by abandoned coal mines and treated or abated over 10 billion gallons of acid mine drainage (AMD) annually resulting in increased safety and an improved environment for the citizens of Pennsylvania. Through reclamation activities:⁸⁹

- Over 91,400 acres of high priority abandoned coal mine sites have been reclaimed.
- Hazards associated with more than 1,880 open mine shafts and portals have been eliminated.
- Over 1,433,000 linear feet (271 miles – the equivalent of a trip from Harrisburg to Erie) of dangerous highwalls are no longer a threat to people.
- Over 1,800 acres of dangerous piles and embankments have been eliminated and the land reclaimed.
- Over 2,500 AML impacted water supplies have been replaced with clean and reliable water lines and \$142.8 million has been dedicated to abating or treating AMD to improve water quality.

However, Pennsylvania AML legacy has a long way to go. Consider that today: ⁹⁰⁹¹

⁸⁹ Department of Environmental Protection, Pennsylvania's Surface Mining Control and Reclamation Act
https://files.dep.state.pa.us/Mining/Abandoned%20Mine%20Reclamation/AbandonedMinePortalFiles/AML_Fact_Sheet_Final_2019_03_11.pdf

⁹⁰ Pennsylvania DEP, Pennsylvania's Surface Mining Control and Reclamation Act
https://files.dep.state.pa.us/mining/Abandoned%20Mine%20Reclamation/AbandonedMinePortalFiles/AML_Fact_Sheet_Final_2019_03_11.pdf

⁹¹ Appalachian Region Independent Power Producers Association (ARIPPA), What is Coal Refuse
https://arippa.org/wp-content/uploads/2018/12/ARIPPA-Coal-Refuse-Whitepaper-with-Photos-10_05_15.pdf

- Pennsylvania currently has inventoried over 287,000 acres of land in need of reclamation, and the estimated construction cost to complete this important work is expected to exceed \$5 billion.
- Approximately 10 percent of Pennsylvania’s land area has been undermined by underground coal mining operations.
- Pennsylvania also has over 5,500 miles of streams which are degraded by AMD based on the Pennsylvania Integrated Water Quality Monitoring and Assessment Report⁹².
- Pennsylvania addresses roughly 77 emergencies per year relating to mine subsidence problems, burning mine fires, and AMD breakouts.
- It is estimated that there is over 9,000 acres filled with coal refuse and that over 3,700 acres have been reclaimed.
- At least 40 coal refuse piles are burning and there may be as high as 90 coal refuse piles and underground mine fires still burning.

On November 15, 2021, President Biden signed the Bipartisan Infrastructure Investment and Jobs Act (IIJA) that reauthorized the collection of the coal AML reclamation fee and authorized the deposit of \$11.3 billion in additional US Treasury funding into the national AML Trust Fund for pre-1977 coal AML reclamation. The IIJA brings transformative changes to the coal AML and AMD program with US Treasury funding that will be distributed over the next 15 years. Pennsylvania will receive \$244.9 million annually for 15 years in addition to the traditional AML grant based on the fee collected from coal producers.

The Present

The present refers to those sites where bonds were forfeited by DEP. Forfeited bonds are almost always a result of progressive enforcement of an unabated violation. As a result of the bond forfeitures, DEP is to utilize the bonds moneys (if any) to reclaim these sites.

DEP has been addressing this program. However, the ability to complete the reclamation has been tied to the availability of funds ensuring the reclamation is completed. The three categories of bond forfeitures are based on timing of the permitting programs per the federal Surface Mining Reclamation and Enforcement Control Act and bonding program in place at the time of the bond forfeiture. The categories are pre-primacy sites, primacy sites covered by the Alternative Bonding Program (ABP), and primacy sites tied to the Conventional Bonding Program. The following table summarizes the sites falling into these categories (Table 11).

With the primary emphasis on addressing alternative bonding sites, DEP is providing treatment on 65 of the 73 sites. Work is underway to address the remaining sites with discharges.

DEP has 63 fully funded trust funds covering discharges for 131 permits. It should be noted that in most of these cases, the company establishing the trust fund is providing the treatment, as these sites would not be part of the bond forfeiture program. There are 15 trust funds that are partially funded with the operator continuing to fund the trust based on a payment schedule.

If a company fails to treat or ensure that the trust is fully funded, DEP will initiate steps to forfeit the trusts and/or direct the trustee to continue to provide the financing for the required treatment.

⁹² Pennsylvania DEP, Integrated Water Quality Report – 2022

<https://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/IntegratedWatersReport/Pages/2022-Integrated-Water-Quality-Report.aspx>

Table 11. Three Categories of Bond Forfeiture.
Source: DEP, Office of Active and Abandoned Mine Operations

	Pre-Primacy	Primacy ABP	Primacy Conventional Bonding
Surface Mines	810	377	84
Surface Mines Reclaimed	544	371	65
Surface Mines with Discharges	93	65	4
Coal Refuse Disposal	5	0	24
Coal Refuse Disposal Reclaimed	5	0	19
Coal Refuse Disposal with Discharges	0	0	11
Deep Mines	9	0	48
Deep Mines Reclaimed	9	0	41
Deep mines with Discharges	0	0	9
Prep Plants	1	28	2
Prep Plants Reclaimed	1	26	2
Prep Plants with Discharges	1	13	0

The trust was designed to provide a mechanism for both the operator and DEP to have a source of funds that paid for the long-term cost of treatment. A trustee's sole purchase purpose is to manage the investment and to provide the funds from the trust for the required water treatment. The trust funds have a built-in hedge of 116 percent of the project cost of treatment to be considered fully funded.

Another critical component of the present are the various mine drainage treatment systems that

been constructed to treat and/or ameliorate the impacts of mine drainage on water quality. These systems have been established by DEP, non-profit organizations, and industry. These systems have helped improve the water quality of streams previously impacted by mine drainage.

According to an inventory of AMD treatment projects compiled by Datashed⁹³, Pennsylvania has over 325 passive treatment systems and at least 15 active publicly funded systems. These systems are treating billions of gallons of water, reducing the pollution loads of metals and acid to the streams. (Through integrated land reclamation and installations of treatment systems, the water quality in many streams has been improved or restored.) Many, if not most, of the passive treatment systems have been built by watershed associations.

DEP Bureau of Abandoned Mine Reclamation (BAMR) and District Mining Offices (DMO) constructed 46 of these passive treatment systems (four in the Anthracite Region) and continue to monitor them (for various reasons – Figure 13). They have nine active AMD treatment plants with one in the anthracite region that they treat with set-aside money from the AML Trust Fund and seven more in the planning stages (Figure 14).

⁹³ Datashed, Stream Restoration Incorporated (SRI)

<https://www.datashed.org/>

Figure 13. DEP Abandoned Mine Reclamation Passive Treatment Systems

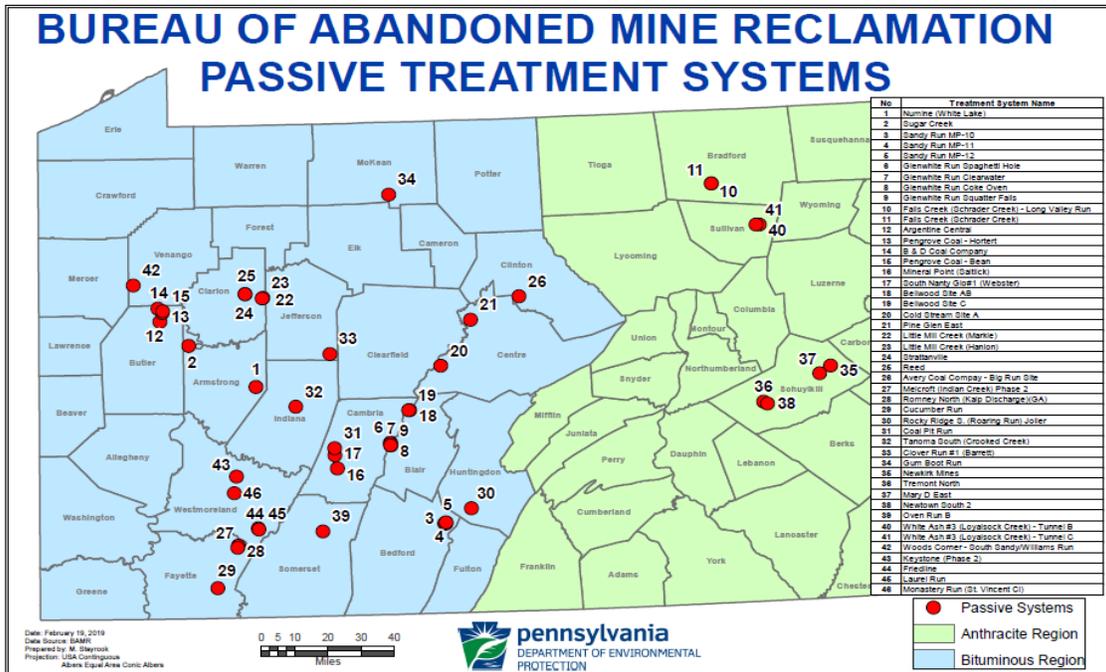
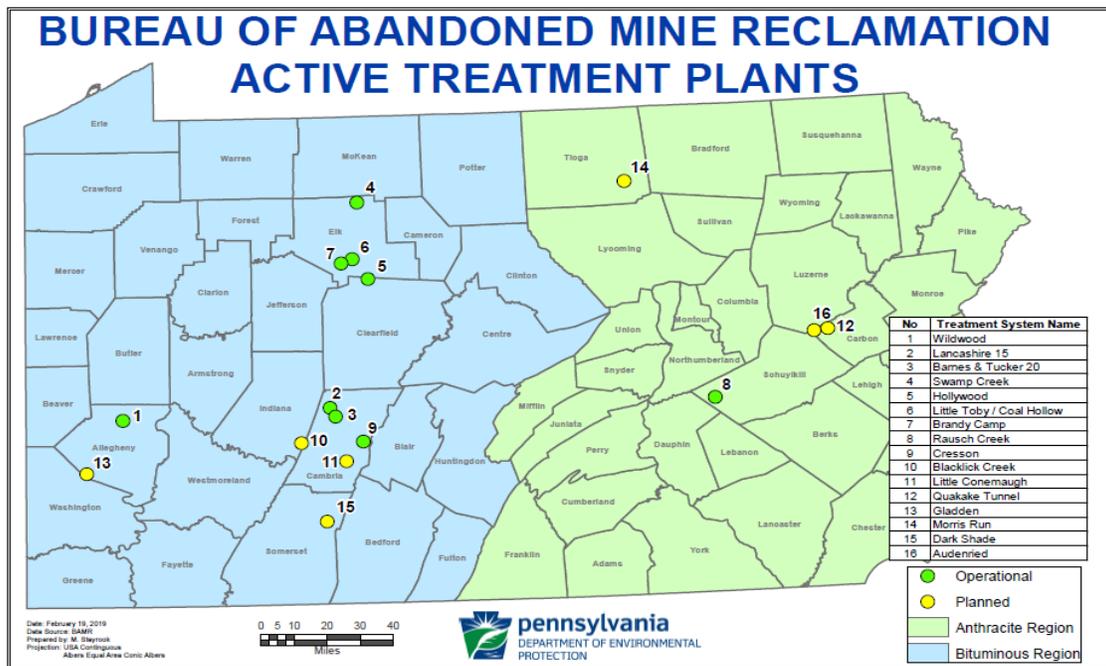


Figure 14. DEP Abandoned Mine Reclamation Active and Planned Treatment Plants



The Good Samaritan Act

Pennsylvania's Good Samaritan Act⁹⁴ has provided a mechanism to allow non-profits to support AML reclamation projects.

Pennsylvania is extremely fortunate to have numerous non-profit organizations such as the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR), Western Pennsylvania Coalition of Abandoned Mine Reclamation (WPCAMR), Foundation of Pennsylvania Watershed Associations, and watershed associations working with the conservation districts, government (local, county, state and federal), and industry, along with the inter-state river basin commissions, as well as our state legislators and the Pennsylvania Congressional Delegation in addressing the impacts of mining in the watersheds and their local communities.

These groups' assistance includes but is not limited to:

- Playing a major role in reducing impacts of AMD on water quality through the development, construction, and operations of passive treatment systems that reduced the pollution load of these discharges resulting in the improvement of the water quality in streams where the discharges are located.
- Playing a major role to ensure that the federal AML Program was extended in the past and are now playing a major role in obtaining another extension to continue funding of the AML Trust Fund.
- Working to secure funding through grants and donations allowing them to focus on improving the health of the watersheds.
- Supporting and developing concepts to generate revenue streams that can be used for addressing mining related problems or the use of the water in mine pools as economic development tools.
- Leading the efforts to extend the federal AML Trust and the reclamation fees.

These groups have been able to obtain Growing Greener grants for environmental projects and other grants at the state level. These groups are keys to addressing legacy mining issues.

These groups have developed in excess of 300 passive AMD treatment systems that have improved the pH and lowered the acidity through simple alkaline addition systems to more complex designed wetland treatment systems that reduced the metals loading, improved pH and lowered the acidity that were associated with past abandoned mining operations.

The Coal Industry

With a viable and substantial coal industry, Pennsylvania has been able to address a small portion of its AML Program through its mining regulatory program and its AML programs.

The coal industry has conducted re-mining operations of previously impacted mine lands, and in the process, have reclaimed these properties and have ameliorated AMD emanating from portions of these sites. Further, members of the coal industry had funded Mine Drainage Treatment Trusts related to sites that will or have polluted discharges that require long-term treatment.

In addition, the coal industry, in developing coal mines where the new mine will be dewatering abandoned mines with discharges to surface waters of the commonwealth, have developed a program to build long-term treatment facilities funded through a charge based on tons of coal

⁹⁴ Pennsylvania DEP, Good Samaritan Act

<https://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/LegacyWells/Pages/Good-Samaritan.aspx>

produced so that when they stop mining, the state will be able to provide for long-term treatment of the pre-existing discharges.

The Waste Coal Industry

The waste coal industry is a subset of the coal industry and has played a major role in addressing the environmental issues related to un-reclaimed coal refuse sites (coal refuse, coal slurry, gob, culm). This industry has delivered the fuel to the waste coal power plants with air pollution controls that minimized the impact of their emissions by controlling sulfur dioxide (SO₂), nitrogen oxides (NO_x), and particulate matter (PM), and are low emitters of mercury.

The low British Thermal Unit (BTU), high ash fuel contains wide ranges in sulfur content based on its source being anthracite coal or bituminous coal. The waste coal, along with limestone, is burned in a Fluidized Bed Boiler that has baghouses controlling the PM emissions, and uses combustion controls, or combustion controls along with selective non-catalytic reduction systems to control NO_x emissions.

These waste coal plants, together, have consumed over 210,000,000 tons of coal refuse, have used the alkaline ash as part of the remediation and reclamation of the sites, and improved hundreds of miles of AMD-impacted streams, as well as reclaimed thousands of acres of mine land.

Examples of Industry Led Water Improvements

Coal Industry and Abandoned Deep Mine Discharge

EPA identifies one project describing a consent order and agreement between DEP and Rosebud Mining as “Actions Eliminate Long-Time, Major Acid Mine Discharge”⁹⁵ EPA wrote:

“An innovative cleanup project has eliminated a decades-long, 3,000-gallon-a-minute acid mine discharge to the Little Conemaugh River in Pennsylvania’s Cambria County.

Stark before-and-after photos [Figure 15] show the immediate benefits of an operation to halt pollution that had poured untreated from the abandoned St. Michael mine shaft since the early 1960s – enough to fill a pro football stadium more than 100 times. Waters that had flowed orange were soon near-clear.

The EPA Mid-Atlantic Region’s Office of NPDES Permits and Enforcement worked with the Pennsylvania Department of Environmental Protection (DEP) on a 2012 permit allowing Rosebud Mining Co. to pump and treat water from the mine pool as part of the company’s proposal to gain access to underlying coal reserves. The permit – the first of its kind in Pennsylvania – requires the company to document that its treatment activities are improving water quality.

Under a related Consent Order and Agreement between DEP and Rosebud, the company built a \$15 million wastewater treatment plant next to the St. Michael shaft in 2013 to treat the polluted mine water. Rosebud also agreed to make annual payments to

Figure 15. The Little Conemaugh River Before and After the Cleanup Effort. Photo Credit: Rosebud Mining Company



⁹⁵ United States Environmental Protection Agency, Actions Eliminate Long-Time, Major Acid Mine Discharge <https://www.epa.gov/pa/actions-eliminate-long-time-major-acid-mine-discharge>

a special trust fund to permanently pay operation, maintenance, and other costs for the plant once mining is done.

The actions support a Total Maximum Daily Load (TMDL) for the Kiskiminetas-Conemaugh watershed.

The DEP had estimated that the St. Michael discharge was responsible for 3,700 tons of acid mine drainage (AMD) each year - nearly a third of the AMD pollution impacting the Little Conemaugh River, which runs into the Conemaugh, Kiskiminetas and Lower Allegheny rivers as the water moves downstream to Pittsburgh.

District Mining Manager Joel Korcich of DEP's California District Mining Office said the project will yield "phenomenal" reductions in pollution – 1.7 million tons of iron alone. Iron loads are expected to drop by 98 percent, aluminum by 100 percent and manganese by more than half. "There was a win for everybody," he said. "It was really quite exciting to see a 3,000-gallon-a-minute discharge dry up almost instantaneously after almost 50 years of flowing and polluting the streams. Hopefully, this builds momentum to where other major discharges in the area are taken care of similarly. We took care of the biggest one first."

Indeed, DEP, in cooperation with the federal Office of Surface Mining Reclamation and Enforcement, is discussing plans to build a mine water treatment plant to process three other significant sources of AMD to the Little Conemaugh, leading to potential restoration of cold and warm water fisheries along sections of the river."

The waste coal industry is tied to the Public Utility Regulatory Policies Act of 1978 (PURPA) plants that obtained a power sales agreement from the local utilities. These plants became "Qualifying Facilities." Some plants were classified as cogeneration facilities and other plants were classified as small power production facilities. The technology employed by these plants had several things in common: utilized fluidized bed combustion technology; used limestone injected into the boiler to control SO₂ emissions; had baghouses designed to control particulate emissions; and either used combustion air and/or selective non-catalytic reduction to control the unit NO_x emissions.

These facilities used waste coal (aka coal refuse, coal slurry, culm, gob, and a variety of other names). The waste coal had low BTUs (3,500 to 8,000 BTUs/pound), high ash (30 percent to 60 percent), and a wide range in sulfur pending the quality of the coal that was mined (0.5 percent to 7.5 percent).

Most of the waste coal sites that were mined had polluted discharges associated with the waste coal placed on the property. The companies mining the coal refuse developed mining plans, abatement plans to improve the quality of the discharge from the sites, and the reclamation of the sites. A key aspect of these plans was the beneficial use of fly ash in reclaiming the sites and ameliorating AMD by reducing the pollution load, improving the overall water quality in the stream.

A report entitled "Reclamation of Refuse Piles using Fluidized Bed Combustion Ash in the Blacklick Creek Watershed, Pennsylvania"⁹⁶ was prepared by Gregory Aaron, Rock Martin, and Gregory Greenfield (DEP's active mining program) which includes a study of five sites. The study concluded that the mining and operation reclaimed these sites and significantly reduced the pollution load to Blacklick Creek.

The five sites included in the study (listed in the order that they were permitted) were (Figure 16):

- Revloc #1 (Surface Mining Permit No. 11880201)
- Colver (Surface Mining Permit Nos. 11900201 & 11970201)

⁹⁶ Blacklick Creek Watershed Association, Technical Documents and Reports
<https://blacklickcreekwatershed2.files.wordpress.com/2018/11/reclamation-of-refuse-piles-using-fluidized-bed-combustion-ash.pdf>

- Revloc #2 (Surface Mining Permit No. 11960202)
- Nanty Glo West (Surface Mining Permit No. 11020202)
- Nanty Glo East (Surface Mining Permit No. 11070202)

Four of the sites were associated with Ebensburg Power and the other (Colver) was operated by Maple Coal Company. The sites ended up being reclaimed and the mining, beneficial use of the ash, and the reclamation significantly reduced the pollution load to Blacklick Creek (Table 12).

Figure 16. Study of Five Sites from “Reclamation of Refuse Piles using Fluidized Bed Combustion Ash in the Blacklick Creek Watershed, Pennsylvania”



Table 12. The Total Reduction of Loading to the Blacklick Creek Watershed

	Total Average Baseline Loading	Total Average Recent Loading	Total Reduction	Percent Reduction
Acidity (kg/day)	4,826	204	4,622	96
Iron (kg/day)	1,016	11	1,004	99
Aluminum (kg/day)	467	26	441	94
Manganese (kg/day)	23	3	20	87
Sulfate (kg/day)	3,789	689	3,100	82

Regional/Centralized Water Treatment

As part of the AMD set-aside of a portion of the AML grants, DEP has looked at consolidating discharges from multiple AMD discharges and bring those discharges to a centralized AMD treatment facility.

The Susquehanna River Basin Commission (SRBC) has recommended that in the anthracite area, DEP look at managing discharges from different mine complexes and bring the discharges to a centralized treatment plant by either piping the discharge or using the mine pools to convey the water to the centralized treatment plant.

The following is an overview of SRBC recommendations regarding the anthracite coal region and the Bennett Branch of the Sinnemahoning Creek of the Susquehanna River, where DEP constructed a treatment plant and piped 21 discharges to the centralized treatment plant.

Anthracite Regional AMD Treatment -- Example

SRBC (Report No. 279, published December of 2011) published a report “Anthracite Region Acid Mine Drainage Remediation Strategy”⁹⁷. SRBC conducted a comprehensive study of the four different anthracite fields in Pennsylvania. The purpose of the study was to examine the impacts of mining on the water quality of the Susquehanna River. There is over 517 square miles of the anthracite area within the Susquehanna River Basin and the AMD has impacted 534 miles of surface water. The impact of AMD discharges varies from one area to another.

In 2009, a partnership emerged between SRBC and EPCAMR, particularly considering EPCAMR’s Anthracite Region Mine Pool Mapping Initiative in the Western-Middle Field. The two organizations began sharing data, which proved beneficial to both parties in their project endeavors. That partnership endures as both agencies work together to implement the restoration strategy and continue the mine pool mapping effort in the other anthracite coal fields.

Based on this effort, the SRBC identified their top-20 prioritized discharges within the Anthracite Region of the Susquehanna River Basin and their separated pollution contribution percentage identified in Table 13.

⁹⁷ Susquehanna River Basin Commission, Anthracite Region Mine Drainage Remediation Strategy <https://www.srbc.net/our-work/reports-library/technical-reports/279-anthracite-mine-drainage-strategy/docs/anthracite-mine-drainage-strategy.pdf>

Table 13. Top 20 Prioritized Discharges within the Anthracite Region of the Susquehanna River Basin and their Separated Pollution Contribution Percentages.

Source: Susquehanna River Basin Commission

Discharge	Field	Watershed	Flow %	Fe Load %	Mn Load %	Al Load %	Acid Load %	Loading Average %
Jeddo Tunnel	Eastern-Middle	Nescopeck Creek	9.78	3.45	11.30	42.92	13.41	17.8
Old Forge Borehole	Northern	Lackawanna River	11.45	16.78	13.36	1.87	2.49	8.6
Nottingham-Buttonwood Airshaft	Northern	Solomon Creek	4.60	7.85	5.22	0.53	7.40	5.3
Solomon Creek Boreholes	Northern	Solomon Creek	4.70	9.07	4.77	0.34	4.30	4.6
Gowen Tunnel	Eastern-Middle	Nescopeck Creek	3.00	0.19	4.50	10.46	3.76	4.7
Duryea Breach	Northern	Lackawanna River	4.17	7.40	5.72	0.42	0.88	3.6
Audenreid Tunnel	Eastern-Middle	Catawissa Creek	3.00	0.26	2.05	9.56	8.75	5.2
Packer #5 Breach and Boreholes	Western-Middle	Mahanoy Creek	3.04	3.72	6.07	0.08	2.54	3.1
Gilberton Pump	Western-Middle	Mahanoy Creek	2.18	4.65	5.11	0.63	1.72	3.0
Centralla Tunnel	Western-Middle	Mahanoy Creek	1.27	0.49	2.48	3.76	2.54	2.3
Dundee Outfall	Northern	Nanticoke Creek	0.72	4.50	0.92	0.00	2.89	2.1
Derringer Tunnel	Eastern-Middle	Nescopeck Creek	0.78	0.04	1.09	2.82	1.16	1.3
Mocanaqua Tunnel	Northern	Susquehanna River	0.62	2.02	1.85	1.48	3.64	2.2
Porter Tunnel	Southern	Wiconisco Creek	0.17	0.82	0.34	2.03	1.40	1.1
West Penn Breaker Plant Discharge	Western-Middle	Mahanoy Creek	0.27	0.96	0.75	1.71	0.40	1.0
Jermyn Slope	Northern	Lackawanna River	2.72	0.25	0.31	0.12	0.27	0.2
Doutyville Tunnel	Western-Middle	Mahanoy Creek	1.49	0.47	0.88	1.54	1.07	1.0
Continental Plant Bypass	Western-Middle	Mahanoy Creek	1.48	1.36	3.00	0.18	1.80	1.6
Susquehanna #7 Shaft	Northern	Newport Creek	1.43	3.30	1.70	0.23	0.49	1.4
Plainsville Outlet	Northern	Susquehanna River	0.69	2.41	0.62	0.14	2.08	1.3
		Total %	57.6	70.0	72.0	80.8	63.0	

Based on the top 20 discharges, SRBC developed a conceptual strategy by approaching the discharges on a watershed by watershed basis for water treatment:

- Conceptual Plant #1 – Lackawanna River
- Conceptual Plant #2 – Solomon Creek
- Conceptual Plant #3 – Nanticoke
- Conceptual Plant #4 – Jeddo Tunnel
- Conceptual Plant #5 – Black Creek
- Conceptual Plant #6 – Catawissa Creek
- Conceptual Plant #7 – Mahanoy Creek Plant #1
- Conceptual Plant #8 – Mahanoy Creek Plant #2
- Conceptual Plant #9 – Mahanoy Creek Plant #3
- Conceptual Plant #10 – Mahanoy Creek Plant #4
- Other Conceptual Plants – Jermyn Slope, Mocanaqua Tunnel, Porter Tunnel, Plainsville Outlet

It should be noted that the conceptual plans included moving water from one mine pool complex to another thus reducing the number of treatment plants as well as piping water from multiple mine discharges to a treatment plant.

Bituminous Regional AMD Treatment - Bennett Branch Sinnemahoning Creek Watershed: An Example

Figure 18. Bennett Branch of the Sinnemahoning Creek, a Tributary to the Susquehanna River. Source: DEP Bennett Branch Study



Bennett Branch is located in northwestern Pennsylvania and the Susquehanna River's West Branch watershed. Many of its tributaries hold wild populations of brook trout, the state fish. It's mostly surrounded by public lands in the heart of elk country. The only problem was that, until recently, the lower 33 miles of the stream were dead from uncontrolled, untreated AMD. Prior to the project this water ran red (Figure 17).

It took a public-private partnership to restore the 33 miles impacted by untreated AMD. The state, private groups, and coal companies forged a partnership to address the situation. As part of this effort, a Total Maximum Daily Load (TMDL) was developed for the watershed. The United States Army Corp of Engineers was involved in operation and maintenance plans for two large vertical flow passive treatment systems for Dents Run (3888 and

3893). A third passive treatment system was also installed in Dents Run (3895). In addition, a dosing unit (to provide calcium to help neutralize surface water) was located on David's Run.

The most critical facility constructed was the state-of-the-art Hollywood Treatment Plant. The Hollywood Treatment Plant was a centralized plant to treat AMD from over 21 sources. Pipelines (totaling nearly 3.5 miles) were constructed to convey 21 discharges to the Hollywood Treatment Plant.

There were at least 37 different projects involved in this effort, including removal of coal refuse from the watershed to be used as fuel in a waste coal power plant, surface reclamation by coal companies, and the installation of four passive treatment facilities and one plant (Hollywood Treatment Plant) designed to chemically treat AMD.

The Future

The future is the unknown. The consolidation of the coal industry, the bankruptcies of coal companies that have occurred, are occurring, and will probably occur in the future, with the push to produce a "*net decarbonization of the grid*," all place increasing economic strains on the coal industry. Of note is the G7⁹⁸ resolution to stop funding coal fired power plants. Companies that provided insurance coverage to the coal industry or who underwrote surety bonds are leaving the marketplace and finding companies to provide the insurance or the surety bonds is becoming more difficult. In many cases, companies are having to use their lines of credit or use cash to provide bond coverage.

⁹⁸ The Group of Seven (G7) is an inter-governmental political forum consisting of Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States

https://en.wikipedia.org/wiki/Group_of_Seven

Pennsylvania has seen a steady decline in the amount of coal being mined annually. One major reason for this decline is tied to the closing of coal fired power plants. There are several reasons for this decline:

- A. The Shale Gas Revolution (For Pennsylvania, its availability and costs are now making it more competitive than coal).
- B. The Shale Gas Revolution has led to the development, construction, and operations of large gas combined cycle power plants (more economical to build and operate).
- C. The efforts to develop renewable energy projects take away capacity from coal plants.
- D. Greenhouse gas emissions and potential carbon taxes are also having an impact.

As such, the coal industry is undergoing a major shift with its marketplace for power generation steadily declining and the use of gas in Electric Generating Units (EGUs) switching to gas by non-EGU industrials.

Nationally, there has been an increase in bankruptcy filings by coal companies. Companies are selling off their coal related assets and exiting the coal business.

There are several areas of concerns relative to the future. First, companies may no longer be viable and may stop doing the reclamation, which may result in bond forfeiture. While this may be a problem, Pennsylvania's Full Cost Bonding Program should result in the availability of money needed to reclaim the sites.

The second area of concern is ensuring that the long-term treatment trust funds are used specifically for the treatment of AMD. While the water treatment trusts were funded by companies, the funding was intended to be used to pay for the post-mining treatment operations with the funds being made available to the company funding the trust, a successor to that company, the commonwealth, or to a third party hired to treat the water. Water treatment trusts are designed to ensure moneys are available for long-term water treatment. DEP should continue to work to protect the trust fund assets and their expenditures.

The third area of concern relates to the treatment facilities that DEP placed into operation or the passive treatment systems established by Good Samaritans (i.e., EPACAMR, WPCAMR, watershed associations and other non-profits). In many instances, the passive treatment systems have been paid for by the commonwealth through grants to the non-profit organizations or from fund raisers of the non-profits. The problem here is ultimately taking steps to ensure long-term funding while funds are available. Funding is a concern if federal funds are no longer available.

AML Funding

With demand for coal being reduced, coal sales are dropping. As coal sales drop, the revenues to the AML Trust Fund through reclamation fees is decreasing making less money available to the AML Program.

AML grants have been critical to Pennsylvania being able to address its pre-1977 AML problems. Industry, through remining, has played a major role in addressing part of the problem. However, from a water quality perspective, it is the AMD set-aside of 30 percent of the AML grant moneys to the state from the federal government that is used to address AMD problems. In addressing the AMD problems, the moneys have been used to design, construct and operate passive and active (chemical) treatment systems.

AML Funding Concerns

The extension of the AML Trust Fund, along with continuing the reclamation fees tied to coal production is a necessity. Further, an additional appropriation of \$11,293,000,000 authorized under the 2021 bipartisan Infrastructure Investment and Jobs Act will be made into the AML Trust Fund by 2022⁹⁹. This is in addition to moneys presently in the fund and revenues from future payment of reclamation fees.

DEP along with the watershed associations, EPCAMR and WPCAMR, the General Assembly, conservation districts and others should continue to work to achieve reauthorization of the fund now but also in the future.

Treatment Facilities Designed, Constructed and Operated using AML Funds

The funding of these facilities for operation, maintenance, and capital replacement is a critical element. There needs to be moneys set aside and invested for each facility (including the facilities developed by Good Samaritans) to ensure long-term treatment. Ideally, the funds would be invested in a manner like the long-term treatment trusts of the active coal companies. When looking at the facilities identified in datashed.org regarding AMD treatment plants (passive and active), over \$270 million will be needed over the next 20 years. Finding a long-term source of funding for operation, maintenance and repair is critical to ensure long-term water quality improvements continue after other funding sources disappear.

Active Coal Industry

Pennsylvania's bonding program is basically two bonding programs tied together. The physical reclamation of the site is covered by its full cost bonding program which is constantly being evaluated to ensure that the fee rates for bonds being charged to ensure reclamation is adequate on a unit basis. For sites that may have or will have a polluted discharge, DEP has established an alternative bonding system that relies on the coal company fully funding a water treatment trust where the revenues to the trust can be used to provide payment for the treatment of AMD. DEP has integrated key checks and balances in the trust to cover the annual treatment costs. The trustee for the water treatment trust that is fully funded for a specific site invests the moneys to obtain a return on investment and ensures the balance is 116 percent of the trust calculation for operation, maintenance, and capitalization of future plant replacement and upgrades. Further, DEP is in control of the fund as they are the only party who can authorize expenditures from the fund per the agreements used to establish the funds.

⁹⁹ 30 USC Ch.25: SURFACE MINING CONTROL AND RECLAMATION, From title 30- MINERAL LANDS AND MINING
<https://uscode.house.gov/view.xhtml?path=/prelim@title30/chapter25&edition=prelim>

Concerns Regarding the Water Treatment Trust Funds

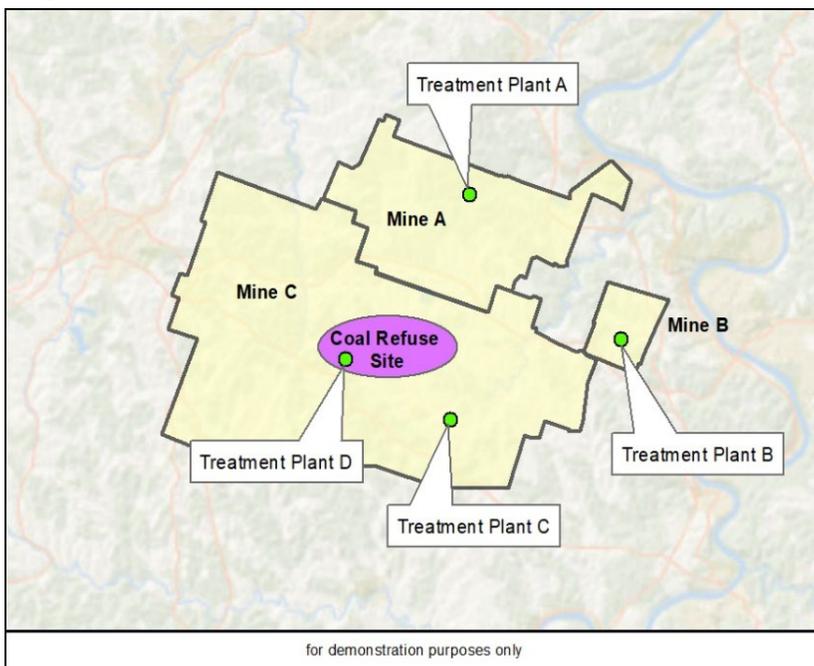
As the coal industry continues to downsize and companies disappear, the water treatment trust funds will be expected to continue to cover the costs of water treatment. DEP should continue to work to protect the trust fund assets and their expenditures.

Integrating AMD Treatment of Discharges Associated with Trust Funds into Regional Treatment Facilities

Treatment trust funds provide long-term revenue to operate AMD treatment facilities where a party has been deemed responsible for the discharge. The trusts are designed such that the return on investments are greater than the cost of treatment increased by inflation. Language in the trusts anticipate that a company that funded a trust will still be around and viable, but this may not be the case.

It is recommended that DEP look at areas where there are multiple trust funds associated geographically in the same area as the mines (especially where underground mines are located). By interconnecting these mines and discharges hydrologically, the water pumped and being treated would ensure that multiple polluting discharges would be controlled by pumping from a centralized point and treated. The key to success is that the approach is technically viable and offers a long-term economic solution. The economic solution achieved is through consolidating the revenues from the multiple trust funds and extending the life of the trust fund by increasing the overall revenues and having the overall costs reduced. Assuming the economic and technical aspects of the regionalization works, then legal concerns may need to be addressed. The key is ensuring that there are revenues to provide for continued long-term treatment when there is no source of new contributions to the trust funds.

Figure 21. Example for Centralized Treatment Plant



Example

Consider an example for which there are several underground mines and coal refuse sites overlying these mines (see Figure 20). Each of these mines and coal refuse sites have fully funded trusts. The mines are hydrologically connected, and one can design a low cost system to move the water from one mine to another where it can be treated as a single point (via breaching the barriers to allow for more easier flow, install siphons to move water from one mine to another, or to pump from one mine to another). The mines extend across multiple drainage basins. The drainage from the coal refuse sites can be injected into the underground mine beneath it. This mine water would flow to the centralized treatment plant. While the map shows a limited number of mines, it could be less or more.

Also, this approach in conjunction with AMD from mines that have no responsible party for treatment, could allow AML and trust fund moneys to be used to provide even more effective long-term treatment strategies and lower overall costs of treatment. Also, there may be cases where mines are being treated resulting from an issue not associated with the past mining but where coal ash and other related waste may have been discharged into the mine.

This example illustrates a condition where establishing the concept of regional AMD treatment plants may be realistically applied. At actual sites, conditions should be fully evaluated. Ensuring adequate funding is paramount for long-term water treatment, especially when a company is no longer economically viable and no longer in the coal mining business. It may prove beneficial in providing long-term water treatment including adding other abandoned mines along with a trust fund to maintain.

Appendix D-2 - Overview of the Oil and Gas Industry – The Legacy Well

History

Brine Wells (with undesirable byproducts)

Brine seeps in Pennsylvania and surrounding areas have been used as a source of salts since prehistoric times. Brine was utilized by the white settlers from the second half of the eighteenth century on.

In the early 1800's, wells were dug and later drilled for brine production. In 1802, a 58-foot well was drilled using a spring pole in the Kanawha Valley of West Virginia by the brothers David and Joseph Ruffner to produce brine. The well took 18-months to drill. In 1815, a brine well in West Virginia first started to exploit natural gas.

In 1815, oil is produced in the United States as an undesirable byproduct from brine wells in Pennsylvania. Seeping petroleum plagued salt well operators as it frequently came to the surface with salt brine. In 1852, Samuel Kier and his father owned salt wells near Tarentum, PA, which produced a large quantity of oil along with the desired brine. Kier found that the oil associated with the brine from his operations was like "American Medicinal Oil" and marketed it as medicinal oil under the name of Keir's Petroleum and Rock Oil. The amount of oil produced from his brine operations was more than he could market the oil as medicinal. Working with Professor James Curtis Booth, Franklin Institute of Pennsylvania, they built a distillery to produce "carbon oil" to be marketed in the region¹⁰⁰.

Drilling for Oil

The Drake Well

In 1859, Colonel Edwin Drake drilled the first domestic commercial oil well, which was located in Cherry Tree Township, Venango County, Pennsylvania. The well was located along the banks of Oil Creek and was drilled to a depth of 69.5 feet.

Pithole (aka Pithole City) is another historic oil and gas location in the commonwealth. Currently a ghost town located in Cornplanter Township, Venango County, Pennsylvania, the area is about six miles from the Drake Well. Pithole's sudden rapid growth and rapid decline was tied to it being a proving ground for a new petroleum industry, making it one of the most famous oil boomtowns.

After the Drake Well

Since the first commercial oil well was drilled in Pennsylvania in 1859, it is estimated that as many as 300,000 to 760,000 oil and gas wells have been drilled in the state. A significant number of these wells were drilled prior to modern well permitting and plugging requirements, and it is estimated that somewhere between 100,000 and 560,000 oil and gas wells remain unaccounted for in state records. Historical plugging practices and materials used have not always been adequate to ensure protection of the commonwealth's water resources. As a result, a significant number of wells still pose a potential threat to human health and the environment.

¹⁰⁰ American Chemical Society, Development of the Pennsylvania Oil Industry

<https://www.acs.org/content/acs/en/education/whatischemistry/landmarks/pennsylvaniaoilindustry.html>

Figure 221. Example of Historical Wells - Frick/Carnegie Library of Pittsburgh



The following photo provides an example of numerous historical wells drilled in a close area (Figure 21).

Oil and Gas Well Permitting

From 1859 through the early 1950s, there were limited regulations addressing drilling, location and decommissioning/plugging of wells. As a result of the Gas Operations Well-Drilling Program Petroleum and Coal Mining Act (1955 Act), the Oil and Gas Division was organized within the Pennsylvania Department of Mines and Mineral Industries on February 1, 1956. The division tracked wells being drilled throughout the commonwealth and required permits for wells drilled in coal areas. Also, the Oil and Gas Conservation Act of 1961 (Act of 1961) promoted spacing of wells penetrating the Onondaga Horizon to a

depth of 3,800 feet. This resulted in wells affected by the Act of 1961 to be permitted. As well as permitting and tracking wells, the Oil and Gas Division carried out inspections of wells being drilled.

The Oil and Gas Act of 1984 required well operators to register all known oil and gas wells, which had not been registered under previous law. A 1992 amendment to the Oil and Gas Act allowed the Department of Environmental Resources (now the Department of Environmental Protection (DEP)) to designate an abandoned well, with no identifiable owner/operator in the recent past and from which no economic benefit was earned after April 18, 1979, as an “orphan well.”

“Legacy Well” is a general term used to describe a well which was drilled and abandoned historically and for which there is no current responsible party. The number of the legacy wells are estimated to be in the hundreds of thousands and have been drilled across the commonwealth. These wells were abandoned without being properly decommissioned. Without proper abandonment, wells have the potential to contribute to health, safety, environmental, and financial impacts. As such, as soon as a well is discovered, it is important to notify DEP. Upon discovery, it is also important not to touch or make any modifications to any component of the well, as doing so may increase the risk of environmental impact and ownership responsibilities at stake.

Addressing legacy wells is a growing concern. While there has been a recognition of water quality problems and public safety risks associated with some legacy wells, other more recent concerns are tied to climate change resulting from the methane emissions and potential economic impacts as part of efforts to address climate change.

There are three critical elements regarding legacy wells as well as active or inactive wells. They are:

1. Accurately identify the locations of the wells.
2. Define any impacts to human health and safety, and the environment, to prioritize actions needed to correct the problem and/or properly managed (decommission/plug) the well; and
3. Take the appropriate corrective action on a timely basis.

The fundamental issue is supporting sustainable funding to support these activities for legacy wells where there is no associated responsible party.

Identification of Legacy Wells

Pennsylvania's oil and gas regulations require that operators identify existing wells within a 1,000-foot buffer zone surrounding unconventional wells. The rule requires operators to consult state well databases, company records, historic maps and photos, and landowner recollections to identify active wells, inactive wells, orphan wells, abandoned wells, and plugged wells within the 1,000-foot buffer zone. This effort will help contribute to knowledge regarding previously unidentified legacy wells. However, due to the footprint of current unconventional resource development, implementing these provisions may not successfully allow every well historically drilled in the commonwealth to be identified. Further, research conducted by the National Energy Technology Laboratory has found the following in relationship to historical oil and gas well drilling:

1. Well databases are nearly complete for wells drilled after 1955 (the year well locations started being recorded as part of the permitting process).
2. Location records for wells drilled before 1955 are less complete.
3. Airborne magnetic surveys for locating existing wells with steel casings is referred to as the gold standard – the technique's applicability to older wells is limited for a variety of reasons:
 - a. The casing is non-magnetic (wood) or weakly magnetic (cast iron).
 - b. The casing has been removed.
4. Removed and used at another well site.
5. Removed and the scrap metal was used to support war needs in the United States during World War 2.
6. Coal mining activities could have resulted in known wells being mined through as well as abandoned unknown wells.

Today, additional concerns associated with the permitting aspects of unconventional wells are being driven by the leakage of methane and climate change. In concert with this, more attention is being directed to identifying abandoned, inactive, and orphan wells leaking methane gas. Active wells are or will be regulated for natural gas emissions going forward based on United States Environmental Protection Agency regulations.

Programs designed to locate oil and gas wells (active, inactive, abandoned, and orphan) are critical for managing risk. The wells have the potential to allow for the vertical migration of fluids (gas, oil, and brine) that can impact water quality and contribute to greenhouse gas emissions.

Numerous contemporary sensor technologies are being used to locate unmarked or unknown abandoned wells. Common tools include the use of airborne magnetic surveys (including drone deployment), LiDAR (Light Detection and Range-Remote) surveys and use of FLIR Technology (Forward Looking Infrared Technology). It should be recognized that if the wells are covered over, these technologies may only allow one to identify potential sites, but more on the ground investigation may be required to better define the actual well site. In the case of methane emissions associated with legacy wells, airborne surveys have also been challenged by the relatively low emission rates.

Prioritization

DEP has developed a matrix regarding prioritization of the environmental impacts caused by abandoned/orphan wells. In establishing prioritization for actions needed, the weighting of criteria to support these actions will most likely be dictated by the sources and amount of funding available to address the issue of decommissioning/plugging any given well.

This is an evolving issue and will most likely require input from various DEP programs.

Appropriate Corrective Actions

DEP should continue to take appropriate corrective actions addressing legacy wells based on their ongoing effort to properly manage/decommission/plug these wells. However, the magnitude of the potential problems (due to the sheer number of potential legacy wells) is very large in scope. The moneys available to take the appropriate corrective actions is small compared to what will ultimately be needed.