2022

Mill and Gardner Creek Coldwater Conservation Plan

Luzerne County, Pennsylvania

Prepared by:

EPCAMR

Eastern Pennsylvania Coalition for Abandoned Mine Reclamation

Technical Assistance, Mapping, Monitoring, Assessment, & Sampling Conducted by:

EPCAMR Staff

Robert "Bobby" E. Hughes, Executive Director & NAACC Lead 1 Coordinator

Michael A. Hewitt, Program Manager, GISP

Steve Cornia, GIS Watershed Outreach Specialist & NAACC Lead Observer

Shawnese Taylor, GIS Watershed Outreach Specialist & NAACC Lead Observer

Frank Sindaco, GIS Watershed Outreach Specialist & NAACC Lead Observer

Laura Rinehimer, Environmental Education/Outreach Specialist & NAACC Lead Observer

Denise Hernandez, Urban Environmental Education & Outreach Specialist

Marissa Loftus, EPCAMR Volunteer Intern & NAACC Lead Observer

Katie Van Orden, EPCAMR Volunteer Intern & NAACC Lead Observer, King's College, Wilkes-Barre

Levi Sunday-Lefkowitz, EPCAMR Watershed Outreach Specialist Intern, University of Rochester, New York

PARTNERS

Luzerne Conservation District

LUZERNE CONSERVATION DISTRICT

John Levitsky, Watershed Specialist

Pennsylvania American Water

PENNSYLVANIA AMERICAN WATER

Susan Turcmanovich, Public Relations, PA American Water Company

Susquehanna River Basin Commission

SRBC SUSQUEHANNA RIVER BASIN COMMISSION NY ■ PA ■ MD ■ USA

Tom Clark, AMD Basin Coordinator

Andrew King, Environmental Scientist

Community Partners-

EDSI, PA CareerLink, & the Luzerne/Schuylkill Workforce Investment Board, Inc.

Stanley Cooper Sr. Chapter #251 Trout Unlimited

Pennsylvania Council of Trout Unlimited

J. Scott Brady
Dr. Joe Simons III

Kathleen Lavelle
Field Coordinator
PA Coldwater Habitat Restoration Program
Allison Lutz
Field Technician
PA Coldwater Habitat Restoration Program
Dr. Shawn Rummel, Ph. D., Program Coordinator
PA Coldwater Habitat Restoration Program

Conservation Legacy Stewards Individual Placement Program (Stewards)

AmeriCorps-Volunteers In Service to America (VISTA) Program, &
US Department of Interior Office of Surface Mining Reclamation & Enforcement (US DOI OSMRE)

Kyle Argenziano, EPCAMR Summer Watershed Outreach Specialist Intern-Bloomsburg University, and current Office of Surface Mining Reclamation & Enforcement (OSMRE) AmeriCorps VISTA & NAACC Lead Observer

University

Municipalities

Laurel Run Borough

Funded By

The Project was financed in part by a grant from the Coldwater Heritage Partnership on behalf of the PA Department of Conservation & Natural Resources (Environmental Stewardship Fund), the PA Fish & Boat Commission, the Foundation for PA Watersheds, and the PA Council of Trout Unlimited.

Matching Funds Provided By:

Disclaimer

The Eastern Pennsylvania Coalition for Abandoned Mine Reclamation, (EPCAMR), its professional Staff, and field work and assessments conducted by volunteers is to be used for educational and planning purposes only. EPCAMR makes no warranties, expressed or implied, regarding the quality of any work product produced. Sponsor agrees to indemnify and hold harmless EPCAMR against any claims arising of the Sponsor's utilization or transfer of reports developed in whole or in part by EPCAMR, its professional Staff, students, interns, and volunteers. The Mill Creek Coldwater Conservation Plan is to be used as a tool that will help educate and build community consensus within the watershed with various stakeholders for the conservation of the coldwater ecosystem.

Limitations

The limits of this project were determined by the number of individuals involved, their knowledge and expertise of tasks outlined in the project plan, amount of funding available for staff time, equipment, etc., the timeline of the project, prevailing weather conditions during the project period, and the amount of existing data and research for the project location. Cost estimates, engineering designs, conceptual plans, and exact measurements in the field, should be a part of the recommendations referred to in the Mill Creek Coldwater Conservation Plan going forward for future implementation by any number of stakeholders in the watershed, including the municipal level governments, non-profits, businesses, or educational institutions, and EPCAMR.

Limits experienced during the development of the Mill Creek Coldwater Conservation Plan included the onset of the global pandemic from Covid-19 that hit Pennsylvania in March 2019 and interrupted the operations of our organization, Staff, workflow, field work, office work, and public gatherings. An extension for the completion of the Plan was sought and approved from the PA Council of Trout Unlimited.

During the Fall of 2022, in the month of September, Hurricane Ida made its way up from the Gulf Coast and lingered over Northeastern PA for a period that left the region with high rainfall totals and streams and tributaries within the Mill Creek watershed were at one point outside of their banks and bankfull. It took several weeks for the streams to come back down to their base flows during a time when the EPCAMR Staff had planned on conducting additional macroinvertebrate surveys at specific locations within the watershed. The scouring of the stream bottoms and extremely fast-moving waters ended up picking up most of the macroinvertebrate populations and moving them downstream, therefore, our counts and diversity of macroinvertebrates were often much lower than expected. EPCAMR doesn't believe there was enough of a recovery period for the macroinvertebrates to repopulate the areas that we had chosen for some of the sampling locations.

TABLE OF CONTENTS

FIGURES

MAPS

TABLES

APPENDICES

EXECUTIVE SUMMARY

Coldwater Heritage Partnership[1] (CHP) planning grants[2] provide funding to conservation organizations to create cold water conservation plans that can be used by municipalities, local businesses, state and local governments, conservation organizations and communities for the conservation and protection of Pennsylvania's coldwater resources.

The Mill Creek Coldwater Conservation Plan will provide a general description of the watershed that is defined as being the stream segments that are in the following Townships: Bear Creek, Jenkins, Pittston, and Plains. Additional stream segments are in the Borough of Laflin and Laurel Run, and a large portion of the lower watershed is located within the City of Wilkes-Barre, Luzerne County, PA where it enters the Susquehanna River after flowing under the N. River Street Bridge just north of the Wilkes-Barre City's Hollenback Cemetery. The Plan includes ***Gardner Creek***, a major tributary to the Mill Creek, which contains **5** additional headwater named tributaries, including ***Quarry Creek***, ***Lampblack Creek***, ***Three Spring Brook***, and ***Deep Hollow Creek,*** and ***Warden Creek*** that feeds the larger Mill Creek Reservoir.

The Plan takes into consideration **5** ponds, reservoirs, and dams, including the ***Mill Creek*** and ***Gardner Creek Reservoirs***, the ***Deep Hollow Pond, Davy John's Dam,*** and **Harlow Pond**, and unnamed feeder tributaries that flow into the Reservoir from the upper headwater forested landscape within the watershed.

This Mill Creek Coldwater Conservation Plan will cover the watershed area and will include relevant geographical, geological, historical, and other information; analysis of recent or current scientific data already available or collected during the course of the grant period; a description of the unique or outstanding ecological, economic, aesthetic, and/or recreational values of the watershed; lists of areas of concern or potential threats, impacts, problems, or opportunities in the watershed; and recommendations report or a plan of action for future conservation, preservation and/or restoration activities and implementation projects that can be undertaken by the partnership established during the course of the development of the Plan.

Importance of Completing the Watershed Assessment

EPCAMR has completed hundreds of watershed restoration projects, environmental education programs, community outreach presentations, watershed field tours, and dozens of watershed assessments on behalf of the Commonwealth of PA, including watershed restoration action strategies, rivers conservation plans, watershed implementation plans, and other cold-water heritage partnership plans under the Coldwater Heritage Partnership (CHP).

We looked to identify areas where municipal storm sewers, coal siltation, AMD, heavy sediment loads, and illicit discharges might be leaking into the watershed so that we can better understand the conservation measures that could be put into place to protect, improve, reconnect, and conserve the cold-water fisheries. We also

[1] Coldwater Heritage Partnership

[2] Coldwater Heritage Partnership Grant Application and Guidelines

looked to gain a better understanding on other types of green infrastructure, stormwater best management practices, culvert assessments, stream corridor improvement needs, and ways to reduce flooding and sedimentation issues throughout the entire watershed.

Impetus for Development of the Mill Creek Coldwater Conservation Plan

EPCAMR sought a cold-water conservation planning grant for the Mill Creek tributary of the larger Upper Susquehanna River watershed because of an upturn in community support from municipal officials, nonprofits that operate within the watershed, and the potential to gain public access along portions of properties within the watershed to evaluate and make recommendations for future tributary and stream improvements to the watershed. EPCAMR had already built several community partnerships within the overall Mill Creek Watershed and thought it was only natural to propose completing the entire watershed by taking a closer look at the Gardner Creek and other tributaries of Mill Creek, outside of, and north of the confluence of the Laurel Run tributary to Mill Creek. It was too large to assess under a single Coldwater Heritage Partnership planning grant. Given the limited financial resources that could be allocated to the planning project that was proposed and the necessary Staff time and technical field expertise and resources that would need to be concentrated on within the watershed in a short period of **24** months, the most strategic approach was taken to break down the sub watersheds over a period of a few years to complete.

EPCAMR has been developing coldwater conservation and river conservation plans throughout the Wyoming Valley for more than two decades, in addition to monitoring many abandoned mine drainage (AMD) discharges and working to advocate for abandoned mine land reclamation, fishery and wildlife habitat improvement projects, stream connectivity, and economic development on reclaimed abandoned mine lands.

For the last few years, EPCAMR has worked in partnership with the Wyoming Valley Sanitary Authority (WVSA) in the Wyoming Valley on identifying potential stormwater improvement and green infrastructure projects because they welcomed EPCAMR's expertise in evaluating areas within the watershed that need improvement and may be funded as future implementation projects under their Municipal Stormwater Sanitary Separation (MS4) Program. This partnership and potential for implementation funding also makes this plan a priority for EPCAMR and the Wyoming Valley. The future work of WVSA will provide additional economic and recreational opportunities, as well as the potential for flooding reduction, fishery, water quality, wildlife habitat, and stormwater improvements in many portions of the watershed.

EPCAMR had to break down the entire Mill Creek Watershed into manageable sub watersheds to conduct the assessments and make recommendations due to the size of the square mile drainage over a several year planning effort to complete the comprehensive watershed coldwater conservation plan. EPCAMR completed the ***Laurel Run Coldwater Conservation Plan***[3] in 2016, which is a major tributary to the Mill Creek that comes to a confluence with the waterway just below the Hollenback Park in the City of Wilkes-Barre. We have strategically jumped back to the east side of the Wyoming Valley to assess the next watershed to the north of Laurel Run after having completed the ***Huntsville*** and ***Lower Toby Creek Watershed Coldwater Conservation Plan*** in the

[3] Laurel Run Coldwater Conservation Plan (2016)

Spring of 2021. We have had the support of multiple local governments and regional partners to tackle the challenge that lies ahead. There hasn't been a fisheries assessment of this watershed by EPCAMR in recent years by any agencies, including the PA Fish & Boat Commission (PA F&BC).

The EPCAMR Executive Director pulled some of their Coalition Partners together in the Wyoming Valley and throughout the City of Wilkes-Barre to make an application for funding for **$6000** (*the maximum amount of funds to conduct a watershed assessment planning effort under the CHP Program*) for the Mill Creek in the Winter of 2019. It has been EPCAMR's intention to identify and eventually assess as many watersheds over a several year span throughout the Wyoming Valley's eastern and western flanks where we felt that there were viable wild and native trout stream populations that were either isolated above the coal measures or had the ability to be reconnected to downstream habitat areas should stream restoration, habitat improvement projects, streambank stabilization, or culvert replacement or rehabilitation projects be implemented over time in future rounds of CHP Implementation funding.

A decade ago, a large abandoned mine land reclamation and stream channel restoration project completed along US Route Highway 315 across from the entrance to the ***Mohegan Sun Arena at Casey Plaza***[4] and just north of the ***KOMATSU***[5] dealership adjacent to Mill Creek that had allowed for the reconnection of the stream channel to flow downstream and remain on the surface as opposed to being lost to an infiltration point that had been in the area where during high water events, water loss occurred that entered the underground mine pool complex in the Wyoming Valley. EPCAMR had an inclination that the reclamation project by the PA Department of Environmental Protection's Bureau of Abandoned Mine Reclamation (PA DEP BAMR) helped to improve the fishery and eliminated a very large flow loss that was suspected to enter the mine pool complex that reached the Plainsville AMD borehole, in Plains Township, west of River Road.

There is a large municipal Golf Course in the watershed that is in Wilkes-Barre City adjacent to **8.8**-acre ***Hollenback Park***[6], called the ***Hollenback Municipal Golf Club***[7] and Course that is parallel to Mill Creek along N. Washington Street. The Laurel Run tributary comes to a confluence with Mill Creek along Hollenback Park, flowing in a westerly direction just north of the North Cross Valley State Route 309 bridge abutments and south of the Hollenback Park baseball field. EPCAMR continues to work with the City to see what type of riparian corridors are maintained around the stream corridors to see if we can recommend or educate them on the importance of establishing and maintaining areas around the stream channel to keep the streams cool, reduce soil and streambank erosion, to determine the potential for habitat restoration, and to promote wetlands conservation.

[4] Mohegan Sun Arena at Casey Plaza - Wilkes-Barre

[5] Komatsu Dealership, Wilkes-Barre, PA

[6] City & Neighborhood Parks | Hollenback Park, Wilkes-Barre PA

[7] Hollenback Golf Club - Facebook Home

Finally, there is a new high school complex constructed in the City of Wilkes-Barre, for the ***Wilkes-Barre Area School District***[8], located between Maffett Street and South Main Street, just northeast of the North Cross Valley Highway State Route 309, within the Mill Creek watershed. EPCAMR intended to assess the water quality of stream sections that flow adjacent the property to determine the stream health and water quality in those portions of Plains Township and downstream in the City of Wilkes-Barre before its confluence with the Susquehanna River. The physical location of the Mill Creek runs parallel to the northeast side of the Wilkes-Barre Connecting Railroad tracks on the northeast side of S. Main Street in Plains Township and is bordered by the Hollenback Golf Course and Park in the City of Wilkes-Barre.

EPCAMR has been in communication with faculty and School Board members and believes that there remains great potential for a future partnership with the Wilkes-Barre Area School District, their Science Technology Engineering and Math (***STEM Academy***)[9] Program, and other teachers, to utilize the watershed for field studies, outdoor learning experiences, fishery education, and or riparian restoration and stream cleanups within the watershed with EPCAMR. EPCAMR has communicated with several Wilkes-Barre Area STEM teachers on providing examples of how the local watershed can be used for outdoor environmental education experiences and applied science programs. The Wilkes-Barre Area School District has always been a supportive partner in multiple grant and environmental education projects and programs with EPCAMR for more than two decades.

Goals and Objectives for the Mill Creek Watershed Assessment Coldwater Conservation Plan

EPCAMR's goals and objectives for the coldwater conservation assessment plan are to evaluate the headwaters, tributary streams-where accessible, partner with our long-standing community partners and the municipalities to evaluate and assess culverts, conduct a baseline water quality and macro-invertebrate snapshot of the watershed, note public access areas along the streams and tributaries, make recommendations to our community partners upon completion of the assessment that will lead to future implementation projects, and to conserve and protect existing cold-water fishery resources in the Mill Creek Watershed.

EPCAMR applied for a ***Foundation for PA Watersheds- PA Trout Unlimited Technical Assistance Grant***[10] to conduct an electroshocking survey in areas of the watershed where we deemed those locations to be of great importance or in areas where we lacked the knowledge of the presence of fish in great numbers to establish a baseline prior to future implementation projects being considered under future rounds of funding.

EPCAMR believes that we have increased the awareness of not only the CHP Program and our collective efforts of the funders to increase support for cold-water fishery improvement, but also, of the importance of private landowner cooperation in making those improvements in partnership with qualified environmental professionals and local community organizations that have the best interests of the watershed in mind.

[8] Wilkes-Barre Area School District

[9] WBASD STEM Academy

[10] The Foundation for Pennsylvania Watersheds » TU Technical Assistance

In essence, EPCAMR goals were to:

- Evaluate trout abundance and recommend mitigation and watershed habitat improvement projects to reduce sediment loading on trout streams;
- Evaluate and assess culverts that can be approached publicly, and reach out to private landowners with culverts to determine if they could be assessed using the ***North Atlantic Aquatic Connectivity Collaborative***[11] (NAACC) approach;
- Assess urban and rural development patterns related to storm water, culvert maintenance, blockages, and possible replacement recommendations to improve up/downstream water quality, stream corridors, & aquatic passage;
- Increase public awareness and appreciation of native brook trout streams and cold-water fisheries;
- Request a Technical Assistance Grant from PA Trout Unlimited to conduct an electroshocking survey at various locations to be determined within the watershed for the fishery health and status; and
- Create a list of recommendations for future implementation projects upon completion of the cold-water conservation planning assessment

Project Work Plan

EPCAMR followed the timeline proposed below within the grant and the criteria in ***Attachment A***. EPCAMR monitored stream locations-where accessible, at pre-determined and accessible locations that were identified based on the confluence of tributaries on the watershed map for chemistry, macro-invertebrates, and stream habitat. Some stream flows will be taken on occasion if water loss is suspected into the underground mine workings. A fish electroshocking survey was completed under a Technical Assistance Grant from the PA Trout Unlimited at various locations to be determined following the field reconnaissance by the EPCAMR Staff. Culvert evaluations and assessments were conducted with an emphasis on the publicly accessible ones. EPCAMR Staff worked with some of the local municipalities to identify private landowners who had culverts crossing a waterway to access their property and assess their culverts. EPCAMR provided photo documentation of pristine, historical, cultural features, and impacted areas of concern in the watershed.

EPCAMR Staff followed the ***US EPA Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers***[12] for benthic macro-invertebrate sampling and PA TU's Protocols and Methodologies for the Electroshocking Survey. Water quality monitoring was a snapshot assessment utilizing EPCAMR's HACH spectrophotometer test kit, and our YSI multi-parameter probe. There was no lab sampling conducted due to the expenses necessary for sampling that are beyond the budget scope of the grant. EPCAMR tested for pH, alkalinity, Iron, Aluminum, Oxidation Reduction Potential (ORP), Dissolved Oxygen (DO), Specific Conductivity, Temperature, and Total Dissolved Solids (TDS). On occasion, Nitrates and Phosphates were sampled. Results were tabulated and recorded in the final cold-water conservation plan.

We anticipated that we were going to have additional EPCAMR interns and volunteers from the local Stanley Cooper Sr. Chapter TU along with us or volunteers who are interested in becoming certified in the culvert

[11] NAACC

[12] US EPA Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, 2nd Edition (1999)

assessments as a Lead Observer with NAACC, as we have done on past projects. However, due to the pandemic, interactions were limited with the public, our volunteers, and even sponsoring interns with EPCAMR in partnership with the local colleges and universities in 2020 and 2021. Most of the field work was completed by the EPCAMR Staff and research on elements of the plan were completed by our OSMRE AmeriCorps VISTA volunteer, Kyle Argenziano.

Anticipated Use of the Mill Creek Watershed Assessment Coldwater Conservation Plan

The completed Plan will be used to partner with stakeholders and community partners to prioritize implementation projects that are feasible, fundable, and would benefit the fishery and other watershed improvements throughout the Mill Creek watershed. Partners will be encouraged to seek funding for any number of recommendations that will be suggested in the plan.

Electronic copies of the Mill Creek Coldwater Conservation Plan will be provided to all stakeholders and be made available on the EPCAMR website, PA Trout's website, and various social media outlets. A physical copy of the Plan will be made available for public review in the EPCAMR Office. EPCAMR intends on partnering with the stakeholders to work together to solicit future grant funds for implementation projects. Some partners like the WVSA, Susquehanna River Basin Commission, and the Luzerne Conservation District, may have funding in place to leverage, while others like the Stanley Cooper Sr. Chapter of TU might apply for an Embrace-A-Stream grant or a Forever WILD[13] grant to implement some of the recommendations. Municipalities could apply for technical assistance for design, construction, rehabilitation of culverts that might be determined to need replacement or realignment. EPCAMR and other non-profit organizations like PEC NE Office, North Branch Land Trust, Wilkes-Barre Citizens Blight Committee, Luzerne Conservation District, and New Roots Recovery Center, would also be eligible to apply for riparian restoration projects, litter cleanups, and streamside cleanups through other sources. Willing private landowners will be necessary to implement any future stream channel restoration projects that might be suggested should they be interested in protecting their streambanks and preventing further erosion from occurring on their properties.

Project Partners

EPCAMR has many partners in the Wyoming Valley that were made aware of the development of the coldwater conservation plan including the Luzerne Conservation District (LCD), Susquehanna River Basin Commission (SRBC), North Branch Land Trust (NBLT), Wyoming Valley Sanitary Authority (WVSA), Pennsylvania Environmental Council (PEC) NE Office, Wilkes-Barre Area School District (WBASD), New Roots Recovery Center (NRRC), Wilkes-Barre Citizens Blight Committee, Penn-State University Master Watershed Stewards (PSU MWS), Bloomsburg University, King's College, University of Rochester-NY, Luzerne County Community College, University of Kutztown, EDSI, PA CareerLink, Luzerne/Schuylkill County Workforce Investment Board, Inc., and the Stanley Cooper Sr. Chapter TU.

EPCAMR provided in-kind Staff support and technical field and office equipment towards the overall total project budget. The Stanley Cooper Sr. Chapter TU volunteered during the electroshocking survey with PA TU.

[13] PA Council of Trout Unlimited's Forever WILD Grant Program

EPCAMR's OSMRE AmeriCorps VISTA Volunteer assisted with conducting background research on the watershed for historical context, including historic maps of the patterns of the waterways.

EPCAMR had submitted a request to the Foundation for PA Watersheds- Trout Unlimited Technical Assistance Grant to have the Habitat Division Field Staff come out and conduct an electroshocking survey in the Mill Creek watershed on October 1, 2021. Members of the EPCAMR Staff participated in the survey, including Steve Cornia- EPCAMR GIS Watershed Outreach Specialist, Michael Hewitt-EPCAMR Program Manager, Bobby Hughes, EPCAMR Executive Director, along with John Levitsky, Watershed Specialist for the Luzerne Conservation District, and Dr. Joe Simons III, Treasurer for the Stanley Cooper Chapter of Trout Unlimited and EPCAMR President. An addendum to the Plan will include the results of the electroshocking survey by the PA Council of Trout Unlimited, prepared by Kathleen Lavelle and Allison Lutz.

EPCAMR prepared to bring together support from stakeholders and partners within the watershed in the Fall of 2019, obtained letters of support, developed a budget, and submitted the proposal in December 2019. Every municipality was contacted and communicated with about the project proposal. Letters of Support were obtained and received from the City of Wilkes-Barre, Earth Conservancy, North Branch Land Trust, Penn-State Master Watershed Stewards, New Roots Recovery Center, Plains Township Board of Supervisors, Stanley Cooper Chapter of Trout Unlimited, Wyoming Valley Sanitary Authority, and the Wilkes-Barre Area School District. Letters of support are attached in ***Appendix D***.

The Eastern PA Coalition for Abandoned Mine Reclamation (EPCAMR) was successful in obtaining the grant and was awarded **$6000** in March of 2020 and signed and mailed in an Assurance Letter to the Coldwater Heritage Partnership before beginning the development of the Plan. By late Winter, in March of 2020, EPCAMR had received our fully executed grant agreement to begin working on the Plan Announcement of 2020 CHP Grant Awards. In April of 2020, EPCAMR began posting social media posts about our initial field investigations to help spread the word on what some of our scope was for the watershed and e-mails sent to municipal partners on the announcement of the award. Due to the pandemic, we were not able to schedule an initial public informational in-person meeting because no municipal buildings or locations were allowing gatherings of the public for precautionary and health and safety concerns.

The Mill Creek Coldwater Conservation Plan preparation included a public participation process, which served to inform stakeholders and build community consensus for the conservation of the coldwater stream and its tributaries. A virtual public information meeting was held to relay the draft information collected in the Plan and the City of Wilkes-Barre's Mayor's Office was informed of the grant award and had been fully supportive of EPCAMR's efforts as they had been during the completion of the Laurel Run and Solomon Creek Watershed Coldwater Conservation Plans years ago. EPCAMR utilized several social media groups to try and learn more about the watershed from residents by creating posts that sought historic and anecdotal information on the watershed. The virtual meeting was held via Zoom due to concerns about the current Covid-19 pandemic and health and safety reasons.

On April 29, 2020, EPCAMR shared on our Facebook social media page of **3000** followers and the Parsons, North End, Miners Mills, East End, Wilkes-Barre, and Plains Facebook social media page of **5000** members, information on our work on the Mill Creek Coldwater Conservation Plan and sought input as a part of our community outreach from residents who lived in the watershed and local neighborhoods. Sixteen responses were generated and followed up with by EPCAMR.

Our Final Draft Plan meeting was scheduled for a virtual Zoom meeting in the Winter of 2022 due to COVID-19 restrictions for public gatherings on February 8, 2022 from 6-8PM. However, EPCAMR sent copies of the draft plan to all partners and municipalities within the watershed for comments prior to final publication and each of the earlier mentioned social media pages will have a link provided for the public and residents from within the watershed to be able to provide comments. **11** interested people attended, and the presentation was recorded and will be posted on the EPCAMR website. Comments were noted and incorporated into the Final Plan.

The process that EPCAMR followed to develop the Mill Creek Coldwater Conservation Plan was as follows:

a) Notified municipalities in the watershed about the grant award, including an explanation of the project;
b) Postponed the anticipated scheduling of the initial public informational meeting due to the Covid-19 pandemic and inability of large gathering to occur and for the health and safety of the Staff and public;
c) Gathered existing information (geological, hydrological, historical, etc.) about the waterway and watershed and collect scientific data on current stream conditions;
d) Prepared a draft of the Mill Creek Coldwater Conservation Plan for review by CHP Staff and stakeholders;
e) Presented the results and solicited feedback of the final draft of Mill Creek Coldwater Conservation Plan at a virtual Zoom public informational meeting near the end of the grant period in February 2022; and
f) Prepared and submitted FINAL Mill Creek Coldwater Conservation Plan to PA Council of Trout Unlimited.

The Mill Creek Coldwater Conservation Plan includes the following:

• Introduction of the Eastern PA Coalition for Abandoned Mine Reclamation (EPCAMR)
• Background on the Coldwater Heritage Partnership Planning Grant Program
• Impetus for Development of the Mill Creek Coldwater Conservation Plan
• EPCAMR Coalition Building through Partnerships and Stakeholder Outreach
• Detailed Map of the Mill Creek Watershed
• EPCAMR Scope of Work Items
• Cursory Environmental Issues & Problem Areas within the Mill Creek Watershed
• Tentative Timeline for the Development of the Mill Creek Coldwater Conservation Plan
• Macroinvertebrate, Water Quality Sampling, Survey Protocols & Field Equipment
• Historic & Geomorphic Description of the Mill Creek Watershed
• Previous and Current Studies-Analysis of the Mill Creek Watershed
• Mill Creek Watershed Description and Background Information
• Land Use Characteristics of the Mill Creek Watershed
• Historic Land Use within the Mill Creek Watershed
• Fishery Designations by Drainage within the Mill Creek Watershed
• General Flow and Drainage Pattern of Mill Creek from Headwaters to the Susquehanna River Confluence
• Historical Flow and Current Ground-Truthed Detailed Drainage Pattern of Mill Creek from Headwaters to the Susquehanna River Confluence

- Mill Creek Watershed Research & Field Reconnaissance Observations with EPCAMR Staff
- Mill Creek Watershed NAACC Culvert Assessments
- Current Biological Monitoring and Assessments
- Areas of Concern and Potential Conflicts
- EPCAMR Recommendations
- Future Funding Grant Opportunities and Potential Partners
- Summary/Conclusions
- Appendices

Coldwater Conservation Plans are available on the Coldwater Heritage Partnership webpage[14].

[14] Coldwater Heritage Partnership

INTRODUCTION OF THE EASTERN PA COALITION FOR ABANDONED MINE RECLAMATION

The Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR)[15] is a regional environmental organization founded in the Wyoming Valley 26 years ago to address past mining practices throughout watersheds and communities that were impacted by resource extraction of Anthracite, Bituminous, and other mining industries throughout Northeastern and Northcentral Pennsylvania.

EPCAMR Mission

"The general purpose of EPCAMR is to encourage the reclamation and redevelopment of land affected by past mining practices. This includes reducing hazards to health and safety, eliminating soil erosion, improving water quality, [and] returning land affected by past mining practices to productive use, thereby improving the economy of the region." -from the Preamble of the EPCAMR Bylaws. Incorporation Date: January 15, 1997

We are:

- a 501 (c)(3) non-profit, educational, scientific, technical, public, charitable organization founded in 1995
- located centrally within the Coal Regions of Northeastern and North Central PA with an office in Ashley, PA co-located with the Earth Conservancy[16]
- prioritize restoring streams impacted by abandoned mine drainage (***AMD***[17]), a water pollution problem that affects **7,356** miles of PA streams[18]
- reclaim abandoned mine lands scarred from past mining practices
- assess watersheds within the Coal Regions of PA to develop watershed conservation, coldwater conservation, and implementation plans to protect and improve existing water resources, coldwater, and warm-water fisheries
- provide technical grant writing assistance and professional services to organizations and private entities in need of assistance
- providers of environmental education opportunities, outdoor learning experiences, field tours and opportunities for youth and students to become engaged and learn about local watersheds, problems & solutions to protecting our environment
- partners with local governments, regional environmental non-profits, historical preservation organizations, reclamation related organizations, State, Federal, County, and International organizations to improve the quality of life throughout the 16 county-service are of EPCAMR
- advocates for additional revenue sources, legislation, policies, and funding from the various forms of government to assist with leveraging other programs to reclaim abandoned mine lands through economic development opportunities; and
- remediation of streams impacted by mine water pollution through ***AMD Treatment Systems***[19]

[15] EPCAMR
[16] Earth Conservancy
[17] Acid Mine Drainage (AMD) and Remediation
[18] PA Department of Environmental Protection 2022 Integrated Water Quality Report
[19] AMD Treatment Systems

Additional information on the variety of projects that EPCAMR has undertaken can be found on our website at the following link entitled, "***What EPCAMR Does!***"[20]. You can also find ***EPCAMR's Guide to Watershed Protection***[21] on the website.

While developing the plan, there were **4** Full-Time EPCAMR experienced Staff[22], **1** Full-Time Volunteer from the Office of Surface Mining Reclamation & Enforcement AmeriCorps Volunteer in Service to America (VISTA), **3** Watershed Outreach Specialist Interns, and **3** Part-Time Staff involved. EPCAMR has **32** regional, volunteer Board of Directors[23] made up of diverse community members, watershed organization representatives, Conservation District representatives, Independent Power Producers trade association, the Anthracite Industry, private consulting firm representatives that work in the reclamation and AMD remediation sector, educators, lawyers, outdoor recreationists, filmmakers, artists, and photographers.

EPCAMR administers and manages a variety of grants, contract agreements, professional service agreements, corporate donations, and foundation funds, to leverage funding from multiple sources to complete our projects, programs, environmental education and outreach events and workshops, mine pool mapping, field tours and outdoor educational experiences, and abandoned mine land and AMD remediation projects. Our membership base is small; however, we are always looking for additional individual, organizational, and industry members to join our cause to support our mission, goals, and objectives. We rely heavily on our volunteer base in our communities that we serve to get our "boots on the ground" projects up and running. We are seen as a national leader in abandoned mine reclamation and AMD remediation projects throughout the country. We advocate for funding that supports land reclamation, AMD treatment, watershed restoration, trout stream restoration, habitat improvement for both fish and waterfowl, dam removal, and economic development of abandoned mine lands and the use of mine water for alternative clean energy projects.

EPCAMR has completed seven Coldwater Conservation Plans for the CHP Program over the years including the ***Abraham Creek***, ***Upper Toby Creek***, ***Lower Toby Creek***, ***Huntsville Creek***, ***Laurel Run***, ***Solomon Creek***, and outside of the Wyoming Valley, ***Bowman's Creek*** in Wyoming, Luzerne, and Sullivan Counties. All the Plans can be found on the CHP website[24].

[20] What EPCAMR Does!
[21] EPCAMR's Guide to Watershed Protection
[22] EPCAMR Staff
[23] EPCAMR Board
[24] Coldwater Heritage Partnership

Technical Assistance & Provided Services

Grant Writing & Administration

Interpretation of Historic Surface & Underground Mine Maps

Building Broad Coalitions Throughout the EPCAMR Region

EPCAMR is looking to continue to build partnerships with all of the Conservation Districts in NC and NE PA that have impacts from not just abandoned coal mines but also abandoned quarries, limestone, sand and gravel, and other mines where mineral extraction has occurred. We encourage membership from other organizations and Conservation Districts to become involved with our regional organization to address the important issues associated with achieving clean water, land reclamation, economic development, job opportunities, and environmental education and outreach opportunities throughout the region.

Now, more than ever, EPCAMR would like gain the local support of community groups, local governments, educational institutions, conservancy groups, Conservation Districts, reclamation related organizations, land trusts, historical societies, cultural organizations, Trout Unlimited Chapters, co-generation plants, coal companies, and private sector industries. These partnerships will allow EPCAMR to provide the necessary resources, information, data, first-hand knowledge, anecdotal evidence, technical resources, mapping, historic mine maps (both surface and underground), and institutional knowledge from community leaders and volunteers who want to achieve the same goal of restoring our watershed impacted by past mining practices.

A large majority of EPCAMR's work has focused on areas impacted by both bituminous and anthracite coal mining. We are willing to assess and provide technical assistance in other areas. Contact us today to find out how to become a partner!

Overview of Programs

Watershed and Urban Outreach Programs

Mine Map Scanning, Georeferencing, & Digitizing for the PA Mine Subsidence Insurance Program

- Professional Services for Water Quality, Flow, Borehole Monitoring, & Maintenance & Operation of AMD Treatment Systems

- Environmental Education Program to Underserved School Districts and Environmental Justice Coalfield Communities

- Visual Habitat, Biological Fishery and Macro-Invertebrate Assessments, Trout Stream Coldwater Conservation & Watershed Assessment Plan Development

- 3D Mine Pool Mapping & Modeling of Underground Mine Pool Complexes throughout the State

Figure 1. EPCAMR Brochure Highlights

Who We Are

EPCAMR is a regional non-profit environmental organization that works throughout Northeastern and North Central Pennsylvania's Anthracite, Semi-anthracite and Bituminous Coalfields with community groups, local governments, schools, colleges and universities, as well as mining companies, conservation districts, reclamation-related businesses, watershed groups, Trout Unlimited chapters, and other regional non-profit organizations to support the reclamation of abandoned mine lands (AML) and the remediation of polluted abandoned mine drainage (AMD) rivers and streams impacted by past mining practices.

Our staff and board are interested in developing partnerships with community leaders and organizations that seek opportunities to leverage funding from various levels of government, foundations, corporate donations, and volunteer matching funds from individuals interested in becoming involved in local projects within their own coal-impacted communites.

EPCAMR creates new partnerships and builds on existing ones to raise the awareness of our mission and goals. We provide professional services to support AML reclamation, AMD remediation efforts and watershed restoration projects in our region and beyond.

The 40-ft high Harry E. Breaker Waste Coal Pile, which was on fire, continues to be a source of pollution in Swoyersville, PA.

Our Mission

"The general purpose of the EPCAMR is to encourage the reclamation and redevelopment of land affected by past mining practices. This includes reducing hazards to health and safety, eliminating soil erosion, improving water quality, and returning land affected by past mining practices to productive use, thereby improving the economy of the region."

The orange pollutant in AMD known as iron-oxide pours out of the Old Forge Borehole in Lackawanna County, Pennsylvania at an estimated 40 to 100 million gallons a day. This amount of drainage per day is equivalent to the amount of water the average person uses in an entire year!

Although AMD is often thought to be orange due to iron oxide, it has many different colors and levels of toxicity dependent on the chemistry. This form of AMD is crystal blue, which gets its hue from the high amount of aluminum. The Jeddo Tunnel of Luzerne County, Pennsylvania releases an estimated 40,000 gallons of polluted mine water every minute.

"EPCAMR prides ourselves on the professional quality of our work created by our highly skilled, passionate staff who are committed to watershed restoration, land reclamation, and providing educational awareness of our efforts to reclaim mining impacted areas in the Anthracite and Bituminous Coalfield communities that are often underrepresented."

—Robert E. Hughes, Executive Director

Figure 2. EPCAMR Organizational Description and Mission

Contact Us

EPCAMR's Office is centrally located throughout the coalfields off of Inter-State Route I-81; Nanticoke Exit 164 onto State Route 29 Ashley/Sugar Notch Exit 1 onto S. Main Street. 101 S. Main Street, Ashley PA 18706; (Red Brick Building)

Office hours usually 9AM-5PM Monday through Friday; Occasional Saturdays while coordinating community projects.

For updates on future volunteer opportunities and what's going on in the office, sign up for our monthly newsletter in the "Volunteer Registration Form" under the "Get Involved!" tab on our website at www.epcamr.org

570-371-3522

EPCAMR

info@epcamr.org

epcamr

epcamr.org;
orangewaternetwork.org;
treatminewater.com

@epcamr

Figure 3. EPCAMR Contact Information and Social Media Outlets

BACKGROUND ON THE COLDWATER HERITAGE PARTNERSHIP PLANNING GRANT PROGRAM

The Coldwater Heritage Partnership provides funding support for evaluation, conservation, & protection of Pennsylvania's cold-water streams and is dedicated to preserving natural fisheries. The Partnership consists of:

- PA Department of Conservation and Natural Resources (PA DCNR)[25]
- PA Fish & Boat Commission (PA F&BC)[26]
- PA Council of Trout Unlimited (PATU)[27]
- Foundation for PA Watersheds (FPW)[28]

Proposals that meet the following criteria are given priority:

- Project will occur in a watershed containing streams with naturally reproducing trout populations;
- List of streams containing naturally reproducing trout[29];
- Project will occur in a watershed listed as ***Special Protection Waters*** within the PA's ***Chapter 93***[30] or have the potential to be upgraded;
- Streams and other water bodies in project area are generally open to the public for recreational activities, including angling;
- Project demonstrates significant partnerships, volunteer involvement, and promotes opportunities for citizen science and engagement;
- Local watershed organizations, regional non-profits, TU chapters, County Conservation Districts or academic institutions take the leading role in the implementation of the project; and
- Proposed project demonstrates benefits to cold water fish species as well as to the local community's economic, recreational, aesthetic characteristics or objectives.

PA DCNR is especially concerned with the "**EPCAMR Recommendations**" portion of all final plans. They want to see a Coldwater Conservation Plan that has very specific, attainable, and fundable, shovel ready recommendations and suggested action items that can be funded either with CHP Implementation grants, can serve as possible mitigation projects in the future, or would become eligible for known and existing alternative funding programs.

[25] PA Department of Conservation and Natural Resources
[26] PA Fish & Boat Commission
[27] PA Council of Trout Unlimited
[28] Foundation for PA Watersheds
[29] PA Fish & Boat Commission Natural Trout Reproduction Report, November 2021
[30] PA Code-Chapter 25 Subsection 93.3

FPW is focused on "priority" watersheds, where there is a high likelihood of being able to support native trout populations into the future, if steps are taken to improve, restore, conserve, protect, the existing resource. We took into consideration future development pressures, potential for temperature increases, and whether the Mill Creek watershed is where wild trout species, with a little help from habitat improvement projects, streambank stabilization projects, riparian buffer plantings, dam removal, and culvert replacements or rehabilitation, can survive and thrive.

EPCAMR COALITION BUILDING THROUGH PARTNERSHIPS AND STAKEHOLDER OUTREACH

The following partners and stakeholders were reached out to at the very beginning of the process to develop the planning grant and additional partners were added throughout the course of the completion of the watershed assessment and development of the Mill Creek Coldwater Conservation Plan. Many of the partners provided letters of support for the grant application, while others provided local knowledge of areas of concern or for those sites in need of protection or restoration. EPCAMR felt that it was important to reach out to partners early prior to submitting our application to gain their support and benefited greatly from doing so by increasing the awareness of the CHP Program and EPCAMR's professional technical services that we were offering publicly to complete the watershed assessment and development of the Coldwater Conservation Plan at no expense to any local governments.

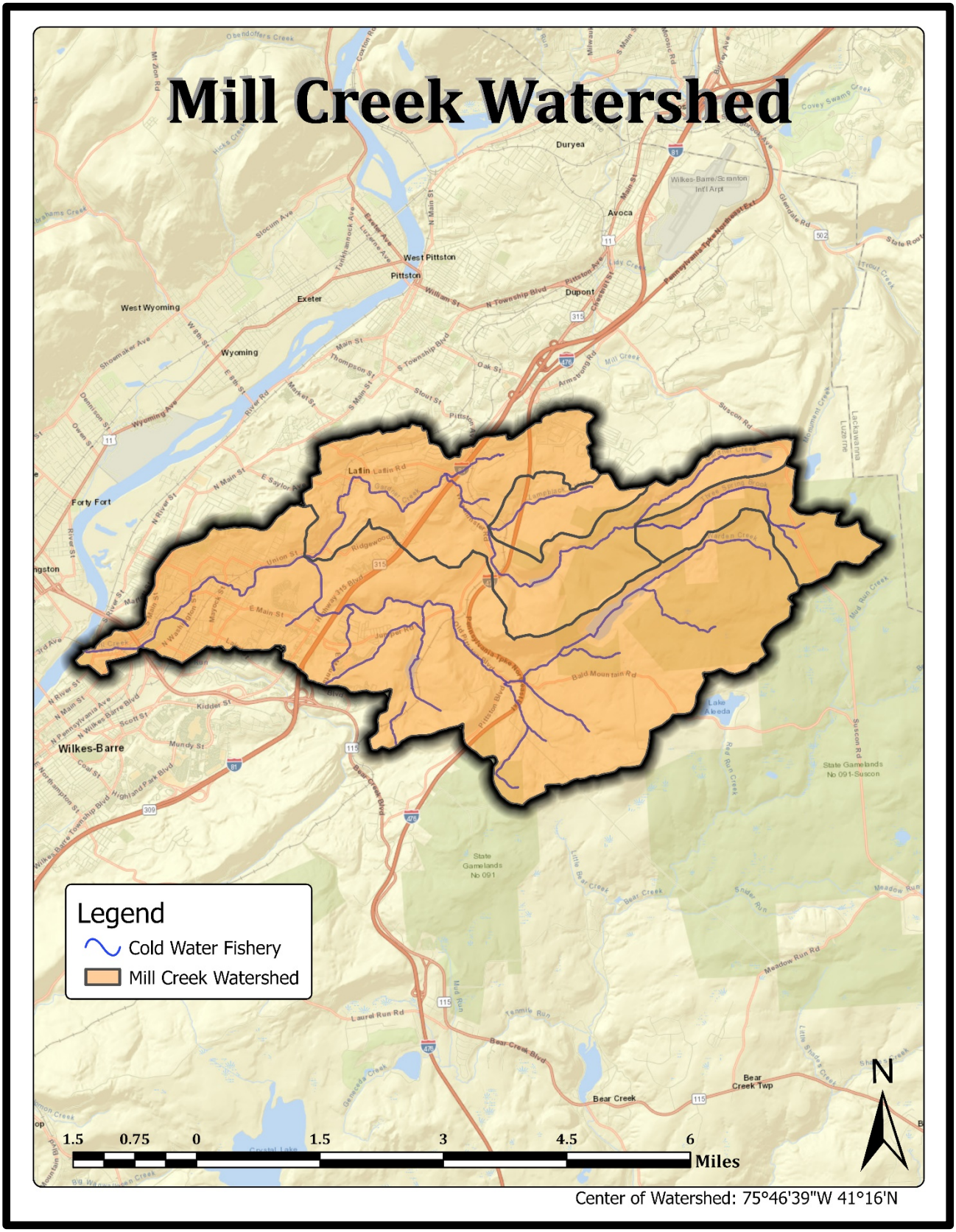
At the January 2022 virtual Zoom public information meeting, Robert "Bobby" E. Hughes, gave an in-depth comprehensive overview presentation to the audience on behalf of EPCAMR, took notes based on comments provided by individuals who had information and knowledge to share, including the Gardner Creek tributary. EPCAMR Staff acquired contact information and e-mail addresses from everyone who were interested in receiving our monthly volunteer newsletter, those who offered access to private properties along the creek and tributaries for future investigations, and those who offered technical assistance and support.

John Levitsky, Watershed Specialist from the Luzerne Conservation District and EPCAMR Board Member and Dr. Joe Simons III, Stanley Cooper Chapter of Trout Unlimited Treasurer and EPCAMR President, were very helpful during the planning portion of the project, providing technical assistance, and volunteering to participate in the electroshocking survey with the PA Council of Trout Unlimited and the EPCAMR Staff.

Table 1. EPCAMR Coalition Building through Partnerships and Stakeholder Outreach in the Mill Creek Watershed

Community Partners	Municipalities in the Mill Creek Watershed
Stanley Cooper Chapter of Trout Unlimited	Plains Township
Pennsylvania Environmental Council NE Office	Pittston Township
North Branch Land Trust	Bear Creek Township
PA American Water Company	Jenkins Township
Penn-State University Master Watershed Stewards	Laurel Run Borough
Wilkes-Barre City Municipal Authority's Hollenback Golf Course	Laflin Borough
Wilkes-Barre Citizens Blight Committee	City of Wilkes-Barre
Earth Conservancy	
Luzerne Conservation District	Educational Institutions, Colleges, & Universities
Wyoming Valley Sanitary Authority	Wilkes-Barre Area School District
EDSI	King's College
PA CareerLink-Wilkes-Barre	Luzerne County Community College
Luzerne/Schuylkill Workforce Investment Board, Inc.	University of Rochester-NY
Susquehanna River Basin Commission	University of Kutztown
The Natural Lands Trust	University of Bloomsburg
PA Game Commission	

Map 1. Map of the Mill Creek Watershed



EPCAMR SCOPE OF WORK ITEMS

• EPCAMR received **$6,000** grant to assess the Mill Creek Watershed

• Fish surveys: Assess populations of Brook Trout and Wild Brown Trout with PA Council of Trout Unlimited

• Macroinvertebrate sampling

• Water quality monitoring: water chemistry

• Culvert assessments for ***aquatic connectivity and aquatic organism passage (AOP)***[31] through NAACC[32]

• Research existing plans and reports available on the Mill Creek Watershed or Conservation Efforts within the identified municipalities

• Visual habitat assessment

• Photo documentation

• Creation of various watershed maps using GIS available data layers and EPCAMR data

CURSORY ENVIRONMENTAL ISSUES & PROBLEM AREAS WITHIN THE HUNTSVILLE CREEK

Prior to conducting field reconnaissance, EPCAMR listed some cursory anticipated environmental issues and problem areas within the watershed as the development of the Mill Creek Conservation Plan got underway. Many of these issues are common to the watersheds throughout the Wyoming Valley on both the eastern and western flanks. Many of the suggested concerns were based on the EPCAMR Staff's experiences and extensive knowledge of the watershed prior to beginning the assessment and having worked in the watershed on previous occasions on other projects with local partners and municipal governments.

[31] Aquatic Connectivity and Aquatic Organism Passage

[32] North Atlantic Aquatic Connectivity Collaborative-Stream Continuity

Table 2. Anticipated Environmental Issues and Problem Areas within the Mill Creek Watershed

Anticipated Environmental Issues and Problem Areas within the Mill Creek Watershed
Flooding Issues
Pipeline crossings under and over streams
Riparian corridor restoration needs
Culvert damage assessments and need for repair or replacement
Headwall failures along waterways
Streambank erosion and stabilization needs
Stormwater management issues
Sediment accumulation in stream channels and storm drains or pipe culverts
Downed trees and major woody debris blockages
Illegal dumping issues
Private property, public property, and urban runoff issues
Major infrastructure constriction points along waterways
Poor Water Quality
Poor fishery habitat ecology in need of stream habitat improvement
Severely incised channels
Potential dam removal projects
Public and private infrastructure issues
Invasive Plants
Abandoned Mine Drainage (AMD)
Abandoned Mine Land Reclamation
Failing retaining walls
Gravel bar and point bar formation and accumulation both in-stream and under bridge culverts
Scour pools and projecting culverts that could be unaligned and floating well above stream grade

TENTATIVE TIMELINE FOR THE COMPLETION OF THE MILL CREEK COLDWATER CONSERVATION PLAN

Project Timeline (***An extension was granted for the completion of the plan through December 2021 due to the pandemic***)

Mar-Sept. 2020

a. Notify municipalities and stakeholders about the grant award. Post articles to EPCAMR social media outlets

b. Have EPCAMR OSMRE AmeriCorps VISTA gather, research historical data, references, and reports on Mill Creek with Staff

c. Schedule initial public informational meeting within the Mill Creek watershed at a local municipal building

d. Reach out to the local media to obtain a cover story on the grant announcing the first public informational meeting within the Mill Creek watershed

Jan-Sept. 2020

a. Identify potential impacts, opportunities, and problems, within the Mill Creek watershed through numerous field reconnaissance visits throughout the area

b. Conduct stream habitat, biological (macro-invertebrate assessment), water quality snapshot of each of the tributaries at in-stream field monitoring stations to be established by the EPCAMR Staff

c. Conduct an evaluation and assessment of as many culverts during low flow conditions that are publicly accessible within the watershed as a priority and identify other culverts on private property that may need to be followed up by local municipal officials to gain access for further evaluation and assessment

d. Identify number and locations for the future electroshocking survey within the Mill Creek watershed

e. Request Technical Assistance from PA Trout Unlimited to determine when the best date is to plan for conducting the fishery electroshocking and conduct the survey

Oct. 2020

a. EPCAMR Staff begin formulating a draft for the Mill Creek Cold-water Conservation Plan

b. List recommendations in the DRAFT Plan for future implementation and assessment projects to provide to the municipal and community partners in the watershed and seek any comments

c. Present DRAFT and recommendations at the second public informational meeting within the Mill Creek watershed at a local municipal building. Seek local media out for a positive cover story about the outcomes of the CHP and the recommendations made.

Nov. 2020

a. Incorporate feedback into the DRAFT and follow up on any suggestions made by the public and modify the DRAFT Plan to make it FINAL.

b. Send Final DRAFT Plan to PA TU for review and approval

November 30, 2020 (*extended another year due to the pandemic, therefore the FINAL draft plan was scheduled for tentative completion by November 30, 2021, with a virtual Zoom meeting to be held on February 8, 2022)*

a. Prepare FINAL Mill Creek Cold-water Conservation Plan and submit to the CHP for FINAL approval*; **FINAL Mill Creek Coldwater Conservation Plan anticipated to be completed and approved by February 15, 2022***)

b. Send out electronic copies of the Mill Creek Coldwater Conservation Plan to all partners and post to the EPCAMR website the Final CHP Plan and a link to the CHP website for when it is posted to their site and approved

MACROINVERTEBRATE, WATER QUALITY SAMPLING, SURVEY PROTOCOLS & FIELD EQUIPMENT

The following sampling protocols were used by the EPCAMR Staff and volunteers in the field.

- EPCAMR Stream Quality and Quantity Field Sampling Data Sheets Document
- Trout Unlimited Macro Data Survey and Assessment Document
- ***EPA Rapid Bioassessment Protocols for sampling macroinvertebrate***s[33]
- ***NRCS Stream Visual Assessment Protocol (SVAP) for stream habitat assessment***[34]
- ***Part 614 NRCS Stream Visual Assessment Protocol (SVAP) Version*** 2[35]
- ***North Atlantic Aquatic Connectivity Collaborative*** (NAACC)[36] ***Protocols for Aquatic Organism Passage*** (AOP) on road crossings and culverts

EPCAMR Staff used a Photometer, YSI Meter, 1'm Kick Screen, Telescoping Stadia Rod, 300' measuring tape, and Sampling Ice Cube Trays for sorting macroinvertebrates for identification and determination of stream health. EPCAMR also had taken some drone footage with our DJI Mavica 2 Pro Plus, of the watershed to create some small clips of areas located within the study area of the Wyoming Valley along Gardner Creek and Mill Creek.

[33] EPA Rapid Bioassessment Protocols for sampling macroinvertebrates, 1999

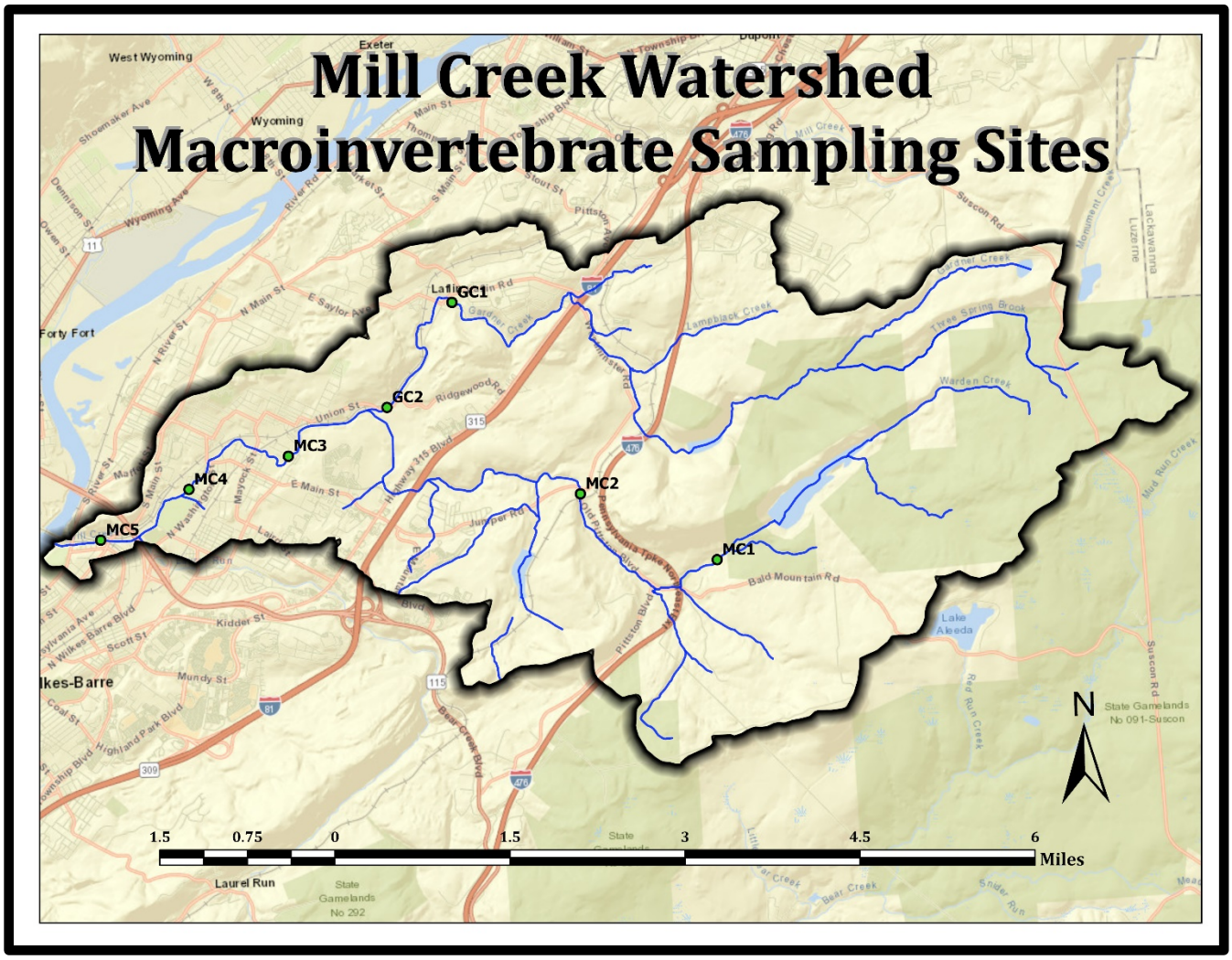
[34] NRCS Stream Visual Assessment Protocol (SVAP) for stream habitat assessment, 1998

[35] Part 614 NRCS Stream Visual Assessment Protocol (SVAP) Version 2, 2009

[36] North Atlantic Aquatic Connectivity Collaborative

HISTORIC & GEOMORPHIC DESCRIPTION OF THE MILL CREEK WATERSHED

Map 2. Mill Creek Monitoring Sites for Consideration on USGS Topographic Map (2020)



Gardner Creek Tributary to Mill Creek and its Headwaters

A headwater tributary, called ***Quarry Creek***, flows down from a pond between the US 476 Turnpike and Armstrong Road south to the intersection with Capital Road, where it then flows from an elevation of 1000' beneath the Turnpike, north of Denmark Street, just to the northeast of Old Boston Road, where another small pond is located at elevation of 950', that flows in a westerly direction, that crosses Industrial Drive in Jenkins Township, west of Fieseler Signs, and just south of WVIA FM that continues under Pittston Avenue, the railroad tracks, Interstate I-81, in Laflin Borough, east of US Route Highway 315, before crossing under an old masonry culvert, and then flows south of Laflin Road, where it comes to a confluence with ***Gardner Creek***, near the Design Center Outlet.

A new bridge culvert was recently replaced in 2020 along State Route Highway 315 during the field investigations within the watershed in this area that was in serious disrepair. ***Gardner Creek*** then flows behind Dr. Joseph Raymond G., MD, Medical Building and Name Brand Liquidations Outlet Store in Laflin Borough. ***Gardner Creek*** flows then flows south below the base of the residential area below Haverford, Peachwood, and Creekside Drives in Wilkes-Barre parallel to State Route Highway 315 and a large linear stockpile area of waste culm and quarry rock. The creek meanders to the west around the northeast side of Wilkes-Barre Materials, LLC, south of the residential area below the hillside of Dogwood, Elmwood, and Walnutwood Drives in Wilkes-Barre. The creek then crosses under E. Saylor Avenue in Wilkes-Barre and meanders between the Laflin Creekside Community Playground and Recreational Complex southeast of Main Street.

Gardner Creek then flows under Main Street west towards the edge of the Casey-Kassa Coal/Silverbrook Anthracite Inc. Operation before heading south beneath the bridge along E. Saylor Avenue and further south along the rear of the residential homes along Union Street, Laflin Borough, before crossing under the railroad tracks along the edge of some waste culm banks on the New Enterprise Stone & Lime Company, Inc. property. From there, it flows across from western edge of the Wilkes-Barre Materials, LLC property along Union Street and under two utility line right of ways that lead to the Jenkins Substation in Plains. As ***Gardner Creek*** meanders around the curve along Union Street towards the bridge and further south below the railroad tracks, it is found flowing over a bedrock outcropping just below the pull-off parking area across from the residential homes several hundred feet below Ridgewood Road. The area below Union Street and to the northwest of the vast Mohegan Sun Pocono property and northeast of the Pocono Downs Racetrack is the main Stem of the Mill Creek.

Another unnamed headwater tributary to ***Gardner Creek*** flows west down from near the Ball Corporation, Pittston, crossing under the railroad tracks behind the homes along Whispering Way, flowing northeast, where it comes to the confluence with ***Gardner Creek*** behind the area of 214 Westminster Road in Jenkins Township. Upstream of this confluence, ***Gardner Creek*** flows down from its sources at ***Harlow Pond*** in Pittston Township, along Ridge Road, along one branch. It crosses Township Road 606, in Pittston Township, then flows west dropping over 200' in elevation south of Chapel Road and the utility right of way, continuing in a westerly direction behind the Home Depot Distribution Center at the end of Technology Drive in Jenkins Township.

The headwaters of ***Lampblack Creek*** begin across the road from The Black Tux Industrial Building and the easternmost road entrance to Pennsy Supply Quarry, in Jenkins Township. The tributary then flows along the southern edge of the Pennsy Supply Quarry. A small waterbody can be found along the western corner of the Quarry that may flow into the ***Lampblack Creek***; however, it was not investigated. From there, it flows under the US 476 Turnpike just above the Wyoming Valley Toll Plaza into a ponded area to the southeast corner of the Ball Corporation, until the confluence with ***Gardner Creek*** along Westminster Road in Jenkins Township.

Another first order unnamed headwater stream just along the edge of the ***PA Game Commission State Game Lands 91***[37] flows northwest along Suscon Road before flowing through a small ponded area and then comes to the confluence with ***Three Spring Brook***, a named headwater tributary to ***Gardner Creek*** that begins in Pittston Township, along Suscon Road, that crosses under a private driveway, before heading to the north and then west again through the corner of PA Game Commission's State Game Lands 91, and coming to a confluence with ***Gardner Creek***, approximately 4000 linear feet above the ***Gardner Creek Reservoir*** in Jenkins Township. From the outlet of the Reservoir, ***Gardner Creek*** continues to flow in a northwesterly direction underneath the US 476 Turnpike, the railroad tracks, along Westminster Road, once again, where it is ponded just upstream of the private residence, 1012 Westminster Road, Wilkes-Barre. From here, ***Gardner Creek*** flows beneath Old Pickaway Road, until it comes to the confluence with the ***Lampblack Creek*** named tributary. Two private ponds are found in the watershed to the north of the Old Pickaway Road loop behind two private residential homes, east of ***Gardner Creek***, and south of ***Lampblack Creek***.

[37] PA State Commission State Game Lands 091 Map

Mill Creek Main Stem and its Headwater Tributaries

The very first order headwaters of the ***Mill Creek*** begin at an estimated elevation of 1700' in one of the western corners of the PA State Game Lands 91 to the west of the unnamed tributary that flows to ***Three Spring Brook***, along Suscon Road in Pittston Township. It is a named headwater tributary called ***Warden Creek***. ***Warden Creek*** flows for a little over a linear stream mile before entering the ***Mill Creek Reservoir***. Several small ephemeral unnamed tributaries flow into the Reservoir from the eastern side with one major unnamed tributary originating in the PA State Game Lands 91 at an estimated elevation of 1800' called ***Rough Hollow***.

Below the Reservoir Dam, another first order unnamed tributary enters ***Mill Creek*** approximately 2000' to the south, and comes to the confluence with ***Mill Creek***, along a bedding outcrop of glacial rock and sandstone, and a number of step pools. The unnamed tributary can be found crossing the haul road into the ***Mill Creek Reservoir*** near the parking area along Bald Mountain Road in Bear Creek Township in a heavily forested and wooded area. A large pond is located at 1590 Bald Mountain Road in Plains Township near the top of the mountaintop watershed divide that could possibly outlet to the unnamed tributary that flows below the ***Mill Creek Reservoir***. The vast majority of the upper Gardner Creek, Three Spring Brook, Warden Creek headwaters, and both the Gardner Creek and Mill Creek Reservoirs that lay in Jenkins Township are zoned Conservation District-1 (C-1), according to the Jenkins Township Zoning Map.

From the confluence of the unnamed tributary with ***Mill Creek*** below the ***Mill Creek Reservoir***, the stream flows west beneath another utility line right of way, to the confluence with yet another unnamed tributary that flows from the east to the west just before the PA Turnpike US 476 that runs overhead, down from The Natural Lands Trust's 385 acre Bald Mountain Preserve[38] property, along Bald Mountain Road, located in the Pocono Plateau. The unnamed tributary flows from an estimated elevation of 1650' through a ravine in a westerly direction until it comes to the confluence with ***Mill Creek*** after flowing under a culvert just above the PA Turnpike US 476. Three small bodies of water are found along the southside of Bald Mountain Road in Bear Creek Township, in the vicinity of the Bear Creek Wind Park, LLC[39] that is a wind turbine farm that generates electric power. Two additional smaller water bodies can be found to the southside of Bald Mountain Road in Bear Creek Township, one near the road at an estimated elevation of 1500' and the other at around 1560' to the north of the gap where the unnamed tributary begins to flow west towards the confluence with ***Mill Creek***.

After the confluence with ***Mill Creek***, the combined streams flow another 600' along Bald Mountain Boulevard before crossing it in an easterly direction where it then combines with yet another unnamed combination of two first order tributaries that flow from the east of Pittston Boulevard and the PA Turnpike US 476. The easternmost unnamed tributary starts in a forested area at an estimated elevation of 1520'. The unnamed tributary to the west that combines with the eastern unnamed tributary at an elevation of 1400', begins along an eastern property line of the Bear Creek Camp Conservation Area[40] at an elevation of 1840' before flowing beneath a utility right of way and then north under the PA Turnpike US 476 towards the Bear Creek Nursery

[38] Introducing Our 42nd Nature Preserve: Bald Mountain

[39] Bear Creek Wind Farm

[40] Bear Creek Camp

near the bridge at Pittston Boulevard. ***Mill Creek*** then flows west along Old Pittston Boulevard in Wilkes-Barre, crosses another utility right of way, and picks up another small headwater first order unnamed tributary a few hundred feet northwest of the utility lines.

Mill Creek then flows along the western bank of Old Pittston Boulevard in Wilkes-Barre to the Reading Blue Mountain & Northern Railroad[41] Tunnel in Plains Township, where it flows beneath its own arched tunnel crossing before coming upon a PA American Water intake control valve and dam structure on ***Mill Creek*** adjacent to the PA American Water property, along Jumper Road. ***Mill Creek*** flows under the bridge and bedrock of sandstone outcropping along Jumper Road in Wilkes-Barre and continues to flow in a westerly direction until it comes into confluence with another unnamed water body called ***Davy John's Dam,*** along the western side of 1808 Westminster Road, Wilkes-Barre, that flows beneath the utility lines just north of Super Luxury Mansion & Green Retreat[42] in Plains Township at 1700 Jumper Road.

Deep Creek, another named headwater tributary flows from an estimated elevation of 1280' for around 2000 linear feet across a utility right of way and railroad tracks before entering the ***Deep Hollow Pond*** (locally known as the Valley Dam) in Plains Township, exiting the pond, and crossing the utility right of way once more. The ***Deep Creek*** tributary then heads north until it crosses under Jumper Road, enters a small water body on the Super Luxury Mansion & Green Retreat property, before coming to the confluence with ***Mill Creek*** and the unnamed tributary and water body called ***Davy John's Dam***, along the western side of 1808 Westminster Road, Wilkes-Barre. There is a Deep Hollow Tract[43] of the PA Department of Conservation and Natural Resources Pinchot State Forest, that contains over 1300 acres of forested lands in Plains Township. This area is characterized by a dry oak, mixed hardwood forest and many of the scenic High-Quality streams in both the Mill Creek and Laurel Run watersheds.

The Fox Hill Flume Project in Plains Township seems to have been constructed to redirect water away from the Anthracite coal measures along State Route 115 north of Wildflower Drive and to the east of Halsey Drive where it conveys water beneath E. Mountain Boulevard slightly west and then turns northeast for approximately 7500' that is also unlined, before it flows under Jumper Road continuing northeast for around 1500' and crosses over the coal measures. The waterway then meanders back across Jumper Road to the east and comes to the confluence with ***Deep Creek***. In the Mill Creek-Luzerne County Operation Scarlift Report[44], it was estimated that there were several leakage points from 100-500 gpm of clean water flow loss into the mines near the southside of the trailer park, below the Deep Creek spillway, and north of the Lehigh Valley Railroad grade, until it reached Davy Johns Dam. It follows the contour line of 1010'.

Mill Creek then proceeds to flow in a heavily forested area in a westerly direction crossing another utility right of way before heading north of the Pocono Mobile Home Park, Swan Court, Eagle Court, and Mill Creek Acres,

[41] Reading Blue Mountain & Northern Railroad
[42] Short Term Holiday Homes
[43] Deep Hollow Tract-PA DCNR Pinchot State Forest
[44] Mill Creek-Luzerne County Scarlift Report

north of Stoney Creek Road in the rear of the residential development. ***Mill Creek*** reaches the US Interstate I-81 at this point and flows beneath the highway infrastructure through a bridge culvert and enters an area of the stream that had undergone a major abandoned mine land reclamation and stream restoration project for over a 1000' in length up to US Highway 315. ***Mill Creek*** restored, then flows under US Highway 315 for several hundred feet and turns northwest to the east of the Pocono Downs Racetrack before crossing under the road to the stable where it then comes into confluence with the ***Gardner Creek*** below Union Street and the railroad tracks.

Another unnamed first order tributary flows from the Geisinger Wyoming Valley Medical Center, along E. Mountain Boulevard, Plains Township, starting at an estimated elevation of 960' near the entrance to the Medical Center, where it crosses the E. Mountain Boulevard and back again flowing north into a basin area towards Jumper Road where it crosses under a road culvert before continuing northwest along an access road to the eastern side of the Wilkes-Barre Career & Technology Center in a wooded area. The tributary flows through a storm drainage system and a series of rock-lined channels between homes crossing Brian Creek Road, Lan Creek Road, and the two residential homes at 13 and 15 Stoney Creek Road before coming into the confluence with ***Mill Creek*** just a few hundred feet to the north in a heavily wooded area.

Once ***Mill Creek*** is below the confluence with ***Gardner Creek*** down over the hillside from the Italian American Citizen's Club at 93 Union Street, Wilkes-Barre, on the other side of the Pacific Railway Railroad tracks, a series of impoundments can also be found to the north and east of First Street, Plains Township. ***Mill Creek*** then flows south along First Street between the residential neighborhood over to where it flows under the Cleveland Street bridge along the L.A.N.I. Veterans of Foreign Wars Post 6325, Hudson at 35 Cleveland Street. ***Mill Creek*** then continues to meander and takes a turn behind the neighborhood off Center Street to the south and flows around the Evercor Field at The Bog Athletic Field-Home of Wyoming Valley Challengers Baseball. ***Mill Creek*** then flows just to the north of the end of Dewey Lane, Kelly Avenue, and Waddell Place. The stream continues to follow under the Delaware & Hudson Railroad bridge and Mayock Street in Wilkes-Barre, in a westerly direction, north of Brogan Court, N. Cleveland Street, and Dillon Street, before turning south along the Dillon Street Park and west of Pelza Street in Plains Township.

Mill Creek flows under E. Main Street at the bridge behind and adjacent to Philly Subs & Pizzeria on 1428 N. Washington Street in Wilkes-Barre in a southerly direction under the W. Sidney Street bridge, a pedestrian bridge along Coon Street, and then continues to flow east of W. Beatty Street and Miller Street. East of Chilwick Street, ***Mill Creek*** runs in between the Wilkes-Barre Connecting Railroad, Canadian Pacific Railroad tracks, and the Delaware & Hudson Railroad tracks to the northwest and along the Wilkes-Barre Hollenback Golf Course to the east. A pond is found on the grounds of the Hollenback Golf Club that has a direct hydrogeologic connection to ***Mill Creek***, less than a few hundred feet to the west.

An unnamed first order tributary comes to the confluence with ***Mill Creek*** within the Hollenback Golf Course that emanates from under N. Washington Street just to the south of Grist Lane. The flow of the water in the

tributary parallels a spur of the Delaware & Hudson Railroad and Canadian Pacific Railroad tracks to the east of Stucker Avenue and the Trane Heating & Cooling Services Company[45] along N. Washington Street.

Another unnamed tributary was investigated behind several homes to the west of the area of 192 Mayock Street where it seems to appear that stormwater is an issue as the stream channel wraps around homes that are near the end of 114 E. Thomas Street behind their yard and proceeds to flow at the bottom of the Delaware & Hudson Railroad tracks in a conveyance into a storm drain system at the end of S. Cleveland Street. The tributary appears to flow into a storm drainage system during rainfall events and down along the rear of the residential homes along St. Clair Street, Wilkes-Barre until it intersects with Grist Lane where a masonry culvert was found carrying moving water into the unnamed tributary along Grist Lane.

Just below the Hollenback Golf Course in Wilkes-Barre, several athletic fields are located just northeast of the N. Cross Valley Expressway (State Route 309). The major ***Laurel Run*** tributary within the Mill Creek watershed comes to a confluence with ***Mill Creek*** in between the northeast side of the N. Cross Valley Expressway and to the southwest side of the baseball and athletic fields off N. Washington Street and Biscontini Drive. The Laurel Run Coldwater Conservation Plan[46] completed by EPCAMR goes into details of what was found during our investigation of the watershed in 2015 and 2016, as well as recommendations for future implementation projects that will not be discussed in this plan. However, the Plan is available online for public review and information. The stream flow direction comes into the ***Mill Creek*** almost at a ninety-degree angle, perpendicular to the direction of flow from upstream, which causes some geomorphologic concerns and flooding issues in this area that will be discussed later.

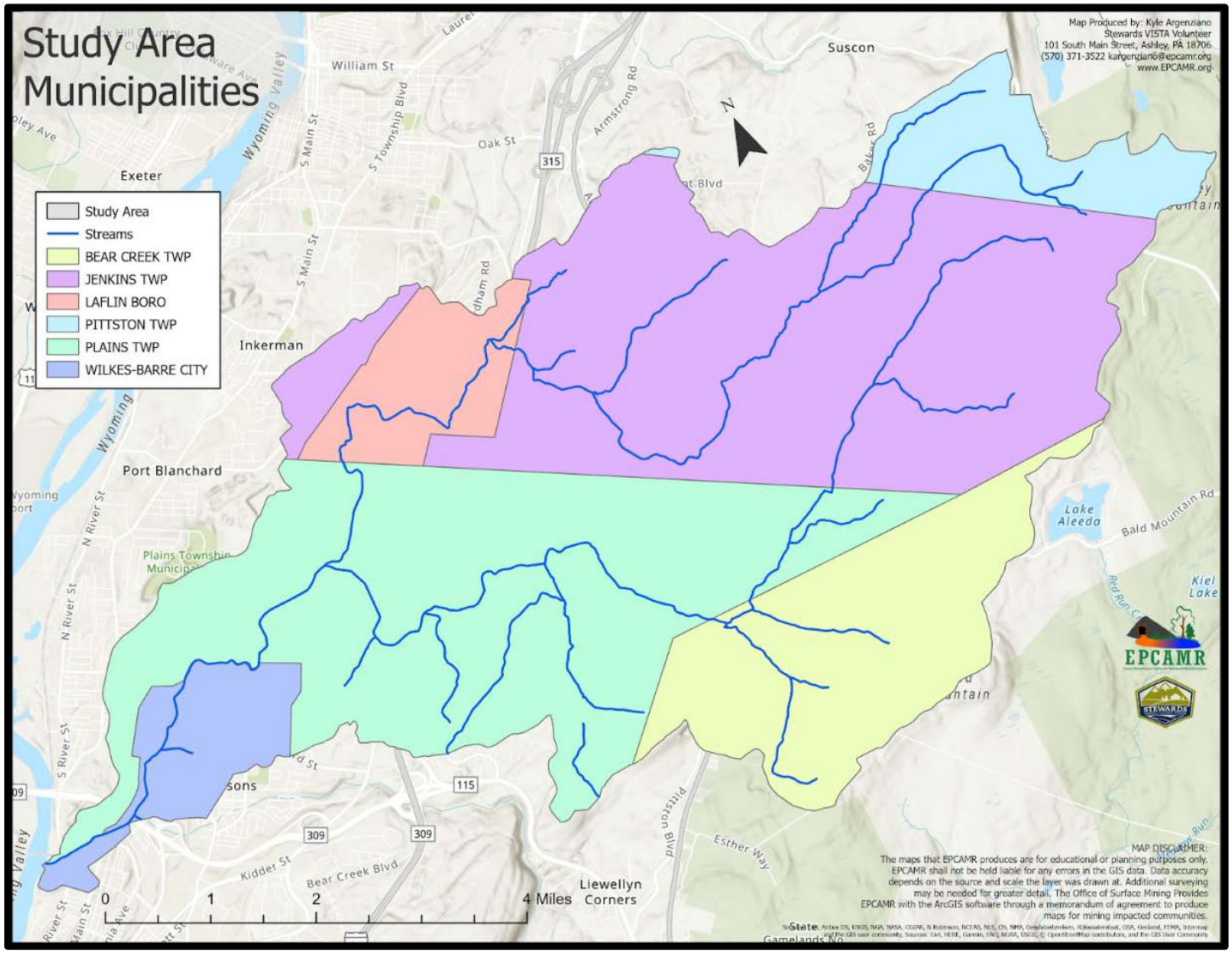
Downstream of the N. Cross Valley Expressway, ***Mill Creek***, after flowing through a series of seven squashed corrugated steel culverts along Biscontini Drive, flows west under N. Main Street in Wilkes-Barre, just north of Johnson Street. The stream continues to flow in a westerly direction behind the residential neighborhood of homes along W. Chestnut Street, Sycamore Street, N. Franklin Street, Hawthorne Street, Juniper Street, Cypress Street, and the Saints Peter & Paul Ukrainian Greek Catholic Church[47] in Wilkes-Barre. ***Mill Creek*** finally flows under N. River Street then continues to flow west along the northeast side of the Hollenback Cemetery, Wilkes-Barre and south of the electric sub-station in Plains Township and Wilkes-Barre Connecting Railroad tracks that cross the Susquehanna River. Mill Creek then flows under the Canadian Pacific Railroad tracks and the South Branch of the Reading Blue Mountain & Northern Railroad tracks, before finally entering the confluence with the Susquehanna River.

[45] Trane® Residential | Home Heating and Cooling | HVAC Systems

[46] Laurel Run Coldwater Conservation Plan (2016)

[47] Saints Peter & Paul Ukrainian Greek Catholic Church, Wilkes-Barre, PA

Map 3. Mill Creek Watershed Study Area Municipalities



EPCAMR did some research into several the Townships and Laflin Borough that is also included in the *Mill Creek Research* document in the ***Appendix*** that follows the historical information on the Anthracite Coal Collieries. Grist mills, saw mills, and powder mills, in addition to all the historic underground and surface mining of Anthracite dotted the landscapes throughout the watershed along Gardner Creek and Mill Creek. A great deal of information was found in W.W. Munsell & Company's "History of Luzerne Lackawanna and Wyoming Counties" (1880)[48], on Jenkins Township, Laflin Borough, and Plains Township and the other municipalities.

[48] History of Luzerne Lackawanna and Wyoming Counties-W.W. Munsell & Company, 1880

MILL CREEK WATERSHED DESCRIPTION AND BACKGROUND INFORMATION

Mill Creek is a tributary to the Susquehanna River that ultimately drains to the larger Chesapeake Bay watershed. There are dozens of Mill Creek watersheds all over Pennsylvania. This particular Mill Creek is in Luzerne County, PA with a small portion of the headwaters of Three Spring Brook and Gardner Creek, near Harlow Pond, just south of Ridge Road and east of Suscon Road.

Mill Creek is **~51.87** miles long (*stream length*) or **273,863.04** feet and flows from its headwaters from Harlow Pond, sitting at an elevation of 1639', and Three Spring Brook, where it crosses Suscon Road at an elevation of 1767', before forming Gardner Creek at an elevation of 1300', which comes into confluence with Mill Creek before picking up the Laurel Run tributary in Wilkes-Barre City and finally emptying into the Susquehanna River. It flows through **7** municipalities including Wilkes-Barre City, Plains Township, Laflin Borough, Laurel Run Borough, Bear Creek Township, Jenkins Township, and Pittston Township. The watershed has a total drainage area of **~15,271.35** acres.

Mill Creek is designated as a Naturally Reproducing Trout Stream for **10.19** miles and has a ***Class A*** section that is ***4.18*** miles long.

Map 4. Mill Creek Watershed Class A Wild Trout Waters

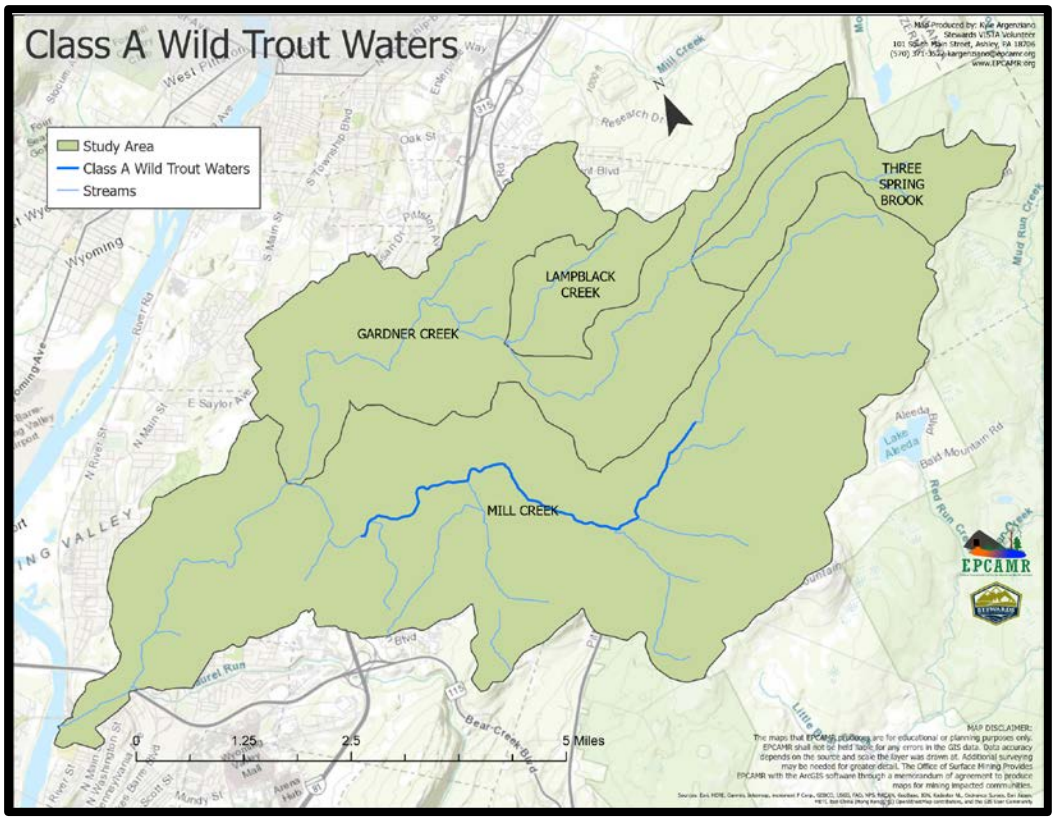
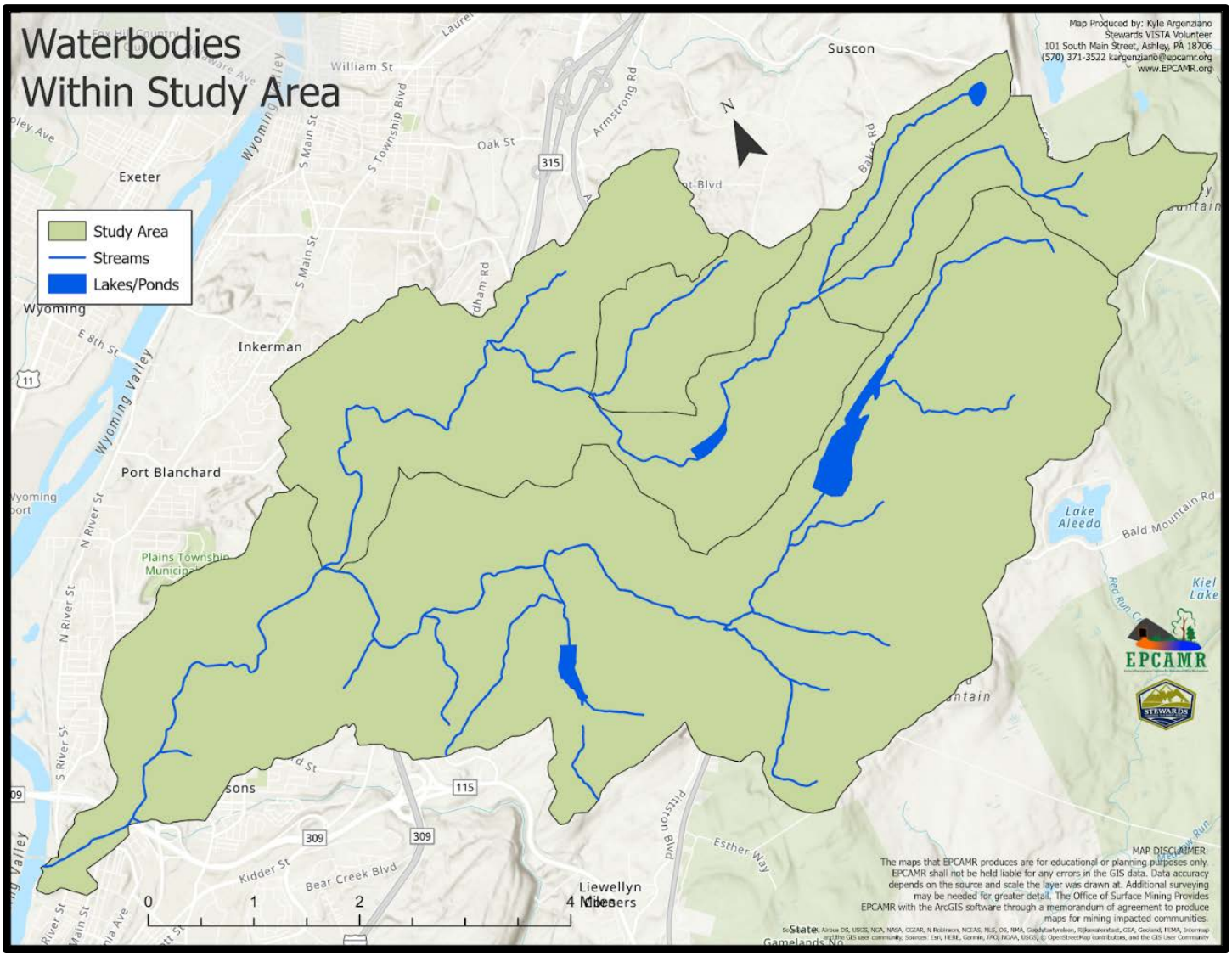


Table 3. PA Fish & Boat Commission Wild Trout Waters-11/2021 (Natural Reproduction) Limits in Mill Creek Watershed

Water	Tributary To	Wild Trout Limits
Deep Creek	Mill Creek	Headwaters downstream to mouth
Mill Creek	North Branch Susquehanna River	Mill Creek Reservoir Downstream to Gardner Creek
Three Spring Brook	Gardner Creek	Headwaters downstream to mouth

Map 5. Mill Creek Watershed Waterbodies within Study Area



Harlow Pond, sitting at an elevation of 1639', is the headwaters of the major tributary, Gardner Creek to Mill Creek. The entire watershed is **~ 36.60** square miles.[49]. Currently, **2.98** miles of Three Spring Brook in the Gardner Creek sub watershed of Mill Creek from the headwaters to the mouth, **5.5** miles of Mill Creek from the Mill Creek Reservoir downstream to Gardner Creek, and **1.71** miles of Warden Creek, in the headwaters of Mill Creek from the headwaters to the mouth are classified as ***Wild Trout***[50] waters of natural reproduction, according to the PA Fish & Boat Commission.

The Mill Creek Reservoir, impounded at an elevation of 1432' is in the southeastern edge of Plains Township that heads southwest into Bear Creek Township, where it crosses under I-476 and turns northwest, returning to Plains Township. After some distance it turns west, passing by the Mill Creek Intake Dam and receiving the tributary of Deep Hollow Creek and Deep Hollow Pond, sitting at an elevation of 1123'.Mill Creek Reservoir is owned, operated, and maintained by the PA American Water Company. In total, there are **10,928,333** square feet on Pond Area within the watershed that equates to **.39** square miles and **.93%** of the Land Cover. Shortly afterwards, it crossed under I-81 and PA Route 315 and meanders southwest again, skirting around the border between Plains Township and Wilkes-Barre city. The creek turns south following the city and it receives the tributary Laurel Run at an elevation of 567', before crossing PA Route 309 and turns west. Shortly thereafter, it reaches the mouth of the Susquehanna River at an elevation of 521.31', just north of Wilkes-Barre City's Hollenback Cemetery. There is a levee on Mill Creek in the Parsons region of Wilkes-Barre.

Figure 4. Aerial of PA American Water Company's Mill Creek Reservoir (Photo: ArcGIS Pro[51])

[49] PA Gazetteer of Streams

[50] PA Fish & Boat Commission Wild Trout Waters Reproduction Report, November 2021

[51] 2D, 3D & 4D GIS Mapping Software | ArcGIS Pro

The **92** acres of the Mill Creek Reservoir is used to supplement the public water supply from the Watres Reservoir[52], which is located outside of the Mill Creek watershed located in Lackawanna County. The **164-acre** Watres Reservoir is supplemented by the Watres, Mill Creek, and Gardner Creek Reservoirs. The intake of the Watres Reservoir consists of the Painter Creek, Panther Creek, and Spring Brook watersheds located in the PA Department of Conservation and Natural Resources Thornhurst Tract [53]of the Pinchot State Forest outside of the Mill Creek watershed. The Watres Reservoir supplies **7.42** million gallons of water daily to customers.

There are **3249.18** publicly owned acres owned by the PA Game Commission on State Game Lands No. 91[54] and **598.04** acres owned by the PA Department of Conservation and Natural Resources in the Pinchot State Forest within the watershed. Local municipally owned parks account for another **37.67** acres from **8** parks (Laflin Borough Park, Miner Memorial Park, Parsons Park, Hollenback Park, Irishtown Park, Scouten Lee Park, Dillon Street Park, and the Laflin Playground).

Most of the upper reaches of the Mill Creek watershed are forested or otherwise rural, while most of the lower reaches are urban areas and flow through previously impacted abandoned mine lands from past Anthracite mining practices, both deep, underground mining and surface mining or quarrying. Forests occupy **26.24** square miles (**73.17%**) of the Mill Creek watershed, making it the largest land use. Residential properties of **0.125** acres or less makes up **1.6** square miles (**4.47%**) of the watershed and commercial land occupies **1.15** square miles (**3.2%**). **1.06** square miles (**2.96%**) of the watershed is occupied by a combination of forested and mining lands and **0.86** square miles (**2.4%**) is occupied by a combination of industrial and commercial land. **0.8 square miles** (**2.24%**) of the watershed are meadows, **0.68** square miles (**1.9%**) are residential properties between **0.25** and **0.33** acres, and **0.63** square miles (**1.74%**) are residential properties between **0.5** and **1.0** acres. **0.53** square miles (**1.47%**) is occupied by residential properties of **2.0** to **4.0** acres, **0.52** square miles (**1.46%**) is open space, and **0.5** square miles (**1.39%**) is a combination of forest and meadow. **0.46** square miles (**1.29%**) of the Mill Creek watershed are used for mining, **0.43** square miles (**1.2%**) are paved, and **0.26** (**0.71%**) are water. **0.11** square miles (**0.32%**) are industrial, and **0.03** square miles (**0.08%**) are institutional.

[52] PA American Water, 2020 Annual Water Quality Report (Ceasetown-Watres)

[53] Thornhurst Tract of the PA DCNR Pinchot State Forest

[54] PA State Commission State Game Lands 091 Map

Brief History of the Mill Creek Watershed

The Mill Creek Watershed is in Northeastern Pennsylvania's Wyoming Valley, Luzerne County. In Oscar Jewell Harvey's book, "A History of Wilkes-Barre, Luzerne County, PA[55]", he mentioned about the early settlers to the Wyoming Valley in the Mill Creek Watershed. His quote was *"In the Spring of 1771, when the Pennamite settlers seemed to be in a fair way to become securely established in Wyoming Valley, they erected near the mouth of Mill Creek, a small saw-mill…"* (pages 692-693). An entire section is dedicated to early life and settlement around Mill Creek in his book that is a wonderful read on the history of the Wyoming Valley and the City of Wilkes-Barre.

According to the Luzerne County Historical Society[56], the land was originally owned by the Iroquois Confederacy who then sold land to both Connecticut and Pennsylvania during same time period. The Nanticoke, Shawanese, and Delaware tribes later arrived in the 1700s. In 1762, the Susquehanna Company sent 200 men to the Wyoming area, and they settled along the mouth of Mill Creek and returned to Connecticut. In 1763, they return and are attacked by the Native American tribes in the Wyoming Valley. Iroquois sold the land to Pennsylvania while settlers from Connecticut (Susquehanna Company) had already settled. The Connecticut people established Fort Durkee in 1769 and Pennsylvanians established Fort Wyoming in 1771. Many counties continue to be settled by both sides in Pennsylvania. The tension continued and three Pennamite Wars[57] occurred.

Plains Township History[58]

Modern-day Plains Township was originally owned and occupied by the Wanami tribe of the Delaware Native Americans. Roughly two hundred settlers from the Susquehanna Company of Connecticut arrived in Plains in August 1762; they established a small village of cabins just above the mouth of Mill Creek.

During the summer of 1763, the Iroquois and Delaware came together to form a relationship. This resulted in a deadly fire which claimed the life of the Delaware chieftain (Teedyuscung[59]), of the Unami, or Turtle (Pakoango) Clan, one of three subtribes associated with the Lenape, known through history as the Lenni-Lenape, or Delaware Indians. The Iroquois[60] charged the colonists with the crime, and the aggrieved Delaware were determined to resolve the matter. On October 15, 1763, the unsuspecting pioneers were attacked by the Delaware. Twenty or thirty were killed, several were taken prisoner, and those who were not captured fled to the mountains; they had no other choice but to return to New England. This was known as the Massacre of 1763. The Native Americans finally burned what was left of the English settlement. Iroquois are a historical indigenous confederacy in northeast North America.

[55] Oscar Jewell Harvey, Ernest Gray Smith: "A History of Wilkes-Barre, Luzerne County, PA", Volume II, 1909
[56] The History of Wilkes-Barre-Luzerne County Historical Society
[57] Connecticut Battles Pennsylvania in the Pennamite Wars-New England Historical Society
[58] Wikipedia on Plains Township, Luzerne County History
[59] Pennsylvania Heritage Magazine Article, Fall 2006
[60] Wikipedia on the Iroquois

In January 1769, a group of Pennamites (who represented Pennsylvania) took possession of the land once occupied by the Susquehanna Land Company of Connecticut. They were known as the Ogden party; they established a fort in the region. The Connecticut settlers, who learned of the Pennamite occupation of the area, returned in the spring of 1769. This resulted in the Pennamite-Yankee Wars — a struggle between the Pennamites and the Yankees (from Connecticut). After a series of minor skirmishes, the conflict ended with the land being granted to Pennsylvania.

Large amounts of anthracite coal rested underneath Plains. In 1808, Henry Stark of Plains succeeded in burning anthracite coal in a grate. This was the second successful attempt in the region. This resulted in the widespread use of anthracite coal as a fuel source. Throughout the 1800s, canals and railroads were constructed to aid in the mining and transportation of coal. The mining industry in Luzerne County boomed. Farming was a major way of life in Plains prior to the mining industry. Farmland was replaced by great collieries, breakers, canals, and railroads. As a result of the growing population in Plains, it was officially made a township on November 10, 1851. Plains Township was formed from sections of Wilkes-Barre Township and Pittston Township.

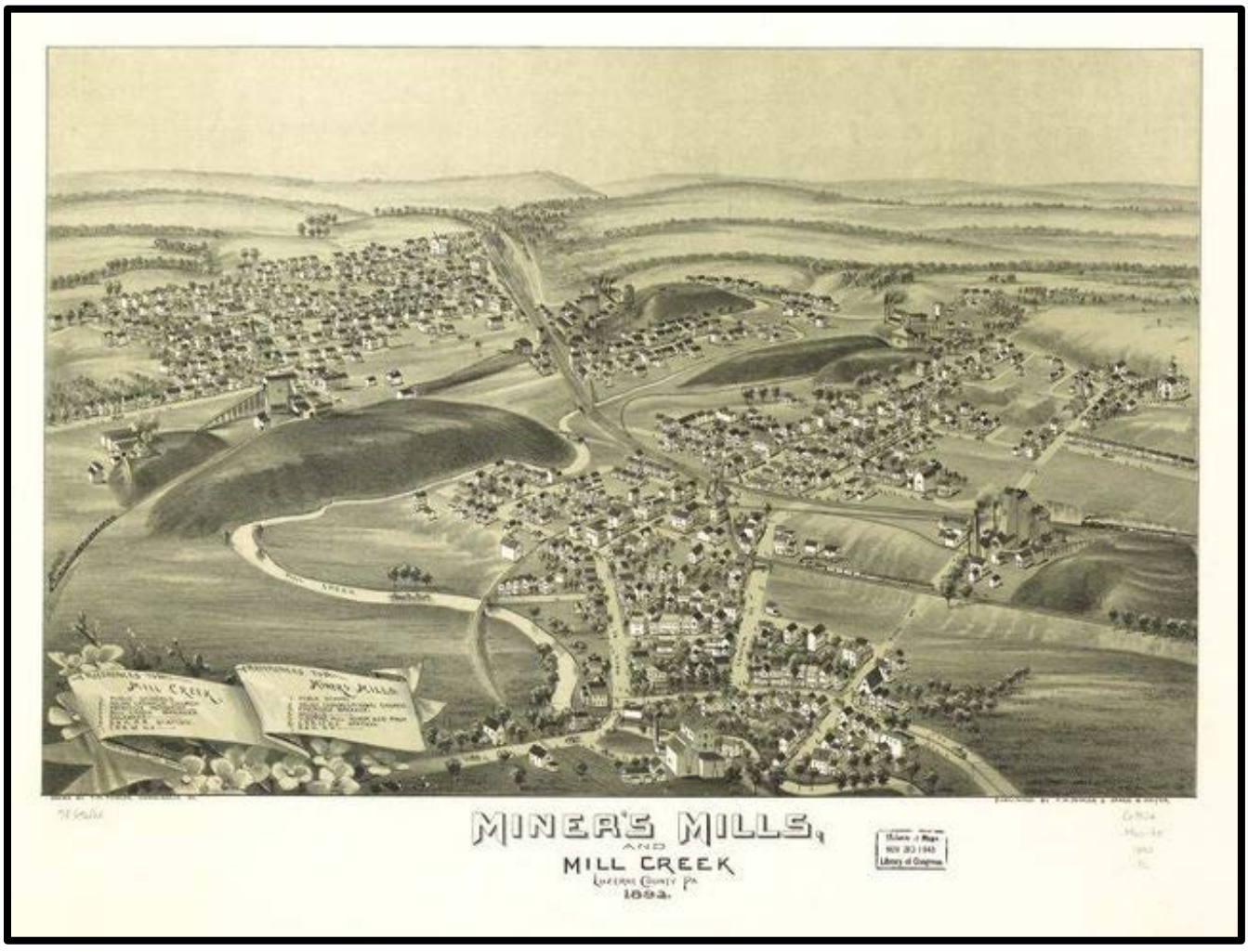


Figure 5: Miner's Mills and Mill Creek, Luzerne County, PA 1892 Aerial View Map[61]

[61] Miner's Mills and Mill Creek, Luzerne County, PA 1892 Aerial Views Map

Miner's Mill Borough History[62]

Thomas Wright, a bright, young, educated Irishman, landed in Philadelphia in 1763, and soon after oversaw a school at Dyerstown, near Doylestown, where he married Mary Dyer. A few years after, he moved to Wilkes-Barre and became the founder of Wrightsville, now the borough of Miner's Mills. He built a mill at that place in 1795, which has since remained in the possession of his descendants—to Asher Minor (his son-in-law); to Robert Minor; to C. A. Miner; four generations. From 1795 to 1801 Thomas Wright was one of the commissioners of Luzerne County. The mill was burned in the latter part of 1825; rebuilt by Robert Minor for his father. It is now the firm of Charles A. Miner & Co., making the fifth change and always in the same family.

As related elsewhere, Asher and Charles Miner each married a Wright. The great mill is still the most important plant of the kind in the county. The Miners men established newspapers, were important factors in developing the coal of this region, leaders in statesmanship and advanced manufactures successfully.

Gardner Creek History

Laflin Borough[63]:

Laflin was incorporated as a borough in 1889. It was likely named for one of the owners of the Laflin & Rand Powder Company. The following year, in 1890, the population of the newly formed borough was just over two hundred. Coal mining led to a population boom in the region. Laflin witnessed its greatest increase between 1970 and 1980, when the number of residents grew by over 313% (or from 399 people to 1,650 people).

Jenkins Township[64]:

Isaac Gould and Joseph Gardner were the first permanent settlers in modern-day Jenkins Township. The first important settlement in the territory was Joseph Gardner's gristmill in 1794 (on Gardner's Creek). The first schoolhouse was built in the early 1810s. Jenkins Township was formed from a section of Pittston Township on June 24, 1852. It was named after Col. John Jenkins (who settled the area with his family in 1769). He served as an officer in the American Revolution (1775-1782), and as a Representative of Luzerne County in the Pennsylvania Legislature (elected in 1797).

Logging and farming were the first major employers in the region, but due to the abundance of anthracite coal under the township, the coal mining industry quickly expanded. Port Griffith was named in honor of one of the original stockholders of the Pennsylvania Coal Co. Other villages in the township include Port Blanchard, Inkerman, and Sebastopol.

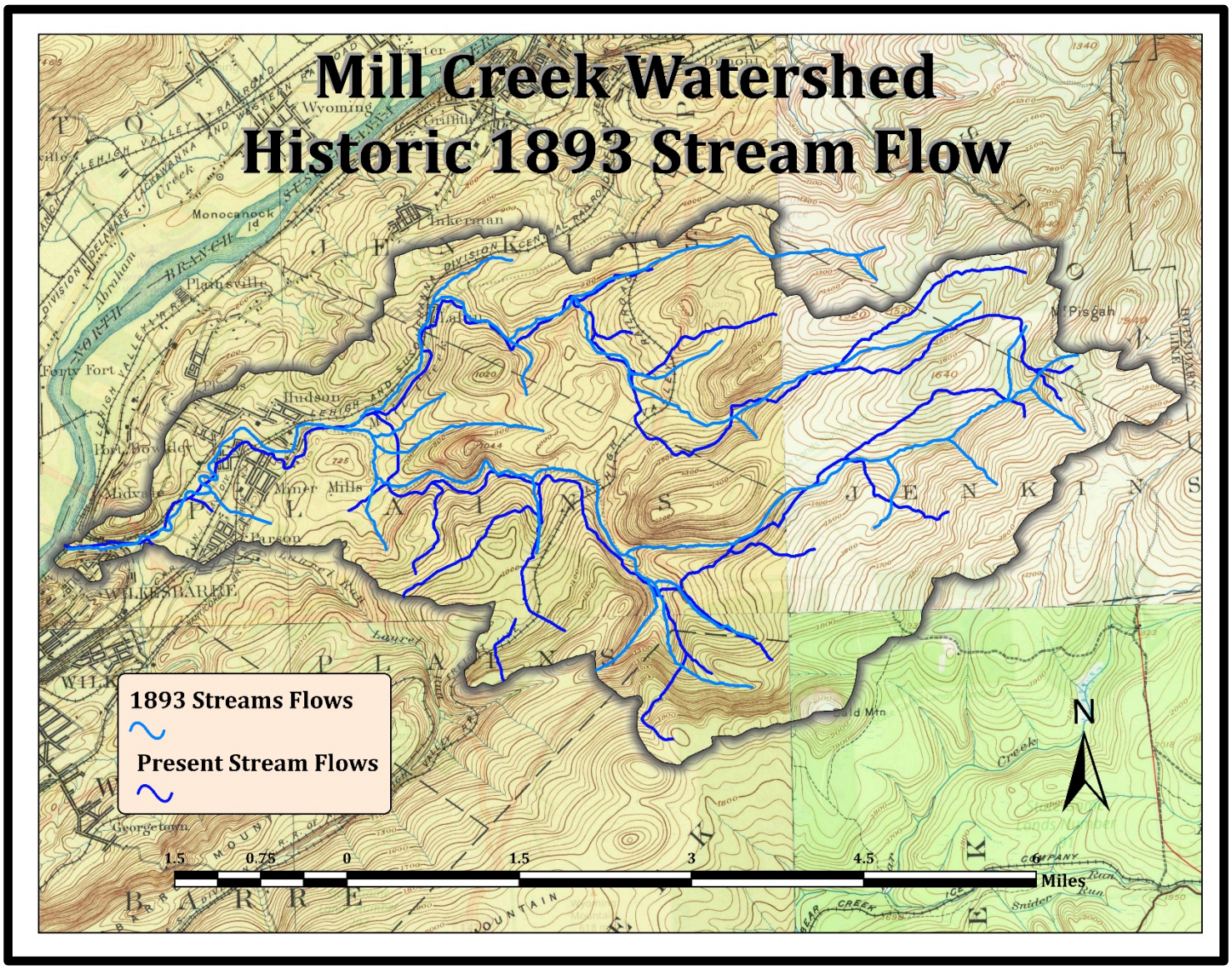
At the beginning of the 20th century, Luzerne County was amid an economic boom. Industry, which included manufacturing and coal mining, drew thousands of immigrants (mostly from Europe) to the region. By the mid-20th century, anthracite production was declining at a steady rate. Consumers were gradually switching from

[62] History of Luzerne County, PA: H.C. Bradsby, Editor, S.B. Nelson & Company, Publishers, 1893
[63] Wikipedia on Laflin Borough, Luzerne County, PA
[64] Wikipedia on Jenkins Township, Luzerne County, PA

coal to other forms of energy (e.g., oil, gas, and electricity). In early January 1959, the Knox Mining Company started mining past a stop line and into the unconsolidated sediment that is the bottom of the Susquehanna River in Port Griffith, Jenkins Township. On January 22, 1959, the Susquehanna River broke through the River Slope Mine. The incident claimed twelve lives and flooded mines under the entire Wyoming Valley. This event was internationally known as the Knox Mine Disaster[65]. Thousands of jobs were lost overnight, and the mining industry never completely recovered in Luzerne County. In the following months, two of the area's largest coal companies announced a full withdrawal from the anthracite business. Readers can also review a film documentary on the Knox Mine Disaster[66] sponsored by the International Documentary Association (IDA). EPCAMR provided underground mine map interpretation and maps for the film.

[65] PA Center for the Book, Penn State University Libraries- Death Underground: The Knox Mine Disaster, Lauren Berger, Fall 2009
[66] Knox Mine Disaster Film Documentary

Map 6. USGS Historical File Topographic Division Recreated Map overlay with present stream flow

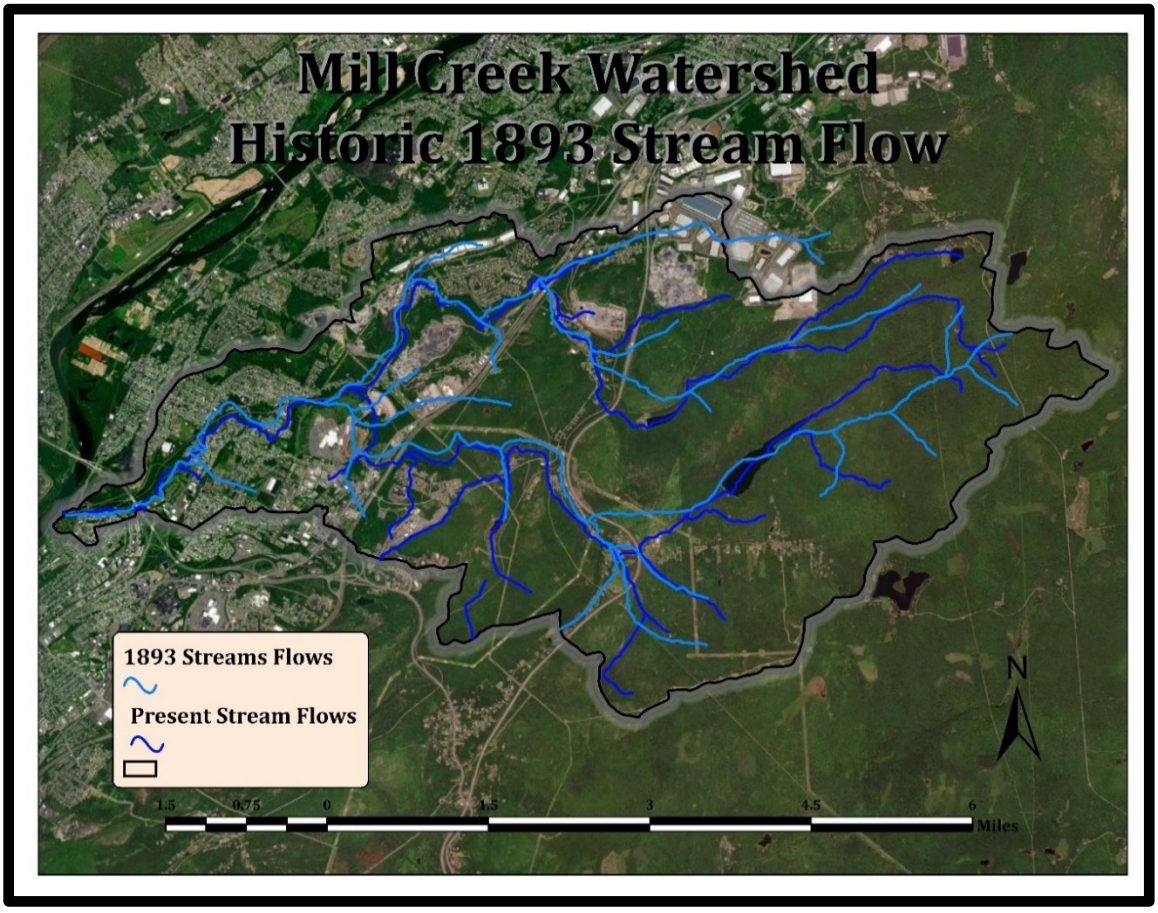


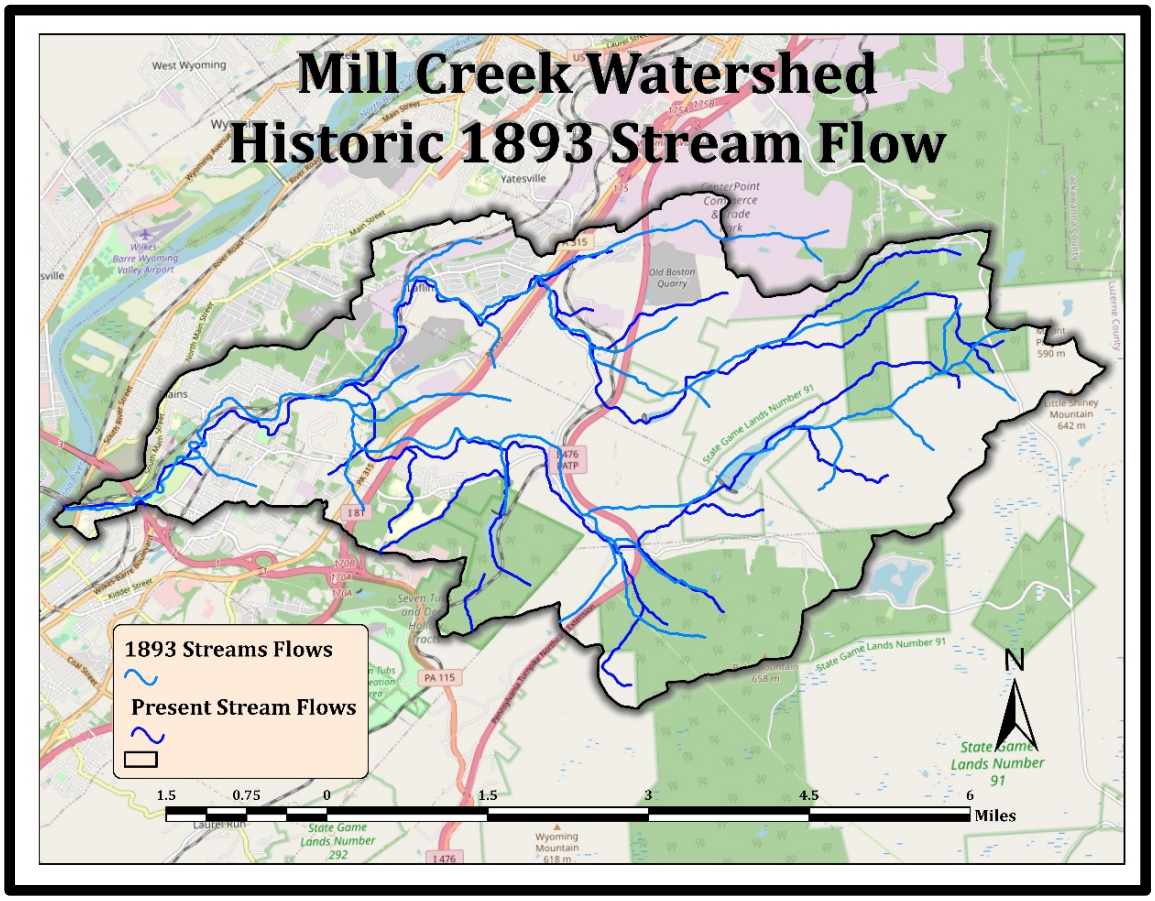
The Mill Creek lies within the bottom right corner portion of the ***USGS Topographic Pittston Quadrangle*** (1893) [67], extending slightly into the ***Wilkes-Barre and Scranton Quadrangles***.[68] As seen in the comparison above and in the following maps, some of the stream channels have been moved by mining and other development since 1893.

[67] USGS TopoView: Pittston

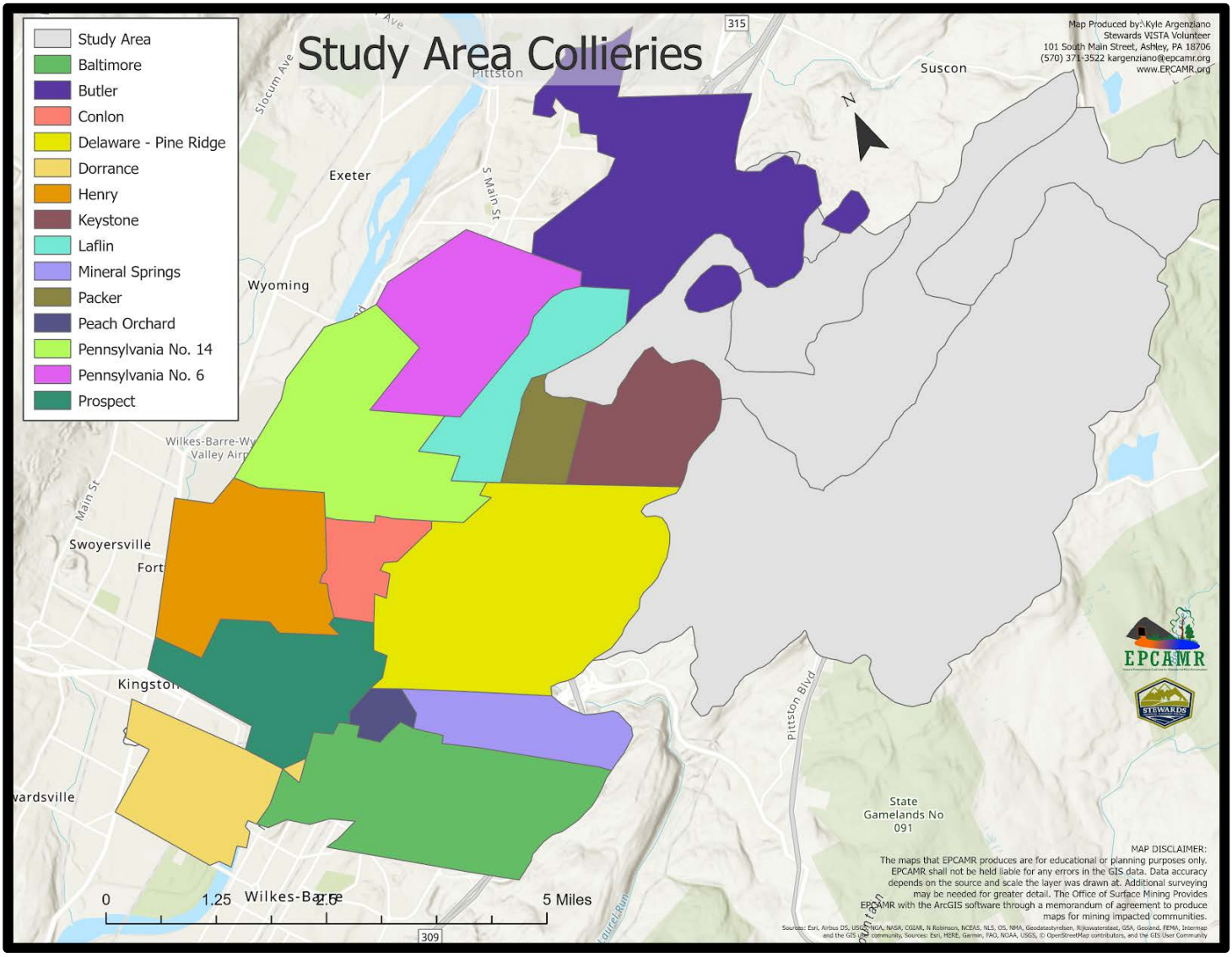
[68] Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Map 7: Mill Creek Modern day (Darker Blue) and historic flows (Lighter Blue)





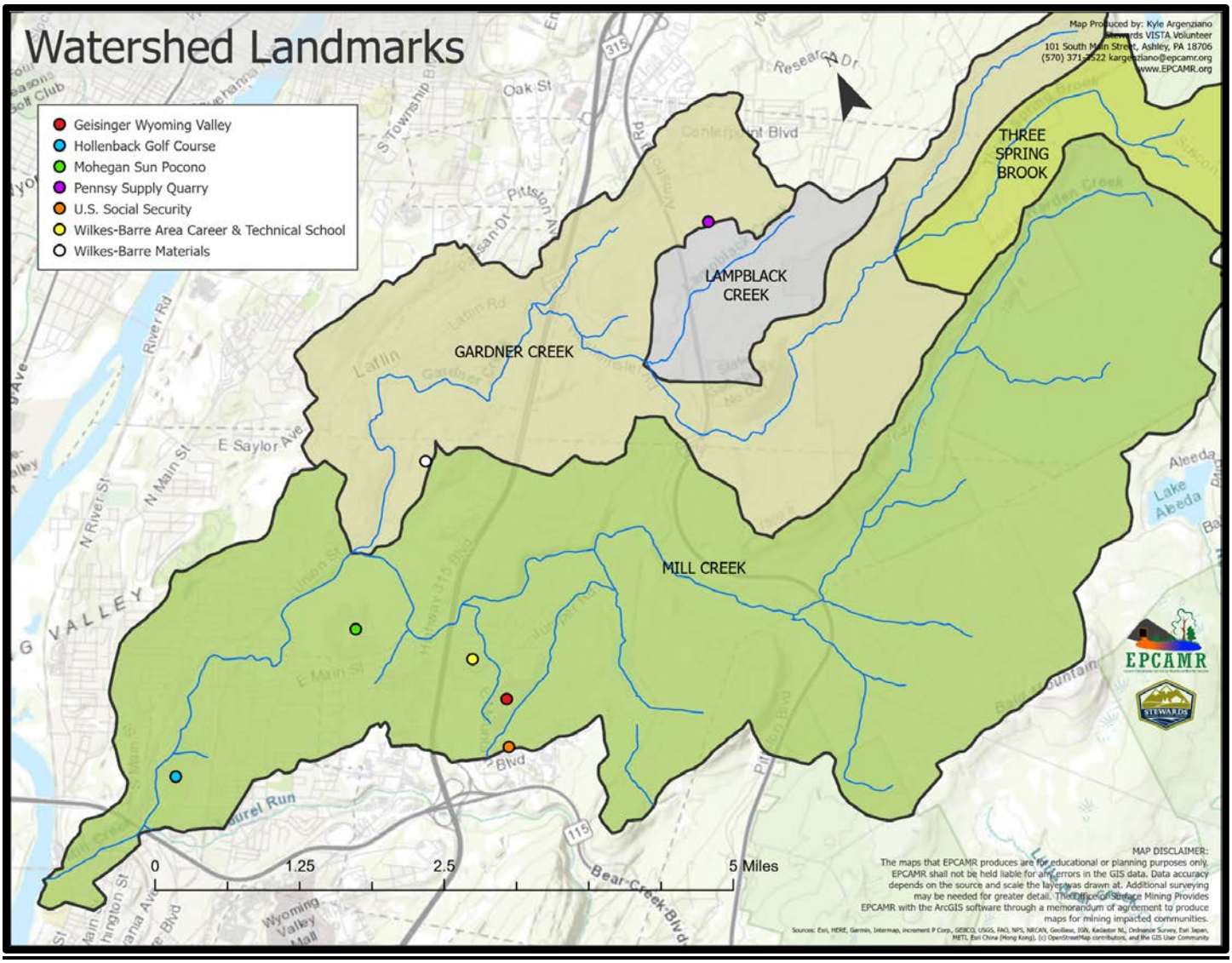
Map 8. Study Area Historic Mining Collieries located within the Mill Creek Watershed



There were **14** historic Anthracite Mining Collieries located within the Mill Creek Watershed. Historic photos of the coal breakers, the surrounding outbuildings that make up the collieries, and some background information on each of them can be found in the *Mill Creek Research* document in the ***Appendix.***

WATERSHED LANDMARKS

Map 9. Mill Creek Watershed Landmarks from Google Maps[69]



[69] Google Maps

Figure 6. Aerial view of the 400-acre Mohegan Sun Casino & Pocono Downs Racetrack[70] from Google Satellite View[71]

Figure 7. View of the entrance to the Mohegan Sun Casino property and 20,000 square foot Convention Center

[70] About Mohegan Sun Pocono | Wilkes-Barre, PA Casino and Hotel

[71] Mohegan Sun Casino and Pocono Downs Racetrack

Figure 8. Aerial View of the Geisinger Medical Center[72] along E. Mountain Boulevard from Google Satellite View[73]

Figure 9. View of the front entrance of the 25,000 square foot Geisinger Wyoming Valley Medical Center

[72] Geisinger Wyoming Valley Medical Center

[73] Geisinger Wyoming Valley Medical Center Google Satellite View

Figure 10. Aerial View of US Social Security Administration along E. Mountain Boulevard Google Satellite View[74]

Figure 11. Aerial View of the Wilkes-Barre Area Career and Technical Center[75] from Google Satellite View[76]

[74] US Social Security Administration Google Satellite View

[75] Welcome To the Official Wilkes-Barre Area Career & Technical Center Website

[76] Wilkes-Barre Area Career and Technical Center Google Satellite View

Figure 12. Aerial View of the former Prospect Mine Colliery in Plains Township in 2005 from Google Satellite View[77]

The New Wilkes-Barre Area School District High School combined students from GAR, EL Meyers, and Coughlin High Schools into one school built on reclaimed coal mine lands. Mill Creek is shown in orange to the southeast of the site in the before photo above and after photo below.

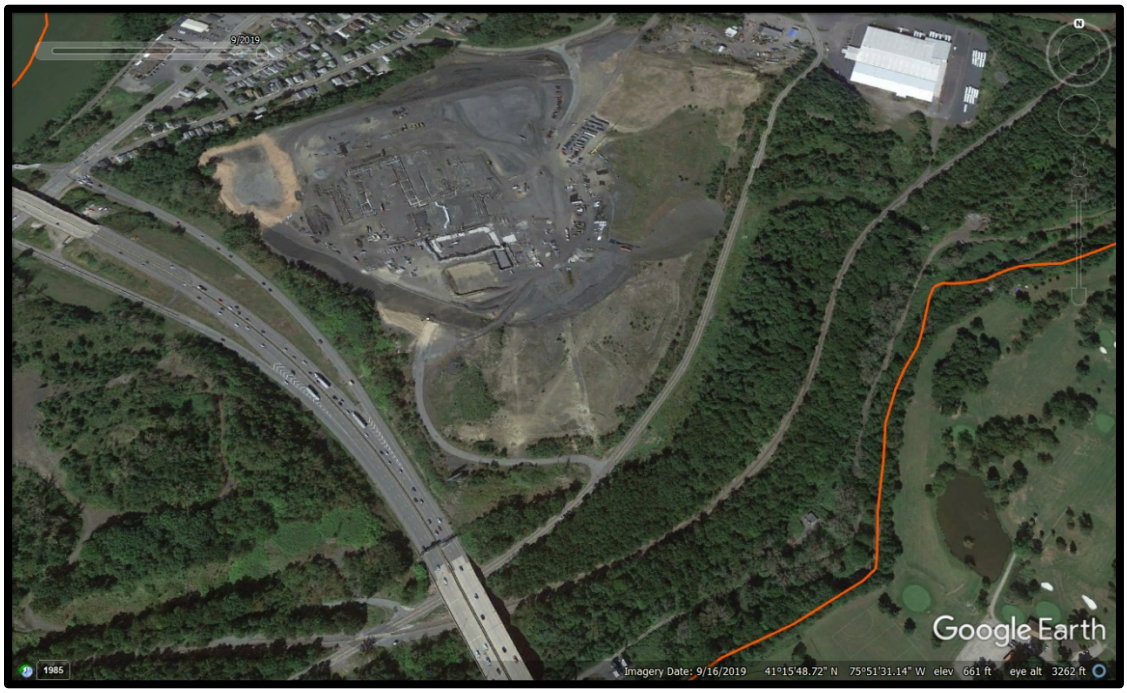


Figure 13. Aerial View of the former Prospect Mine Colliery in Plains Township in 2021 during construction

[77] Prospect Mine 2005

Figure 14. Construction progress[78] of the new Wilkes-Barre Area School District

Figure 15. Construction progress[79] of the new entrance to the Wilkes-Barre Area School District

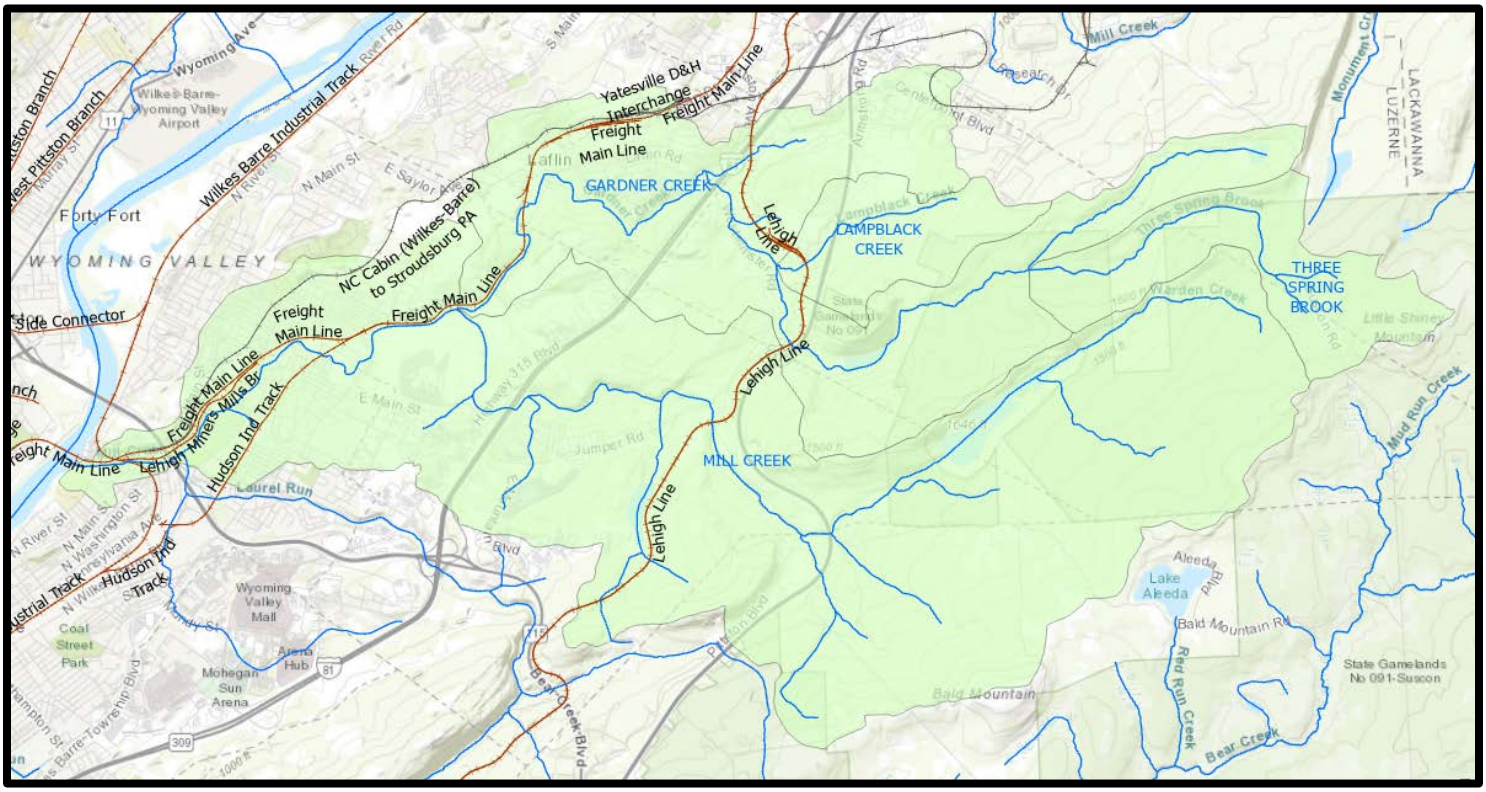
[78] PA Homepage Progress Being Made on New Wilkes-Barre Area High School
[79] PA Homepage Progress Being Made on New Wilkes-Barre Area High School

Figure 16. The Hollenback Golf Course in Wilkes-Barre from Google Satellite View[80]

Mill Creek flows from the northeast to the southwest below the CP Rail Systems and an unnamed tributary flows through the 102.6 acre, 9-hole municipal Hollenback Golf Club[81] from the east along Grist Lane.

[80] Hollenback Golf Club
[81] Hollenback Golf Club Facebook Page

Map 10. Mill Creek Watershed Active Rails (not to scale)



There are **75434.64'** or **14.29** miles of active rail lines [82]that dissects the watershed. Researching OpenRailwayMap[83], the site collates an excellent detailed online collection of the world's railway infrastructure built on OpenStreetMap data that has been publicly available since 2013, EPCAMR noted that the mileage includes the Wilkes-Barre Connecting Railroad that is the Sunbury Main Line (Canadian Pacific) that crosses the Susquehanna River near the mouth of the watershed, and the Lehigh Division Branch Line (Reading, Blue Mountain & Northern Railroad) that runs through the center of the watershed on the western side of the US PA Turnpike 476.

Northeast to Southwest

NC Cabin (Wilkes-Barre) to Stroudsburg PA was built by Wilkes-Barre & Eastern RR 1892-93, a subsidiary of New York Susquehanna & Western RR controlled by Erie RR 1898 to 1937. Abandoned 1939. The Freight Main Line is Canadian Pacific (Delaware & Hudson). It's still an active line. The Yatesville Interchange to the D&H switched trains from the NC Cabin Line to the D&H Freight Line. The Lehigh Miners Mills Branch brought an old line into the millworks at the corner of N. Washington and E. Main Streets in Plains behind the Philly's Subs and Pizza Restaurant on the other side of Mill Creek. The Hudson Industrial Track connects the D&H Freight Main Line to the Wilkes-Barre Industrial Track. These are both active and are owned by the Luzerne County Rail Authority and operated by the Canadian Pacific Railroad Company. Lastly, is the Reading and Northern Lehigh Line. Owned and operated by Reading and Blue Mountain & Northern Railroad, which is also still active.

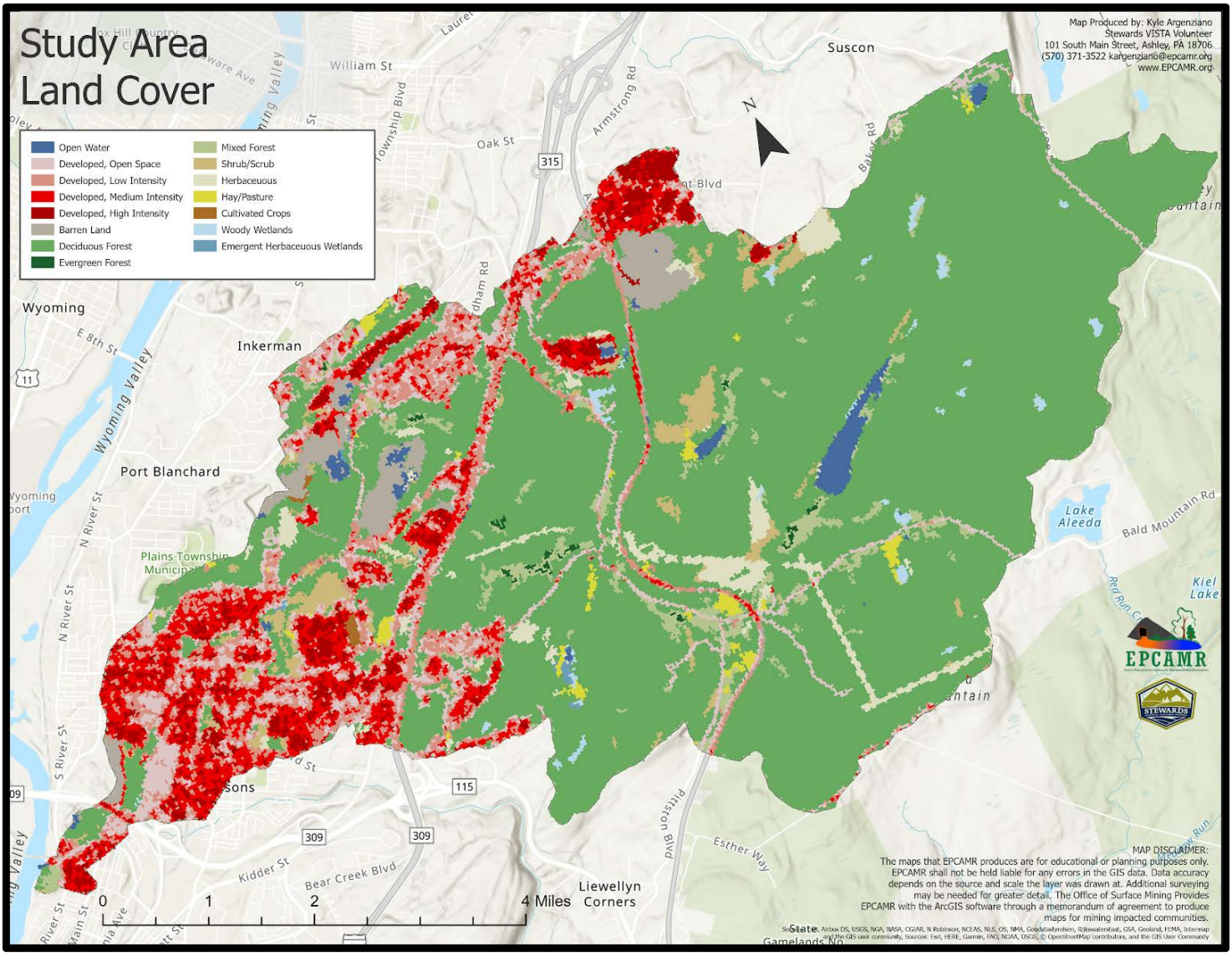
[82] Pennsylvania Spatial Data Access (PASDA)

[83] OpenRailwayMap.org

LAND COVER CHARACTERISTICS OF THE MILL CREEK WATERSHED

According to the National Land Cover Database,[84] the Mill Creek watershed is around **66** % predominantly Deciduous Forest, **3.3** % highly developed, **6.7%** with low intensive development, **6.6%** medium intensive development, and **5.2** % development with open space, **2.5%** barren land, **2.4%** mixed forest, and only **1%** open water. The major development corridor is along State Route 315 Highway and in the City of Wilkes-Barre and Plains Township in the Wyoming Valley.

Map 11. Mill Creek Watershed Land Use



[84] National Land Cover Database

Table 4. Mill Creek Watershed Land Cover Class Statistics via ArcGIS Online Analysis[85]

Land-Use Cover Class	Count	Area (Square Feet)	Percentage of Land Cover
Deciduous Forest	45,447	440,268,693.04	66.189%
Developed, Low Intensity	4,645	44,998,527.50	6.765%
Developed, Medium Intensity	4,536	43,942,587.89	6.606%
Developed, Open Space	3,580	34,681,319.36	5.214%
Developed, High Intensity	2,233	21,632,230.76	3.252%
Barren Land	1,731	16,769,096.04	2.521%
Mixed Forest	1,638	15,868,156.74	2.386%
Herbaceous	1,517	14,695,966.89	2.209%
Shrub/Scrub	1,482	14,356,903.71	2.158%
Open Water	717	6,945,951.39	1.044%
Hay/Pasture	487	4,717,821.94	0.709%
Woody Wetlands	371	3,594,069.69	0.540%
Evergreen Forest	119	1,152,814.81	0.173%
Cultivated Crops	86	833,126.67	0.125%
Emergent Herbaceous Wetlands	73	707,188.91	0.106%

[85] 2D, 3D & 4D GIS Mapping Software | ArcGIS Pro

MAJOR NAMED TRIBUTARIES OF THE MILL CREEK

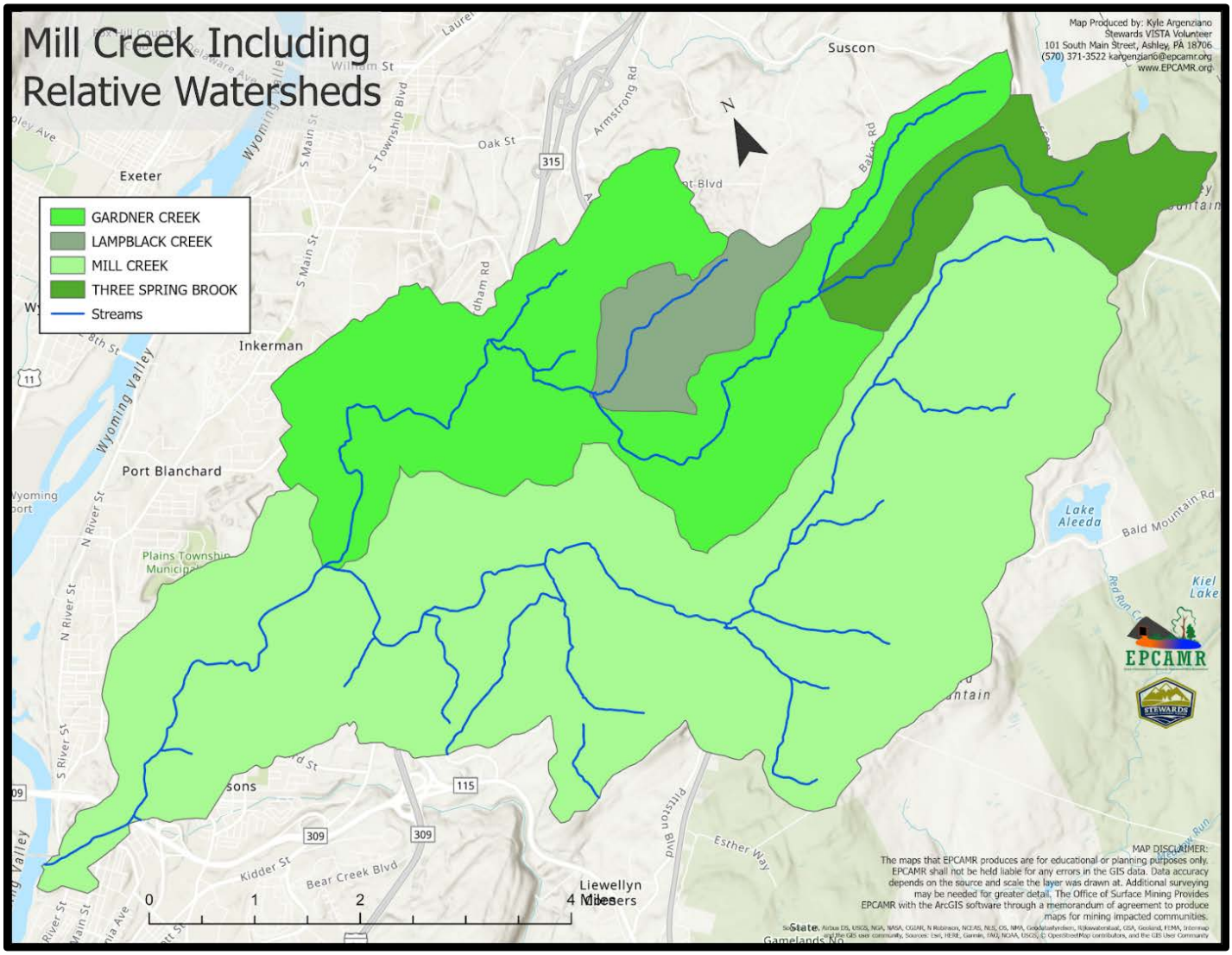
Mill Creek has several named tributaries. Gardner Creek, Lampblack Creek, Three Spring Brook, and Dark Hollow Creek. According to some benchmark locations around the watershed from the USGS National Map Viewer[86], the headwater elevations around the watershed range from 1767', on Suscon Road, just south of the easternmost unnamed tributary to Three Spring Brook that crosses the road, to 1800' in the other unnamed tributary southwest of Suscon Road along the Lackawanna County municipal line and through a portion of the PA Game Commission State Game Lands 91. Lampblack Creek headwaters starts at an elevation of 1200' to the east of the Pennsy Quarry. Gardner Creek at its confluence with the headwater tributary from Harlow Pond is at 1300'. The Gardner Creek Reservoir sits at 1074'.

A headwater tributary, called ***Quarry Creek***, flows down from a pond between the US 476 Turnpike and Armstrong Road south to the intersection with Capital Road, where it then flows from an elevation of 1000', then flows beneath the Turnpike, north of Demark Street, just to the northeast of Old Boston Road where another small pond is located at elevation of 950', that flows in a westerly direction, crosses Industrial Drive in Jenkins Township, west of Fieseler Signs, and just south of WVIA FM that continues under Pittston Avenue, the railroad tracks, Interstate I-81, in Laflin Borough, east of US Route Highway 315, before crossing under an old masonry culvert, and then flows south of Laflin Road, where it comes to a confluence with ***Gardner Creek***, near the Design Center Outlet.

The ***Warden Creek*** headwaters above the Mill Creek Reservoir is at 1770' west of Suscon Road in Jenkins Township. ***Rough Hollow*** headwaters begin to flow at an elevation of 1870' 2.5 miles east of the Mill Creek Reservoir that sits at 1432' in Plains Borough. ***Deep Hollow Pond*** sits at 1123'. The confluence of Deep Creek with Mill Creek sits at 840' in Plains Borough. 637.01' is the confluence elevation of Mill Creek with Gardner Creek below Ridgewood and to the west of the stables at the Mohegan Sun Pocono Downs Racetrack. The ***Laurel Run*** tributary confluence with Mill Creek west of the Hollenback Golf Course and Athletic Fields is at 567'. Finally, the mouth elevation of ***Mill Creek*** just north of the corner of the Wilkes-Barre City's Hollenback Cemetery where the waterway enters the confluence with the Susquehanna River is at 521.31'.

[86] The National Map - Advanced Viewer

Map 12. Mill Creek Including Relative Sub watersheds



GENERAL IMPAIRMENTS WITHIN THE MILL CREEK WATERSHED

There is a major section of the Gardner Creek tributary that is considered non-attaining the by the PA Department of Environmental Protection's Integrated Water Quality Monitoring and Assessment Report[87] and is listed as Impaired by reason of urban runoff, abandoned mine drainage (AMD), pH, and flow regime modification. **47,900.16** feet (stream length) or **9.072** miles (**17.491** %) of the watershed are listed as "Impaired". The impairments started at the confluence of Gardner Creek with Quarry Creek (41.290218184998594, -75.78448227448874) south of Laflin Road, and just north of Dr. Joseph Raymond's Medical Office, along US State Route Highway 315 in Laflin Borough.

Mill Creek Infiltration Area along SR Highway 315

In 2012, Mill Creek was flowing downstream below the Wilkes-Barre Career and Technical Center and behind the residential homes along Jumper Road where it then proceeded to backwater into a former abandoned mine land area and stripping pit and a major portion of the flow was being lost to the isolated North-West underground abandoned mine pool complex[88] becoming a part of the Plainsville AMD Borehole discharge along the Plainsville Flats area on the Price property in Plains Township, along the eastern shore opposite the Forty-Fort Borough Levee.

The flow of Mill Creek during high flows still proceeded to follow the stream channel underneath the US State Route 315 culvert and highway before heading northwest towards the Mohegan Sun Casino and Pocono Downs Racetrack. The loss point was in the Delaware-Pine Ridge Collieries. EPCAMR had previously sampled the creek with Wilkes-Barre Area Elementary Students from Dan Flood Elementary and the aquatic life and fish life were seemingly thriving because of the excellent water quality in this location, despite the creek losing a large volume of clean water to the underground mines as it created backwater eddies and swirled into the underground fractured bedrock and strip-mined area to the north of the right banks of Mill Creek.

[87] Integrated Water Quality Report-2020

[88] Mill Creek-Luzerne County Operation Scarlift Report

Figure 17. Water from Mill Creek flowed into a backwater eddy section of an abandoned stripping pit in 2012

The photo above shows an infiltration point where surface water was being lost to the underground mine workings that EPCAMR believed flowed towards the Plainsville AMD Borehole on the Price property in the Plainsville Flats, off S. River Street. Mike Hewitt, EPCAMR Program Manager can be seen in the right of the photo for scale. The PA DEP Bureau of Abandoned Mine Reclamation backfilled and reclaimed the entire area reclaimed in 2014. This photo below is an approximate location of the same area. A rip-rap channel was reconstructed (in the top right of the photo below) to route the water towards Mill Creek.

Figure 18. Approximate area where the PA DEP Bureau of Abandoned Mine Reclamation reclaimed the area by 2014.

Figure 19. Aerial View of the site in 2011 where Mill Creek diverted into the circular ponded area (north of the tan colored soils and rock in the center of the image) and infiltrated into the underground mine workings below.

Figure 20. Aerial View of the site in 2014 following reclamation work completed by PA DEP BAMR

PA DEP Bureau of Abandoned Mine Reclamation (BAMR) backfilled the water loss flow point, recontoured the land, and constructed a rip-rap channel the entire length of the Mill Creek between US I-81 Southbound lanes (right) to a culvert beneath State Route 315 Northbound lanes (left) in the photo above. The photo below shows the site 5 years following reclamation. The rip rap channel contains Mill Creek and the vegetation on the site has recovered, however the creek remains unshaded.

Figure 21. Aerial View of the site in 2019 showing the site 5 years post reclamation

Packer Air Shaft AMD

EPCAMR Staff found a very large unnamed AMD discharge [41.27812 -75.8138] with a combination of iron and aluminum flowing into Gardner Creek above the Union Street Bridge in Plains Township. We discovered the discharge while walking the stream channel and following an odd whitish/gray color in the middle of the channel that was coating the surface of the bedrock bedding plane that outcrops in the area parallel to the CP Rail Systems railroad tracks. It turned out to be aluminum hydroxide that is impacting this stretch of stream with a lower pH than the upstream area on Gardner Creek. No bugs or fish were found below the AMD flow into Gardner Creek that impairs the lower 9 miles of the watershed. Upon evaluation of underground mine maps from the Packer Colliery we discovered it was flowing out of an abandoned air shaft. EPCAMR named it the Packer Air Shaft AMD Discharge.

Figure 22. Packer Air Shaft AMD discharge in Plains Township before flowing under a culvert beneath the railroad.

Figure 23. Concrete culvert carries Packer Air Shaft AMD discharge under railroad *before dumping into Gardner Creek*

Figure 24. Looking upstream on the Packer Air Shaft AMD discharge thru the squashed corrugated metal pipe culvert

Figure 25. Packer AMD Discharge as it enters Gardner Creek.

Notice the chemical reaction evidenced by a whitish gray depositional line of precipitated aluminum hydroxide settled on the stream bottom in the photo above where the low pH/heavy metal Packer AMD discharge mixes with higher pH stream water. It looks like a ray of light peeking through the tree canopy, but it's not.

Figure 26. Looking upstream on Gardner Creek toward the confluence with *Packer Air Shaft AMD discharge*

Figure 27. Noticeable amounts of surface foam floating on Gardner Creek in the mid-September (unknown source).

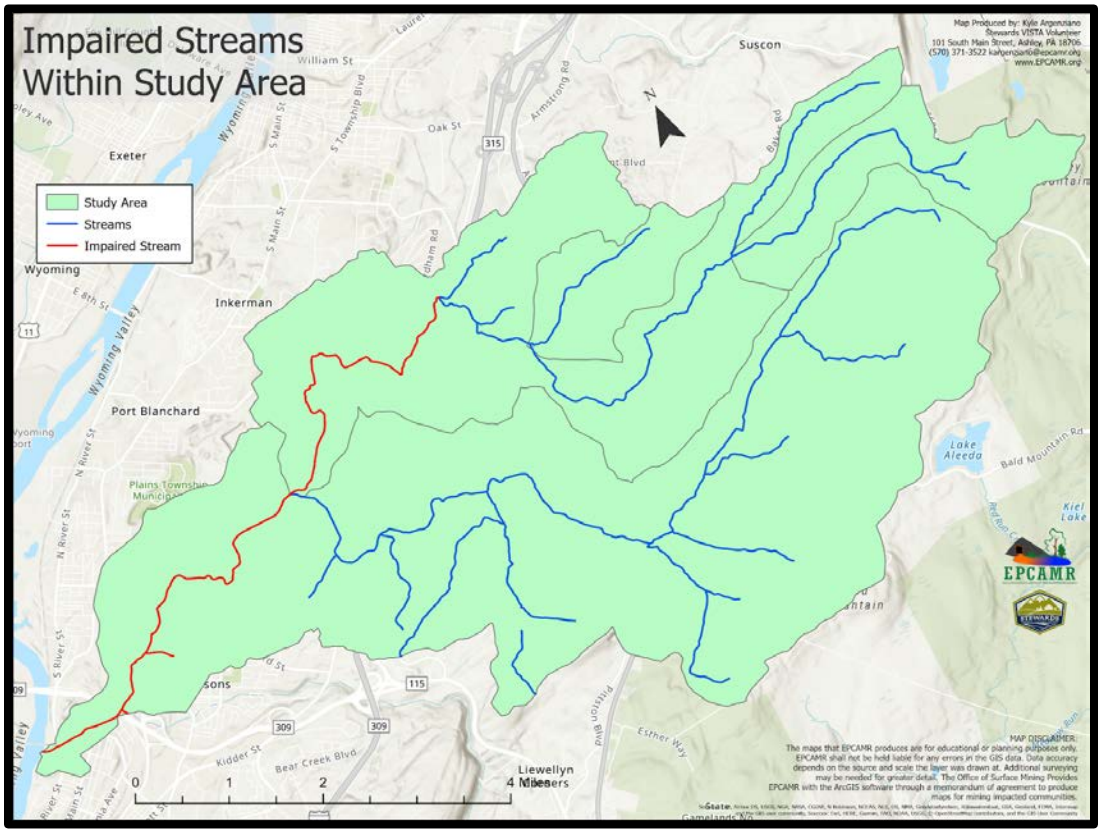
On October 1, 2021, Michael Hewitt, EPCAMR Program Manager visited the Packer Air Shaft AMD discharge location to sample chemistry and calculate flow for inclusion in the Mill Creek Coldwater Conservation Plan. Mike conducted the water sampling and flow reading while other EPCAMR Staff and partners were with the PA Council of Trout Unlimited conducting the electroshocking survey at various sites selected throughout the entire watershed to identify the fish species and absence and presence of native brook trout and wild brown trout. The flow of the AMD discharge was **1302** gpm. The Temperature was **51.6** degrees (Fahrenheit). The pH was **3.71** and very acidic. The Dissolved Oxygen level at the source was **0.63** mg/L. The Redox Potential (ORP) was **388** mvolts(mv). The Conductivity was **626** micro siemens/centimeter (µS/cm). The Total Dissolved Solids (TDS) was **340** mg/L. The Turbidity was **4** Formazin Turbidity Units (FTU). Calculated Total Suspended Solids (TSS) was **1.3** mg/L. The Alkalinity was **20** mg/L. The Total Iron was **3** mg/L. The Total Aluminum was **>5** mg/L. The Sulfate (SO4) was **195** mg/L. The Nitrate-Nitrogen (NO3-N) was **0.062** mg/L. The Phosphate (PO4) was **12.7** mg/L.

On December 8, 2021, EPCAMR Staff had visited the site with John Levitsky, Watershed Specialist, Luzerne Conservation District and Susquehanna River Basin Commission[89] (SRBC) AMD Basin Coordinator, Tom Clark, and Environmental Scientist, Andrew King. SRBC is going to conduct some lab sampling of the discharge for EPCAMR. Although this partnership was developed late in the planning, we are happy to have them on board. Compared to the first sampling, the Packer Air Shaft AMD Discharge had a significantly lower flow at approximately 200 gpm only two months following the initial investigation of the discharge. The fluctuation of flow indicates a flashy, fluctuating mine pool which is driven by precipitation. This area could benefit from looking for and repairing surface water infiltration points above the mine pool. Stable mine pool flows indicate the makeup is mostly groundwater.

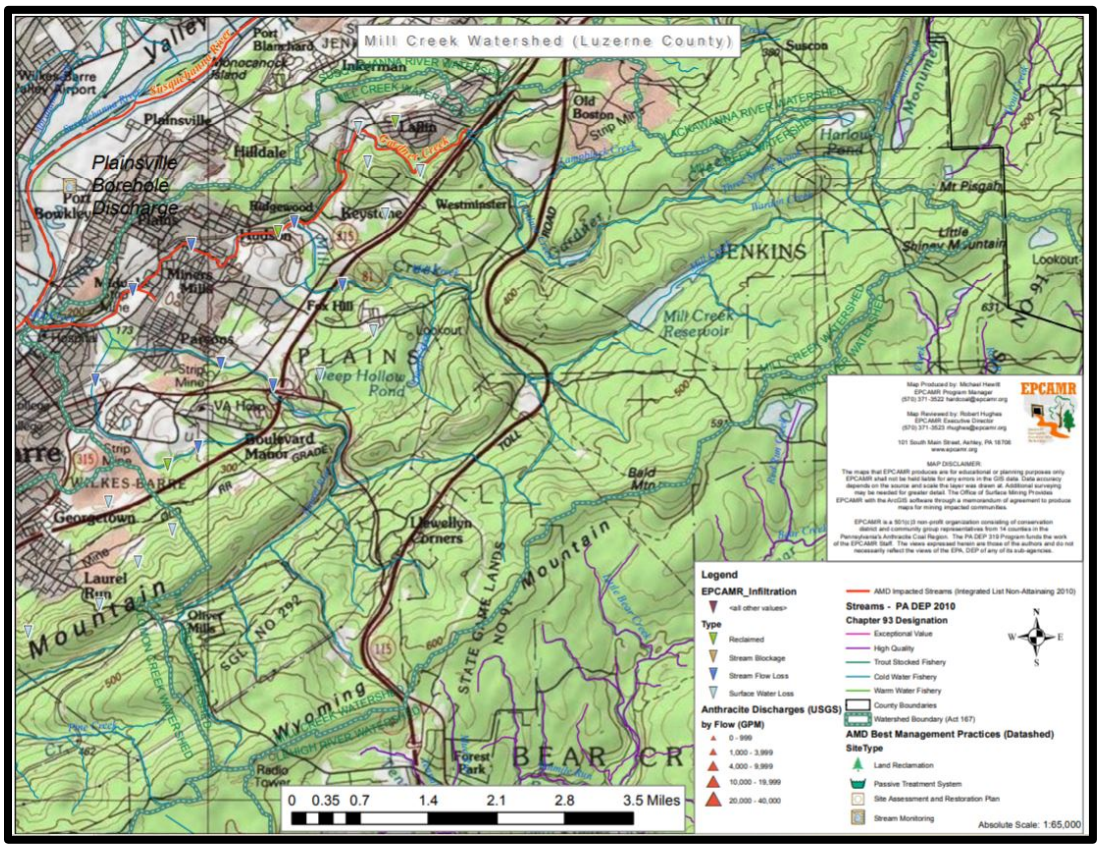
Figure 28: SRBC and EPCAMR staff sample flow and chemistry at Packer Air Shaft AMD discharge in December 2021

[89] Susquehanna River Basin Commission

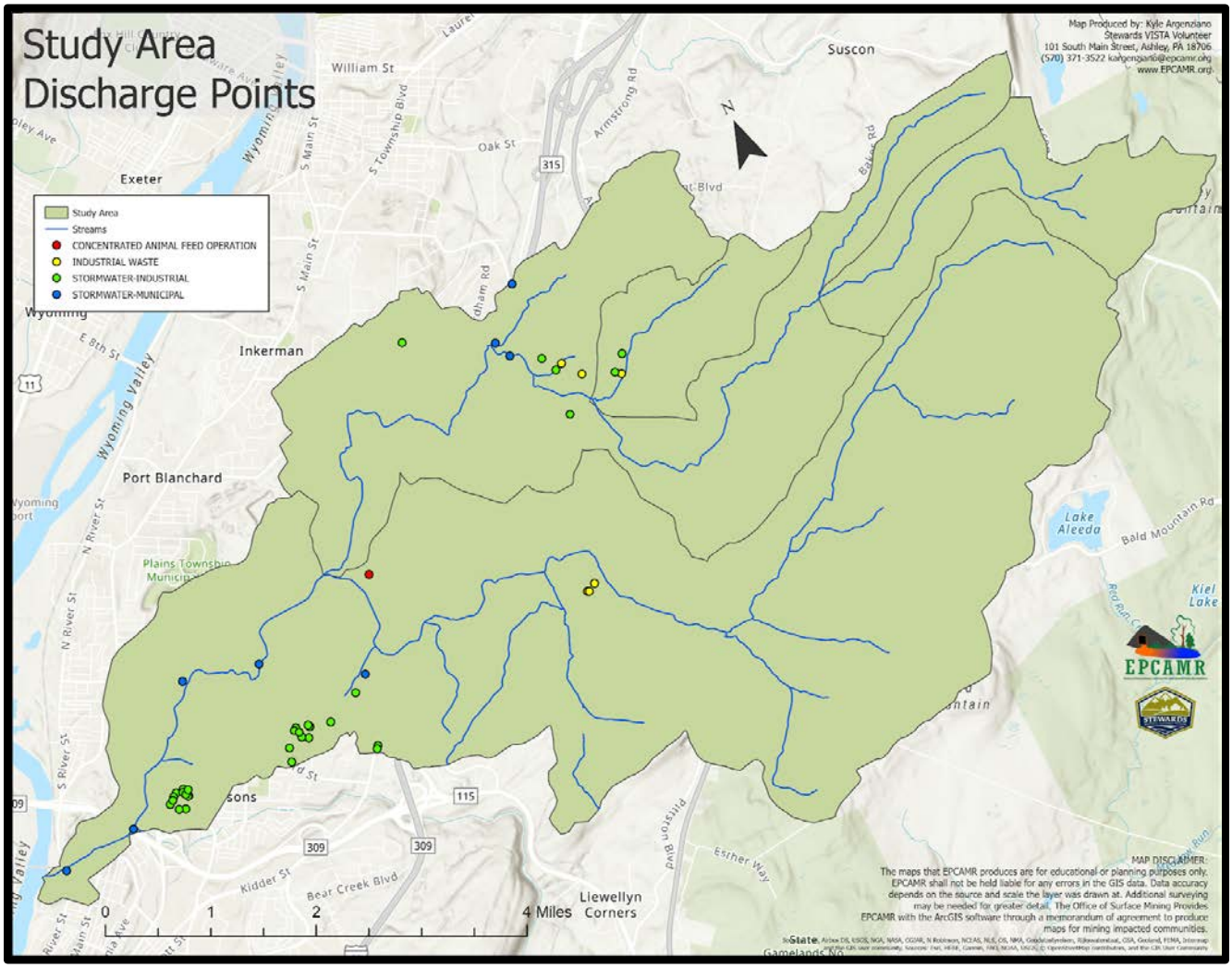
Map 13. Impaired Section of Gardner and Mill Creek (shown in red) within the watershed



Map 14. Impaired Section of Gardner and Mill Creek (shown in red) and Chapter 93 use designations



Map 15. Mill Creek Watershed PA DEP Water Pollution Control Facility Discharge Points



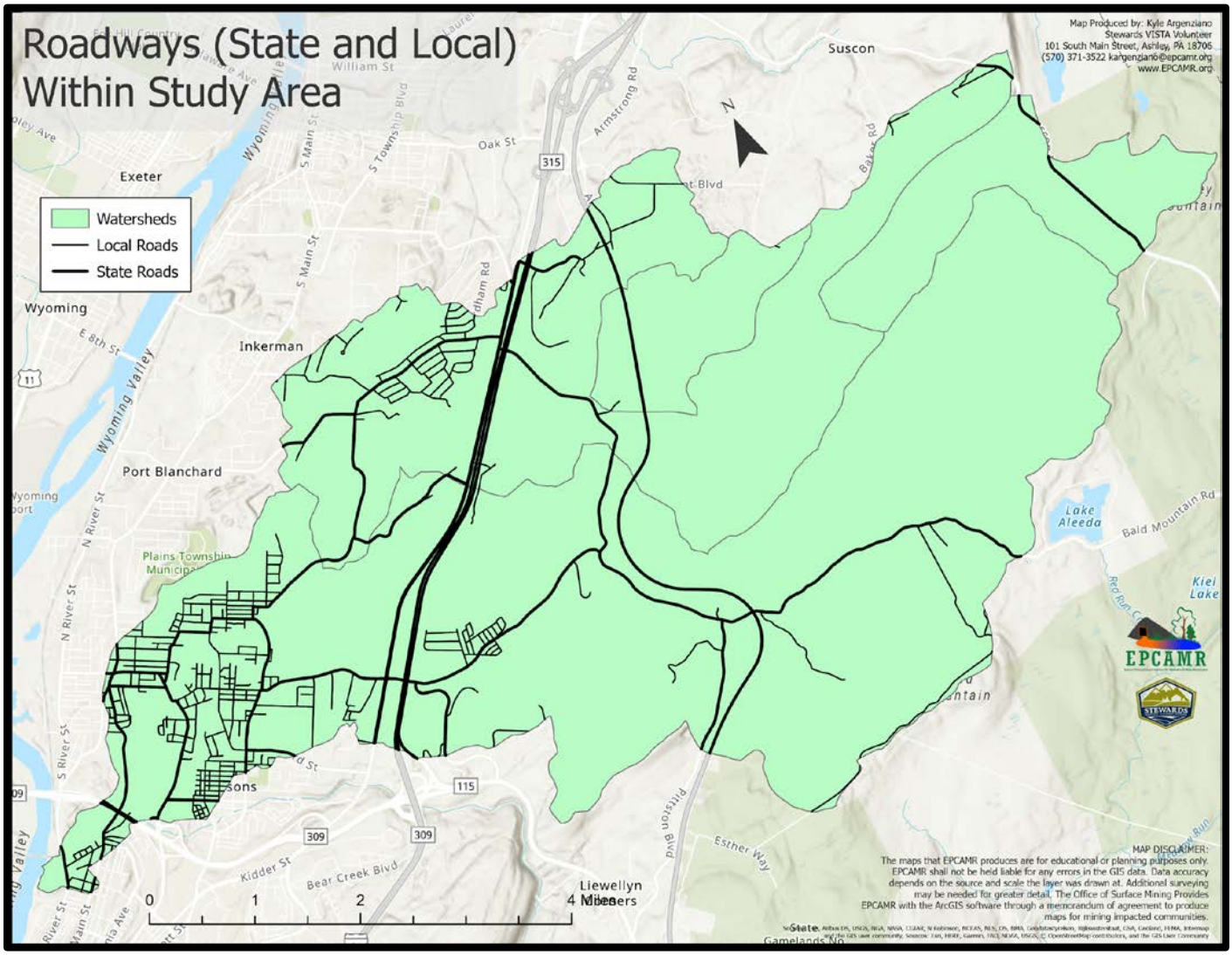
The PA Department of Environmental Protection tracks primary facilities related to the water pollution control program. These include water treatment plants and water storage units, land and stream discharges, conveyance systems and conduits, cooling water intake structures, biosolids treatment and processing, agricultural activities, pesticide treatment areas, manure management, concentrated animal operations, concentrated animal feedlot operations, and internal and groundwater monitoring points.

Table 5. Mill Creek Watershed Study Area Discharge Point Statistics via ArcGIS Online Analysis[90]

Site by Source	Number	Percentage (%)
Industrial Stormwater	32	64%
Municipal Stormwater	11	22%
Industrial Waste	6	12%
Concentrated Animal Feed Operation	1	2%
Total Registered DEP Sites	50	NA

[90] 2D, 3D & 4D GIS Mapping Software | ArcGIS Pro

Map 16. Mill Creek Watershed Roadways



There are **130.596** miles of roadways within the Mill Creek watershed with **45.002%** owned, operated, and maintained by the PA Department of Transportation and The PA Turnpike Commission, with the remaining **54.998%** owned, operated, and maintained by the County or Local municipal governments. Plains Township[91] alone has **32.10** miles of road system and **27.14** miles of the PA State Highway System running through the municipality based on their First-Class Township Map, Luzerne County (2017). Laflin Borough has **6.91** miles of road system and **4.35** miles of the PA State Highway System running through the municipality based on their Borough Map (2000) and segments of Gardner Creek and Quarry Creek run entirely through the Borough.

[91] Plains Township

FISHERY DESIGNATION BY DRAINAGE WITHIN THE MILL CREEK WATERSHED

The Mill Creek Watershed has included for Naturally Producing Wild Trout Waters[92] three fishery designations for **1.71** miles (Warden Creek), **2.98** miles (Three Spring Brook), and **5.50** miles (Mill Creek) by the PA Fish and Boat Commission for a total of **10.19** miles.

Table 6. Wild Trout Waters fishery designations within the Mill Creek Watershed

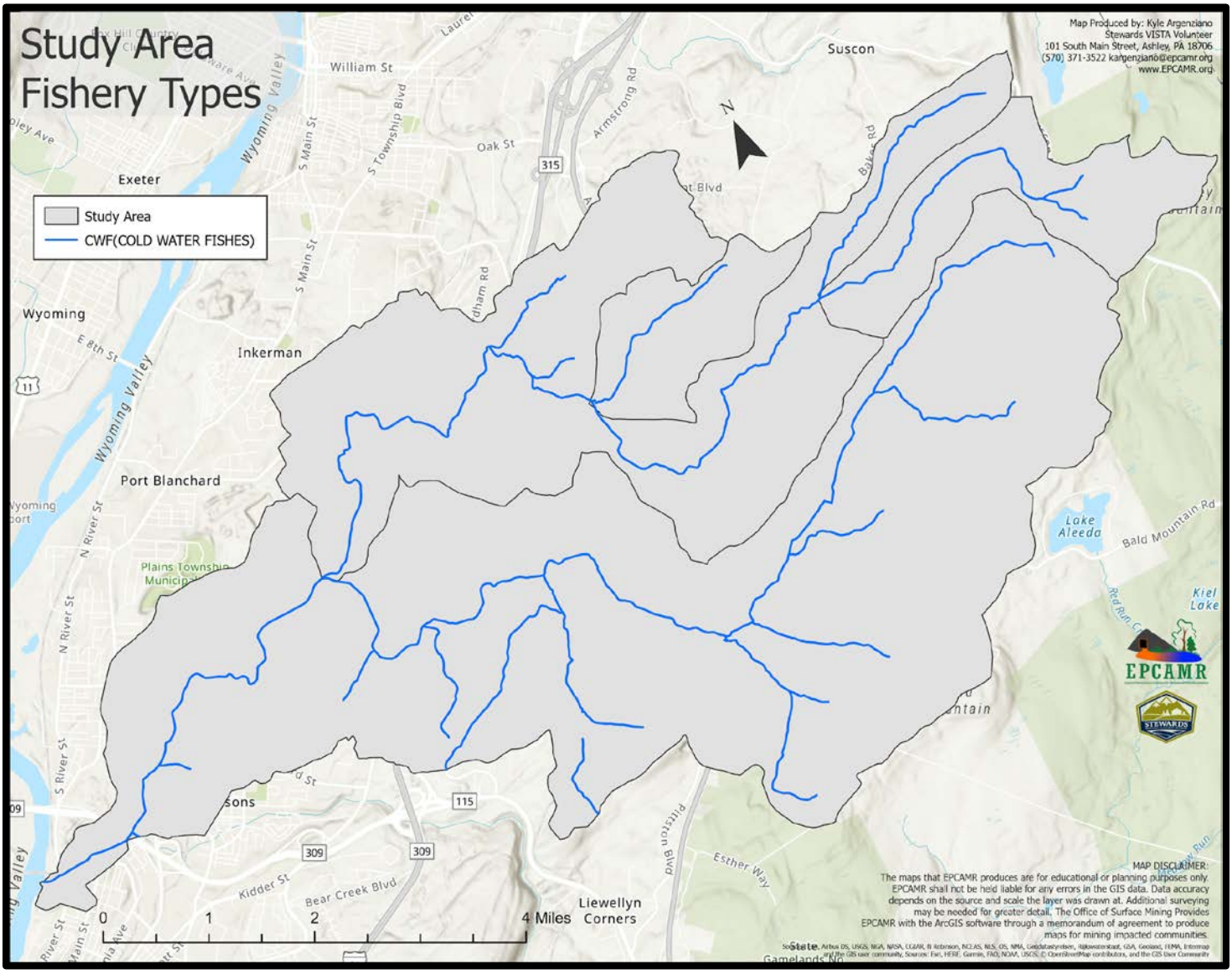
County of Mouth	Water	Tributary to	Wild Trout Limits	Lower Limit [Latitude]	Lower Limit [Longitude]
Luzerne	Warden Creek	Mill Creek	Headwaters to Mouth	(41.269169)	(-75.739441)
Luzerne	Three Spring Brook	Gardner Creek	Headwaters to Mouth	(41.279999)	(-75.740555)
Luzerne	Mill Creek	N. Br. Susquehanna	Mill Creek Reservoir DS to Gardner Creek	(41.276112)	(-75.818054)

Excluded from this Plan is the unnamed tributary to Laurel Run (RM 3.66; Wheelbarrow Run) from the Headwaters to Mouth [Latitude](*41.237183*), [Longitude](*-75.809837*) for another **1.43** miles, Laurel Run from the Headwaters downstream to the Colebrook Dam [Latitude](*41.247780*), [Longitude](*-75.817780*) for an additional **5.19** miles, and Deep Hollow, a tributary to Laurel Run from the Headwaters to Mouth [Latitude](*41.230556*), [Longitude](*-75.807220*) for **1.32** miles, for an additional total of **7.94** miles of Naturally Producing Wild Trout Waters, because they were documented previously in the Laurel Run Coldwater Conservation Plan in 2016.

Combining totals for both the Laurel Run Coldwater Conservation Plan with the current Mill Creek Coldwater Conservation Plan, would equal **18.13** miles of Naturally Producing Wild Trout Waters for the overall entire watershed. The upper reaches of the watershed are relatively undisturbed forest areas with an abundance of tree cover and cooler water temperatures that are excellent habitat for trout. The good water quality and base flow in the headwater streams are reliable, steady, and has minimal flow losses because they are well above the coal measures. It's the baseflow and the surface runoff that contribute the most to the flow of the streams above the coal measures.

[92] PA Fish & Boat Commission PA Wild Trout Waters (Natural Reproduction) - December 2020

Map 17. Mill Creek Watershed Fishery Types



Every stream mile of the Mill Creek Watershed is classified as a Cold-Water Fishes section (CWF). Stream classifications[93] are defined by the PA Fish & Boat Commission and the PA Department of Environmental Protection.

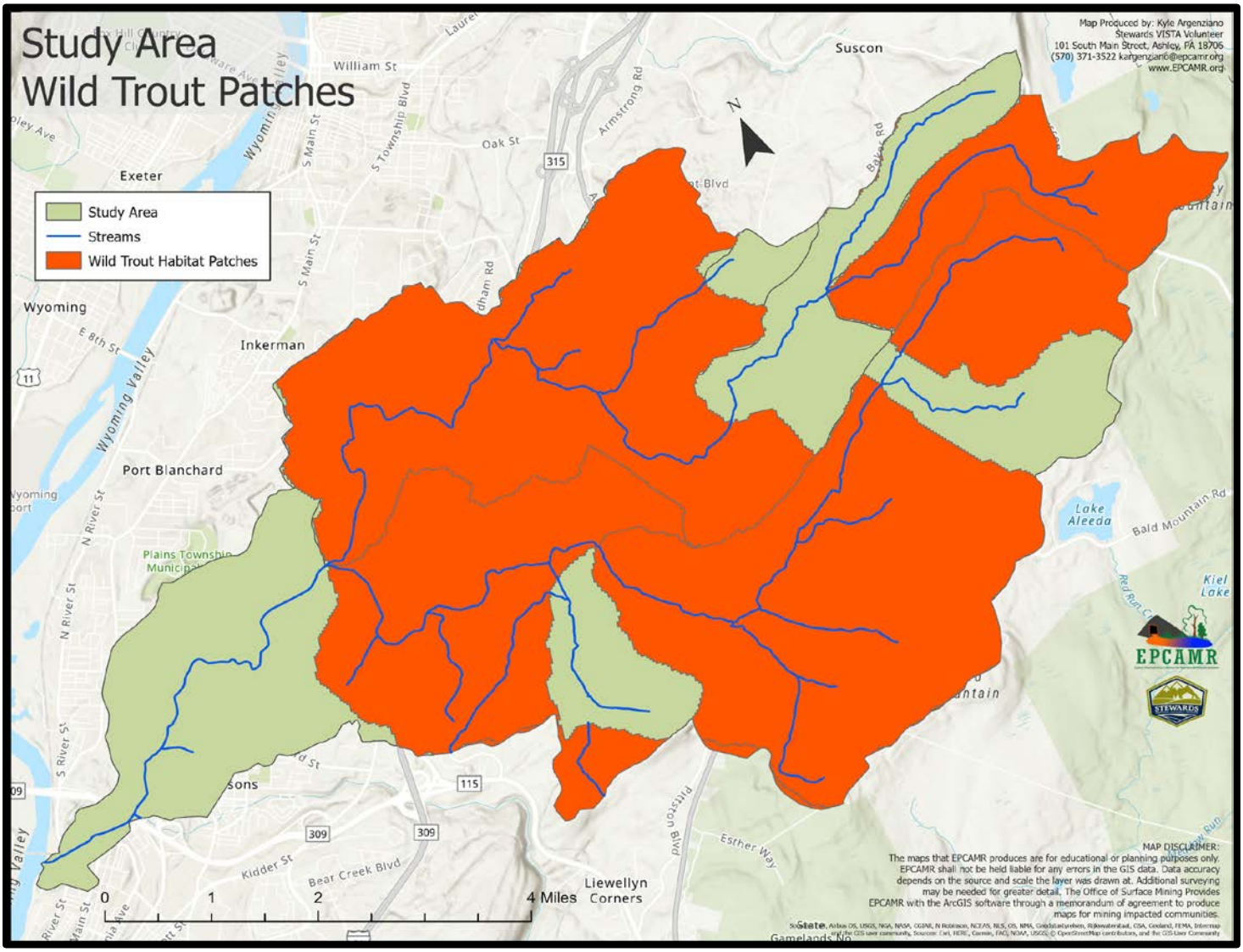
[93] Trout Water Classifications and Redesignation Qualifications Presentation-PA DEP Office of Water Management

Brook Trout Habitat

Examples of good brook trout habitat are forested stretches of stream that are well vegetated, water that is cool and clean with natural spring inputs from groundwater sources, and the presence of any species of trout are excellent indicators of overall stream health and water quality. A habitat patch is a defined area used by species for reproduction and survival. According the Eastern Brook Trout: Roadmap to Restoration[94], a patch is a group of contiguous catchments occupied by wild trout, are not connected physically (i.e., they can be separated by a dam, unoccupied warm water habitat, downstream invasive species, etc., and are generally assumed to be genetically isolated.

The Wild Trout and Brook Trout Habitat Patch area for the Mill Creek watershed is **30.454** square miles or **72.312%** of the Land Cover.

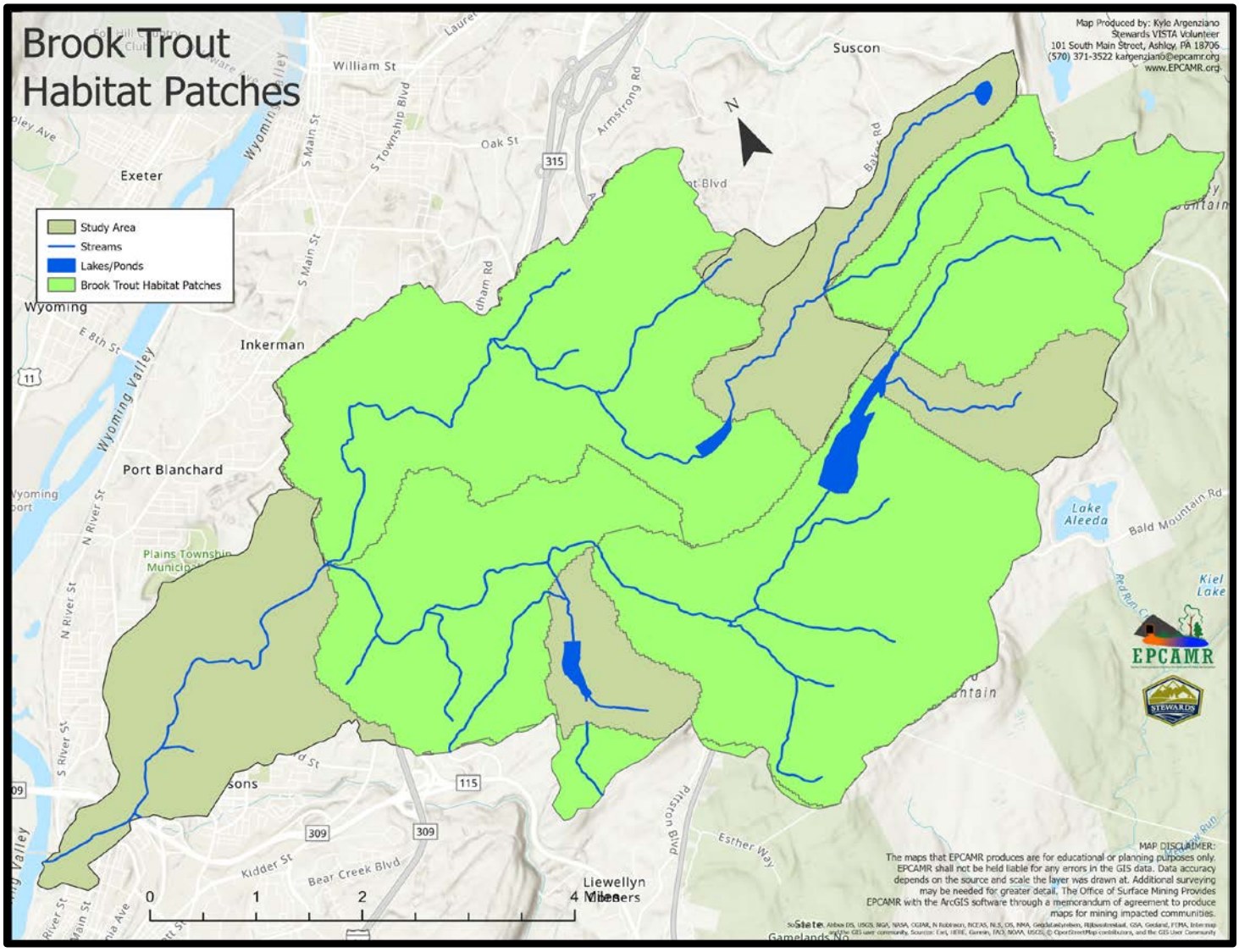
Map 18. Mill Creek Watershed Wild Trout Habitat Patches according to Eastern Brook Trout Joint Venture[95]



[94] Eastern Brook Trout: Roadmap to Restoration

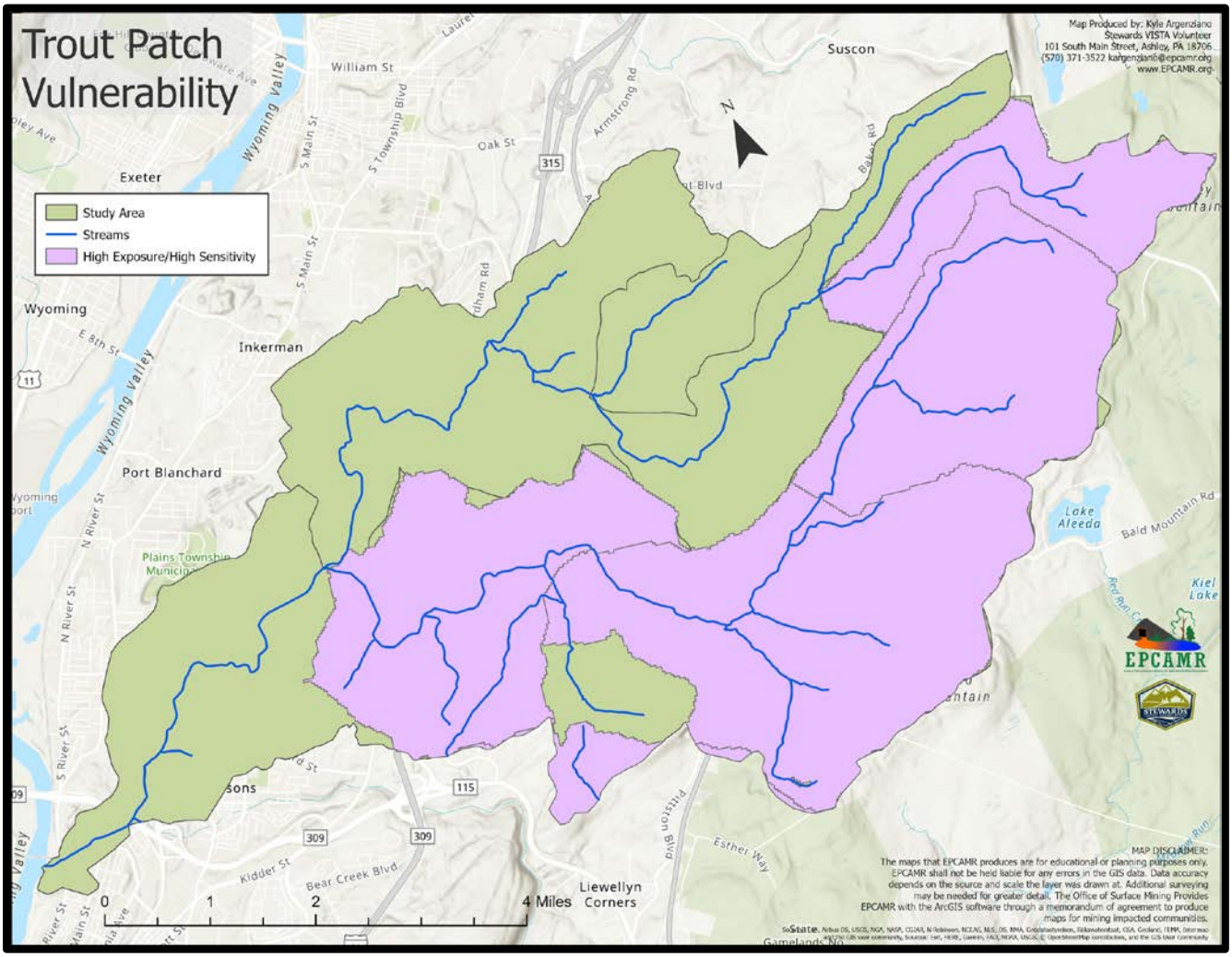
[95] Eastern Brook Trout Joint Venture Data & Tools — EBTJV

Map 19. Mill Creek Watershed Brook Trout Habitat Patches according to Eastern Brook Trout Joint Venture[96]



[96] Eastern Brook Trout Joint Venture Data & Tools — EBTJV

Map 20. Mill Creek Watershed Trout Patch Habitat Vulnerability according to Eastern Brook Trout Joint Venture[97]



Trout Patch Vulnerability according to [*Ranking Site Vulnerability to Increasing Temperatures in Southern Appalachian Brook Trout Streams in Virginia: An Exposure - Sensitivity Approach — EBTJV*](#)[98] is determined by two factors: 1) *Sensitivity* (predicted change in water temperature per unit increase in air temperature and 2) *Exposure* (predicted frequency, magnitude, and duration of threshold water temperatures). They are ranked low or high for both factors and combined.

- Low Exposure / Low Sensitivity (LE / LS)
- High Exposure / Low Sensitivity (HE / LS)
- High Exposure / High Sensitivity (HE / HS)
- Low Exposure / High Sensitivity (LE / HS)

22.701 square miles or **53.903%** of the Land Cover in the Mill Creek watershed is susceptible to Trout Patch Vulnerability.

[97] Eastern Brook Trout Joint Venture Data & Tools — EBTJV

[98] Ranking Site Vulnerability to Increasing Temperatures in Southern Appalachian Brook Trout Streams in Virginia: An Exposure - Sensitivity Approach — EBTJV

PA CODE CHAPTER 25 Subsection 93.3 Stream Designations[99]

There are no exceptions to specific criteria under the ***PA Code Title 25, Chapter 93 Drainage List K*** for Mill Creek. EPCAMR has included the other zones that include the Laurel Run tributary due to the water uses protected for the entire watershed listed for all of Mill Creek. Cold Water Fishery (CWF), Migratory Fishery (MF), and High Quality-Cold Water Fishery (HQ-CWF) are the listed Water Uses Protected.

Table 7. PA Code Title 25, Chapter 93 Drainage List K Stream Designations

Stream	Zone	County	Water Uses Protected
2—Mill Creek	Basin, Source to Laurel Run	Luzerne	CWF, MF
3—Laurel Run	Basin, Source to UNT 62998 at (41°14'14.0"N; -75°48'33.5"W)	Luzerne	CWF, MF
4—UNT 62998 to Laurel Run	Basin	Luzerne	HQ-CWF, MF
3—Laurel Run	Basin, UNT 62998 to Mouth	Luzerne	CWF, MF
2—Mill Creek	Basin, Laurel Run to Mouth	Luzerne	CWF, MF

GEOGRAPHY

According to the USGS National Map Viewer[100] elevation interpolation, Mill Creek's mainstem has an estimated mouth elevation of **521.31'** [Latitude] (*41.26059*), [Longitude] (*-75.87028*). **4** notable elevations were recorded at differing headwater areas. The measurements were taken via ArcGIS Online Analysis[101] that EPCAMR uses to make maps, analyze data, and to share and collaborate information.

Table 8. Elevations within the Mill Creek Watershed from Headwaters to Mouth at the Susquehanna River

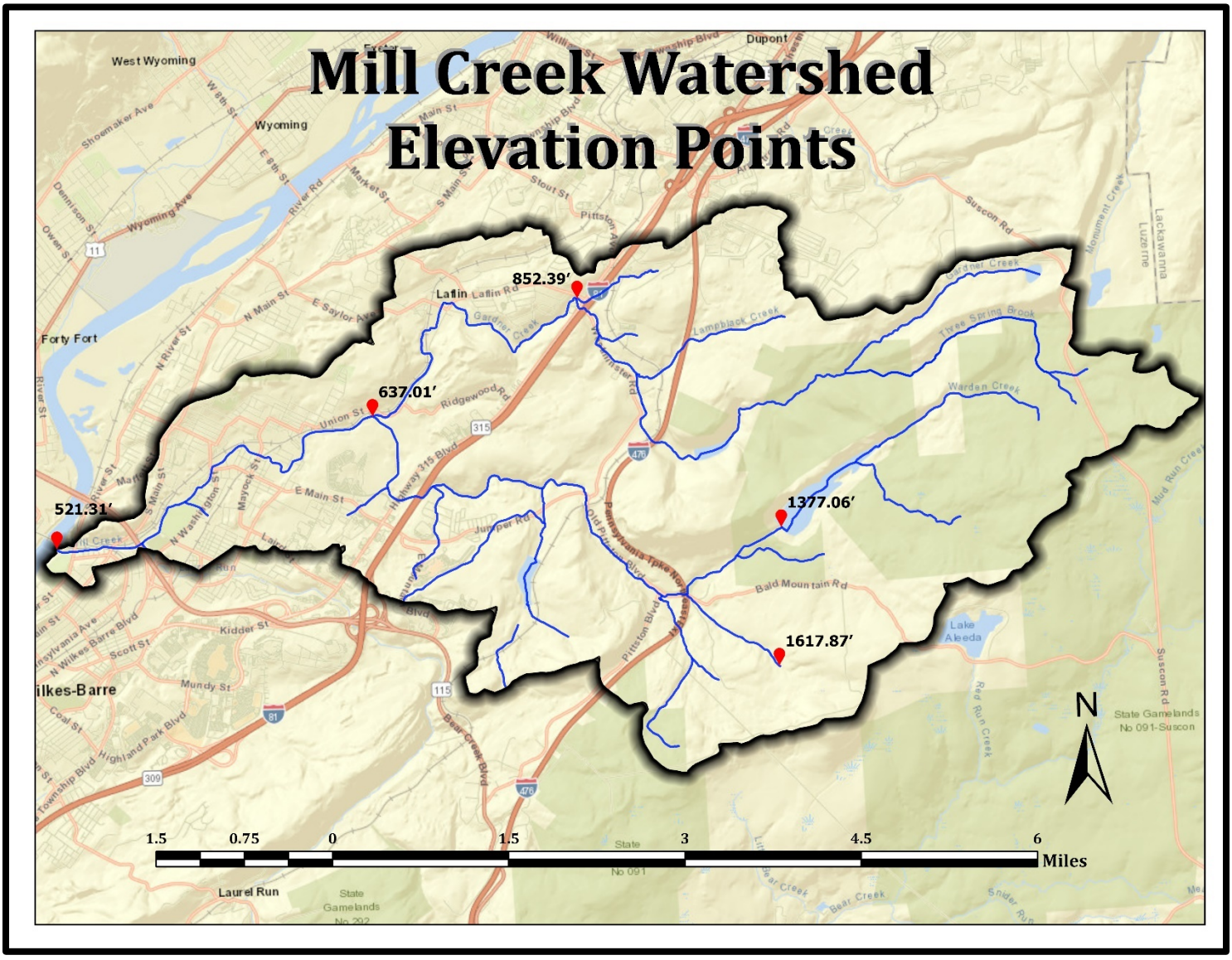
Location	Elevation (feet)	Latitude	Longitude
Headwaters	1617.87'	41.24426	-75.75265
Mill Creek Reservoir	1377.06'	41.26133	-75.75183
Gardner Creek below I-81	852.39'	41.29007	-75.78436
Gardner and Mill Creek Confluence	637.01'	41.27607	-75.81822
Mill Creek Confluence with River	521.31'	41.26059	-75.87028

[99] PA Code: Chapter 25: Subsection 93.3 Designations for Mill Creek in Drainage List K

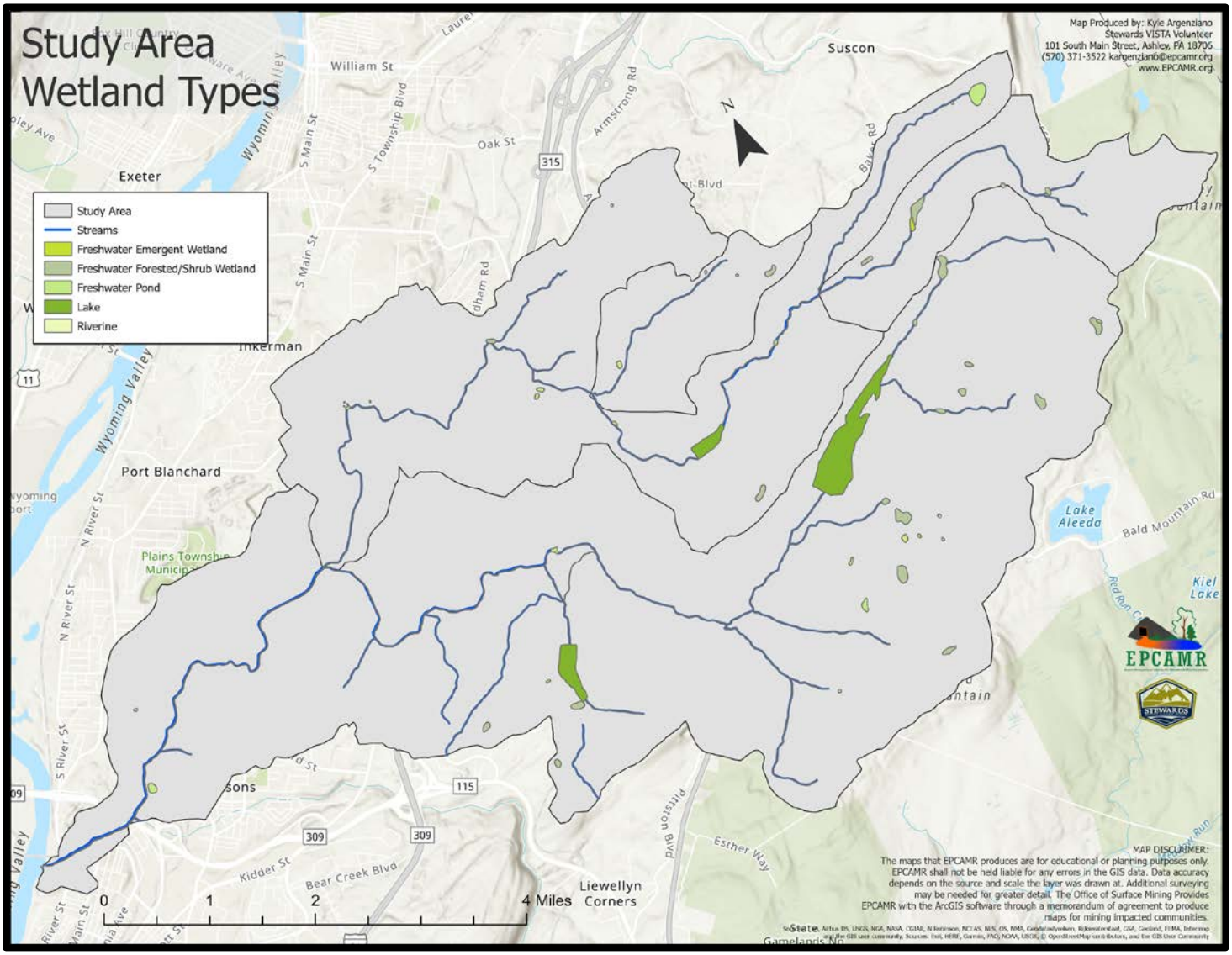
[100] USGS, The National Map - Viewer

[101] What is ArcGIS Online—ArcGIS Online Help | Documentation

Map 21. Mill Creek Headwater Elevations



Map 22. Mill Creek Watershed US Fish & Wildlife Service Wetland Types[102]



52 polygons of data from the US Fish & Wildlife Service data that details information from the [National Wetlands Inventory](#)[103], showed a total Wetland Area of **.86** square miles and only **2.05%** of the Land Cover within the watershed. The measurements were taken via **[ArcGIS Online Analysis](#)**[104].

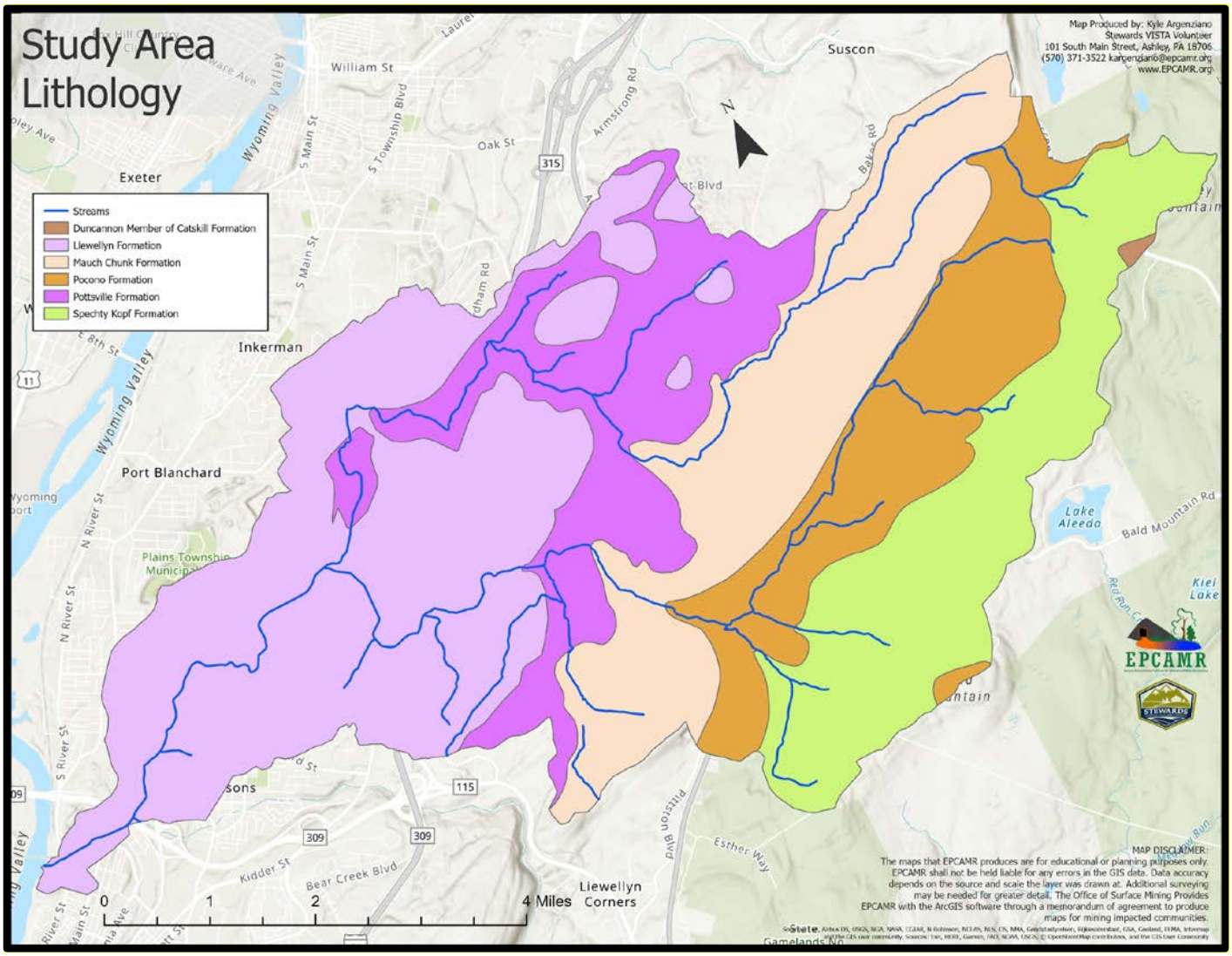
[102] USFWS Wetlands Type Data

[103] National Wetlands Inventory

[104] 2D, 3D & 4D GIS Mapping Software | ArcGIS Pro

GEOLOGY

Map 23. Mill Creek Geology and Lithology



Geography and Geology Overview

The Mill Creek watershed is in southeastern part of the Wyoming Valley and **32** percent of the watershed is in the Wyoming Coal Basin. The middle reaches of Mill Creek experience erosion near Bald Mountain Road. The lowest elevation in the watershed is 521.31' above mean sea level (MSL) at the confluence of the creek with the Susquehanna River. The highest elevation is 2,160' above mean sea level (MSL) on the tops of ridges on the southeastern edge of the watershed. The bedrock strata that underlie the Wyoming Valley and adjacent mountains consist of sandstone, shale, siltstone, conglomerate, and Anthracite coal. In stratigraphic sequence, the older (lower rock strata) to the youngest (upper strata) is the Catskill Formation (Devonian Age) to the Llewellyn Formation (Pennsylvanian Age). [105]

[105] Geology of PA

The Mill Creek watershed is in the Appalachian Mountain section of the Ridge and Valley physiographic region. The Spechty Kopf Formation[106] occupies much of the southern part of the Mill Creek watershed (in Bear Creek and Jenkins Townships, mostly), that contains light- to olive-gray, fine- to medium- grained, cross bedded sandstone, siltstone, and local polymictic diamictite, pebbly mudstone, and laminite; arranged in crude fining-upward cycles in some places; locally has grayish-red shale near top and conglomerate at base and in middle.

There are some areas of the Pocono Formation[107] contains light-gray to buff or light-olive-gray, medium-grained, cross bedded sandstone and minor siltstone; commonly conglomeratic at base and in middle. North of the Spechty Kopf formation lies the Pocono Formation. It is found in Laurel Run, northern Bear Creek Township, southern Plains Township, southern Jenkins Township, and central Pittston Township.

There are some areas from the Duncannon member of the Catskill Formation[108] that consist of grayish-red sandstone, siltstone, and mudstone in fining-upward cycles; conglomerate occurs at the base of some cycles.

The Mauch Chunk Formation[109] is north of the Pocono Formation. It consists of grayish-red shale, siltstone, sandstone, and some conglomerate; some local non-red zones. It is found in southern Wilkes-Barre Township and Plains Township, central Jenkins Township, and northern Bear Creek Township and Pittston Township.

The Pottsville Formation[110] is found in central Wilkes-Barre Township and Plains Township, in central and northern Jenkins Township, and in Laflin. It consists of light-gray thin to thick-bedded quartzose sandstone and conglomerate containing interbedded dark-gray shale, siltstone, and coal.

The Llewellyn Formation[111] is found in the northwestern-most reaches of the watershed, including northern Wilkes-Barre Township, Wilkes-Barre, and northern Plains Township. It consists of gray, fine- to coarse-grained sandstone, siltstone, shale, conglomerate, and numerous anthracite coals in repetitive sequences. It's been reported by the US Geological Survey's J.R. Hollowell in his History of the Pleistocene Sediments in the Wyoming Valley, Luzerne County, PA[112] from 1971, and US Bureau of Mines Geologist, Stephen H. Ash in his 1954 Bulletin Report, Surface-Water Seepage into Anthracite Mines in the Wyoming Basin, Northern Field, Anthracite Region of Pennsylvania[113] that there are at least **26** coal beds ranging in thickness from inches to 27' thick with the lowest workable seam being the Red Ash that is 10'+ thick that outcrops on the flanks of the mountain slopes at various elevations from 900'-1000'. In the Mill Creek Watershed, the bottom elevation of the Red Ash is mapped at 800'

[106] Spechty Kopf Formation
[107] Pocono Formation
[108] Duncannon Member of Catskill Formation
[109] Mauch Chunk Formation
[110] Pottsville Formation
[111] Llewellyn Formation
[112] History of the Pleistocene Sediments in the Wyoming Valley, Luzerne County, PA-J.R. Hollowell, 1971
[113] Reference to Stephen H. Ash's Surface Water Seepage into Anthracite Mines in the Wyoming Basin, Northern Field, Anthracite Region of PA, 1954 can be found in EPCAMR's Mine Water Resources Report of the Anthracite Region, 2012

below mean sea level (MSL) in the vicinity of the Wilkes-Barre General Hospital along S. River Street, Wilkes-Barre.

The *Oquaga-Wellsboro-Lackawanna* soil association is found in the upper reaches of Mill Creek as well as in the southwestern part of the watershed. The *Oquaga-Wellsboro-Lackawanna* soil association is found along parts of the eastern watershed boundary. This association consists of gently sloping to very steep, moderately deep, and deep soils that are moderately well drained and well drained. These soils were formed in glacial till derived from red sandstone and shale.

The *Oquaga-Lordstown-Arnot* soil association is found in a large portion of the central reaches of the watershed. *The Oquaga-Lordstown-Arnot* soil association is found around Wilkes-Barre Mountain and makes up one third of the watershed. This association is moderately steep and very steep, moderately deep, and shallow soils that are well drained. These soils are on mountainsides and formed in glacial till derived from sandstone, shale, or conglomerate.

The *Chenango-Pope-Wyoming* is found in a small part of the central reaches of the watershed. *The Chenango-Wyoming-Pope* soil association consists of gravelly sandy loam soils found along the PA Turnpike NE Extension. This association consists of nearly level to steep, deep soils that are somewhat excessively drained and well drained. These soils formed in loamy to coarse textured glacial outwash deposits derived from reddish and brown upland glacial till.

The *Strip mine-Mine dump* soil association is found in the northern part of the watershed, near the Susquehanna River, and in parts of the central reaches of the watershed. The *Strip mine-Mine dump* association comprises the northwestern half of the watershed. This association has nearly level to very steep, moderately deep, and shallow soils that are well drained on mountain ridges and mountainsides. It consists of exposed bedrock and soils and rock material that were removed to gain access to coal.

Characteristics of each of the Luzerne County soil associations, including the Strip mine-Mine dump soil association, can be found in greater detail in the Soil Survey of Luzerne County, PA[114], published and issued in 1981 by the US Department of Agriculture, Soil Conservation Service in cooperation with The Pennsylvania State University, College of Agriculture and the PA Department of Environmental Resources State Conservation Commission.

[114] Soil Survey of Luzerne County, Pennsylvania (1981)

Abandoned Mine Land Impacts

Abandoned mine land impacts are throughout the watershed and there are some infiltration points that EPCAMR would like to investigate to determine the potential for restoration as opposed to having clean water entering the deep mines. There are **42** abandoned mine land features within the watershed, **477.86** acres that contain the features, and **2746.39** acres of Problem Areas. The water quality of Mill Creek decreases downstream of its confluence with Gardner Creek, but increases downstream of its confluence with Laurel Run, due to much better water quality co-mingling with Mill Creek diluting upstream pollution effects. The Red Ash coal seam is found in the Mill Creek watershed found as low as 800' below mean sea level (MSL). However, on the Gardener Creek tributary, the coal appears at the surface.

The entire Mill Creek-Luzerne County Scarlift Report[115] can be accessed on the Western PA Coalition for Abandoned Mine Reclamation's AMR Clearinghouse[116] page that documents some of the early assessments and feasibility studies on the historic mining, reclamation, and AMD water quality impacts within the Mill Creek Watershed. *Operation Scarlift Project No. SL-181-4* was the 111-page Mine Drainage Pollution Abatement Study of for the Mill Creek Watershed in Plains, Jenkins, and Wilkes-Bare Townships, Luzerne County, PA, prepared by Geo-Technical Services-Consulting Engineers & Geologists, Harrisburg, PA in 1976. While this information is well over 6 decades old, it still provides much valuable background information for groups assessing their watershed. The paper versions of the Scarlift reports were digitized by using a scanner, translating the individual report pages into a format that is deliverable over the internet.

The recommendations for the corrections of the problems identified were made by Geo-Technical Services and did not necessarily reflect the policies, views, or approval of the PA Department of Environmental Resources at the time. Operation Scarlift was a Pennsylvania state program which operated in the 1960's and 1970's whose purpose was to remediate ravages of land and water from historic mining practices. In addition to addressing problems such as mine fires, abandoned strip mine areas, open deep mine shafts, burning refuse banks, and mine drainage, the project produced numerous studies of areas impacted by old mining practices.

It's not EPCAMR's intention to go into detail on this Study, however, it would be advantageous to the reader to review the historical context of the document and the areas for the proposed abatement, reclamation, and AMD remediation measures within the Mill Creek Watershed. Many of the projects have occurred over the last 6 decades, while there remains much reclamation and AMD remediation to make additional improvements to the watershed. Upper Coal and Lower Coal Brook AMD Abatement Projects were in the Laurel Run sub watershed of the Mill Creek, Laurel Run had recommended stream abatements, as did Mill Creek, Gardner Creek, and the PA American Water Company, Fox Hill Flume AMD abatement project.

Flow losses and infiltration points were discussed and documented throughout the watershed. Monitoring stations for both flow and water quality testing were established as well. Precipitation records were collected from various climatological stations in Mountain Top, Bear Creek, Avoca Airport, and as far south in the

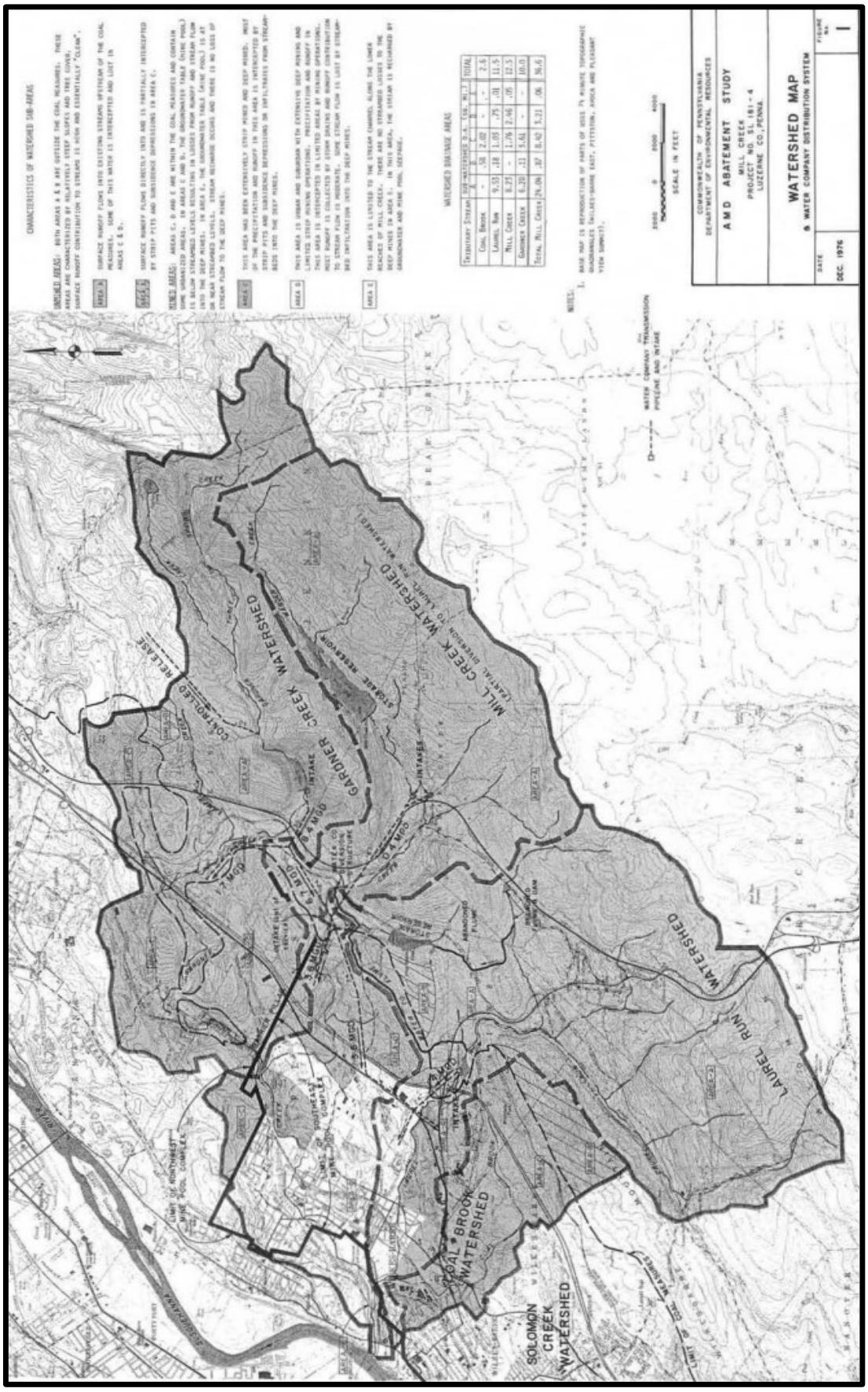
[115] Mill Creek-Luzerne County Scarlift Report
[116] AMR Clearinghouse Scarlift Reports

Wyoming Valley as West Nanticoke. Stream flow correlation curves were created for the Mill Creek, Toby Creek, and Solomon Creek Watersheds. **42** monitoring stations in all were established during the investigation.

The Introduction of the Study provides a great explanation and background information on AMD and its formation and direct connection to the associated activities of deep mining at the time that caused a significant change in the direction of the groundwater flow within the Mill Creek Watershed into fractured stream channels, bedrock, and stripping pits that eventually flowed into the underground groundwater table that EPCAMR commonly refers to as mine pool complexes and sometimes as multi-colliery hydrologic units defined in our Northern and Southern Field Regional Mine Pool Models Report for the Susquehanna River Basin Commission, 2014[117] for the Susquehanna River Basin Commission, 2014. Most deep mine water pumping ceased in 1967 and many of the mines were abandoned. The turning off of those pumps caused the mine water in the underground mine pools and the associated water levels to rise significantly and the mines became flooded. This was even before Hurricane Agnes[118] on June 23, 1972.

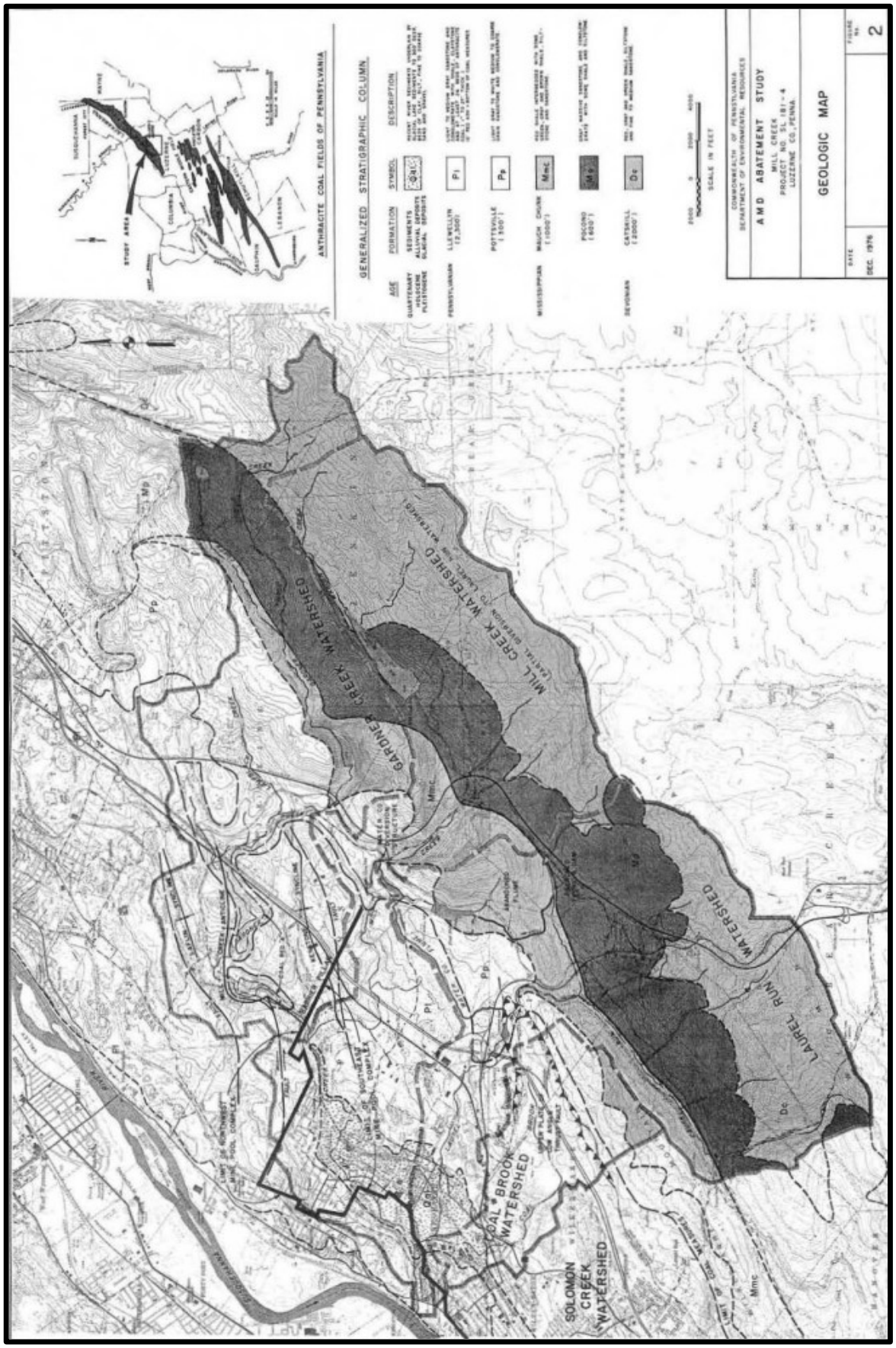
[117] EPCAMR Northern and Southern Field Regional Mine Pool Models Report for the Susquehanna River Basin Commission, 2014
[118] Hurricane Agnes (weather.gov)

Map 24. Historic Mill Creek Watershed Map from the Mill Creek Operation Scarlift Report[119]



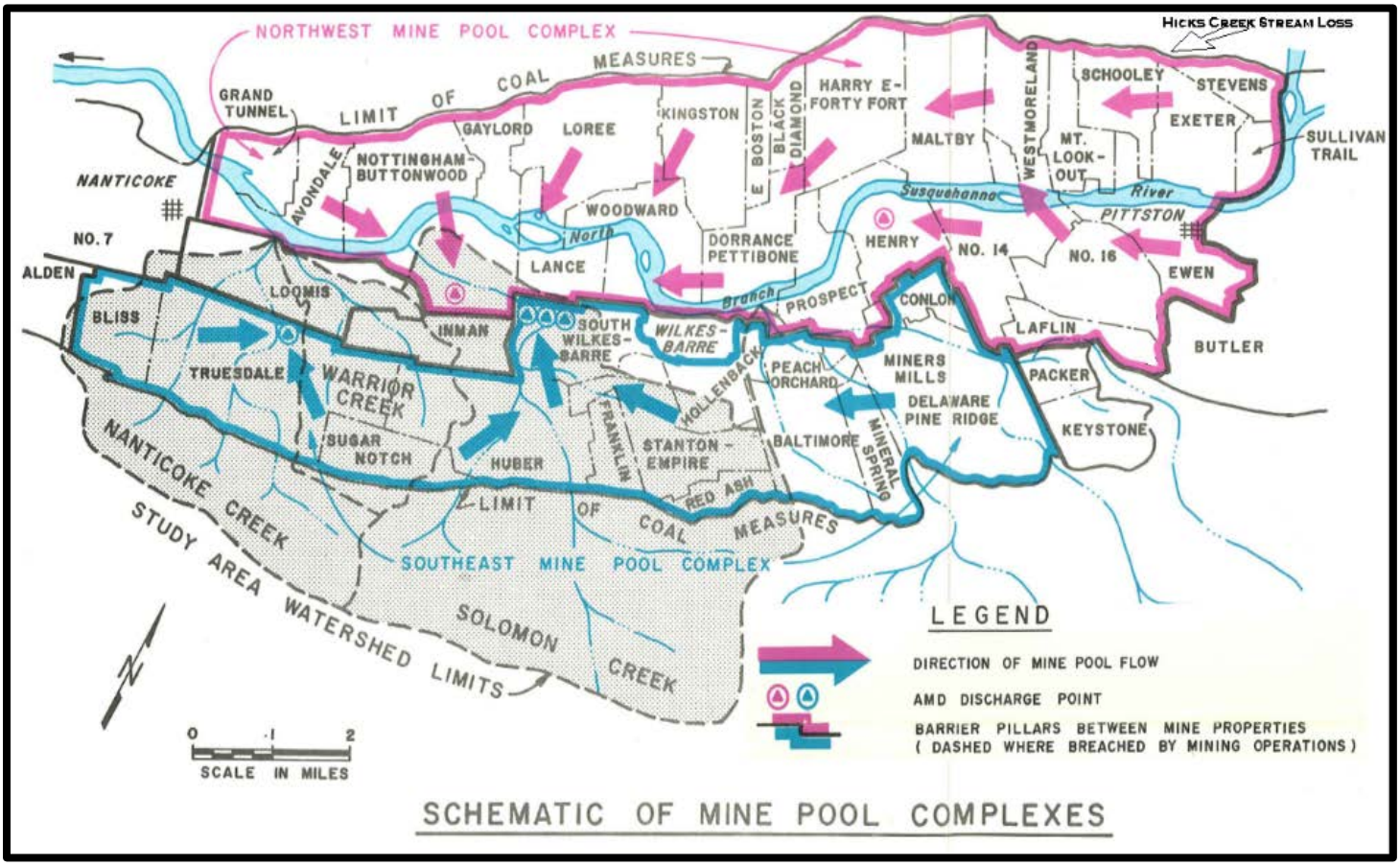
[119] Mill Creek-Luzerne County Scarlift Report

Map 25. Historic Mill Creek Watershed Geology Map from the Mill Creek Operation Scarlift Report[120]



[120] Mill Creek-Luzerne County Scarlift Report

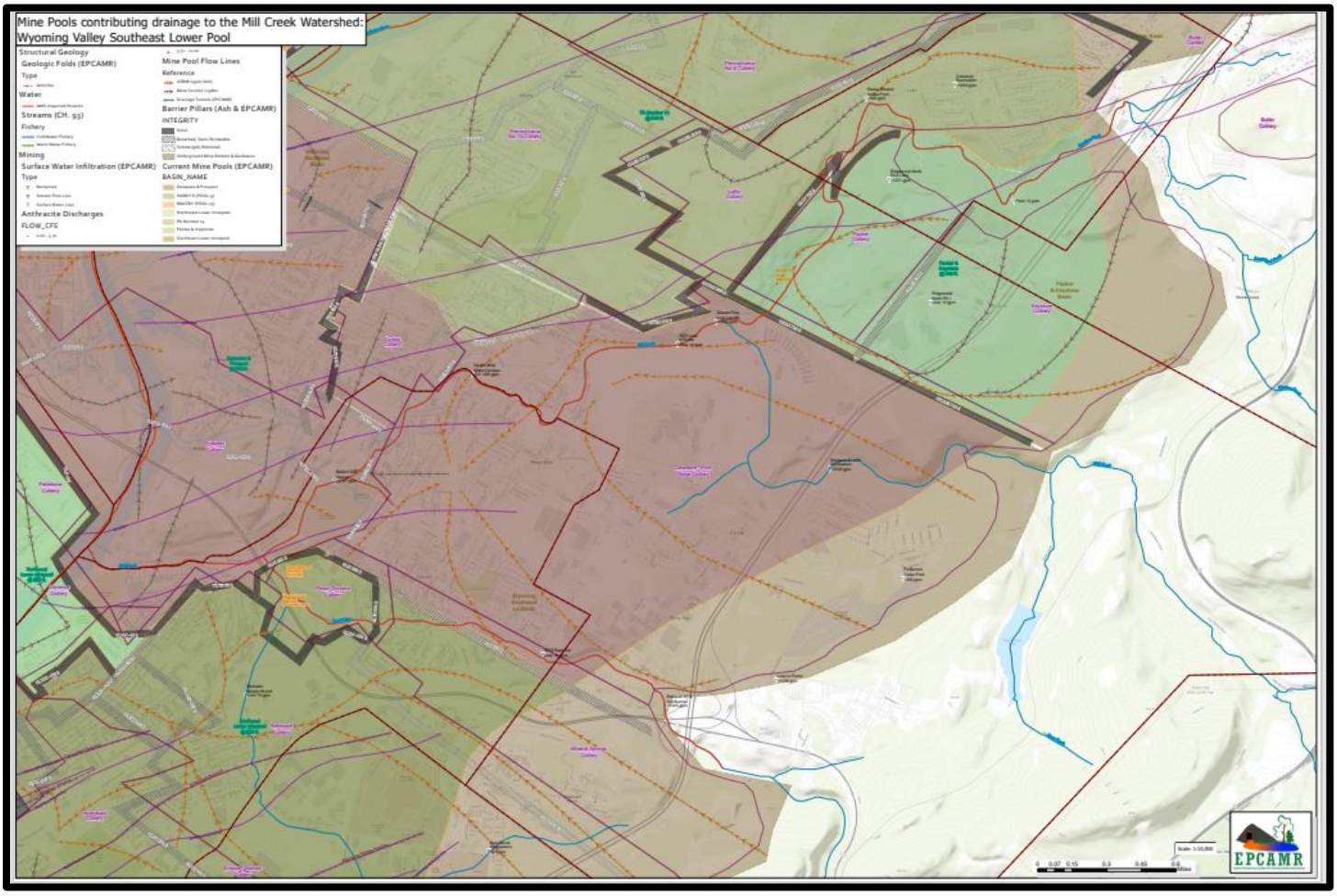
Map 26. Historic Mine Pool Flows and AMD Discharge Locations from the Mill Creek Operation Scarlift Report[121]



Geo-Technical Services also completed another Operation Scarlift report in the 1970s for the Nanticoke, Warrior and Solomon Creeks where they estimated the general direction of mine pool flows to discharges. They were one of the first to term these multi colliery hydrologic units they called the Northwest and Southeast Mine Pool Complexes in the Wyoming Valley. Not much was known about drainage in the Packer and Keystone Collieries, but EPCAMR has begun to understand this mine pool and discharge(s) as well.

[121] Mill Creek-Luzerne County Scarlift Report

Map 27. Current Mine Pool Boundaries and mine pool flow lines under the Mill Creek Watershed

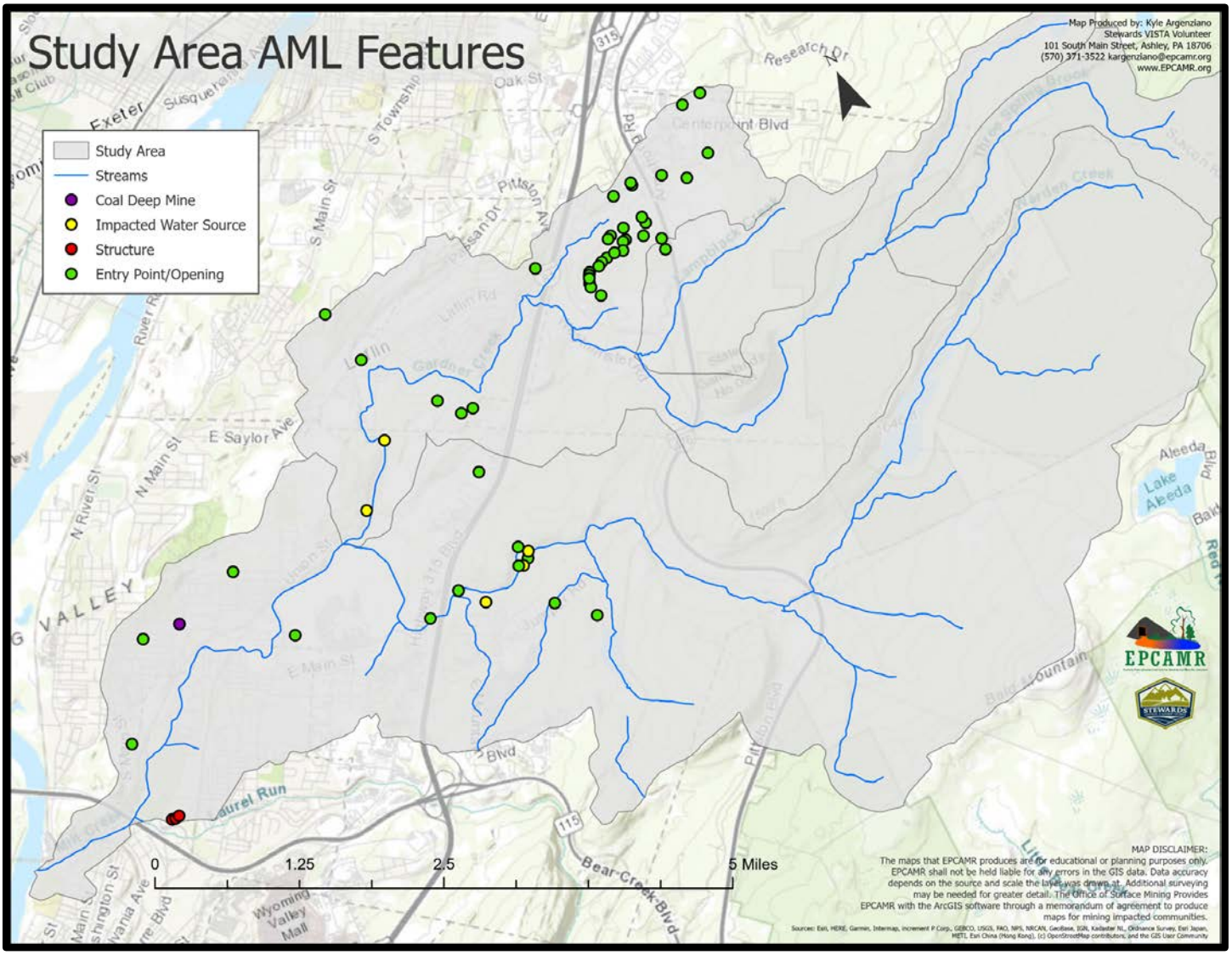


The map above shows

- Municipal boundaries (maroon lines)
- Colliery boundaries (mauve lines and text),
- Mine pools (multiple color filled polygons; teal text),
- Barrier pillars (solid black to breached gray polygons; white text),
- Geologic structure (violet lines),
- Mine pool flow lines (orange/brown lines with arrows to indicate flow direction),
- Surface water infiltration points (white outlined down-arrow; black text)
- Surface streams (impaired red lines and unimpaired blue lines),
- AMD discharges (orange up-arrow and text)

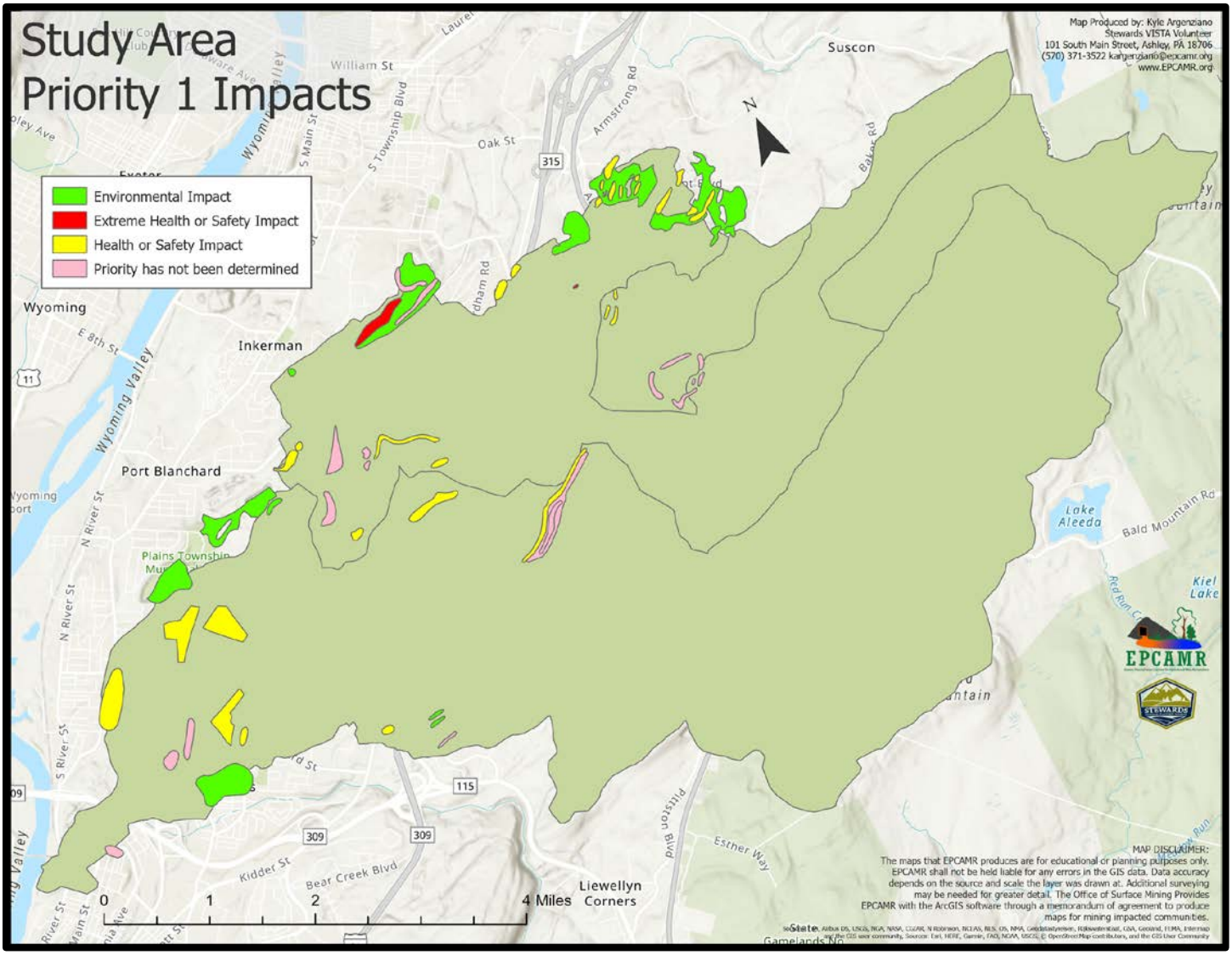
Data above is based on EPCAMR's regional study of the Northern Anthracite Coalfields in 2012, which recommends that more localized mine pool specific studies are needed.

Map 28. Mill Creek Watershed Abandoned Mine Land Feature Points



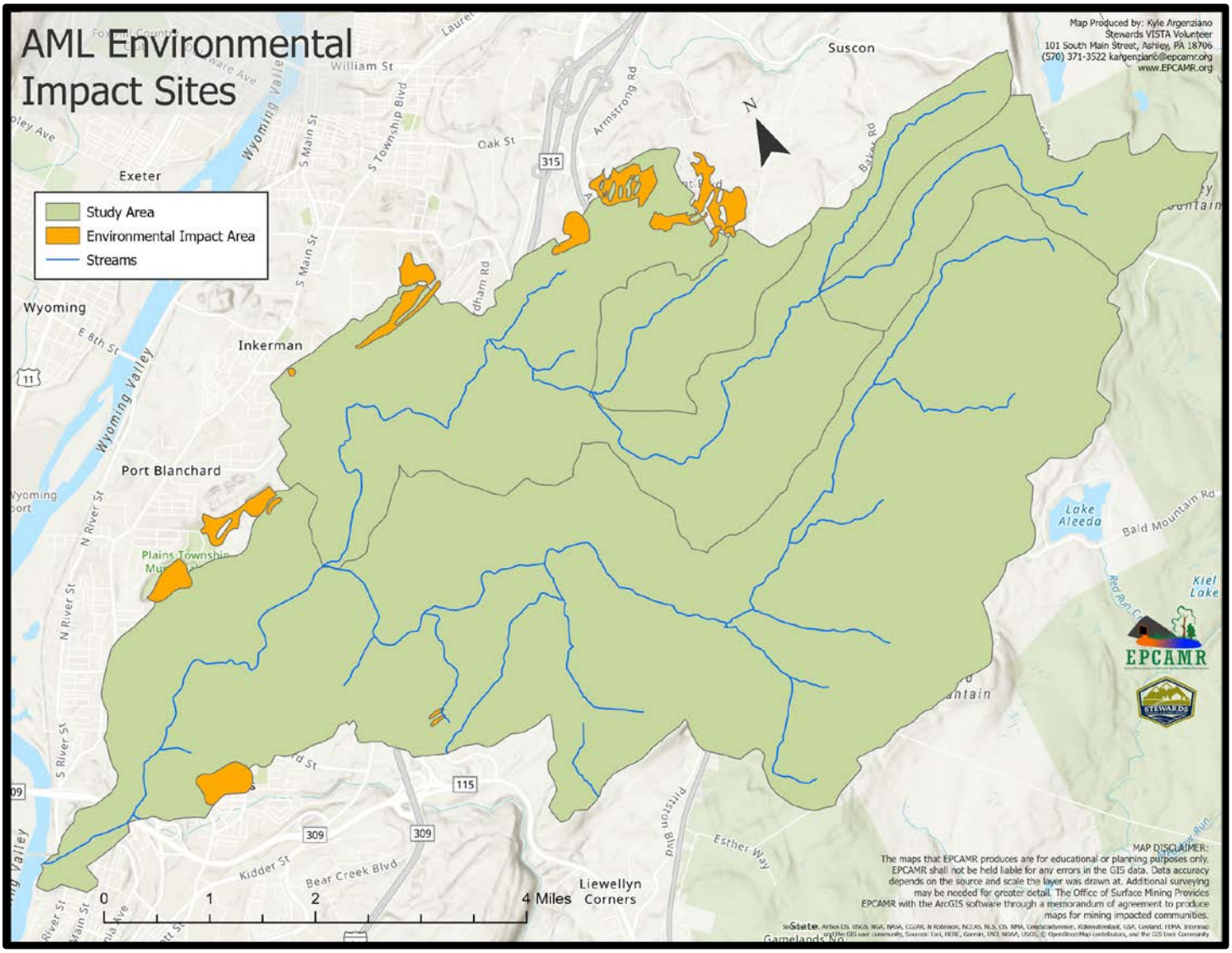
Abandoned Mine Land (AML) Features are part of the Abandoned Mine Land Inventory System (AMLIS) maintained by PA DEP Bureau of Abandoned Mine Reclamation (BAMR). The points were placed where specific features were discovered. This map does not show their reclamation status, however. EPCAMR developed the Reclaimed Abandoned Mine Land Inventory System (RAMLIS) tool to help in determining specific reclamation projects that can be recommended in the watershed. These features indicate the heavily underground mined areas below.

Map 29. Mill Creek Watershed Abandoned Mine Land Priority 1 & 2 (Health & Safety Impact) & Lower Priority Features



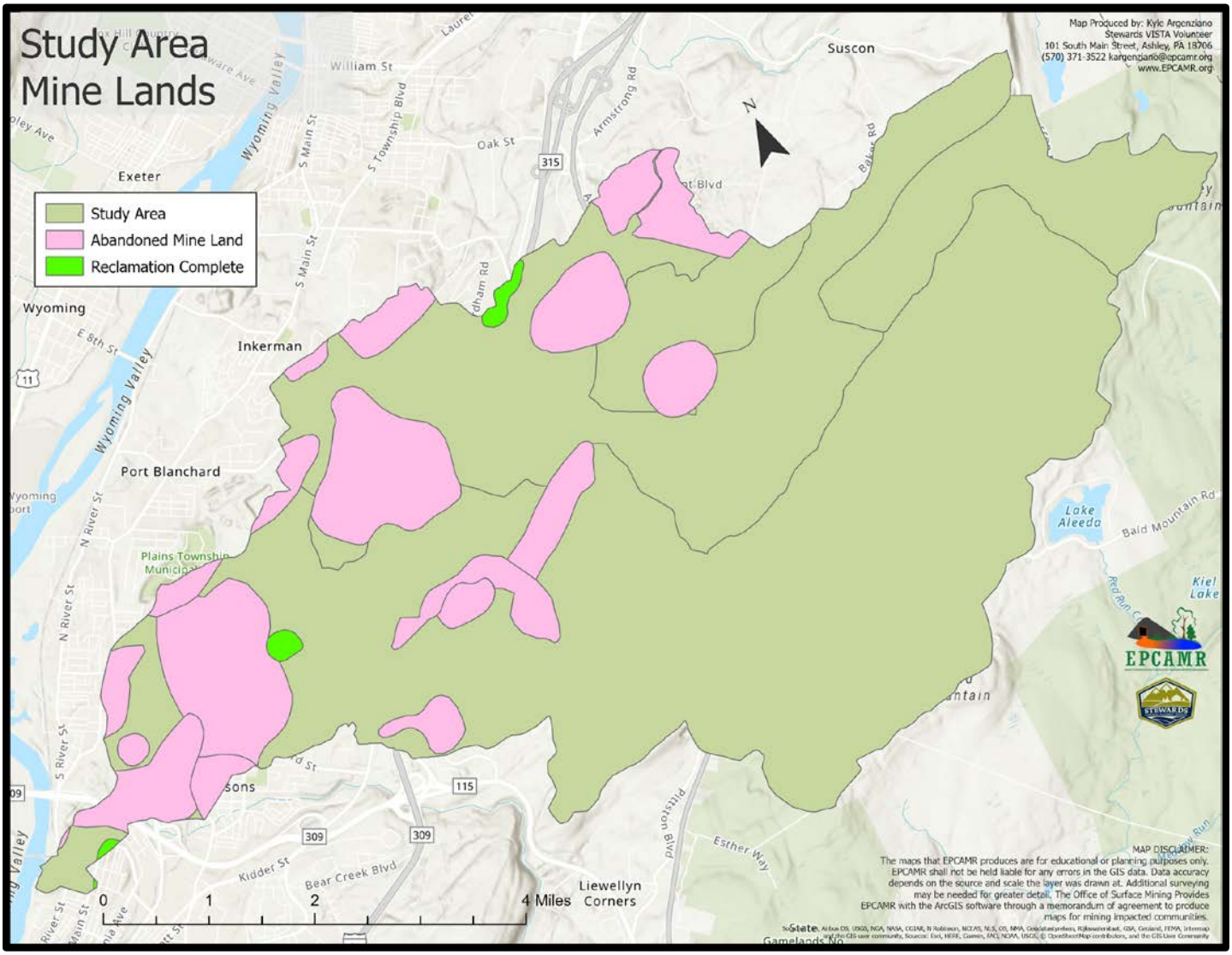
Abandoned Mine Land (AML) Features are part of the Abandoned Mine Land Inventory System (AMLIS) maintained by PA DEP Bureau of Abandoned Mine Reclamation (BAMR). The polygons were drawn around where specific features were discovered. This map does not show their reclamation status, but their Priority 1 (red), Priority 2 (yellow), Priority 3 (Green) and Undetermined Priority (pink) within the Mill Creek watershed. This is important in defining a potential funding source for reclamation projects. The federal government grants states funding from the SMCRA Title IV AML Trust fund annually for Priority 1 and Priority 2 features.

Map 30. Mill Creek Watershed Abandoned Mine Land Environmental Impact Features



Abandoned Mine Land (AML) Features are part of the Abandoned Mine Land Inventory System (AMLIS) maintained by PA DEP Bureau of Abandoned Mine Reclamation (BAMR). The polygons were drawn around where specific features were discovered. This map does not show their reclamation status, but these Priority 3 (Orange) within the Mill Creek watershed are not eligible for SMCRA Title IV AML Trust fund mentioned previously. There have been recent pots of funding open due to the Bipartisan Infrastructure Law, however that may allow reclamation as these sites if the projects have an economic or community benefit.

Map 31. Mill Creek Watershed Abandoned Mine Land Problem Areas and Completed Reclamation

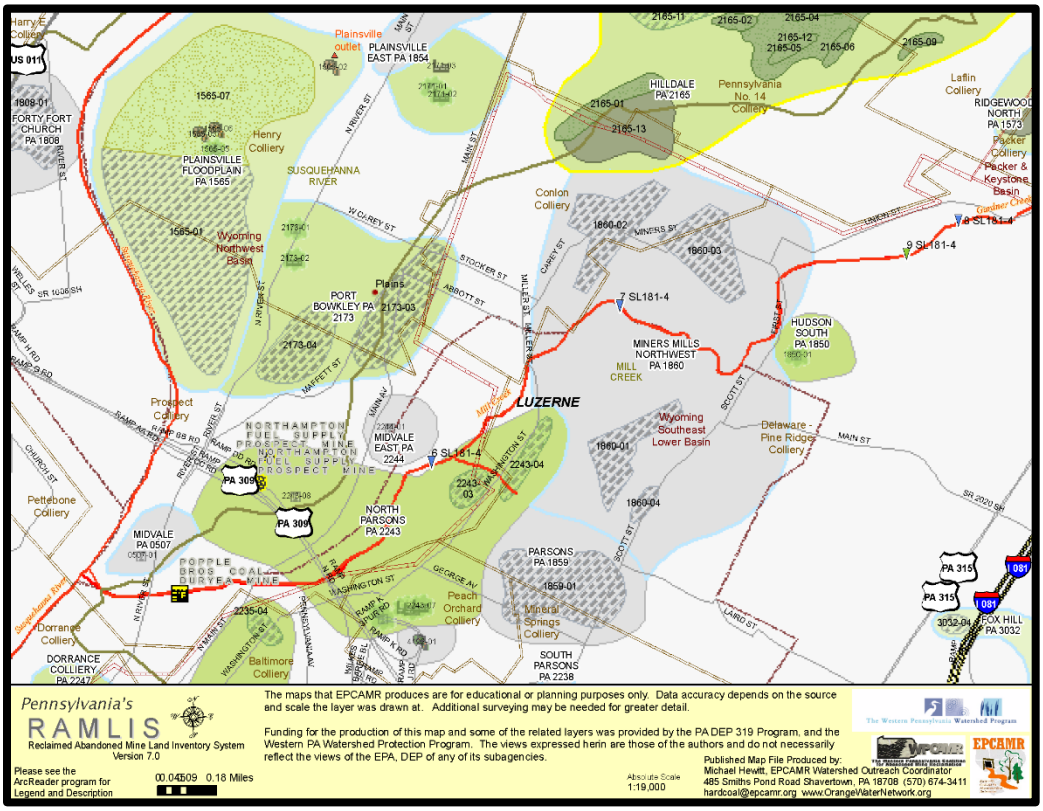


Abandoned Mine Land (AML) Problem Areas are part of the Abandoned Mine Land Inventory System (AMLIS) maintained by PA DEP Bureau of Abandoned Mine Reclamation (BAMR). These polygons were drawn around a group of AML point and polygon features. The total AML Problem area coverage (shown in the pink polygons in the map above) contained within the identified Problem Areas is **19.9** square miles or **~18%** of the Land Cover within the Mill Creek watershed. The total reclamation completed coverage (shown in the neon green polygons) contained within the Mill Creek watershed is **less than 0.2** square miles or only **0.4%** of the Land Cover.

More detail can be found on EPCAMR's RAMLIS Tool on the reclaimed and unreclaimed feature points that are contained within each Problem Area. The current status of reclamation and stream restoration efforts are on EPCAMR's RAMLIS ArcGIS Online Viewer[122].

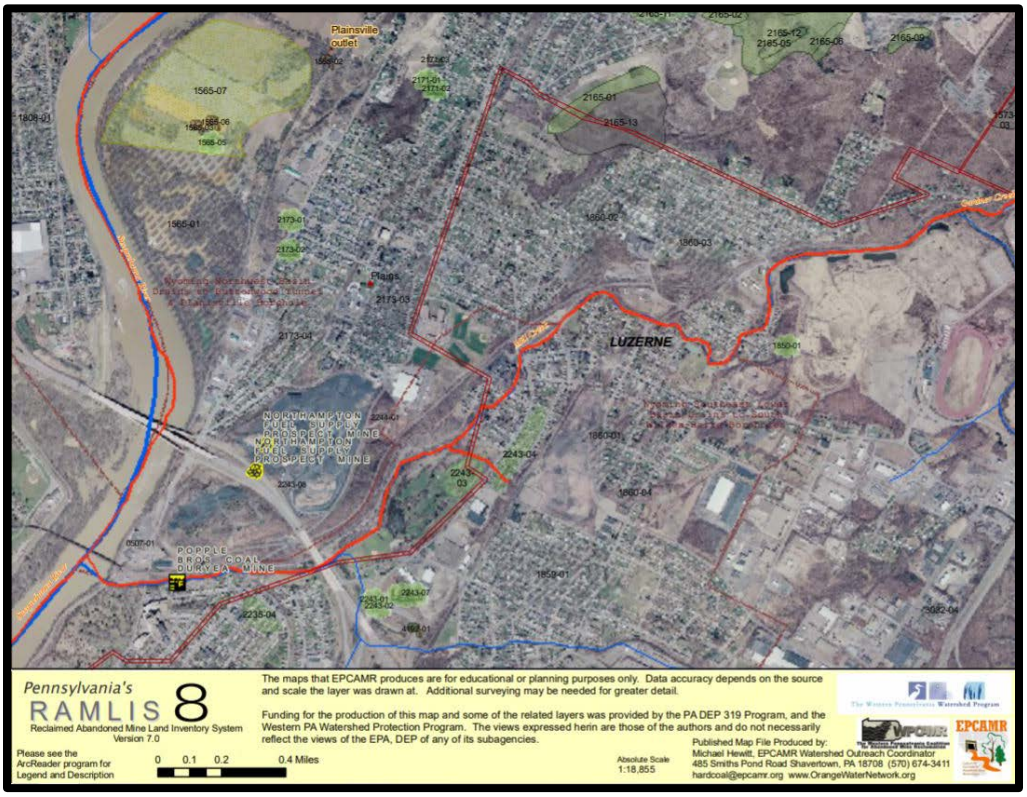
[122] EPCAMR ArcGIS Online Viewer of our Reclaimed Abandoned Mine Land Inventory System (RAMLIS) GIS Tool

Map 32. Mill Creek Mouth Abandoned Mine Lands and Completed Reclamation by 2008

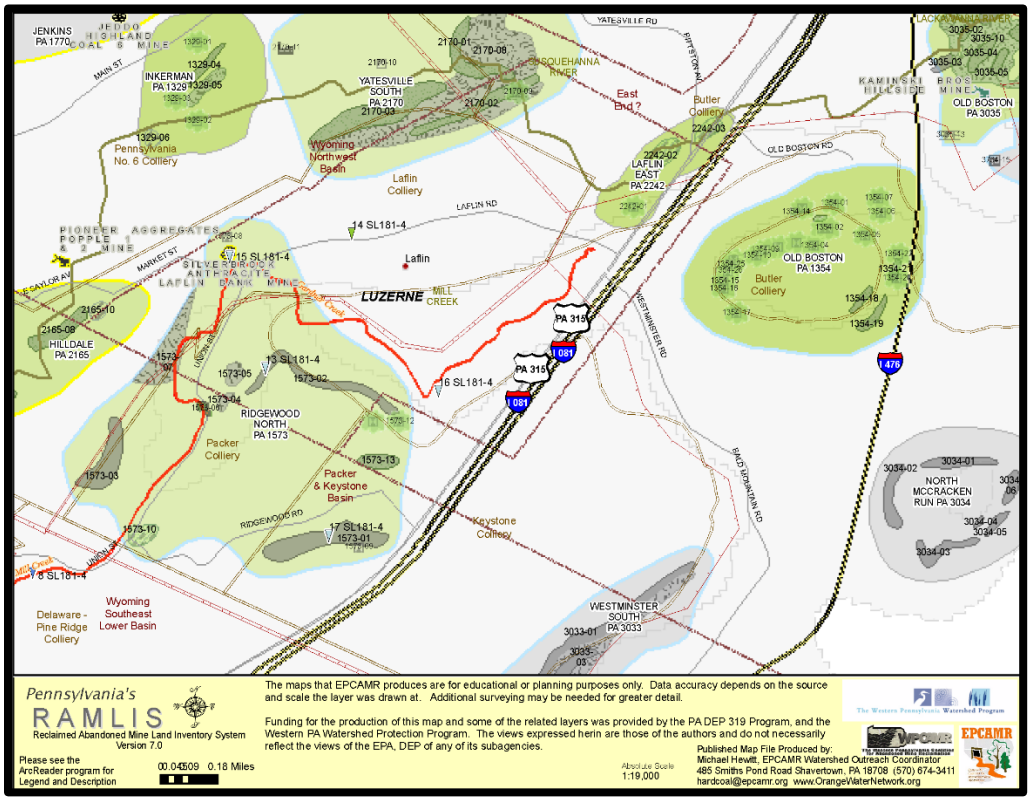


Snapshots of AML features, AMD impaired streams, infiltration points, Active coal operations, and partial/completed reclamation projects (shades of green represent 25-100% reclamation) from 2008 that have occurred to the lower portion of Mill Creek below Gardner Creek confluence. Subsidence prone areas dominate the lower portion of the watershed.

Map 33 Mill Creek Mouth Abandoned Mine Lands and Completed Reclamation by 2008 (aerial)

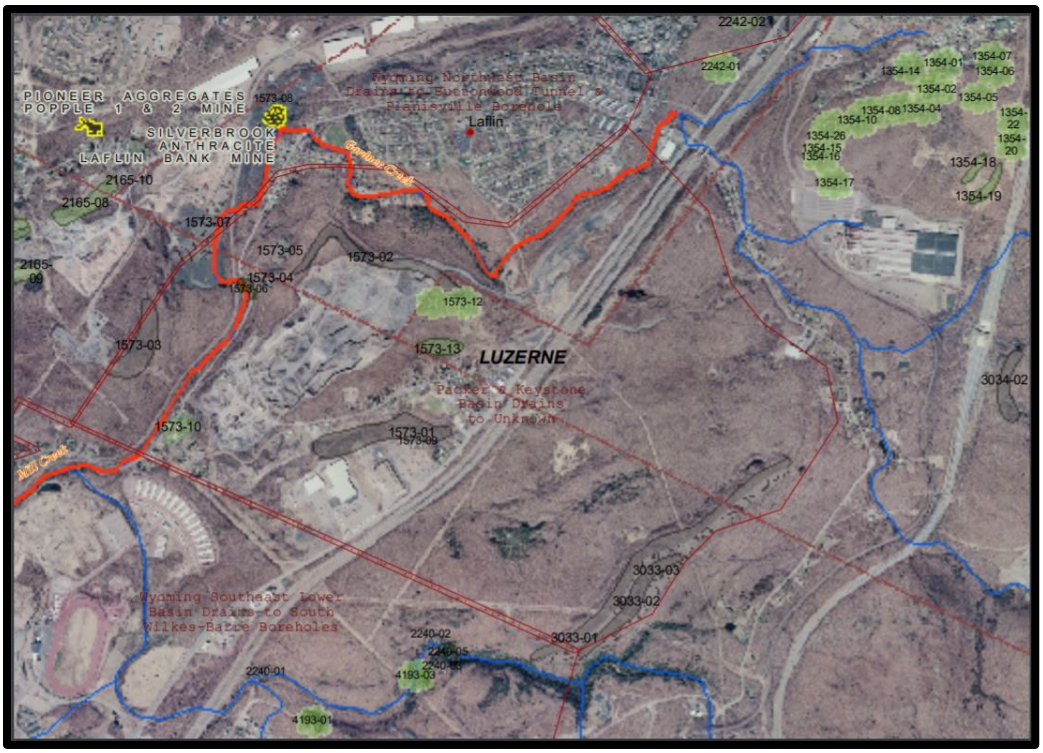


Map 34 Gardner Creek Abandoned Mine Lands and Completed Reclamation by 2008

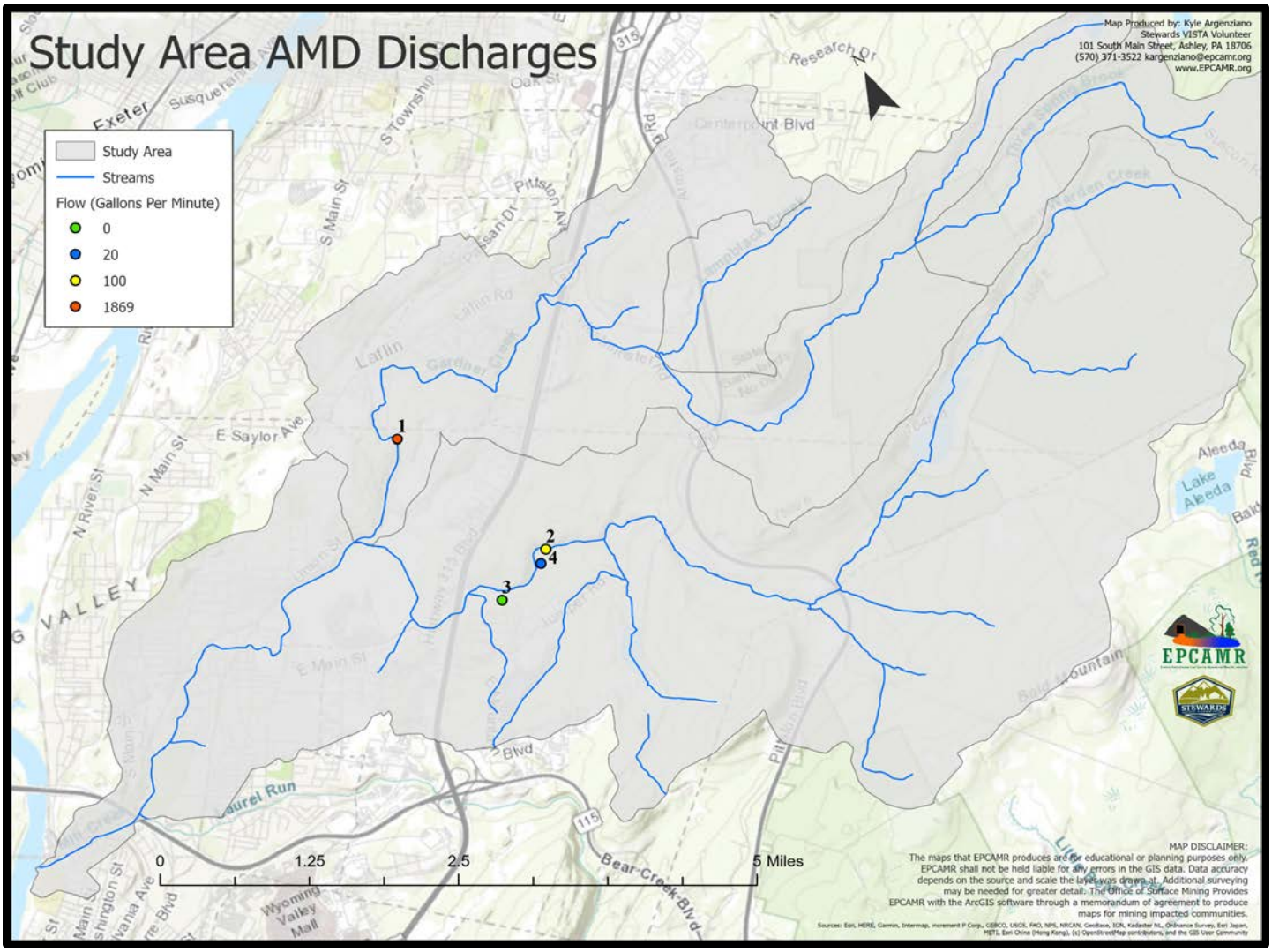


Snapshots of AML features, AMD impaired streams, infiltration points, Active coal operations, and partial/completed reclamation projects (shades of green represent 25-100% reclamation) from 2008 that have occurred to the lower portion of Gardner Creek above Mill Creek confluence. Strip mining and underground mine entrances dominate this portion of the watershed.

Map 35. Gardner Creek Abandoned Mine Lands and Completed Reclamation by 2008 (aerial)



Map 36. Mill Creek Watershed Abandoned Mine Drainage (AMD) Discharges



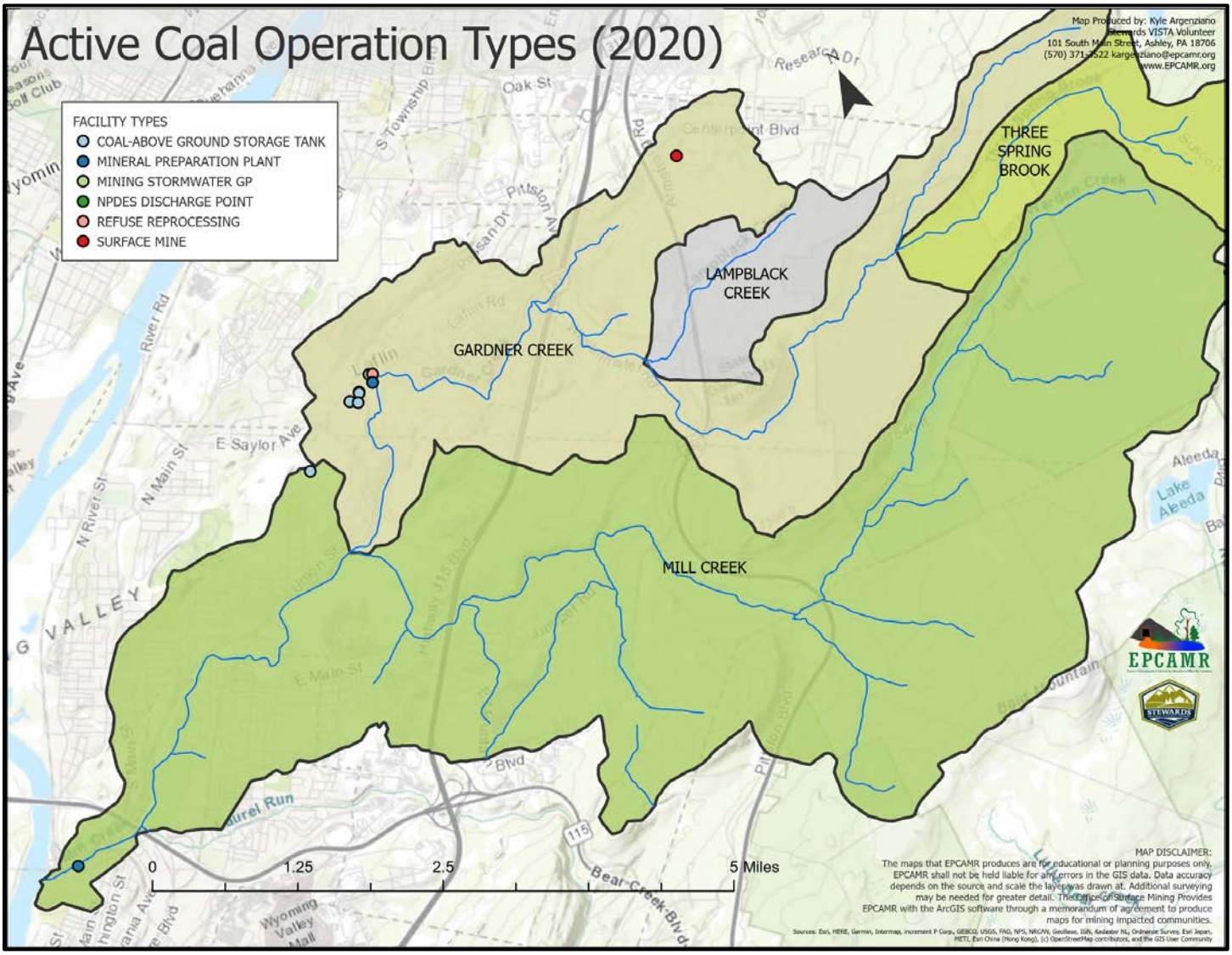
EPCAMR verified these discharges exist through field reconnaissance although #1(G-8A) in the map and table seems to have moved since the 1970s to the newly discovered Packer Air Shaft AMD Discharge. This could have been an effect from active mining as the Kassa Coal Co had a water withdrawal permit and an industrial waste permit (No. 16419) from DER for a coal processing plant upstream at the time.

Table 9. AMD Discharges within the Mill Creek watershed from the historic Mill Creek Operation Scarlift Report[123]

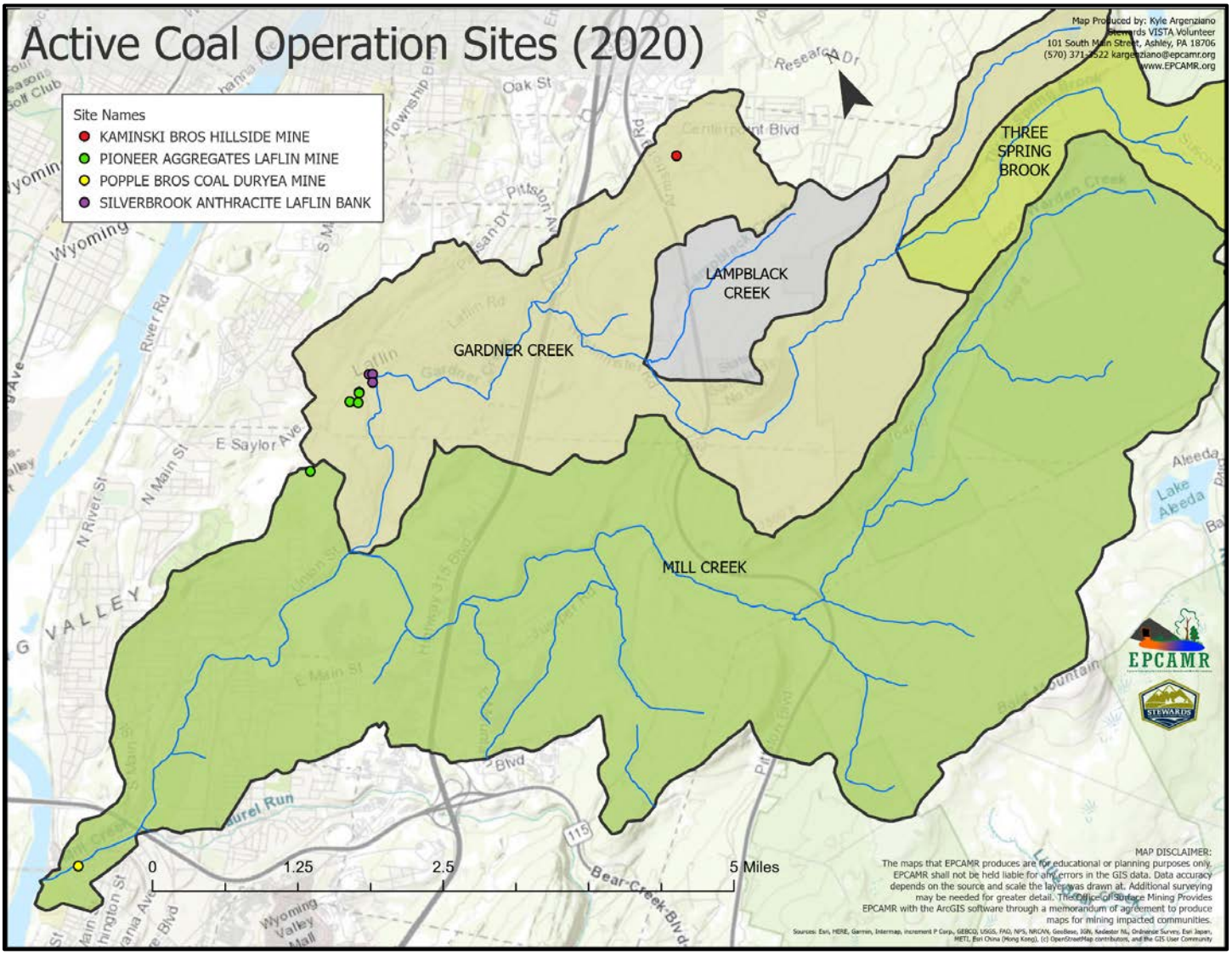
Point	Status	Priority	Flow (GPM)
1 (*G-8A)*	Abandoned	Priority has not been determined	1869
2 (M-17)	Abandoned	Environmental Impact	100
3 (M-15)	Reclamation Complete	Priority has not been determined	0
4 (M-16)	Abandoned	Environmental Impact	20

[123] **Mill Creek Operation Scarlift Report**

Map 37. Mill Creek Watershed Active Coal Operation Types



Map 38. Mill Creek Watershed Active Coal Operation Sites by Owner/Operator



Quarries and Active Anthracite Coal Refuse Production and Reclamation

While the 2 preceding maps showed "active mines" the term relates to their SMCRA Title V "Post Act" status. In 2020, there are **no** active refuse reprocessing, underground or surface mining operations in the Mill Creek Watershed. There were **13** permitted surface mines and **9** permitted refuse reprocessing operations in Luzerne County (*noted in the tables below*).

Table 10. Permitted Anthracite Coal Refuse Production Permits in Luzerne County[124], PA

Company	Permit	Site Name	Surface Permit Acres	Total Tons Production	Number of Employees	Hours Worked	Accidents	
							Fatal	Non-Fatal
Emerald Anthracite II	40050201	7 Washery	83.6	24,432	5	6,311	0	0
Emerald Anthracite II	40823205	Truedale Mine	239.0	11,032	5	3,701	0	0
Diamond Coal Co Inc	40830202	Lattimer Mine	141.0	21,599	27	32,516	0	0
Heavy Media Inc	40763206	Loree Bank	77.0	500	1	10	0	0
Jeddo Highland Coal Co	40990201	Franklin Bank	194.4	633	2	31	0	0
Newport Aggregate Inc	40150201	West End Bank	78.0	500	1	10	0	0
Northampton Fuel Supply Inc	40763204	Glen Lyon 6	61.2	527	1	97	0	0
Northampton Fuel Supply Inc	40900203	Glen Lyon S Mine	49.5	511	1	97	0	0
Northeast Energy Co	40850202	Laurel Mine	29.0	0	7	10,436	0	1
Luzerne County Total	**9**		**952.7**	**59,734**	**50**	**53,209**	**0**	**1**

Table 11. Permitted Anthracite Surface Mine Production Permits in Luzerne County[125]

Company	Permit	Site Name	Permit Acres	Total Tons Production	Mineral	Explosives Used	Number of Employees	Hours Worked	Accidents	
									Fatal	Non-Fatal
Atlantic Carbon Group	40990101	Hazleton Shaft Mine	481.0	288,616	Little Buck Mtn	0	67	115,992	0	0
Atlantic Carbon Group	40663024	Stocktone Mine	583.0	0	Anthracite (Unknown)	0	5	7,581	0	0
Glen O Hawbaker Inc	40930102	Lattimer Basin Mine	688.0	210,173	Primrose, Mammoth Bottom Split, Buck Mtn	761,308	25	57,758	0	0
Jeddo Highland Coal Co	40663031	2 North Mine	523.0	596	Skidmore	0	2	71	0	0
Jeddo Highland Coal Co	40663027	Jeddo Basin W Mine	470.0	0	Holmes to Buck Mtn	0	1	954	0	0
Jeddo Highland Coal Co	40663013	Jeddo 7 Mine	304.0	24,740	Anthracite (Unknown)	0	4	6,844	0	0
Jeddo Highland Coal Co	40663033	Lehigh 6 Mine	1,515.0	549	Holmes to Buck Mtn	0	2	64	0	0
Northampton Fuel Supply Inc	40663029	Highland 5 Mine	596.0	2,946	Holmes to Buck Mtn	0	3	5,061	0	0
Northampton Fuel Supply Inc	40120101	Eckley Mine	1,013.0	2,328	Buck Mountain	0	2	3,029	0	0
No. 1 Contra Corp	40980103	Jeansville Mine	37.0	170,815	Mammoth	0	54	30,204	0	1
Pagnotti Enterprises Inc	40663034	Lehigh 5 Mine	347.0	512	Anthracite (Unknown)	0	3	167	0	0
Pagnotti Enterprises Inc	40663028	Jeddo Basin E Mine	474.0	0	Little Diamond Diamond Buck Mountain	0	6	6,062	0	0
Susquehanna Coal Co	40920102	Glen Lyon Mine	1,325.0	224,460	Hillman Middle Ross	52,909	12	27,149	0	0
Luzerne Co. Total	**13**		**8,356.0**	**925,735**		**814,217**	**186**	**260,936**	**0**	**1**

[124] PA DEP Bureau of Mining Programs Annual Reports for Anthracite Coal Refuse Listed by County-2020

[125] PA DEP Bureau of Mining Programs Annual Reports for Anthracite Surface Mines Listed by County-2020

Figure 29. Aerial view of the Silverbrook Anthracite Operation in Laflin Borough from Google Satellite View[126]

In the figure above, Gardner Creek flows from Main Street west and then south along the edge of the Laflin Banks before heading under Market Street. At the Laflin Bank, Silverbrook Anthracite and Casey-Kassa Coal section to the east of the railroad track has permits for Refuse Reprocessing and an NPDES Discharge point both in compliance.

[126] Laflin Bank- Casey-Kassa Coal and Silverbrook Anthracite

Figure 30. Aerial view of the Pioneer Aggregates Laflin Mine from Google Satellite View[127]

In the figure above, Gardner Creek flows in from the east to the south of along a large culm bank east of the operation. Also at the Laflin Bank, Pioneer Aggregates section directly to the west of the railroad track was reclaimed and has buildings the remainder of the site is bisected by the utility right of way in the center of the photo. The last remaining production numbers available for the Operation are from the 2017 PA DEP Bureau of Mining Programs Annual Report for the Pioneer Quarry and Laflin Mine[128]

Figure 31. Aerial view of the 138 acre permitted Wilkes-Barre Materials, LLC[129] from Google Satellite View[130]

Wilkes-Barre Materials, LLC Operation[131] *produced 523,260 Tons of Sandstone in 2020, east of Ridgewood. Gardner Creek wraps around the entire operation from the northeast to the southwest*

[127] Pioneer Aggregates Laflin Mine and Quarry Google Satellite View
[128] PA DEP Bureau of Mining Programs Annual Report for Anthracite Surface Mines Production of the Pioneer Quarry and Laflin Mine
[129] Wilkes-Barre Materials, LLC
[130] Wilkes-Barre Materials, LLC Google Satellite View
[131] PA DEP Bureau of Mining Programs Annual Report of Industrial Minerals and Mines Listed by County-2020

Figure 32. Aerial view of the Pennsy Supply Quarries in Jenkins Township from Google Satellite View[132]

The figure above shows Pennsy Supply[133] Quarries with the headwaters of Lampblack Creek flowing from the east to the west along the southern edge of the property before flowing under the US PA Turnpike 476. Pennsy Supply operates several quarries in the watershed and their production levels and acres are in the [2020 PA DEP Bureau of Mineral Resources Industrial Minerals and Mines Annual Report]

[132] Pennsy Supply Google Satellite View
[133] Pennsy Supply-A CRH Company

Figure 33. Aerial view of the former Hillside Mine Operation from 2005 Google Satellite View[134]

Former Hillside Mine in the figure above from 2005 shows the site before it was reclaimed and the figure below from 2021 shows it developed into the CenterPoint Industrial Park[135]. Armstrong Road can be seen running north to south parallel to PA Turnpike 476 in the center of each figure.

Figure 34. Aerial view of the former Hillside Mine Operation from 2021 after it was reclaimed

[134] Former Hillside Mine now a part of the Center Point Industrial Park Google Satellite View
[135] CenterPoint

Plainsville AMD Borehole

EPCAMR is working in the City of Wilkes-Barre, the Luzerne Conservation District, the Susquehanna River Basin Commission, and Plains Township on watershed issues and monitoring the Plainsville AMD Boreholes with the permission of the private landowner. EPCAMR's initial research shows that some of the water loss in the Mill Creek watershed ends up feeding the underground mine pool complex that drains to these discharges that flow on average around 2,500 gpm into the former topsoil pit on the Price property in Plains Township, west of N. River Street and adjacent to the O'Malia Farm Fields along the floodplain of the Susquehanna River.

EPCAMR has recommended in the Recommendations section of this Mill Creek Coldwater Conservation Plan that a more thorough mine pool feasibility study be funded and completed when funding becomes available.

Figure 35. View of the Second Plainsville Borehole AMD outlet

Figure 36. View of the First Plainsville AMD Boreholes flowing into the 13-acre flooded former topsoil pit

Figure 37. Landscape shot of the impacts of AMD flowing from the Plainsville AMD Boreholes

While not a proper AMD Passive Treatment System, the pond facilitates early 50% removal of the iron hydroxide within the 13.2 acre topsoil pit.

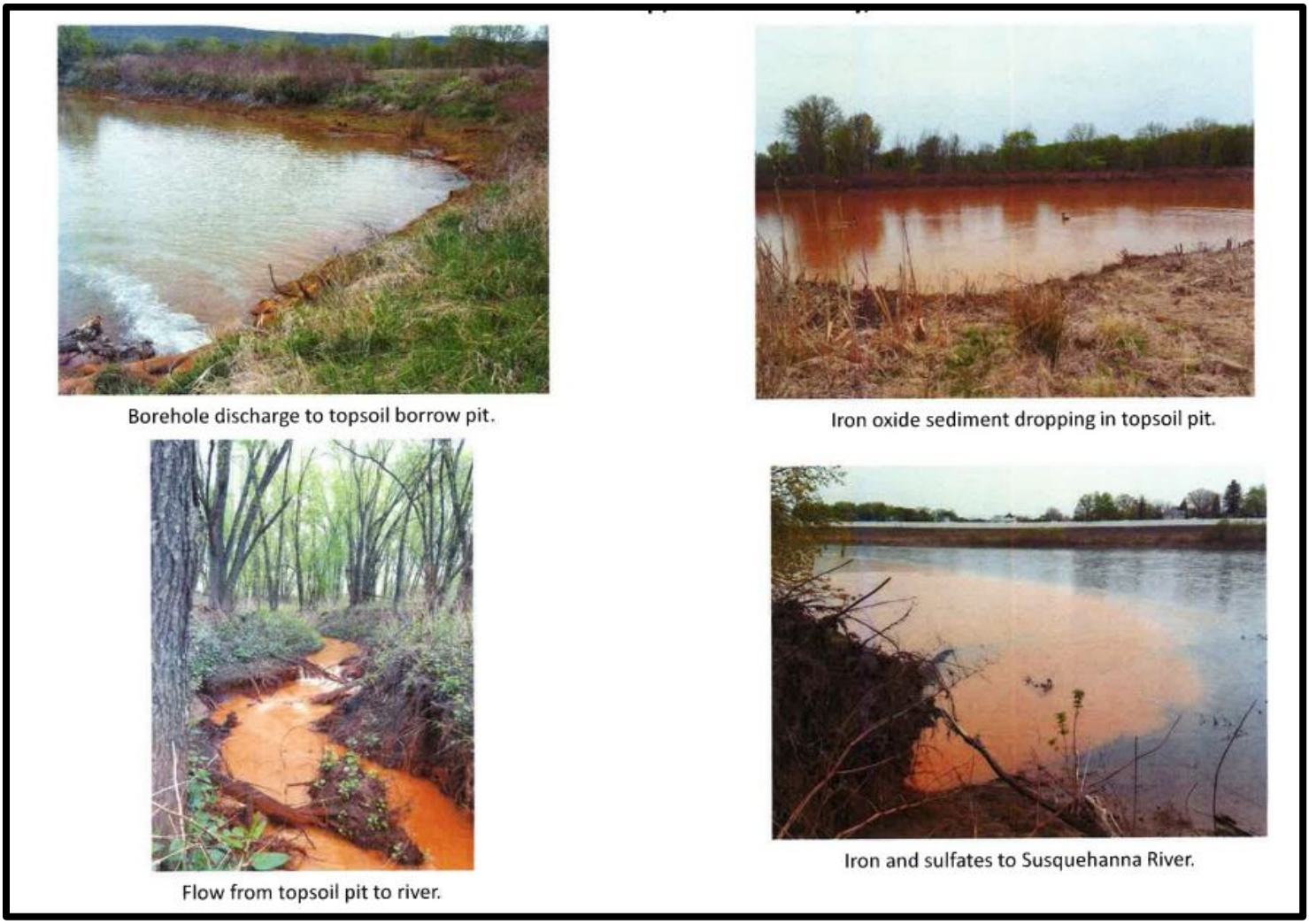


Figure 38. A series of Photos showing the Plainsville AMD Boreholes discharge

The figure above shows the discharges flowing to the borrow pit, iron oxide sediment dropping out in the topsoil pit, flow from the topsoil pit to the Susquehanna River, and AMD entering the mouth of the River opposite the Forty-Forty Levee on the West Side of the Wyoming Valley.

MILL CREEK WATERSHED NAACC AOP CULVERT ASSESSMENTS

EPCAMR provided a list of the dates, **34** culverts assessed, **42** structures assessed, and the municipalities that were visited during the NAACC Aquatic Organism Passage (AOP) Culvert Assessments within the Mill Creek Watershed. All the qualitative and quantitative data has been entered and approved into the online NAACC Data Center[136] database. The website stores all the for road-stream crossings assessments. You may search, view, map and download most of the data in Excel or Shapefile format without logging on. If you are logged on, pages accessed from the navigation bar allow for entering and correcting crossing records. If logged on, you may also manage user data and download the Offline Data Manager[137]. Only certified NAACC lead observers and coordinators can log on. This is another reason EPCAMR is encouraging municipal officials and local interested residents to become interested in obtaining their AOP Culvert Assessment Protocol Training Certification and become EPCAMR Volunteers and Certified Lead Observers.

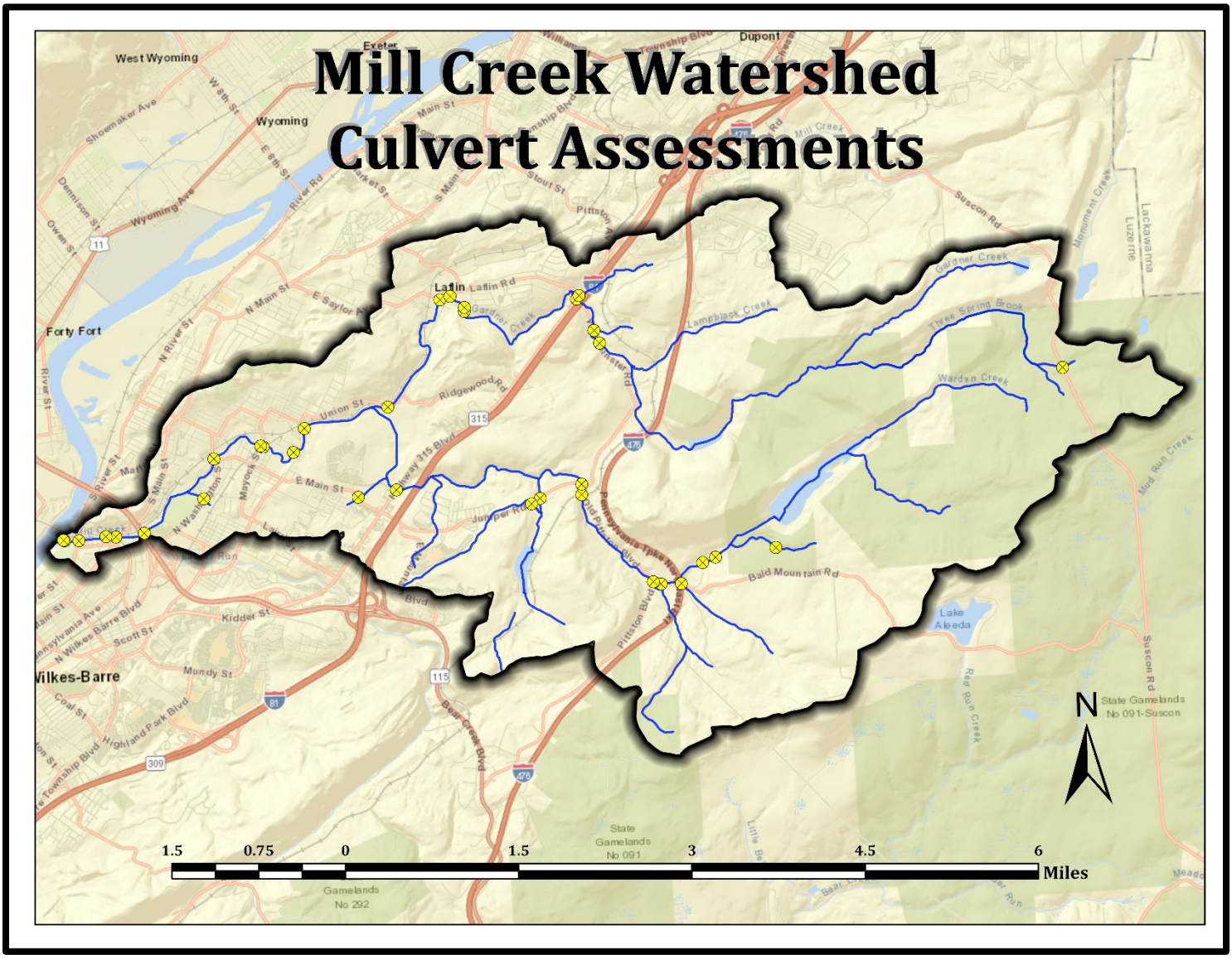
Table 12. Mill and Gardner Creek Culvert Assessments for Aquatic Organism Passage (AOP) using NAACC Protocols

Date	Number of Culverts Assessed	Number of Structures Assessed	Lead Observers
7-29-20	9	17	EPCAMR Staff
7-30-21	6	6	EPCAMR Staff
8-05-21	8	8	EPCAMR Staff
8-12-21	6	6	EPCAMR Staff
8-19-20	5	5	EPCAMR Staff
			EPCAMR Staff
Total	**34**	**42**	

[136] NAACC Data Center database

[137] NAACC Offline Data Manager Users Guide

Map 39. Mill Creek Watershed Culvert Assessment Survey



CURRENT BIOLOGICAL MONITORING AND ASSESSMENTS

Electroshocking Fishery Survey with the Trout Unlimited Eastern Conservation Program

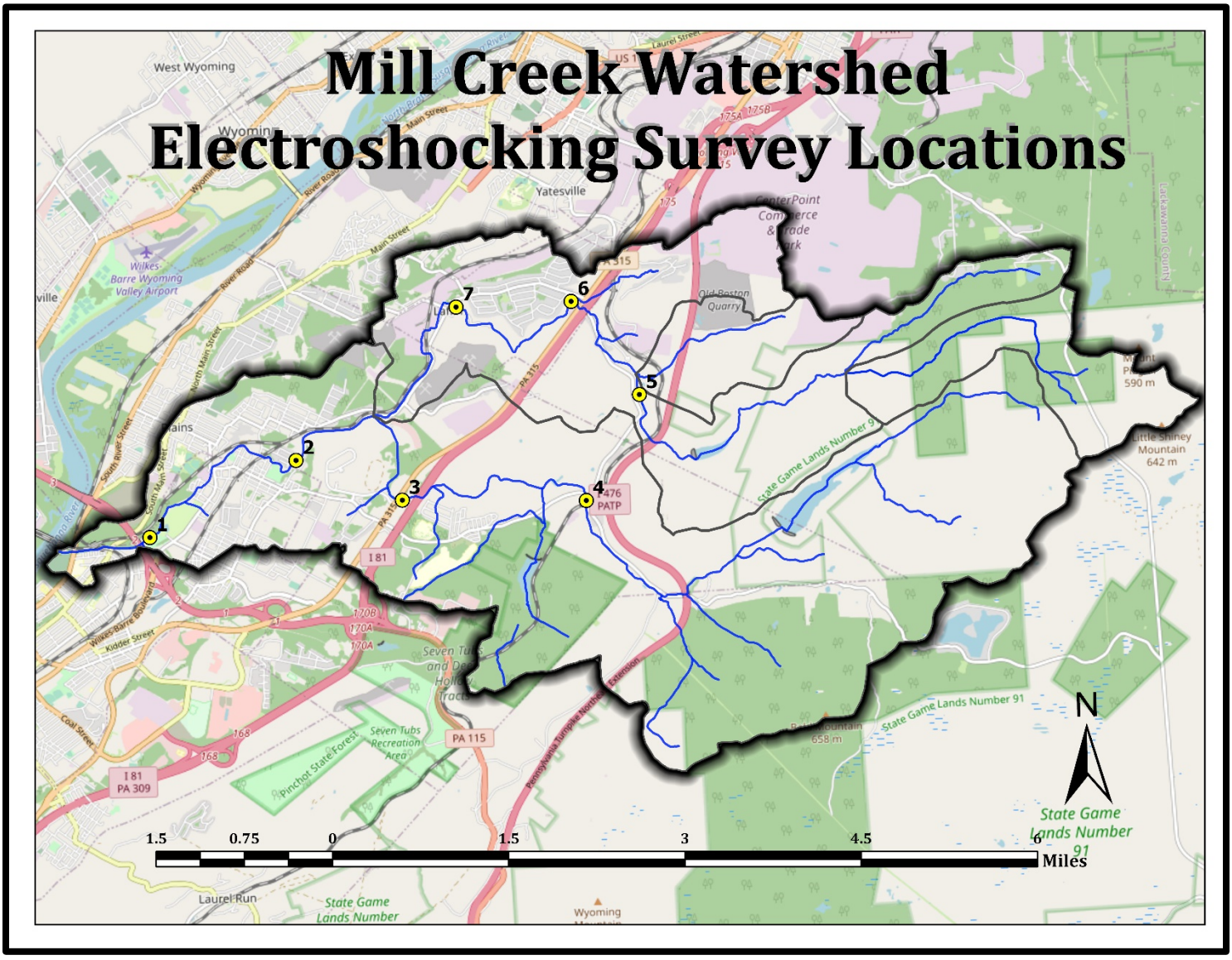
EPCAMR made an official request to Trout Unlimited's AMD Technical Assistance Program[138] (**Appendix B**) to assist us with conducting an updated Biological Survey of the fish population in the Mill Creek since there hasn't been any contemporary data available to indicate the presence of how healthy or prevalent the fish population might be in the watershed. EPCAMR suggested that a survey be conducted to determine the furthest downstream extent of where the fish, particularly wild trout species, might be present within the Mill Creek watershed.

The request was forwarded to Rachel Kester, Trout Unlimited Project Coordinator at the time, and Dr. Shawn Rummel, Ph.D., with Trout Unlimited for approval and consideration. The technical assistance was approved and EPCAMR coordinated with Kathleen Lavelle, Trout Unlimited Field Technician-Eastern Conservation Program[139] to schedule October 1, 2021, for the full day fish survey of **7** locations within the watershed. Trout Unlimited provided EPCAMR with a document of the completed survey included as (**Appendix C**) of the fishery that was conducted. Several passes were made on each segment of stream. The distances were measured by the Trout Unlimited Staff for the length of the segments to be sure that we had sampled a representative habitat coverage area. The stream width was measured in several locations to obtain an average width and identification of all species of fish were recorded and their relative abundance, absence, or presence were noted. Species of significance to EPCAMR were the native populations and or different age classes of wild brown trout. Several fish species were measured as noted in the Report. Photos of many of the fish that were identified are included in this section of the Plan. No genetic research, fin clips, or scales were sampled during this survey.

[138] PA Trout Unlimited Technical Assistance Grant Program

[139] TU Eastern Conservation Program

Map 40. Mill Creek Electroshocking Survey Sites



MILL CREEK FISHERY SURVEY PHOTO LOCATIONS

Table 13. Site locations and descriptions for surveys completed in Mill and Gardner Creeks

Site ID	Site Description	Latitude	Longitude
	Site below N. Main Street in Wilkes-Barre was excluded due to difficulty of access to electroshock and lack of trout at Site 1		
1	Mill Creek main stem above the confluence with Laurel Run west of the Hollenback Golf Course in Wilkes-Barre, PA	41.266958	-75.84843
2	Mill Creek above the Cleveland Street Bridge where no fish were present	41.270679	-75.831495
3	Mill Creek main stem northeast of State Route Highway 315 in between the Interstate I-81 North and Southbound lanes north of the Komatsu business in Plains Township	41.265772	-75.813655
4	Mill Creek main stem along northeast of Jumper Road bridge and intersection with Westminster Road before Tunnel Road	41.265772	-75.783656
	Mill Creek below the Reservoir along the Utility Line Right of Way wasn't surveyed due to time limitation		
5	Gardner Creek east of Westminster Road and upstream of Old Pickaway Road	41.283571	-75.779971
6	Gardner Creek west of State Route Highway 315 and northwest of Dr. Joseph G. Raymond's Medical Facility	41.256658	-75.761202
7	Upstream of the bridge located at the Laflin Borough Park on Gardner Creek	41.276468	-75.815188

EPCAMR has included several photos of aquatic habitat areas that were electroshocked with the Trout Unlimited Staff and our partners. The Appendix will include their completed report. It's our intention in this section to show the diversity of species found during our investigation on 10-1-21.

Figure 39. Looking upstream on Mill Creek from Biscontini Road Site 1

The figure above shows Mill Creek (left) and Laurel Run (right) confluence into a very heavily sediment-laden portion of the two streams in the City of Wilkes-Barre, PA at Site 1 above Biscontini Road.

Figure 40. Looking downstream on Mill Creek at Site 1

The figure above is just below the confluence of Laurel Run and Mill Creek along Biscontini Road where 7 squashed culverts are severely blocked by woody debris causing flooding incidents that often closes the road. EPCAMR President and Stanley Cooper Chapter Trout Unlimited Board Member-Joe Simons III, (standing above the culvert on the top left of the photo), Luzerne Conservation District Watershed Specialist, John Levitsky (far left with net), Trout Unlimited Staff-Kathleen Lavelle (center), Allison Lutz (red hat), EPCAMR GIS Watershed Specialist-Steve Cornia (orange shirt), and EPCAMR Program Manager-Michael Hewitt (orange hat).

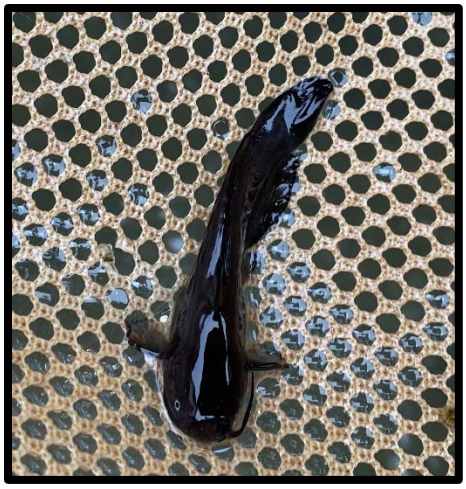


Figure 41. Young catfish found on Mill Creek at Site 1

Figure 42. Minnow sucker fish found on Mill Creek at Site 1

Figure 43. Black-nosed dace found on Mill Creek at Site 1

Figure 44. Shiner minnows found on Mill Creek at Site 1

Figure 45. Allison Lutz-TU inadvertently electroshocked a large bull frog on Mill Creek at Site 1

Figure 46. Sediment and invasive Japanese Knotweed at Site 1

The figure above shows the lower portion of Mill Creek before it comes to the confluence with Laurel Run is completed aggraded with sediment. The figure below shows a gravel bar along the entire length of Mill Creek from just below Chilwick Street down Biscontini Road along at Site 1 with the right bank (looking upstream) eroded

Figure 47. Large gravel bars and point bars along Mill Creek at Site 1

Figure 48. Looking upstream on Mill Creek at Site 3

The PA DEP Bureau of Abandoned Mine Reclamation completed a stream restoration and abandoned mine land reclamation project at Site 3 northeast of State Route Highway 315 between Interstate I-81 North and Southbound lanes next to the Komatsu business.

Figure 49. Kathleen Lavelle-TU (left) and Allison Lutz (right) electroshock a 100-meter length along Mill Creek at Site 3

Figure 50. Shiner minnows found along with an abundance of black-nosed dace and stoneflies at Site 3

Figure 51. EPCAMR and TU staff shocking and netting at Site 3

In the figure above, Mike Hewitt and Steve Cornia (out of frame with net) are prepared to move the fish species into the bucket to obtain their age class, weight, and size as Kathleen Lavelle-TU gives Allison Lutz-TU some direction as they decide to split the stream to shock both sides.

Figure 52. A few of the sizable wild brown trout surveyed on Mill Creek at Site 3

Figure 53. A white sucker fish surveyed on Mill Creek at Site 3

Figure 54. More native brook and wild brown trout surveyed on Mill Creek at Site 3

Figure 55. More native brook and wild brown trout in the bucket waiting to be measured on Mill Creek at Site 3

Figure 56. A large wild brown trout in the tray being weighed on Mill Creek at Site 3

Figure 57. Mike Hewitt measuring the length of a trout on Mill Creek at Site 3

Figure 58. Mike Hewitt obtaining weight of a wild brown trout on Mill Creek at Site 3

Figure 59. Native brook (left) and wild brown trout (right) surveyed on Mill Creek at Site 3

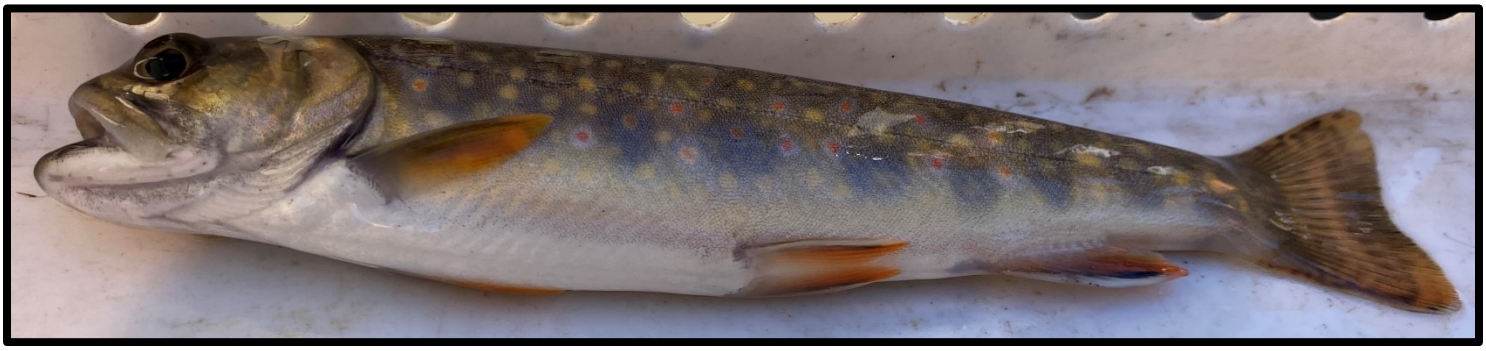


Figure 60. A sizable wild brook trout surveyed on Mill Creek at Site 3

Figure 61. A larger wild brook trout surveyed on Mill Creek at Site 3

Figure 62. Measuring the width of the stream channel *on Mill Creek at Site 3*

In the figure above, Allison Lutz-TU is recording the average width of the wetted stream channel of Mill Creek at Site 3 while Bobby Hughes-EPCAMR Executive Director and Mike Hewitt-EPCAMR Program Manager roll out the tape measure across the stream at various intervals as everyone makes their way up the stream channel

Figure 63. A wild brown trout is weighed on the scale on Mill Creek at Site 3

Figure 64. Prepared to sample the last location on Mill Creek near Tunnel Road, off Jumper Road at Site 4

In the figure above and below, TU Staff, Steve Cornia-EPCAMR GIS Watershed Outreach Specialist, and John Levitsky-Luzerne Conservation District Watershed Specialist survey fish at our last location on Mill Creek near Tunnel Road, off Jumper Road at Site 4 in Plains Township

Figure 65. Electroshocking and netting fish on Mill Creek at Site 4

Figure 66. Native brook trout surveyed on Mill Creek at Site 4

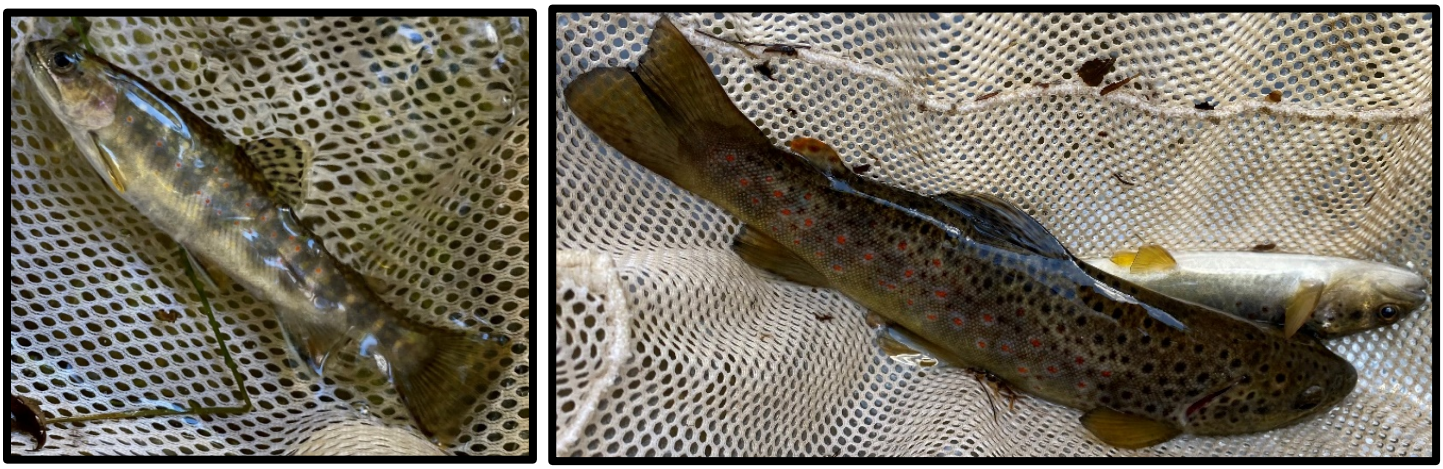


Figure 67. A native brook trout (left) and a brown trout (right) surveyed on Mill Creek at Site 4

Figure 68. Native brook trout and brown trout waiting in the bucket on Mill Creek at Site 4

Figure 69. Brown trout waiting in the bucket on Mill Creek at Site 4

Figure 70. Working around a large woody debris pile to net fish on Mill Creek at Site 4

The figure above shows, Allison Lutz-TU, Kathleen Lavelle-TU, Mike Hewitt-EPCAMR Program Manager Manager and Steve Cornia-EPCAMR GIS Watershed Outreach Specialist trying to scoop up a very large native brook trout near the PA American Water intake structure that is backed up with woody debris that we're recommended to be removed by hand on Mill Creek at Site 4 next to Jumper Road and downstream of Tunnel Road in Plains Township

Figure 71. EPCAMR Staff following the electroshockers on Mill Creek at Site 4

Figure 72. TU staff document the weight, age class, and size of trout on Mill Creek at Site 4

Figure 73. Bobby Hughes-EPCAMR Executive Director released the last of the brown trout on Mill Creek at Site 4

All the fish species and data that were documented are contained as having been absent or present in the stream sections that were surveyed by Trout Unlimited are in their final report found in **Appendix C**.

Figure 74. Shocking on Gardner Creek at Site 5 above the culvert

In September 2021, Hurricane Ida swept through the Wyoming Valley and raised the water level of the headwaters of Mill Creek as well. Many emergency repairs were completed before the fish sampling event in October including Site 5 along Westminster Road where riprap was placed in the rear yard along the eastern streambank above multiple structure corrugated steel squash culverts. The old rusty pipes on Old Pickaway Road, Jenkins Township, were reinforced with stone grouted in place, but are being recommended for replacement with an open box bridge culvert.

Figure 75. Old Pickaway Road crossing emergency repairs following Hurricane Ida in September 2021.

Figure 76. Black-nosed dace and white sucker minnows were surveyed on Gardner Creek at Site 5

Figure 77. A white sucker surveyed on Gardner *Creek at Site 5*

Figure 78. A long-nosed dace and some fallfish surveyed on Gardner Creek at Site 5

Figure 79. A white sucker surveyed on Gardner Creek at Site 5

Figure 80. A fallfish surveyed on Gardner Creek at Site 5

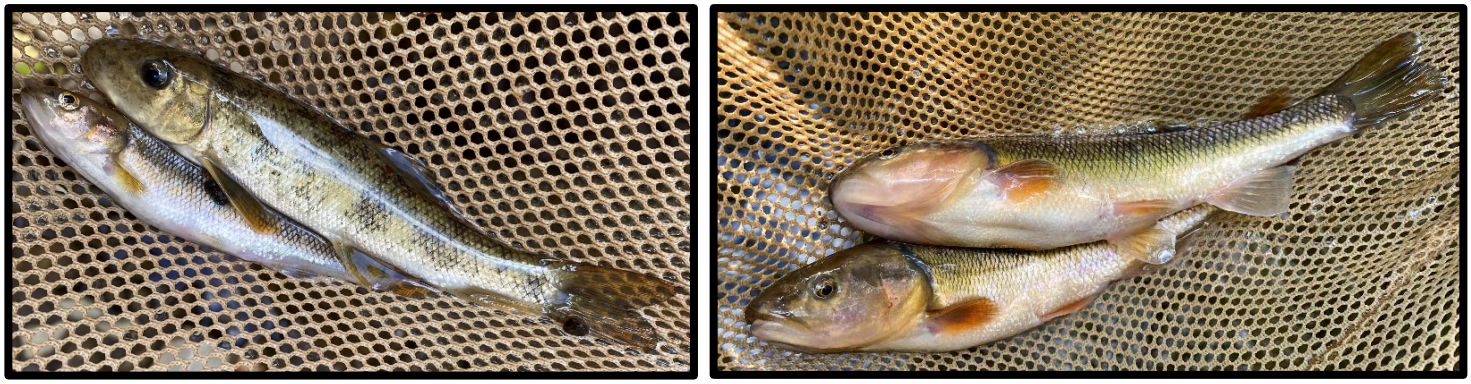


Figure 81. A fallfish and white sucker minnow (left) and two fallfish (right) surveyed on Mill Creek at Site 5

Figure 82. Several small mouth bass were found in Mill Creek at Site 5 likely washed out of an upstream pond

Figure 83. More fallfish (above) and a white nosed sucker fish minnow (below) in Mill Creek at Site 5

Figure 84. Another fallfish surveyed in Mill Creek at Site 5

Figure 85. A severely undercut streambank along *Gardner Creek* at Site 6

The figure above shows undercut bank at Site 6 in Laflin Borough which is northwest of Dr. Joseph Raymond's Medical Office off State Route Highway 315 at the light near Westminster Road. In September 2021, Hurricane Ida swept through the Wyoming Valley and raised the water level of Gardner Creek enough to pile all this woody debris that washed downstream on the outside bend of the undercut streambank in the figure below. There where there were no fish present

Figure 86. Woody debris that washed downstream on Gardner Creek at Site 6

Figure 87. Bobby Hughes with a backpack electro shocker on Gardner Creek at Site 7

In the figure above EPCAMR Executive director gave Kathleen Lavelle-TU a much-needed break from the heavy backpack electro shocker and this wasn't his first go around with the equipment. Not many fish found on Gardner Creek at Site 7 at Laflin Borough Park, however, there were plenty of bricks in the stream from several different brick manufacturing companies from around PA. One is shown in the figure below.

Figure 88. More bricks than fish found on Gardner Creek at Site 7

Figure 89. Tree cover and habitat is decent at Gardner Creek at Site 7

Figure above shows the tree canopy cover and instream habitat wasn't terrible along Gardner Creek at Site 7 but, very little diversity was found in the number of fish surveyed and no trout were surveyed above the Laflin Borough Park

The water quality was very suitable and hospitable for native and wild trout above the Gardner Creek Reservoir.

EPCAMR has chosen to add just a few photos into the report and will post the remainder of them online in our Mill Creek ArcGIS Online Story Map and include them as electronic files to submit with the final Mill Creek Coldwater Conservation Plan.

Competition Between Native Brook Trout and Wild Brown Trout

A colleague of EPCAMR's, Ken Undercoffer, is a lifelong devotee of the conservation, protection, and restoration of our native brook trout populations. He has served on 2 different occasions as President of PA Council of Trout Unlimited, and was most recently in 2020, the PA Council's delegate to the Coldwater Heritage Partnership (CHP) and representative for the Eastern Brook Trout Joint Venture (EBTJV). He stated in his article, *My Thoughts on Competition Between Native Brook Trout and Wild Brown Trout Living in PA's Freestone Streams*[140], that brown trout do not replace brook trout in our streams. Ken believes that they displace them. It is well known that brown trout are harder to catch than brook trout. Studies by fish biologists have shown that this is indeed the case.[141] His reasons for believing so are the following mechanisms:

1. Fisheries biologists, by and large, agree that brook trout are far more vulnerable to angling pressure than are brown trout.
2. Brown trout spawn, on average, a few weeks later than brook trout. Typically starting in early November, after brook trout spawning is mostly done
3. Brown trout are known to use brook trout redds to excavate their own redds. Thereby displacing or eating the previously deposited brook trout eggs.
4. Brown trout lay larger and therefore more viable eggs and consequently more viable young in the early stages of life.
5. One trend that I have noticed thru the years is that smaller (young of year [YOY] to fingerling size) brown trout density in streams is typically much lower than that of brook trout. Typically, the few browns caught tend to be of legal size to ten inches. But ultimately these few larger browns do take over the really prime lies and therefore continue to grow and outlive the brookies. In time the browns can and do get much larger than the brookies. In olden days brook trout filled all the niches in PA streams and achieved much larger ultimate size than today. According to Cooper both species grow at about the same rate, given that both are living in low to moderately fertile waters. But the brook trout tend to peak out at slightly less than a foot. I think what happens is that brown trout, although initially smaller in number tend to live longer and grow a bit larger than brook trout, on average. It is well established that once trout get to be about ten inches in length they must switch over to larger prey like minnows and/or crayfish if growth is to continue.
6. So as brown trout grow, they eventually come to depend on smaller brook trout as their primary food source.
7. As long as smaller brookies are abundant, the larger browns can continue to grow sometimes reaching sizes well in excess of 12 inches. I have caught wild browns in small freestone streams as big as 17 inches. I have lost or seen a few that were probably 20 inches. This is the same ultimate size brook trout once achieved when PA was a brook trout angling Mecca.

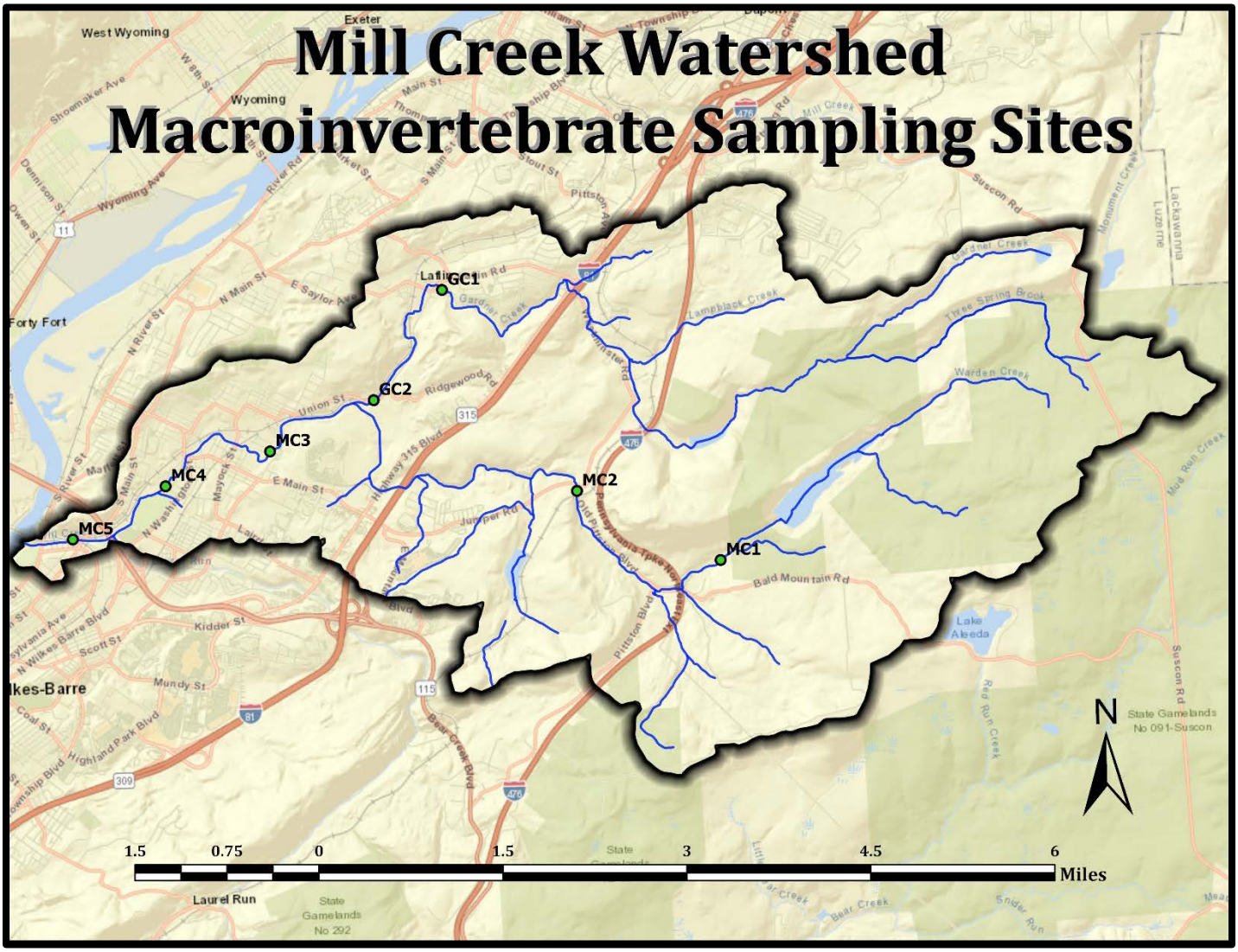
Ken also has provided some informative content to the PA Council of Trout Unlimited's website on how Wild Trout Are Travelers.[142] EPCAMR encourages the reader to review the article for more information.

[140] My Thoughts on Competition Between Native Brook Trout and Wild Brown Trout Living in PA's Freestone Streams, Ken Undercoffer, 2020

[141] Rate of Exploitation of Wild Eastern Brook Trout and Brown Trout Populations in the Pigeon River, Otsego County, Michigan, Edwin L. Cooper, 2011

[142] Ken Undercoffer, Wild Trout Are Travelers Article, 2019

Map 41. Mill Creek Macroinvertebrate/Biological/Visual Habitat Assessment Sampling Locations



MILL CREEK MACROINVERTEBRATE/BIOLOGICAL/HABITAT ASSESSMENT SAMPLING

EPCAMR Staff and Volunteers collected macroinvertebrate, biological, and chemical sampling data on 8/9/21 and 9/22/21. 2021 had been an extremely wet year and during the month of September we had Hurricane Ida drop 3-5" inches of precipitation over the region from the Lackawanna Valley to the Wyoming Valley. EPCAMR believes that the numbers and diversity of macros were low and underrepresented for those sites sampled due to scouring of the stream bottom by raging floodwaters and high-water levels and sedimentation. This explains the higher flow that we had investigated at the Packer AMD Air Shaft on Gardner Creek as well. The results of the data collection and sampling locations are below.

Figure 90. Macroinvertebrate sampling and identification in the Mill Creek watershed

Table 14. Macroinvertebrate Sampling Data and Qualitative Designation

Site ID	MC1	MC2	MC3	MC4	MC5	GC1	GC2
Stream	Mill Creek	Mill Creek	Mill Creek	Mill Creek	Mill Creek	Gardner Creek	Gardner Creek
Latitude	**41.256673**	**41.265202**	**41.270731**	**41.266873**	**41.260819**	**41.289323**	**41.276505**
Longitude	**-75.761198**	**-75.783590**	**-75.831462**	**-75.847950**	**-75.862646**	**-75.803971**	**-75.815075**
Date	8/9/2021	8/9/2021	9/22/2021	9/22/2021	9/22/2021	8/9/2021	9/22/2021
Water Penny Larvae	1	50	0	0	6	6	0
Hellgrammites	5	1	0	0	0	0	0
Mayfly Larvae	0	0	0	0	0	0	0
Gilled Snails	0	0	0	0	0	0	0
Riffle Beetles	0	2	0	0	0	0	0
Stonefly Nymphs	10	12	1	0	12	2	0
Non-net Spinning Caddisfly Larvae	0	0	0	0	0	0	0
Beetle Larvae	0	0	0	0	3	0	0
Clams	0	0	0	0	0	0	0
Cranefly Larvae	0	3	0	0	0	2	0
Crayfish	4	0	0	0	0	0	0
Damselfly Nymphs	0	0	0	0	0	0	0

Site ID	MC1	MC2	MC3	MC4	MC5	GC1	GC2
Dragonfly Nymphs	8	2	0	0	0	0	0
Scuds	0	0	0	0	0	0	0
Sowbugs	0	0	0	0	0	0	0
Fishfly Larvae	2	0	0	0	0	7	0
Alderfly Larvae	0	7	0	0	0	0	0
Net Spinning Caddisfly Larvae	30	50	1	0	10	50	0
Aquatic Worms	0	1	0	0	0	0	0
Blackfly Larvae	0	0	0	0	0	0	0
Leeches	0	0	0	0	0	0	0
Midge Larvae	0	0	0	0	0	0	0
Snails	0	0	0	0	0	0	0
Group I Score	16.2	20.9	5.0	0.0	10.6	10.0	0.0
Group II Score	13.2	15.8	3.2	0.0	6.6	9.6	0.0
Group III Score	0.0	1.2	0.0	0.0	0.0	0.0	0.0
Total Water Quality Score	29.4	37.9	8.2	0.0	17.2	19.6	0.0

Water Quality Scores: Good >40 Fair 20-40 Poor <20

Table 15. Water Quality Sampling and Visual Habitat Assessment Data

Site ID	MC1	MC2	MC3	MC4	MC5	GC1	GC2
Latitude	**41.256673**	41.265202	**41.270731**	**41.266873**	**41.260819**	**41.289323**	**41.276505**
Longitude	**-75.761198**	**-75.783590**	**-75.831462**	**-75.847950**	**-75.862646**	**-75.803971**	**-75.815075**
Stream Name	Mill Creek	Mill Creek	Mill Creek	Mill Creek	Mill Creek	Gardner Creek	Gardner Creek
Date	8/9/2021	8/9/2021	9/22/2021	9/22/2021	9/22/2021	8/9/2021	9/22/2021
Water Clarity	Clear	Clear	Clear	Clear	Clear	Clear	Murky
Water Color	None	None	None	None	None	None	Gray/ White
Odor	None	None	None	None	None	None	None
Surface Foam	None	None	None	None	None	None	Moderate
Streambed Color	Brown	Brown	Brown	Brown	Brown	Black	Gray/ White/ Orange/ Red
Algae Present	Scattered	None	None	None	None	None	None
Algae Growth	Matted	N/A	N/A	N/A	N/A	N/A	N/A
Algae Color	Dark Green	N/A	N/A	N/A	N/A	N/A	N/A
Land Use	Forest	½ Forest ½ Industrial	Residential	Residential	Residential	Residential	Residential/ AML

Table 16. Water Quality Chemistry

Site ID	MC1	MC2	MC3	MC4	MC5	GC1	GC2
Latitude	**41.256673**	41.265202	**41.270731**	**41.266873**	**41.260819**	**41.289323**	**41.276505**
Longitude	**-75.761198**	**-75.783590**	**-75.831462**	**-75.847950**	**-75.862646**	**-75.803971**	**-75.815075**
Stream	Mill Creek	Mill Creek	Mill Creek	Mill Creek	Mill Creek	Gardner Creek	Gardner Creek
Date	8/9/2021	8/9/2021	9/22/2021	9/22/2021	9/22/2021	8/9/2021	9/22/2021
Channel Width (ft)	20	15	30	30	20	20	25
Flow (cfs)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TDS (mg/l)	46	122	101	101	108	197	135
Conductivity (µS/cm)	85	224	187	186	200	366	250
Temperature (C)	18.5	20.3	17.4	18.8	19.0	21.6	17.6
pH	6.97	7.16	6.67	6.72	7.8	7.19	5.62
DO (%)	106.6	105.8	97.5	102.5	95.3	94.5	96.1
DO (mg/l)	9.98	6.90	9.29	9.54	8.88	8.19	9.11
ORP (mV)	92	130	118	170	150	144	182

Table 17. Determination of Stream Visual Habitat Sampling Locations

Site ID	MC1	MC2	MC3	MC4	MC5	GC1	GC2
Latitude	**41.256673**	41.265202	**41.270731**	**41.266873**	**41.260819**	**41.289323**	**41.276505**
Longitude	**-75.761198**	**-75.783590**	**-75.831462**	**-75.847950**	**-75.862646**	**-75.803971**	**-75.815075**
Stream Name	Mill Creek	Mill Creek	Mill Creek	Mill Creek	Mill Creek	Gardner Creek	Gardner Creek
Date	8/9/2021	8/9/2021	9/22/2021	9/22/2021	9/22/2021	8/9/2021	9/22/2021
Instream Cover	20	20	12	5	5	13	16
Epifaunal Substrate	20	20	10	2	15	12	1
Embeddedness	20	20	11	8	14	17	10
Velocity/Depth Regimes	18	20	15	10	16	10	15
Channel Alteration	20	5	10	5	10	7	12
Sediment Deposition	16	20	8	5	8	10	8
Frequency of Riffles	20	15	16	13	16	10	16
Channel Flow	20	20	18	16	16	11	18
Condition of Banks	20	17	15	19	4	12	12
Bank Vegetative Protection	20	20	13	16	5	13	12

Site ID	MC1	MC2	MC3	MC4	MC5	GC1	GC2
Grazing or Disruptive Pressures	20	12	11	12	10	12	14
Riparian Vegetative Zone Width	20	20	10	5	7	10	14
Total Habitat Assessment Score (Impaired if < 140)	**234**	**229**	**115**	**116**	**126**	**137**	**156**
Sedimentation Score (Impaired if < 24)	**36**	**40**	**19**	**13**	**22**	**27**	**18**
Bank Erosion Score (Impaired if < 24)	**40**	**37**	**28**	**35**	**9**	**25**	**24**

EPCAMR RECOMMENDATIONS

Following EPCAMR's collection and data analysis, we have developed recommendations to serve as actions for the restoration, maintenance, or enhancement of many areas within the Mill Creek Watershed. EPCAMR has included specific projects which can be undertaken in the future should implementation funding, funding for design, funding for construction, habitat improvement projects, sediment reduction projects, streamside cleanups, or other suggested ideas being recommended become available or pursued by any number of partners in the Wyoming Valley. These recommendations and next steps are as specific and tangible as possible.

EPCAMR and all partners within the watershed should keep in mind that future funding opportunities may depend on the ability of the funder to form direct links between their priorities and requirements and the specific projects recommended in this completed Mill Creek Coldwater Conservation Plan. EPCAMR has made **43** recommendations for efforts that will promote, support, and implement coldwater resource conservation awareness initiatives, education and outreach programs, and stewardship opportunities in the Mill Creek Watershed.

1. Continue to conserve and protect the headwater streams of the Mill Creek Watershed in partnership with the PA American Water Company Water Supply areas and properties, particularly around the Reservoirs

2. Roadside and stream-side cleanups along North Main Street near the railroad tracks 41.260778, -75.863149

3. Roadside cleanup along the entire length of Biscontini Drive from N. Main Street to N. Washington Street 41.261079, -75.856495

4. Roadside and stream-side cleanup of unnamed tributary to Mill Creek along Grist Lane 41.265187, -75.846419

5. Streamside cleanup on Mill Creek downstream from the retaining wall along W. Beatty Street to Biscontini Drive and the confluence with Laurel Run 41.267403, -75.847497

6. Cleanout of woody debris and trash along the 7 squashed culverts along Biscontini Drive in the City of Wilkes-Barre 41.261123, -75.856474

7. Recommend evaluating the replacement of the 7 squashed culverts along Biscontini Drive with a wide span bridge 41.261107, -75.856463

8. Recommend a riparian planting of ground covering wetland species on the unnamed tributary to Mill Creek located in the Hollenback Golf Course flowing from the culvert beneath N. Washington Street from Grist Lane 41.265526, -75.847055

9. Evaluate the stream channel constant flooding of the Laurel Run tributary to Mill Creek along Biscontini Drive that flows perpendicular to Mill Creek during high flows during bankfull events

due to heavy sedimentation and blockage of the squashed culverts on Mill Creek where sediment removal is suggested 41.261283, -75.856279

10. Cleanup beneath the North Cross Valley State Route 309 along Biscontini Drive and along the left streambank looking downstream until you get to the levee behind Oakley Lane 41.260787, -75.857140

11. Seek funding for the updated feasibility study on the mine pool complex(s) that flow within the Mill Creek Watershed to determine flow losses and potential groundwater connections to the Plainsville AMD Borehole where EPCAMR suspects the major outflow discharge is for the watershed 41.280982, -75.861943

12. Offer training to Municipal Road Department Employees within the watershed on becoming Lead Observers to assist in completing additional culvert assessments and structures under the NAACC guidelines in partnership with EPCAMR

13. Conduct and assess any of the remaining culverts and structures in the Mill Creek to its confluence with the Susquehanna River for aquatic organism passage (AOP) and stream connectivity under the NAACC guidelines in partnership with EPCAMR

14. Recruit community members and students from the King's College and Wilkes University to become EPCAMR volunteers to educate them on how to obtain certification in aquatic organism passage (AOP) as Lead Observers through the NAACC

15. Invasives Removal of Japanese Knotweed along Mill Creek from N. Main Street to Chilwick Street with a recommended native wetlands vegetation planting 41.262882, -75.853646

16. Invasives Removal of Japanese Knotweed along the unnamed tributary to Mill Creek that flows from the end of St. Clair Street and Grist Lane to west towards N. Washington Street with a recommended native wetlands vegetation planting 41.264841, -75.846009

17. Streamside cleanup of unnamed tributary along the railroad tracks located behind Trane Heating & Cooling Services down to where the waterway flows into the area along the corner of St. Clair and Grist Lane 41.263724, -75.845972

18. Evaluate the consideration of the removal of gravel bar aggradation and buildup of sediments beneath the E. Main Street Bridge from 2 E. Main Street down to behind Philly Subs & Pizzeria where Mill Creek take a very hard meander to the southwest coming from the levee system along the Dillon Street Park and the residential area in between Adams Street 41.270199, -75.844675

19. Invasives Removal of Japanese Knotweed along Mill Creek from E. Main Street up to the end of Pelza Street with a recommended native wetlands vegetation planting 41.271442, -75.842433

20. Streamside and roadside cleanup along the bank of Mill Creek along the Mayock Street Bridge 41.271808, -75.836711

21. Consider a streambank stabilization project along the northern streambank along Mill Creek that is severely eroded and undercut behind the residential homes near the end of Center Street and behind 70-72 Cleveland Street. 41.270825, -75.834040

22. Streamside cleanup along Mill Creek upstream and downstream (along the retaining wall on the north side of the stream) of the Cleveland Street Bridge up to the First Street Bridge 41.271429, -75.830021

23. Investigate further the Packer AMD discharge that EPCAMR initially sampled for chemistry and flow to determine if there were a feasibility for AMD Treatment that would improve Gardner Creek from this point after crossing the railroad tracks beneath the culvert and downstream areas on Mill Creek that it is currently impacting 41.278018, -75.813779

24. Investigate further AMD seeps to determine their overall impact that are entering Gardner Creek from the western streambank along Union Street 41.283325, -75.808330

25. Streamside and roadside cleanup along Gardner Creek where the off-road parking areas are along the western shoulder of Union Street southwest of the intersection of E. Saylor Ave when Main Street transitions into Union Street in Plains Township 41.282614, -75.808363

26. Investigate further AMD seeps to determine their overall impact that are entering Gardner Creek from the western streambank upstream of the railroad bridge near the culm banks that are adjacent to the New Enterprise Stone & Lime Company, Inc. in Laflin Borough 41.283758, -75.809425

27. Determine from the private landowner at the New Enterprise Stone & Lime Company, Inc. in Laflin Borough if the culm banks qualify under the Surface Mining Control & Reclamation Act of 1977 as “abandoned mine lands” under the law to see if there might be interest in a reclamation project since the Gardner Creek is very close to the toe of the culm spoil banks in between the railroad tracks along Union Street 41.284986, -75.809676

28. Consider a streambank stabilization project along the meander in Gardner Creek located behind Dr. Joseph G. Raymond’s Medical Facility in Laflin Borough, which is severely undercut 41.289969, -75.785289

29. Conduct a woody debris removal project to unblock the section along Gardner Creek just to the north of Dr. Joseph G. Raymond’s Medical Facility in Laflin Borough 41.289852, -75.784855

30. Streamside and roadside cleanup along Gardner Creek upstream and downstream of US State Route Highway 315 and under the Interstate 81 North and Southbound lanes along Westminster Road 41.289090, -75.783685

31. Investigate further an AMD seep to determine its overall impact on Gardner Creek, along the northern streambank 150’ upstream of the Westminster Street Bridge along 428 Westminster Road in Jenkins Township 41.283490, -75.779527

32. Trailside cleanup of minimal trash and debris along the eastern shore of the Mill Creek Reservoir, Rough Hollow, northeast to the wetland area where Warden Creek enters the Reservoir 41.262379, -75.746374

33. Streamside cleanup along an unnamed tributary to Mill Creek on The Natural Lands Trust Bald Mountain Preserve property along Bald Mountain Road east of the US Turnpike 476 overpass 41.252718, -75.766633

34. Consider a streambank stabilization project along bridge on Bald Mountain Road in Bear Creek Township just east of the Sanchez property where the Road was severely undercut and washed-out during Hurricane Ida in September 2021 41.253368, -75.770750

35. Consider a streambank stabilization project or a new culvert placement on an unnamed tributary to Mill Creek that cascades down from the utility right of way that flows in a southwesterly direction carrying cobble and gravel that builds up near the shoulder of Old Pittston Boulevard just west of the utility right of way and looks to have overtopped the shoulder on to the road during high flows that historically may have caused a minor flooding issue for Plains Township along the road 41.257635, -75.777207

36. Woody debris and trash removal project at the intake structure to the PA American Water company along Old Pittston Boulevard in Plains Township, west of the intersection with Jumper Road and Westminster Road 41.265418, -75.783621

37. Roadside trash cleanup along Westminster Road 41.265771, -75.782391

38. Streamside and roadside cleanup of trash along where Deep Creek crosses Jumper Road 41.264229, -75.790560

39. Roadside cleanup from the Wilkes-Barre Area Career & Technical Center along Jumper Road east past the entrance to the Pocono Mobile Home Park to the utility lines right of way 41.261812, -75.802941

40. Woody debris and trash removal project on the upstream eastern side of US Interstate 81 Northbound lanes just above the double bridge culverts and west of Briar Creek Road 41.265940, -75.810602

41. Explore the feasibility of a Streambank Riparian planting project along the estimated 800’ section of rip-rap rock channel restoration that was completed by the PA DEP Bureau of Abandoned Mine Reclamation to provide additional cover and to maintain cooler temperatures for the trout population that was found in this stretch of Mill Creek in Plains Township 41.265956, -75.812876

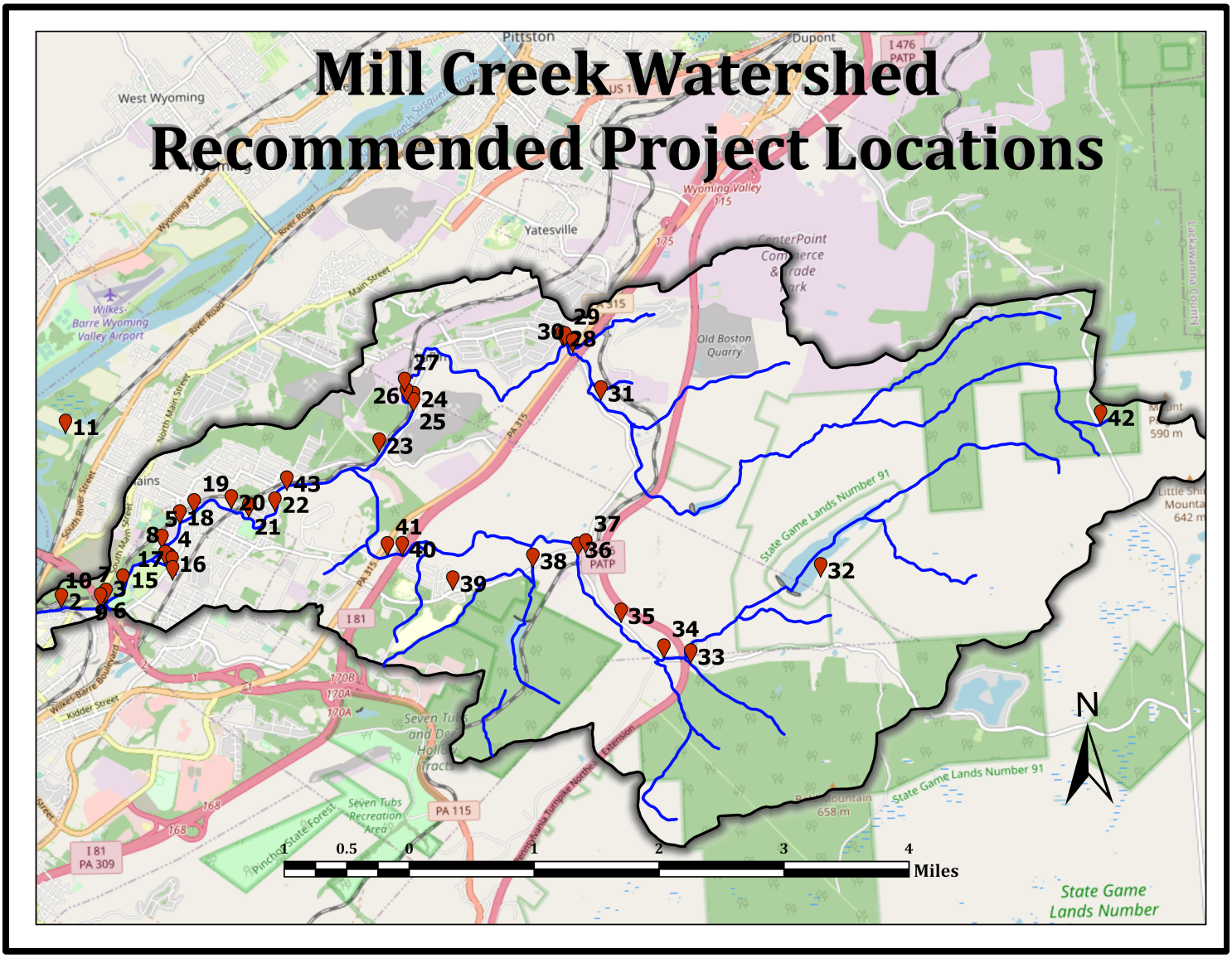
42. Roadside and streamside cleanup along Three Spring Brook in Pittston Township, along Suscon Road, and recommend placement of several natural log or fallen tree deflectors along the roadside swale that is carrying a large sediment load of gravel that is depositing both along the streambank and in Three Spring Brook 41.279326, -75.702802

43. Follow up with the Luzerne Conservation District and Wyoming Valley Sanitary Authority on the suggested project to revegetate the retention ponds on the back side of the Mohegan Sun Arena along Mill Creek before the confluence with Gardner Creek 41.273840, -75.828114

Table 18. Breakdown of Recommendation Types

Recommendation Type	Recommendation #	Total Projects
Pipe or Bridge/Culvert Alteration/Replacement	**7, 34**	**2**
Streambank Restoration/Riparian Planting	**8, 18, 21, 28, 34, 35, 41, 43**	**8**
Debris/Woody Debris Removal	**29, 36, 40**	**3**
Invasives Removal	**15, 16, 19**	**3**
Streamside/Road-side Cleanups	**2, 3, 4, 5, 10, 17, 20, 22, 25, 30, 33, 37, 38, 39, 42**	**15**
Community Outreach/Assessment	**12, 13, 14**	**3**
Conservation of Public Water Supply Areas & Reservoirs	**1, 32**	**2**
AMD Monitoring	**23, 24, 26, 31**	**4**
Abandoned Mine Land Reclamation	**27**	**1**
Mine Pool Study	**11**	**1**

Map 42. EPCAMR Recommended Project Location Map



FUTURE FUNDING GRANT OPPORTUNITIES AND POTENTIAL PARTNERS

EPCAMR has provided numerous known possible funding sources for future opportunities to implement and take the Mill Creek Coldwater Conservation Plan one step further. Grants, fundraisers, foundations, joint-ventures, public-private partnerships, providing local in-kind matching funds and letters of support and commitment are all avenues that should be pursued by any existing partners within the entire Mill Creek and Watershed and the municipal governments. EPCAMR is just one of many partners that will undoubtedly join others in the pursuit of implementation projects recommended in the future. Local partners within the watershed that are eligible for applying for funding are encouraged to do so to help in carrying out the commendations above. EPCAMR plans on following up with our partners following the completion and approval of the Mill Creek Coldwater Conservation Plan to see what priorities many of them have for the next few years. A multitude of funding sources and additional partners were provided in the Upper Toby Creek Coldwater Conservation Plan[143] on pages 85-88 that are all relevant and applicable to the Mill Creek Coldwater Conservation Plan.

SUMMARY AND CONCLUSIONS

EPCAMR and our partners in the project over the course of the last 24 months traversed as many miles as possible of streams that were publicly accessible or located along the major roads and bridges where stream crossings and culverts were present and good visual assessments could be obtained. Many private landowners talked to us when we were out during the assessments and provided us with great information and access to their properties to conduct the coldwater conservation assessment. Our intentions were to document all kinds of projects that we encountered within the Mill Creek Watershed as possible during the project period that were related to coldwater fisheries improvement, protection, and restoration. Several private landowners will need to be followed up with as indicated in the Recommendations section of the report. The windshield survey that we were able to conduct based on the limited funding that we had didn't allow us to follow up with every single landowner or identify all landowners within the watershed for further discussions.

There are also partnerships within the Greater Wyoming Valley that EPCAMR will continue to build on as well as a number of regional environmental non-profits, conservation groups, the local Stanley Cooper Sr. Trout Unlimited Chapter, Luzerne Conservation District, Wyoming Valley Sanitary Authority (WVSA), North Branch Land Trust, Pennsylvania Environmental Council, and the colleges and universities including King's College and Wilkes University, in addition to the local municipalities within the watershed.
Cost estimates, engineering design, permitting, and construction costs were not a part of the coldwater conservation plan. They are to be determined as a part of the numerous recommendations in the report. It is anticipated that those costs will become a part of future grants where engineering firms, consultant firms, the municipal engineers, or other partners can work with other entities to come up with those costs specific to the projects that would be proposed. There are too many factors that are assumed to be able to give accurate cost estimates when in some cases, additional discussions will need to be had first with private landowners or

[143] Upper Toby Creek Coldwater Conservation Plan

companies that need to first allow for permission and consideration of the projects to take place to make conservation improvements throughout the watershed.

EPCAMR would like to personally thank Kathleen Lavelle, Allison Lutz, and Dr. Shawn Rummel, Ph. D.-Trout Unlimited and their team for providing us technical assistance during the electroshocking trout survey at several locations within the watershed. EPCAMR would finally like to personally thank John Levitsky, Watershed Specialist for the Luzerne Conservation District for his expertise and technical assistance and advice on how to move forward on many of the projects within the watershed and providing us with contacts with landowners that were supportive of conservation efforts within the Mill Creek Watershed.

EPCAMR would also like to thank Dr. Joe Simons III, from the Stanley Cooper Chapter of Trout Unlimited and EPCAMR President for joining us on the electroshocking survey and for taking some candid photos and pictures to use for education and outreach purposes as a part of the conservation plan development for the Mill Creek. We also would like to thank J. Scott Brady, President of the Stanley Cooper Chapter of Trout Unlimited for their continued support of our efforts to conserve and protect coldwater species throughout the Wyoming Valley.

One of the biggest lessons learned is that EPCAMR couldn't account for the seasonal weather changes that had occurred during the course of the project. We did not expect Hurricane Ida to come through in the Fall of 2021 when we were sampling for macros and trying to conduct our fishery survey. The sampling events at that time of the year led to what we think was an underrepresentation of both the aquatic life, fishery diversity and population, and changes to both the streambanks and areas where we had seen culvert blockages and impediments earlier in the year throughout our field assessments. We were sure to note the precipitation events in the fishery survey that was completed by Trout Unlimited. We also learned that some of the fishery populations exceeded our expectations. The current fishery survey has given the watershed a clear indication that on Mill Creek, a large percentage of the watershed above State Route 315 are strongholds for native brook trout and brown trout populations.

The Mill Creek watershed has excellent buffering capacity along its riparian corridors, forested areas, and headwater wetlands.

There are **43** Recommendations in the report that could lead to positive improvements to both the watershed, private lands, public lands, and the fishery population within the watershed.

Since the PA DCNR is especially concerned with the " EPCAMR Recommendations" portion of all final plans, EPCAMR has tried to be recommend very specific, attainable, and fundable, shovel ready recommendations/suggested action items that can be funded either with CHP Implementation grants, can serve as possible mitigation projects in the future, or would become eligible for known and existing alternative funding programs.

The Foundation for PA Watersheds are focused on priority watersheds they want to see where it has a high likelihood of being able to support trout into the future if certain steps are taken to improve, restore, conserve, protect, the existing resource. EPCAMR took into consideration future development pressures, potential for

temperature increases, and whether the Mill Creek watershed is where wild trout species, with a little help from habitat improvement projects, streambank stabilization projects, riparian buffer plantings, and culvert replacements or rehabilitation can survive and thrive.

EPCAMR looks forward to continuing to build on our relationship with our partners in the Mill Creek watershed, as we look towards future implementation projects.

MILL CREEK WATERSHED RESEARCH AND FIELD RECONNAISSANCE OBSERVATIONS

EPCAMR recorded a summary account of some of the major work done for the Mill Creek Coldwater Conservation Plan in the watershed during the development of the Plan.

December 2019- EPCAMR made official requests for Letters of Support from all of the municipalities, Stanley Cooper Chapter of Trout Unlimited, and regional partners within the watershed such as The North Branch Land Trust, and the Pennsylvania Environmental Council-NE Office, Wyoming Valley Sanitary Authority, Penn-State Master Watershed Stewards, and others to support the submission of the Coldwater Conservation Planning Grant Application by EPCAMR for **$6000**; All Letters of Support are included in the **Appendix D**

1-2-2020 EPCAMR provided PA Council of Trout Unlimited our Bureau of Charitable Organization (BCO) Letter of Exemption; Directed Staff to obtain their 2020 PA Fishing License and Trout/Salmon Permit for work

1-7-2020 EPCAMR provided an additional Letter of Support from the New Roots Resource Recovery Center in Wilkes-Barre that is a partner and in support of our application to the PA Council of Trout Unlimited for the completion of the Mill Creek Coldwater Conservation Plan under the CHP Program

1-9-2020 EPCAMR provided another letter from the Stanley Cooper Chapter of Trout Unlimited that is a partner and in support of our application to the PA Council of Trout Unlimited for the completion of the Mill Creek Coldwater Conservation Plan under the CHP Program; Requested to revise the timeline on the project to 18 months by Rachel Kester-Program Manager for the CHP Program administered by the PA Council of Trout Unlimited

1-17-2020 Provided the updated narrative and 18-month timeline to Rachel Kester-Program Manager for the CHP Program administered by the PA Council of Trout Unlimited

2-4-2020 Requested that Staff review some monitoring devices from In-Situ[144] for measuring turbidity, suspended sediments and solids just in case we can secure future funding to have additional reliable pieces of field equipment to add to our field monitoring inventory

3-18-2020 EPCAMR was informed that we were going to be awarded a $6000 CHP grant for the completion of the Mill Creek Coldwater Conservation Plan and that Grant Assurances documentation will be forwarded for our signature; Informed Rachel Kester-Program Manager for the CHP Program administered by the PA Council of Trout Unlimited that EPCAMR had to transition working from home remotely due to the onslaught of the Covid-19 pandemic

[144] In-Situ

3-23-2020 EPCAMR made some minor budget revisions and submitted them to Rachel Kester-Program Manager for the CHP Program administered by the PA Council of Trout Unlimited; PA TU temporarily waived the requirement to hold a public informational meeting before we can begin the assessment due to Covid-19 restrictions; EPCAMR will utilize its social media to get the word out on the grant approval to partners; Informed the EPCAMR Staff of the award notification and encouraged them to look it over and then when the Spring is in the air that we would begin working on the field assessment and traversing of the Mill Creek watershed

3-31-2020 EPCAMR applied for a $10,000 PA American Water 2020 Environmental Grant to purchase and install HOBO Temperature sensors throughout the watershed in the headwaters, tributaries, and main stem of Mill Creek to obtain real-time readings throughout the year utilizing a Bluetooth wireless technology to collect the data; Locations are to be determined that are the most suitable that will hopefully survive increased rainfall events, flash runoff events, and high flow situations

4-1-2020 EPCAMR Staff, Denise Hernandez completed her NAACC Aquatic Organism Passage (AOP) Culvert Assessment online certification

4-3-2020 EPCAMR received the Mill Creek Coldwater Conservation grant award letter documentation in the mail, signed it, and mailed it back to the PA Council of Trout Unlimited

4-6-2020 EPCAMR received the Mill Creek Coldwater Conservation signature page, assurances document, budget, and Nondiscrimination/Sexual Harassment Clause documentation in the mail, signed it, and mailed it back to the PA Council of Trout Unlimited

4-18-2020 Kyle Argenziano, Mountain Top, PA and a Bloomsburg University student and senior majoring in Geography and Planning and minoring in Spatial Analysis & GIS, was selected for an internship with EPCAMR as a Watershed Outreach Specialist Intern to assist with working on projects including the Mill Creek Coldwater Conservation Plan and a grant was received from EDSI and the PA CareerLink to support the position for 8 weeks out of the 12-week internship; His position started on 5-18-21 EPCAMR will utilize those funds as matching funds as a part of the Mill Creek Coldwater Conservation Plan

4-29-2020 EPCAMR received first-hand information from one of our volunteers and donors who is an avid fisherman and conservationist, Mr. Bob Kent, from the Philadelphia area, who had previously fished in the headwaters of Gardner Creek and provided us with locations where he had caught native brook trout; He encouraged our work and was looking forward to our finished report; He noted the areas around Three Spring Brook as having dense high shrubbery

4-29-2020 Susan Turcmanovich, PA American Water followed up with EPCAMR following a social media post seeking information from residents in the watershed; She will be able to provide EPCAMR with information on the reservoirs in the Study Area; Directed Kyle and Levi to follow up with her later for information

5-1-2020 Mike Hewitt, EPCAMR Program Manager created several AML Maps from our Reclaimed Abandoned Mine Land Inventory System based on the Problem Areas

5-11-2020 Levi Sunday-Lefkowitz, Back Mountain, PA and a rising junior student at the University of Rochester, NY studying Chemical Engineering with a minor in Environmental Engineering was selected for an internship with EPCAMR as a Watershed Outreach Specialist Intern to assist with working on projects including the Mill Creek Coldwater Conservation Plan and a grant was received from EDSI and the PA CareerLink to support the position for 8 weeks out of the 12-week internship

5-14-2020 Marissa Loftus, Wilkes-Barre, PA, and a Luzerne County Community College graduate with an Associates of Science degree in Chemistry and student completing her bachelor's degree in Geology at Kutztown University was selected for an internship with EPCAMR to assist with working on projects including the Mill Creek Coldwater Conservation Plan; Provided her with boundary maps for the watershed for her to begin researching information on some of the landmarks within the watershed

6-19-2020 EPCAMR Staff Shawnese Taylor and Steve Cornia created a new helpful field sheet to take with us in the field for when we conduct culvert assessments and to take notes when thinking about creating and suggested recommendation projects for any Coldwater Conservation Plans

9-4-2020 Bob Kent, one of our volunteers and donors who is an avid fisherman and conservationist, Mr. Bob Kent, from the Philadelphia area, sent EPCAMR information on a geocaching site that he uses to find stream images that had some great images of Mill Creek between Jumper Road and US Interstate I-81

9-21-2020 Katie Van Orden, Wilkes-Barre, PA and a King's College student and senior majoring in Environmental Science was selected for a Fall internship with EPCAMR as a Watershed Outreach Specialist Intern through an existing partnership with King's and their community-based Federal Work Study Program

10-21-2020 Rachel Kester, PA TU Coldwater Heritage Plan Program Manager sent EPCAMR information from Ken Undercoffer on the competitive interactions between native brook trout and brown trout species; EPCAMR will incorporate it into the Mill Creek Coldwater Conservation Plan as a reference

12-14-2020 EPCAMR sent some photos of the HOBO Temperature sensor loggers to Susan Turcmanovich, PA American Water at her request

12-15-2020 Katie Van Orden, EPCAMR Watershed Outreach Specialist Intern provided the Executive Director with the historical background information she could find on various locations within the Mill Creek watershed for inclusion in the Mill Creek Coldwater Conservation Plan

12-16-2020 EPCAMR provided Susan Turcmanovich, PA American Water with a map of the intended locations of the HOBO Temperature sensors and their placement in the Mill Creek Watershed; Shipment of many of them were on backorder due to the pandemic and shipping

1-14-2021 EPCAMR received a revised CHP Fact Sheet from Rachel Kester, Program Manager for the CHP Program from PA Council of Trout Unlimited to use for outreach and education purposes; It details the application process for the Assessment and Implementation Programs under the CHP Grant Program

3-24-2021 EPCAMR Program Manager Mike Hewitt did some mapping research on the Operation Scarlift Report for Mill Creek and provided the Executive Director the file folder and documents as well as maps from the report to reference in the Mill Creek Coldwater Conservation Plan related to the mine pools that and their discharge locations according to the consultant who prepared the report

5-11-2021 EPCAMR coordinated with the PSU Master Watershed Stewards from Luzerne and Lackawanna County who wanted to become certified trained Lead Observers to assist with culvert assessments as EPCAMR volunteers and PSU Master Watershed volunteers as a part of their 50 hours of community service hours needed to maintain their certification

5-18-2021 EPCAMR provided them with information on the NAACC AOP certification for Non-Tidal Streams and conducted a webinar on what they needed to do and how to sign up to become certified to help EPCAMR out in the future as well as to begin to assess their local watersheds in their own communities

6-3-2021 Rachel Kester, PA Council of Trout Unlimited's CHP Program Coordinator reached out to EPCAMR and asked if we needed an extension beyond 9-30-2021 due to any circumstances related to the pandemic and how to proceed with making the official request; EPCAMR provided her with an update on the status of the project and that we would greatly appreciate obtaining an extension through the end of the December 2021; EPCAMR still had macro sampling remaining to due in the Fall 2021 and to begin drafting the draft report in the late Fall, early Winter 2021 as we worked towards completion of the plan development

6-9-2021 EPCAMR Executive Director travelled around with Steve Cornia, EPCAMR GIS Watershed Outreach Specialist the day after a high-water rainfall event to see if we can capture any photos of areas that might be of concern that could be documented in the plan

7-6-2021 Kyle Argenziano, EPCAMR's OSMRE Conservation Steward AmeriCorps VISTA Volunteer provided the Executive Director with some research information in a presentation format that they both had been working on developing together to gather additional resources, maps, and information for the Mill Creek Coldwater Conservation Plan

8-6-2021 Steve Cornia, EPCAMR GIS Watershed Outreach Specialist pulled together a map of potential macroinvertebrate sampling locations for EPCAMR to consider investigating and sampling as a part of the plan

development; EPCAMR Executive Director reached out to Rachel Kester, PA Council of Trout Unlimited CHP Program Manager to see if EPCAMR can make a request for the TU TAG grant to conduct an electroshocking survey of the watershed in the Fall of 2021 at various locations prior to the completion of the plan development

8-13-2021 EPCAMR made an official request for the extension through 12-31-21 to complete the Mill Creek Coldwater Conservation Plan to Rachel Kester, PA Council of Trout Unlimited CHP Program Manager; EPCAMR was informed by Dr. Shawn Rummel that Trout Unlimited could perform the electroshocking survey and to coordinate with Kathleen Lavelle, Trout Unlimited Field Coordinator

8-18-2021 EPCAMR received our official granted extension through 12-31-21 from PA Council of Trout Unlimited from Rachel Kester, PA Council of Trout Unlimited CHP Program Manager

September 2021 EPCAMR coordinated with Kathleen Lavelle, TU Field Coordinator and a 10-1-21 date was chosen to conduct the electroshocking survey in the Mill Creek watershed and EPCAMR was tasked with trying to get a few good volunteers to tag along with TU; During the early part of September Hurricane Ida struck the region and dumped several large precipitation events in the Wyoming Valley and the stream flows were very high for a number of weeks and EPCAMR had to wait for the flows to come down to monitor for macroinvertebrates as well; Joe Simons III, EPCAMR President and Treasurer of the Stanley Cooper Chapter of Trout Unlimited as well as John Levitsky were able to join us on for the electroshocking survey

9-1-2021 EPCAMR completed the TU TAG request with the help of Steve Cornia, EPCAMR GIS Watershed Outreach Specialist and submitted it for approval to Dr. Shawn Rummel, Trout Unlimited Program Coordinator

9-3-2021 Dr. Shawn Rummel, Trout Unlimited Program Coordinator informed EPCAMR that he'd be working on the scope of work for the survey of the anticipated **8** sites, possibly **6**, within the Mill Creek Watershed

10-1-2021 EPCAMR communicated with Kathleen Lavelle-Field Coordinator for the PA Coldwater Habitat Restoration Program-TU, who coordinates the electroshocking fishery surveys about scheduling some time to come out and assess a few sites in the Mill Creek watershed for the CHP. John Levitsky-Luzerne Conservation District Watershed Specialist, offered to assist with setting up the survey and participating with everyone as did Dr. Joe Simons III, Stanley Cooper Chapter TU and EPCAMR President

10-1-2021 EPCAMR, TU, Stanley Cooper Chapter TU, and the Luzerne Conservation District were represented and assisted during the electroshocking survey throughout the entire day in the Mill Creek Watershed; A phenomenal day was had by everyone

November 2021 EPCAMR Executive Director and Staff continued to add to the draft narrative of the Mill Creek Coldwater Conservation Plan and prepare the Recommendations Report for the Mill Creek CHP

January 2022 EPCAMR Executive Director and Staff continue to finalize the draft and are looking to hold a Zoom public informational meeting with stakeholders and municipal leaders throughout the watershed once the plan is complete and chose 2-8-2022 for the meeting

2-8-2022 Convened a Zoom informational meeting with the public, municipal officials, and partners within the watershed to review the draft final plan prior to adding comments and submitting the final Mill Creek Coldwater Conservation Plan to PA Council of Trout Unlimited's CHP Program Coordinator, Rachel Kester

STORMWATER MANAGEMENT

The Wyoming Valley Sanitary Authority is responsible for managing and enforcing proper stormwater practices within the majority of the watershed's municipalities, except Bear Creek Township. To promote best management practices, a credit system is implemented as a part of the Stormwater Management Plan (SMP) which reduces fees charged by WVSA. Property owners with a minimum of 500 square feet of impervious area (IA) or higher, are eligible for SMP fee reduction if select best management practices are implemented. The maximum fee reduction is 30% for properties 7,000 square feet and greater (Tier 3), and 15% for properties 500 to 6,999 square feet (Tier 2). [145]

Table 19. WVSA Stormwater Credit Summary Table [146]

WVSA Credit Code	Credit	Eligible Property Type		Max Credit
		Tier 2	Tier 3	
1	Impervious Area located outside of the Urbanized Area	X	X	15%
2	Low Impact Parcel		X	30%
3	BMP Easement	X	X	TBD
4	Existing BMP with WQ Benefit		X	15%
5	Retrofit of an Existing or New BMPs to add a WQ Benefit		X	30%
6	Riparian Buffer		X	20%
7	Stream Restoration	X	X	TBD
8	Turf and Landscape Management Program		X	15%
9	Pervious Pavement	X	X	15%
10	Separate MS4 Permit	X	X	40%
11	Education Credit	X	X	15%
12	Stormwater Partnership Credit	X	X	TBD
13	Public Participation Credit Donation		X	10%
14	Rain Barrels & Downspout Disconnection	X	X	15%
15	Green Roofs		X	15%
16	Re-Vegetate and Re-Forest Disturbed Areas, Using Native Species		X	20%

EPCAMR reviewed the WVSA Pollution Reduction Plan for any projects in the Mill Creek Watershed (PRP)[147] under Appendix VI, Table A and the focus of planning areas were directed to the Laurel Run tributary and not in the Gardner Creek or on the main stem of Mill Creek in our study area, therefore a number of our recommendations could be potentially added or amended to their PRP, if they chose to include any of them.

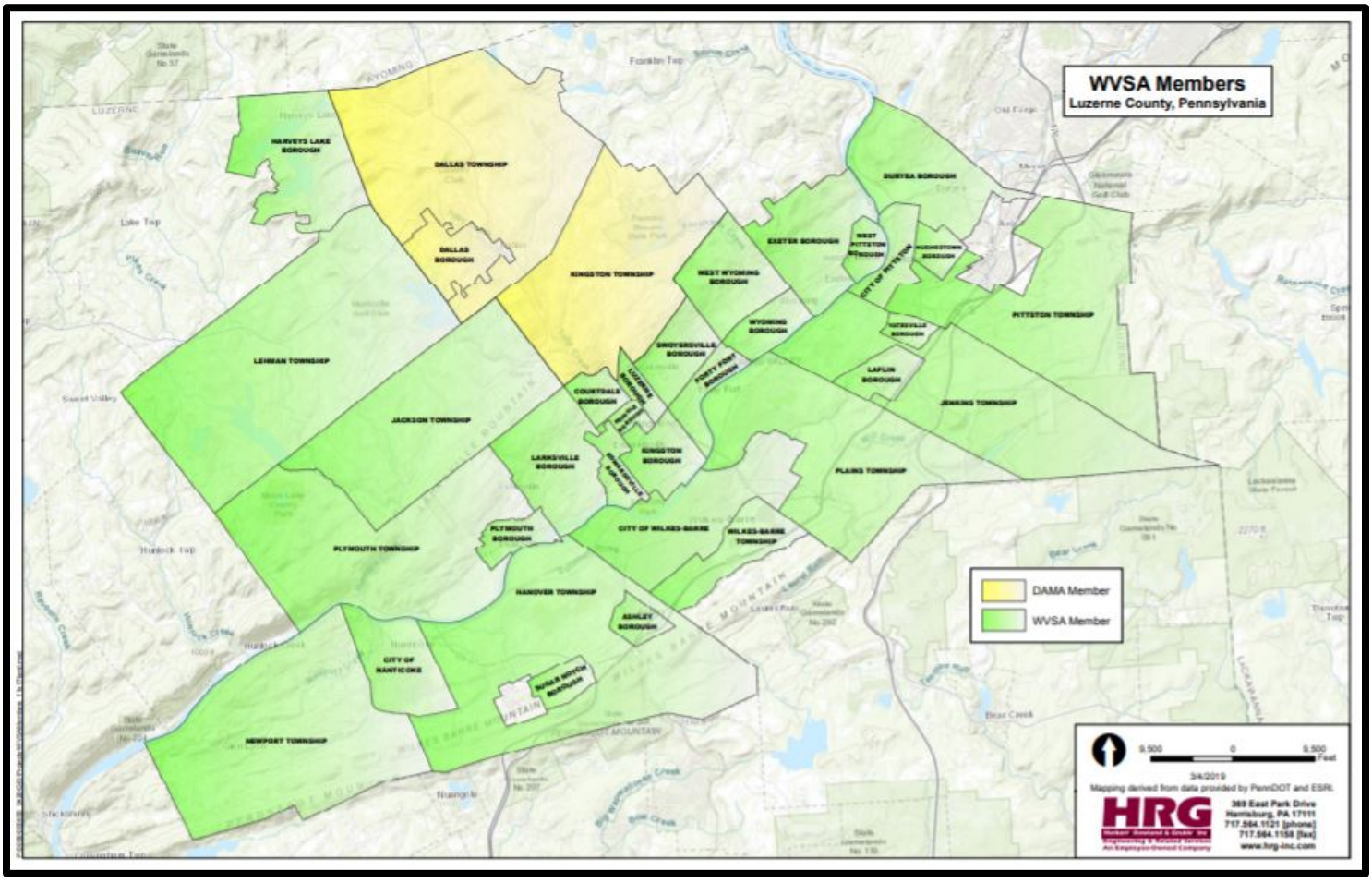
[145] Wyoming Valley Sanitary Authority: Rules and Regulations

[146] Wyoming Valley Sanitary Authority: Stormwater Credit Summary Table

[147] WVSA Regional Chesapeake Bay Pollutant Reduction Plan Amendment No. 1, September 2020

In June 2000, Borton-Lawson Engineering, Inc. was the consultant that completed the Mill Creek Watershed Act 167 Stormwater Management Plan[148] prepared by the Luzerne County Planning Commission, with assistance from the Luzerne Conservation District and a Watershed Plan Advisory Committee (WPAC) made up of volunteers from the municipalities within the watershed, for the Luzerne County Commissioners.
Two decades have passed since the completion of that plan and the entire Wyoming Valley landscape has been transformed, developed, had reclamation projects, stormwater basin retrofits, new stormwater basins constructed, stream channel improvements, stormwater improvements, and municipal stormwater projects and major land development projects completed. Many projects on State, County, Municipal, and some private roads have been completed during that time to improve the historically inadequate sized storm sewers, culverts, and or unstable outlets where hydrologic studies were completed to determine pipe size and replacements with the properly sized infrastructure, however, there are still some projects that remain to be completed that are recommended in the plan. Localized flooding can and does result around areas caused by inadequately sized storm sewers or culverts or when structures are located within the floodplain of the major tributaries of Mill Creek. The costs for these projects are typically borne by the owners of the roads unless grant funding can be found to assist with them.

Map 43. WVSA Members, Luzerne County Map



[148] Mill Creek Watershed Act 167 Stormwater Management Plan, June 2000

Appendix A

Coldwater Heritage Partnership Coldwater Conservation Plan Criteria

Coldwater Heritage Partnership planning grants provide funding to conservation organizations to create coldwater conservation plans that can be used by municipalities, local businesses, state and local government, conservation organizations and communities for the conservation and protection of Pennsylvania's coldwater resources.

Coldwater Conservation Plan Format

All plans should be submitted in one digital document (including all text, tables, figures, and maps). There is no "one size fits all" Coldwater Conservation Plan format since each watershed is unique, and the goals, needs and capacities of each organization creating the plan are different. However, the basic elements of a plan, described blow, should be included in the final Coldwater Conservation Plan.

1) Introduction and Background

Provide an overview of the organization and general background information about the project area

2) Watershed/Project Area Description

a) Location- geographic location within the state including counties, townships, etc. Include latitude and longitude whenever possible.
b) Size of Watershed, Drainage Area, stream length or order
c) List of Streams containing naturally reproducing trout and Chapter 93 Stream designation
d) Land Use (farming, residential, commercial/ industry)
e) Ownership (%)- public and private (area assessed)
f) Stream impairment data- 303(d) list status (cause and source of impairment)

3) Detailed Map of Watershed with Streams Segments, etc.

Maps can show many of the above listed elements and should also include sampling and monitoring locations.

4) Previously Existing Information and Current Data Analysis

a) Characterize and discuss relevant previously existing information, data, and studies (hydrology, geology, biological, historical, etc.)
b) Current Biological Monitoring and Assessments: Data and discussion related to:
    i) Habitat assessments: In-stream and Riparian Corridor
    ii) Aquatic organism passage (stream crossings)
    iii) Aquatic life (invertebrates and fish)
    iv) Aquatic and terrestrial invasive species that impact stream or riparian corridor
c) Water quality
    i) pH, alkalinity, temperature, DO, etc.

5) Areas of Concern and Opportunity

This section shall address problem areas or unique features within the watershed or specific stream section. Include photos where possible (please use discretion when working with private landowners).

6) Recommendations

Following collection and data analysis develop recommendations to serve as actions for the restoration, maintenance, or enhancement of the watershed. Include goals, clearly defined objectives and specific projects which can be undertaken in the future. These recommendations and next steps should be as specific and tangible as possible. A large-scale restoration project, for example, should be broken down into logical, attainable smaller steps. Keep in mind that future funding opportunities may depend on the ability of the funder to form direct links between their priorities and requirements and the specific projects recommended in your completed plan. General statements of need or loosely defined recommendations will make future implementation efforts more difficult. Recommendations for efforts that promote, support, and implement coldwater resource conservation awareness initiatives, education and outreach programs, and stewardship opportunities are also strongly encouraged.

Additionally, consider the opportunity for a Chapter 93 designation upgrade and what specific steps would be necessary.

7) Future Funding Opportunities and/or Potential Partners

Consider including known or possible funding opportunities (grants, foundations, donations) and partners who may be available to help implement and carry out the recommendations above. What are the organization's proposed next steps upon approval of the CHP?

8) Summary and Conclusions

A final summary of the process, data, lessons learned, partner recognition, recommendations, and next steps.

9) References

10) Appendices

Include maps, figures, tables, and photographs not included in the narrative

Appendix B.

Trout Unlimited AMD Technical Assistance Program Request from EPCAMR

Date Received:_____ *For Office Use Only* Group Eligibility:_____

TAG Number:_____ Project Priority: H M L

Trout Unlimited's AMD Technical Assistance Program

Request Form

Please fill in the following form as completely as possible. Feel free to use the back of this page to describe the type of assistance you require. Provide as much detail as possible as it will assist us in helping you quickly.

Name of Your Organization or Municipality: EPCAMR

When was your group formed? 1995 **Approx. Membership:** 32

Name/Title of Contact Person: Steve Cornia, Watershed Specalist

Address: 101 South Main Steet Ashley, PA 18706

Phone: (570)371-3522 **Fax:** ( )

Email: scornia@epcamr.org

Do you have 501(c)(3) (incorporated non-profit) status? ☑ Yes ☐ No ☐ Don't know

What stream or watershed area requires the technical assistance (watershed, county or counties, townships, or other geographical description of your area): Mill Creek Watershed

1. What kind(s) of technical assistance do you require (check all that apply and describe on back)?

- ☐ Rapid AMD Characterization (characterization of a single discharge or a combination of discharges in a watershed and will evaluate the type and severity of the AMD, as well as the treatment restoration potential)
- ☐ Rapid AMD Watershed Snapshot (one-time snapshot of water quality and flow to assess metals and acidity loadings on a stream or in a specific problem area)
- ☐ Conceptual Design for AMD Treatment System
- ☐ Full Design and Permitting for AMD Treatment System (please call us first as only a limited number of projects will be considered)
- ☐ Construction Oversight of AMD Remediation Project Construction
- ☐ Existing Treatment System Evaluation and Recommendations
- ☐ Watershed Restoration Plan Development (for Qualified Hydrologic Unit approval)
- ☐ Monitoring Plan Development
- ■ Biological Survey (Fish, Macroinvertebrates) and/or Stream Habitat Survey
- ☐ Documentation of Improving Waters
- ☐ Technical Capacity Building
- ☐ Other AMD-Related Assistance (Please describe on next page or attach separate page)

Revised 4/2016

2. What information on your watershed or area of concern already exists (check all that apply)?

- ☐ Stream Restoration/Management Plan
- ☐ Rivers Conservation Plan
- ■ Project Scarlift Report
- ■ TMDL Study
- ☐ EPA Section 319 Watershed Implementation Plan
- ☐ Water Quality Data (please describe type and condition of data on back)
- ■ GIS mapping
- ☐ Other (please fully describe on back)

3. Are you requesting technical assistance that is necessary to implement recommendations in your watershed restoration plan or other similar plan?

☐ No ☑ Yes (Please provide the name of the plan Coldwater Heritage Plan)

4. Are you requesting technical assistance that must be completed in order for your group to apply for grant funds?

☑ No ☐ Yes Funding Source:_____

Funding Application Deadline Date:_____

(Please describe the project you will be applying for below or on back.)

Please provide additional comments below (indicate question number from above if applicable) :

EPCAMR is requesting technical assistance for an electroshocking survey of 8 sites within the Mill Creek Watershed. The results of the survey will aid us in making recommendations for our Coldwater Heritage Plan. The locations of the proposed site are provided on the map attached to this application. Below are the coordinates to each site.

Site 1: -75.86240195, 41.26077114

Site 2: -75.84784316, 41.26695818

Site 3: -75.83149505, 41.27067858

Site 4: -75.81365543, 41.26577176

Site 5: -75.78365570, 41.26587493

Site 6: -75.76120223, 41.25665772

Site 7: -75.77997148, 41.28357114 Site 8: -75.8151878, 41.27646787

Please mail the completed form to:
Trout Unlimited AMD Technical Assistance
18 E. Main St, Suite 3, Lock Haven, PA 17745
Or scan and email it to awolfe@tu.org
If you have any questions or concerns, please contact Amy Wolfe at (570) 786-9562.

Figure 91: EPCAMR Trout Unlimited AMD Technical Assistance Program Request

Appendix C

Mill Creek Biological Assessment

Report Proved by Trout Unlimited
AMD Technical Assistance Program

Fishery Assessment of Mill Creek, Luzerne County

Technical Assistance Grant Program
January 2022

Background

The Eastern Pennsylvania Coalition of Abandoned Mine Reclamation (EPCAMR) requested technical assistance from Trout Unlimited (TU) to conduct fishery assessments on Mill Creek, a tributary to the North Branch Susquehanna River in Luzerne County (Figure 1). Portions of the watershed are currently listed as impaired by abandoned mine drainage according to DEP. These assessments will assist in the development of a Coldwater Conservation Plan for the Mill Creek watershed as part of a Coldwater Heritage Partnership (CHP) grant awarded to EPCAMR from Pennsylvania Council of Trout Unlimited (PATU).

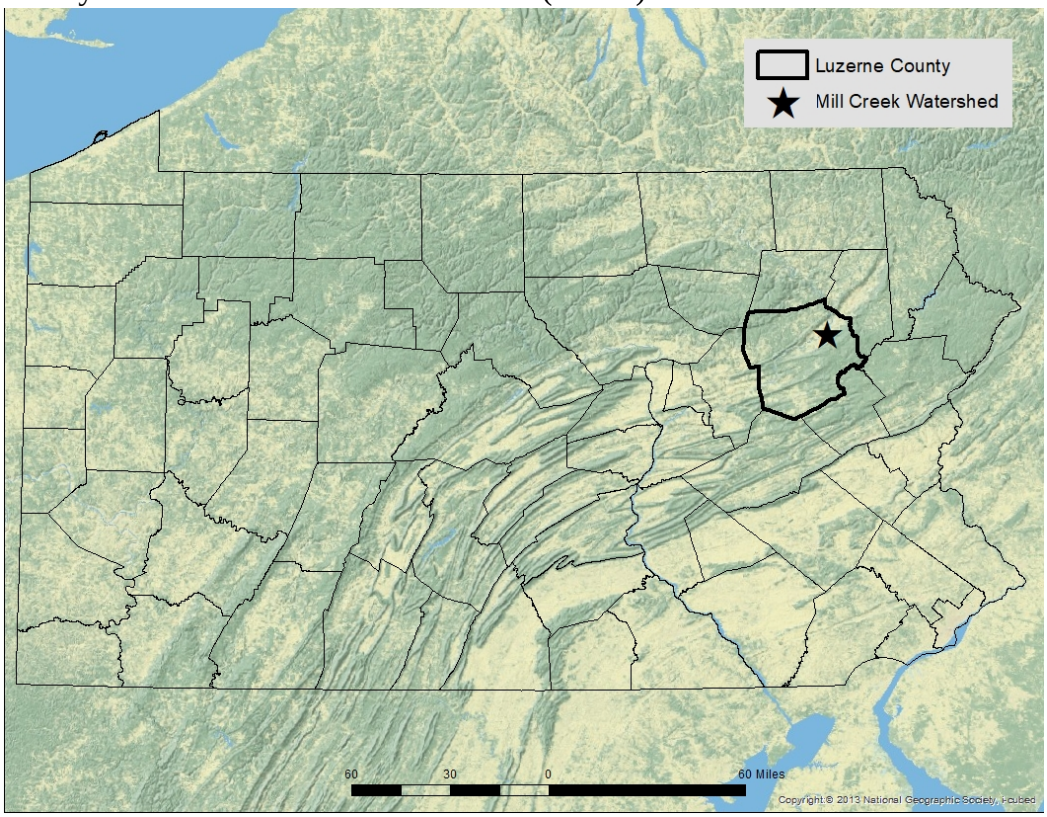


Figure 1. Location of Mill Creek watershed in Luzerne County.

Methods

Fishery surveys were completed using Smith-Root LR-24 backpack electrofishing units using puled DC current. Voltage was determined and adjusted based on specific conductance at each site. Two units were used simultaneously at larger sites. Due to limited time, only single pass electrofishing survey were completed. All trout were held and measured to the nearest millimeter and weighed to the nearest gram. Non-trout species were identified and assigned a relative abundance based on Pennsylvania Fish and Boat Commission (PFBC) Unassessed Waters Initiative Protocol (Fishandboat.com).

Chemical data were collected in the field using an Apera PC60 multimeter. Parameters measured in the field included water temperature (o C), pH (standard units), and specific conductance (µmhos).

Results

Mill Creek upstream of Gardner Creek is currently listed by PFBC as a Naturally Reproducing Wild Trout (WT) water (Figure 2). Fishery surveys were completed at seven sites within the watershed: four sites on Mill Creek and three sites on Gardner Creek (Table 1, Figure 3). Field chemistry was also measured at all sites (Table 2).

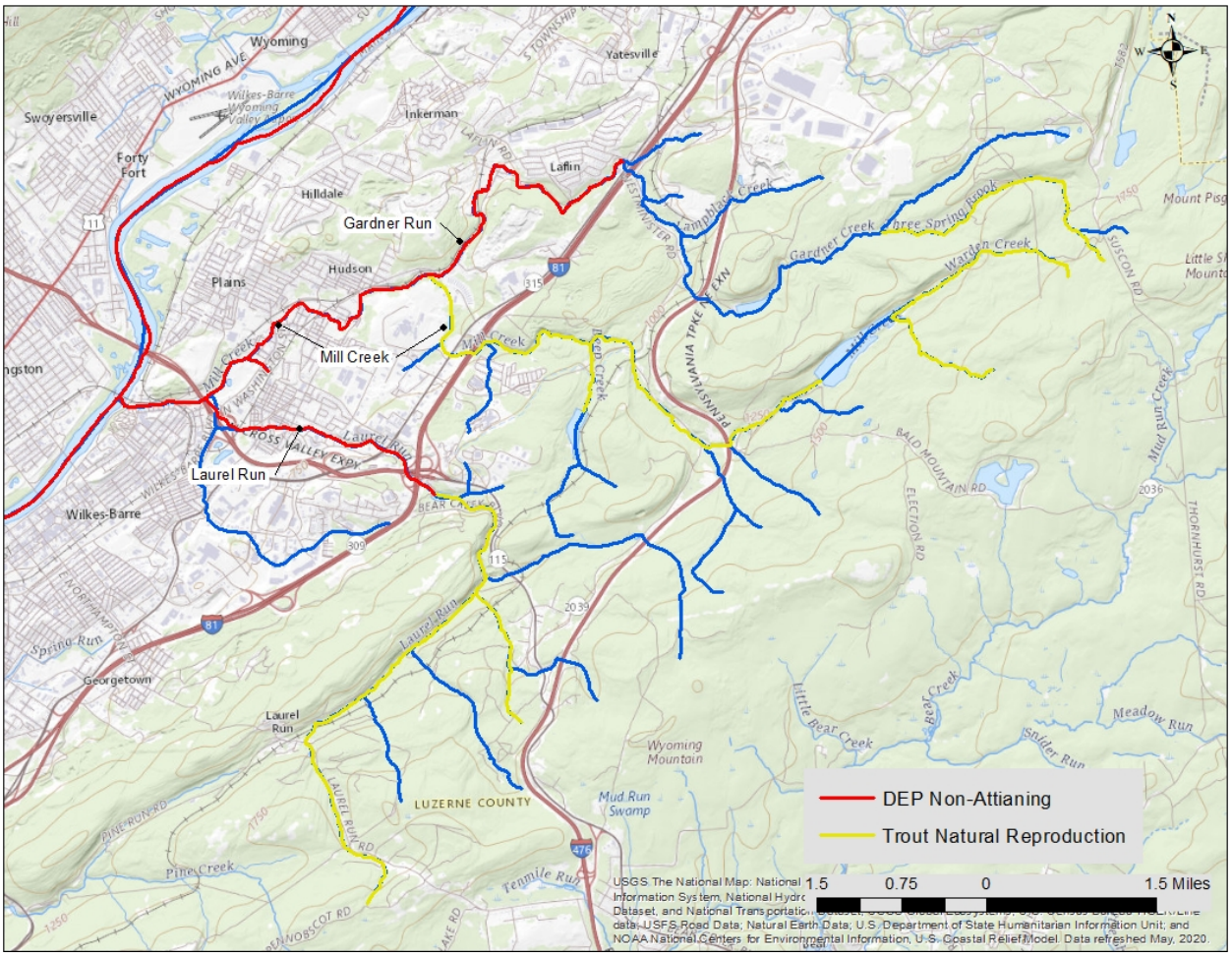


Figure 2. Mill Creek watershed in Luzerne County and current stream listings and designations.

Table 1. Survey locations in the Mill Creek watershed.

Site ID	Latitude	Longitude	Site Description
MC01	41.2613	-75.85608	Mill Creek just upstream confluence with Laurel Run
MC02	41.2709	-75.83135	Mill Creek upstream of the bridge on Cleveland St
GC01	41.2893	-75.80389	Gardner Creek upstream Laflin Creekside Community Park and AMD
GC02	41.2895	-75.78545	Gardner Creek downstream of Rt 315 bridge
GC03	41.2783	-75.77481	Gardner Creek upstream of Pickaway Road culvert
MC03	41.2658	-75.81425	Mill Creek upstream of Rt 315
MC04	41.2653	-75.78355	Mill Creek downstream of double tunnel on Old Pittston Blvd

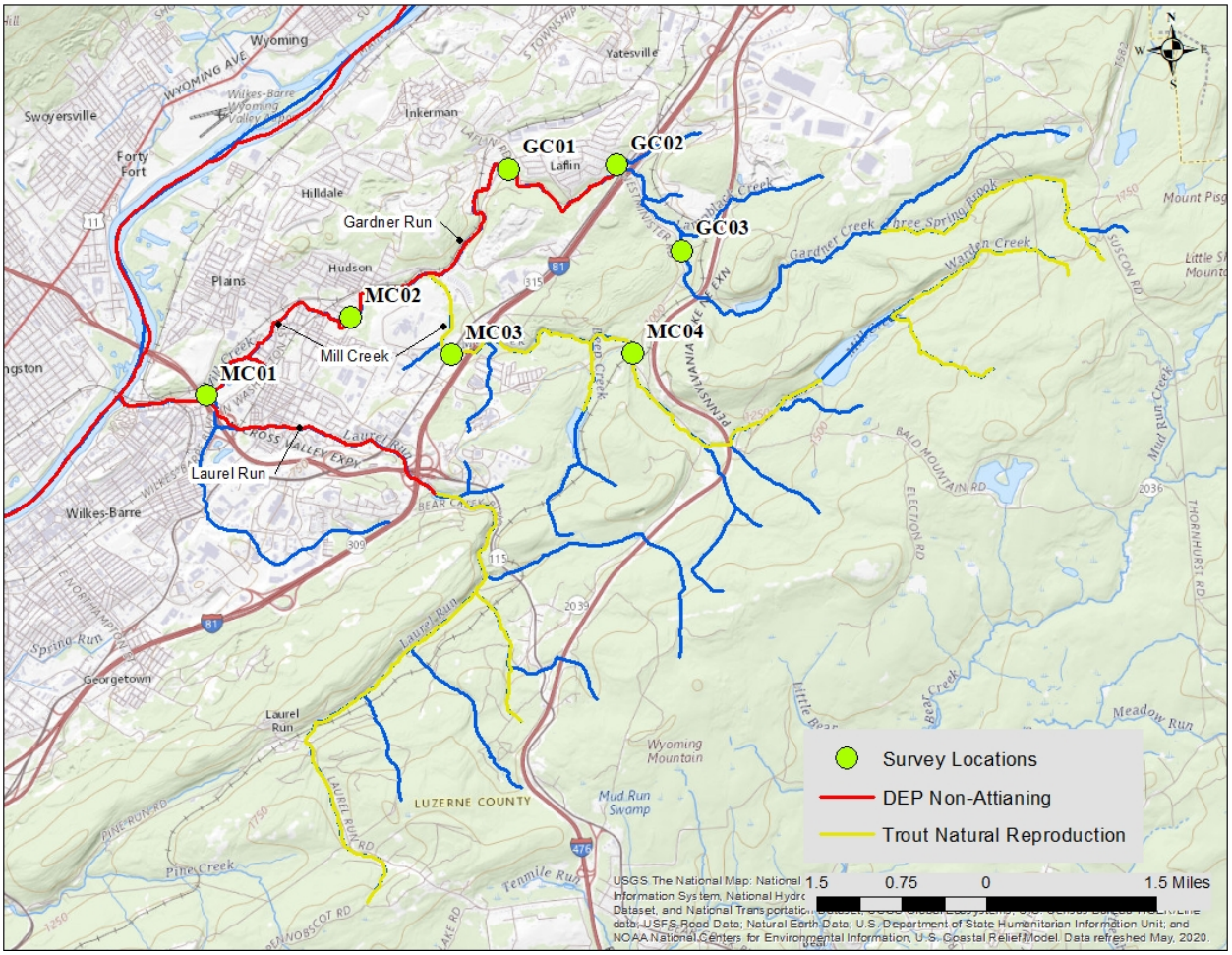


Figure 3. Survey locations in Mill Creek watershed.

Table 2. Field chemistry measured at each site during fishery surveys.

Site ID	pH	Conductivity µs	Temperature C°
MC01	7.07	199.2	11
MC02	6.85	193.5	11.4
GC01	7.31	200	13
GC02	7.14	182.6	15.7
GC03	7.06	115	15.2
MC03	7.01	97.9	13
MC04	7.02	114.8	15.6

Table 3. Fish species and relative abundancies for each site. Abundancy ratings are from the PFBC UWI protocol as follows: 1=Rare, 2-8=Present, 9-32=Common, >33=Abundant.

Common Name	Scientific Name	MC01	MC02	GC01	GC02	GC03	MC03	MC04
Brook trout	*Salvelinus fontinalis*						2	2
Brown trout	*Salmo trutta*						2	2
White sucker	*Catostomus commersonii*	3	1	2		3	3	
Creek chub	*Semotilus atromaculatus*	3	3	2	3		3	
Blacknose dace	*Rhinichthys atratulus*	3	2	3	4	3	4	
Longnose dace	*Rhinichthys cataractae*				3	4		
Brown bullhead	*Ameiurus nebulosus*	1						
Pumpkinseed	*Lepomis gibbosus*			2				
Largemouth bass	*Micropterus salmoides*					2		

Table 4. Total length (mm) of all brook and brown trout documented at each site.

MC03		MC04	
Brook	Brown	Brook	Brown
160	200	144	277
150	195	167	200
132	170		171
	185		160
	185		235
	185		280
			85

Table 5. Biomass calculations for trout at sites MC03 and MC04.

Site	Species	kg/ha	#/ha	CPUE
MC03	Brook	1.0235		
	Brown	4.14244		
MC04	Brook	1.10467		
	Brown	11.5643		

Mill Creek Downstream Gardner Creek

Site MC01, Mill Creek just upstream of the confluence with Laurel Run, was very wide and lacking habitat for fish communities (Figure 4). Four fish species were captured and identified in this reach. White sucker (*Catostomus commersonii),* creek chub (*Semotilus atromaculatus*), and blacknose dace (*Rhinichthys atratulus)* were found to be common based on relative abundance. One brown bullhead (*Ameiurus nebulosus)* was also documented. Over 200m were surveyed at this site and nearly all the habitat was wide, slow, shallow riffle. There were effectively no pools, undercut banks, stable vegetation, or other suitable habitat typical to trout streams.

Figure 4. Confluence of Mill Creek (left) and Laurel Run (right) at site MC01.

Site MC02 is located on Mill Creek upstream of the Cleveland Street bridge in the village of Miners' Mills. Habitat at this site is channelized as it passes through an urban area. There was more adequate instream habitat and substrate for benthic macroinvertebrates at this site, but evidence of recent and frequent flooding and bank scouring were common throughout the site (Figure 5). Creek chub, white suckers, and blacknose dace were documented at this site (Table 3).

Figure 5. Example of habitat at site MC02 on Mill Creek in Miners' Mills.

Gardner Creek Sites

The most downstream site on Gardner Creek surveyed for fishery communities was site GC01. The site was located in Laflin Creekside Community Playground upstream of Main St. and a known AMD discharge downstream along Union Street prior to the confluence with Mill Creek (Figure 3). Gardner Creek in this section is listed by DEP as impaired by urban runoff/ storm sewers, flow regime modification, and acid mine drainage. Instream habitat at this site seemed suitable to support a trout population but no trout were documented. White suckers, creek chub, and pumpkinseed (*Lepomis gibbosus)* were present and blacknose dace were common at this site. Surveyors noted a low density of fish species despite relatively good instream habitat. This site also had the highest conductivity of any site (200us); although it should be noted it is not significantly higher than the other survey sites on Mill Creek and Gardner Creek (Table 2).

GC02 is located downstream of Rt 315. This site had significant erosion and evidence of recent sediment transport (Figure 6). Three fish species were documented at this site (Table 2). Longnose dace (*Rhinichthys cataractae*) and creek chub were common and blacknose dace were abundant. Surveyors noted the low density of fish at this site despite the size of the site and available habitat.

Figure 6. Erosion, bar formation, and failing banks at site GC02. This site had the sections of bedrock and was affected by recent flooding events throughout the site.

GC03 is located at Pickaway Road, upstream of the dense urban development on Gardner Creek and is not currently listed by DEP as impaired. This particular site was heavily impacted by the high water events of 2021 and recent bank remediation and a culvert replacement on Pickaway Road were explained by the landowner (Figure 7). During the recent flooding the road stream crossing on Pickaway Road was destroyed by high water and the property in Figure 7 was heavily eroded. Three fish species were documented at site GC03: largemouth bass (*Micropterus salmoides*) were present, blacknose dace and white suckers were common, and longnose dace were abundant. The presence of largemouth bass is suspected to be from the impoundments/ponds upstream of this site on and along Gardner Creek.

Figure 7. Gardner Creek at site GC03. Note the recent bank stabilization and grading completed during summer 2021 after heavy rainfall negatively impacted the area.

Mill Creek Upstream of Gardner

MC03 is located on Mill Creek upstream of Gardner Creek between route 315 and interstate 81 (Figure 3). This section of Mill Creek is listed by PFBC as WT and not impaired according to PA DEP (Figure 3). Both brook trout and brown trout were documented at this site (Table 3, Figure 8). In addition to both trout species, three other fish species were documented making MC03 the most diverse site surveyed (Table 3). Creek chub and white suckers were common and blacknose dace were abundant (Table 3). The banks in this section were heavily riprapped and armored and did not show signs of erosion evident at other sites (Figure 9).

Figure 8. Brook (foreground) and brown trout were documented at site MC03.

Figure 9. Heavily armored banks at site MC03.

The most upstream site on Mill Creek, site MC04, is located along Old Pittston Blvd and downstream of the railroad tunnel. This site has deep pools and bedrock as the dominant substrate which made electrofishing less effective. Additional trout were observed but were unable to be catpured within the deeper pools.

An old water withdrawal structure and dam were located in the middle of the 70m long site posing a potential barrier to fish migration (Figure 10). Trout were documented both upstream and downstream of this structure. Only brook and brown trout were documented at this site but fish were missed due to habitat limitations (Table 3).

Figure 10. Old water withdrawal structure and dam at site MC04 downstream of the railroad tunnel on Old Pittston Blvd posing a barrier to aquatic organism passage. Trout were documented upstream and downstream of this structure.

Summary

Trout were documented at two locations on Mill Creek and at none of the sites on Gardner Creek. Both brook trout (*Salvelinus fontinalis)* and brown trout (*Salmo trutta*) were present at both sites. No trout were documented in segments not previously listed as WT by PFBC.

Including both trout species, a total of nine species were identified throughout these surveys. Blacknose dace (*Rhinichthys atratulus*) were the most common fish species and were identified at six of the seven sites. White sucker (*Catostomus commersonii*) and creek chub (*Semotilus atromaculatus)* were the second most common species, being present in five of the seven sites surveyed. TU staff noted low densities of fish at sites where recent erosion and major sediment transport was obvious (ie, site MC02 and GC02).

Erosion and habitat impairments were evident throughout nearly all sites. Frequent high-water events in Summer 2021 had impacts on this watershed. Below is a hydrograph from USGS showing the Susquehanna River in Wilkes-Barre located 0.7 miles downstream of the confluence of Mill Creek (Figure 11). While the graph shows flows on the river which is much larger, it

represents the flows in many of the smaller streams during those times. Flooding from these high water events have affected the region and caused damage to both infrastructure and waterways.

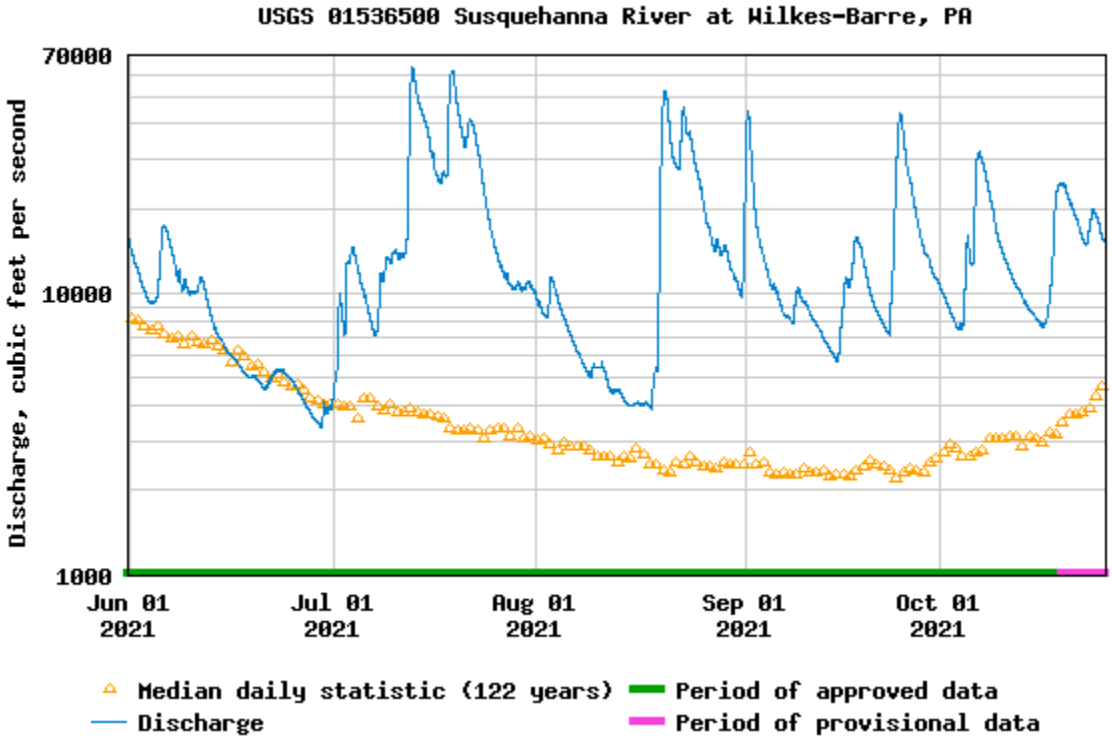


Figure 11. Hydrograph from USGS.gov showing flows in the Susquehanna River 0.7 miles downstream of the confluence with Mill Creek. Yellow triangles depicting average discharge over time show flows far above average starting in June and persisting through the summer months.

Appendix D.

Letters of Support for the Mill and Gardner Creek Coldwater Conservation Plan

WILKES-BARRE CITY
PENNSYLVANIA

Anthony G. George
Mayor

40 East Market Street
Wilkes-Barre, PA 18711
Phone: 570.208.4158
Fax: 570.208.4101

Coldwater Heritage Partnership
Rachel Kester, Program Director
595 E. Rolling Ridge Drive
Bellefonte, PA 16823

December 12, 2019

RE: EPCAMR's Submission of a Cold-water Heritage Partnership Grant to Complete an Assessment Report for the Mill Creek Watershed, Luzerne County, PA

Dear Ms. Kester,

The City of Wilkes-Barre supports the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation's request for funding to conduct a cold-water heritage watershed assessment of the Mill Creek Watershed in Luzerne County, PA. EPCAMR will identify potential impacts, threats, problems and opportunities in Mill Creek and formulate a plan of action for proposed conservation and protection strategies in the watershed. This plan will benefit cold-water fish species as well as the region's economic, recreational, and aesthetic characteristics.

The Mill Creek Watershed is in an area where EPCAMR and the City of Wilkes-Barre would like to build a partnership. It contains many high quality and naturally reproducing trout and cold-water fishery assets. Portions of Mill Creek are a natural trout reproduction stream that is used for recreation as well as by industry and private citizens. The health of Mill Creek watershed is not only important for the health of trout populations, but for the health and well-being of our community members as well.

The City of Wilkes-Barre will commit to helping EPCAMR build community awareness of the environmental issues affecting the watershed and provide support for the conservation of the Mill Creek watershed by providing comments, suggestions, and any available data on the history and current state of the watershed.

Fully supportive,

Mayor Anthony "Tony" George

Earth Conservancy

Dedicated to Mine Land Reclamation, Conservation, & Economic Development in the Wyoming Valley

December 12, 2019

Rachel Kester, Program Director
Coldwater Heritage Partnership
595 East Rolling Ridge Drive
Bellefonte, PA 16823

RE: Coldwater Heritage Partnership Grant Proposal
EPCAMR | Watershed Assessment for Mill Creek, Luzerne County, PA

Dear Ms. Kester:

Earth Conservancy (EC) supports the request from the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR) for funding from the Coldwater Heritage Partnership to conduct a watershed assessment of Mill Creek (a cold-water trout fishery) in Luzerne County, Pennsylvania.

This project dovetails with EC's own mission to revitalize legacy minelands in northeastern Pennsylvania. Our reclamation and restoration projects have made significant improvements in the south Wyoming Valley's environment, economy, and quality of life. As of today, 2,000 mine-scarred acres have been reclaimed, which are available for or already in productive use; two acid mine drainage treatment systems improve local creeks/watersheds; 4,750LF of stream channel is under reconstruction; and 8,000 acres have been conserved for greenspace. We also have built trails, participate in education initiatives, and run a community garden and a composting facility for county residents. All of these projects trace back to EC's overarching plan, one that seeks a more livable community now, and clears the way for positive, progressive change for future generations.

We understand that EPCAMR's proposal for the Mill Creek watershed assessment will identify potential impacts, threats, problems, and opportunities; and develop strategy for conservation and protection. When implemented, the plan will not only benefit aquatic life, but also will enhance the aesthetic, recreational, and economic characteristics of the community. EC will help EPCAMR with its watershed assessment by 1.) helping to build community awareness about the environmental issues affecting Mill Creek, especially in relation to mine-scarred lands; and 2). providing comments, suggestions, and pertinent data on the watershed's history and/or status, as appropriate.

As EC is dedicated to the environmental revitalization of local watersheds, we are pleased to support EPCAMR on this important initiative and strongly recommend the project's funding. If I can be of any further assistance, please do not hesitate to contact me.

Sincerely,

Michael A. Dziak
President/CEO

101 South Main Street | Ashley, PA 18706 | T 570.823.3445 | F 570.823.8270 | www.earthconservancy.org

Coldwater Heritage Partnership
Rachel Kester, Program Director
595 E. Rolling Ridge Drive
Bellefonte, PA 16823

December 30, 2019

RE: EPCAMR's Submission of a Cold-water Heritage Partnership Grant to Complete an Assessment Report for the Mill Creek Watershed, Luzerne County, PA

Dear Ms. Kester:

North Branch Land Trust supports the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation's request for funding to conduct a cold-water heritage watershed assessment of the Mill Creek Watershed in Luzerne County, PA. EPCAMR will identify potential impacts, threats, problems and opportunities in Mill Creek and formulate a plan of action for proposed conservation and protection strategies in the watershed. This plan will benefit cold-water fish species as well as the region's economic, recreational, and aesthetic characteristics.

The Mill Creek Watershed is in an area where EPCAMR and NBLT would like to build a partnership. It contains many high quality, naturally reproducing trout and cold-water fishery assets. Portions of Mill Creek are a natural trout reproduction stream that is used for recreation as well as by industry and private citizens. The health of Mill Creek watershed is not only important for the health of trout populations, but for the health and well-being of our community members as well.

NBLT is committed to helping EPCAMR build community awareness of the environmental issues affecting the watershed and provide support for the conservation of the Mill Creek watershed by providing comments, suggestions, and any available data on the history and current state of the watershed.

Fully supportive,

Rylan Coker

Rylan Coker
Land Protection and Stewardship Coordinator

PennState Extension

Master Watershed
Steward Program

Coldwater Heritage Partnership
Rachel Kester, Program Director
595 E. Rolling Ridge Drive
Bellefonte, PA 16823

1/2/2019

RE: EPCAMR's Submission of a Cold-water Heritage Partnership Grant to Complete an Assessment Report for the Mill Creek Watershed, Luzerne County, PA

Dear Ms. Kester:

Penn State Extension Master Watershed Stewards of Luzerne and Lackawanna Counties supports the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation's request for funding to conduct a cold-water heritage watershed assessment of the Mill Creek Watershed in Luzerne County, PA. EPCAMR will identify potential impacts, threats, problems and opportunities in Mill Creek and formulate a plan of action for proposed conservation and protection strategies in the watershed. This plan will benefit cold-water fish species as well as the region's economic, recreational, and aesthetic characteristics.

The Mill Creek Watershed is in an area where EPCAMR and Penn State Extension would like to build a partnership. It contains many high quality, naturally reproducing trout and cold-water fishery assets. Portions of Mill Creek are a natural trout reproduction stream that is used for recreation as well as by industry and private citizens. The health of Mill Creek watershed is not only important for the health of trout populations, but for the health and well-being of our community members as well.

Penn State Extension will commit to helping EPCAMR build community awareness of the environmental issues affecting the watershed and provide support for the conservation of the Mill Creek watershed by providing comments, suggestions, and any available data on the history and current state of the watershed.

The Penn State Extension Master Watershed Steward Program trains individuals on water conservation and environmental stewardship, in return, these individuals volunteer some of their time helping Penn State Extension educate the community. The program finished a training in 2019 and has several new volunteers who must complete 50 volunteer hours by September 2020. Volunteers can partner with EPCAMR to educate the community on the Mill Creek Watershed and help with stream surveys if needed.

Fully supportive,

Elizabeth M Banos

Elizabeth M Banos
Master Watershed Steward Coordinator, Penn State Extension
16 Luzerne Ave Suite 200
West Pittston, PA 18643

Coldwater Heritage Partnership
Rachel Kester, Program Director
595 E. Rolling Ridge Drive
Bellefonte, PA 16823

January 1, 2020

RE: EPCAMR's Submission of a Cold-water Heritage Partnership Grant to Complete an Assessment Report for the Mill Creek Watershed, Luzerne County, PA

Dear Ms. Kester:

New Roots, Inc. supports the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation's request for funding to conduct a cold-water heritage watershed assessment of the Mill Creek Watershed in Luzerne County, PA. EPCAMR will identify potential impacts, threats, problems and opportunities in Mill Creek and formulate a plan of action for proposed conservation and protection strategies in the watershed. This plan will benefit cold-water fish species as well as the region's economic, recreational, and aesthetic characteristics.

The Mill Creek Watershed is in an area where EPCAMR and New Roots, Inc. would like to build a partnership. It contains many high quality, naturally reproducing trout and cold-water fishery assets. Portions of Mill Creek are a natural trout reproduction stream that is used for recreation as well as by industry and private citizens. The health of Mill Creek watershed is not only important for the health of trout populations, but for the health and well-being of our community members as well.

New Roots, Inc. will commit to helping EPCAMR build community awareness of the environmental issues affecting the watershed and provide support for the conservation of the Mill Creek watershed by providing comments, suggestions, and any available data on the history and current state of the watershed.

Fully supportive,

Sarah Helcoski

Sarah Helcoski
New Roots, Inc.
Chief Operating Officer
121 Water Street
Wilkes-Barre, PA 18702

TOWNSHIP OF PLAINS

MUNICIPAL BUILDING * 126 NORTH MAIN STREET * PLAINS, PENNSYLVANIA 18705

Phone: (570) 829-3439 Extensions 4001, 4002, 4003 Fax (570)829-0710

December 11, 2019

Coldwater Heritage Partnership
Rachel Kester, Program Director
595 E. Rolling Ridge Drive
Bellefonte, PA 16823

RE: EPCAMR's Submission of a Cold-water Heritage Partnership Grant to Complete an Assessment Report for the Mill Creek Watershed, Luzerne County, PA

Dear Ms. Kester:

Plains Township supports the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation's request for funding to conduct a cold-water heritage watershed assessment of the Mill Creek Watershed in Luzerne County, PA. EPCAMR will identify potential impacts, threats, problems and opportunities in Mill Creek and formulate a plan of action for proposed conservation and protection strategies in the watershed. This plan will benefit cold-water fish species as well as the region's economic, recreational, and aesthetic characteristics.

The Mill Creek Watershed is in an area where EPCAMR and Plains Township would like to build a partnership. It contains many high quality, naturally reproducing trout and cold-water fishery assets. Portions of Mill Creek are a natural trout reproduction stream that is used for recreation as well as by industry and private citizens. The health of Mill Creek watershed is not only important for the health of trout populations, but for the health and well-being of our community members as well.

Plains Township will commit to helping EPCAMR build community awareness of the environmental issues affecting the watershed and provide support for the conservation of the Mill Creek watershed by providing comments, suggestions, and any available data on the history and current state of the watershed.

Fully supportive,

Gerald J. Yozwiak
Chairman
Plains Township Board of Commissioners
126 North Main Street
Plains, PA 18705

STANLEY COOPER SR. CHAPTER

January 9, 2020

Coldwater Heritage Partnership
Rachel Kester, Program Director
595 E. Rolling Ridge Drive
Bellefonte, PA 16823

RE: EPCAMR's Submission of a Cold-water Heritage Partnership Grant to Complete an Assessment Report for the Mill Creek Watershed, Luzerne County, PA

Dear Ms. Kester:

Stanley Cooper, Sr. Chapter of Trout Unlimited supports the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation's request for funding to conduct a cold-water heritage watershed assessment of the Mill Creek Watershed in Luzerne County, PA. EPCAMR will identify potential impacts, threats, problems and opportunities in Mill Creek and formulate a plan of action for proposed conservation and protection strategies in the watershed. This plan will benefit cold-water fish species as well as the region's economic, recreational, and aesthetic characteristics.

The Mill Creek Watershed is in an area where EPCAMR and Stanley Cooper, Sr. Chapter Trout Unlimited would like to build a partnership. It contains many high quality, naturally reproducing trout and cold-water fishery assets. Portions of Mill Creek are a natural trout reproduction stream that is used for recreation as well as by industry and private citizens. The health of Mill Creek watershed is not only important for the health of trout populations, but for the health and well-being of our community members as well.

Stanley Cooper, Sr. Chapter Trout Unlimited will commit to helping EPCAMR build community awareness of the environmental issues affecting the watershed and provide support for the conservation of the Mill Creek watershed by providing comments, suggestions, and any available data on the history and current state of the watershed.

Fully supportive,

J. Scott Brady
Chapter President
Stanley Cooper Sr. Chapter of Trout Unlimited
61 N. Washington Street
Wilkes-Barre, PA 18701
(570) 606-6100
JSBrady@jscottbradylaw.com

Wilkes-Barre Area School District

730 SOUTH MAIN STREET WILKES-BARRE, PENNSYLVANIA 18711-0375

SUPERINTENDENT: (570) 826-7111 Ext. 1148 FAX: (570) 819-5010 BOARD SECRETARY: (570) 826-7111 Ext. 1162 FAX: (570) 819-5011

Coldwater Heritage Partnership
Rachel Kester, Program Director
595 E. Rolling Ridge Drive
Bellefonte, PA 16823

December 20, 2019

RE: EPCAMR's Submission of a Cold-water Heritage Partnership Grant to Complete an Assessment Report for the Mill Creek Watershed, Luzerne County, PA

Dear Ms. Kester:

The Wilkes-Barre Area School District supports the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation's request for funding to conduct a cold-water heritage watershed assessment of the Mill Creek Watershed in Luzerne County, PA. EPCAMR will identify potential impacts, threats, problems and opportunities in Mill Creek and formulate a plan of action for proposed conservation and protection strategies in the watershed. This plan will benefit cold-water fish species as well as the region's economic, recreational, and aesthetic characteristics.

The Mill Creek Watershed is in an area where EPCAMR and the Wilkes-Barre Area School District would like to build a partnership. It contains many high quality, naturally reproducing trout and cold-water fishery assets. Portions of Mill Creek are a natural trout reproduction stream that is used for recreation as well as by industry and private citizens. The health of Mill Creek watershed is not only important for the health of trout populations, but for the health and well-being of our community members as well.

The Wilkes-Barre Area School District will commit to helping EPCAMR build community awareness of the environmental issues affecting the watershed and provide support for the conservation of the Mill Creek watershed by providing comments, suggestions, and any available data on the history and current state of the watershed.

Fully supportive,

Dr. Brian Costello
Superintendent
Wilkes-Barre Area School District
730 S. Main Street
Wilkes-Barre, PA 18711

WYOMING VALLEY
SANITARY AUTHORITY
Together, we put water in its place.

Coldwater Heritage Partnership
Rachel Kester, Program Director
595 E. Rolling Ridge Drive
Bellefonte, PA 16823

December 10th, 2019

RE: EPCAMR's Submission of a Cold-water Heritage Partnership Grant to Complete an Assessment Report for the Mill Creek Watershed, Luzerne County, PA

Dear Ms. Kester:

Wyoming Valley Sanitary Authority supports the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation's request for funding to conduct a cold-water heritage watershed assessment of the Mill Creek Watershed in Luzerne County, PA. EPCAMR will identify potential impacts, threats, problems and opportunities in Mill Creek and formulate a plan of action for proposed conservation and protection strategies in the watershed. This plan will benefit cold-water fish species as well as the region's economic, recreational, and aesthetic characteristics.

The Mill Creek Watershed is in an area where EPCAMR and Wyoming Valley Sanitarty Authority would like to build a partnership. It contains many high quality, naturally reproducing trout and cold-water fishery assets. Portions of Mill Creek are a natural trout reproduction stream that is used for recreation as well as by industry and private citizens. The health of Mill Creek watershed is not only important for the health of trout populations, but for the health and well-being of our community members as well.

Wyoming Valley Sanitarty Authority will commit to helping EPCAMR build community awareness of the environmental issues affecting the watershed and provide support for the conservation of the Mill Creek watershed by providing comments, suggestions, and any available data on the history and current state of the watershed.

Fully supportive,

Jeff Colella

Jeff Colella
WVSA Stormwater Division Manager

Wyoming Valley Sanitarty Authority
1000 Wilkes-Barre St.
Wilkes-Barre Pa 18703

Appendix E.

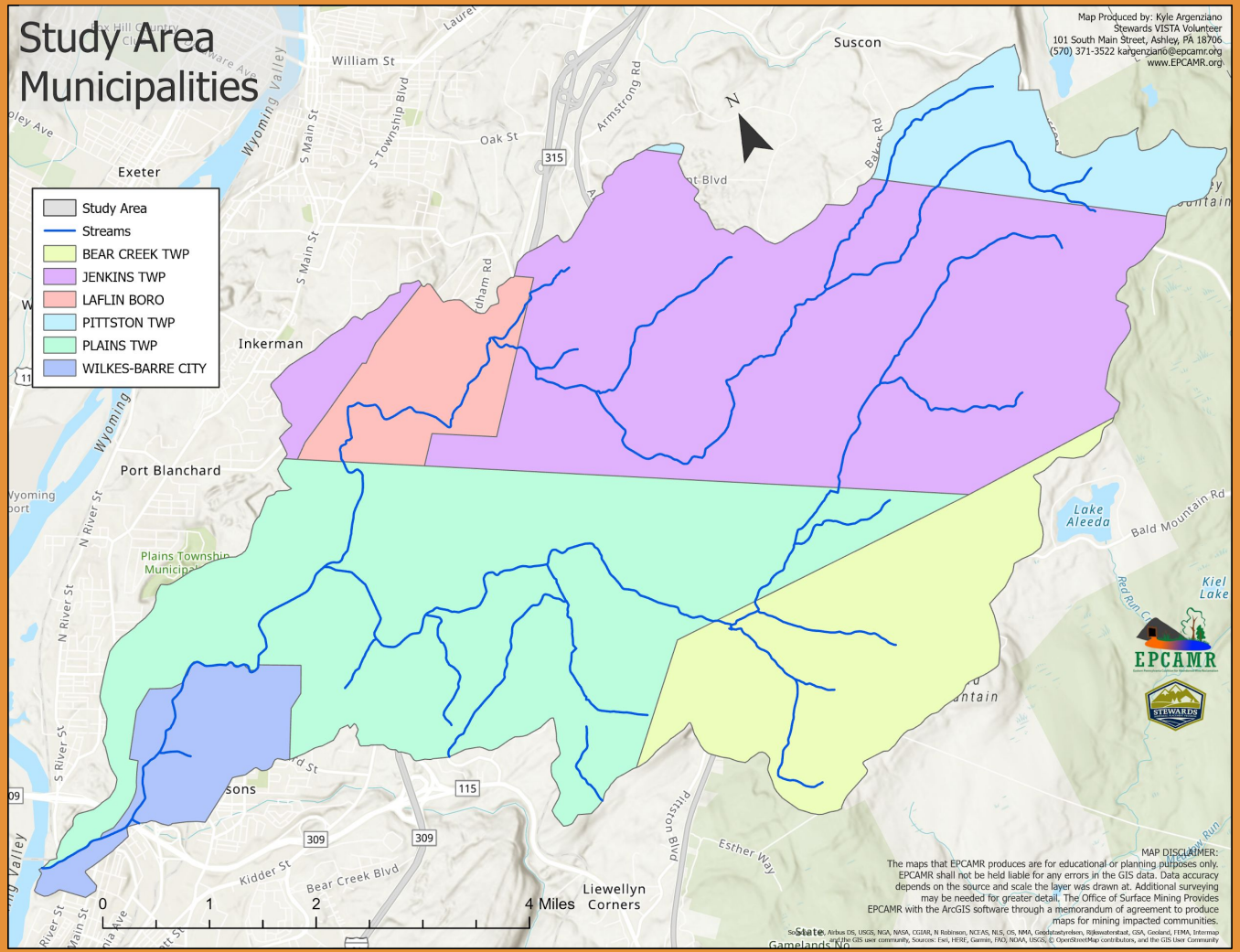
PowerPoint Presentations of Research, Assessment Work, and Culverts Assessed for Aquatic Organism Passage within the entire Mill Creek Watershed

Mill Creek Watershed Research and Documentation

EPCAMR

Eastern Pennsylvania Coalition for Abandoned Mine Reclamation

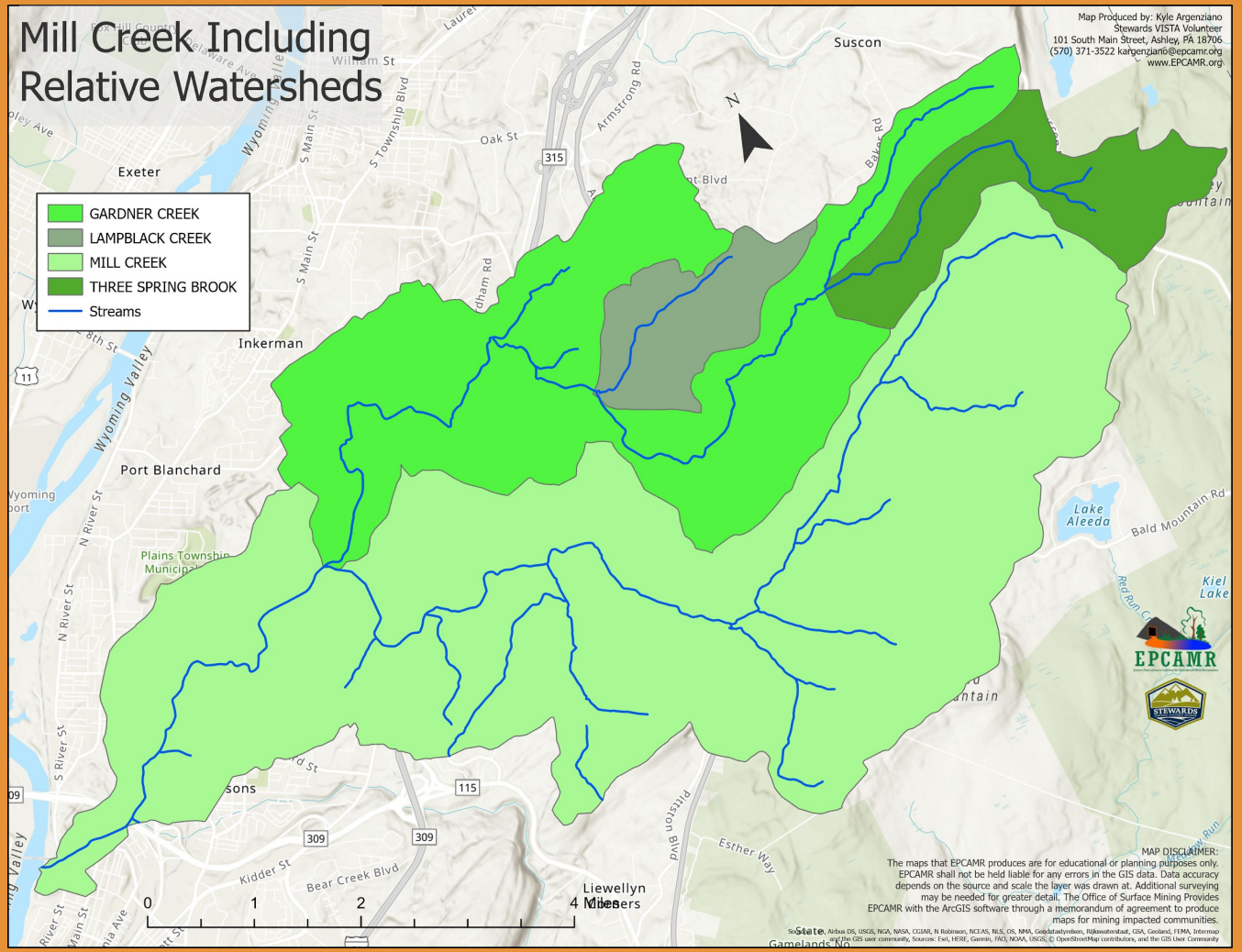
Study Area Municipalities



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

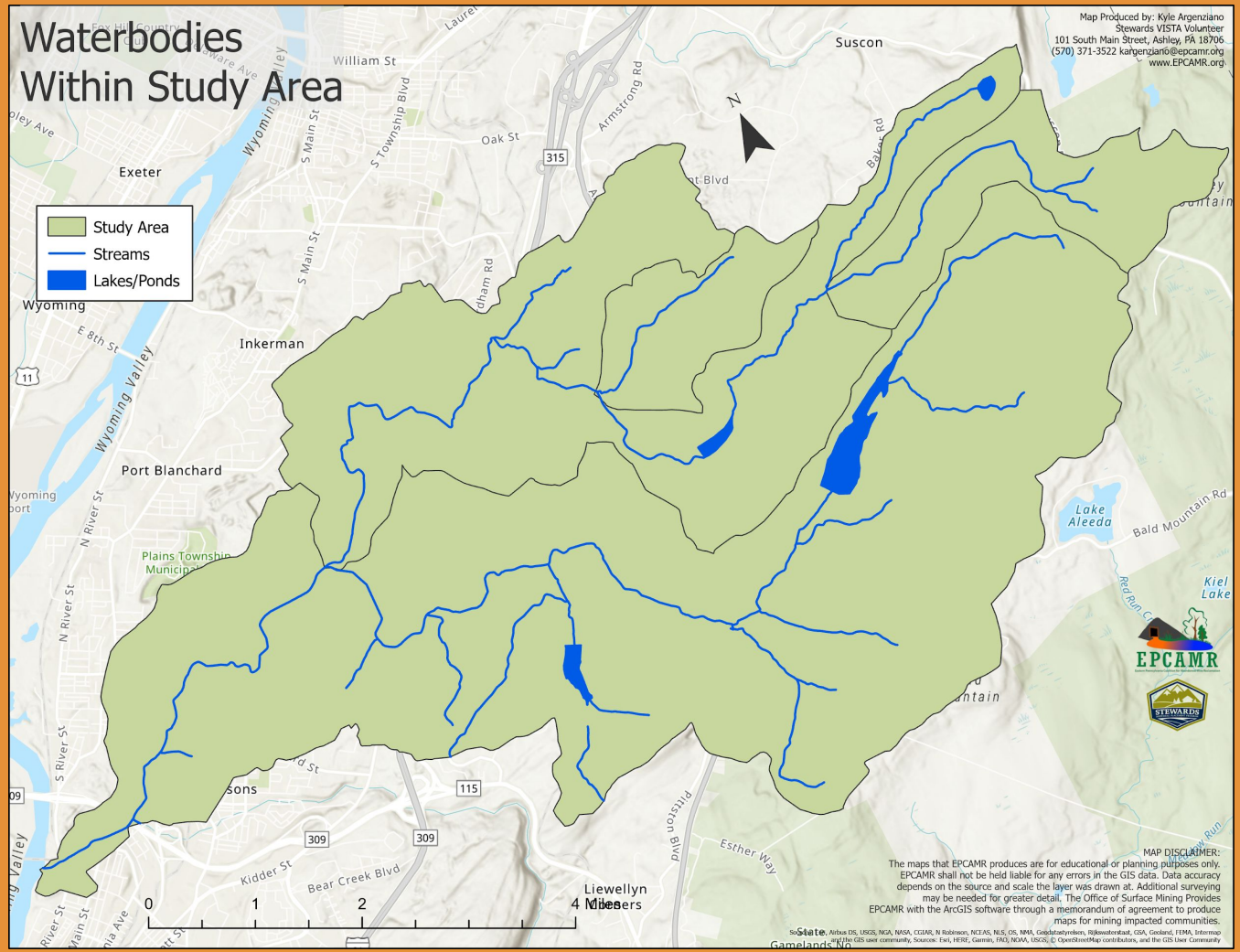
Mill Creek Watershed Overview



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Mill Creek Watershed Lakes and Ponds



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Hydrology Statistics

Stream Length (US Feet)	Stream Length (Miles)
273863.04	51.87

Pond Area (Square Feet)	Pond Area (Square Miles)	% Land Cover
10,928,333	0.39	0.93

Measurements taken via ArcGIS Analysis

Hydrology Statistics

Mouth Elevation (US Feet)	Location (Decimal Degrees)
521.31	41.26059, -75.87028

Headwater Elevations (US Feet)	Location (Decimal Degrees)
637.01	41.27607, -75.81822
852.39	41.29007, -75.78436
1377.06	41.26133, -75.75183
1617.87	41.24426, -75.75265

USGS, The National Map - Viewer

Measurements taken via ArcGIS Analysis

Mill Creek Reservoir

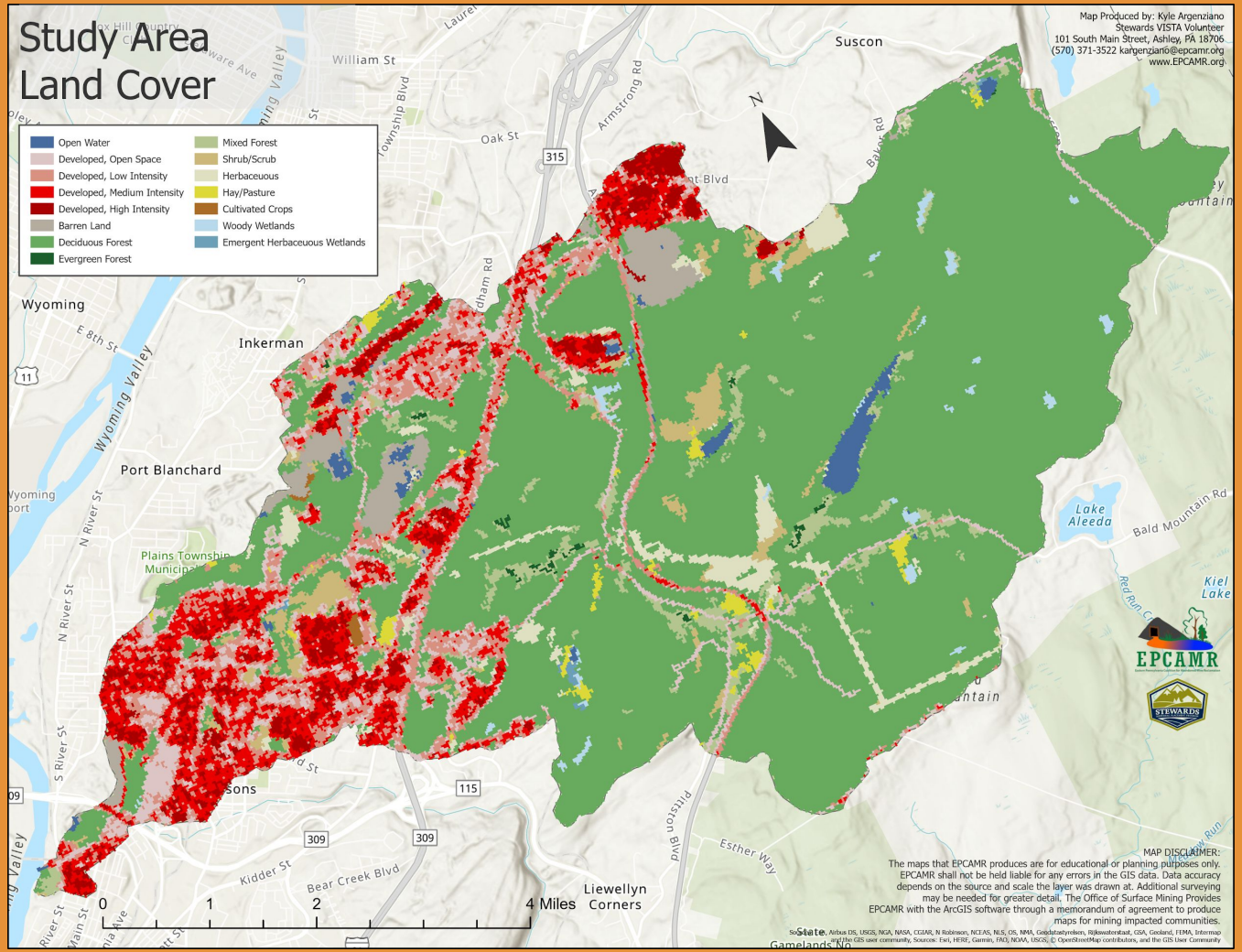
ArcGIS Pro

Mill Creek Reservoir

- Mill Creek Reservoir water is used to supplement the Watres Reservoir
- Watres Reservoir is supplemented by the Watres, Mill Creek, and Gardner's Creek Reservoirs
    - The intake of the Watres reservoir consists of three watersheds
        - Painter Creek
        - Panther Creek
        - Spring Brook
- Watres Reservoir supplies 7.42 million gallons of water daily to customers

PA American Water: 2020 Annual Water Quality Report (Ceasetown - Watres)

Mill Creek Watershed Land Cover



ArcGIS Pro

National Land Cover Database - Data (2016)

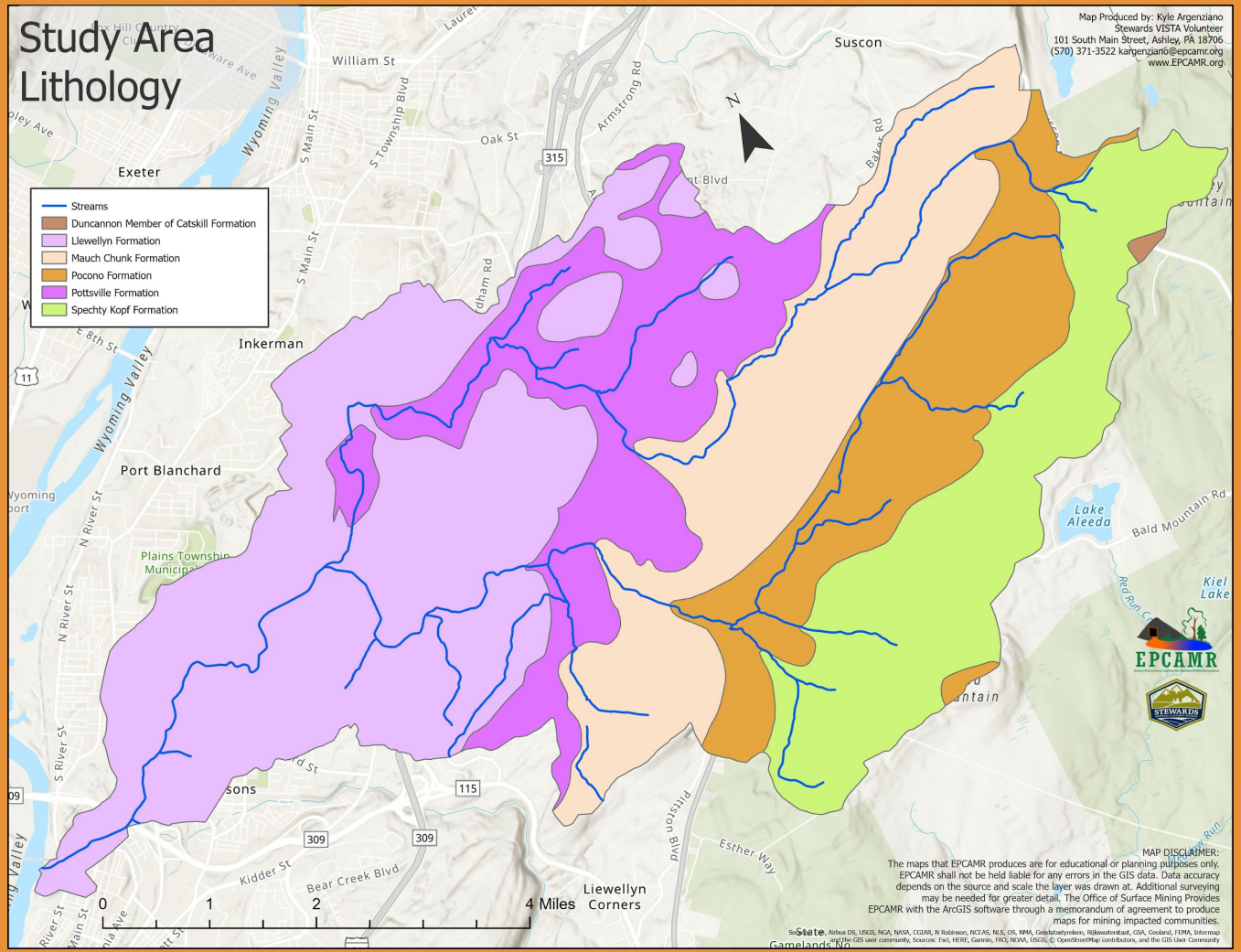
Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Land Cover Class Statistics

Land-Use Cover Class	Count	Area (Square Feet)	Percentage of Land Cover
Developed, High Intensity	2,233	21632230.76	3.252%
Herbaceous	1,517	14695966.89	2.209%
Cultivated Crops	86	833126.67	.125%
Developed, Medium Intensity	4,536	43942587.89	6.606%
Emergent Herbaceous Wetlands	73	707188.91	.106%
Shrub/Scrub	1,482	14356903.71	2.158%
Barren Land	1,731	16769096.04	2.521%
Evergreen Forest	119	1152814.81	.173%
Developed, Low Intensity	4,645	44998527.50	6.765%
Open Water	717	6945951.39	1.044%
Woody Wetlands	371	3594069.69	.540%
Developed, Open Space	3,580	34681319.36	5.214%
Hay/Pasture	487	4717821.94	.709%
Mixed Forest	1,638	15868156.74	2.386%
Deciduous Forest	45447	440268693.04	66.189%

Measurements taken via ArcGIS Analysis

Mill Creek Watershed Lithology

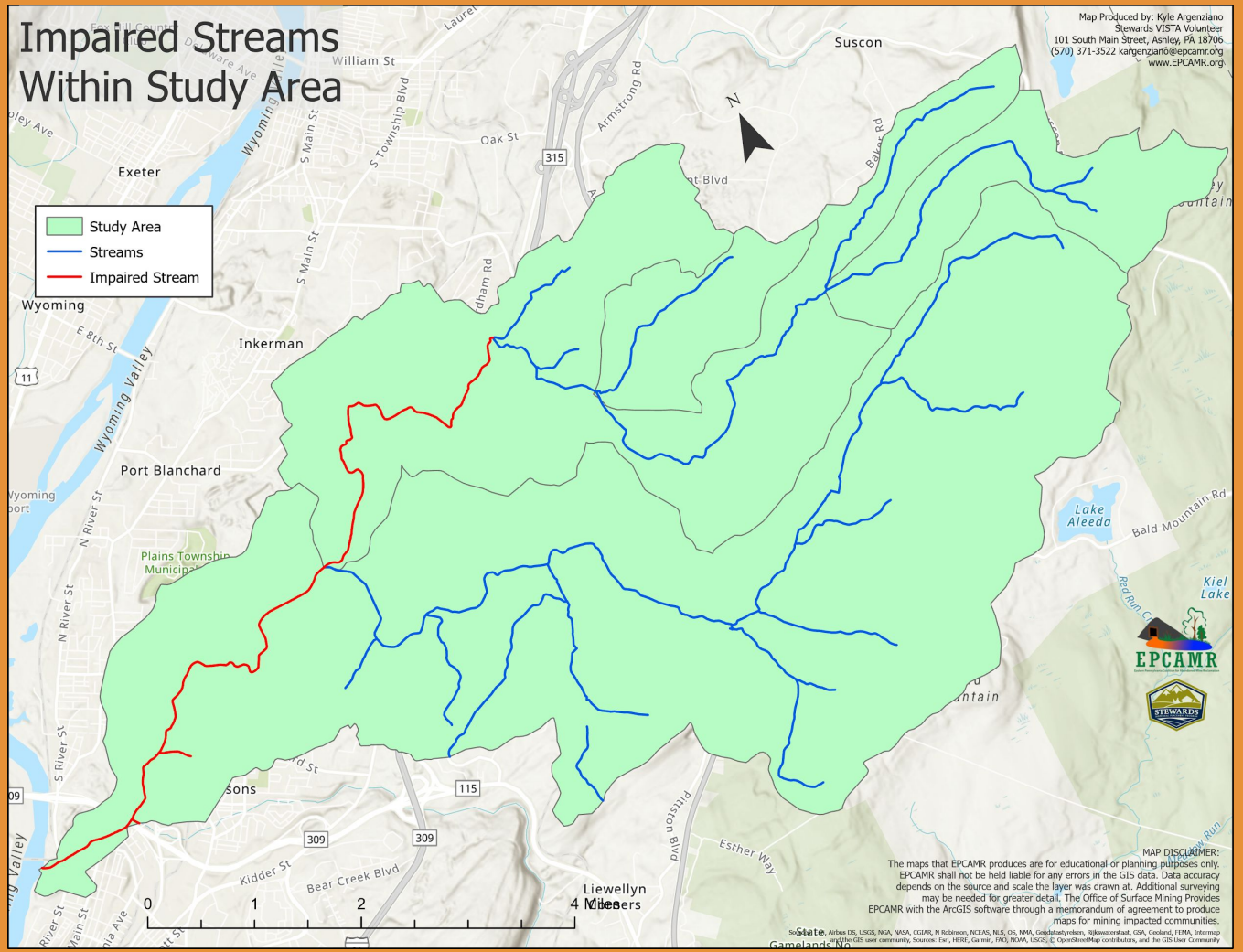


DCNR, Geology of Pennsylvania

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Mill Creek Watershed Impaired Streams



ArcGIS Pro

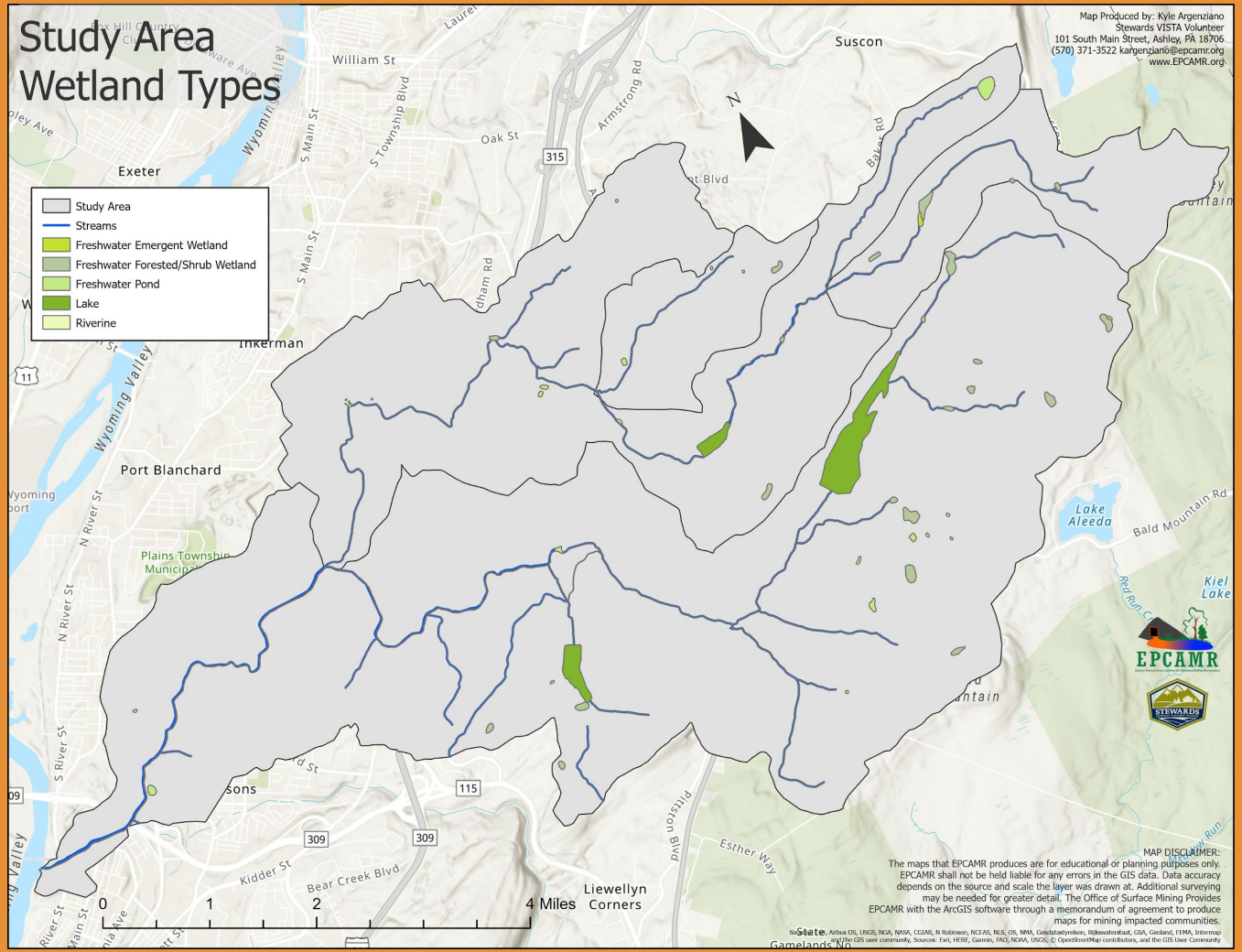
Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Stream Impairment Statistics (2020)

Impairment Reason	Stream Length (Feet)	Stream Length (Miles)	% Impaired
Urban runoff, AMD, pH, Flow Regime Modification	47900.16	9.072	17.491

Measurements taken via ArcGIS Analysis

Mill Creek Watershed Wetland Types



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

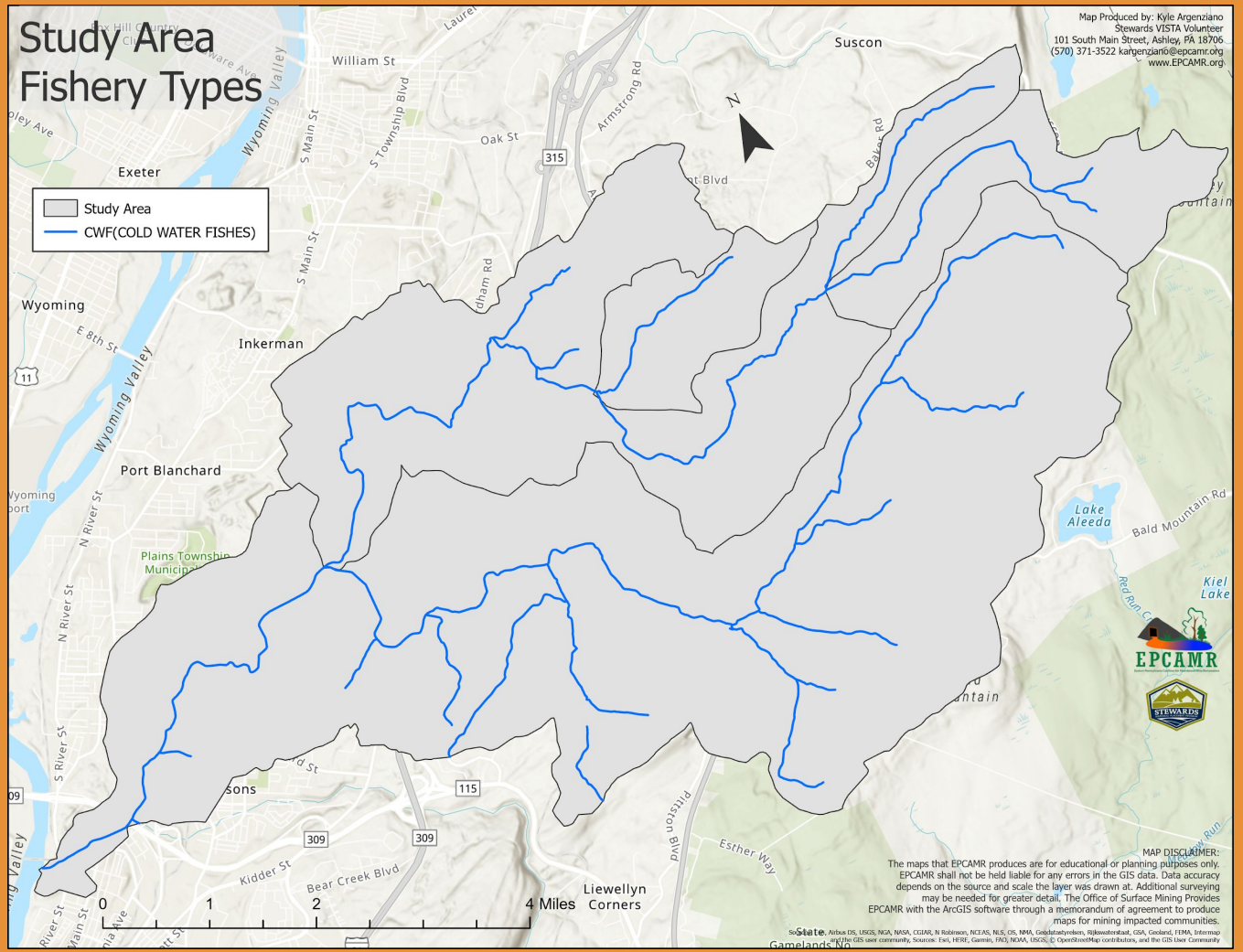
USFWS: Download Wetlands Data

Wetland Statistics

Number of Polygons	Wetland Area (Square Kilometers)	Wetland Area (Square Miles)	% Land Cover
82	2.24	0.86	2.05

Measurements taken via ArcGIS Analysis

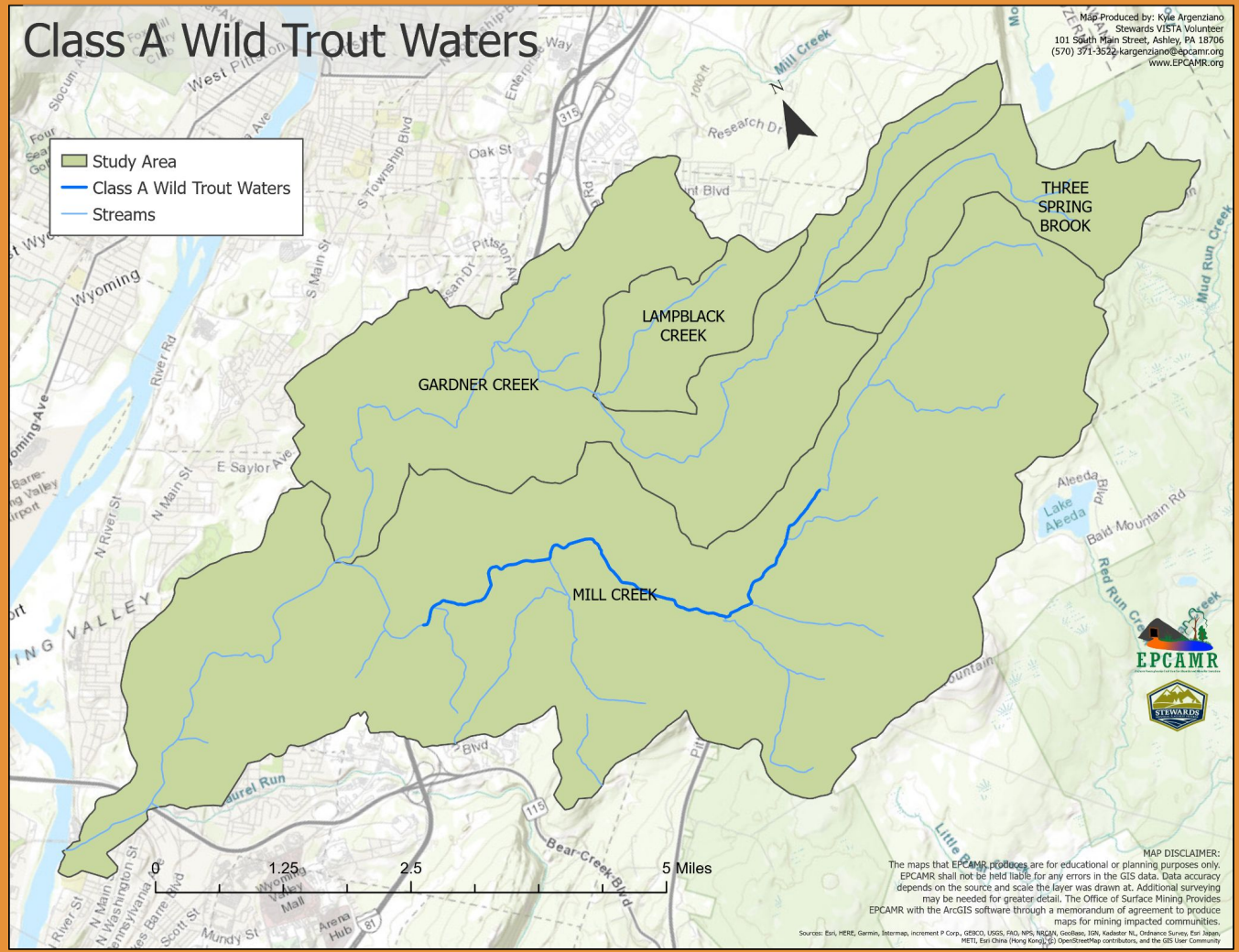
Mill Creek Watershed Fishery Types



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

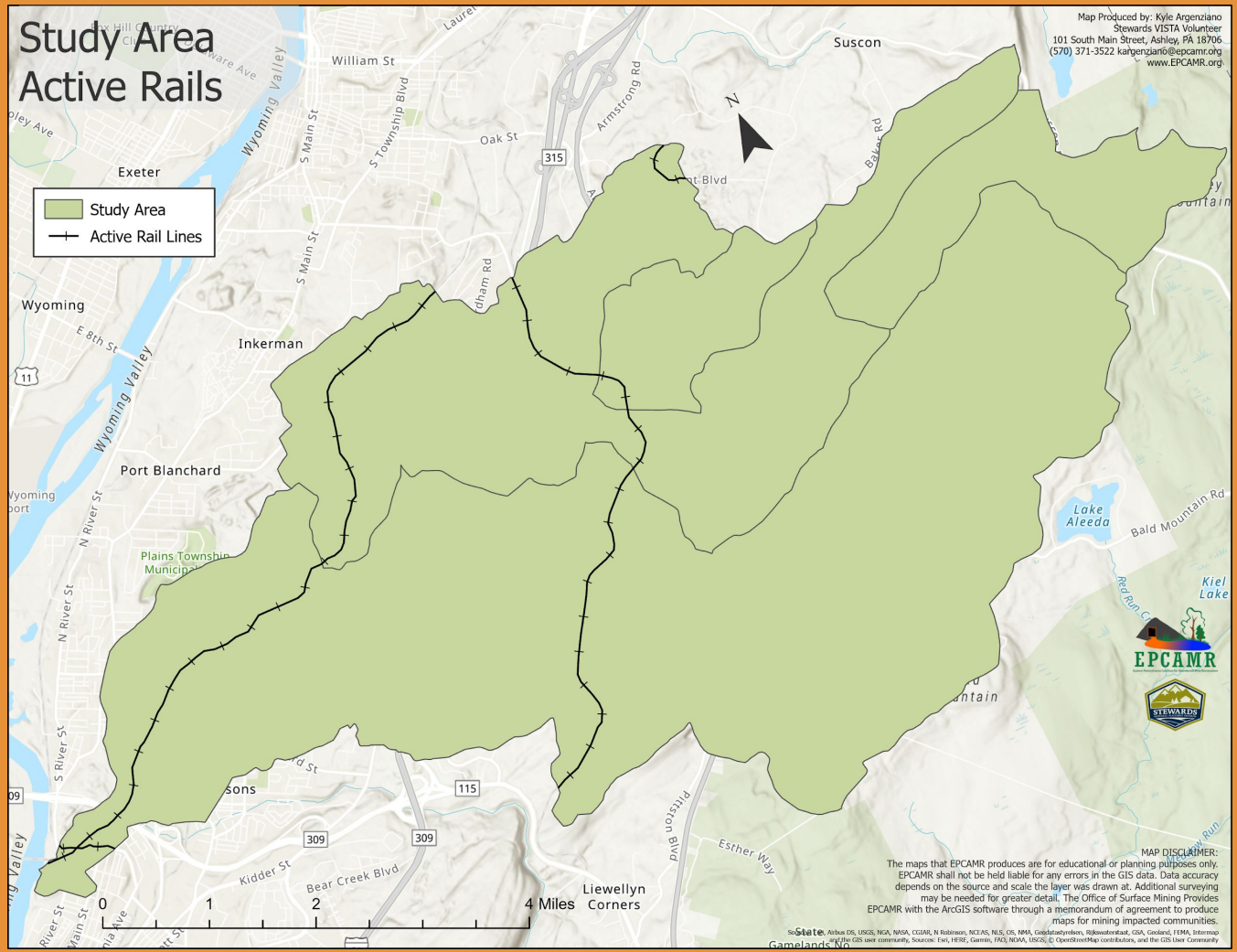
Mill Creek Watershed Class A Wild Trout Waters



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Mill Creek Watershed Active Rails



ArcGIS Pro

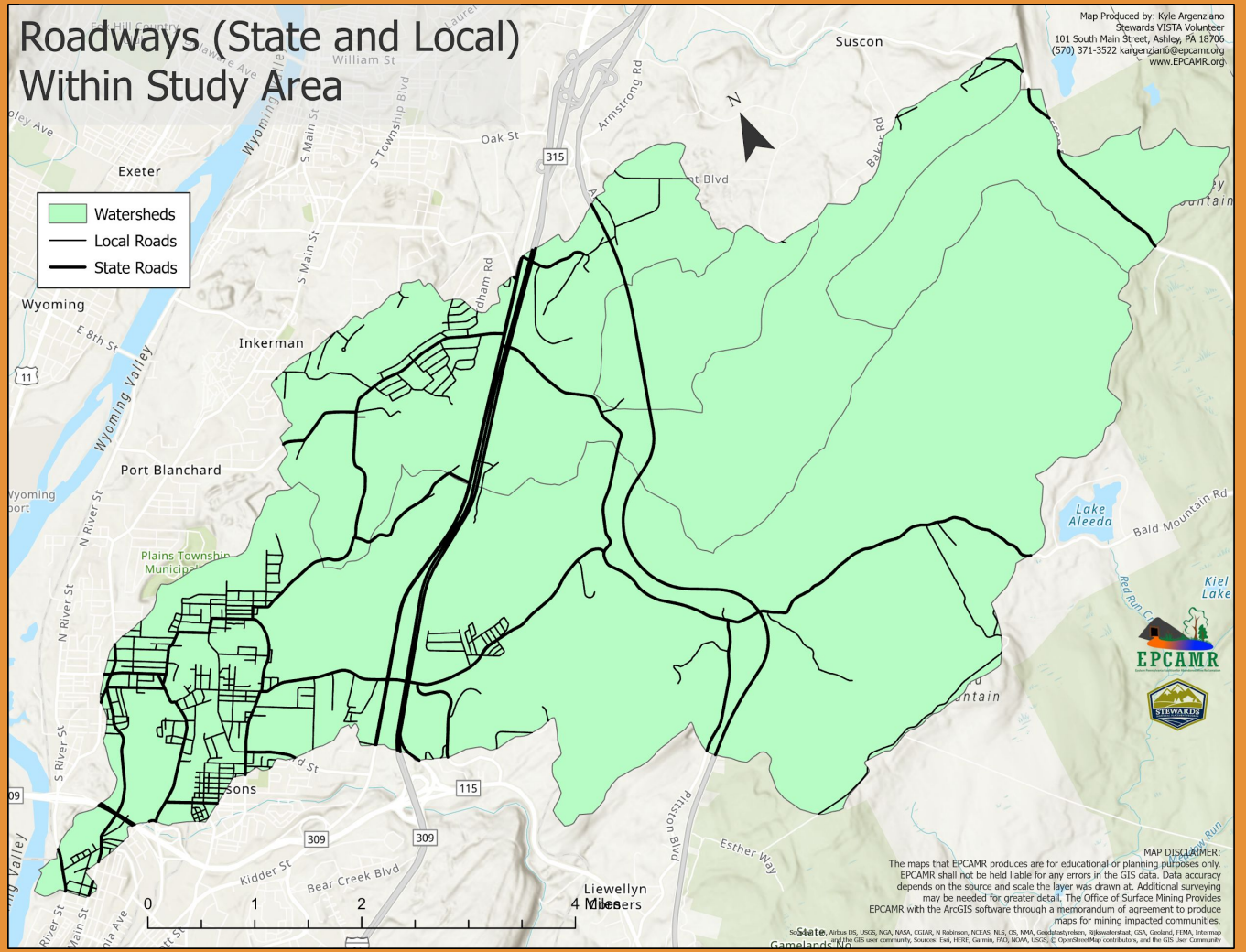
Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Active Rail Statistics

Active Rails (US Feet)	Active Rails (Miles)
75434.64	14.29

Measurements taken via ArcGIS Analysis

Mill Creek Watershed Roadways



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Roadway Statistics (2020)

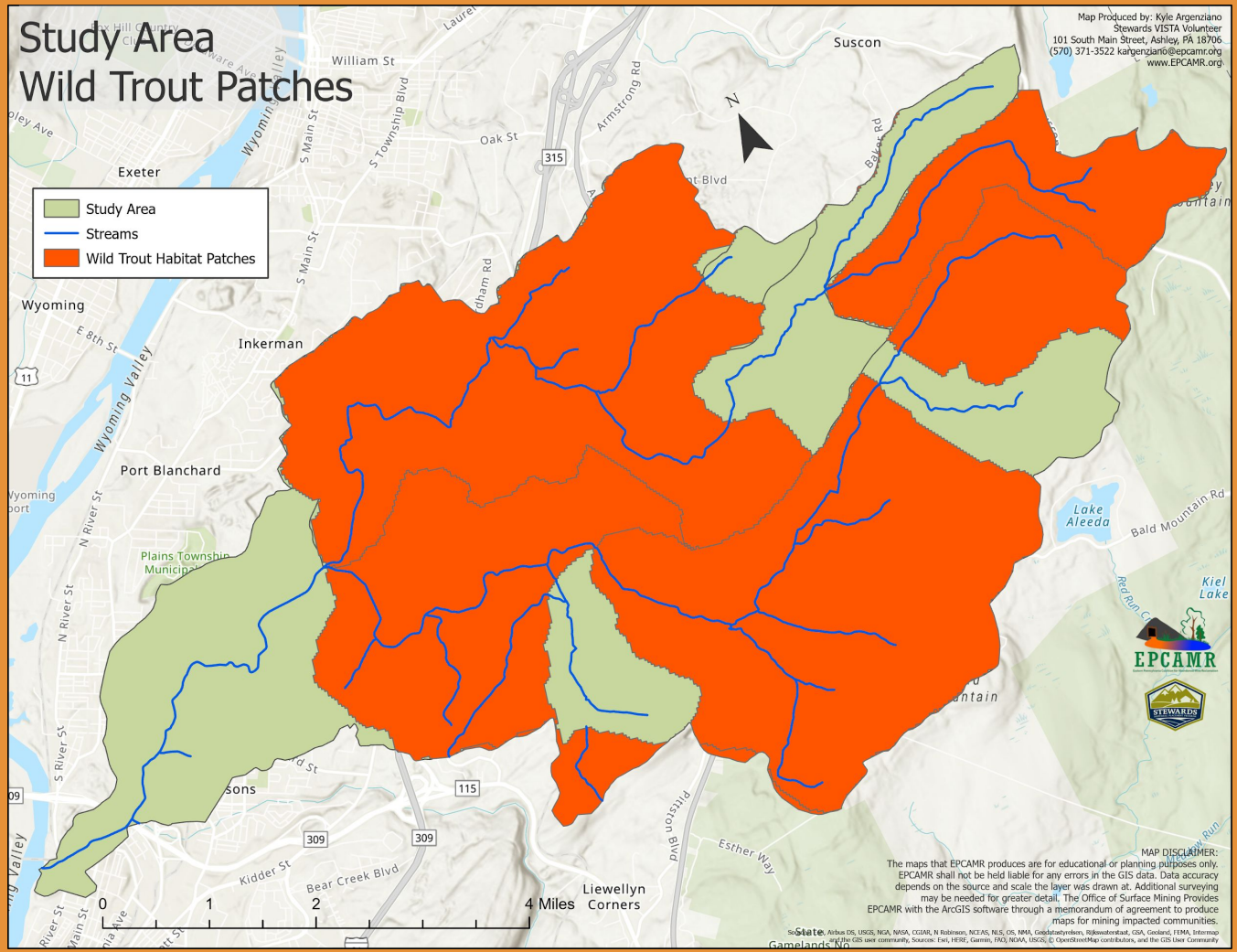
Roadways (Miles)	% State Roads	% Local Roads
130.596	45.002	54.998

Measurements taken via ArcGIS Analysis

Brook Trout Habitat

- Examples of good habitat are
  - Forested stretches of stream
  - Cool and clean water with spring inputs
  - Trout are excellent indicator of overall stream health and water quality
- **Habitat Patch**
  - According to Eastern Brook Trout: Roadmap to Restoration
    - “ A group of contiguous catchments occupied by wild trout”
    - “ Patches are not connected physically (i.e., they are separated by a dam, unoccupied warm water habitat, downstream invasive species, etc.) “
    - “Are generally assumed to be genetically isolated.”

Mill Creek Watershed Wild Trout Patches



ArcGIS Pro

Eastern Brook Trout Joint Venture - Data and Tools

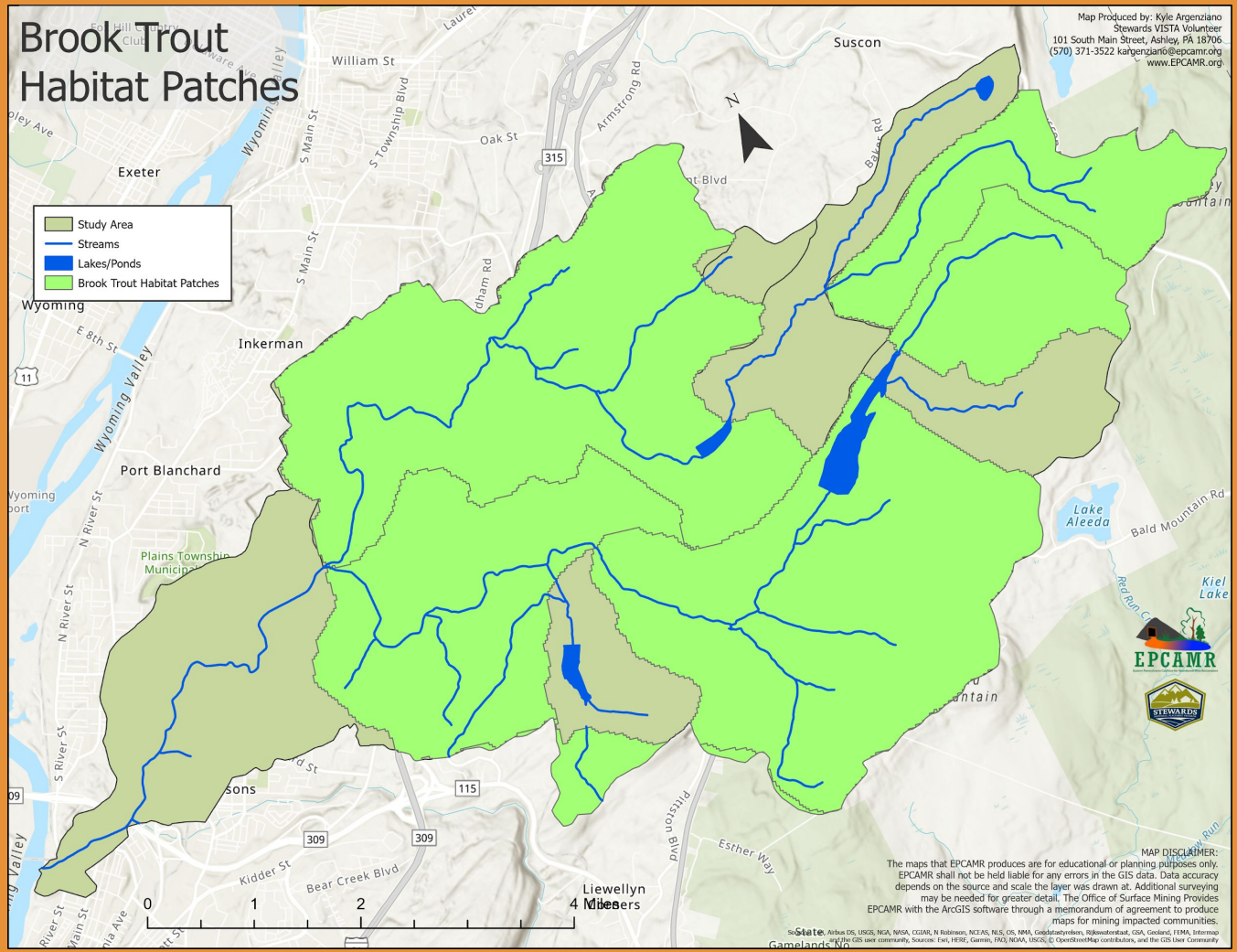
Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Habitat Patch Statistics

Wild Trout Patch Area (Square Miles)	30.454
% Land Cover	72.312

Measurements taken via ArcGIS Analysis

Mill Creek Watershed Habitat Patches



ArcGIS Pro

Eastern Brook Trout Joint Venture - Data and Tools

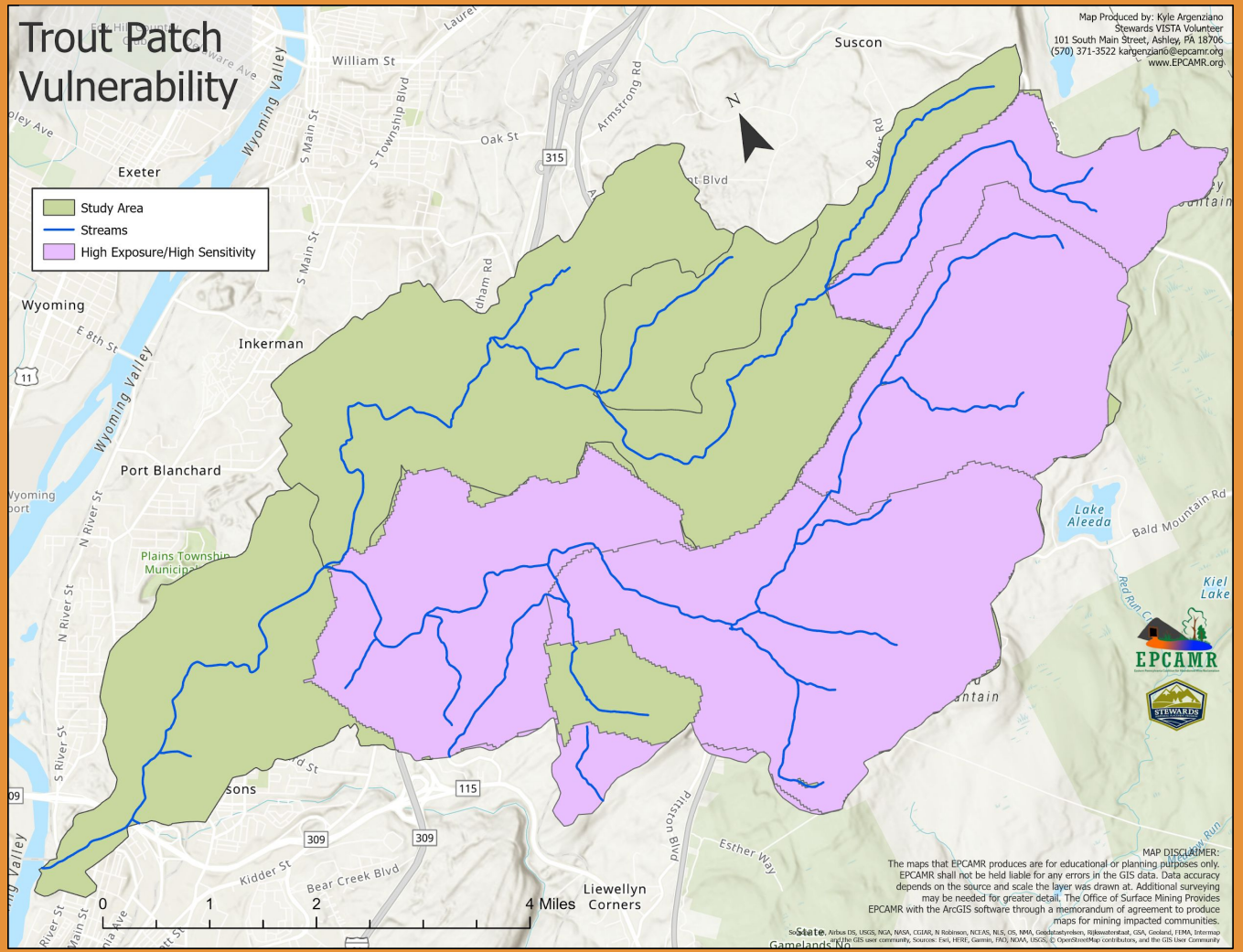
Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Habitat Patch Statistics

- **Habitat Patch**
  - According to Eastern Brook Trout: Roadmap to Restoration
    - " A group of contiguous catchments occupied by wild trout"
    - " Patches are not connected physically (i.e., they are separated by a dam, unoccupied warm water habitat, downstream invasive species, etc.) "
    - "Are generally assumed to be genetically isolated."

Brook Trout Patch Area (Square Miles)	30.454
% Land Cover	72.312

Mill Creek Watershed Trout Patch Vulnerability



ArcGIS Pro

Eastern Brook Trout Joint Venture - Data and Tools

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Vulnerability Defined

According to: Ranking Site Vulnerability to Increasing Temperatures in Southern Appalachian Brook Trout Streams in Virginia: An Exposure - Sensitivity Approach — EBTJV

Habitat vulnerability:

- Determined by two factors
  - Sensitivity (predicted change in water temperature per unit increase in air temperature)
  - Exposure (predicted frequency, magnitude, and duration of threshold water temperatures
- Ranked Low or High for both factors and combined
  - Low Exposure / Low Sensitivity (LE / LS)
  - High Exposure / High Sensitivity (HE / HS)
  - High Exposure / Low Sensitivity (HE / LS)
  - Low Exposure / High Sensitivity (LE / HS)

Measurements taken via ArcGIS Analysis

Ranking Site Vulnerability to Increasing Temperatures in Southern Appalachian Brook Trout Streams in Virginia: An Exposure - Sensitivity Approach — EBTJV

Vulnerability Statistics

Vulnerable Area (Square Miles)	22.701
% of Land Cover	53.903

Measurements taken via ArcGIS Analysis

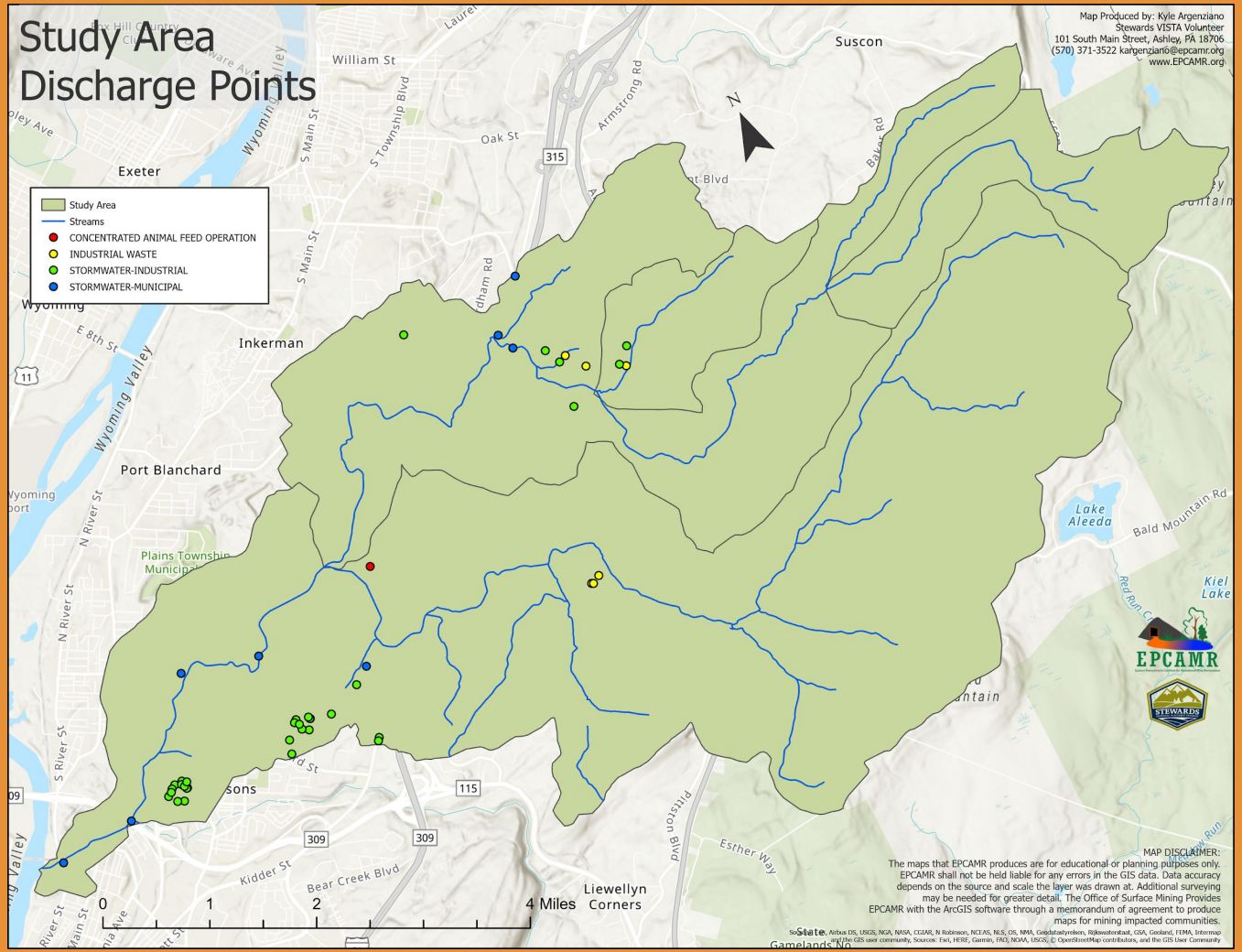
Ranking Site Vulnerability to Increasing Temperatures in Southern Appalachian Brook Trout Streams in Virginia: An Exposure - Sensitivity Approach — EBTJV

Water Pollution Control Facilities (DEP)

- DEP Primary Facility related to Water Pollution Control Program (WPCP)
- Includes
  - Treatment Plants and Storage Units
  - Land and Stream Discharges
  - Conveyance Systems and Conduits
  - Cooling Water Intake Structures
  - Biosolids Treatment and Processing
  - Agricultural Activities, Pesticide Treatment Areas, Manure Management, CAFOs
  - Internal and Groundwater Monitoring Points

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Mill Creek Watershed Discharge Points



ArcGIS Pro

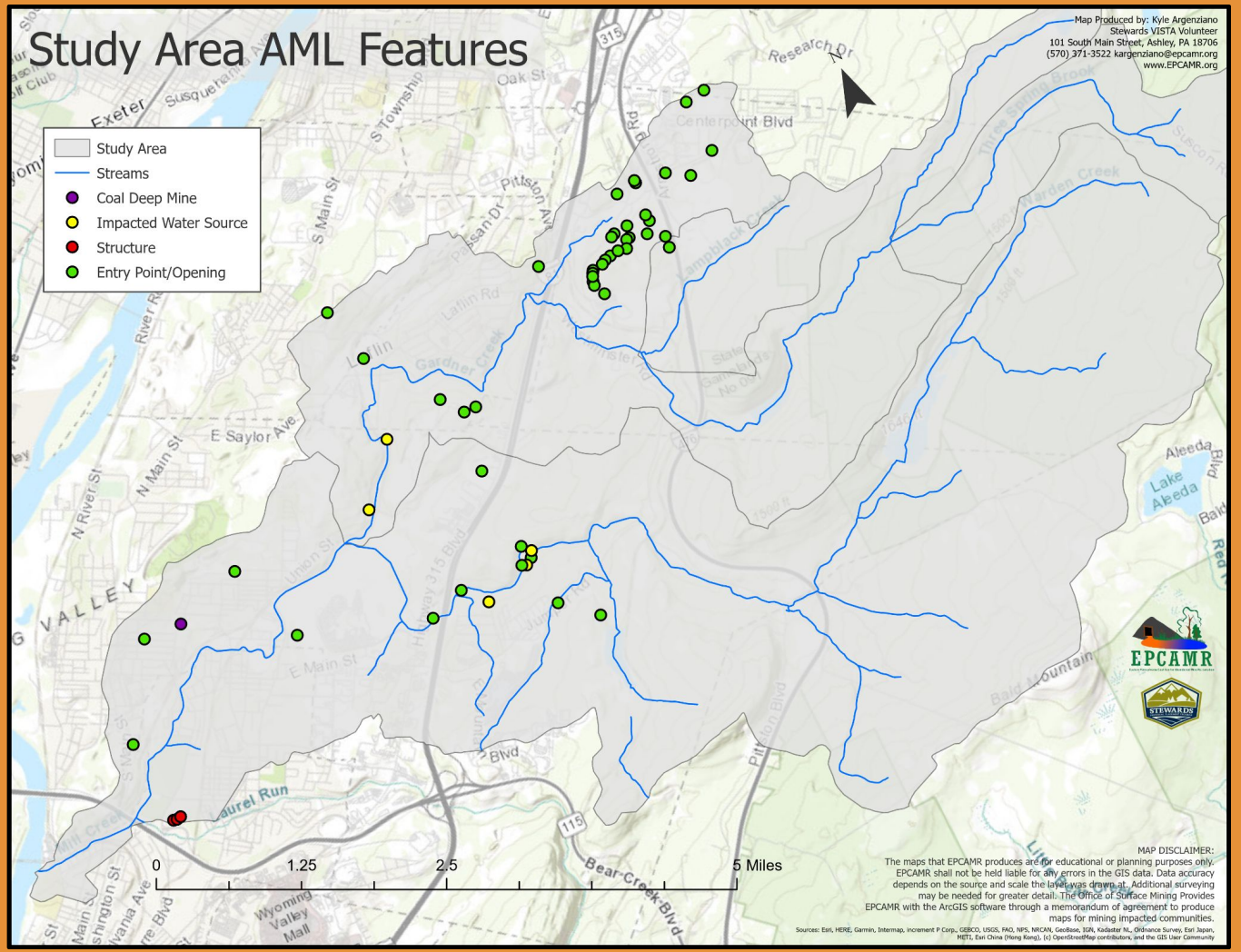
Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Discharge Point Statistics

	Number	Percentage
Total Registered DEP Sites	50	NA
Municipal Stormwater	11	22
Industrial Stormwater	32	64
Industrial Waste	6	12
Concentrated Animal Feed Operation	1	2

Measurements taken via ArcGIS Analysis

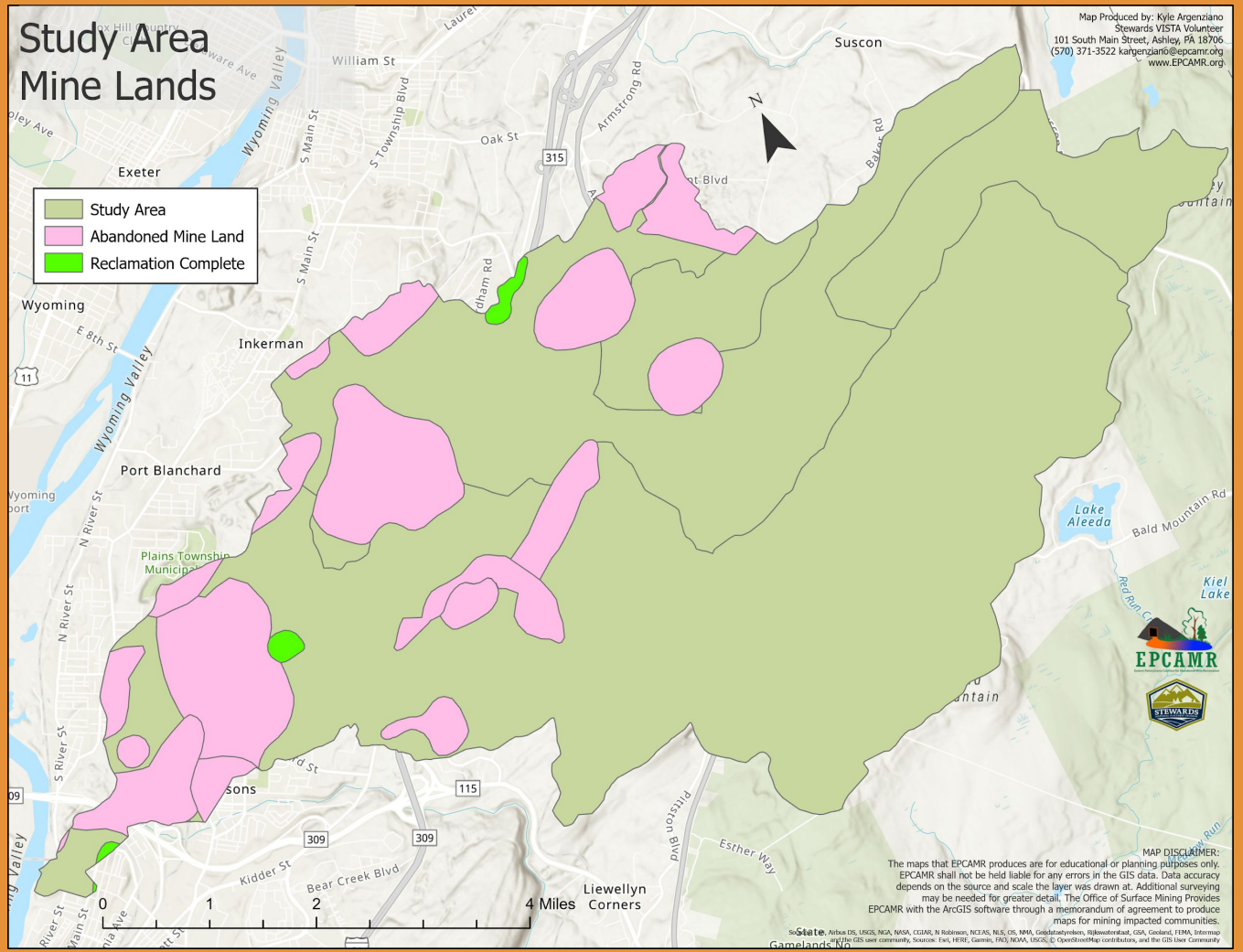
AML Features



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Mill Creek Watershed Mine Lands



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Mine Land Statistics

Total AML

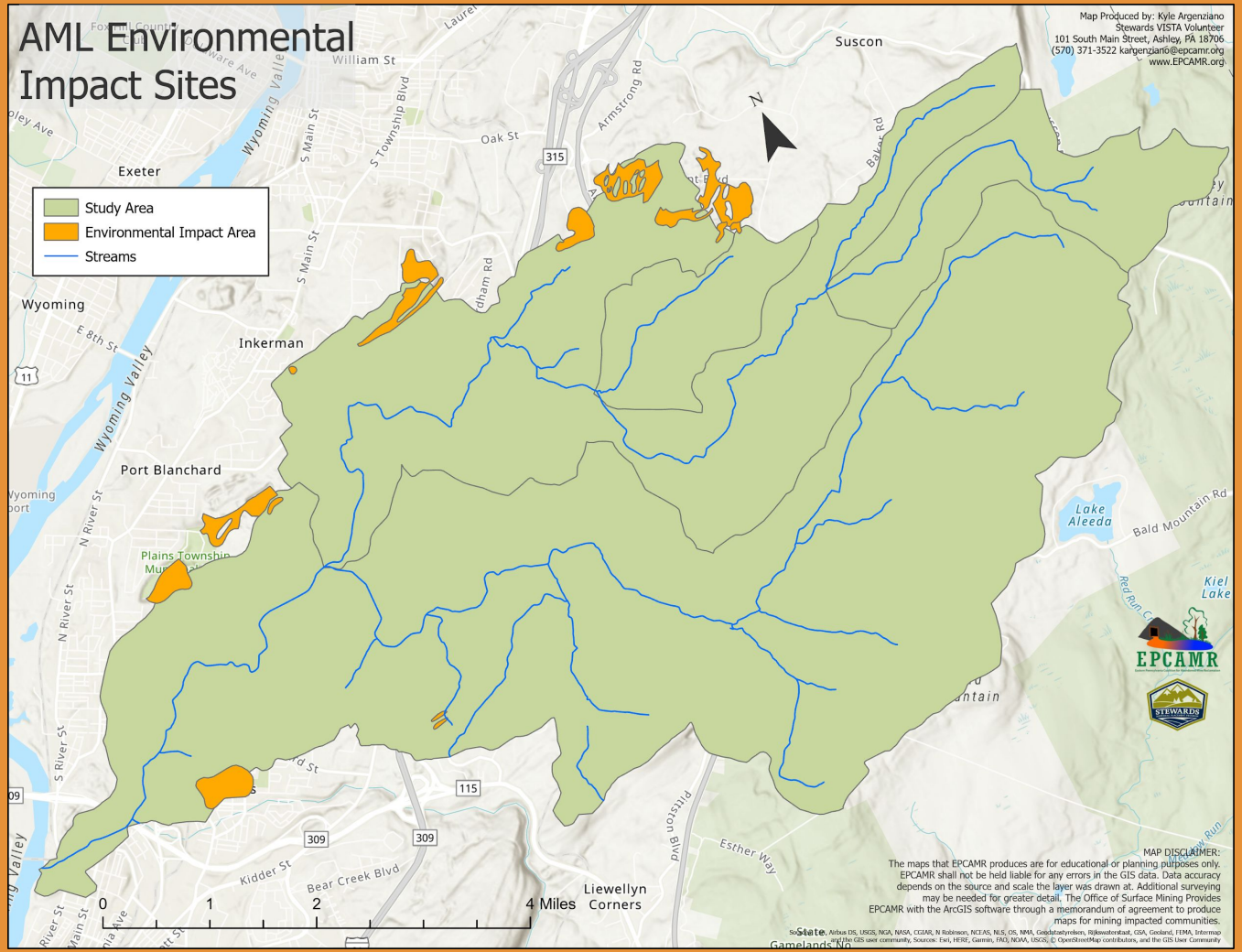
Total AML Site Coverage (Square Miles)	19.877
% Land Cover	18.223

Reclaimed AML

Total Reclaimed Site Coverage (Square Miles)	0.186
% Land Cover	0.442

Measurements taken via ArcGIS Analysis

Mill Creek AML Environmental Impact Sites

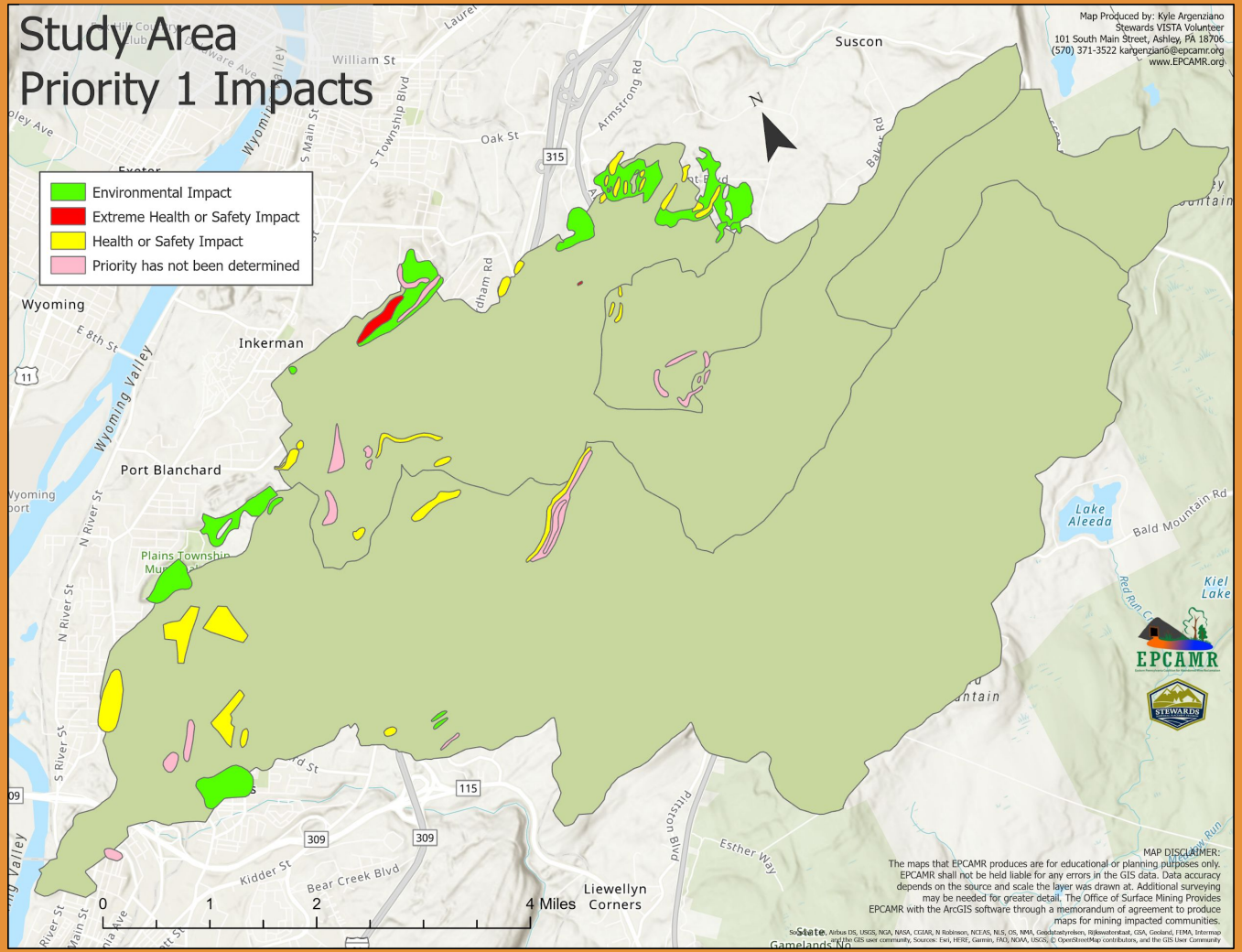


ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Mill Creek Watershed AML Priority Impacts

Priority 1 - Red
Priority 2 - Yellow
Priority 3 - Green

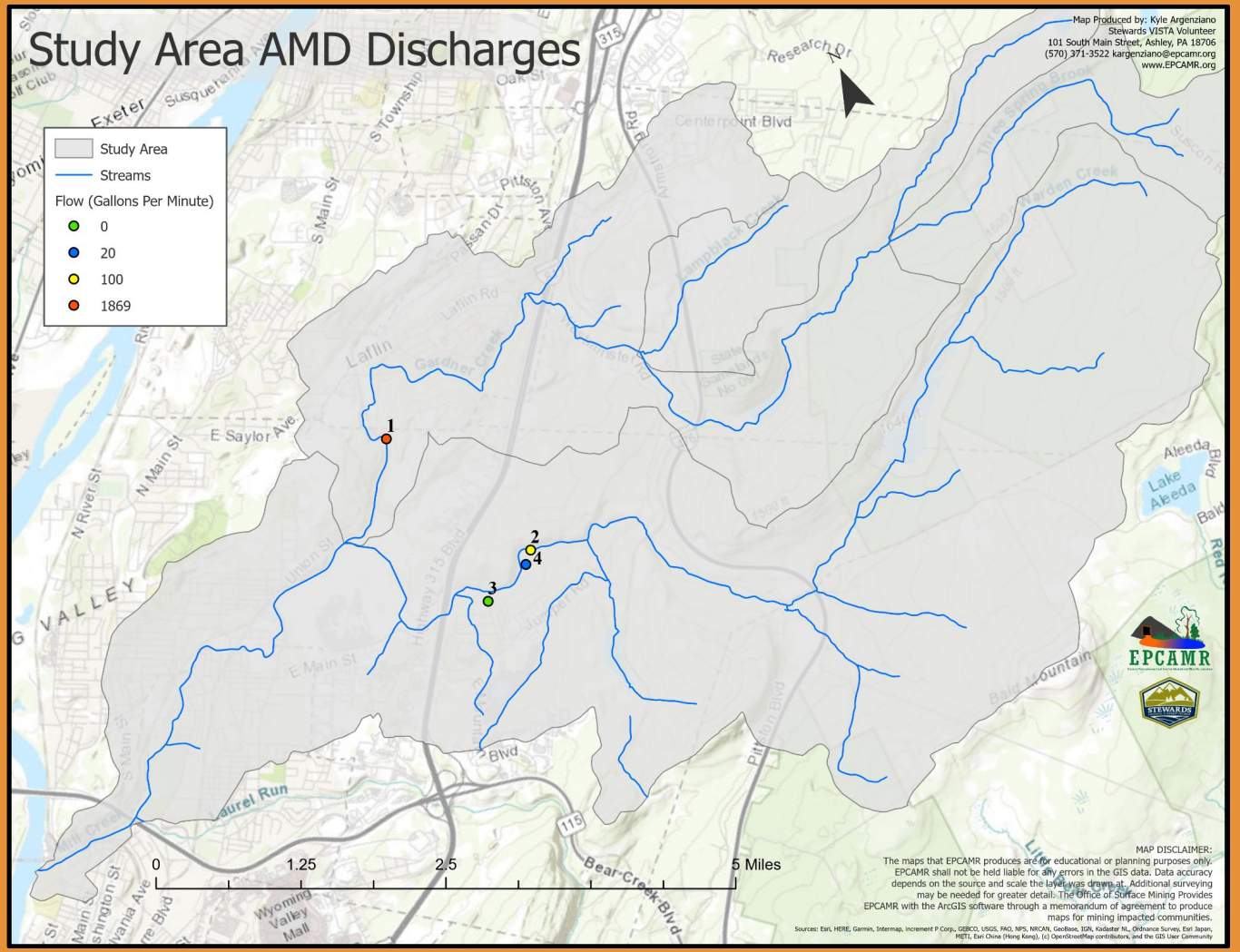


ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Mill Creek Watershed AMD Discharges

Associate feature labels to table below.



ArcGIS Pro

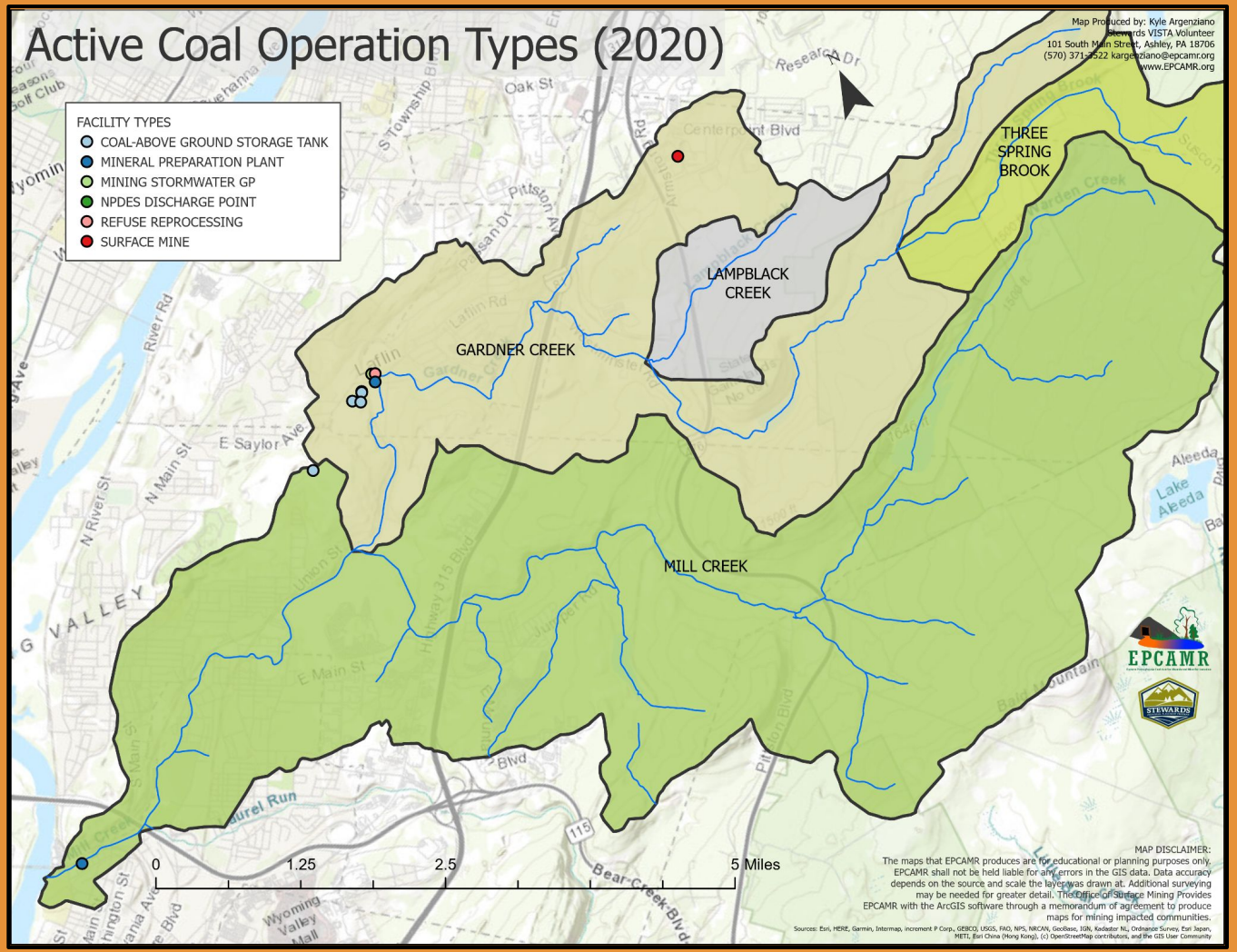
Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Abandoned Mine Drainage Discharge Statistics

Point	Status	Priority	Flow (GPM)
1	Abandoned	Priority has not been determined	1869
2	Abandoned	Environmental Impact	100
3	Reclamation Complete	Priority has not been determined	0
4	Abandoned	Environmental Impact	20

Measurements taken via ArcGIS Analysis

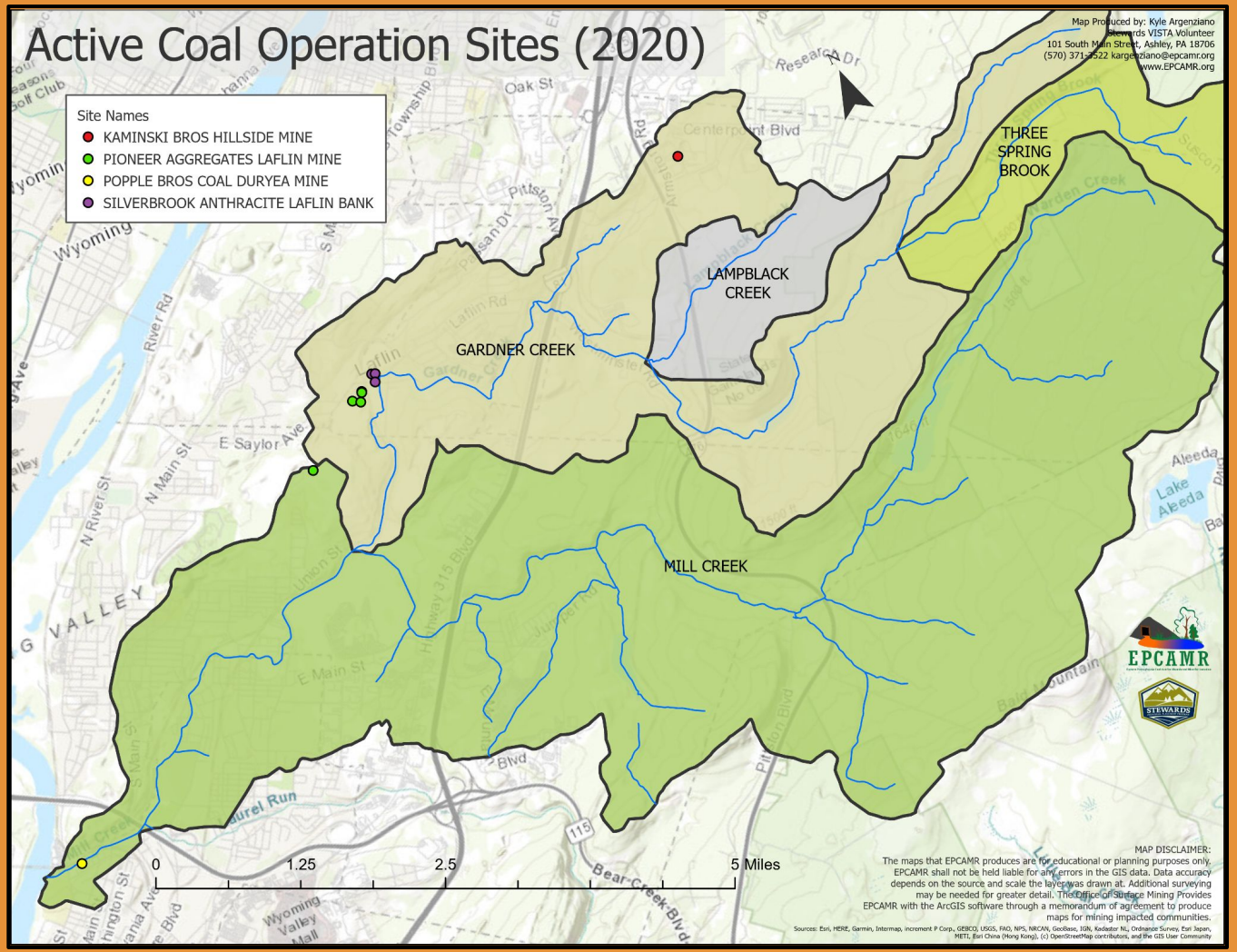
Active Coal Operation Types



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Active Coal Operations

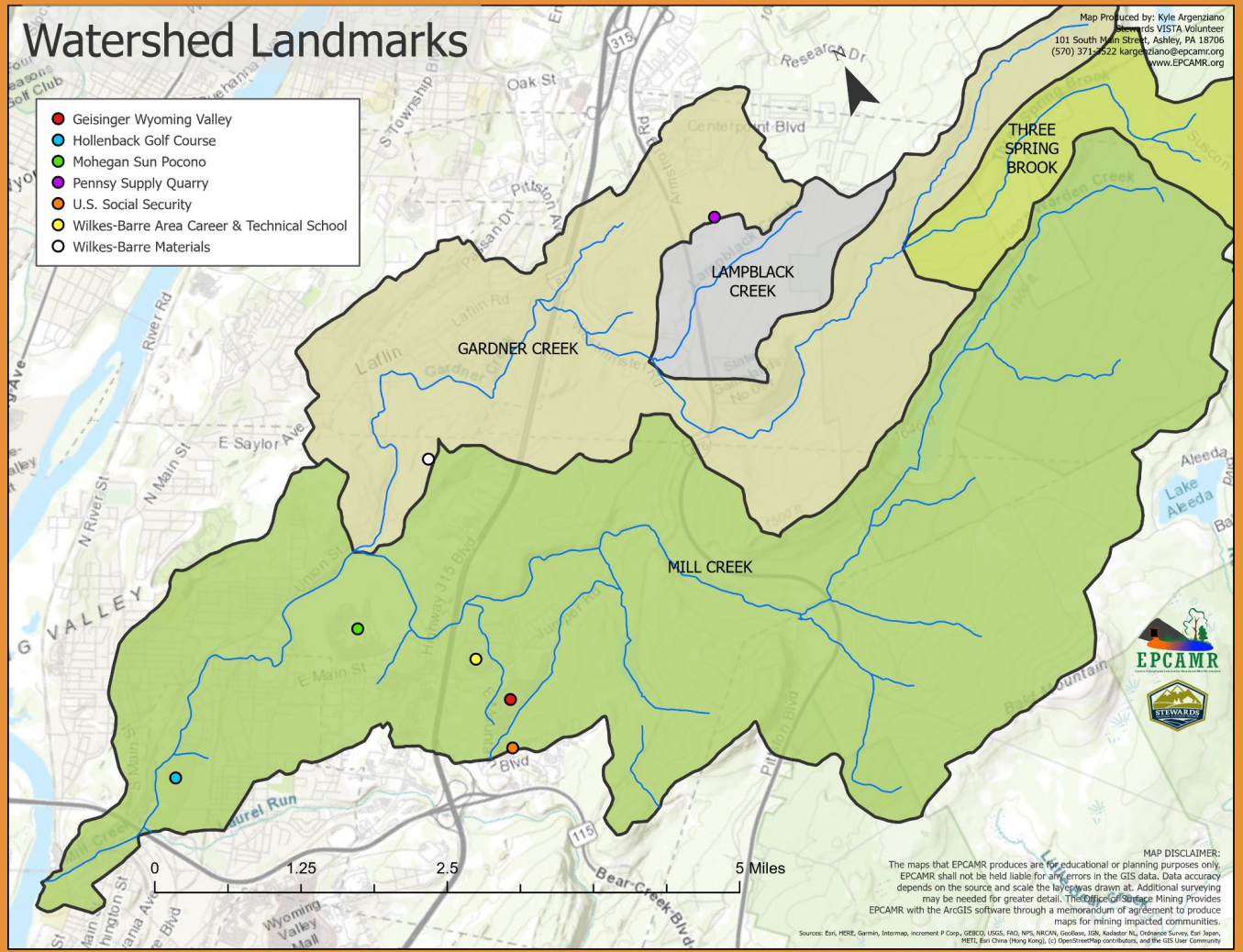


ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

LANDMARKS

Watershed Landmarks



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps

Mohegan Sun Pocono Downs

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps Satellite View

Mohegan Sun Pocono Downs

Mohegan Sun Pocono - About

- 400 acre property
- 20,000 square foot Convention Center

Geisinger Medical Center

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps Satellite View

Geisinger Wyoming Valley Medical Center

Geisinger Wyoming Valley Medical Center: About

- 25,000 square foot facility

Geisinger Wyoming Valley Medical Center

U.S. Social Security Administration

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps Satellite View

Wilkes-Barre Area Career and Technical Center

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps Satellite View

Hollenback Golf Course

- 102.6 acres in size

- 9-Hole Municipal Course

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps Satellite View

Citizens Voice: Hollenback Golf Course

Former Prospect Mine: Soon to be the New WBASD High School

Google Maps Satellite View

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

New Wilkes-Barre Area School District High School

pahomepage.com:
Wilkes-Barre Area School District New High School

New Wilkes-Barre Area School District High School

pahomepage.com:
Wilkes-Barre Area School
District New High School

Former Prospect Mine

- Jeddo Highland Coal Co. had permits for Refuse Reprocessing and a NPDES Discharge Point.
- Reclamation is Complete and In Compliance.
- Now the Wilkes-Barre Area School District New High School.

QUARRIES AND COAL

Active Anthracite Coal Refuse Production and Reclamation

Anthracite Coal Refuse Production in Luzerne County (2020)

Luzerne County

Company	Permit	Site Name	Surface Permit Acres	Total Tons Production	Number of Employees	Hours Worked	Accidents Fatal	Accidents Non-Fatal
Emerald Anthracite II	40050201	7 Washery	83.6	24,432	5	6,311	0	0
Emerald Anthracite II	40823205	Truedale Mine	239.0	11,032	5	3,701	0	0
Diamond Coal Co Inc	40830202	Lattimer Mine	141.0	21,599	27	32,516	0	0
Heavy Media Inc	40763206	Loree Bank	77.0	500	1	10	0	0
Jeddo Highland Coal Co	40990201	Franklin Bank	194.4	633	2	31	0	0
Newport Aggregate Inc	40150201	West End Bank	78.0	500	1	10	0	0
Northampton Fuel Supply Inc	40763204	Glen Lyon 6	61.2	527	1	97	0	0
Northampton Fuel Supply Inc	40900203	Glen Lyon S Mine	49.5	511	1	97	0	0
Northeast Energy Co	40850202	Laurel Mine	29.0	0	7	10,436	0	1
Luzerne County Total	**9**		**952.7**	**59,734**	**50**	**53,209**	**0**	**1**

As of 2020, there are no active underground or strip mines in the watershed. There are refuse reprocessing operations (noted in the table above) which are helping in the cleanup of abandoned mine lands by removing waste coal piles.

2020 ANTHRACITE COAL REFUSE PRODUCTION - LISTED BY COUNTY

Wilkes-Barre Materials LLC

Stream in close proximity to large culm bank although it is buffered by a heavily wooded area around the perimeter.

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps Satellite View

2020 INDUSTRIAL MINERALS SURFACE / UNDERGROUND MINES REPORTING PRODUCTION - LISTED BY COUNTY

Wilkes-Barre Materials LLC

2020 INDUSTRIAL MINERALS SURFACE / UNDERGROUND MINES REPORTING PRODUCTION - LISTED BY COUNTY

- Permit - 6473SM3
- Permit Acres - 138.0
- Total Tons Production - 523,260
- Mineral - Sandstone

Pennsy Supply Quarries

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps Satellite View

Pennsy Supply

- Jenkins Township
- Sandstone Quarries
- Pittston East Quarry (Permit # 40970302)
  - 52.0 acres
  - 413,469 Tons production
- Pittston West Quarry (Permit # 6475SM10)
  - 128.9 acres
  - 275,646 Tons production

Pennsylvania Active Industrial Minerals Mining Permits - November 2020

2015 INDUSTRIAL MINERALS SURFACE / UNDERGROUND MINES REPORTING PRODUCTION - LISTED BY COUNTY

Laflin Bank Casey-Kassa Coal-Silverbrook Anthracite

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps Satellite View

Laflin Bank

- Silverbrook Anthracite has permits for Refuse Reprocessing and a NPDES Discharge Point and is Active and In Compliance

Hillside Mine: Now the Center Point Industrial Park

Google Maps Satellite View

Hillside Mine

- Kaminski Bros. had permits for a Surface Mine.
- Reclamation is Complete and In Compliance.
- Now the Center Point Industrial Park (southern end).

Pioneer Aggregates Laflin Mine and Quarry

ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Google Maps Satellite View

Pioneer Aggregates Laflin Mine and Plains Quarry

- Laflin Mine
  - Permit # 40940101
  - 64 Acres
  - 4,847 Tons production
- Plains Quarry
  - Permit # 40060301
  - 162.0 Acres
  - 20,532 Tons production
  - Anthracite

2017 ANTHRACITE SURFACE MINES REPORTING PRODUCTION - LISTED BY COUNTY

FISHING REPORTS

Wild Trout Limits within the Mill Creek Watershed

Water	Tributary To	Wild Trout Limits
Deep Creek	Mill Creek	Headwaters downstream to mouth
Mill Creek	North Branch Susquehanna River	Mill Creek Reservoir Downstream to Gardner Creek
Three Spring Brook	Gardner Creek	Headwaters downstream to mouth

Pennsylvania Wild Trout Waters (Natural Reproduction) - July 2020 County of Mouth Water Trib To Wild Trout Limits Lower Limit La

HISTORY

Name Origin of Mill Creek

Oscar Jewell Harvey: "A History of Wilkes-Barre, Luzerne County, PA..."

"In the Spring of 1771, when the Pennamite settlers seemed to be in a fair way to become securely established in Wyoming Valley, they erected near the mouth of Mill Creek, a small saw-mill…" (pg. 692-693)

First Inhabitants

- Land originally owned by the Iroquois Confederacy
    - They **“sold”** land to both Connecticut and Pennsylvania during same time period
    - Nanticoke, Shawanese, and Delaware tribes later arrived in the 1700s
- In 1762, the Susquehanna company sent 200 men to Wyoming area
    - They settle along the mouth of Mill Creek and return to Connecticut
    - In 1763, they return and are attacked by Native American tribes

History of Wilkes-Barre | Wilkes-Barre PA: Luzerne County Historical Society

Pennamite Wars

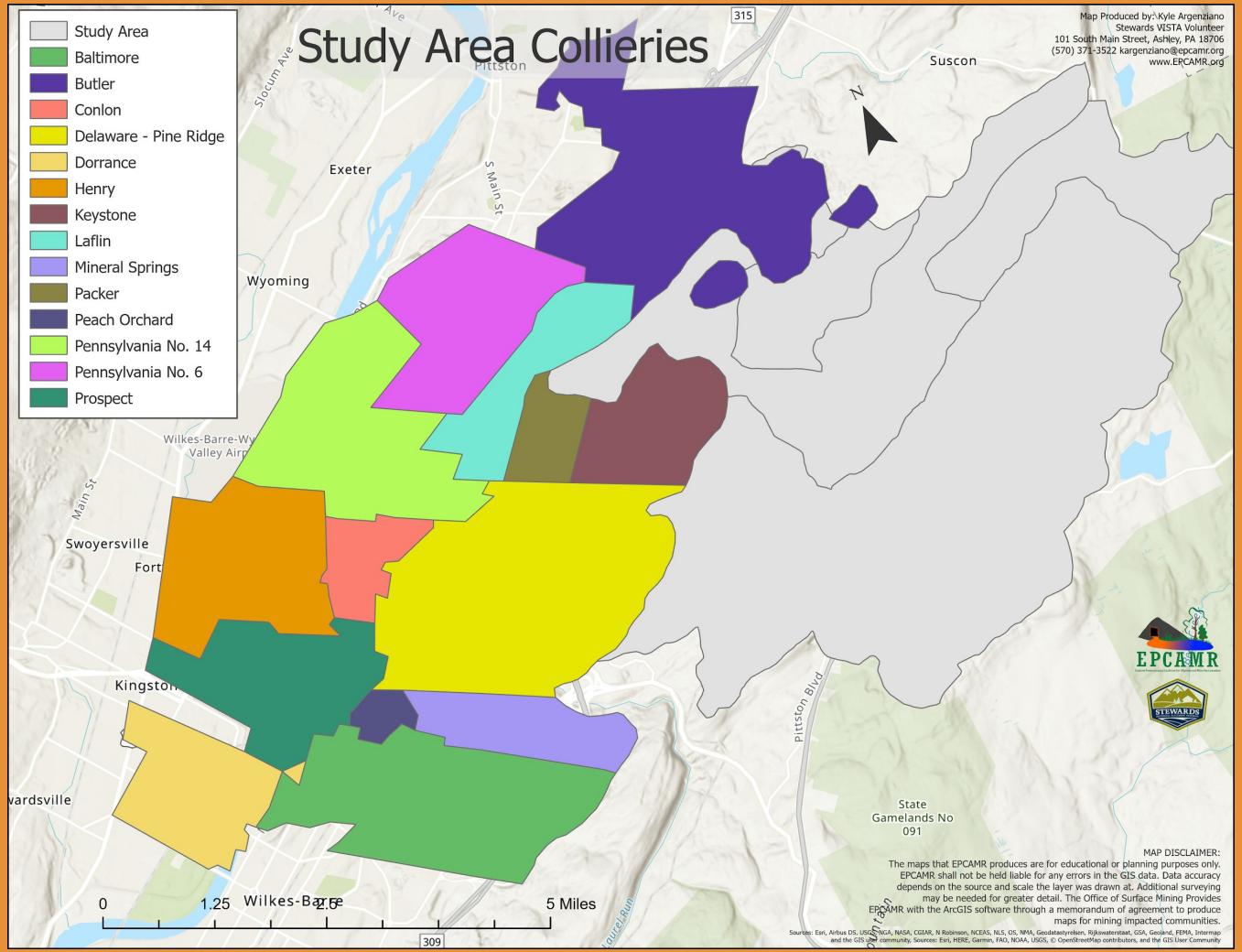
- Iroquois sold the land to Pennsylvania while settlers from Connecticut (Susquehanna Company) had already settled
- Connecticut people established Fort Durkee in 1769 and Pennsylvanians established Fort Wyoming in 1771
- Counties continue to be settled by both sides in Pennsylvania
- Tension continued and three Pennamite Wars occurred
    - The wars however were not particularly bloody and had few casualties

Connecticut Battles Pennsylvania in the Pennamite Wars-New England Historical Society

History of Wilkes-Barre | Wilkes-Barre PA: Luzerne County Historical Society

ANTHRACITE COLLIERIES

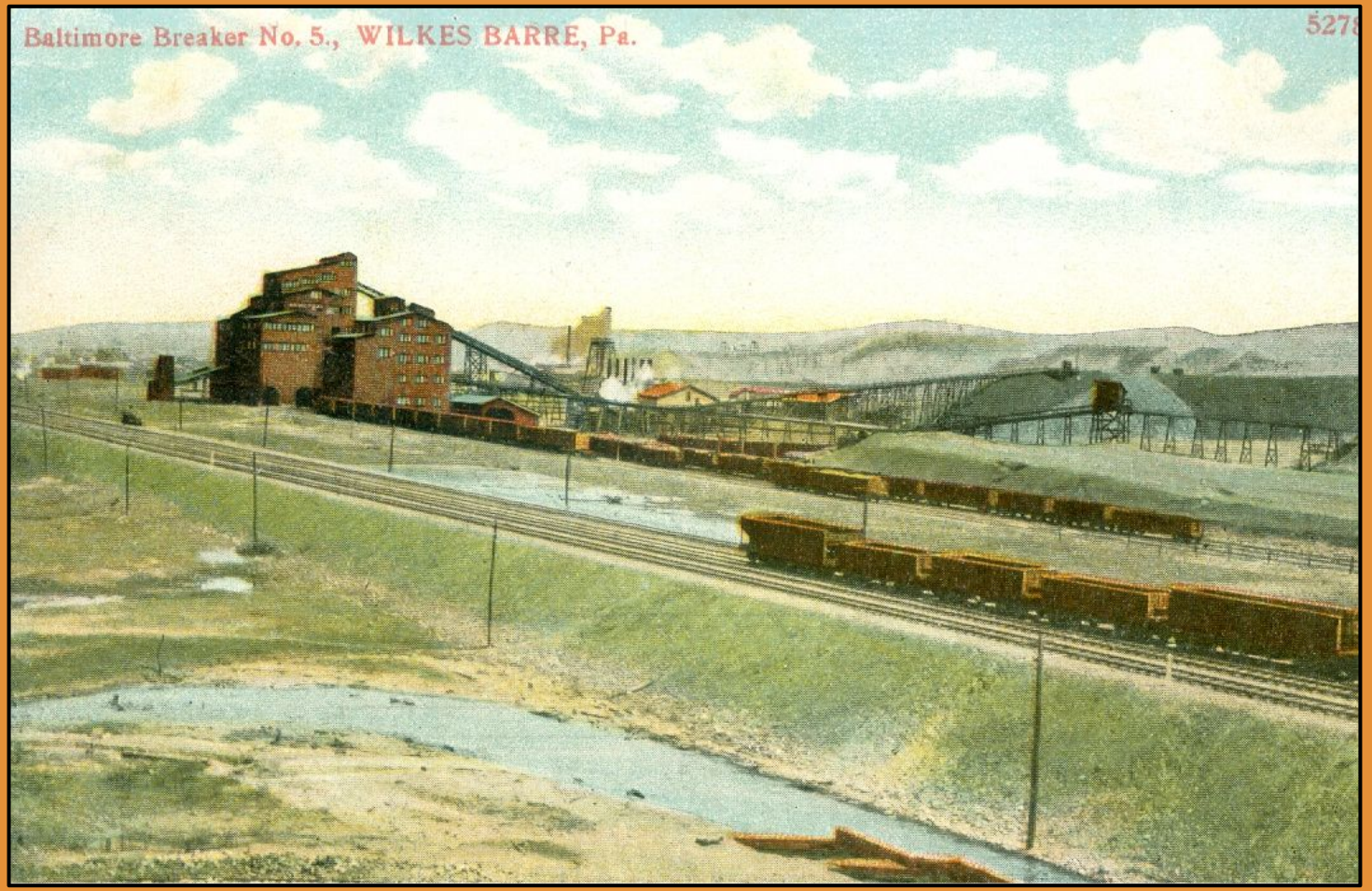
Mill Creek Land Cover



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Baltimore Colliery



UpTheWoods.net: Anthracite Collieries - Luzerne County

Baltimore Colliery

- 1955
  - Owned by Hudson Coal Co.
  - 209,546 Production Tons (Highest for Colliery)
  - 125,586 railroad shipments
  - 355 employees
- Ceased operation in 1970 under Lehigh Valley Anthracite, Inc.

Northernfield.info: Baltimore Colliery

Baltimore Mine Tunnel Disaster

- June 5, 1919
- Explosion in mouth of Baltimore Tunnel No. 2
- 92 killed and 44 injured
- Explosion caused by accidental ignition of blasting powder
    - Keg of blasting powder in cart with miners
    - Electric car cable ignited keg

Baltimore Mine Tunnel Disaster

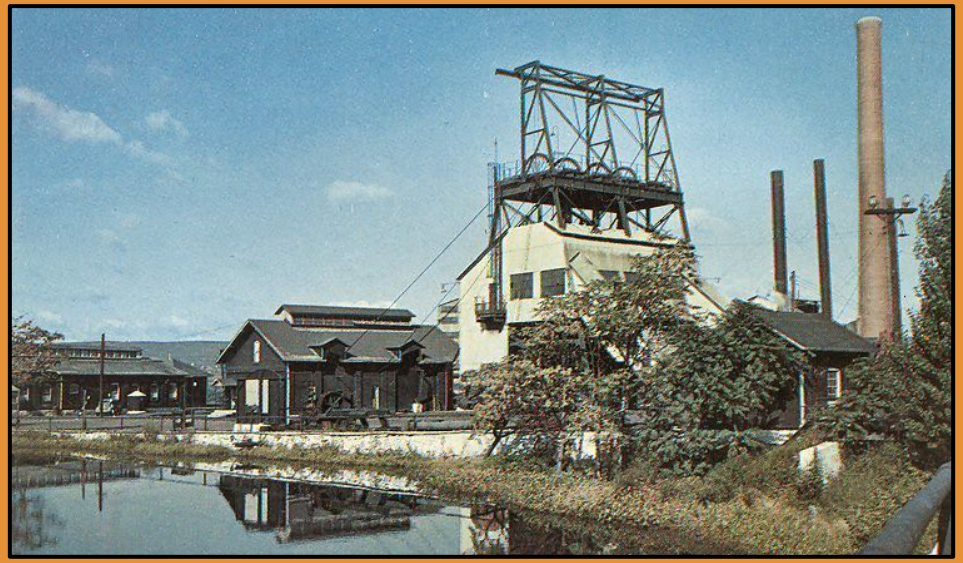
Henry Colliery

- Owned by Lehigh Valley Coal Co.
- Plains Township, Luzerne County
- 614, 596 tons produced in 1937
    - 574,864 tons railroad shipments
    - 710 Employees
- Ceased operation in 1966 under Capone Coal Co.

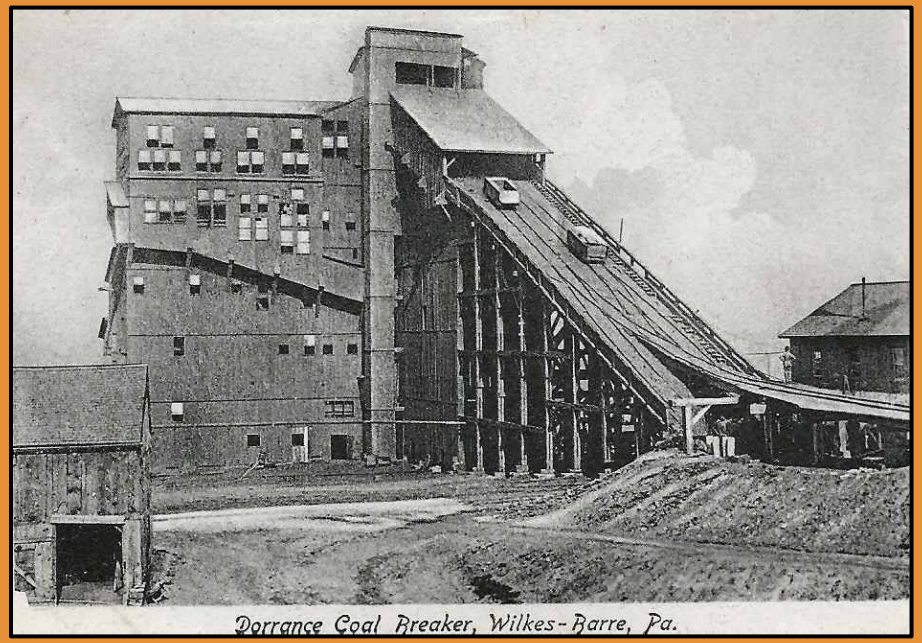
Henry Colliery, northernfield.info

Dorrance Colliery

- Owned by Lehigh Valley Coal Co.
- 499,170 tons coal produced in 1945
  - 727 Employees
  - 323,794 tons railroad shipments
- 10 veins mined from vertical shaft
- Utilized a fan complex to divert gases from mine
  - 76 gas explosions between 1870 and 1950



Dorrance Colliery; Northernfield.info
Dorrance Colliery Fan Complex
Dorrance Colliery | View taken in 1953 of the Dorrance Colli…

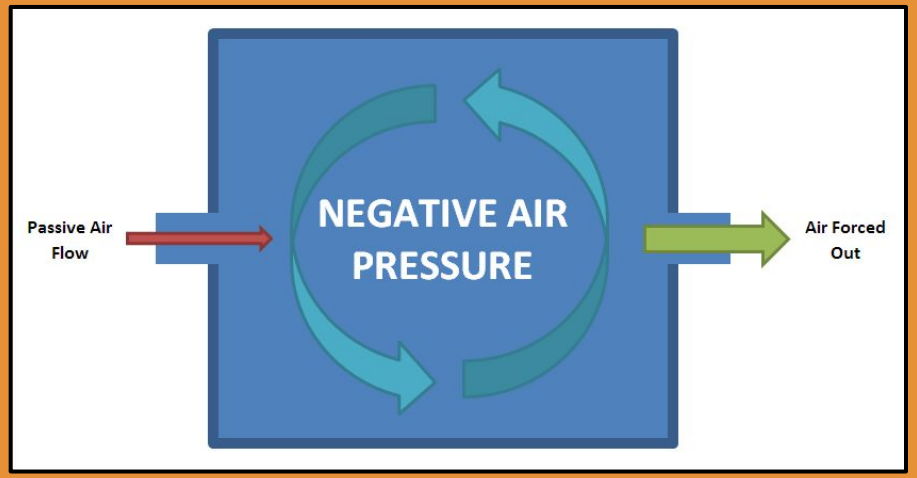


Facebook: Wyoming Valley Anthracite Coal

Facebook:
Wyoming Valley
Anthracite Coal

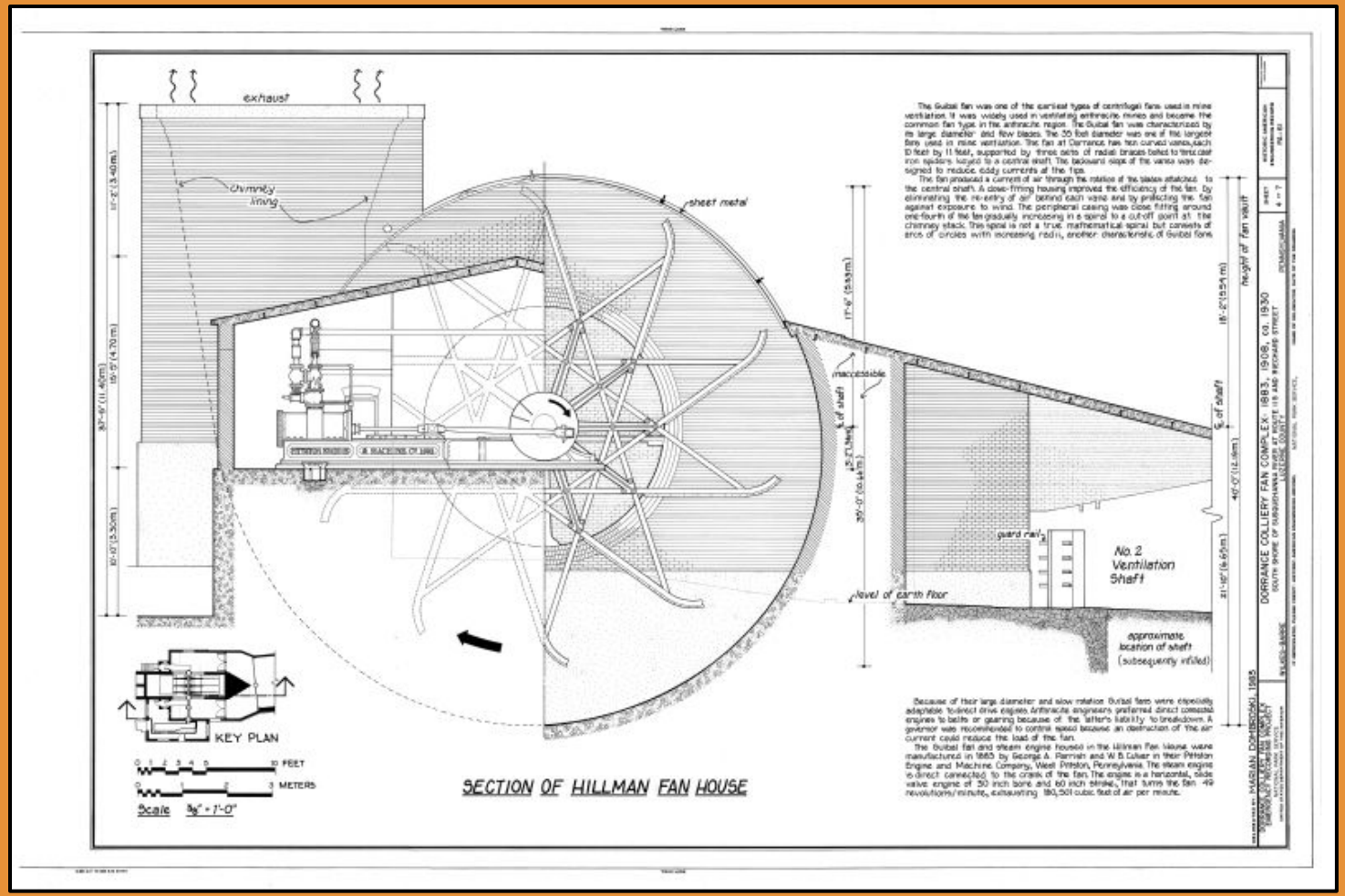
Dorrance Fan Complex

- Spanned entire existence of colliery
- Consisted of main fan in exhaust stack
  - 35 feet wide
  - 49 Revolutions Per Minute
  - Used negative pressure to pull air through mine
  - Air pulled through mine shafts due to fan exhaust, removing gases



Dorrance Colliery Fan Complex

Negative room pressure



File:Dorrance Colliery Fan Complex, South side of Susquehanna River at Route 115 and Riechard Street, Wilkes-Barre, Luzerne County, PA HAER PA,40-WILB,5- (sheet 4 of 7).png

Dorrance Fan Complex

Dorrance Colliery Fan Complex, South side of Susquehanna River at Route 115 & Riechard Street, Wilkes-Barre, Luzerne County, PA

Exhaust Fan and Fan House

Dorrance Colliery Fan Complex: Photos

Library of Congress: Hillman Fan House

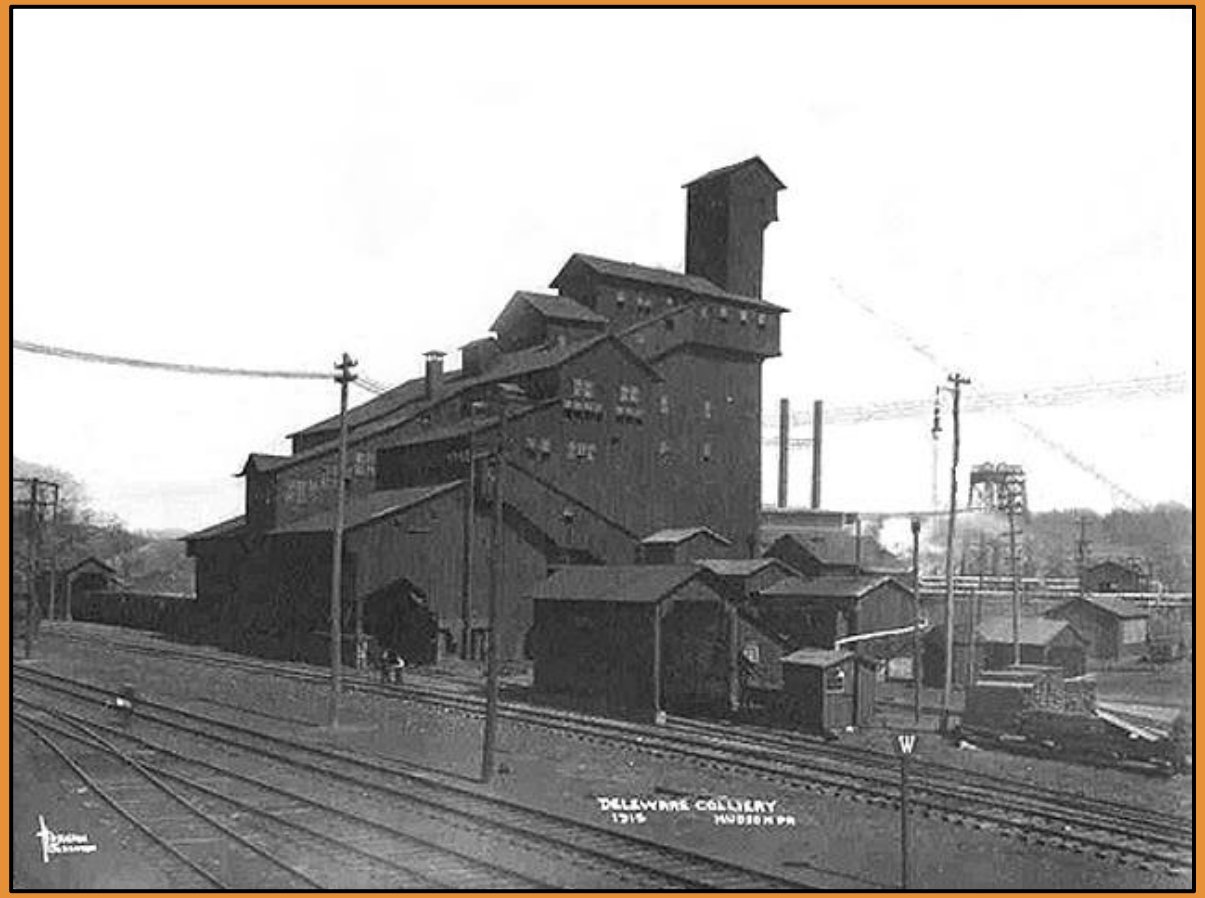
Dorrance Colliery Backfill Testing

- PA DEP is testing site to determine if two shafts have been backfilled
- All unfilled areas will be encased and sealed
- After backfilling, remaining structures are to be removed
- At least one fan will be moved to a local mining museum on the site of the Lansford No. 9 Mine

Times Leader: Testing of Abandoned Mine Shafts Underway at Wilkes-Barre Site

Delaware Colliery

- Owned by Hudson Coal in 1942
  - 432,737 Production Tons
  - 403,634 Tons Railroad Shipments
  - 579 Employees
- Ceased operation in 1963 under Hudson Realty Co.



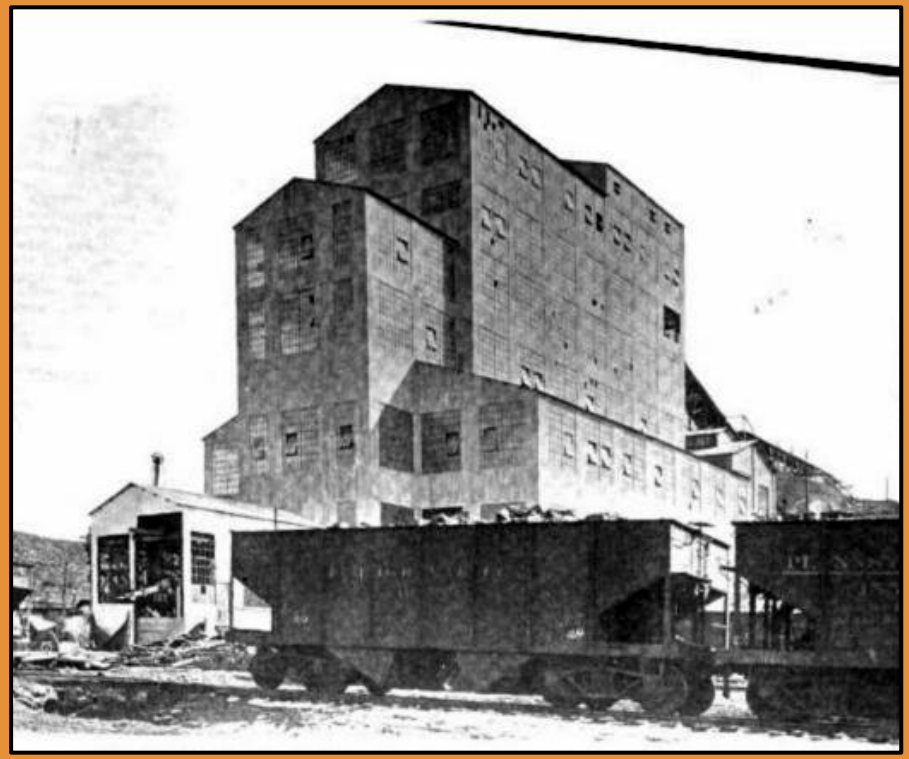
Facebook: Wyoming Valley Anthracite Coal Mining

northernfield.info: Delaware Colliery

Mill Creek Flow Loss to Underground Mines

Photo from 2011-2012: Water flowed from headwaters and crossed under 81 then directly into a strip mine pit until a project was done by BAMR to reclaim the site and put the water back into the stream channel to flow under 315 then around Mohegan Sun.

Mineral Springs Colliery



Facebook: Wyoming Valley Anthracite Coal Mining

Facebook: Wyoming Valley Anthracite Coal Mining

Mineral Springs Colliery

- Colliery is named after Mineral Spring, located on the property
- The spring was tapped into by the coal company and dewatered
- Highest production year was 1938
  - Owned by Mineral Spring Coal Co.
  - 408,026 total production Tons
  - 367,129 Tons Railroad Shipments
- Ceased operation in 1960, under N & R Coal Co.

Francis Dombrowski, III Donates Historic Mine Maps to EPCAMR Archive from the Mineral Spring Coal Company

northernfield.info: Mineral Spring

Butler Colliery

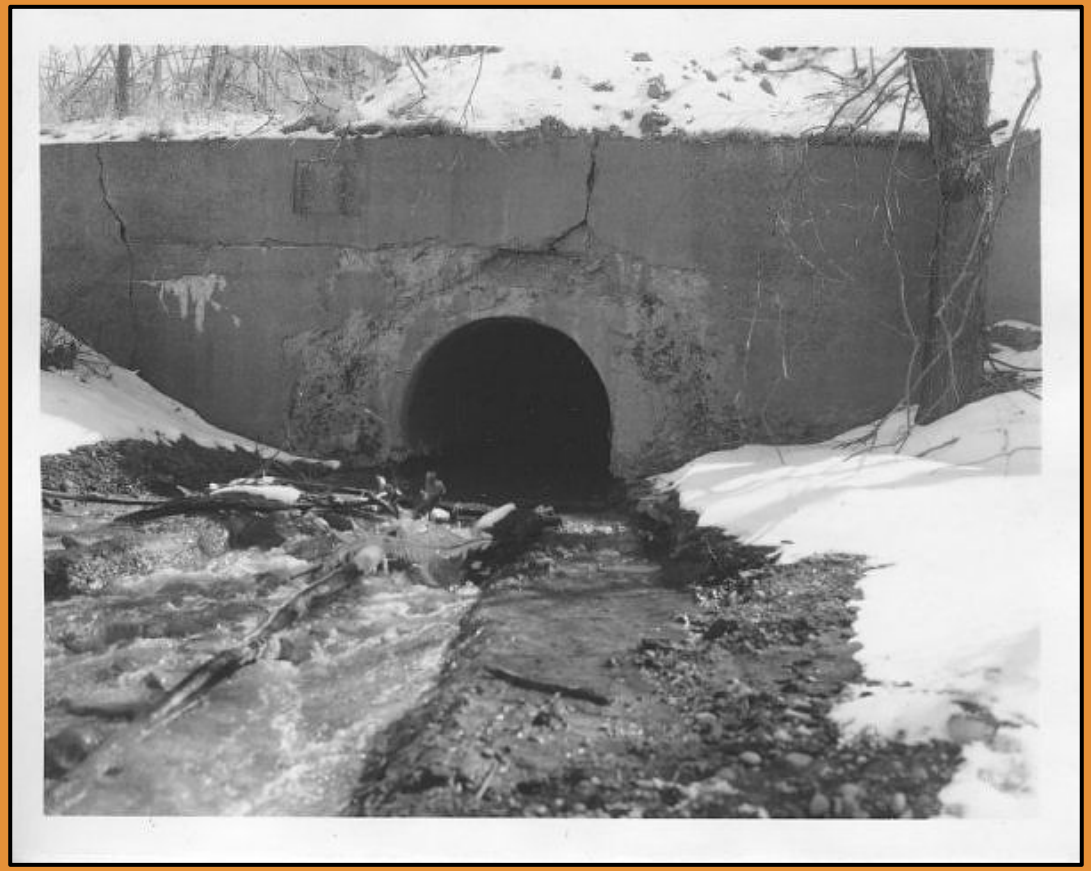
Northernfield.info: Butler Colliery - Period Photos

Butler Colliery

- Owned by Hillside Coal and Iron Co.
- 1918
  - 844,683 Total Production Tons
  - 786,863 Railroad Shipment Tons
  - 1554 employees
- Ceased operation in 1966 under Macarelli Coal Co.

Northernfield.info: Butler Colliery

Butler Mine Tunnel



Pinterest: Butler Mine Tunnel

Butler Mine Tunnel Superfund Site

- According to the Environmental Protection Agency
- Superfund site located in West Pittston
- Provided mine drainage for 5 mile square area into Susquehanna River
- “Contamination was caused by the illegal disposal of liquid industrial wastes, including oily wastes, into underground mine areas via a mine ventilation borehole that was located at the Hi-Way Auto Service (HWAS) station in Pittston, PA.”
- The contamination was discovered in 1979 through noticing an oil slick on the Susquehanna River
- “Approximately 25,000 people live within a five-mile radius of the site” and “1,400 people live within the boundaries of the Butler Mine Tunnel site”

cumulis.epa.gov: Butler Mine Tunnel - Superfund Site

Butler Mine Tunnel Superfund Site

- According to an article posted by World Coal
  - The Butler Mine Tunnel may be removed from the EPA's Superfund National Priority's List (NPL)
  - Removal from the NPL often takes years of study and consideration
  - When sites are removed, there is often very positive economic impacts to site locations

Worldcoal.com: EPA proposes removing Butler Mine Tunnel from contaminated sites list

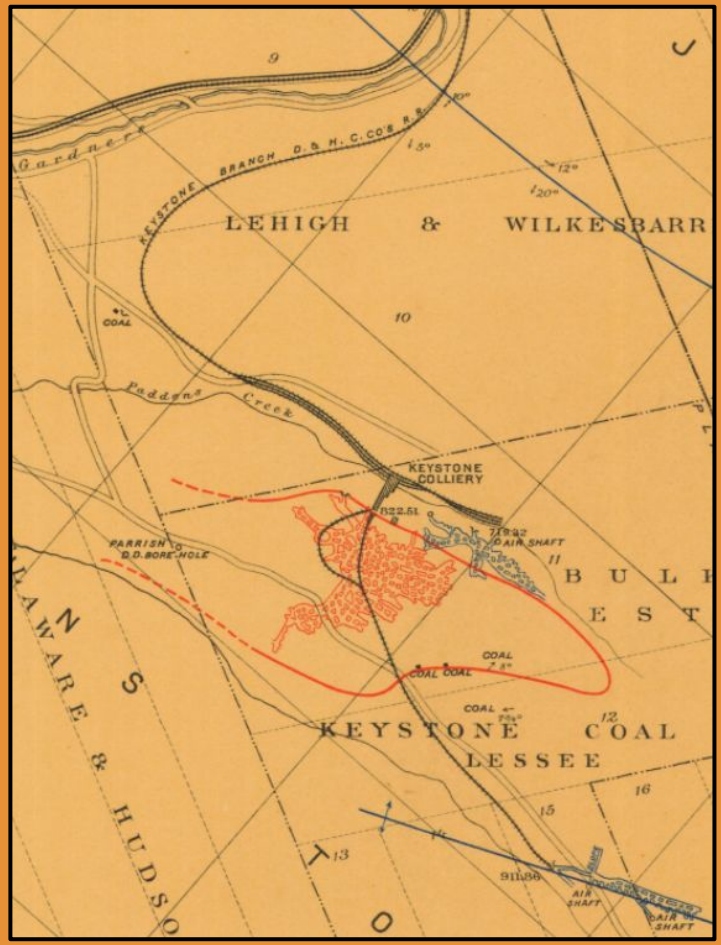
Conlon Colliery

- Owned by John Conlon Coal Co.
- 1932
  - Produced 116,735 Tons of Coal
  - 92,495 Tons Railroad Shipments
  - 332 Employees
- Ceased operation in 1944 under Fabrizio Bros.

Northernfield.info: Conlon Colliery

Keystone Colliery

- 1888
  - Owned by Keystone Coal Co.
  - 119,018 Total Production Tons
  - 118,469 Railroad Shipment Tons
  - 336 Employees
- Experienced fire, causing loss of $75,000
  - 300 employees out of work after fire
  - Fire year is unknown
- Ceased operation in 1957, under Conlon Coal Co.



Facebook: Wyoming Valley Anthracite Coal Mining

northernfield.info: Keystone Colliery

Laflin Colliery

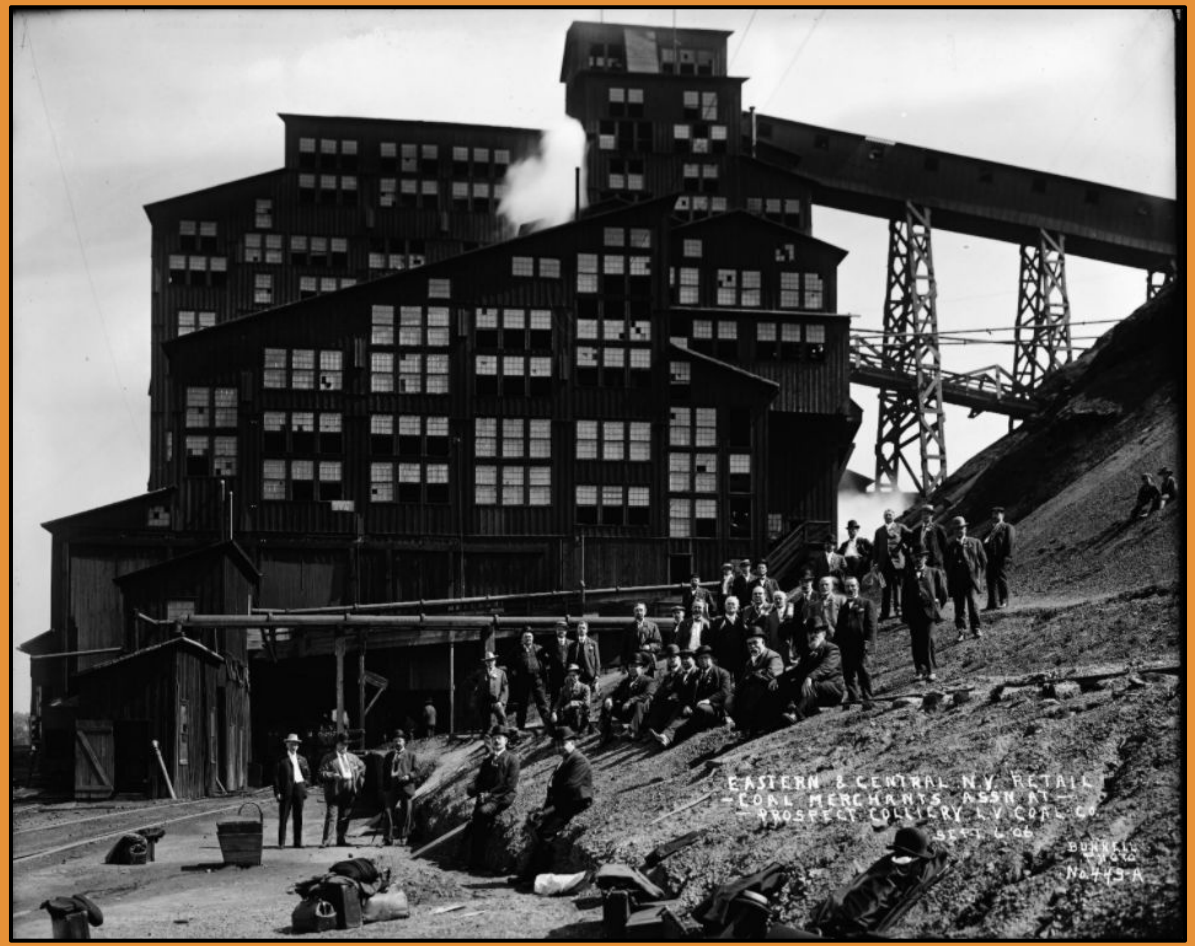
- 1921
  - Owned by Hudson Coal Company
  - 315,436 Total Production Tons
  - 303,082 Railroad Shipment Tons
  - 538 Employees

Laflin Breaker

- Operation ceased in 1969 under Laflin Heights Coal Co.
- Breaker erected, using 900,000 Feet of lumber according to Inspector of Mines report

northernfield.info: Inspector Narratives

Prospect Colliery



northernfield.info: Prospect Colliery - Period Photos

Prospect Colliery

- 1911
  - Owned by Lehigh Valley Coal Co.
  - 1,093,667 Total Production Tons
  - 962,133 Railroad Shipment Tons
- Ceased operation in 1970 under same company

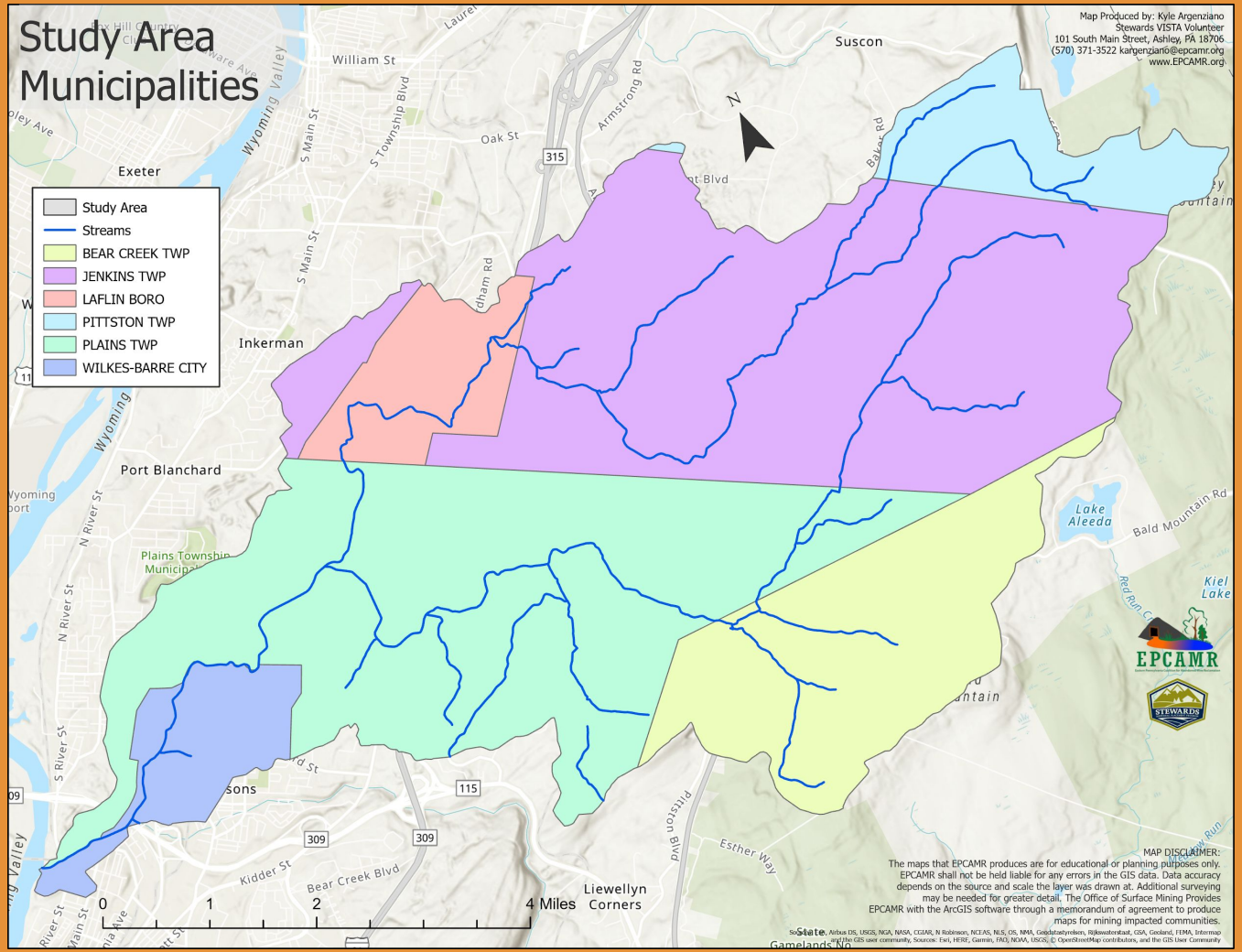
northernfield.info: Mine Inspections

Prospect Gas Explosion

- February 17, 1915 at 12 noon
- Occurred within Red Ash Vein, No. 10 slope
- 13 people killed
- A rush of coal in a chamber caused gas to be forced downwards
- A miner’s exposed headlamp ignited the gas

TOWNSHIP HISTORIES

Municipalities



ArcGIS Pro

Pennsylvania Spatial Data Access - The Pennsylvania Geospatial Data Clearinghouse

Jenkins Township

- "History of Luzerne, Lackawanna, and Wyoming Counties, Pa": W.W. Munsell & Co
- Township formed from Pittston Township
- “About one half of the township is cleared, and very nearly the whole of it is owned by the Pennsylvania and Lehigh Coal Companies, being underlaid with anthracite.”
- Joseph Gardner and Isaac Gould were first settlers (pg. 301)
    - Settled where Gardner Creek crosses into Plains Township Line

"History of Luzerne, Lackawanna, and Wyoming Counties, Pa": W.W. Munsell & Co

Jenkins Township Industry

- "History of Luzerne, Lackawanna, and Wyoming Counties, Pa": W.W. Munsell & Co
- Joseph Gardner and Isaac Gould Settled where Gardner Creek crosses into Plains Township Line (pg. 301) and built a pioneer grist mill
- They also built two saw mills along Gardner Creek
    - First near opening to Everhart Coal Mines
    - Second near Powder Mills

Laflin Powder Mills

- History of Luzerne, Lackawanna, and Wyoming Counties, Pa": W.W. Munsell & Co
- Seven mills along Gardner Creek, near the Southwest corner of the township (pg. 302)
- Buildings run in a line, extending 1,430 ft along the creek, and sit in a grove of White Oaks
- Mills founded in 1873,
- Employed 16 men and manufacturing 75,000 pounds of blasting powder

Plains Township

- History of Luzerne, Lackawanna, and Wyoming Counties, Pa": W.W. Munsell & Co

- Formed November 10, 1851 (pg. 340)
    - Combined parts of Wilkes-Barre and Pittston townships
- Originally owned and occupied by Delaware Indians, Wanamie Tribe
    - Actual title was Jacob’s Plains, named after chief whose name was Jacob
    - Jacob’s name was left out when town was created