Upper Toby Creek Coldwater Conservation Plan

Photo Credit: Dr. Joseph Simons, III- Wild Brown Trout caught on Toby Creek

EPCAMR

Eastern Pennsylvania Coalition for Abandoned Mine Reclamation

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pec
pennsylvania environmental council

PA Organization for Watersheds and Rivers (POWR)

POWR
Pennsylvania Organization for Watersheds & Rivers

North Branch Land Trust

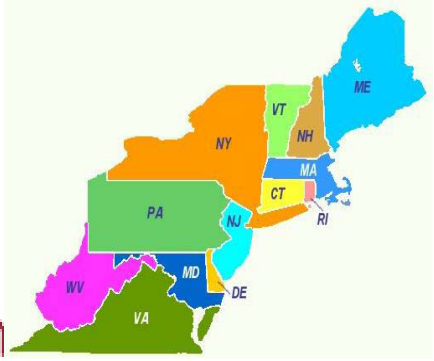
North Branch Land Trust

The Lands at Hillside Farms

[The Back Mountain Trail] - Anthracite Scenic Trails Association (ASTA)

Educational Institutions

North Atlantic Aquatic Connectivity Collaborative & University of Massachusetts Extension



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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Disclaimer

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The Upper Toby 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 Upper Toby 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.

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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 Upper Toby Creek Coldwater Conservation Plan will provide a general description of the Upper Toby Creek watershed that is defined as being the stream segments that are located above the confluence in Kingston Township, Luzerne County, PA with the Huntsville Creek tributary, which is a major drainage basin to the watershed. The Huntsville Creek Coldwater Conservation Plan was considered to be applied for by EPCAMR during another grant round separately from the Upper Toby Creek Coldwater Conservation Plan.

The remaining downstream portion of the watershed was not evaluated or assessed in this particular Plan development from below the confluence of Huntsville Creek through the Gap in State Route 309 back into the Wyoming Valley where Toby Creek flows southeast through Pringle Borough in a flood detention area into an underground culvert system that exits in Edwardsville Borough behind the K-Mart Plaza located along State Route 11, before flowing under the State Road and entering the Susquehanna River just south of Valenti's Junkyard. The entire watershed is **~ 36.5** square miles[3]. **11.13** miles of Toby Creek are classified as Wild Trout[4] waters of naturally reproducing from the headwaters to mouth of the Susquehanna River, and is a Cold Water Fishery (CWF), according to the PA Fish & Boat Commission. The major tributaries are Trout Brook and Huntsville Creek, and neither were previously documented to support natural reproduction of trout.

The entire watershed covers areas of **14** municipalities, including: Swoyersville, Pringle, Luzerne, Larksville, Kingston, Harveys Lake, Forty-Fort, Edwardsville, Dallas, and Courtdale (Boroughs); Lehman Township, Kingston Township, Jackson Township, and Dallas Township (Townships). This Upper Toby Creek Coldwater Conservation Plan will cover the watershed area and streams located in **3** of **14** municipalities, including Dallas Borough, Dallas Township, and Kingston Township.

The Plan 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.

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[1] Coldwater Heritage Partnership

[2] Coldwater Heritage Partnership Grant Application and Guidelines

[3] PA Gazetteer of Streams

[4] PA Fish & Boat Commission Wild Trout Waters Reproduction Report, 2019

The Upper Toby Creek Coldwater Conservation Plan preparation included a public participation process, which served to inform stakeholders and build community consensus for the conservation of the cold water stream and its tributaries. Two public information meetings were required to be held within the watershed during the beginning and end of the completion of the plan development. EPCAMR prepared to bring together support from stakeholders and partners within the watershed in the Fall of 2017, obtained letters of support, developed a budget, and submitted the proposal in December 2017. The Eastern PA Coalition for Abandoned Mine Reclamation (EPCAMR) was successful in obtaining the grant and was awarded **$5000** in February of 2018 and signed and mailed in an Assurance Letter to the Coldwater Heritage Partnership before beginning the development of the Plan. By late Spring in March of 2018, EPCAMR had received our fully executed grant agreement to begin working on the Plan Announcement of 2018 CHP Grant Awards.

The first of two public informational meetings was scheduled and hosted by the Dallas Township Board of Supervisors at their Municipal Building on July 18, 2018 from 6-8PM (**Appendix A.**) to announce the grant award, present the anticipated tasks and outcomes, and to solicit public input to the plan, including known or suspected issues of concern or opportunity. The Citizens Voice published an article entitled, "*Study Targets Toby Creek Watershed*"[5], on July 23, 2018, written by Paul Golias, Correspondent, who attended the public informational meeting. Another article appeared in the Times-Leader newspaper that was published on July 21st, written by Eileen Godin, Correspondent, entitled, "*Back Mountain Residents Input Sought for Upper Toby Creek Plan*"[6] EPCAMR held a second informational meeting on January 16, 2020 at the Dallas Township Municipal Building to present and solicit comments on the final draft plan.

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

1. Notify all municipalities in the watershed about the grant award, including an explanation of the project;
2. Schedule an initial public informational meeting in a location(s) convenient for a majority of the stakeholders in the watershed to explain the project and solicit information and support from residents;
3. Gather existing information (geological, hydrological, historical, etc.) about the waterway and watershed and collect scientific data on current stream conditions;
4. Prepare a draft Upper Toby Creek Coldwater Conservation Plan for review by CHP Staff;
5. Present the results and solicit feedback of the final draft Upper Toby Creek Coldwater Conservation Plan at a second public informational meeting near the end of the grant; and
6. Prepare final Upper Toby Creek Coldwater Conservation Plan and submit to CHP.

[5] Study Targets Toby Creek Watershed Article-The Citizens Voice

[6] Back Mountain Residents Input Sought for Upper Toby Creek Conservation Plan Article-The Times Leader

The Upper Toby 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 Upper Toby Creek Coldwater Conservation Plan
- EPCAMR Coalition Building through Partnerships and Stakeholder Outreach
- Detailed Map of the Toby Creek Watershed
- EPCAMR Scope of Work Items
- Cursory Environmental Issues & Problem Areas within the Upper Toby Creek Watershed
- Tentative Timeline for the Development of the Upper Toby Creek Coldwater Conservation Plan
- Macroinvertebrate, Water Quality Sampling, Survey Protocols & Field Equipment
- Huntsville Creek Subwatershed of Toby Creek to be Assessed Separately
- Historic & Geomorphic Description of the Lower Toby Creek Watershed
- Previous and Current Studies-Analysis of the Toby Creek Watershed
- *The Post* Article Series on Toby Creek from October 2004
- *The Times Leader* Article from June 2017
- *The Citizens Voice* Article August 2019
- Previous Work Completed by the Borton-Lawson Engineering and the Luzerne Conservation District
- Upper Toby Creek Watershed Description and Background Information
- Land Use Characteristics of the Toby Creek Watershed
- Historic Land Use within the Upper Toby Creek Watershed
- Fishery Designations by Drainage within the Toby Creek Watershed
- General Flow and Drainage Pattern of Toby Creek from Headwaters to the Susquehanna River Confluence
- Historical Flow and Current Groundtruthed Detailed Drainage Pattern of Toby Creek from Headwaters to the Susquehanna River Confluence
- Upper Toby Creek Watershed Research & Field Reconnaissance Observations with EPCAMR Staff, Volunteers, & DAMA
- Upper Toby Creek Watershed NAACC Culvert Assessments
- Current Biological Monitoring and Assessments
- Areas of Concern and Potential Conflicts
- EPCAMR Recommendations
- DAMA Proposed Retrofit, Forest Buffers, and Streambank Stabilization Projects
- Misfit Best Management Practices that Don't Qualify for Sediment Reduction Credit within the Toby Creek Watershed Under DAMA Chesapeake Bay Pollution Reduction Plan
- Future Funding Grant Opportunities and Potential Partners
- Appendices
- Summary/Conclusions

Coldwater Conservation Plans are available on the Coldwater Heritage Partnership webpage[7].

[7] Coldwater Heritage Partnership

INTRODUCTION OF THE EASTERN PA COALITION FOR ABANDONED MINE RECLAMATION

The Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR)[8] is a regional environmental organization founded in the Wyoming Valley 24 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.

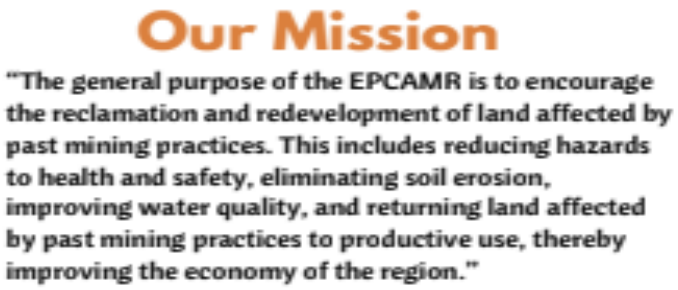

Figure 1. EPCAMR Mission

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 Northcentral PA with an office in Ashley, PA co-located with the Earth Conservancy[9]
- prioritize restoring streams impacted by abandoned mine drainage (AMD), a water pollution problem that affects over 5,500 miles of PA streams
- 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, cold-water, 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 and remediation streams impacted by AMD through economic development opportunities

[8] EPCAMR
[9] Earth Conservancy

Currently, there are only 4 Full-Time and 2 Part-Time Staff[10], along with seasonal interns and hundreds of volunteers that are a part of EPCAMR, along with 30 regional Board of Directors[11] 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 "on the ground" projects up and running.

Figure 2. EPCAMR Safety Orange Shirt Showing Partnerships at Annual Centralia Cleanup

[10] EPCAMR Staff
[11] EPCAMR Board

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 3. EPCAMR Brochure Highlights

Who We Are

EPCAMR is a regional non-profit environmental organization that works throughout NE and NC Pennsylvania Coalfields with community groups, local governments, schools, colleges and universities, as well as Conservation Districts, reclamation-related organizations, watershed groups, TU Chapters, and regional non-profit coalitions to support the reclamation of abandoned mine lands and the remediation of rivers and streams impacted by past mining practices and polluted abandoned mine drainage (AMD).

Our staff and organization is interested in developing relationships and partnerships with community leaders and organizations that would like to work together on seeking opportunities for the leveraging of 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 community that has been impacted by abandoned mine lands.

EPCAMR is interested in creating new partnerships and building on existing ones to raise the awareness of our mission and goals in the EPCAMR Region. EPCAMR would like to continue to support reclamation and remediation efforts in these areas on abandoned mine land reclamation, AMD, and watershed restoration projects with community groups, conservation groups, co-generation plants, coal companies, Conservation Districts, TU Chapters, and watershed groups covering these areas.

The main intent of the development of this brochure is to allow us to: 1) reach out to additional partners and make them aware of our Coalition's efforts in the region, in these two respective counties where we work; 2) update them on regional projects and technical assistance of importance to their watersheds; 3) provide them information on events, conferences, workshops, trainings, legislation, and advocacy opportunities; and 4) offer additional technical assistance and services to those community leaders and groups with similar goals and desires to clean up their mining impacted watersheds and areas suffering from past mineral extraction industries that have been abandoned.

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."

"EPCAMR prides ourselves on the professional quality of ourwork created by our highly skilled, passionate Staff, who arecommitted to watershed restoration, land reclamation, andproviding education and awareness of our efforts to reclaimAnthracite and Bituminous Coalfields and mining impactedareas to those communities that are often underrepresented."

—Robert E. Hughes, Executive Director

Acid Mine Drainage (AMD) and the orange pollutant 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 a 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 contributors 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 a minute.

Figure 4. EPCAMR Organizational Description and Mission

Figure 5. EPCAMR Contact Information

Figure 6. Example of a few stoneflies (plecoptera) found in Toby Creek

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)[12]
- PA Fish & Boat Commission (PA F&BC)[13]
- PA Council of Trout Unlimited (PATU)[14]
- Foundation for PA Watersheds (FPW)[15]

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[16];
- Project will occur in a watershed listed as Special Protection Waters within the PA's Chapter 93[17] 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. In other words, they want to see a Coldwater Conservation Plan that has 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.

FPW is focused on "priority" watersheds, in other words, they want to see that a watershed 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. We took into consideration future development pressures, potential for temperature increases, and whether or not the Upper Toby 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.

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[12] PA Department of Conservation and Natural Resources
[13] PA Fish & Boat Commission
[14] PA Council of Trout Unlimited
[15] Foundation for PA Watersheds
[16] PA Fish & Boat Commission Trout Reproduction Report, 2019
[17] PA Code-Chapter 25 Subsection 93.3

IMPETUS FOR DEVELOPMENT OF THE UPPER TOBY CREEK COLDWATER CONSERVATION PLAN

In June 2017, State Representative Aaron Kaufer, 120th District[18], reached out to EPCAMR to see if we had any interest in applying for a Coldwater Heritage Partnership Planning Grant for Toby Creek to determine the state of the watershed. EPCAMR informed the Representative's Office that it was a very large watershed consisting of nearly **36.5** square miles[19]. 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 18 months. Therefore, EPCAMR informed the State Representative Kaufer that our organization decided to break up our strategy of assessing the watershed into two planning grants, one for the Upper Toby Creek Watershed and the other for the Huntsville Creek subwatershed that drains to the larger Toby Creek at its confluence in Kingston Township[20] at the end of Huntsville Road and the intersection of State Route 309.

The lower end of Toby Creek does cross the Anthracite mining impacted region in Luzerne, Swoyersville, and Pringle Boroughs, as well as when it flows in the southwesterly direction through Kingston and eventually Edwardsville Borough towards its mouth with the Susquehanna River near Valenti's Scrap Yard, near State Route 11, and the former Redner's Supermarket. Toby Creek has cut a gap in the Larksville Mountain range that runs in a northerly and southerly direction along State Route 11. EPCAMR was informed that in the Fall of 2017 that the round of grants was open and that the deadline for submission was on December 15th, 2017. The EPCAMR Executive Director pulled some of our Coalition Partners together in the Wyoming Valley and the Back Mountain to make an application for funding for **$5000** (the maximum amount of funds to conduct a watershed assessment planning effort under the CHP Program. It had been EPCAMR's intention to identify and eventually assess as many watersheds as we could over a several year span throughout the Wyoming Valley's eastern and western flanks. EPCAMR was awarded **$5000** on January 30, 2018.

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 coldwater conservation plan for the Upper Toby Creek Conservation Plan. Many of the partners provided letters of support for the grant application, whiles others provide meeting space, as in the case of Dallas Township[21] for our first public informational meeting, and or local knowledge of areas of concern or for those areas in need of protection or restoration. The first of two public informational meetings was hosted by the Dallas Township Board of Supervisors at their Municipal Building on July 18, 2018 from 6-8PM (**Appendix A.**) to announce the grant award, present

[18] State Representative Aaron Kaufer-120th District
[19] PA Gazetteer of Streams
[20] Kingston Township
[21] Dallas Township

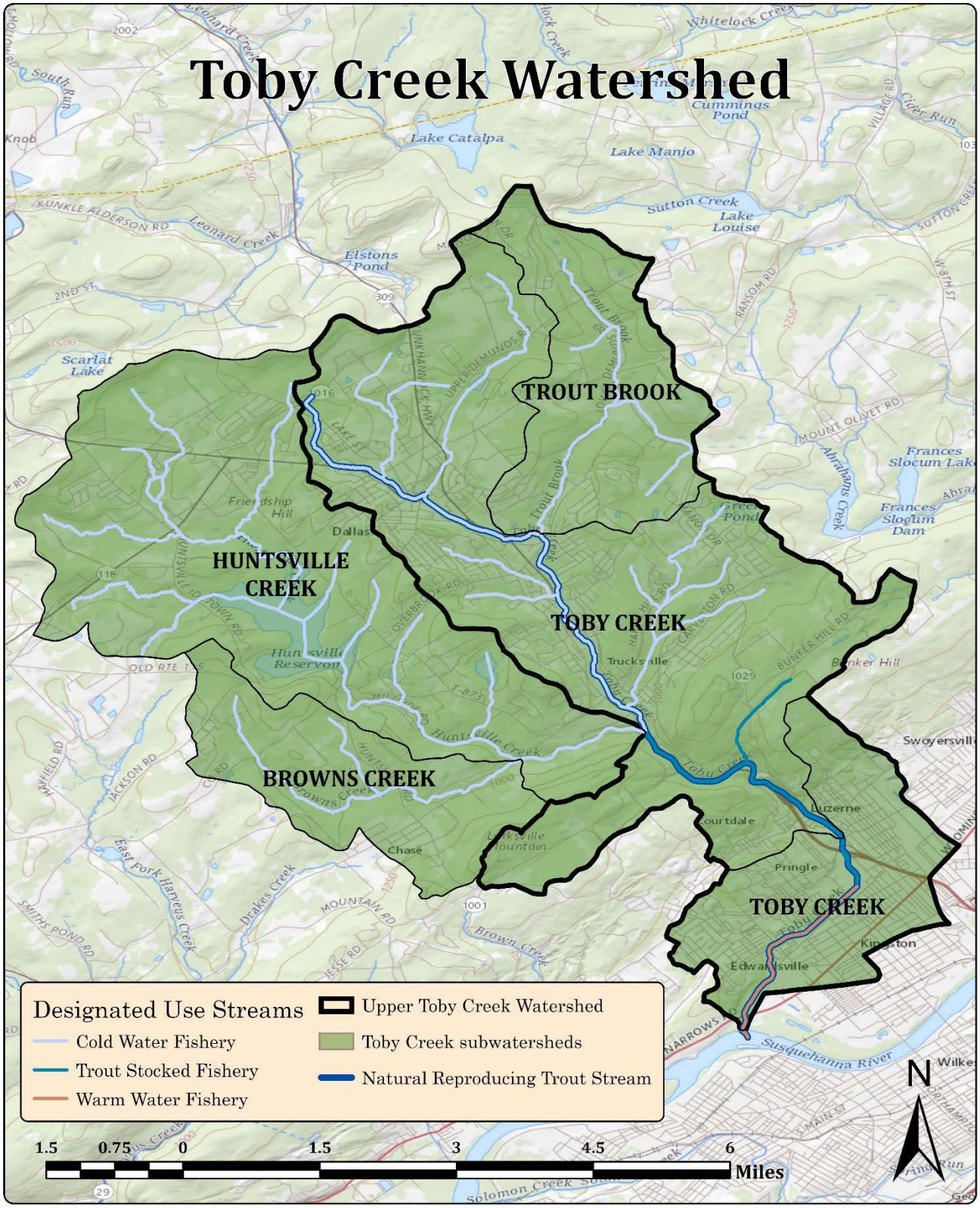
the anticipated tasks and outcomes, and to solicit public input to the plan, including known or suspected issues of concern or opportunity. **20** interested people attended with great interest.

At the 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, and marked up a draft watershed map with points of interest to visit within the Toby Creek watershed. EPCAMR Staff acquired contact information and e-mail addresses from everyone who was interested in receiving our monthly volunteer newsletter, was offered access to private properties along the creek, and was offered technical assistance and support from Tom Mayka, the Dallas Area Municipal Authority Stormwater Program Coordinator and John Levitsky, Watershed Specialist from the Luzerne Conservation District and EPCAMR Board Member. EPCAMR received verbal support from the Dallas Township municipal government and State Representative Karen Boback's Office. Finally, EPCAMR had received some very valuable historic news articles on Toby Creek that ran in a series in 2004 from the owner Charlotte Bartizek, of *The Post*, that are included in the report (**Appendix C.**).

Table 1. EPCAMR Coalition Building through Partnerships and Stakeholder Outreach within the Toby Creek Watershed

Partners and Stakeholders	Partners and Stakeholders
Dallas & Kingston Townships	Wilkes, Misericordia University, King College, & The Pennsylvania State University, Wilkes-Barre
Dallas Borough	Times-Leader (TL), Citizens Voice (CV), & The Post
Penn-State Master Watershed Stewards (PS MWS)	Irem Temple Country Club & Huntsville Golf Club
Dallas Area Municipal Authority (DAMA)	PA Department of Transportation (PA DOT)
North Branch Land Trust (NBLT)	PA Fish & Boat Commission (PA FBC)
Back Mountain Trail (BMT)	State Representative Aaron Kaufer
Anthracite Scenic Trails Association (ASTA)	State Representative Karen Boback
Stanley Cooper Chapter TU #251 (SCTU)	Senators Lisa Baker & John Yudichak
The Lands at Hillside Farms (TLHF)	PA Environmental Council-NE Office (PEC NE)
Luzerne Conservation District (LCD)	PA Organization for Watersheds & Rivers (POWR)
Luzerne Merchants Association	Pizza Perfect

DETAILED MAP OF THE TOBY CREEK WATERSHED



Map 1. Toby Creek Watershed Map

EPCAMR SCOPE OF WORK ITEMS

- EPCAMR received **$5,000** grant to assess the Upper Toby Creek Watershed
- Fish surveys: Assess populations of Brook Trout and Wild Brown Trout with Trout Unlimited
- Macroinvertebrate sampling
- Water quality monitoring: water chemistry
- Culvert assessments for aquatic organism passage (AOP) through NAACC[22]
- Research existing plans and reports available on the Upper Toby 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 UPPER TOBY CREEK

Prior to conducting field reconnaissance, EPCAMR listed some cursory anticipated environmental issues and problem areas within the watershed as the development of the Upper Toby Creek Conservation Plan got underway. Many of these issues are common to the watersheds throughout the Wyoming Valley.

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

Anticipated Environmental Issues and Problem Areas within the Upper Toby 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
Streambank stabilization and potential restoration areas
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, agricultural, and urban runoff issues
Major infrastructure constriction points along waterways
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

[22] North American Aquatic Connectivity Collaborative-Stream Continuity

TENTATIVE TIMELINE FOR THE COMPLETION OF THE UPPER TOBY CREEK COLDWATER CONSERVATION PLAN

July 2018

- Notified all municipalities about the grant and a review of the project and proposed plan of work
- Continued researching & gathering existing and historical data, references, & reports on Toby Creek
- Held initial Informational Meeting on the development of the CHP to gather community input and reach out to private landowners along the watershed regarding access; Hosted by the Dallas Township Board of Supervisors at their Municipal Building on July 18, 2018 from 6-8 PM

August 2018-September 2018

- Identified potential impacts, threats, problems, and opportunities within the Upper Toby Creek watershed
- Conducted stream habitat, biological assessment, and water quality monitoring at accessible locations in each of the tributaries at in-stream monitoring locations

October 2018-December 2018

- Began AOP culvert assessments and formulation of draft Upper Toby Creek Conservation Plan Outline
- Contacted Trout Unlimited and applied for Technical Assistance Grant (TAG) grant for fish survey/electroshocking assistance

January-early March 2019

- Worked on GIS Maps and Data Analyses with EPCAMR Staff to prepare for draft Upper Toby Creek Coldwater Conservation Plan

April 2019-May 2019

- Continued AOP Culvert Assessments
- Talked with municipalities to request meeting space for presentation of Final Draft Coldwater Conservation Plan

June 2019-July 2019

- Completed AOP Culvert Assessments
- Scheduled & Coordinate TU Fish Survey and electro-shocking survey at select points within the watershed on various tributaries selected

August 2019-September 2019

- Completed additional GIS Maps & Data Analyses with EPCAMR Staff to prepare for the development of the final Draft for the Upper Toby Creek CHP
- Incorporated TU Fishery Survey/electro-shocking results into the Final Upper Toby Creek CHP
- EPCAMR Staff began the compilation of the technical writing & Recommendations Report to include in the Final Upper Toby Creek Coldwater Conservation Plan

October 2019-January 2020

- Prepared Final Upper Toby Creek Coldwater Conservation Plan & submitted to the CHP for Approval
- Shared digital copies of approved Final Report by the CHP to all partners, stakeholders, & interested community members or organizations within the watershed with an interest in obtaining a copy and placed a copy on EPCAMR's website and social media to promote its completion and use
- Held second meeting Dallas Township Municipal Building on January 16, 2020 to present Final Draft Coldwater Conservation Plan & Recommendations & incorporated notes from public stakeholders

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 macroinvertebrates[23]
- NRCS Stream Visual Assessment Protocol (SVAP) for stream habitat assessment[24]
- North Atlantic Aquatic Connectivity Collaborative (NAACC)[25] 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.

DAMA provided technical assistance during the assessments of culverts in the watershed by providing, as an in-kind match, the use of their mobile Geo7x Trimble[26] Handheld Global Positioning System (GPS) Field Data Collector Unit to obtain accurate longitude and latitude locations of the centroid locations of the culvert crossings and the Staff time of the DAMA Stormwater Coordinator and EPCAMR Volunteer, Tom Mayka and his Summer Intern Tim Elston. Tom and Tim both became Certified Lead Observers by studying and taking the online test for Aquatic Organism Passage (AOP) in a relatively short period of time. Tom and Tim converted the files into Google Earth[27] Keyhole Markup Language Zipped (KMZ) files that EPCAMR converted into geographic information system (GIS) shapefiles to utilize in our ArcGIS Pro[28] software suite to create various mapping layers.

[23] US Environmental Protection Agency Rapid Bioassessment Protocol Document

[24] Natural Resource Conservation Service-Stream Visual Assessment Protocol Document

[25] North American Connectivity Collaborative-Stream Continuity

[26] Trimble Geo-7x Product

[27] Google Earth

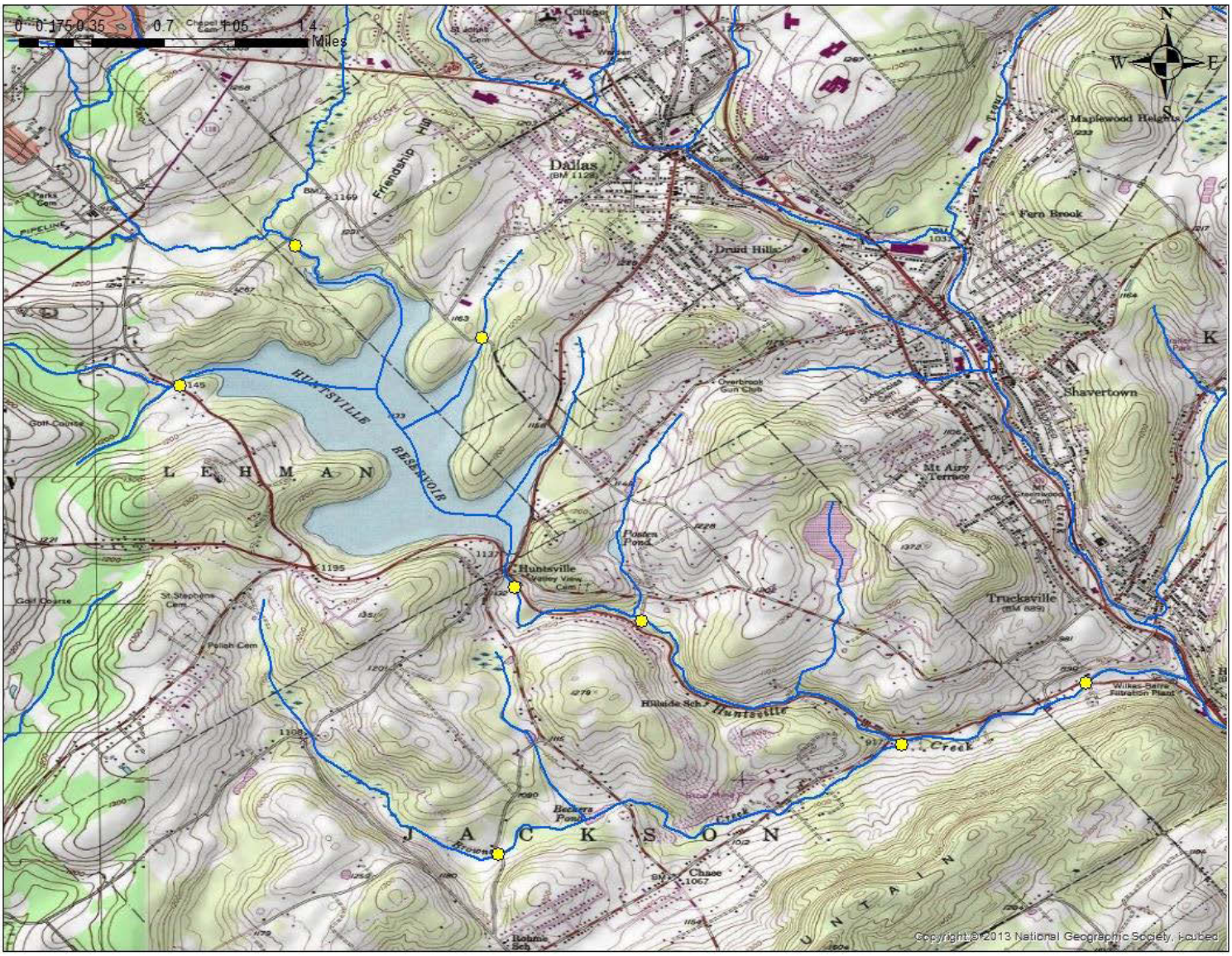
[28] ESRI ArcGIS Pro Product

Figure 7. Tom Mayka, DAMA Stormwater Coordinator surveying the conditions of Toby Creek at outlet of the large corrugated metal culvert east of Dunkin Donuts on the Dallas Memorial Highway before conducting the AOP Assessment.

Figure 8. EPCAMR and DAMA Staff perform an AOP Culvert Assessment/Training at tributary on the Irem Country Club Golf Course

HUNTSVILLE CREEK SUBWATERSHED OF TOBY CREEK TO BE ASSESSED SEPARATELY

EPCAMR will leave the Huntsville Creek watershed, including the Huntsville Reservoir and the Browns Creek tributary, details for the Huntsville Creek Coldwater Conservation Plan currently being assessed and developed. Briefly, the Huntsville Dam in the 1900s, located on Huntsville Road just below the five corners was constructed from flooded farmland and a cranberry marsh to create a **389** acre reservoir. Construction started in 1890 by the Wilkes-Barre Water Company and completed 2 years later. Water flowed from the reservoir along Huntsville Creek to the Wilkes-Barre Water Company filter plant on Hillside Road historically. Now, the PA American Water Company[29] operates a more modern water treatment plant in the same location just southeast of The Lands at Hillside Farms.



Map 2. Huntsville Creek subwatershed Tributary to Toby Creek and Future Monitoring Points on USGS Topographic Map (2019)

[29] PA American Water Company

HISTORIC & GEOMORPHIC DESCRIPTION OF THE LOWER TOBY CREEK WATERSHED

The lower portion of the Toby Creek Watershed is located in Edwardsville, Kingston, Swoyersville, Luzerne, and Courtdale Boroughs. DAMA[30] is located within this section of the lower watershed and the assessment does not include any work below the confluence with Toby Creek from the Huntsville Creek tributary at this time. However, EPCAMR has provided a general historical watershed description of the hydrology, historic flow pathways, and current condition of the waterway from a geomorphic perspective.

A large pond is located on top of the portion of the Larksville Mountain range above North Street and Cottage Avenue, in Luzerne, PA, near the Utility Pole Line corridor northeast of Bunker Hill Road that feeds the locally named, “Wildcat Falls”, an unnamed headwater tributary within the lower watershed. The Wildcat Falls are created by several first order and second order stream channels starting at roughly 1400’ in elevation, near Firewood Farms, steeply cascades down south of Bunker Hill in Kingston Township, after crossing under Dug Road and Bunker Hill Road. Several small ponds at 1100’ in elevation, just north of the intersection of Dug Road and Bunker Hill Road flow downstream and contribute additional flows of mountain water to Wildcat Falls with over a 400’ drop in elevation that is nearly vertical. An additional pond is found near Highwoods Road that provides additional drainage to the unnamed tributary to Toby Creek. It then can be found flowing beneath the Back Mountain Trail[31] wooden bridge and then down near DAMA before flowing southeast into Toby Creek below the parking lot. Trail maps can be found on the website hosted by Wilkes University.

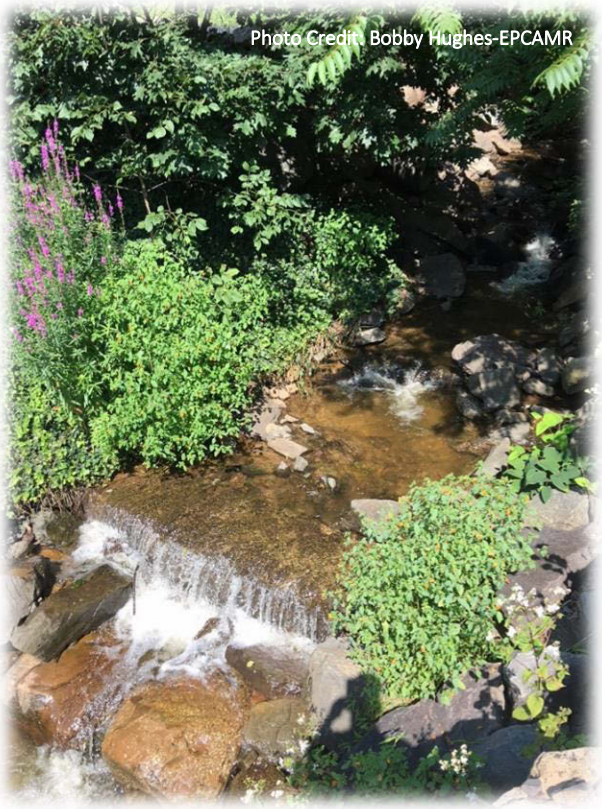


Figure 9. Wildcat Falls, unnamed tributary to Toby Creek flowing over concrete encased sewer line

[30] Dallas Area Municipal Authority
[31] Back Mountain Trail

Figure 10. "Wildcat Falls" tributary flowing into Toby Creek, where Japanese Knotweed, is pervasive, downstream from DAMA parking lot

The unnamed tributary has a sewer line that is encased with concrete that crosses it and enters the DAMA Plant. There is an approximate 2' vertical drop within the stream channel at a concrete encasement that is about 8-10' wide. There is a culvert that runs in a southeasterly direction under the DAMA Plant road before exiting into Toby Creek's left streambank looking downstream. The outlet to the culvert is located on the other side of the DAMA property fence. The area can only be accessed from an upstream point on Toby Creek, where two very large culverts are located at the other end of the DAMA Plant property. Japanese knotweed [32], an invasive plant that is very common throughout the Wyoming Valley streambanks, is prevalent along both banks looking upstream and downstream, along Toby Creek.

Figure 11. Double Metal Corrugated Squashed Pipes directing flow of Toby Creek under State Route 309 adjacent to the DAMA

[32] Invasives Species Information on Japanese Knotweed

On August 27, 2018, the EPCAMR Executive Director toured the plant briefly and learned about DAMA's Interceptor and Infiltration (I & I) best stormwater management practice (BMP) enhancement on the property to deal with storm events that exceed the capacity of the aged sewer and water infrastructure throughout Kingston Township, Dallas Township, and Dallas Borough. On this particular day, Tom Mayka, DAMA Stormwater Coordinator had explained that the BMP was receiving a topcoat of surface blacktop sealant before having the stone that was stockpiled near the channel and retention area placed back into the structure to allow for further aeration during high flows.

An unnamed tributary also flows from an elevation of 1160' along the mountaintop in Jackson Township, creating a cascading waterfall that drops over 500' directly into Toby Creek, along the outcropping of the bedrock to the west of State Route 309, and to your left, if you were driving out towards the Back Mountain.

Another unnamed tributary flows northeast down through Courtdale and Pringle Borough along Courtdale Avenue from an estimated 700' in elevation through a stormwater conveyance system under State Route 309 and Main Street in Luzerne Borough before flowing directly into Toby Creek behind Skovish Pools.

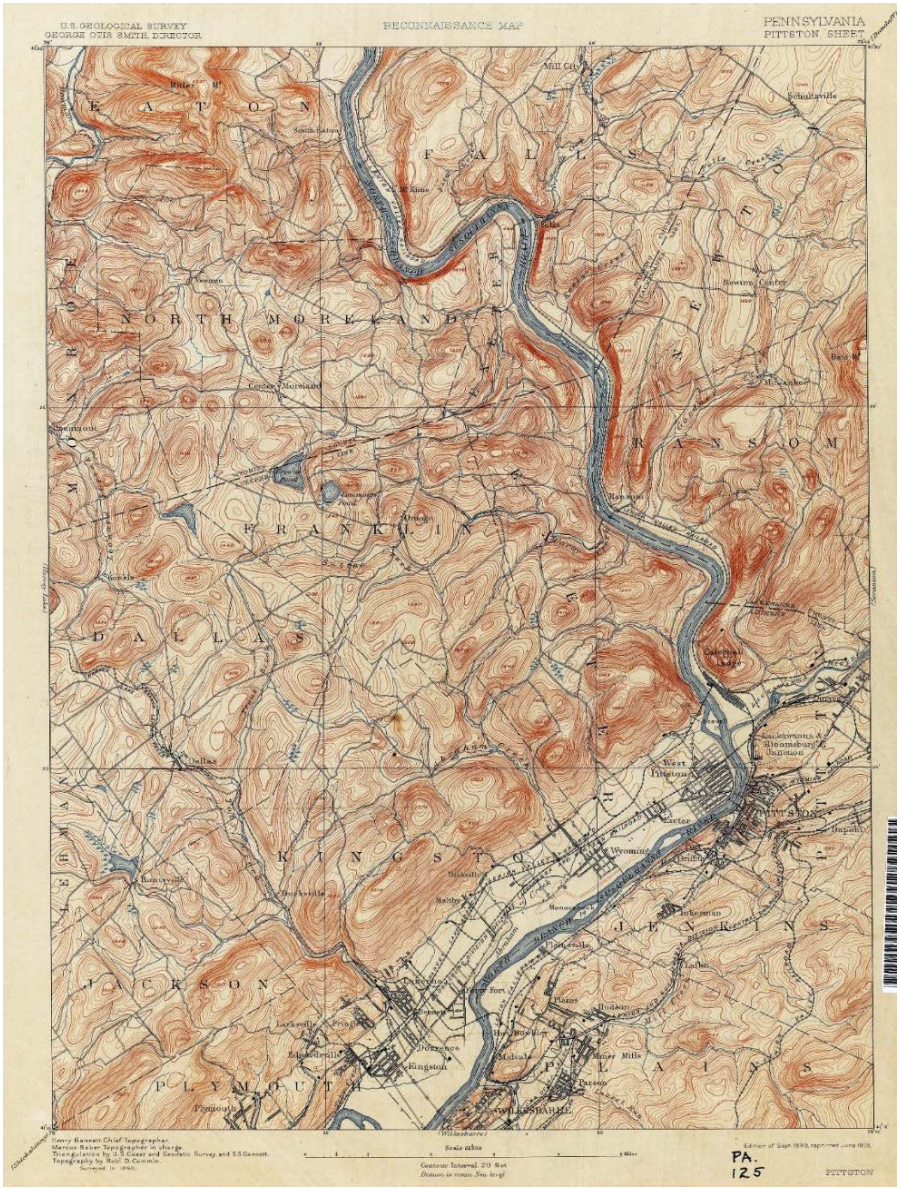
Yet another unnamed tributary flows from a pond along Corby Road in Courtdale Borough at about 1200' in elevation in a northern direction following the Utility Pole Line corridor directly down along the gap of the Larksville Mountain range to the Back Mountain down to the banks on the opposite side of Wasserot's lot, before flowing into Toby Creek.

Historically, another unnamed first order headwater tributary use to flow from an elevation of 700' alongside the Larksville Mountain range in Luzerne above and to the northeast of Miller Street where an abandoned mine reclamation project that has reclaimed a former past mining area that was likely a part of the Harry E. Colliery operations where it crossed along Main Street in Swoyersville. The lower reaches of Toby Creek were polluted by coal mining waste in the early 1900s[33]. It then flowed southwest where under the Harvey Lake Branch of the Lehigh Valley Railroad Branch and the Bloomsburg Division of the Delaware, Lackawanna, & Western Railroad, out towards the Dorrence Colliery in the floodplain of the Susquehanna, through Kingston Borough, current day Nesbitt Park, Kirby Park, and then coming to the confluence with the main stem of Toby Creek, just south of the current Wendy's along State Route 11. Water to this day can still be seen impounded in this area due to the construction of the Wyoming Valley Levee Raising Project.

South of DAMA, Toby Creek naturally flows behind the Luzerne Lumber property in Luzerne Borough, and continues to make its way through Luzerne Borough paralleling Main Street, running along over the hillside of Parry Street, paralleling Union Street, before passing under the Buckingham and Evans Street Bridges, then under State Route 309, where it enters the Toby Creek Flood Protection Levee System basin. At this point Toby Creek widens and becomes unstable and braided settling out deposits within the levee basin before being funnels again into the concrete US Army Corps of Engineers Flood Protection culvert system. Several inputs of stormwater are noted on current aerial photography leading into the basin were noted. A large contribution is coming into the side of the levee to the northeast from what appears to be Webster and McAndrew Streets.

[33] Water Supply Commission of PA (1921), Water Resources Inventory Report, pp. 608-609

Originally, as depicted on the historic 1890 US Geologic Survey Map[34] (*See Map 2.*) surveyed by Henry Gannett-Chief Topographer, Markus Baker-Topographer in Charge, and Topography by Robert T. Cummin, Toby Creek flowed right in between a spur of the Harvey Lake Branch of the Lehigh Valley Railroad Branch that ran northeast from Edwardsville Borough and the Bloomsburg Division of the Delaware, Lackawanna, & Western Railroad that is now Railroad Avenue. Toby Creek now flows through a US Army Corps of Engineers flood control culvert system beginning behind the Keeley's Alehouse & Grille, off Division Street and just north of the intersection of Brook Street with Railroad Avenue and outlets behind the K-Mart Plaza in Edwardsville Borough. It then flows around the K-Mart Shopping Plaza in Edwardsville Borough behind the former Redner's Supermarket and then flows under State Route 11 before emptying into the floodplains of the Susquehanna River just south of Valenti's Scrap Yard Incorporated.



Map 3. USGS Reconnaissance Map, Pittston Quadrangle, 1893 (Surveyed in 1890)

[34] USGS Reconnaissance Map, Pittston Quadrangle, 1893 (Surveyed in 1890

In the 1960s, a portion of Toby Creek, as it flowed through Kingston, PA was once a residential recreational swimming hole near a historic mine quarry, locally known as Poverty Beach, where a small dam was constructed on the stream.

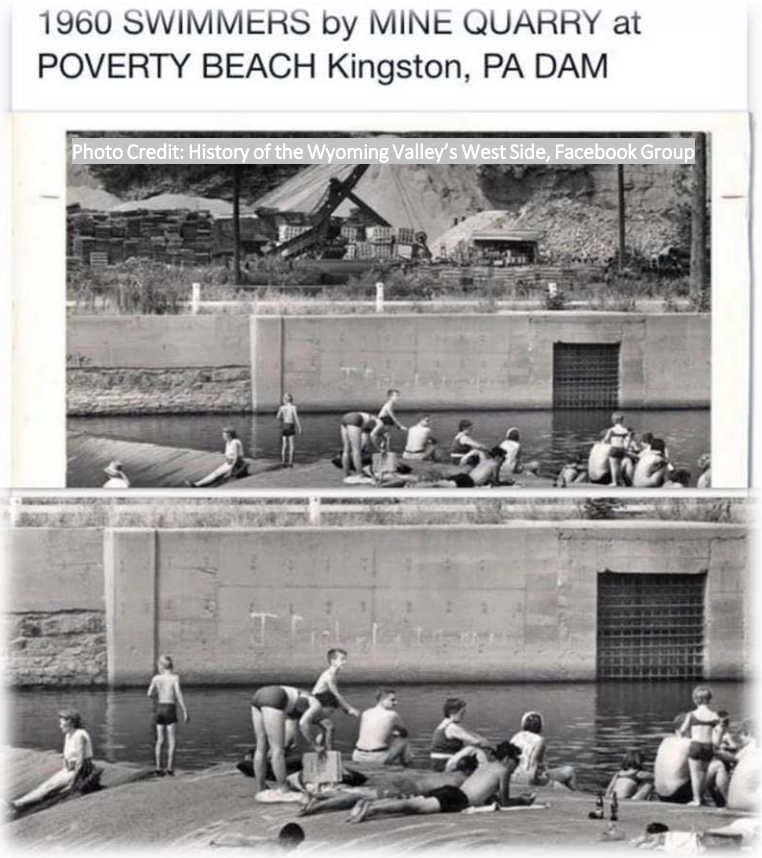


Figure 12. Poverty Beach Dam on Toby Creek, near Mine Quarry, Kingston, PA where people enjoy the recreational use of the water[35]

Figure 13. Overflow from the Huntsville Dam in the Huntsville Creek subwatershed of larger Toby Creek Watershed[36]

[35] History of the Wyoming Valley's West Side Facebook Group

[36] Flickriver

THE POST ARTICLES* SERIES ON TOBY CREEK FROM OCTOBER 2004

Back in 2004, *The Post* took a keen interest in the Toby Creek watershed and prepared a series of reports about the historic and irreplaceable nature of the watershed and its assets to raise awareness of the character of the creek and support efforts to protect, restore, preserve, and utilize the opportunities and attributes that it had for the benefit of the Back Mountain Community. Many reporters had written on the past and then present condition of the watershed, as well as shared oral histories from existing residents and those who had moved away to share their memories of how the waterway and its features were utilized publicly by the community. The editors of the local newspaper for the Back Mountain realized how public a resource the Toby Creek was due to its proximity to all kinds of land uses and people who inhabited the region. They encouraged residents to get off the beaten path and to look beyond the growth of vegetation that lined the creek, a majority of which was the invasive Japanese knotweed plant, even, in 2004, to see the true beauty of the watershed and remnants of the railroad era, stone arched bridges, natural bedrock features, gristmills, and other early mills and their stone foundations.

The Post was encouraging active, local community involvement to take a role in cherishing the Toby Creek watershed and lead the charge on restoring and improving the health of the entire area within the Back Mountain. While there is strength in numbers, even a small group can create a great deal impact on the improvement and protection of the watershed. The editors discussed the surrounding community watershed associations, like the Bowman's Creek Watershed Association, in the Noxen and South Mountain area, and how they were operated and had taken on local watershed restoration projects. EPCAMR was instrumental, as well as the Luzerne Conservation District in assisting with the startup of the Bowman's Creek Watershed Association in 1997. At the time of the printing of *The Post* Opinion article in October 2004, Toby Creek did not have a community watershed association.

The Post editors had given many positive reasons to give the Back Mountain Community a chance to consider the formation of a Toby Creek Watershed Association to showcase the hidden resource of the Back Mountain.

In another Opinion Letter from *The Post* during the same month, the editor decided to sign his name, as Ron Bartizek, because he based it upon his personal observations and hiking along the entire length of the Toby Creek from the Irem Temple Country Club Road in Dallas Township in the Back Mountain to the gap between Kingston Township and Luzerne Borough. He described it as not being an easy hike to do because so much of the length of Toby Creek straddled the Dallas Memorial Highway. In many ways, it is easy to see why so many people might not be able to enjoy the beauty of the watershed when traffic is passing by you and walking along the shoulder of the Highway is not the safest place to be to enjoy the view.

Although, the Back Mountain Trail, does offer some respite and areas along Toby Creek from Luzerne into the Back Mountain for several miles to take in just this type of outdoor recreational pleasure. Ron discussed the important roles Toby Creek and its headwaters played in the life of the residents of the Back Mountain and how the force of the water from the Creek had powered several mills that provided food and an income for early settlers of the region after the American Revolution. As he noted, there still are many locations where remnant foundations and gristmill stones are still located along the creek that lay abandoned and camouflaged by Mother Nature. His observations at the time 15 years ago aren't much different than they are today. It still has its issues with sediment buildup, localized trash, woody debris blockages, streambank erosion, and issues with culverts in many locations that could be corrected and restored, when an interest in doing so is enough to take some action to address those

localized areas of concern. The water quality on the other hand is still relatively clean or else it wouldn't hold the population of brown and brook trout, along with a diversity of other species along its main stem.

Ron Bartizek reflected back on the previous year's Spring 2003 Cleanup along Toby Creek that occurred in Dallas Borough, which gave dozens of volunteers the opportunity to remove tires that were illegally dumped, trash, overgrown brush and woody debris blockages along the section of the creek that was often the hardest hit. This event provided an opportunity to get people up and close with the Toby Creek. Ron also had walked the Back Mountain Trail, along Toby Creek, at its newest connection, between Franklin Street in Shavertown, and Lower Demunds Road in Dallas Township where it parallels the creek for nearly a half mile. Ron had hoped for more access points like this one at the time.

In yet another article in the series on Toby Creek, Ron Bartizek did a great job describing everything that he had seen as he walked the entire length of the creek, from a historical perspective to the meandering flow patterns it traversed through the Back Mountain back down into the Wyoming Valley. He discussed the need for a shared vision of the creek's potential. He traced the origin of the headwaters of Toby Creek along the northwest side of Country Club Road in Dallas Township from a seep emerging from the hillside as it bubbled up from the ground behind 420 Country Club Road, where an old spring house was constructed over it. This source of clean water had been utilized by the family for decades. From there it flows off the hillside into a marshy area with some constructed ponds before taking another plunge in elevation before heading towards the Wyoming Valley floor.

The remaining portion of the article goes into very descriptive detail of the pathways of the tributaries of Toby Creek and the vegetation that is found along the watercourses as it makes its way to the urban corridor and follows the Dallas Memorial Highway on its way down through the Back Mountain into the Wyoming Valley. Ron described the earthen dam at 390 Elmcrest Drive and flows behind the Elmcrest development, another headwater tributary to Toby Creek, where it runs parallel to a dirt road that services a pump station for the Dallas Area Municipal Authority (DAMA).

Ron described Merle Thomas's produce stand that was located along the Toby Creek, near what was Payne Printery that has now been purchased by Misericordia University, where he used to sell tomatoes that had been grown on land leased from Howard Wardan for more than 60 years since 1972.
Ron talked about how quickly the water can rise and the power of the stream when the remnants of Hurricane Ivan came through the region in September of 2004.He noted the sheer amount of litter that is along Toby Creek due to its proximity to the Dallas Memorial Highway, where garbage had been discarded, hubcaps, tires, fast food packaging, beer and soda cans, and other detritus could be found. That problem is still pervasive today.

Other community leaders, like Joe Moscovitz, Dallas Borough Manager at the time, and Josh Longmore, Watershed Specialist for the Luzerne Conservation District, at the time, discussed Toby Creek as being an economic development center point and a community treasure that the vision for the development of a Toby Creek Watershed Association could rally around. Mark Carmon, Spokesman for the PA Department of Environmental Protection (PA DEP) NE Office, at the time, encouraged more people to get involved, because knowing about Toby Creek is half the battle and he'd lived in the Back Mountain for over 40 years. Judy Rimple, Executive Director of the Anthracite Scenic Trails Association (ASTA), was all too familiar with the Toby Creek because it parallels and meanders along the Back Mountain Trail for miles and some of the headwater tributaries like Wildcat Falls, just above the DAMA, cross the bridge over the Falls.

In another *Post* series article, Rich Adamchick, who co-owned Pizza Perfect along Carverton Road talked about his son and local youth who fished Toby Creek who would pull out a “stringer full” of fish, including a 23.5” brown trout from a shallow area near the Trucksville Fire Hall in 2003 Walter Chamberlain, District Manager for the Luzerne Conservation District, at the time, didn’t have so much luck during the Earth Day Cleanup in 2003, when he only encountered a much smaller 2” fish he wasn’t able to identify, that was more than likely a minnow species. It was found out that the PA Fish & Boat Commission do not stock Toby Creek, although some residents had done so on their own. Rich Adamchick, began to stock privately, in 1992, locally known, “Snake Creek”, the unnamed tributary to Toby Creek that comes down along Carverton Road to meet up with Toby Creek, behind Pizza Perfect, where it meanders behind the business and then shoots through a major constriction point at the stone arched bridge that is a remnant transportation structure from the Lehigh Valley Railroad before coming to a confluence in Toby Creek in a 3’ plunge pool right on the main stem. He would obtain the trout from a Bear Creek hatchery. He had also helped organize cleanups along this stretch with the local community members, businesses, and the volunteer fire and the police departments. He stopped stocking in 2002 because too many adults were netting the fish and taking the fun out of the joy of the experience of fishing for the younger kids.

In yet another article in the *Post* series, Camille Fioti, *Post* Correspondent, interviewed Matt Krebs who had lived on South Main Street for 18 at the time, in Kingston Township, who said that Toby Creek had been stocked by the Toby Creek Fisherman’s Association in Luzerne. The Mayor of Luzerne Borough, at that time said that brothers Jim and George Riley, and members of the Toby Creek Fisherman’s Association would take up collection from businesses and local residents, then use them to purchase trout to stock Toby Creek for the annual 3-day fishing derby. As expected, by the end of the weekend, the pressure was so high that most of the fish were harvested. It hasn’t been verified if private stockings still occur by the Toby Creek Fisherman’s Association some 15 years later.

Mark Albrecht, President of the Anthracite Scenic Trails Association (ASTA) informed Camille that William Trucks Sr., operated grist mills more than 100 years ago along Toby Creek in Kingston Township. Trucksville was named after William Trucks, Sr. ASTA and other partners, including Boy Scout Troops, PA Department of Transportation (PA DOT) and community volunteers, had come together for a decade and participated in Keep Pennsylvania Beautiful Day to clean up the Back Mountain Trail and along Toby Creek.

Figure 14. Back Mountain Trail & Anthracite Scenic Trails Association Trailhead along Toby Creek north of Harris Hill Road

In two more whimsical articles by Ron Bartizek in the *Post* series, the question arose as to what was the official name of the creek. Toby? Toby’s? Tobey? Tobey’s? Signs along the creek officially say “Toby”.

EPCAMR has chosen to use the name Toby as well because from our research many of the creeks and streams don't carry the apostrophe to show possession of the creek. It is usually singular and tied to a particular family name or historical person. Although, Ron found an early publication, Stewart Pearce's *Annals of Luzerne County*[37], written in 1860, that keep's the name in the form of Toby's, with the apostrophe "s" to show possession. Historic legend also told us that Toby was an elderly Native American who lived in the area in the middle of the19th century. According to F. Charles Petrillo, a local lawyer and local historical author, a Wilkes-Barre newspaper, the *Luzerne Union*[38], described a Toby's Cove, and other references day he lived somewhere near the creek, but further down in the Wyoming Valley before it's confluence with the Susquehanna River. The name could also have been derived from a contraction of Tobyhanna, another Native American term for alder or birch-like tree.

Ron also received communication from Guy Giordano, from Harvey's Lake, PA, who was an avid post card collector who had 7 different post cards with the name 'Topy" Creek printed on them. Some of the postmarks go as far back as 1907. They are all different views of Toby Creek. For a creek to drop 500' in elevation, the name "Topy", possibly as in topography, might not be so far-fetched. Ron gave the origination some serious buy in.

In another article, Dr. Dale Bruns, Dean of the College of Science and Engineering at Wilkes University[39] at the time, led a research effort and proposal to start the Environmental Monitoring for Public Access and Community Tracking (EMPACT) Program in 2001. It was created under the American Heritage Rivers Program[40], that EPCAMR was a part of the Steering Committee at the time, and initially funded by the US Environmental Protection Agency, Region III, in Philadelphia. Toby Creek was part of the Upper Susquehanna-Lackawanna River Watershed that was designation for priority funding. EMPACT was one of the earliest integration systems of geographic information systems (GIS) software, hardware, computer mapping, environmental assessment, and monitoring of watersheds with real time water quality data and monitoring. Sondes were used to collect data such as various chemical parameters like dissolved oxygen, acidity, nitrates, and ammonia. Dallas Area Municipal Authority (DAMA) had installed one of the four sondes. Even in 2004, Dr. Bruns had stated that although there was a fair amount of suburban development, the water quality looked reasonably good. He did note salt spikes from snow melt runoff during the Winter from road salts.

One other article written by Charlotte Bartizek, *Post* Correspondent, she described the availability of all the resources to reclaim and protect streams in the region and highlighted the work of the Bowman's Creek Watershed Association (BCWA), the adjacent waterway to the north and west of Toby Creek. She described its early formation in 1998, when EPCAMR was also involved in its formation along with the Noxen-Monroe Sportsman's Association[41], the Stanley Cooper Chapter #251 of Trout Unlimited[42], South Mountain Land Association[43], and the Luzerne and Wyoming County Conservation Districts[44]. The EPCAMR Executive Director, along with Josh Longmore, who at the time was a Watershed Specialist with the Wyoming County Conservation District, at that time, assisted in the formation of the

[37] Annals of Luzerne County E-book
[38] The Luzerne Union Newspaper
[39] Wilkes University
[40] OLR Research Report on the American Heritage Rivers Initiative
[41] Noxen-Monroe Sportsman's Association
[42] Stanley Cooper Chapter #251 of Trout Unlimited
[43] South Mountain Land Association Facebook Page
[44] Wyoming County Conservation District

watershed association and helped them to secure a $32,000 PA Department of Environmental Protection (PA DEP) Environmental Stewardship Fund Growing Greener grant to reduce the acid loading of the Creek and its tributaries and construct a handicap access along Bowman Creek in Noxen. Dorne White, was an original founder of the BCWA and helped to pull all the IRS paperwork together to officially form the group. EPCAMR provided start-up funds to the BCWA to get them started under a Regional Watershed Support Initiative grant to support community organizations, print and develop brochures, attract new members, produce a video on Bowman's Creek, and were a founding partner organization that provided the BCWA with technical and grant writing assistance as well as project management. Dorne White also helped to start another watershed association on the upper and lower Tunkhannock Creek.

Karen Szwast, Coordinator for the Hicks Creek Watershed Association, another stream that flows from the top of Peters Mountain down through Exeter Borough and into the Susquehanna River in the Wyoming Valley, also was interviewed and talked about the importance of having a watershed assessment conducted to assess the problems that need to be addressed in the watershed. EPCAMR also assisted in the formation of this watershed in 2001. The Exeter Borough Cleanup[45] was one of many successes early on for the community and concerns about flooding along the creek from local residents and businesses continued to surface. The mining companies had rerouted the creek and made it flow against gravity to the north, causing sedimentation and flooding issues.

Other organizations like the Wyoming Valley Watershed Coalition, the Susquehanna River Basin Commission, also were available to assist with the formation of community watershed associations in the early 2000s.

Editorial Board and Correspondents Who Authored *The Post* Articles

- Our Opinion, *We Can't Afford to Keep this Precious Resource in Hiding*, Sunday, October 10, 2004
  [Editorial Board]
- *Long Abused, Creek Cold be a Gem*, Sunday, October 10, 2004 (Cover Story, p.1-then, p. 7)
  [Vicki Keiper]
- *Most of the Time, Living is Easy by the Creek*, Sunday, October 10, 2004 (p. 8)
  [Camille Fioti]
- *A Trek with Nature, Man, and History,* Sunday, October 10, 2004 (p. 6-7)
  [Ronald Bartizek]
- *All Things Considered*, Sunday, October 10, 2004
  [Ronald Bartizek]
- *Surprises Abound Along the Creek*, Sunday October 17, 2004 (p. 6-7)
  [Ronald Bartizek]
- *Needed: A Shared Vision of the Creek's Potential*, Sunday, October 17, 2004 (Cover Story, p.1-then, p.6-8)
  [Ronald Bartizek]
- *Plenty of Help is Available to Reclaim and Protect Streams*, Sunday, October 17, 2004 (p. 8)
- [Charlotte Bartizek]
- *Usually Place Creek Can Pack a Punch*, Sunday, October 17, 2004 (p. 8)

[45] PA DEP Secretary Joins Hicks Creek Watershed Group Stream Cleanup (April 2002)

- Our Opinion, *Let's Reach Out and Grasp a Bright Future for Toby's Creek*, Sunday, October 17, 2004
  [Editorial Board]

The Post* Articles have been scanned and are included as **Appendix C. in the Plan.

THE TIMES LEADER ARTICLE FROM AUGUST 2017

- "*Toby Creek Project in Luzerne Advances with Aid of Watershed Expert*"[46], August 2, 2017

John Levitsky, Watershed Specialist for the Luzerne Conservation District, addressed volunteers who have been working with the Luzerne Merchants Association and Mayor Jim Keller to commend them for beautifying and finding ways to restore and protect the streambanks of Toby Creek in the Borough below the gap in the Back Mountain in the lower Toby Creek Watershed where there is a growing desire to transform the area into an urban greenway corridor, much like Dallas Borough has plans for in the Upper Toby Creek. John provided some great suggestions and guidance to the audience on August 2, 2017.

Streamside litter cleanups and removal of large amounts of the invasive Japanese Knotweed that made accessing the stream nearly impossible and prevented more of the public from utilizing Toby Creek have been successfully completed by the volunteers. Levitsky suggested getting rye grass planted to prevent further soil erosion and then a herbicide application to prevent the return of the Japanese Knotweed.

Levitsky discussed the Luzerne Conservation District's work on projects throughout the watershed such as stormwater basins in Dallas Township, stream bank stabilization in Kingston Township and other work throughout the headwaters of the creek. All of the efforts are to hopefully reduce the flood peaks throughout the entire watershed and especially in Luzerne.

The Luzerne Conservation District wanted to form a Toby Creek Watershed Association that had been suggested years ago by a former District Manager, Walter Chamberlain, as far back as 2004. This would allow for all of the municipal governments and community members and businesses interested in Toby Creek to work together and generate joint project ideas.

The meeting focused on the section of Toby Creek that runs directly through Luzerne Borough to turn it into an urban greenspace and park. Levitsky mentioned that with the work going on upstream, Toby Creek's temperatures will remain cool and it could improve the coldwater fishery, macroinvertebrates, and or native trout populations that are in parts of the watershed. The park could be used year-round and serve as an improved recreational greenspace within the Borough.

Levitsky talked about facilitating working with State agencies and organizations to get funding to plant shrubs and trees. He recommended sycamores, pin oaks and some other native species that would provide good shade, coloration and good looks for the park. Dr. Jim Reisinger, a member of the Seneca Nation[47], recommended incorporating medicinal plants and herbs when planting new vegetation. He

[46] Toby Creek Project in Luzerne Advances with Aid of Watershed Expert
[47] Seneca Nation of Indians

said federal funding might be available to assist with some aspects of the project because the area of Toby Creek in Luzerne is a Native American site.

Levitsky discussed the limited funding sources due to the political climate, particularly at the Federal government level, without going into many details and that any sources would be welcomed.

Levitsky recommended a minor engineering study to determine the best way to address the Toby Creek streambank erosion behind the Firehouse because of the constriction of the stream caused by the bridge and overhead pipeline that are likely contributors to the problem. Finally, he encouraged local business leaders and owners to raise funds and have their own fundraisers for local projects following a question from Jim Lane, owner of Main Bean Coffee Shop on Main Street, who asked if the Borough had to wait for State or Federal funds to become available or not.

THE CITIZENS VOICE ARTICLE FROM JUNE 2019

- *"Misericordia Creating New Community Park in Dallas"*[48]*, June 4, 2019*

Misericordia University[49] was completing a beautification project at the beginning of Lake Street, near the State Route 415 Roundabout, where additional parking and a community park and greenspace area was constructed adjacent to Toby Creek along the Dallas Memorial Highway to serve as a new gateway to the Campus and downtown community. An additional 35 parking spaces were constructed at the site of the former Olde House Café that now has become the John P. Passan Hall, where the College of Health & Sciences and Education is located. Misericordia had been acquiring several properties along Lake Street since 2016, including the former Himmler Theater.

PREVIOUS WORK COMPLETED BY THE BORTON-LAWSON ENGINEERING AND THE LUZERNE CONSERVATION DISTRICT[50]

Toby Creek Assessment Grant– In 2010, the District received a PA Department of Environmental Protection (PA DEP) Growing Greener Grant in the amount $86,689 for an assessment of the Toby Creek watershed. The primary goal of the Toby Creek Assessment Grant was to provide a comprehensive, watershed wide appraisal of the Toby Creek watershed, which is **36.5** square miles. This particular assessment focused on evaluating stormwater management, streambank erosion, and flooding problem areas and identified where and how Best Management Practices (BMPs) should be implemented both within and along stream corridors throughout the basin. Key locations for Conservation efforts were also identified, and a hydrologic model was used to demonstrate the benefits of future implemented projects. Borton-Lawson Engineering was the contractor chosen to conduct the project and completed the Plan in the Spring of 2011.

[48] Misericordia Creating New Community Park in Dallas Article-The Citizens Voice

[49] Misericordia University

[50] Luzerne Conservation District 2010 Annual Report (**Appendix B.**)

Toby Creek Construction Grant - The approximately **36.5** square mile Toby Creek watershed is notable for the heavily-urbanized strip along the main stem Toby Creek, extending from the community of Dallas near the headwaters, through Shavertown, Trucksville, and finally Luzerne, Pringle, Kingston, at the lower end of the basin until it flows into the Susquehanna River in Edwardsville Borough. The stream has been largely channelized and relocated to alternating sides of the valley through much of this **9**-mile-long urbanized stretch. While the sub-basins of Trout Brook, Huntsville Creek, and Brown's Creek are much less developed, these areas are now beginning to urbanize.

Unfortunately, an increase in the area of impervious surface accompanying expanding development in these areas portends an increase in the occurrence and magnitude of high stream flows during increased rainfall events. The negative effects of this legacy of land use changes in the Toby Creek watershed has been amply demonstrated during the severe storms, in late June of 2006 and September of 2011, with Tropical Storm Alberto and Tropical Storm Lee, respectively, when this area experienced major rainfall events. Before these last major storms, channels throughout the watershed were already eroded and therefore vulnerable to future extreme weather events. As a consequence, the storms caused severe damages in many places, especially along the developed main stem of Toby Creek. Downtown Luzerne was especially hard in the Lower Toby Creek watershed below the gap from the Back Mountain.

The Luzerne Conservation obtained another PA DEP Growing Greener grant in the amount of $102,362 for the design, permitting and construction of stream channel repairs at the most critical site in Luzerne Borough. The District was able to realign grant funds for on-the-ground BMPs by utilizing the PA Association of Conservation District's (PACD) Engineering Technical Assistance Grant Program[51]. This allowed the use of funds that were originally allocated for design, permitting and project oversight, to be reallocated for project construction instead. In addition to the first grant, the District received a second Growing Greener grant in the amount of $445,435 for the construction of the project. The project stabilized 2000' linear feet of stream that contributed massive sediment loads to downstream waters, while also helping to protect many homes and business that otherwise would not be protected from the erosion during storm events. The remaining grant funds allowed for implementation of a second phase of this project, which started in the Spring of 2011 in the vicinity of Harry C. Snowdon Funeral home in Shavertown, where a massive rock stabilization project was completed along the retaining wall on the Snowdon property along Toby Creek above the Pioneer Bridge and the Dallas Memorial Highway.

The Luzerne Conservation District also secured PA DOT approved identification signs for Toby Creek that were placed along the stream in strategic locations. The signs were funded by the Pocono NE Resource Conservation & Development Council[52], in partnership with the Dallas Borough and the Luzerne Conservation District.

The Luzerne Conservation District also developed a conceptual site plan for a Greenway/Rail Trail behind the Commonwealth Telephone building on Lake Street in Dallas Borough and presented it then College Misericordia and the Commonwealth of PA on behalf of Dallas Borough and the ASTA in the hopes of gaining their support for additional funding.

[51] PA Association of Conservation Districts (PACD) Engineering Technical Assistance Grant Program

[52] Pocono Northeast Resource Conservation & Development Council

UPPER TOBY CREEK WATERSHED DESCRIPTION AND BACKGROUND INFORMATION

Toby Creek (known locally as Toby's Creek), is a tributary of the Susquehanna River, situated in north-central Luzerne County[53], Pennsylvania. The watershed of the creek has an area of **36.5** square miles. It is approximately **10.5** miles long and flows through Dallas Township, Dallas, Kingston Township, Courtdale, Luzerne, Pringle, Kingston, Edwardsville, and Larksville[54]. The creek is entirely located within the US Geological Survey Topographic Kingston Quadrangle Map. It is adjacent to watersheds such as those of Harvey Creek and Abraham Creek[55].

The stream density of the uppermost **31.8** square miles of the watershed is **1.6** miles/**1** square mile. A total of **59.7**% of this segment of the watershed is forested and **17.7%** is urban[56].

Toby Creek's watershed is in part or all of **14** municipalities. It is in **10** Boroughs: Swoyersville, Pringle, Luzerne, Larksville, Kingston, Harveys Lake, Forty-Fort, Edwardsville, Dallas, and Courtdale. It is also in **4** Townships: Lehman Township, Kingston Township, Jackson Township, and Dallas Township. Toby Creek is mainly rural. Pennsylvania State Route 309 (Dallas Memorial Highway), Pennsylvania State Route 118, State Route 415, and US State Route 11 are partially within it. The **2** billion-gallon Huntsville Reservoir is also in the Toby Creek drainage basin. Several mills were built along the creek in the 1800s and many bridges have been constructed over it. The creek has experienced significant floods in 1942, 1972, 2006, and 2011.

Land Use Characteristics of the Toby Creek Watershed

A 9-mile long stretch of land along the main stem of Toby Creek is highly urbanized. This stretch of land begins in Dallas, near the creek's headwaters, and passes through Shavertown, Luzerne, Kingston, and Edwardsville[57]. Both the Back Mountain and Endless Mountain regions are associated with the creek's watershed and are adjacent to it[58].

Most of it (**61.3** %) is forested land. Considerably less common are grassland (**19.6** %) and urban land (**16.4** %). A total of (**2.1** %) of the creek's watershed consists of wetlands and mining lands (**0.6%**). The mining land is confined to one area near the mouth of the creek[59].

The watershed of Toby Creek is very narrow in its lower reaches. However, it becomes much broader in its middle and upper reaches. The watershed is developed. The number of employees in the creek's drainage basin is expected to increase until 2030. Pennsylvania State Route 309 runs through the

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[53] Zbick, Dr. Paul J. Luzerne County: History of the People and Culture. Lancaster, PA: Wyoming Historical and Geological Society and Strategic Publications, 1994.

[54] The National Map Viewer

[55] Luzerne County Act 167 Phase II Stormwater Management Plan, Completed by Borton-Lawson (June 30, 2010)

[56] *Toby Creek Streambank Stabilization Project,* Luzerne Conservation District (November 2013)

[57] Luzerne Conservation District 2010 Annual Report (**Appendix B.**)

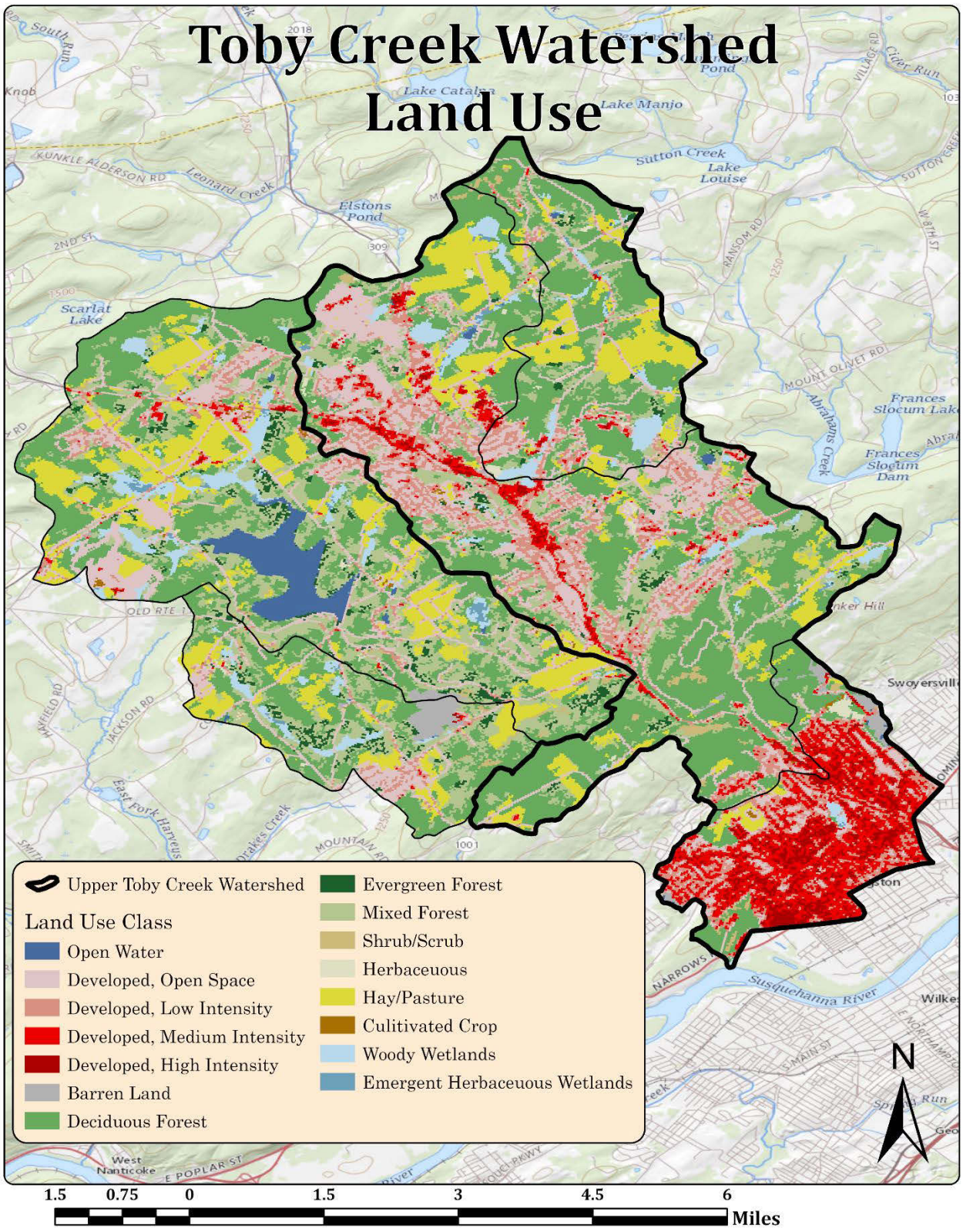
[58] Geospatial Tools to Support Watershed Environmental Monitoring and Reclamation: Assessing Mining Impacts on the Upper Susquehanna-Lackawanna American Heritage River, Dale Bruns (2004)

[59] Geospatial Tools to Support Watershed Environmental Monitoring and Reclamation: Assessing Mining Impacts on the Upper Susquehanna-Lackawanna American Heritage River, Dale Bruns (2004)

watershed in a north-south direction. PA State Route 118 is in the watershed's northwestern portion and US State Route 11 passes through its southernmost part[60].

[60] Supporting Documentation Toby Creek, Luzerne County Nomination for Critical Water Planning Area Under Pennsylvania State Water Plan, Pennsylvania Department of Environmental Protection (October 2009)

Toby Creek Watershed Land Use



Map 4. Toby Creek Watershed Land Use

Water Usage from the Toby Creek Watershed

A total of **4.03** million gallons of water/day (MGD) are withdrawn from Toby Creek and its tributaries. **3.38** million gallons/day (MGD) (**84** %) are removed by registered water suppliers and **0.51** million gallons/day (MGD) (**13** percent) are removed for commercial and industrial purposes. **0.10** million gallons/day (MGD) (**2** %) are removed for mineral purposes and **0.04** million gallons/day (MGD) (**1** %) are removed for residential purposes. The Huntsville Reservoir is located in the watershed of Toby Creek and has a storage capacity of approximately **1.915** billion gallons[61]

Toby Creek is the main source of flooding in Courtdale, Dallas, Luzerne, Pringle, and Kingston Township. It is also one of the main sources of flooding in the Borough of Kingston. However, the creek's floods cause little damage in Courtdale Borough, since its floodplain is relatively undeveloped in that Borough[62]. Toby Creek has an Act 167 Stormwater Management Plan[63].

There are also numerous swamps, lakes, and ponds in the watershed of Toby Creek[64].

Major Named Tributaries of Toby Creek

Toby Creek has two named tributaries[65]. Huntsville Creek and Trout Brook[66]. Huntsville Creek joins Toby Creek **5.04** miles upstream of its mouth. Its watershed has an area of **14.7** square miles. Trout Brook joins Toby Creek **7.60** miles upstream of its mouth. Its watershed has an area of **4.20** square miles.

General Impairments and Average Flow of Toby Creek

Today, no part of the watershed of Toby Creek is considered to be impaired[67]. It has been described as showing "some degraded conditions" but does not rank among the most polluted watersheds in the Middle Susquehanna Subbasin, many of which are impaired by abandoned mine drainage (AMD) and other non-point sources of pollution. However, Toby Creek does have levels of nutrients and sodium, according to the Susquehanna River Basin Commission[68]. There is one combined sewer overflow in the watershed, near the mouth of the Toby Creek[69].

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[61] Supporting Documentation Toby Creek, Luzerne County Nomination for Critical Water Planning Area Under Pennsylvania State Water Plan, Pennsylvania Department of Environmental Protection (October 2009)

[62] Federal Emergency Management Agency (FEMA) Flood Insurance Study VOLUME 1 of 6, Luzerne County, Pennsylvania (All Jurisdictions), pp.32, 34.

[63] Luzerne County Act 167 Phase II Stormwater Management Plan, Completed by Borton-Lawson (June 30, 2010)

[64] Water Supply Commission of PA (1921), Water Resources Inventory Report, pp. 608-609.

[65] The National Map Viewer

[66] PA Gazetteer of Streams

[67] Luzerne County Act 167 Phase II Stormwater Management Plan, Completed by Borton-Lawson (June 30, 2010)

[68] Susquehanna River Basin Commission Middle Susquehanna Subbasin Year-1 Survey (September 2009)

[69] Geospatial Tools to Support Watershed Environmental Monitoring and Reclamation: Assessing Mining Impacts on the Upper Susquehanna-Lackawanna American Heritage River, Dale Bruns (2004)

Bridge Construction and Repairs over Toby Creek

Numerous bridges have been built over Toby Creek. One was built in 1920 and repaired in 1989. Another was built in 1928 and repaired in 1963 and a third was built in 1939. Six bridges were built over the creek in 1941, all of them in Kingston Township and Dallas Township. Another bridge was built over Toby Creek in 1955 and four more were built in 1963, one of which was repaired in 1988. One was built in 1970 and repaired in 1980 and another was built in 1976 and repaired in 1997. Two more bridges were built across the creek in 1980, one more in 1984, and one in 1989[70].

General Chemistry and Water Quality of Toby Creek

The turbidity of Toby Creek ranges from **1** to **150** JTU. The creek's specific conductance ranges from **70** to **210** microsiemens per centimeter at **25** °C (**77** °F)[71]. This value was historically somewhat higher[72].The creek is slightly alkaline, with an average **7.1** pH. Its pH ranges from **6.4** to **7.7**. The concentration of water hardness in the creek's waters ranges from **26** to **84** milligrams/liter[73]

The concentration of dissolved oxygen in the waters of Toby Creek ranges from **9.1** to **13.6** milligrams per liter and is typically over **10** milligrams/liter. The concentration of carbon dioxide in the waters of the creek ranges from **0.9** to **12** milligrams/liter and the ammonia concentration ranges from **0.05** to **0.76** milligrams/liter per liter. The nitrite concentration ranges from **0.048** to **0.124** milligrams/liter and the nitrate concentration ranges from **0.94** to **1.60** milligrams/liter. The phosphorus concentration ranges between **0.06** and **0.62** milligrams/liter. The concentration of chloride ranges from **7** to **25** milligrams/liter and the sulfate concentration ranges from **2** to **24** milligrams/liter[74]. The average concentration of total dissolved solids in the creek is **117** milligrams/liter, but this was historically slightly higher[75]. A total of **10,200** tons of dissolved solids flow through the creek per day[76].

The calcium concentration in the waters of Toby Creek ranges from **8.8** to **152** micrograms/liter and the magnesium concentration ranges from **1** to **13** micrograms/liter. The concentration of recoverable iron in the creek ranges from **20** to **21,000** micrograms/liter and the concentration of recoverable aluminum was once measured to be **12,000** milligrams/liter. The concentrations of chromium and copper were both once measured to be **20** micrograms/liter and the arsenic concentration was measured to be **1** microgram/liter. The manganese and zinc concentrations were once measured to be **520** and **70** micrograms/liter[77].

The discharge of Toby Creek in its lower reaches is lowest in August and September, when it averages **15** cubic feet/second (**6,732.47** gallons/minute) and **19** cubic feet/second (**8,527.79** gallons per minute). In July and October, the average discharge is also relatively low **22** cubic feet/second (**9,874.29** gallons/minute) and **21** cubic feet/ second **(9,425.45** gallons/minutes), respectively. The highest average discharges occur in April and March: **83** cubic feet/second (**37,252.99** gallons/minute) and **82**

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[70] National Bridge Reports for Luzerne County

[71] USGS 01537000 Toby Creek at Luzerne, PA

[72] Geospatial Tools to Support Watershed Environmental Monitoring and Reclamation: Assessing Mining Impacts on the Upper Susquehanna-Lackawanna American Heritage River, Dale Bruns (2004)

[73] USGS 01537000 Toby Creek at Luzerne, PA

[74] USGS 01537000 Toby Creek at Luzerne, PA

[75] Geospatial Tools to Support Watershed Environmental Monitoring and Reclamation: Assessing Mining Impacts on the Upper Susquehanna-Lackawanna American Heritage River, Dale Bruns (2004)

[76] USGS 01537000 Toby Creek at Luzerne, PA

[77] USGS 01537000 Toby Creek at Luzerne, PA

(**36,804.16** gallons/minute) cubic feet per second, respectively. The highest average monthly discharge between 1941 and 1993 was **269.3** cubic feet/second (**120,870.23** gallons/minute) in April 1993[78].

However, during severe floods, the discharge can top **3000** cubic feet/second (**1,346,493.51** gallons/minute)[79] The lowest recorded average monthly discharge during that time, **3** cubic feet/second (**1,346.49** gallons/minute), occurred in September 1951. The average discharge of the creek between 1941 and 1993 was **41.2** cubic feet/second (**18,491.84** gallons/minute)[80]. The gage height of the creek between 1986 and 1993 ranged from **0.25** feet to **1.46** feet, but can be over **4** to **6** feet, during severe floods.[81,82]

Geography

The elevation near the mouth of Toby Creek is **518** feet above sea level[83]. The elevation of the creek's source is between **1,220** and **1,240** feet above sea level. Its gradient is relatively low[84]. In its upper **8** miles, the creek's elevation decreases at a rate of **92.5** feet/mile. In its lower **3** miles, its elevation decreases at a rate of **24** feet/mile[85].

Toby Creek passes through a gorge between Trucksville and Luzerne. Downstream of Luzerne Borough, it flows through broad bottom lands[86]. The creek is surrounded by steep slopes in the borough of Courtdale Borough[87]. The watershed has been affected by glaciation[88].

[78] USGS 01537000 Toby Creek at Luzerne, PA
[79] Federal Emergency Management Agency (FEMA) Flood Insurance Study VOLUME 1 of 6, Luzerne County, Pennsylvania (All Jurisdictions), pp.32, 34.
[80] USGS 01537000 Toby Creek at Luzerne, PA
[81] Federal Emergency Management Agency (FEMA) Flood Insurance Study VOLUME 1 of 6, Luzerne County, Pennsylvania (All Jurisdictions), pp.32, 34.
[82] USGS 01537000 Toby Creek at Luzerne, PA
[83] Geographic Names Information System, Feature Detail Report for Toby Creek
[84] The Early Settlement of Dallas Township, Luzerne County, Pennsylvania, William Penn Ryman (1901), pp. 8, 12–13, 20
[85] Water Supply Commission of PA (1921), Water Resources Inventory Report, pp. 608-609.
[86] Water Supply Commission of PA (1921), Water Resources Inventory Report, pp. 608-609.
[87] Federal Emergency Management Agency (FEMA) Flood Insurance Study VOLUME 1 of 6, Luzerne County, Pennsylvania (All Jurisdictions), pp.32, 34.
[88] Water Supply Commission of PA (1921), Water Resources Inventory Report, pp. 608-609.

Geology

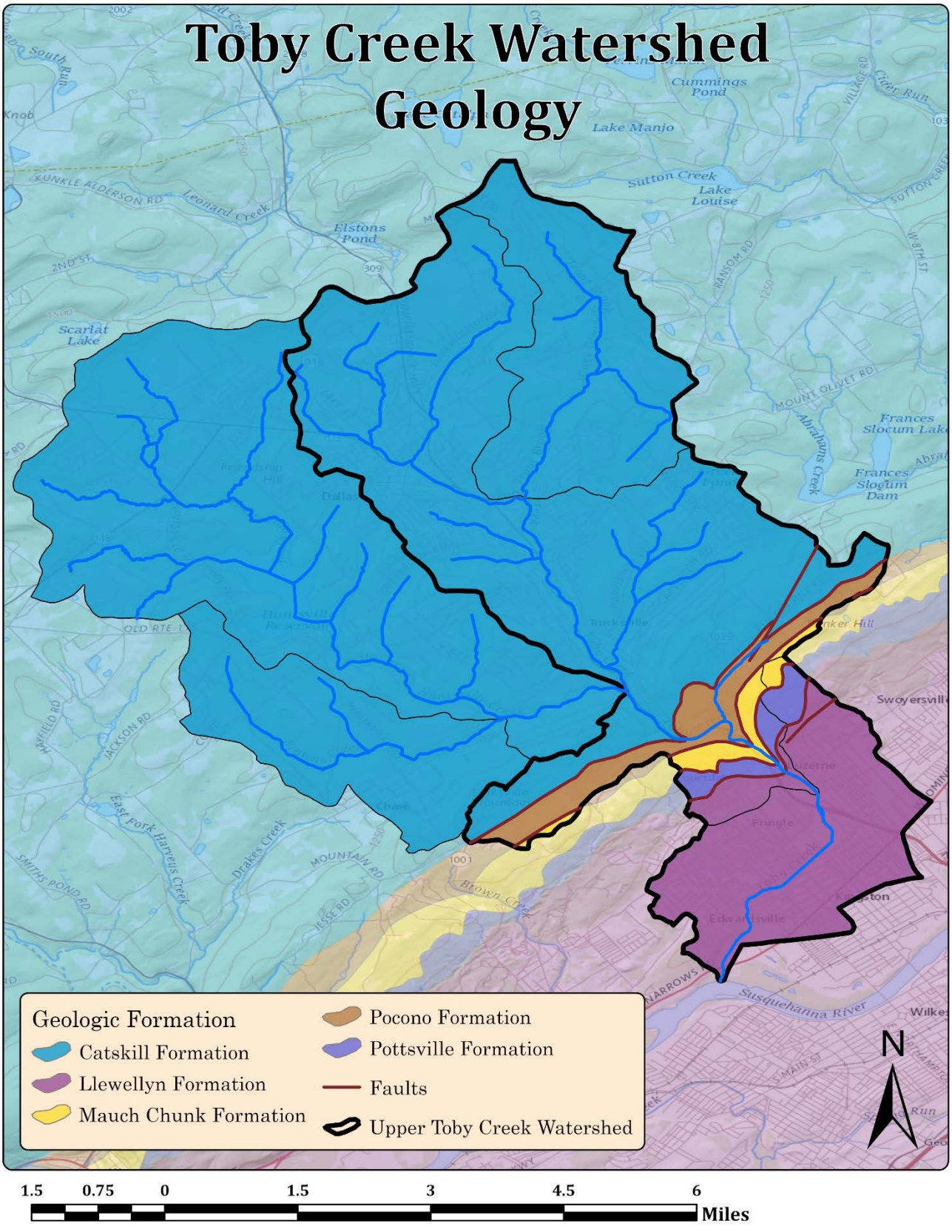
A majority of the watershed's geology is made up by the Devonian aged Catskill Formation which predominantly consists of red sandstone indicating a large-scale terrestrial deposition during the Acadian orogeny. As Toby Creek flows into the valley, in the southeast portion of the watershed the stream cuts across the Pocono, Mauch Chunk, Pottsville, and finally the Llewellyn Formation before the creek makes its way to the Susquehanna River. All of the sample locations in this project took place in the Catskill Formation.

The channel of Toby Creek is sinuous. Rock formations consisting of sandstone and shale occur in its vicinity. There are also coal deposits along the creek in its lower reaches[89]. Rocks of the Chemung Formation occur in the vicinity of Toby Creek[90]. The bedrock is **4.4** feet underground in some areas of the watershed[91].

[89] Water Supply Commission of PA (1921), Water Resources Inventory Report, pp. 608-609.

[90] *History of Luzerne County, Pennsylvania,* Henry C. Bradsby, ed. (1893), pp. 19, 24, 468–469, 593.

[91] *Toby Creek Streambank Stabilization Project,* Luzerne Conservation District (November 2013)



Map 5. Toby Creek Watershed Geology

A large impounding basin diverts water away from Kingston and Pringle. The creek is then piped via gravity into a "massive" underground pipe for some distance[92].The creek resurfaces in Edwardsville Borough[93]. There is also a pressure conduit on the creek[94]. A levee is situated on the creek in Edwardsville Borough, as are flumes and conduits. It is protected by riprap in Dallas Township[95]. The creek is channelized for much of its length and has been relocated in places[96].

Climate

In the uppermost **31.8** square miles of the watershed of Toby Creek, the annual rate of precipitation ranges from **35** to **50.4** inches, with an average of **40.6** inches[97].

History

Toby Creek was entered into the Geographic Names Information System[98] on August 2, 1979. Its identifier in the Geographic Names Information System is 1189612[99].

An ancient fortification is located on a plain near Toby Creek in Kingston Township[100][101]. The fort is elliptical and measures **337** x **272** feet. It is **150** feet from the creek and **.5** mile from the Susquehanna River[102].

In the beginning of the 1800s, there were no roads going through the Back Mountain valley of Toby Creek. However, one was built by the late 1800s and early 1900s[103]. Peter Grubb operated a gristmill and sawmill on Toby Creek in the late 1700s and early 1800s.[104] They were the only gristmill and sawmill that were ever built in Kingston up to 1893. The later came to be owned by Thomas Borbridge, who tore them down in 1826. In 1812, a Mr. Buckingham, Mr. Carbon, Mr. Tuttle, and a Mr. Parker constructed a paper mill on Toby Creek. Later, in 1836, George W. Little built a small charcoal furnace on the creek at the site of the paper mill[105]. Jude Baldwin constructed a mill on the creek in

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[92] PA Code: Chapter 25 Subsection 93.3 Designations for Toby Creek in Drainage K

[93] *"New flood maps mean big savings to Kingston"*, The Times Leader, February 16, 2013

[94] Federal Emergency Management Agency (FEMA) Flood Insurance Study VOLUME 1 of 6, Luzerne County, Pennsylvania (All Jurisdictions), pp.32, 34.

[95] Luzerne County Act 167 Phase II Stormwater Management Plan, Completed by Borton-Lawson (June 30, 2010)

[96] Luzerne Conservation District 2010 Annual Report (**Appendix B.)**

[97] USGS 01537000 Toby Creek at Luzerne, PA

[98] Geographic Names Information System

[99] Geographic Names Information System

[100] Hazeltine, Ralph L. History of the Township of Kingston 1769-1976: Early Settlement of the Fourth Division. Kingston, PA. Bicentennial Commission, 1976.

[101] Brewster, William. History of the Certified Township of Kingston, Pennsylvania, 1769-1929. Wilkes-Barre, PA: Smith-Bennett Corporation, 1929.

[102] *History of Luzerne County, Pennsylvania*, Henry C. Bradsby, ed. (1893), pp. 19, 24, 468–469, 593.

[103] The Early Settlement of Dallas Township, Luzerne County, Pennsylvania, William Penn Ryman (1901), pp. 8, 12–13, 20

[104] Ryman, William Penn. "The Early Settlement of Dallas Township, Pennsylvania." In Volume VI, Proceedings and Collections of the Wyoming Valley Historical and Geological Society, 142-288.

[105] *History of Luzerne County, Pennsylvania*, Henry C. Bradsby, ed. (1893), pp. 19, 24, 468–469, 593.

1813. In 1847, Miner Fuller built another mill approximately **.5** mile further upstream. Both were torn down in the late 1800s since they were no longer needed[106]. In the early 1900s, the main industries in the watershed were agriculture and coal mining. The creek was also used as water power for several mills. Around this time, the Lehigh Valley Railroad crossed the watershed, following the creek for its entire length. The Delaware, Lackawanna, and Western Railroad[107] followed also traversed the watershed and followed the creek in its lower reaches[108].

The two most severe floods in the watershed of Toby Creek occurred on December 30, 1942 and Agnes Flood on June 23, 1972[109][110]. During these floods there were peak discharges of **3,010** cubic feet/second (**1,350,981.82** gallons/minute) and **3,390** cubic feet/second (**1,521,537.66** gallons/minute), respectively. The gage heights reached **4.8** feet and **6.1** feet[111]. The streambank of Toby Creek underwent a stabilization project after 2005[112].

[106] The Early Settlement of Dallas Township, Luzerne County, Pennsylvania, William Penn Ryman (1901), pp. 8, 12–13, 20

[107] Delaware Lackawanna & Western Railroad

[108] Water Supply Commission of PA (1921), Water Resources Inventory Report, pp. 608-609.

[109] Whipkey, Harry E. After Agnes: A Report on Flood Recovery Assistance by the Pennsylvania Historical and Museum Commission. Harrisburg, PA: Pennsylvania Historical and Museum Commission, 1973.

[110] Agnes Flood Documentary Facebook Page

[111] Federal Emergency Management Agency (FEMA) Flood Insurance Study VOLUME 1 of 6, Luzerne County, Pennsylvania (All Jurisdictions), pp.32, 34.

[112] Streambank Stabilization Projects Completed in Luzerne County (2005)

Historical Land Use within the Upper Toby Creek Watershed

EPCAMR reviewed and researched a great reference document from the Images of America series, entitled *Pennsylvania's Back Mountain*[113], authored by Harrison Wick, printed in 2009. Harrison Wick captured some great images of the Back Mountain's history, culture, transportation innovations, and land uses. What is unique about the Back Mountain is that it developed and was settled after the American Revolution and had no Anthracite coal extracted beyond the Larksville Mountain range gap that Toby Creek cuts through along the Dallas Memorial Highway (State Route 309). It is highly encouraged by EPCAMR for interested readers of local history to obtain this book if one is interested in learning a great deal about the Back Mountain, famous people, the early settlement of the Townships and Boroughs, the railroad history[114], about Harvey's Lake attractions, and the Toby Creek watershed.

Just 3 years before the American Revolution, Nathaniel Landon, Nathan Denison, and William Gallup were appointed in Kingston to survey Toby Creek for potential building locations for a gristmill and sawmill. Ruins of the mill constructed by William Trucks in the 1800s remain near the Toby Creek Falls located below the Harris Hill Road Underpass along the Dallas Memorial Highway. The Back Mountain went through another change in its settlement and development following the Agnes Flood of June 23, 1972[115]. It became a Greater Wilkes-Barre area suburb.

Farming, small businesses, civic and social organizations, churches, higher education, and recreational opportunities provided by the water resources of Toby Creek, the Huntsville Reservoir, Mountain Springs Dam, Bowman Creek, and Harvey's Lake, the largest natural Lake in Pennsylvania, dominated the scene of the Back Mountain, once visitors made their way up through the rock cut prior to the construction of the Dallas Memorial Highway, excursions were taken by trolley and train along the Wilkes-Barre & Northern Railroad, in 1896 chartered by John B. Reynolds. A few years later in 1898, the railroad was reorganized as the Wilkes-Barre, Dallas, & Harvey's Lake Railroad Company. In 1910, it had already become the Harvey's Lake Branch of the Lehigh Valley Railroad and a Railroad Station was built in Trucksville, by Dr. James Rowley Lewis, in 1829, along Harris Hill Road where the massive double stone-arched bridge was constructed, known as the "stone bridge" with one arch to allow for Toby Creek to flow through and the other for the trolley line until the service was discontinued. The bridge was later reinforced with concrete before the 1930s and second arch was removed. The masonry work has stood the test of time and can be viewed best by standing on either the upstream or downstream side of Toby Creek.

[113] Images of America, Pennsylvania's Back Mountain, Harrison Wick, 2009

[114] Cox, Harold E. Wyoming Valley Trolleys: Street Railways of Wilkes-Barre, Nanticoke, and Pittston, Pennsylvania. Forty-Fort, PA. Self-published, 1988.

[115] Bailey, J. F., Patterson, J. L. and Paulhus, J. L. H. Geological Survey Professional Paper 924. *Hurricane Agnes Rainfall and Floods, June–July 1972*. United States Government Printing Office: Washington D.C., 1975.

Figure 15. Toby Creek flows downstream through the Stone Arch Bridge over Harris Hill Road

A large streambank stabilization project was completed by the Luzerne Conservation District near the steep bank looking downstream from the stone bridge where the second arch was historically located under a Pennsylvania Department of Environmental Protection (PA DEP) Growing Greener Grant.

Figure 16. Streambank project completed on Toby Creek by Luzerne Conservation District and partners below Harris Hill Road

Figure 17. Toby Creek Restoration Project completed by the Luzerne Conservation District and partners

Around 1915, there was still the Carverton Road iron bridge over Toby Creek at the intersection of Church Road and the Kingston and Dallas Turnpike, where one of the largest gristmills in Trucksville, the Rice and Bisher, was located. It was later called Isaac Rice's mill. The Trucksville Municipal Building was right along the Toby Creek, and the Trucksville Volunteer Fire Company held its first committee meeting there in 1918.

The Wilkes-Barre Railway Corporation ran their trolley line along Toby Creek from Luzerne to Birch Grove Station in Kingston Township in in the late 1930s before the Dallas Memorial Highway was constructed. The Lehigh Valley Railroad ran parallel to the Dallas Memorial Highway.

Fishery Designations by Drainage within the Toby Creek Watershed

The entire drainage basin is designated as a Migratory Fishery and parts are designated as either a Coldwater Fishery (CWF), a Warm Water Fishery (WWF), or a Trout Stocking Fishery (TSF). **11.13** miles of Toby Creek are classified as Wild Trout[116] (WT) waters of naturally reproducing from the headwaters to mouth of the Susquehanna River, and is a Cold Water Fishery (CWF), according to the PA Fish & Boat Commission.

PA Code Chapter 25 Subsection 93.3 Stream Designations[117]

The drainage basin of Toby Creek upstream of the tributary Huntsville Creek is designated as a Cold Water Fishery (CWF) and a Migratory Fishery (MF). From below Huntsville Creek downstream to Pringle Borough, where Toby Creek disappears from the surface, Toby Creek and its drainage basin are designated as a Trout Stocking Fishery (TSF) and a Migratory Fishery (MF). From that point downstream to the creek's mouth, the drainage basin is designated as a Warm Water Fishery (WWF)[118]. Wild trout naturally reproduce in the creek from its headwaters downstream to its mouth[119].

Out of a number of stream segments studied by the Susquehanna River Basin Commission[120], a section of Toby Creek was found to be the poorest habitat. Specific problems faced by the creek include embeddedness, a lack of riffles, poor epifaunal substrate, low instream cover, low-quality streambanks, and sediment deposition[121]. Dallas Borough plans to construct a greenway along the creek[122].

Table 3. PA Code Chapter 25 Subsection 93.3 Stream Designations

Stream Order	Drainage	County	Designation
2—Toby Creek	Basin, Source to Huntsville Creek	Luzerne	CWF, MF
3—Huntsville Creek	Basin, Huntsville Creek to the point where the stream is piped underground at Pringle	Luzerne	CWF, MF
2—Toby Creek	Basin	Luzerne	TSF, MF
2—Toby Creek	Basin, from the point where the stream is piped underground at Pringle to the Mouth	Luzerne	WWF, MF

[116] PA Fish & Boat Commission Trout Reproduction Report, 2019

[117] PA Code: Chapter 25 Subsection 93.3 Designations for Toby Creek in Drainage K
[118] PA Code: Chapter 25 Subsection 93.3 Designations for Toby Creek in Drainage K
[119] PA Fish & Boat Commission Wild Trout Waters Reproduction Report, 2019

[120] Susquehanna River Basin Commission
[121] Susquehanna River Basin Commission Middle Susquehanna Subbasin Year-1 Survey (September 2009)
[122] Planning Matters: Case Study #4

GENERAL FLOW AND DRAINAGE PATTERN OF TOBY CREEK FROM HEADWATERS TO THE SUSQUEHANNA RIVER CONFLUENCE

Toby Creek begins in Dallas Township. It flows south-southeast for a short distance before turning south and then southeast. The creek then flows east-southeast alongside Pennsylvania Route 415 for a few miles, passing through Dallas Borough on the way. It then crosses Pennsylvania State Route 309 (Dallas Memorial Highway) and enters Dallas Township. At this point, it turns east for a few tenths of a mile and receives the tributary Trout Brook from the left. The creek then turns south and slightly east for a few miles, flowing not far from Pennsylvania State Route 309 and entering Kingston Township.

It then turns south-southeast, crossing Pennsylvania Route 309 and receiving the tributary Huntsville Creek from the right. At this point, the creek enters a water gap, flowing very close to Pennsylvania State Route 309. After several tenths of a mile, it gradually turns northeast and then turns south-southeast, briefly passing through Courtdale Borough and into Luzerne Borough, where it exits the water gap. After several tenths of a mile, the creek turns south, crossing Pennsylvania State Route 309 and entering Pringle Borough, where it is funneled underneath the several municipalities from the surface. Toby Creek then flows through an underground culvert system beginning in Pringle Borough, but daylights again, in Edwardsville Borough, where it outlets to the surface behind the K-Mart Shopping Plaza and flows west for a few tenths of a mile before turning south and then south-southwest. Several tenths of a mile further downstream, it reaches its confluence with the Susquehanna River on the border between Edwardsville and Larksville Borough.

HISTORICAL FLOW AND CURRENT GROUNDTRUTHED DETAILED DRAINAGE PATTERNS OF TOBY CREEK FROM HEADWATERS TO THE SUSQUEHANNA RIVER CONFLUENCE

In describing the historical flow patterns and drainage of the Upper Toby Creek watershed, EPCAMR first referred back to the USGS Reconnaissance Map, Pittston Quadrangle, 1893 (Surveyed in 1890)[123]. EPCAMR then reviewed the 2016 *Eastern Pennsylvania All Outdoors Atlas & Field Guide*[124] and then provided an updated narrative description of the current geomorphology of the watershed based on current aerial photography, groundtruthing, and several days of field reconnaissance with the EPCAMR Staff and DAMA Stormwater Coordinator Thomas Mayka and his intern, Tim Elston.

Unnamed Tributaries to Toby Creek

The unnamed, first order, headwater tributary begins to descend between a draw in the mountain from an elevation of ~1380' located northeast of Carverton Road crossing Bunker Hill Road before flowing in a southwesterly direction in the valley through a heavily forested and wooded area, running along Carverton Road down to another unnamed tributary that has additional flow added to it. The unnamed tributary then continues to flow in a southwesterly way until it crosses Dug Road at ~1000' in elevation.

Another unnamed, first order, headwater tributary begins to flow down towards the forested valley to the north of Dug Road and in between Bunker Hill Road from an elevation of ~1300' until it reaches the valley floor near ~1000'. Yet another unnamed, first order, headwater tributary starting at an elevation of 1100' flows across Manor Drive near the intersection with Carverton Road, in front of the current

[123] USGS Reconnaissance Map, Pittston Quadrangle, 1893 (Surveyed in 1890)

[124] Eastern Pennsylvania All Outdoors Atlas & Field Guide, Sportsman's Connection, 2016, pp. 90-91.

Sunoco Gas Station before entering a swale that carries the ephemeral stream back underneath Carverton Road in a culvert before it comes to a confluence with a large wetland area just south of Dug Road.

A large pond is located behind the Cross Creek Community Church[125] that outlets and flows south towards the unnamed tributary to Toby Creek that flows along Carverton Road. Another first order, unnamed headwater tributary comes down off Dug Road flowing from the north and into a wetland area to the east of Terrace Avenue in Trucksville. The DAMA maintains a right-of-way and easement to access a stormwater sewer line that they own that runs through the area. A forested wetland and spring area to the west of Old Carverton Road flows down under Old Carverton Road, then under Carverton Road before flowing into another wetland area that carries the water towards Toby Creek.

Green Pond Unnamed Tributary (Snake Creek, locally) to Toby Creek

The drainage from the north and east of Harris Hill Road flow back towards the valley between it and Carverton Road before flowing towards Trucksville. It begins from two ponds on top of the mountain. The smaller one is located south of Windy Drive and north of the end of Genoa Lane that crosses Green Road through a road culvert and headwall. The larger one, called Green Pond, just north of Manor Road at an elevation of around 1200', crosses Manor Road, in a few residential yards off Woodbine Road, before it crosses in a piped culvert behind another private property along Green Pond Road to the rear of the lot where it takes a sharp turn to the south and flows as an unnamed tributary from Green Pond between the rear lots of the residential homes of Green Pond Road and Harris Hill Road. The unnamed tributary from Green Pond then outlets a heavily wooded area along Harris Hill Road where it meanders one back and forth across Harris Hill Road in a wooded area before cascading downhill meandering across E. Center Street heading southeast towards Echo Valley. This unnamed tributary also picks up additional flow from the Sleepy Hollow headwater pond that is to the northeast of Ondish Road that flows southeast beneath E. Center Street before coming to a confluence with the unnamed tributary from Green Pond below the Harris Hill bridge crossing.

Another unnamed first order tributary flows out of a spring in a lush forebay wetlands on the northwest side of Wakefield Road where the Windsor Farms development entrance is located along Manor Drive. It crosses Manor Drive and heads to the east around the bend in the road before flowing south and picking up another small unnamed tributary on the north side of Manor Road. The other tributary flows through a culvert pipe under Manor Road. The downstream outlet from the pipe culvert has a small scour pool and highly eroded streambank opposite the pipe. The Swoga Family owns the property at 68 Manor Drive and had provided EPCAMR and DAMA with permission to walk along his property to assess the unnamed tributary and discussed some concerns he had with the stream flow coming from the Windsor Farms area. The unnamed tributaries once combined, flow south in a heavily wooded area to a pond along the bend in Country Road behind Cross Creek Community Church. The ephemeral tributary then crosses under Carverton Road into the large wetland complex that is located to the rear of the Terrace Avenue residential homes and become a part of the larger unnamed tributary that flows to the Green Pond unnamed tributary before becoming known as Snake Creek and entering Toby Creek in Trucksville behind Pizza Perfect.

[125] Cross Creek Community Church

The unnamed tributary from Green Pond then picks up a first order tributary that joins it opposite the Echo Valley Estates[126] on the former Stegmaier Estate from a pond. Another first order unnamed tributary flows southeast of the Echo Valley Mobile Home Park and down to Harris Hill Road before joining the unnamed tributary from the former Stegmaier Estate pond. The drainage then flows down through the valley behind a number of private homes along Harris Hill Road. There is an ephemeral unnamed tributary that flows from the cul de sac development within the W. Hillside Street to Woodtip Drive and Fern Ridge Court that has a stable stormwater outlet channel and is normally dry in a very steep slope behind the development. Further downstream this unnamed tributary from Green Pond meanders behind Grove Street and Shady Lane before entering another bridge culvert over Carverton Road along Oak Street and meandering along a bedrock of shale that outcrops near the Kingston Township pocket park. The unnamed tributary from Green Pond, then meanders back across Carverton Road under another bridge culvert where it flows behind Pizza Perfect. Once behind Pizza Perfect, it flows under a smaller stone arched remnant of the Harvey's Lake Branch of the Lehigh Valley Railroad crossing before coming to the confluence the main stem of Toby Creek in Trucksville. A stormwater pipe adds additional flow from Cliffside Ave roadway drainage just below a small concrete encased DAMA sewer pipe along the Kingston Township pocket park causing some sedimentation accumulation in the area. "Snake Creek" is the local name for this tributary to Toby Creek that flows in just above Carverton Road that EPCAMR had identified during our field reconnaissance as the unnamed tributary from Green Pond since it was the initial source of the tributary.

Trout Brook Headwater Tributaries to Toby Creek

Another headwater section of Trout Brook begins to flow from an estimated elevation of 1400' from the east of Manorview Drive and just south of Lake Catalpa Road near Demunds Corners heading towards Crabby's Seafood Grill, Dallas Township, along Lower Demunds Road. This area is the watershed divide between two other watersheds, including the Leonard's Creek major tributary to Bowman's Creek and Sutton Creek. Springs were noted flowing to the east towards Lower Demunds Road into the roadside stormwater conveyances and ditches from a wetland area below Upper Demunds Road. This portion of the headwaters of Trout Brook parallels Lower Demunds Road until it reaches another large farm pond to the east before flowing under a bridge on Edinger Road.

A small pond to the southeast of Edinger Road feeds Trout Brook along Lower Demunds Road. The stream then continues to flow downstream under a bridge on Shupp Road, where another small pond feeds Trout Brook. Trout Brook then continues to flow in a southeasterly direction behind the three Luzerne County Road and Bridge District 2 Maintenance Sheds on Lower Demunds Road. Another first order tributary flows down in a southeasterly direction from Sedler Hill Road to Trout Brook where it crosses under a culvert across from the Luzerne County Road and Bridge District 2 Maintenance Sheds to Trout Brook on the eastern side of the road. Trout Brook continues flowing to the south under a few private driveways with crossings then meanders back across Lower Demunds Road at the bottom of the hill of the Jewish Anshifard Cemetery, then under a private driveway culvert, into a very large wetland area, until it reaches the intersection at the bottom of the hill with Ransom Road and Shepards Hill. Trout Run then flows south beneath a bridge on Wyoming Road, through the Friedman Farm[127] property, founded in 2008.

[126] Echo Valley Estates Mobile Home Park
[127] Friedman Farm

One of the headwaters of Trout Brook, a major tributary to the Upper Toby Creek starts in a wetland swamp area in Kingston Township at an estimated elevation of 1180' that begins to flow out of the forested swamp to the east below Saddle Ridge Drive. It then flows northwest until Mt. Olivet Road transitions into Wyoming Road before heading in a westerly direction downstream towards Lower Demunds Road in Dallas Township to where Trout Brook flows through the Friedman Farm property. The unnamed tributary combines with Trout Brook on the Farm and appears to have been partially channelized and stacked to a depth of several feet with rock retaining walls to allow for the farm to utilize as much area for pasture grazing as possible historically. Once combined together on the Friedman Farm, they pick up another unnamed tributary from across Lower Demunds Road that looks to be receiving flow from an outlet of a pond below Hildebrant Road before heading south past Maplewood Heights. Another additional first order unnamed tributary flows down along the utility line that crosses Lower Demunds Road from an elevation of around 1180' looking southeast heading downstream. One other first order unnamed tributary flows from an elevation of around 1300' looking southwest heading downstream from Lower Demunds Road into Trout Brook.

Trout Brook Confluence with Toby Creek

Trout Brook comes into confluence with Toby Creek's main stem in behind the Perfect 10 nail salon business and Lum's Fernbrook Inn before crossing Lower Demunds Road and flowing behind Penn Oil and parallel to Main Road until Toby Creek meanders to the east along N. Main Street and the Back Mountain Trail. Toby Creek then crosses under E. Franklin Street, east along Lewis Chiropractic, until it takes a very sharp bend before meandering under N. Main Street behind Cook's Pharmacy. It then heads down the Back Mountain passing Snowdon's Funeral Home and Amelia's Diner before flowing under E. Center Street at the light in the center of Shavertown.

Unnamed Tributaries to Upper Toby Creek above Trout Brook

Yet another first order headwater tributary flows in a southwesterly direction from the rear of the properties along Goodleigh Road beginning up by Farmhouse Lane at an elevation of around 1320' downstream through Krause's Swamp where the Krause Farm is located and the Shepard's Cottage. If flows through a forested wetland area across Upper Demunds Road before heading south into the Klug's property's wetlands complex along Lower Demunds Road at an estimated elevation of 1240' that flows under a culvert off Glendalough Road. The unnamed tributary flows out of the wetlands into a meandering stream channel until it reaches Hildebrandt Road below the Dallas Area High School[128]. Stormwater basins from the Dallas Shopping Center add additional controlled stormwater flows in this area through detention basins and rock lined swales that enter on the west side of Upper Demunds Road into the unnamed tributary before flowing under Hildebrandt Road. Several other stormwater basins were planted by Dallas Township and the Luzerne Conservation District in the Spring of 2018 between Conyngham Avenue and School Road west of the High School track. This same tributary crosses over State Route 309 (Tunkhannock Highway) heading downstream towards Sago Street before cascading down a steep slope through a wooded area where Dallas Township is in the processing of creating a municipal park with some stormwater best management practices at the end of South Side Drive. The unnamed tributary then crosses in a southerly direction across Woodlawn Avenue between Foster and Mill Streets behind Sprau

[128] Dallas Area School District

& Clements Dentistry before coming into the confluence with Toby Creek behind the Dallas Post Office and PNC Bank.

Toby Creek takes a very sharp meander below the confluence with this unnamed tributary behind Don Olsen's State Farm Insurance Agency and then back across the Dallas Memorial Highway (State Route 415) before flowing south parallel to the southbound lanes of the highway in Dallas. Toby Creek doesn't cross back the under the Dallas Memorial Highway (State Route 309) until it reaches the Barber Shop off Main Street and turns to the north and flows behind Offset Paperback[129], a major employer in the Back Mountain. A small pond is located just northeast of Lt. Michael Cleary Drive, where the Dallas Township Municipal Building is located.

Behind the parking lot of Frontier Communications off the Tunkhannock Highway (State Route 309), an outlet from the pond at an estimated elevation of 1240' creates a first order unnamed tributary that flows through a wooded wetlands area. It then flows beneath the highway through a culvert that drains into the edge of a forested wetland area into a first order unnamed tributary that crosses under a culvert along Irem Road into another wetlands area on the golf course where another pond is fed by the groundwater from the unnamed tributary. Chestnut Ridge topographically is the top of the watershed where the Irem Country Club[130] is located along the ridge sitting at an elevation around 1420' on 383 acres since 1922, with the Harvey's Lookout Tower[131] at the highest point on the ridge at 1690'.

Another unnamed headwater first order tributary flows down from the north side of the Ridgway Drive and Country Club Road intersection around the stormwater basin on the corner of Irem Road and Country Club Road and under the cart way until it reaches the bottom of the hill where it seeps out of the bank into a wetlands vegetated swale before emptying into the unnamed tributary from the pond behind Frontier Communications. The unnamed tributary then flows past a few holes of golf and picks up additional overflow from another large pond near the cul de sac on Masonic Drive before heading into a heavily wooded forested area to the northwest of the Misericordia University Mangelsdorf Field.

A small pond behind the Cemetery owned by the St. Mary's United Greek Catholic Church outlets to the unnamed tributary to Toby Creek and flows southwest towards Lake Street and follows the stormwater ditch into the headwaters of Toby Creek under the culvert that carries the stream behind Elmcrest Drive. Elmcrest Drive and White Birch Lane site topographically on the top of the hill that is the watershed divide between the Huntsville Creek subwatershed of Toby Creek. Drainage falling to the northeast of Elmcrest Drive flows into the Upper Toby Creek headwaters and drainage falling to the west down from White Birch Lane flows behind the Roll Away Skating Rink and Back Mountain Bowl towards a headwater pond to the north of Oval Drive before it outlets across the Dallas Memorial Highway (State Route 415) and feeding the watershed behind the former Yalick Farms below Old Farm Lane to the west and Mercy Consultation Center to the east.

Another forested wetland area on the east side of the Tunkhannock Highway (State Route 309) to the west of the Dallas RV and Motor Home Park at an estimated elevation of 1240' flows under a bridge before heading west towards the Irem Country Club golf course where it is piped across a few of the holes into a large pond that outlets across Irem Road and follows Pheasant Run Drive through the properties of many private residents until it comes to a dead end road and continues over along Fox Hollow Road. The

[129] Offset Paperback Manufacturing
[130] Irem Temple Country Club History
[131] Harvey's Lookout Tower

unnamed tributary then flows to the west of Midland Drive under a stone arch bridge at the entrance to the Fern Knoll Cemetery and then meanders along McAuley Drive crossing under a culvert on Mercy Center Drive on the Misericordia University Campus. It then flows under Lake Street behind the Meadows Manor Assisted Living Center where it flows along the pond at the rear of the property that flows under the bridge on E. Center Hill Road. The unnamed tributary picks up the main stem of Toby Creek, another first order stream that flows down along the Dallas Memorial Highway (State Route 415) from Elmcrest underneath a bridge at the light on E. Center Hill directly in front of Leggio's before making a sharp turn to the north. The combined tributaries flow behind Hilbert's Equipment & Welding, Bernie's Pizza, and all the commercial businesses until it reaches Lake Street and the Misericordia University Community Park in Dallas.

Another pond just below the Twin Stacks Professional Center on the southbound lane to the west of the Dallas Memorial Highway (State Route 415) drains through a culvert that flows south parallel to the highway and is piped through a culvert to Gerald Avenue where it's piped through again under the highway to the north into Toby Creek.

A series of two ponds on the north side of Irem Country Club Road on private property at an estimated elevation of around 1200' outlets across Country Club Road and heads south through a heavily wooded area towards Lake Street and crosses under the road just east of Elmcrest Drive behind a private property in a wooded area below the Elmcrest stormwater basin. Toby Creek then flows out from behind The Gluten Free Baskets/Farm Baskets business and flows parallel along the Dallas Memorial Highway (State Route 415) under a few small culverts, then across the entrance road to the former Payne Printing facility that is now owned by Misericordia University, and then proceeds south and takes a slight meander to the west through another culvert under the Meadows Maintenance road and flows behind J & J's Subs in a forested wetland riparian area down behind the Meadows until it reaches E. Center Hill Road at the light and continues to flow in front of Leggio's.

A small groundwater seep was located flowing from a red shale outcrop behind Jack Williams Tire & Auto along the Dallas Memorial Highway (State Route 309) that entered a small blocked storm drain before entering a stormwater detention basin in the front of the property near A & A Auto. The basin discharges into a series of storm drains after being piped under Old Mill Road and flows north towards the Barber Shop on the corner of Main Street and cascades down into Toby Creek from a round concrete culvert pipe. Another ephemeral groundwater seep from a very wet area flows through a gravel parking lot to the west of the Luzerne Bank before crossing Main Street at the light. There is an additional groundwater seep coming from a private property along Main Street just after the Luzerne Bank that comes from a wet area that seemingly drains from Still Road where a dry basin is located at the end of the southside of the road.

Unnamed Tributaries to Upper Toby Creek Watershed below Trout Brook

Another unnamed first order tributary flows to the north towards Toby Creek in Dallas Borough near the intersection of Burndale Road and Luzerne Avenue where the Dallas Borough Recreation Center and Back Mountain Recreation Park is located. A stormwater basin has been constructed on the corner lot and the flow heads downstream along a grassed waterway swale system along Luzerne Avenue and then is piped through a culvert towards Susquehanna Avenue and flows to the west towards the corner of Monroe Avenue and Lackawanna Avenue to a Dallas Area Municipal Authority (DAMA) owned drop-inlet concrete infrastructure that cascades the unnamed tributary down several feet in elevation until it

outlets to the surface through a wooded area and grassed open lot off of Columbia Avenue. The unnamed tributary then flows under Columbia Avenue through a concrete box culvert and through the American Legion parking lot and through another culvert across the Dallas Memorial Highway (State Route 415) before it outlets through a concrete headwall culvert directly into Toby Creek along the side parking lot.

Another headwater unnamed tributary in Dallas Township starts to seep from a forested wetland area that is located to the rear of homes along Davenport Street at an estimated elevation of 1240', where an access road to The Meadows and Newberry Estates Drive is located within the golf course. The unnamed tributary crosses Newberry Estates Drive at the bend heading north towards The Meadows where there is a dam on the tributary that then flows into a wetland pond before flowing under a bridge on Ring Road. The unnamed tributary enters a second pond after it outlets through a concrete sluice. The unnamed tributary then flows through some private properties between Yeager Avenue and North Pioneer Avenue until it reaches the intersection of Overbrook Road and North Pioneer Avenue. It has been confined within a rock wall by a private property owner on the west side of Overbrook Road and then flows through a blocked and collapsed culvert system of multiple structures that are severely compromised on the outlet side of the culvert to the northeast along North Pioneer Avenue. The tributary continues to flow in a northeasterly direction through a wooded area along Druid Hills Drive before it outlets along the end of Ferguson Avenue where it follows a drainage ditch and rock-lined channel through the rear yards of a few private property owners along Ferguson Avenue and West Franklin Street. The tributary is then piped for a short distance through a culvert into a wooded area behind McDonald's, Melissa Walter's State Farm Insurance Agency, Casa Bella Nails, and the M & T Bank before entering another severely blocked concrete culvert headwall that carries the tributary beneath the entire parking lot of the Thomas's Market parking lost in a northeasterly direction until it flows under the Dallas Memorial Highway (State 309) and exits just above Amelia's Diner before coming into confluence with Toby Creek just west of Harold C. Snowdon's Funeral Home.

Still yet another unnamed first order tributary feeds Toby Creek from Shavertown that begins to flow from the top of the hillside within the St. Nicholas Cemetery down to a stormwater culvert system east of the parking lot for the Shavertown United Methodist Church along North Pioneer Avenue. The buried culvert system carries the unnamed tributary north along W. Center Street until it crosses Ferguson Avenue through the side parking lot for Thomas's Market until it combines with the other unnamed tributary that outlets just above Amelia's Diner before entering Toby Creek.

Another unnamed first order tributary flows down from the mountainside along Kenilworth Road through some roadside swales where private properties have had to create bridges and driveways with culverts to access their properties to the rear of their lots. The tributary which is usually ephemeral, has its beginnings, in a hollow between West Mount Airy Road and Lincoln Drive that flows to the north to Kenilworth Road before taking a turn to the east and then back again to the north along Wellington Road crossing North Pioneer Avenue in another culvert and then along Holcomb Road where it outlets along the Dallas Memorial Highway (State Route 309) before being piped under the highway directly into Toby Creek.

One more unnamed first order tributary flows down from the mountainside from a steep wooded area between Belford and Hazletine Street on the northern side of the watershed before flowing into a rock-lined drainage structure along North Lehigh Street as it flows southeast through a large wetland pond area that outlets beneath Railroad Street before entering a stone culvert and then directly under the deck of a private residence and shed on the corner of North Main Street and Division Street. It then comes out of a

black HDPE corrugated stormwater pipe and drops into a concrete culvert before exiting on the other side of North Main Street into a scoured-out ditch before entering Toby Creek.

East of Holcomb Road and along North Pioneer Avenue, the last of the first order unnamed tributaries flow directly into Toby Creek from the western portion of the watershed before the larger Huntsville Creek subwatershed flows into it below Hillside. It is an ephemeral stream that flows down from a wooded area between Wellington Road and Davis Street. It crosses through a culvert under South Pioneer Avenue and flows down through the western edge of the Mt. Greenwood Cemetery and to the east of Robert Wright's Farmers Insurance business before being culverted through a round concrete pipe that carries it directly into Toby Creek through a large retaining wall infrastructure along the Dallas Memorial Highway (State Route 309).

UPPER TOBY CREEK WATERSHED RESEARCH AND FIELD RECONNAISSANCE OBSERVATIONS WITH EPCAMR STAFF, VOLUNTEERS, & DAMA

EPCAMR recorded a brief summary account of work done on the Upper Toby Creek Coldwater Conservation Plan below.

8-24-18 Tom Mayka, DAMA and Bobby Hughes, EPCAMR conducted Field Reconnaissance in the Upper Toby Creek Watershed

8-27-18 Tom Mayka, DAMA and Bobby Hughes, EPCAMR conducted Field Reconnaissance in the Upper Toby Creek Watershed. Received photos of areas investigated with Tom Mayka, DAMA on 8-24-18

9-26-18 Tom Mayka, DAMA and Bobby Hughes, EPCAMR conducted Field Reconnaissance in the Upper Toby Creek Watershed

11-30-18 EPCAMR requested a Letter of Support from DAMA for our submission of another CHP Planning Grant for the Huntsville Creek tributary to Toby Creek

12-5-19 There was a public informational meeting[132] to discuss the stormwater program at 7:00 PM on at the Back Mountain Regional Emergency Services building on State Route 118 that was convened by the DAMA. Tom Mayka, Stormwater Coordinator made a presentation and included EPCAMR's efforts that were underway to conduct the coldwater conservation assessment to develop the plan as a partner with the DAMA. This opportunity served as another outreach meeting to inform the residents of the Back Mountain of the work that was going on in the Upper Toby Creek Watershed to take a look at the coldwater resources in the Back Mountain.

1-08-19 Tom Mayka, DAMA and Bobby Hughes, EPCAMR conducted Field Reconnaissance in the Upper Toby Creek Watershed

3-06-19 Received KMZ files of the locations investigated from Tom Mayka, DAMA for incorporation into our GIS Mapping efforts within the Upper Toby Creek Watershed

3-08-19 Jessica Britten, EPCAMR Watershed Outreach Intern and Bobby Hughes, EPCAMR Executive Director conducted Field Reconnaissance in the Upper Toby Creek Watershed

3-11-19 Received additional KMZ files of the locations investigated from Tom Mayka, DAMA for incorporation into our GIS Mapping efforts within the Upper Toby Creek Watershed

3-12-19 Jessica Britten, EPCAMR Watershed Outreach Intern combined all photos from the previous Field Reconnaissance Observations throughout the Upper Toby Creek Watershed

3-14-19 Jessica Britten, EPCAMR Watershed Outreach Intern and Bobby Hughes, EPCAMR Executive Director, researched historical points of interest located in the Upper Toby Creek Coldwater for the Coldwater Conservation Plan

[132] DAMA Plans Stormwater Meeting, Citizens Voice

3-18-19 Jessica Britten, EPCAMR Watershed Outreach Intern and Bobby Hughes, EPCAMR Executive Director conducted Field Reconnaissance in the Upper Toby Creek Watershed

5-20-19 Jessica Britten, EPCAMR Watershed Outreach Intern and Bobby Hughes, EPCAMR Executive Director conducted Field Reconnaissance in the Upper Toby Creek Watershed

5-21-19 Jessica Britten, EPCAMR Watershed Outreach Intern and Bobby Hughes, EPCAMR Executive Director conducted Field Reconnaissance in the Upper Toby Creek Watershed

5-23-19 Received additional KMZ files of the locations investigated from Tom Mayka, DAMA for incorporation into our GIS Mapping efforts within the Upper Toby Creek Watershed

6-25-19 Tom Mayka, DAMA and Bobby Hughes, EPCAMR conducted Field Reconnaissance in the Upper Toby Creek Watershed

6-28-19 Requested and received required personal information from Tom Mayka and Tim Elston, DAMA, to sign them up for the online certification training through NAACC aquatic organism passage (AOP) protocol training to become Lead Observers; Signed them up as new Lead Observers in order for them to both begin to take the online portion of the aquatic organism passage (AOP) Protocol Training

Received additional geospatial vector data in the form of ArcGIS ".shp" files of the locations investigated from Tom Mayka, DAMA for incorporation into our GIS Mapping efforts within the Upper Toby Creek Watershed and shared them with Lauren Perry, EPCAMR Watershed Outreach Intern for her review

7-15-19 Purchased a CST/Berger 25' Fiberglass Rectangular-Shaped Leveling Telescoping Rod with Carrying Bag for Field Reconnaissance in the Upper Toby Creek Watershed

7-17-19 Tom Mayka, Tim Elston-DAMA and Bobby Hughes, and EPCAMR Staff conducted Culvert Assessments in the Upper Toby Creek Watershed

7-31-19 Tom Mayka, Tim Elston-DAMA and Bobby Hughes, and EPCAMR Staff conducted Culvert Assessments in the Upper Toby Creek Watershed

8-02-19 Lauren Perry, EPCAMR Watershed Outreach Intern created a GIS Map of the locations for the Fishery and Electroshocking Survey with Trout Unlimited's Eastern Conservation Program Staff on 8-12-19

Kathleen Lavelle, Field Coordinator Pennsylvania Coldwater Habitat Restoration Program-Trout Unlimited followed up with EPCAMR and informed us that 8-12-19 and 8-13-19 were the only two available days for her to conduct the Fishery and Electroshocking Survey in the Upper Toby Creek and have a chance to hike the unnamed tributary, locally known as Dick's Run in the Abraham Creek watershed to investigate a major flow loss into the underground mine pool workings beneath the Wyoming Valley[133]

8-08-19 Lauren Perry, EPCAMR Watershed Outreach Intern sent Kathleen the suggested 4 survey sites that we had initially considered until we determine if there are other locations in the field on 8-12-19

[133] EPCAMR Mine Water Resources of the Anthracite Coal Fields Report, (2012)

8-16-19 Tom Mayka, DAMA and Bobby Hughes, and EPCAMR Staff conducted Culvert Assessments in the Upper Toby Creek Watershed

8-19-19 Tom Mayka, DAMA and Bobby Hughes, and Jason Zubris & Lauren Perry, Watershed Outreach Interns and EPCAMR Staff, along with Kristen Cease-EPCAMR Volunteer conducted Culvert Assessments and Macroinvertebrate Sampling in the Upper Toby Creek Watershed

8-25-19 Dave Ratcliffe, local historian and a member of the *"You Know You're from Trucksville When.."* Facebook Page provided EPCAMR with an image file from the State Archives of the USGS Reconnaissance Map, Pittston Quadrangle, 1893 Kingston showing the historic topography, tributaries, streams, waterbodies, ponds, lakes, and swamps prior to much of the development in the Back Mountain and the West Side of the Wyoming Valley

8-26-19 Tom Mayka, DAMA sent EPCAMR a list of Misfit Best Management Practices that don't qualify for sediment reduction credits under their Chesapeake Bay Pollution Reduction Plan

9-17-19 Tom Mayka, DAMA and Bobby Hughes, and EPCAMR Volunteers from DHL Supply Chain Logistics conducted Culvert Assessments in the Upper Toby Creek Watershed

9-18-19 Tom Mayka, DAMA and Bobby Hughes, EPCAMR conducted Culvert Assessments in the Upper Toby Creek Watershed

9-24-19 Tom Mayka, DAMA and Bobby Hughes, and EPCAMR Volunteers from DHL Supply Chain Logistics conducted Culvert Assessments in the Upper Toby Creek Watershed

9-26-19 Tom Mayka, DAMA and Bobby Hughes, and EPCAMR Volunteers from DHL Supply Chain Logistics conducted Culvert Assessments in the Upper Toby Creek Watershed

10-02-19 Tom Mayka, DAMA and Bobby Hughes, EPCAMR conducted Culvert Assessments in the Upper Toby Creek Watershed. Lauren Perry, EPCAMR Watershed Outreach intern created a GIS layer of the Macroinvertebrate sampling locations.

10-04-19 Tom Mayka, DAMA sent EPCAMR all the GIS ".shp" files for GPS data on the unnamed tributary crossings for Kenilworth Road that remain to be assessed under the NAACC. The unnamed tributary flows down into Toby Creek at the bottom of Holcomb Street.

EPCAMR requested an extension through the end of the year from PA Trout Unlimited to finalize the Upper Toby Creek Coldwater Conservation Plan and it was approved by Bob Volkmar. EPCAMR will be looking to hold a Final Draft Plan Public Informational Meeting either near the end of December 2019 or very early January 2020

10-08-19 Tom Mayka, DAMA sent EPCAMR several photos from our culvert assessments on 10-2-19 in The Meadows and Newberry Estates

12-19-19 Requested from Kathleen Lavelle, Program Coordinator for the Trout Unlimited Eastern Conservation Program an anticipated date of delivery of the fishery survey results from our electroshocking on 8-12-19 to include in the Final Draft Plan of the Upper Toby Creek Coldwater Conservation Plan. She informed EPCAMR that she would have it completed right after the New Year. Bobby Hughes, EPCAMR Executive Director worked with Steve Cornia, GIS Watershed Outreach Specialist to create several maps for the Plan.

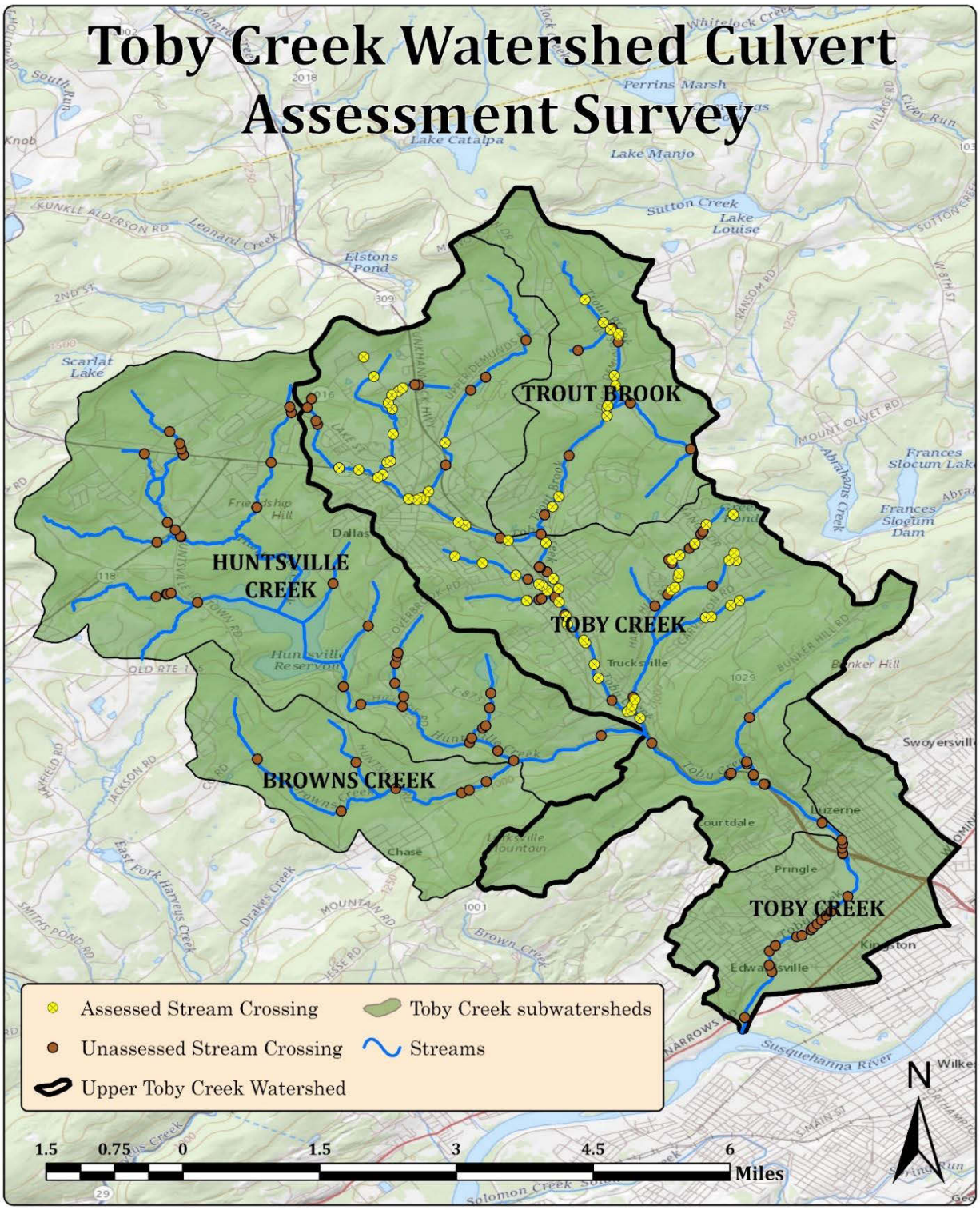
UPPER TOBY CREEK WATERSHED NAACC AOP CULVERT ASSESSMENTS

EPCAMR provided a list of the dates, number of culverts assessed, structures assessed, and the municipalities that were visited during the NAACC Aquatic Organism Passage (AOP) Culvert Assessments within the Upper Toby Creek Watershed. All of the qualitative and quantitative data has been entered and approved into the online NAACC Data Center 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[134]. Only certified NAACC lead observers and coordinators can log on. This is another reason EPCAMR is encouraging municipal 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 4. Upper Toby Creek Culvert and Structure Assessments for Aquatic Organism Passage (AOP) using NAACC Protocols

Date	Number of culverts Assessed	Number of Structures Assessed	Municipal Locations Visited by EPCAMR Staff, Volunteers, and DAMA Staff
7-17-19	9	9	Dallas Township
7-31-19	16	20	Dallas Township and Dallas Borough
8-16-19	6	6	Dallas Township
8-19-19	10	10	Dallas Township
9-17-19	5	7	Dallas Borough with DHL Volunteers
9-18-19	5	8	Kingston Township
9-24-19	6	6	Kingston Township with DHL Volunteers
9-26-19	8	8	Kingston Township with DHL Volunteers
10-2-19	10	13	Kingston Township
Total	**75**	**87**	

[134] Offline Data Manager Document



Map 6. Toby Creek Watershed Culvert Assessment Survey

CURRENT BIOLOGICAL MONITORING AND ASSESSMENTS

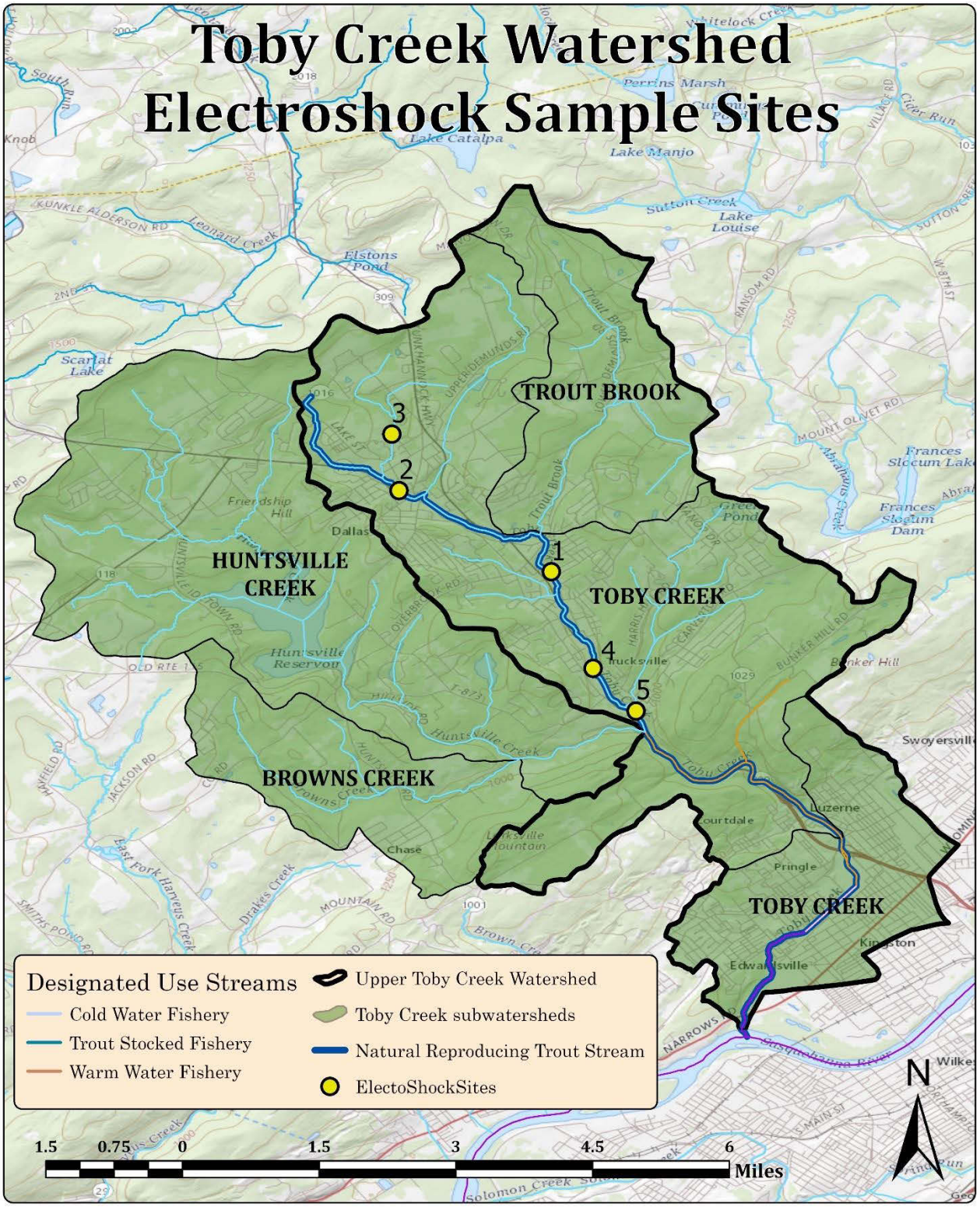
Electroshocking Fishery Survey with the Trout Unlimited Eastern Conservation Program

EPCAMR made an official request to Trout Unlimited's AMD Technical Assistance Program[135] to assist us with conducting an updated Biological Survey of the fish population in the Upper Toby 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. The request was forwarded to Rachel Kester, Trout Unlimited Project Coordinator at the time, and Amy Gottesfeld Wolfe, Northeast Habitat Program Director 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[136] to schedule August 12th, 2019 for the full day fish survey of **5** locations within the watershed. Trout Unlimited will be providing EPCAMR with a document of the completed survey included as (**Appendix E.**) 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 either wild brook or brown trout, in particular. Areas on Trout Run were not able to be surveyed during this expedition. EPCAMR and Trout Unlimited were trying to determine ow far downstream we could possibly find either native brook or brown trout on Toby Creek. Several fish species were measured. No genetic research, fin clips, or scales were sampled during this survey.

Figure 18. EPCAMR Staff, Volunteers, and Trout Unlimited Staff Show a large Brown Trout Surveyed and Measured along Toby Creek

[135] PA Trout Unlimited Technical Assistance Grant Program
[136] Trout Unlimited Eastern Conservation Program



Map 7. Toby Creek Watershed Electroshock Sample Sites

Fishery Survey Locations

a. Above E. Franklin Street Bridge on Toby Creek along the Back Mountain Trail

Figure 19. Fishery Survey Location on Toby Creek upstream of the E. Franklin Street Bridge along the Back Mountain Trail

b. Above Dallas Memorial Highway parallel to Lake Street along Misericordia University's Lake Street Community Park on Toby Creek

Figure 20. Fishery Survey Location on Toby Creek along Dallas Memorial Highway & Misericordia U. Lake Street Pocket Park

c. Below Fern Knoll Bridge adjacent to the Fern Knoll Cemetery on an Unnamed Tributary to Toby Creek

Figure 21. Fishery Survey Location downstream on tributary to Toby Creek near Fern Knoll Cemetery Bridge on Midland Drive

d. Above S. Main Street Bridge on Toby Creek along Dallas Memorial Highway

Figure 22. Fishery Survey Location on Toby Creek upstream of the South Main Street Bridge

e. Below Trucksville Fire Company[137] to Carverton Road Bridge on Toby Creek Main Stem

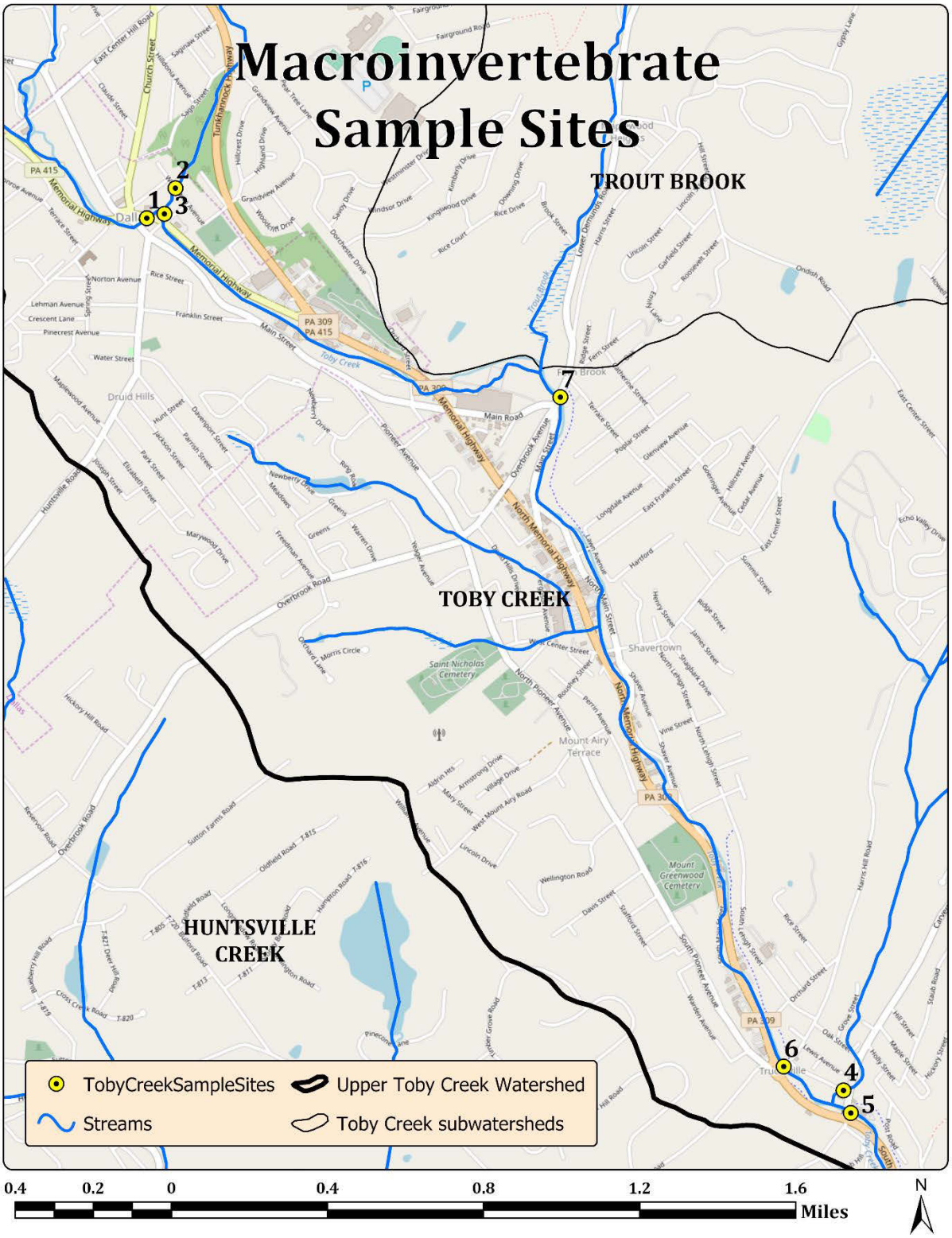
Figure 23. Looking upstream on Toby Creek below Carverton Road Bridge in Trucksville while taking measurements

Figure 24. Looking downstream on Toby Creek from below the Carverton Road Bridge at an abundance of Japanese Knotweed

[137] Trucksville Volunteer Fire & Rescue Company

MACROINVERTEBRATE BIOLOGICAL SAMPLING

EPCAMR Staff and Volunteers collected macroinvertebrate, biological, and chemical sampling data on 8-16-19 and 8-19-19. The results of the data collection and sampling locations are below.



Map 8. Macroinvertebrate Biological Sampling

Photo Credit: Lauren Perry, EPCAMR

Figure 25. EPCAMR, DAMA, & Volunteer Kristen Cease Perform a Macroinvertebrate Survey on Toby Creek above Harris Hill Bridge

Table 5. Macroinvertebrate Sampling Data and Qualitative Designation

Location Number	Lat/Long	Road Crossing	Description	Water Quality Score	Designation
1	41.3361162, -75.9625746	SR 415	Toby Creek crossing 415 between Verve Vertu and Embellish	14.2	Poor
2	41.3372093, -75.9611323	Woodlawn Ave.	UNT to Toby Creek crossing between homes on Woodlawn Ave.	21.8	Fair
3	41.33595, -75.96177	SR 415	Toby Creek crossing 415 after confluence, near Church lot	6.4	Poor
4	41.3032048, -75.9291560	Carverton Rd.	“Snake Creek” UNT to Toby Creek crossing Carverton Rd, along Pizza Perfect lot	27.6	Fair
5	41.3023605, -75.9288207	Carverton Rd.	Toby Creek crossing Carverton Rd, after confluence with UNT	20.8	Fair
6	41.3041375, -75.9320759	Harris Hill Rd.	Toby Creek crossing Harris Hill Rd, near its intersection w/ 415	23.6	Fair
7	41.3291559, 75.9423846	Lower Demunds Rd	Toby Creek crossing Lower Demunds Rd, near its intersection w/ Main St	22.6	Fair

Table 6. Water Quality Sampling and Visual Habitat Assessment Data

Location Number	Weather (now)	Weather (week)	Canopy Cover	Water Clarity	Water Color	Water Odor	Surface Foam	Streambed Color	Algae Abund.	Algae Growth Habitat	Algae Color	Land Use
1	cloudy	some rain	open	clear	none	none	slight	brown	scattered	hairy	dark green	Commercial
2	partly cloudy	some rain	open	clear	none	none	none	brown	None	none	none	Residential
3	partly cloudy	some rain	partly shaded	clear	none	none	slight	brown	scattered	hairy	dark green	Commercial
4	sunny	some rain	partly shaded	clear	brown	none	none	brown	scattered	hairy	dark green	Commercial
5	sunny	some rain	open	clear	none	none	none	brown	scattered	even coating	brown	Commercial
6	cloudy	some rain	partly shaded	clear	none	none	none	brown	None	none	none	Comm/Res
7	cloudy	some rain	open	clear	none	none	none	brown	None	none	none	Residential

Table 7. Water Chemistry Quality

Location Number	Temperature (C)	pH	DO (%)	DO (m/L)	ORP (mV)	Alkalinity (mg/L)
1	19.7	7.37	81.4	7.46	0.8	65
2	20	7.52	82	7.8	11.4	75
3	20.7	7.3	82.4	7.4	18	60
4	19.6	7.45	92.4	8.47	9.2	-
5	21.4	7.82	7.71	7.71	32.8	-
6	19.9	7.9	91.2	8.3	12.3	-
7	20.2	7.76	85.7	7.7	9.1	-

Table 8. Determination of Impairment by Sediment or Bank Erosion and Channel Width of Sampling Locations

Location Number	Sediment Impaired?	Bank Erosion Impaired?	Generally Impaired?	Channel Width (ft)
1	No	No	No	22
2	Yes	Yes	Yes	8.5
3	Yes	Yes	No	11.5
4	No	No	No	25
5	No	No	No	28
6	No	Yes	No	20
7	Yes	Yes	No	17

EPCAMR RECOMMENDATIONS

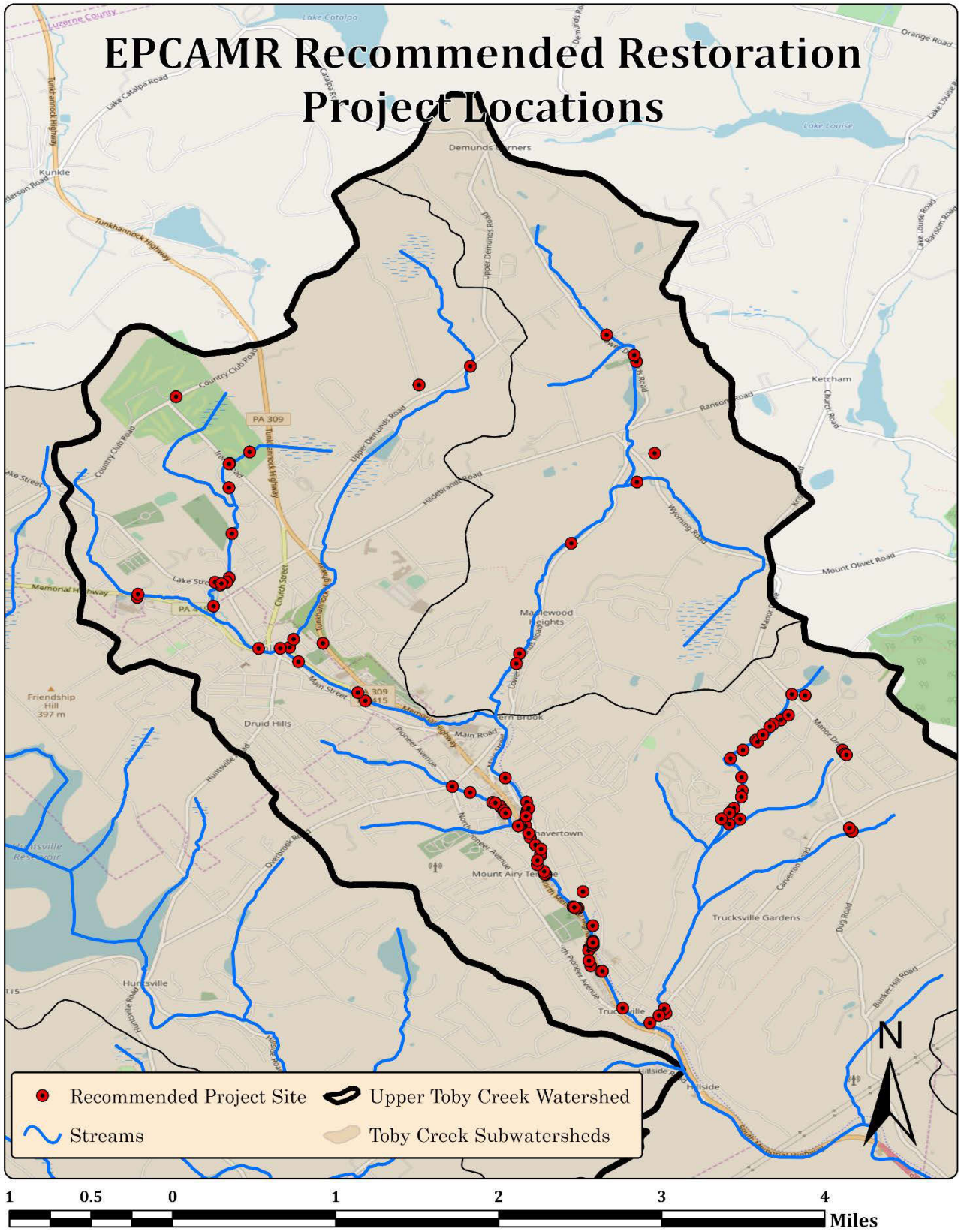
Following EPCAMR's collection and data analysis, we have developed recommendations to serve as actions for the restoration, maintenance or enhancement of many areas within the Upper Toby Creek Watershed. EPCAMR has included specific projects which can be undertaken in the future should implementation 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 Back Mountain.

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 Upper Toby Creek Conservation Plan.

EPCAMR has made **115** recommendations for efforts that will promote, support, and implement coldwater resource conservation awareness initiatives, education and outreach programs, and stewardship opportunities in the Upper Toby Creek Watershed. Multiple projects were considered for some individuals locations within the watershed.

Table 9. Breakdown of Recommendation Types

Recommendation Type	Recommendation Number	Total Projects
Debris Removal	2, 7, 20, 23, 26, 37, 42, 45, 48, 54, 55, 62, 65, 66, 94, 101, 104, 105, 106, 109, 111, 114	22
Streamside Clean-up	7, 32, 45, 46, 53, 56, 57, 72, 90, 100	10
Pipe/Culvert Alteration	3, 11, 15, 19, 28, 29, 30, 33, 38, 40, 51, 61, 64, 67, 68, 69, 70, 74, 81, 85, 92, 94, 98, 99, 101, 108, 112, 115	28
Riparian Planting	1, 5, 10, 12, 16, 27, 28, 29, 30, 31, 47, 49, 52, 59, 76, 78, 79, 83, 87, 88, 89, 95, 102, 103, 105, 107	26
Invasives Removal	2, 3, 16, 35, 47, 49, 59, 76, 78, 79, 82, 83, 93, 107	14
Streambank Restoration	11, 17, 18, 21, 22, 24, 29, 33, 34, 36, 39, 43, 44, 58, 60, 63, 71, 73, 75, 77, 84, 91, 95, 102, 112, 113	26
Community Outreach	4, 13, 14, 50, 96	5
Follow-ups	6, 8, 9, 25, 29, 41, 60, 73, 75, 80, 84, 86, 91, 97, 103, 110	16



Map 9. EPCAMR Recommended Project Locations

1. Recommend a riparian planting along Toby Creek within the Misericordia University Lake Street Community Park in Dallas.

2. Recommend the removal of downstream gravel bars and honey locust trees on the Upper Toby Creek behind the Chinese Restaurant on State Route 309.

3. Recommend further investigation of the collapsed 18" culvert and 2 disconnected 3' diameter concrete culverts from the main pipe culverts at the intersection of Pioneer Avenue and Overbrook Road that are blocked by woody debris at their inlet that carries the unnamed tributary from The Meadows and Newberry Estates down towards Druid Hills.

4. Train Municipal Road Department Employees on becoming Lead Observers to assist in completing additional culvert assessments and structures under the NAACC guidelines in partnership with EPCAMR

5. Recommend a streambank riparian planting from the outlet of the concrete culvert box of the unnamed tributary from Green Pond below the stormwater basin in the Echo Valley Mobile Home Park the entire length of the stream channel to below the Echo Valley Drive Loop Road.

6. Follow up with Jon Sordoni, private landowner who is interested in the protection of the Toby Creek and as the owner of the former Stegmaier Estate. Discuss gaining access to the property for an assessment of the unnamed tributary to behind Silver Arrow LLC that comes to a confluence with the Green Pond unnamed tributary to Toby Creek that flows through his land.

7. Coordination of a small litter cleanup and woody debris removal behind Pizza Perfect in Kingston Township is recommended; Pizza Perfect owner Janine Hudock, offered up their business for meetings to coordinate a cleanup effort and would sponsor pizza pies for the volunteers and allow for the staging area to be set up at their business location parking lot.

8. Follow up with Dr. Matt Hennessey's (Dallas Veterinary Clinic owner) private property east of Wyoming Road. Further investigation is needed on an unnamed tributary that is on his property. John Levitsky, Watershed Specialist for the Luzerne Conservation District has received permission to assess the tributary from the landowner.

9. Follow up with Rob Friedman, private landowner, Friedman's Farm. Mr. Friedman will grant access to his property when EPCAMR completes the assessment to take a look at the unnamed tributary to Trout Brook and Trout Brook as they flow through his property. John Levitsky, Watershed Specialist for the Luzerne Conservation District has thoughts about planting a riparian zone as well as EPCAMR and further field assessment will be necessary to make the determination.

10. Recommend a riparian restoration planting project along Trout Brook in the front of the Pulverman Metal Fabrication property between the double culverts upstream of Trout Run Road. Follow up with Pulvermann owner.

11. Recommend daylighting the tributary that is currently in a pipe from the outlet of the culvert below the Twin Stacks Professional Center along the ditch of the Dallas Memorial Highway (State Route 415), all the way to Gerald Avenue and design and construct a riparian buffer zone and planting.

12. Recommend a riparian restoration streamside planting for the outlet side of the stormwater runoff conveyance rip rap channel that parallels Goodleigh Road and crosses Upper Demunds Road before entering the Krause's Pond unnamed tributary.

13. Conduct and assess the remaining culverts and structures in the Huntsville Creek and Lower Toby Creek Watershed 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 to become EPCAMR volunteers to become certified in aquatic organism passage (AOP) as Lead Observers.

15. Replace and realign rusted metal corrugated 18" pipe that is currently facing upstream entering the unnamed tributary to Toby Creek ("Snake Creek") in the Kingston Township (Trucksville pocket park) to eliminate the deepening of the current scour pool next to the large root wad from a tree along the streambank.

16. Coordinate a small Invasives plant removal and native riparian planting project in the Kingston Township (Trucksville pocket park) to rid it of Tree of Heaven and Japanese Knotweed and other species along the streambank to compliment the abundance of orange and yellow jewelweed.

17. Determine if the concrete dam on the unnamed tributary to Toby Creek within the Kingston Township (Trucksville pocket park) is a municipally owned sewer line to see if a step pool might be able to be constructed to allow for fish passage and to remove the scour pool beneath the dam.

18. Recommend that the impervious macadam sluiceway diversion from an upper parking lot area between Berkshire Hathaway (Ted Poggi, Realtor) and the Swoga property along Carverton Road that enters a storm drain on the property and then crosses Carverton Road be replaced with a grassed waterway.

19. Recommend replacement of rusted out metal corrugated pipe culvert carrying the unnamed tributary beneath Dug Road.

20. Recommend the removal of some large woody debris by hand, that is located upstream on the unnamed tributary to the northeast side of Dug Road that is blocking the culvert as a result of previous high-water events.

21. Recommend improving the stormwater conveyance channels that come down by Checker's Pizza along Dug Road west side and along the east side of Dug Road on the upstream side of the unnamed tributary to prevent continued aggradation near the inlet and a scour pool where the culvert crosses under Dug Road.

22. Recommend a streambank stabilization project along 68 Manor Drive (The Swoga Family) along the unnamed tributary with wetland plants or willow staking along with some cutting back of the streambank and removal of some cinderblocks that are in place to prevent erosion of one side of the streambank on the unnamed tributary running along Manor Road.

23. Recommend removal of the rip-rap impediment on the unnamed tributary along Manor Road at 68 Manor Drive and replacement with a small cross-vane to keep the flow of the unnamed tributary in the center of the stream channel to allow the high water flows to pass under the covered bridge on the property. Engineering will be necessary at this location.

24. Recommend using a rock apron reinforcement along the streambank or willow staking to reinforce the streambank and stabilize the unnamed tributary that flows out of the downstream outlet from the pipe culvert that crosses under Manor Road near the bend that has a small scour pool and highly eroded streambank opposite the pipe.

25. Follow up with Mr. Ed Piekara at 119 Manor Drive, Kingston Township to determine either a perceived storm water issue in his yard that is completely saturated in areas to the point where he can't easily cut his grass and groundwater has compromised his in-ground pool liner. Mr. Piekark allowed EPCAMR and DAMA to walk up the edge of the wetland area adjacent to his backyard and noticed that the water level in the wetland was high. There is a berm preventing the pooled water in the wetland from spilling directly into his yard, however, the groundwater table is suspected to be high in the yard and saturated, due to the elevation of the pooled water in the wetlands and the slope and low-lying nature of the yards along Manor Road. Mr. Piekara suspects that the inundation of groundwater is coming from excess stormwater upstream and from Green Pond. The problem could very well be a high groundwater table due to the soil types along Manor Drive and is recommended to be investigated further to assist the landowner if finding a possible solution or answer to his concerns. He had mentioned his neighbor adjacent to him also has similar issues in her backyard. She was not present to investigate further on her property. It was noted that he informed EPCAMR and DAMA that Kingston Township has informed him that the areas where he was suspecting that the water was coming from was on private property that the Road Department didn't have permission to access.

26. Recommend cleaning out by hand, the headwall on the Green Pond side of Manor Drive, Kingston Township, where a rock wall is located.

27. Recommend that the unnamed tributary from Green Pond at the intersection with Woodbine Drive not be mowed and the area be planting with wetland species to filter out sediment. The area currently has natural vegetation on one side of the streambank and is completely mowed to the bank's edge on the other.

28. Recommend a new corrugated pipe alignment with the unnamed tributary from Green Pond to reduce erosion of the streambank undercutting on the opposite bank at the rear of the lots along Harris Hill Road before heading downstream towards Butternut Drive. A possible elbow pipe could be placed at the end of the corrugated pipe to align it with the Green Pond unnamed tributary. No branches on the Arborvitae indicated extremely high deer browsing and tubex protection would be needed for a riparian restoration in this location until herbaceous layer are

grown beyond the browse line and antler rub damages are overcome by good growth of the plants.

29. Recommend 35' of potential streambank restoration plantings located behind homes on Harris Hill Road and Green Pond Road. White plastic pipes extended above grade are suspected to be sewer lateral cleanouts or defunct water lines. A local resident, Larry Long had indicated they he thought they were defunct water lines. This will need to be further investigated. Any riparian restoration will require utility mark out to make sure the herbaceous plants do not impact sewage flows from homes.

30. Rehabilitation of the black plastic HDPE pipe to open the wingwalls of the pipe to prevent further restriction of flow of water from the unnamed tributary from Green Pond. Too much placement of rock has compromised the pipe phalange and pinched it to the point it is constricting the flow of water through the pipe and causing it to backup. This area also is recommended for a herbaceous riparian restoration.

31. Recommend a streamside riparian planting for streambank erosion protection along Harris Hill Road looking downstream from the O'Donnell property.

32. Recommend the coordination of a small roadside litter cleanup along Harris Hill Road, taking into consideration the busy traffic along the steep section road leading down towards E. Center Street.

33. Recommend the installation of a rock apron utilizing the existing rocks in the channel to construct one or cut the length of the 18" black HDPE pipe back so that it isn't protruding out over the streambank and creating a scour pool below during high flows.

34. Recommend a good wattle restoration project on the Morgan property to minimize disturbance while creating a root anchored stabilization project in the area along Harris Hill Road where both the eastern (along the bank of Harris Hill Road) and western streambank (on private property) of the unnamed tributary from Green Pond is severely eroded.

35. Recommend a small Invasives removal of Japanese barberry and Multi-flora rose and native riparian planting project along the unnamed tributary along Harris Hill Road below E. Center Street.

36. Recommend a small streambank stabilization project along Harris Hill Road on the Abod property.

37. Recommend a log vane deflector or riprap and removal of the rock check dam to prevent further down cutting of the unnamed tributary from Green Pond along Harris Hill Road.

38. Reconstruct the left headwall that is failing along Harris Hill Road.

39. Recommend a simple rock apron for aquatic organism passage (AOP) be installed at the foot of the box culvert to eliminate a 3" cascade drop that is preventing fish passage on the Green Pond unnamed tributary along Echo Valley Loop Road.

40. Recommend replacing corrugated squash culvert pipe along Echo Valley Drive since it is completely rusted out at the bottom of the corrugated metal culvert pipe.

41. Follow up with Ed Castellani-landowner at 192 Harris Hill Road who has historic photos of the area. The unnamed tributary from Green Pond in his yard flows around a headwall before crossing E. Center Street downstream towards Hartzell's Pond.

42. Recommend removal of very large woody debris blockage and the cutting down of a very large fallen willow street that should be removed on the other side of the McDonald's wooden fence.

43. Recommend the installation of a log deflector and some streambank stabilization to prevent high water events from overtopping the streambank and flowing through the McDonald's parking lot.

44. Recommend removal of gravel bar deposits that have aggraded behind McDonald's and the businesses that the unnamed tributary from Ferguson Avenue passes as it makes its way to the Back Mountain Shopping Center near Dollar General.

45. Recommend cleaning out the woody debris, trash, and sediment on the upstream end of the wing wall box culvert in the small plunge pool on the unnamed tributary from Ferguson Avenue near the Dollar General.

46. Coordinate a small streamside cleanup along the unnamed tributary from Ferguson Avenue to Toby Creek between the Valero's gas station and Amelia's Diner along the Dallas Memorial Highway.

47. Recommend the removal of the Invasive, Japanese Knotweed and native riparian planting project along the unnamed tributary from Ferguson Avenue to Toby Creek between the gas station and Amelia's Diner along the Dallas Memorial Highway.

48. Recommend a DAMA Vac truck remove the sediment from an 18" black HDPE stormwater outfall pipe along bridge abutment next to Newell Fuel along Toby Creek. The pipe is half-filled with sediment.

49. Recommend an Invasives removal and native riparian planting project along S. Main Street streambanks along Toby Creek where Japanese Knotweed and barberry are present.

50. Enhance improved public access to Toby Creek along S. Main Street for recreational fishing.

51. Recommend realignment of the 24" concrete stormwater pipe that is currently perpendicular to Toby Creek near Newell Fuel along Toby Creek.

52. Recommend a streambank riparian plant stabilization project on Toby Creek along the northern streambank looking downstream from S. Main Street where a 4' undercut 35' long bank exists.

53. Coordinate a small streamside cleanup of Toby Creek where nearly a dozen or more tires are illegally dumped along the upper streambank near the foundation structure along S. Main Street.

54. Recommend the removal of a very large fallen tree and some woody debris that has landed in Toby Creek redirecting flow to one of the culvert boxes in the bridge and creating a gravel bar deposition behind the tree just upstream of the bridge over State Route 309 along S. Main Street.

55. Recommend the removal of a fallen tree that is across both inlets to the box bridge over State Route 309 to prevent the preferential flow of Toby Creek only to the north side box culvert as it flows downstream.

56. Recommend realignment of the 24” black corrugated HDPE stormwater pipe along State Route 309 with Toby Creek.

57. Recommend removal of a 10’ length of broken section of 24” black corrugated HDPE stormwater pipe that is hanging precariously in Toby Creek along State Route 309.

58. Recommend the removal of a small dam that is creating a pool on Toby Creek behind Modern the Floor Store along State Route 309.

59. Recommend an Invasives removal and native riparian planting project below the closed S. Main Street bridge along Toby Creek where Japanese Knotweed and barberry are present.

60. Recommend the retrofitting and enhancement of the wetland area upstream of Railroad Street below North Lehigh Street as a possible stormwater detention area to reduce the flow from leaving the basin through the stone culvert constriction along Railroad Street to reduce the potential for flooding and stormwater damage to the Wesley property. Property owners (Walker, Covert) will need to be contacted to discuss further possibilities.

61. Recommend realignment of the 18” black HDPE pipe carrying drainage across North Main Street perpendicular to Toby Creek.

62. Recommend the removal of two very large fallen trees across Toby Creek along North Main Street.

63. Recommend a streambank stabilization project on the 50’ undercut bank and wall failure behind the Car Mix lot on Toby Creek.

64. Recommend realignment of the 24” black HDPE stormwater pipe on State Route 309 just before the bridge north of Car Mix lot on Toby Creek.

65. Recommend the DAMA Vac truck remove sediment from the 18” black HDPE stormwater pipe that is completely filled from the storm drain drop box inlet along State Route 309 and covered with leaves. No runoff of this roadside stormwater is making its way to the conveyance along North Main Street into Toby Creek.

66. Recommend the removal of a large tree that is laying across Toby Creek from the western bank to the eastern guardrail and another large fallen tree that is angled into the center of Toby Creek west of the bridge over State Route 309 near the end of North Main Street that could be the cause for a future concern. Severe undercutting of the bedrock along the left wing wall abutment looking upstream is occurring because of the fallen trees creating gravel bars in Toby Creek.

67. Recommend realignment of the 24” black HDPE stormwater outfall pipe that is perpendicular and not aligned to Toby Creek along State Route 309.

68. Recommend realignment of the 24” black HDPE stormwater outfall pipe that is not aligned with Toby Creek along State Route 309.

69. Recommend realignment of the 12” black HDPE stormwater outfall pipe that is perpendicular and not aligned to Toby Creek.

70. Recommend somehow bringing the 12” black corrugated HDPE pipe coming from the Age of Innocence parking lot that is floating 9’ above Toby Creek down to grade and in alignment with the stream channel to prevent scour pool development during heaving precipitation events.

71. Recommend evaluating the stability of the large stone rock wall stabilization project along Toby Creek below the Harold C. Snowdon Funeral Home lot for a potential stabilization and reinforcement of the rock wall due to dislodged rocks and fallen rocks into Toby Creek.

72. Coordinate a small litter cleanup around the streambanks along Toby Creek where the entrance to Cook’s Pharmacy is off North Main Street and the clothing and toy recycling bins are located.

73. Recommend a streambank stabilization project along Toby Creek where it takes a 90-degree dog-leg turn into the right bank looking upstream, causing severe undercutting of the streambank along North Main Street and the opposite streambank located alongside a utility shed station. The well and water treatment system utility buildings are owned by General Waterworks of PA and the access road to it is owned by the Anthracite Scenic Trail Association (ASTA). A utility pole with power is just a few feet from losing enough soil that could cause the pole to fall into Toby Creek. An access road with a yellow gate was noticed and an easement or entrance is possibly located at the rear of the B & J Equipment property near Terrace Street. It is assumed that the utility company has an agreement to access this portion of the property.

74. Recommend realignment of the black HDPE pipe beneath Lower Demunds Road along Trout Brook that flows into a large forested wetland area on private property.

75. Recommend a streambank stabilization project for a large undercut bank on Toby Creek upstream from the bridge on N. Main Street back towards Lewis Chiropractic. Dave Lewis is a willing landowner interested in future potential projects and has given EPCAMR, DAMA, and the Luzerne Conservation District to walk the property. Lewis Chiropractic is owned by his brother who also gave permission to access the property along Toby Creek for further assessment. Follow up with Lewis Chiropractic.

76. Recommend an Invasives removal and native riparian planting project along North Main Street streambanks along Toby Creek where Japanese Knotweed is present behind Cook's Pharmacy.

77. Recommend the construction of a rock apron or step pool channel conveyance up to grade with the 24" concrete storm drain outlet pipe that is currently protruding out over the embankment from a storm drain on Harris Hill Road directing flow upstream and down over a steep embankment or realigning the storm drain to the eastern side of Harris Hill Road where there is already large rip rap rock placed from the Luzerne Conservation District's Bank Stabilization Project.

78. Recommend an Invasive removal of Japanese Knotweed and native riparian planting project on Toby Creek upstream from the curved concrete retaining wall along North Main Street north of the Lonn Dean Salon and North Memorial Highway concrete retaining wall.

79. Recommend an Invasive removal of Japanese Knotweed and native riparian planting project on Toby Creek south of the curved concrete retaining wall along North Main Street towards Plum Aie. Concrete grouting of rip rap along North Main Street had been historically used to stabilize the streambank and protect the road from previous undercutting of the s just below the curved retaining wall along the left bank of Toby Creek.

80. Follow up with John Levitsky, Watershed Specialist with the Luzerne Conservation District to review information and or take a drive to area where an unnamed tributary that comes from the southeast off Wyoming Road wraps around north and south of Wyoming Road against Abraham Creek. He also mentioned that there is anecdotal evidence of brown trout in the Big Swamp, along Lower Demunds Road. Allen Pugh owns property along Trout Brook along Lower Demunds Road that can be accessed for assessment. Follow up with John and Mr. Pugh.

81. Recommend eventual replacement of metal culvert that is slightly rusted out near on the unnamed tributary near the intersection of Sunny Brook Lane and Pheasant Run.

82. Recommend removing the sumac tree growing in front of the culvert outlet on the private access driveway to Misericordia property that was formerly Payne Printing in Dallas.

83. Recommend an Invasive removal of sumac and Japanese Knotweed and native riparian planting project along the streambanks of Toby Creek from the secondary access to Walgreen's down to the Dunkin Donuts entrance in Dallas.

84. Recommend a streambank stabilization project to grade the bank back and lower it along with a riparian planting at 281 Upper Demunds Road on the Menig and Martinez property that are receiving water runoff from the unnamed tributary from the former Krause Farm Pond through a 24" concrete pipe that is directing runoff skewed to the front hillside of the property. Bob Menig has been in contact with PA DOT in the past and hasn't had the issue resolved to date.

85. Recommend realignment and reconstructing a dilapidated headwall that Trout Brook flows under to the other side of Lower Demunds Road near the Jewish Cemetery.

86. Recommend constructing pocket parks in Dallas Borough and establishing a Green Downtown Greenway along Toby Creek as previously supported by the American Planning Association (APA) in their *Planning Matters: Case Study #4*[138].

87. Recommend a small riparian restoration planting project on the unnamed tributary below the stone arch bridge on Lake Street just behind the Meadows Nursing Home.

88. Recommend a small grassed waterway along Lake Street to reduce the erosion of soil that is ending up in the unnamed tributary on the upstream side of the stone arch bridge.

89. Recommend a grassed waterway for drainage along University Road on the Misericordia University Campus that is being eroded from parking lot runoff

90. Coordinate a streamside litter cleanup along Mill Street along Toby Creek across from Wendy's below the parking lot where an abandoned railroad grade is located.

91. Determine if the large rock constructed dam along Trout Brook on Lower Demunds Road on the Howell property can possibly be removed and a wetlands restoration project be constructed since downstream of the structure Trout Brook has to flow through an estimated 6-8' wide constriction of the tributary beneath a massive stone arched rock culvert.

92. Reconstruct and repair dilapidated stone headwall on Trout Brook near Luzerne County Road & Bridge District 2 Maintenance Sheds property near fallen Aspen tree.

93. Recommend an Invasives removal of Japanese Knotweed along Trout Brook upstream of Shupp Road along the west bank looking upstream.

94. Recommend a stormwater best management practice (BMP) such as a dry detention basin along Southside Avenue where a 24" pipe culvert and storm drain is filled with sediment from the Tunkhannock Highway (State Route 309) and causing severe erosion of the roadside swale.

95. Recommend a streambank and riparian restoration planting project for the area on the unnamed tributary just below the bridge on Woodlawn Avenue where severe erosion of the bank is occurring all the way to the corner of the Public Water building behind Sprau and Clements Dentistry.

96. Recommend the formation of a Toby Creek Watershed Association that has been alluded many times in the past by the Luzerne Conservation District and other partners.

97. Follow up with private landowner along Green Pond UNT across from Echo Valley. Discuss gaining access to the property for an assessment of the unnamed tributary above Silver Arrow LLC that comes to a confluence with the Green Pond unnamed tributary to Toby Creek that flows through the property.

[138] Planning Matters: Case Study #4

98. Inlet pipe at the dip in Irem Road at the bottom of the hill. Catfish were present. A severe constriction exists upstream and beneath the road to the other side of the golf course. Pipe is recommended to be replaced to a larger box culvert.

99. Ephemeral stream channel along the intersection of Country Club Road and Ridgeway Drive where the headwall is failing causing a cascading feature leading into the inlet of the culvert.

100. Looking upstream of culvert on unnamed tributary above Hole 4 on the Irem Golf Course. Litter is present and a small cleanup is recommended.

101. Outlet of corrugated metal pipe on Irem Road below Hole 3 where a rock wall is constructed on the upstream end of the pipe that is filled with woody debris. Recommend removing woody debris and reason for why the headwall is constructed away from the culvert creating an inlet drop and scour area before the unnamed tributary enters the culvert.

102. Downstream from the bridge on Midland Drive at the entrance to Fern Knoll Cemetery. Many fish were present at this location and it was one of the electroshocking sites for the fishery survey. Removal of a check dam and a riparian restoration project along the righthand streambank is recommended.

103. Unnamed tributary to Toby Creek at a multiple structure culvert along the outlet culvert on McAuley Drive. Recommend Misericordia University not mow the grass along the streambank and replanting the riparian corridor on the upstream end of the culvert to create cooler water conditions and reduce sediment loads downstream caused by the eroded streambanks.

104. Unnamed tributary to Toby Creek off Lake Street on Misericordia University grounds below the pedestrian bridge and the bridge on Lake Street. Heavy sediment deposition was noted all the way through the culvert. Recommend removal of the sediment.

105. Unnamed tributary to Toby Creek that flows through the Meadows Nursing Home property along Center Hill Road. Recommend not mowing up to the streambank and planting additional riparian area plants along the corridor and removal of sediment in ponded area of the tributary further downstream.

106. Piles of sediment that are being deposited following rain events from culvert pipes that drain to Toby Creek from above the somewhere near the roundabout in Dallas. This section of the main stem is heavily silted from roadside stormwater runoff. Beneath the culvert the entire stretch of Toby Creek is full of sediment. A DAMA Vac Truck is recommended to remove the sediment.

107. Downstream from the culvert over Main Street beneath Main Street in Dallas under the commercial district. This section of the stream is along Verve Vertu in Dallas. Invasives are present downstream in this area, including Japanese Knotweed. An Invasive Removal Project and riparian planting is recommended.

108. Multiple concrete pipe structures are collapsed and disconnected from an unnamed tributary to Toby Creek that conveys mostly stormwater through Druid Hills below Pioneer Avenue and Overbrook Road. The wingwalls of the culvert foundation are undermined with very little support beneath it. Replacement of the entire structure and foundation should be designed and constructed is recommended.

109. Dry, unnamed tributary to Toby Creek at the corner of W. Franklin and Ferguson Avenue filled with sediment. Recommend removal of sediment with a DAMA Vac Truck since the culvert is nearly filled with fine gravels.

110. Dry, unnamed tributary to Toby Creek at the corner of W. Franklin and Ferguson Avenue flows through a private residence that has beautifully landscaped the conveyance with a stone rock wall. Recommend having a discussion with the landowner about considering a riparian restoration project in this area.

111. Standing in front of the inlet side of the bridge culvert over the Dallas Memorial Highway heading towards E. Center Street several large trees have fallen in the channel. Recommend removal of them if they are not lodged in the stream to avoid blockage at the bridge.

112. Looking upstream at a concrete pipe culvert that is carrying flow from an unnamed tributary to Toby Creek that flows along Division Street down to the intersection with N. Main Street that drops into a scour pool and then flows into the concrete pipe before crossing N. Main Street creating another scour pool before entering Toby Creek. Recommend a rock apron at the outlet since the outlet grade is well above the stream channel.

113. Looking downstream on Toby Creek along N. Main Avenue where the new bridge was constructed where a large gravel bar extends the entire length of the bridge from the inlet to the outlet. Recommend gravel bar removal and point bar removal at the other end of the bridge.

114. Looking downstream into the concrete culvert beneath the Back Mountain Shopping Center into the first 20’ and woody debris and large stone are found blocking the flow of stormwater through the length of the pipe of the unnamed tributary to Toby Creek that crosses the parking lot and under the Dallas Memorial Highway before it outlets near Amelia’s Diner and the Gas Station. Removal of the rocks and woody debris is recommended.

115. Looking upstream at a black HDPE Corrugated pipe carrying flow from an unnamed tributary to Toby Creek that flows along Division Street down to the intersection with N. Main Street that drops into a scour pool and then flows into a concrete pipe before crossing N. Main Street and entering Toby Creek. Recommend connecting the pipe with a sleeve or collar to prevent the scour pool since the two pipes are not aligned.

DAMA PROPOSED RETROFIT, FOREST BUFFERS, AND STREAMBANK STABILIZATION PROJECTS

EPCAMR has also included a Table from the Dallas Area Municipal Authority (DAMA) with details on **35** Proposed Retrofit and Forest Buffer Projects (**Table 3.**) and **7** Proposed Streambank Restoration Projects (**Table 7. DAMA's Chesapeake Bay Pollution Reduction Plan-Appendix F.**). Annual load *captured* in pounds/year (lb/year) were calculated to show pollution reductions based on Impervious Area (Acre), Pervious Area (Acre), Total Suspended Solids (TSS) Loading Rate (lb/Acre/year), Total Suspended Solids (TSS) Pervious Loading Rate (lb/Acre/year), and Best Management Practice (BMP) Effectiveness (%). Annual load *prevented* in pounds/year (lb/year) were calculated to show pollution reductions based on Restoration length (ft) and the Best Management Practice (BMP) Effectiveness. DAMA's **35** Proposed Retrofit and Forest Buffer Projects would capture **195,231.78** lbs/year in Total Annual Pollution Reduction. **170,465.53** lb/year would be captured in **28** BMPs would meet the PA Department of Environmental Protection's Pollution Reduction requirements (**Table 6. DAMA's Chesapeake Bay Pollution Reduction Plan-Appendix F.**). **7** Proposed Streambank Restoration Projects would result in preventing **214,077.60** lbs/year in Total Annual Pollution Reduction.

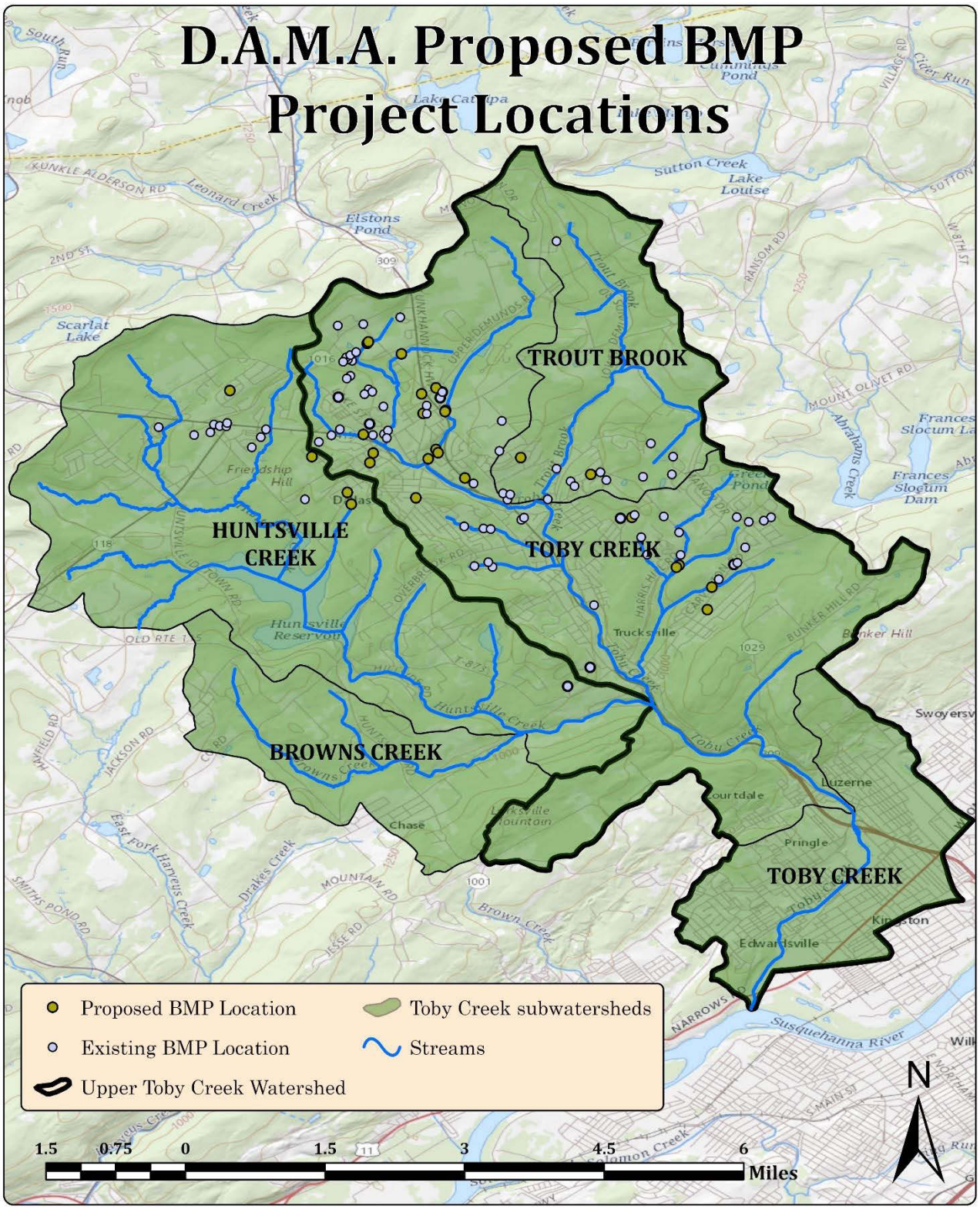
EPCAMR has included the *DAMA Chesapeake Bay Pollution Reduction Plan* completed in September 2017, by T & M Associates as **Appendix F**.

Table 10. Dallas Area Municipal Authority Chesapeake Bay Pollution Reduction Plan Proposed Projects

Name	Latitude	Longitude	Description
B7	41.346645	-75.975603	Retrofit dry detention basin for Misericordia Tennis courts to Extended dry detention basin or better
B8	41.342486	-75.970723	Retrofit dry detention basin for Misericordia along Lake St to Extended dry detention basin or better
B13	41.346552	-75.959739	Retrofit dry detention basin for Country Club Shopping Center to Extended dry detention or better
B38	41.347439	-75.959422	Retrofit dry detention basin for Country Club Shopping Center to Extended dry detention or better
B63	41.327802	-75.931732	Retrofit dry detention basin for Kingston Township municipal building to Extended dry detention or better
B75	41.320648	-75.914155	Retrofit dry detention basin for Cross Creek Community Church to Extended dry detention or better
B79	41.304648	-75.936467	Retrofit dry detention basin for Lantern Hill subdivision to Extended dry detention or better
B80	41.301737	-75.939983	Retrofit dry detention basin for Lantern Hill subdivision to Extended dry detention or better
P1	41.336466	-75.970678	Install extended dry detention basin or better at Dallas Borough Park

Name	Latitude	Longitude	Description
P2	41.337922	-75.970162	Install extended dry detention basin or better at Dallas Borough owned parcel
P3	41.338522	-75.960408	Install extended dry detention basin or better at Dallas Township Park
P4	41.338019	-75.960066	Install extended dry detention basin or better at Dallas Township Park
P5	41.334072	-75.955941	Install vegetated open channels or better throughout neighborhood and next to Valentine's
P6	41.337228	-75.947258	Install vegetated open channels or better throughout neighborhood
P7	41.331007	-75.963535	Install extended dry detention basin or better at Dallas Borough Park
P8	41.317141	-75.917536	Install vegetated open channel or better along Old Carvertown Rd
P9	41.344552	-75.958898	Install Forest Buffer along Trib 63042 to Toby Creek from Hildebrandt Rd to PA-309
P11	41.354972	-75.971094	Install Forest Buffer along Trib 63043 to Toby Creek through Irem Temple Country Club
P13	41.331842	-75.974208	Install extended dry detention or better in Deer Meadows subdivision
P14	41.329995	-75.973593	Install extended dry detention or better in Deer Meadows subdivision
P15	41.320542	-75.922664	Install Forest Buffer along Unnamed Tributary to Toby Creek
P18	41.327975	-75.929985	Replace Kingston Township Park's Parking Lot with Permeable Paving
P19	41.348099	-75.960408	Install extended dry detention or better on Dallas Township Building Parcel
P20	41.347154	-75.962664	Install extended dry detention or better on Dallas School District/ Back Mountain Little League Property
P21	41.344092	-75.962435	Install extended dry detention or better on Dallas School District/ Back Mountain Little League Property
P22	41.347686	-75.992466	Install vegetated open channels or better throughout neighborhood
P23	41.337405	-75.979695	Install vegetated open channels or better throughout neighborhood
P24	41.334651	-75.936373	Install vegetated open channels or better throughout neighborhood

Name	Latitude	Longitude	Description
SB9	41.344383	-75.959022	Streambank Restoration on Trib 63042 to Toby Creek from Hildebrandt Rd to PA-309
SB10	41.353347	-75.965773	Stream Daylighting and restoration on Trib 63043 to Toby Creek through Irem Temple Country Club
SB11	41.355218	-75.970914	Streambank Restoration on Trib 63043 to Toby Creek through Irem Temple Country Club
SB12	41.340816	-75.971692	Streambank Restoration on Toby Creek through Meadows Complex
SB17	41.337041	-75.961636	Streambank Restoration on Unnamed Tributary to Toby Creek
SB15	41.320186	-75.923073	Streambank Restoration on Unnamed Tributary to Toby Creek
SB16	41.313613	-75.918231	Streambank Restoration on Unnamed Tributary to Toby Creek



Map 10. DAMA Proposed BMP Locations

MISFIT BEST MANAGEMENT PRACTICES THAT DON'T QUALIFY FOR SEDIMENT REDUCTION CREDIT WITHIN THE TOBY CREEK WATERSHED UNDER DAMA CHESAPEAKE BAY POLLUTION REDUCTION PLAN

Tom Mayka, DAMA provided EPCAMR with a list of a number of Best Management Practices that do not qualify for sediment removal credit under their DAMA Chesapeake Bay Pollution Reduction Plan within the Toby Creek Watershed.

Table 11. Misfit Best Management Practices that Don't Qualify for Sediment Removal Credit

Best Management Practice (BMPs)	Location Example
Residential owned, installed, and non-engineered rain barrels, rain gardens, bioswales, vegetated open channels	All residential properties within the Toby Creek Watershed
Steep slope swales, ditches, and gullies prone to erosion	Skyview Drive, Holcomb Street, and Terrace Street
Outfall pipes (pipes in general) that are misaligned with existing stream channels	Numerous locations throughout the Toby Creek Watershed; (*many have been reported by EPCAMR in the Recommendations section of the Upper Toby Creek Watershed Conservation Plan for possible realignment with the downstream flow of the unnamed tributaries, Trout Brook, and the main stem of Toby Creek*)
Outfall pipes (pipes in general) that have high drops and/or cascades	bottom of Harris Hill Road at stone bridge, outfall along Back Mountain Trail, etc.
Residential stream bank restoration/impediment removal	Swoga property on Manor Drive – (the covered bridge property)
Steep Slope Stabilization of yards and fields	Harris Hill Road and East Center St.)
No-Mow situations	Green Pond Road, Harris Hill Road, and Butternut Drive
Replace/Repair old/antiquated/failing infrastructure (e.g. old metal pipes with rotted bottoms)	Echo Valley Road, across from Pizza Perfect, and numerous other locations
Installation of storm sewer network to control erosion along roadsides	Numerous locations throughout the Toby Creek Watershed

FUTURE FUNDING GRANT OPPORTUNITIES AND POTENTIAL PARTNERS

EPCAMR has provided numerous known possible funding sources for future opportunities to implement and take the Upper Toby 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 Toby Creek 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 Upper Toby Creek Coldwater Conservation Plan to see what priorities many of them have for the next few years. EPCAMR will be moving on to complete the Huntsville Creek Coldwater Conservation Plan in the Spring of 2020 and has recently submitted for a Coldwater Conservation Planning Grant for the Mill-Gardner Creek Watershed on the east side of the Wyoming Valley to conduct another 18 month watershed assessment of that mining impacted watershed, should it be considered for funding.

GRANT OPPORTUNITIES

Updated Catalog of Federal Funding for Watershed Protection[139] -This website is a searchable database of financial assistance sources (grants, loans, and cost-sharing) available to fund a variety of watershed protection projects.

Grants.gov[140]- A source for federal funding opportunities

Finding the Green![141] - A guide to state funding opportunities for conservation, recreation and preservation projects.

PA Department of Environmental Protection Growing Greener[142] - PA DEP grants for: watershed restoration and protection, abandoned mine reclamation; and abandoned oil and gas well plugging projects.

PA Department of Conservation and Natural Resources[143] -PA DCNR has several grant opportunities for projects and activities related to trail maintenance, land acquisition and conservation, public park and recreational amenities, conservation planning, partnership projects and collaborative initiatives, and others.

[139] Updated Catalog of Federal Funding for Watershed Protection
[140] Grants.gov
[141] Finding the Green!
[142] PA Department of Environmental Protection Growing Greener
[143] PA Department of Conservation and Natural Resources

Patagonia Grant Program[144] -Supports small, local, grassroots organizations with direct-action agendas, working on multi-pronged campaigns to preserve and protect local habitats.

Watershed Restoration and Protection Program[145] -Act 13 of 2012 establishes the Marcellus Legacy Fund and allocates funds to the Commonwealth Financing Authority for watershed restoration and protection projects. The overall goal of the Watershed Restoration and Protection Program (WRPP) is to restore and maintain stream reaches impaired by the discharge of nonpoint source pollution and ultimately to remove these streams from the Department of Environmental Protection's Impaired Waters list.

PA Association of Conservation District's (PACD) Engineering Technical Assistance Grant Program[146] - The PACD Engineering Assistance Program, funded through the Pennsylvania Growing Greener Program and the USDA Natural Resources Conservation Service, provides statewide engineering and soils technical assistance to entities developing or implementing a watershed assessment, watershed restoration plan, or watershed protection plan. Program staff are based out of four regional offices and cover all river basins in Pennsylvania.

PA Council of Trout Unlimited's Coldwater Heritage Partnership Program[147] - The partnership The Coldwater Heritage Partnership (CHP) provides two grant opportunities which help to protect and conserve the health of Pennsylvania's cold-water ecosystems.

The two grant opportunities are:

Planning Grants - (18 month grant) designed to help develop a conservation plan that identifies the threats to the health of local coldwater ecosystems that have naturally reproducing trout as well as the opportunities for habitat restoration and conservation within those watersheds. The information and analysis can be used as a catalyst for more comprehensive planning or for development of watershed improvement projects. Planning grants average around $5K.

Implementation Grants - (18 month grant) designed to provide funding for projects recommended in a completed conservation plan or other approved plan such as a Rivers Conservation Plan. Proposed projects must enhance, conserve or protect the coldwater stream for which the conservation plan or similar document was originally completed. Implementation grants average $8K.

The Coldwater Heritage Partnership urges watershed associations, conservancies, conservation districts, municipalities and local chapters of Trout Unlimited to apply.

[144] Patagonia Grant Program
[145] Watershed Restoration and Protection Program
[146] PA Association of Conservation District's (PACD) Engineering Technical Assistance Grant Program
[147] PA Council of Trout Unlimited's Coldwater Heritage Partnership Program

Eastern Brook Trout Habitat Initiative[148] -Amy Wolfe, TU NE Coldwater Habitat Program Director; 570-748-4901
Throughout PA, native brook trout are at risk. Pressures from poor land management, natural resource development and other problems have reduced the number of fish and fishing opportunities. TU is working to restore brook trout habitat in PA, by reconnecting rivers and streams, repairing and replacing culverts where fish can't swim through and will, overall, increase places for fish to live.

Dirt and Gravel Roads Program[149] - Created in 2001, the Center for Dirt and Gravel Road Studies is contracted by the PA State Conservation Commission (SCC) to provide services to PA's Dirt and Gravel Road Maintenance Program.

PA Environmental Digest Grants & Awards Section[150] - This section gives you a heads up on upcoming deadlines for awards and grants. This page is maintained and updated weekly by Dave E. Hess, Editor, and former PA Department of Environmental Protection Secretary.

Chesapeake Bay Trust[151] - The Chesapeake Bay Trust's grant-making strategies are shaped by three core objectives; environmental education, demonstration-based restoration, and community engagement. We look to these objectives as basic touchstones for developing our programs, engaging new partners, and communicating about our work.

Chesapeake Bay Program[152] - The Bay Program and its partners offer multiple grant opportunities to help fund restoration projects of all sizes across the Chesapeake watershed.

Chesapeake Bay Stewardship Fund[153] - NFWF's Chesapeake Bay Stewardship Fund is dedicated to protecting the Bay by helping local communities clean up and restore their polluted rivers and streams. We advance cost-effective and creative solutions with financial and technical assistance.

Working in partnership with government agencies and private corporations, the Chesapeake Bay Stewardship Fund awards $8-$12M per year through two competitive grant programs; the *Innovative Nutrient and Sediment Reduction Grant Program* and the *Small Watershed Grants Program*. These programs benefit the communities, farms, habitats and wildlife of the Chesapeake Bay region.

NFWF also makes targeted investments that support networking and information-sharing among restoration partners on emerging technologies, successful restoration approaches, and new partnership opportunities.

Foundation for PA Watersheds[154] - The Foundation for Pennsylvania Watersheds, formerly known as the Western Pennsylvania Watershed Program, is a grant-making foundation that invests in efforts to protect healthy, natural streams around the state — and also to clean up pollution and repair

[148] PA Eastern Brook Trout Habitat Initiative
[149] PA State Conservation Commission's Center for Dirt & Gravel Roads Program
[150] PA Environmental Grants & Awards Section
[151] Chesapeake Bay Trust
[152] Chesapeake Bay Program
[153] National Fish & Wildlife Foundation Chesapeake Bay Stewardship Fund
[154] Foundation for PA Watersheds

damaged wildlife habitat. Their mission is to foster stewardship for the protection, preservation and restoration of Pennsylvania's unique water resources and watersheds, while leveraging local, state and federal agency funds. Their primary service area extends from the Ohio border to the mainstem of the Susquehanna River. We achieve success through partnering with federal, state, and local governments as well as partnering with their grantees.

Potential Additional Partners and Resources

Pennsylvania Department of Environmental Protection: Stormwater Management[155]
Environmental Protection Agency[156]
Susquehanna River Basin Commission[157]
Chesapeake Bay Foundation[158]
Pennsylvania Environmental Council[159]
Stormwater PA[160]
Chesapeake Bay Commission[161]
Chesapeake Bay Program[162]
Natural Resources Conservation Service[163]
USGS[164]
Luzerne Conservation District[165]
PA Fish & Boat Commission[166]
EPCAMR[167]
Western Kentucky University[168]
Chesapeake Interstate Agreement[169]
President Obama Executive Order[170]

[155] PA Department of Environmental Protection-Stormwater Management
[156] US EPA Water Topics
[157] Susquehanna River Basin Commission
[158] Chesapeake Bay Foundation
[159] Pennsylvania Environmental Council
[160] Stormwater PA
[161] Chesapeake Bay Commission
[162] Chesapeake Bay Program
[163] Natural Resources Conservation Service
[164] US Geological Survey
[165] Luzerne Conservation District
[166] PA Fish & Boat Commission Susquehanna River Impairment
[167] EPCAMR
[168] Western Kentucky University Stormwater Utility Survey
[169] Chesapeake Bay Watershed Agreement
[170] President Obama Executive Order for the Chesapeake Bay Protection and Restoration

APPENDICES

Appendix A. Toby Creek Coldwater Conservation Plan CHP Public Information Meetings, July 18, 2018 and January 16, 2020 Attendance Lists

Appendix B. Luzerne Conservation District 2010 Annual Report

Appendix C. *The Post* Articles, 2004 (scanned digital copies)

Appendix D. Example Field Sampling Data Sheets & EPA Rapid Bio Assessment Protocols

Appendix E. Trout Unlimited Electroshocking Fishery Survey within the Upper Toby Creek Watershed

Appendix F. *DAMA Chesapeake Bay Pollution Reduction Plan*, T & M Associates, September 14, 2017

Appendix G. Field Reconnaissance Figures

SUMMARY AND CONCLUSIONS

EPCAMR and our partners in the project over the course of the last 18 months traversed as many miles 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 were kind enough to talk 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 any and all kinds of projects that we encountered within the Upper Toby Creek Watershed as possible during the project period that were related to coldwater fisheries improvement, protection, and restoration. A number of 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 Back Mountain 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, DAMA, and the local municipalities within the watershed. This coldwater conservation plan could help the entire Back Mountain community work towards developing a community watershed association for the Toby Creek that was repeatedly mentioned in the report by many community leaders over the years.

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 costs estimates when in some cases, additional discussions will need to be had first with private landowners or 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 personally like to thank the Dallas Area Municipal Authority (DAMA) Executive Director Tom G. Keiper and Stormwater Coordinator, Tom Mayka, from the Stormwater Division for his technical assistance in the field, sharing of GIS data layers, field assistance provided through his intern in the Fall 2019, and the use of their field GPS Equipment to locate the majority of our points, areas of concern, culvert assessments, electroshocking survey, and macro-invertebrate monitoring in the field that we've identified in the coldwater conservation plan. Tom and his intern were both trained and certified by the EPCAMR Executive Director for Aquatic Organism Passage (AOP) to conduct the culvert assessments throughout the Upper Toby Creek Watershed that allowed the EPCAMR Staff to assess **75** culverts.

EPCAMR would also like to personally thank Martin Barry, Dallas Township Manager for hosting both of our public information meetings within the watershed at the Dallas Township Municipal Building and for being so accommodating.

EPCAMR would like to personally thank Kathleen Lavelle, Trout Unlimited and her team for providing us technical assistance during the electroshocking trout survey at several locations within the watershed.

EPCAMR would also like to thank the volunteers from DHL Supply Chain Logistics and Patagonia for assisting us with our culvert assessments within the watershed under the guidance and direction of one of our former employees, Gabby Zawacki. Patagonia, through their World Trout Initiative has provided EPCAMR with funding for training volunteers on how to become certified in conducting culvert assessments and aquatic organism passage (AOP). Through Patagonia Action Works, Amanda Powell, Digital Advocacy Coordinator, in Ventura, CA, they also have provided EPCAMR with free advertising of our events and programs through social media and sponsored our event listings throughout the course of the project.

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 may of the projects within the watershed and providing us with contacts with landowners that were supportive of conservation efforts within the Upper Toby Creek Watershed. The Luzerne Conservation District has already completed several watershed projects within the Upper Toby Creek and are willing partners with additional funding and is ready to work with community partners to pursue additional funding for some of the recommendations included in the Upper Toby Creek Coldwater Conservation Plan.

One of the biggest lessons learned is that water within the Upper Toby Creek watershed has many conveyances from the headwaters, farm ponds, and wetlands, down through the more rural and agricultural areas to the urban corridor where the stormwater issues and sediment issues intensify and cause concerns for the communities that lie within the path of the Toby Creek drainage. When upstream development occurs and new pipes, culverts, and or bridges are constructed, more often than not, the downstream areas that receive the additional flows of runoff end of with undersized culverts and become constriction points within the watershed where either sediment deposition occurs or streambank erosion becomes an issue. Many tributaries are hidden from sight because they have been placed in culverts and outlet in areas where some of the project areas that we've identified that are in need of restoration.

There are **115** 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. Some of the recommendations have multiple projects in the same location, so the number is even larger. The next step will be for all stakeholders to review the entire plan and get together in a forum where a prioritization of the potential projects can be reviewed and discussed in further detail to see if there are any low hanging fruit projects that can be worked on by community members on a volunteer basis and also look at larger projects that may need to be partnerships with private landowners, businesses, the Merchant's Association, or corporations upon further discussion. The municipalities within the watershed, the Luzerne Conservation District, Misericordia University, Penn-State University Wilkes-Barre/Lehman Campus, King's College, Wilkes University, and the Dallas Area Municipal Authority (DAMA) all can become partners in this effort.

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 or not the Upper Toby 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 Upper Toby Creek Watershed as we look towards future implementation projects and working in the other major tributary to Toby Creek in the Huntsville Creek watershed in the Spring and Summer of 2020. A very similar coldwater conservation plan will be developed for the Huntsville Creek watershed is another major project of EPCAMR's in the region to be completed by the Fall of 2020. EPCAMR is going to make an effort to assess below the confluence with Toby Creek through Luzerne Borough, Courtdale, and out to the mouth of the Susquehanna River in Edwardsville Borough, since a large portion of the Creek does go underground through a culvert system and is inaccessible until one reached the end of the levee system in Edwardsville Borough behind the K-Mart Shopping Center. We know that the area is a transitional zone into a Warm Water Fishery and isn't a priority of the Coldwater Heritage Plan, however, it's only a few short miles that need to be assessed and it would allow us to then have documented the remaining issues and potential for restoration or implementation projects in the lower reaches of Toby Creek to its confluence with the Susquehanna River.