BENS CREEK
COLDWATER CONSERVATION PLAN

Prepared by:

Western Pennsylvania Conservancy

water, land, life.

Watershed Conservation Program

Supported by:

Somerset Conservation District

Mountain Laurel Chapter of Trout Unlimited

Pennsylvania Coldwater Heritage Partnership

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Introduction & Background

Founded in 1932, the Western Pennsylvania Conservancy (WPC) is a non-profit conservation organization that protects and restores exceptional places to provide our region with clean waters and healthy forests, wildlife and natural areas for the benefit of present and future generations. The Conservancy creates green spaces and gardens, contributing to the vitality of our cities and towns, and preserves Fallingwater, a symbol of people living in harmony with nature.

The WPC's Watershed Conservation Program protects and restores rivers, lakes and streams to provide our region with sustainable, clean water supplies that are critical to our quality of life and economy. We provide cost-free, comprehensive assistance to communities and local watershed groups, helping with project selection and prioritization, funding proposals and project management. We also partner with individual landowners and businesses to help them improve water quality and protect the environment on their properties. The Watershed Conservation Program has extensive expertise applying on-the-ground restoration activities since 2001.

This project was financed in part by a grant from the Pennsylvania Coldwater Heritage Partnership on behalf of the PA Department of Conservation and Natural Resources, the PA Fish and Boat Commission, the Foundation for Pennsylvania Watersheds, and the PA Council of Trout Unlimited. Coldwater Heritage Partnership planning grants provide funding to conservation organizations to create coldwater conservation plans that can be used by municipalities, local businesses, state and local governments, conservation organizations and communities for the conservation and protection of Pennsylvania's coldwater resources.

This Coldwater Conservation Plan (CCP) for the Bens Creek Watershed reports on watershed assessment activities completed by WPC in 2021 & 2022. The objective of this plan is to summarize the methods and results of the assessment as well as identify and prioritize potential actions which may be taken to further conservation of the coldwater resources within the drainage.

Due to the onset of this project occurring during the COVID-19 pandemic, the initial public meeting for the project was foregone in favor of other methods of acquiring public input. The opportunity for public input on the project was provided via an ArcGIS Storymap. The Storymap provided background information about the Bens Creek watershed and the coldwater conservation planning process, including interactive maps and an opportunity to submit feedback on concerns and potential improvements. WPC gave a brief presentation about the Storymap at the Mountain Laurel chapter of Trout Unlimited (MLTU) banquet on September 11, 2021 and distributed flyers containing the Storymap link and QR code to all banquet attendees. WPC also published articles about the Storymap in the regular newsletters of MLTU and the Stonycreek-Conemaugh River Improvement Project (SCRIP). An article referencing the project was also published in Johnstown's *The Tribune-Democrat* newspaper prior to the PA's opening day of trout season in 2022. The combination of these various public outreach efforts was fairly successful, thanks in part to the support and participation of the Somerset Conservation District (SCD) and MLTU.

The key contributors in this project were MLTU and SCD, which built on the partnership with WPC that was established recently to develop GIS mapping for Bens Creek to be used for project identification and prioritization. Maps from this effort can be found in the Appendix 3. MLTU volunteers also assisted in data collection using Trout Unlimited's River Inventory by Volunteers for Efficient Restoration Strategies (RIVERS) mobile application to record field observations.

Watershed/Project Area Description

Bens Creek is a High-Quality/Exceptional Value watershed located in northwestern Somerset and southwestern Cambria counties. Bens Creek is comprised of two major branches, the North Fork and South Fork. Dalton Run and Mill Creek are also significant sub-watersheds to the mainstem of Bens Creek, downstream of the confluence of the North and South Forks. A Coldwater Conservation Plan (CCP) for the North Fork of Bens Creek has already been developed by the Somerset Conservation District (SCD) in 2014. This CCP covers the remainder of the Bens Creek watershed, including the South Fork, Dalton Run, Mill Creek, and lower mainstem.

Bens Creek is a prized coldwater fishery, offering both wild and stocked trout fishing opportunities, adjacent to the city of Johnstown. About 6.7 miles of stream in the watershed are stocked annually by PA Fish & Boat Commission (PFBC), all contained in the focal area of this project. The Bens Creek watershed also contains nearly 53.4 miles of naturally-reproducing trout streams, including 10 miles of Class A waters. Despite the abundance of wild trout and favorable water quality found in the watershed, there is certainly much room for improvement. According to PA Department of Environmental Protection (DEP) surveys, more than 8.6 miles of stream in the watershed are listed as impaired and do not meet designated aquatic life uses.

The Bens Creek watershed lies in northwestern Somerset County and southwestern Cambria County (Figure 1). The watershed's headwaters emanate from the eastern slope of the Laurel Ridge and confluences with the Stonycreek River at the village of Benscreek, near the community of Riverside, near the city limits of Johnstown, Cambria County. The watershed size is approximately 49.3 square miles, with nearly 111.6 miles of streams draining the area. The mainstem of Bens Creek is 3.4 miles long. Major tributaries include South Fork, North Fork, Dalton Run and Mill Creek. The South Fork Bens Creek includes the named subwatersheds, North Branch South Bens Creek and Gilbert Hollow. Dalton Run includes the subwatershed O'Connor Run, and Mill Creek includes Little Mill Creek.

The Bens Creek watershed is largely rural, but its mouth is near the city of Johnstown. The most-populated areas of the watershed are near the mouth of the mainstem and along the eastern watershed boundary of Mill Creek, which contains a portion of Westmont Borough, Cambria County. Other municipalities in the watershed include Upper Yoder Township in Cambria County, and Conemaugh and Jenner townships in Somerset County. The mainstem of Bens Creek and South Fork mainstem mostly run parallel to the Somerset Pike (PA Route 985) allowing for great access to the watershed, but also has concentrated development within the riparian areas of the stream in many locations. Other populated places in the watershed include Thomas Mills and Forwardstown, found along Somerset Pike and the South Fork Bens Creek.

The primary impetus for the development of this project is the 4.7-mile segment of South Fork Bens Creek that has been designated in 2018 PFBC as supporting a Class A population of wild brown trout (Figure 2). In addition, more than 53.4 miles of streams in the watershed have been identified by the PFBC as supporting native and wild trout. Also, Bens Creek mainstem is not currently listed as a wild trout stream, but anecdotal evidence from local anglers indicates otherwise.

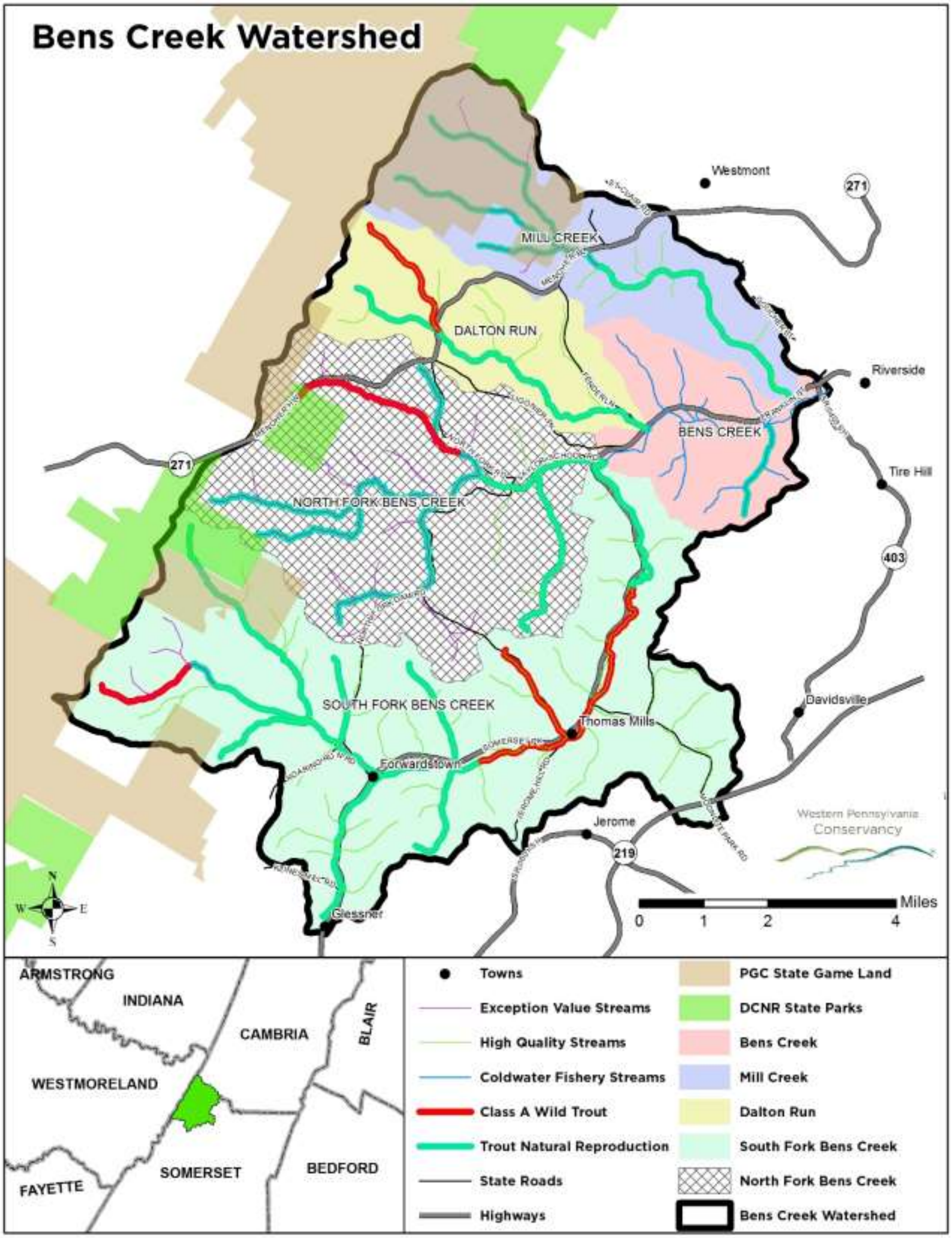


FIGURE 1 – BENS CREEK WATERSHED LOCATION MAP

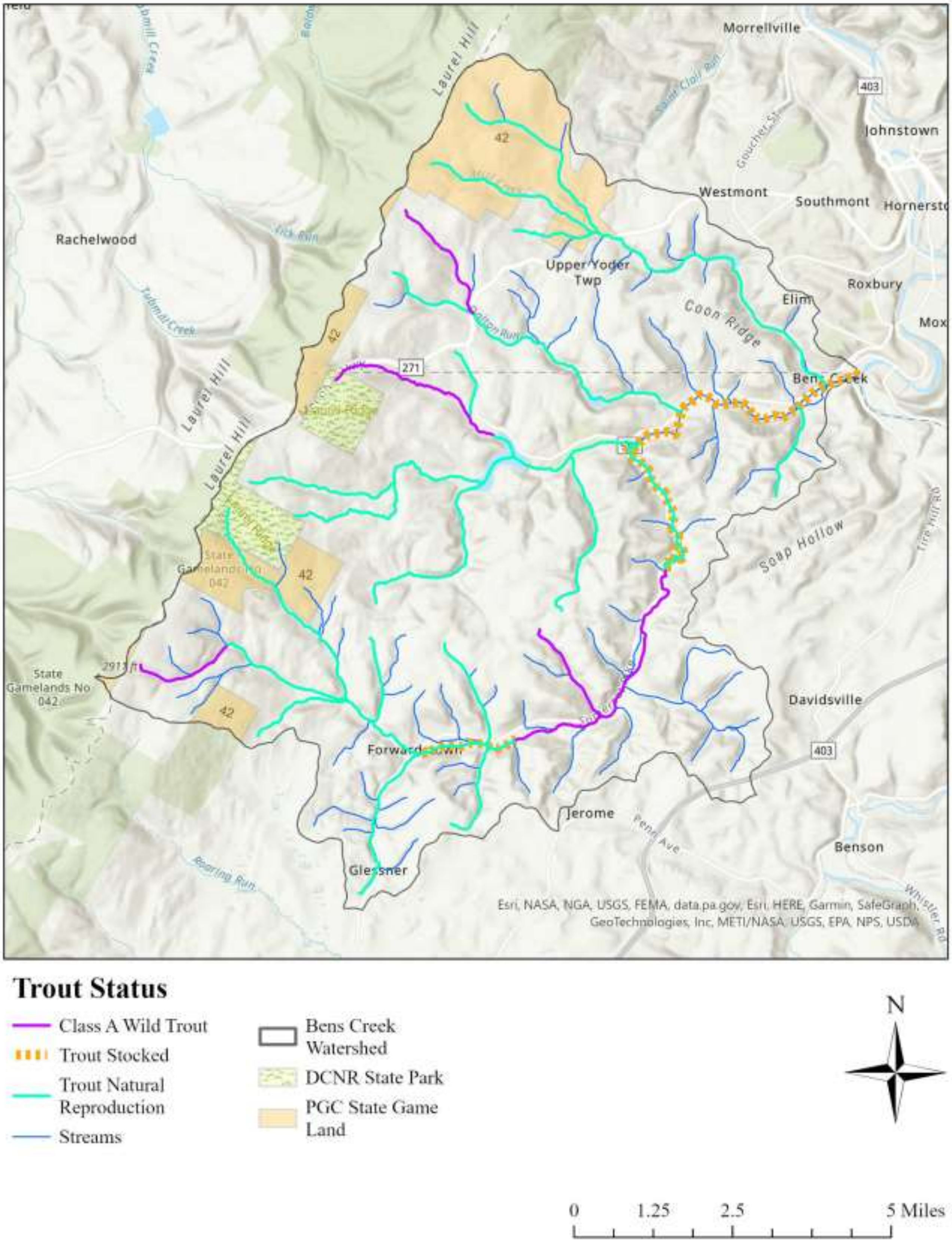


FIGURE 2 – TROUT PRESENCE AND BIOMASS

Land Cover & Land Use

TABLE 1 – LAND COVER IN THE WATERSHED

Land Cover Type	Sq. Miles	Percentage
Open Water	0.173	0.4%
Developed - Open Space	3.008	6.1%
Developed - Low Intensity	0.314	0.6%
Developed - Medium Intensity	0.072	0.1%
Developed - High Intensity	0.016	0.0%
Barren Land	0.037	0.1%
Deciduous Forest	29.368	59.5%
Evergreen Forest	1.088	2.2%
Mixed Forest	8.806	17.8%
Shrub/Scrub	0.282	0.6%
Grassland/Herbaceous	0.261	0.5%
Pasture/Hay	4.763	9.7%
Cultivated Crops	1.147	2.3%
Woody Wetlands	0.002	0.0%
Emergent Herbaceous Wetlands	0.001	0.0%
Total	49.338	100.0%

As noted, the majority of the Bens Creek watershed is rural. Forest and agricultural vegetation dominate the land cover types. Development in the form of buildings and roads is relatively low in coverage, but often densely spaced within the stream corridors.

The land cover data represents land cover conditions as evident in National Land Cover Database (NLCD) for 2016 (Figure 3). Table 2 shows the area (square miles) and overall percentage for land cover types in the watershed. The dominant land use in Bens Creek is forest, which greatly benefits the trout fisheries in the watershed.

The vast majority of the watershed is privately owned, with tracts of municipal authority property, State Game Lands, and DCNR property in the headwaters.

DIRT & GRAVEL ROADS (DGR)

Dirt and Gravel Roads (DGRs) and trails surfaced with dirt and/or gravel can provide an economical alternative to impervious surfacing materials, like concrete or asphalt. They provide several environmental benefits as well: allowing stormwater to more-readily infiltrate into the ground, slowing the flow of runoff, and, where limestone is used, they can help buffer the effects of acid precipitation. However, if improperly constructed or maintained, they can negatively impact the watersheds they traverse. Sediment that washes off DGRs quickly finds its way into streams, filling the interstitial spaces between cobble and gravel that provide habitat for fish and aquatic macroinvertebrates. These interstitial spaces are essential locations for spawning activities for fish, particularly trout, and are often used as colonization areas by a number of important macroinvertebrate taxa.

Bens Creek has approximately 23,000 feet or 4.4 miles of DGRs in the watershed. Many of these roads intersect with streams. During in-field assessments, DGRs were noted when observed within each segment, as well as any obvious issues that may have been associated with them. These issues may have included stream fords, drainage ditches discharging high amounts of sediment to the stream, and changes in streambed substrate composition near the road-stream intersection.

GEOLOGY

The underlying geology of the Bens Creek watershed influences the productivity and fishery dynamics (Figure 4). Sandstone formations cause natural low pH conditions in the headwaters along Laurel Ridge which limited productivity and favors brook over brown trout. However, alkalinity from AMD treatment systems in the South Fork favor brown trout production. These pH conditions and three major dams in the watershed ensure that the brook trout populations are mostly protected from brown trout competition, although regulated to smaller headwater areas. Prioritizing habitat improvements in these areas with large woody materials (LWM) additions will help these isolated populations thrive and be more resilient to changes in climate.

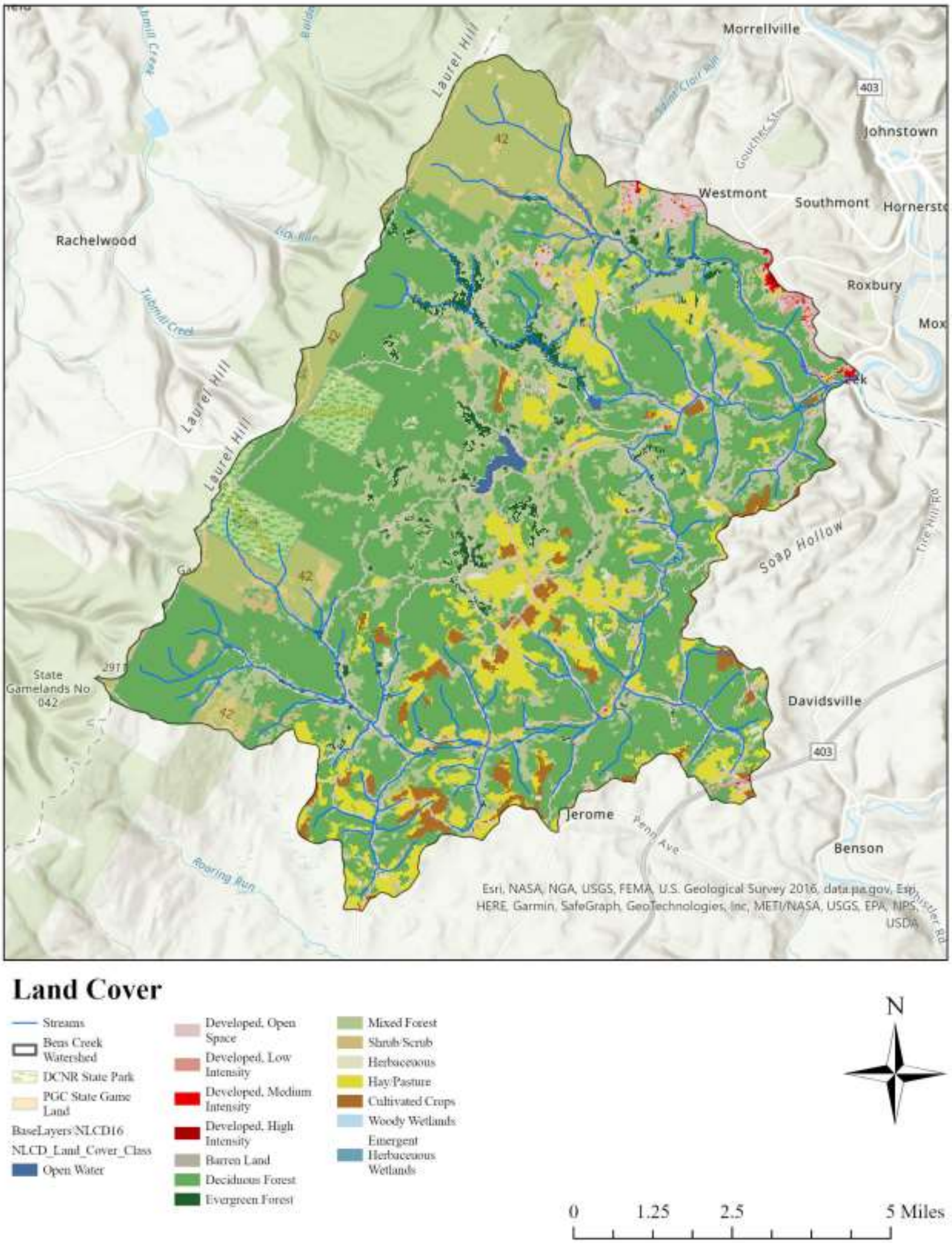


FIGURE 3 – LAND COVER

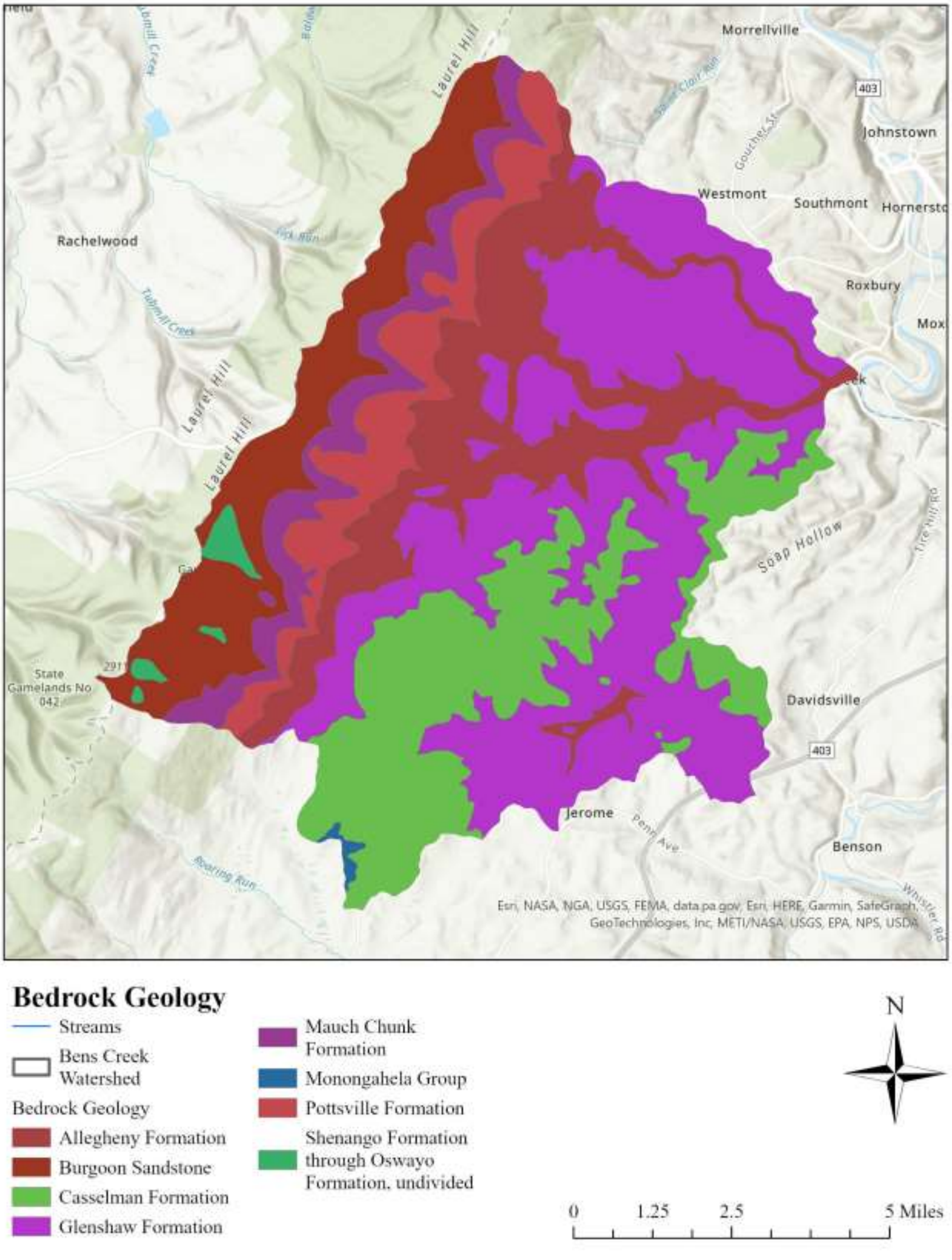


FIGURE 4 – BEDROCK GEOLOGY

Previous & Current Studies/Analysis of the Watershed

Existing Information

Bens Creek watershed has been a priority watershed for local groups such as MLTU and SCD for decades, as they focused on habitat restoration and AMD abatement. As a result, MLTU and SCD were able to provide a wealth of information about past projects and assessments to aid in the development of this plan. SCD also developed the North Fork of Bens Creek CCP in 2014, and provided extensive information about their previous work and studies of the watershed.

Due to mining activity and AMD in the watershed, PA DEP was an additional source of data. Previous studies that have taken place within the Bens Creek watershed include PFBC electrofishing surveys, and DEP macroinvertebrate surveys, both of which focused on the biological resources of the area. Publicly-accessible GIS data from various sources, including the Pennsylvania Spatial Data Access (PASDA), was also a significant source of information about the watershed.

Information from these studies helped direct data collection for the Bens Creek CCP. This includes utilizing those studies in planning for the locations of the water quality surveys, instream habitat assessment and additional field work. Descriptions of the field data collection parameters are listed in an Overview subsection and the results of the work will be summarized following the overview. Components of the results will also be discussed throughout this document.

Assessment & Monitoring

Visual Assessment Overview

The primary assessment protocol was based on the EPA's "Rapid Bioassessment Protocols (RBP) for Streams and Wadable Rivers – Habitat Assessment and Physiochemical Parameters" (Barbour et al. 1999) and was augmented with WPC's current standard Visual Assessment Datasheet to more-closely align with the goals and concerns of this Coldwater Conservation Plan. Stream reach, width, depth and velocity, as well as canopy cover, proportion of stream morphology types, channelization and obstructions were recorded. Water quality parameters, including temperature, pH and conductivity were measured at the upstream and downstream terminus of each segment using standard methods.

Staff and volunteers conducted visual assessments in the field to collect the most accurate data on watershed characteristics. Streams were assessed by examining one "segment" at a time, with each segment being the length of stream between two confluences. These confluences could be at two small tributaries, or a tributary joining the main stem. For example, the point where Bens Creek joins with the Stonycreek River to the point where the first unnamed tributary joins with Bens Creek mainstem is a segment.

Ten physical habitat parameters based on the standard EPA protocol (Barbour et al. 1999) were evaluated at each segment during field assessments. These parameters were then combined to provide the most concise, informed snapshot of watershed health. These parameters were independently scored for each stream segment assessed, and then averaged to provide an overall score for that segment. Any segments, which were dry or inaccessible, were not included in the analysis. Each parameter was worth a maximum of 20 points for the most ideal habitat condition and a minimum of 0 points for the least ideal habitat condition. Point awards of 16–20 scored in the Optimal category, 11–15.9 scored as Suboptimal, 6–10.9 scored as Marginal, and 0–5.9 scored in the Poor category.

In addition to parameters based on the EPA's Habitat Assessment Protocol, special attention was given to the amount of Large Woody Material (LWM) in a segment; the presence of Aquatic Organism Passage (AOP) barriers; the impact of Dirt and Gravel Roads (DGR) on the stream; opportunities for habitat improvements; erosion problem areas throughout the segment; presence and length of channelization on the segment; and any other miscellaneous improvement projects that could benefit the watershed. Descriptions of the methods for each of these categories follow below.

Large Woody Materials (LWM)

During field assessments, segments were classified as having significant, moderate, minimal, or none (not present) amounts of LWM. Guidelines for these categories were somewhat subjective, yet estimates of approximately 120, 80, 40, and zero pieces (respectively) of LWM per mile were used as loose standards for these categories. Minimal and moderately classified segments were further delineated as "Add LWM" segments, if within those reaches a section was obviously lacking this type of habitat, but overall would fall into a higher classification.

Aquatic Organism Passage (AOP)

An AOP barrier is a structure that impedes the movement of fish and other aquatic and riparian species within the stream channel up or downstream of the obstruction. For the purposes of this study, focus was held on anthropogenic (man-made) AOP barriers, but natural AOP barriers were also noted. AOP barriers included culvert and bridge structures at road-stream crossings, active and defunct dams, and any other man-made structures that would impede passage throughout the reach of the stream segment.

Passage barriers were assessed according to the North Atlantic Aquatic Connectivity Collaborative (NAACC) protocol for Aquatic Passability Assessments in Non-Tidal Streams and Rivers. The NAACC is a participatory network of practitioners united in their efforts to enhance aquatic connectivity. NAACC protocol provides a quick and efficient mechanism by which scientific professionals may rank the ability of a road-stream crossing structure to allow the passage of aquatic and terrestrial species. Evaluated attributes included elevation, slope, width, blockage, water depth and velocity, presence of a scour pool, substrate presence and composition, floodplain development, and alignment. Notes and latitude/longitude coordinates were taken for each suspected AOP barrier, and a Yes/No checkbox for "AOP barriers present" was marked on the datasheet. If a potential barrier existed, but the assessor(s) were unsure if it qualified, that distinction was made in the "potentially present" category.

Dirt & Gravel Roads (DGR)

During in-field assessments, DGRs were noted when observed within each segment, as well as any obvious issues that may have been associated with them. These issues may have included stream fords, drainage ditches discharging high amounts of sediment to the stream, heavily eroded tire tracks leading to the stream, and changes in streambed substrate composition near the road-stream interaction zone.

Erosion

This study categorized the degree of erosion as None, Minimal, Moderate, or Heavy, based on the amount of erosion observed throughout an entire segment. The EPA habitat parameters of Bank Stability and Vegetative Protection were also used, in part, to help make these determinations.

Channelization

The EPA's habitat parameter of Channel Alteration played heavily into the assessment of this specific category. Each assessor's best professional and scientific judgment was used to estimate the length of channelization in a segment. This was done at the time the channelization was observed - usually culverts and bridge crossings, but in some instances a stream was forced to flow below ground.

Visual Assessment Efforts & Results

With these four scoring categories as a reference (Table 2), the Bens Creek Watershed Visual Assessment map (Figure 5) was developed based on the overall score for each assessed segment.

TABLE 2 – VISUAL ASSESSMENT SCORING RANGES

Habitat Assessment Ranking	
Optimal	*average score ranges between 16-20*
Suboptimal	*average score ranges between 11-15*
Marginal	*average score ranges between 6-10*
Poor	*average score ranges between 0-5*

There are 111.6 miles of stream in the Bens Creek watershed, which break down into 201 individual reaches based on the habitat assessment protocol. Due to the amount of private property and the size of watershed, the visual assessment effort was focused on state or municipal authority owned stream segments, and portions of the South Fork and mainstem Bens Creek that have been historically stocked and open to public fishing. While additional areas of opportunity and concern likely exist on smaller tributaries and stream segments that weren't included in the visual assessment, the publicly owned and assessible areas are top priority segments for improvement projects due to high angler use. During the course of this project, WPC staff walked the mainstem of Bens Creek and the majority of the South Fork Bens Creek, Dalton Run, and Mill Creek mainstems. The scores for the assessments are shown in Figure 5.

Visual assessment scores for the assessed segments in Bens Creek were split between Optimal and Suboptimal, with Total Scores ranging from 12 to 20. Within specific characteristics being assessed, lower scores were more prevalent in the Riparian Vegetation Width, Bank Stability, Vegetative Protection, and Channel Alteration categories. Even so, there were very few characteristics which scored as Marginal. Overall the visual assessment results depict a watershed in good condition, but identified opportunities for targeted improvements to maximize its potential.

The largest benefit of the visual assessment was the opportunity to walk a significant portion of the watershed and identify specific locations where restoration projects could occur through the implementation of Best Management Practices (BMPs). While walking the stream segments completing the habitat assessment scoring, georeferenced photographs were taken to document points of interest. These photos points include reference points of good habitat as well as photos of potential project sites. Types of projects identified include: Agricultural BMPs, Abandoned Mine Drainage (AMD) Treatment, AOP Restoration, Riparian Buffer Plantings, Streambank Stabilization, Habitat Improvements, and DGR Improvements. Appendix 2 contains maps and a table of the BMP recommendations from the visual assessment photo points. More discussion of sites and restoration approaches can be found in the Areas of Concern & Opportunity, and Recommendations & Next Steps sections of this plan.

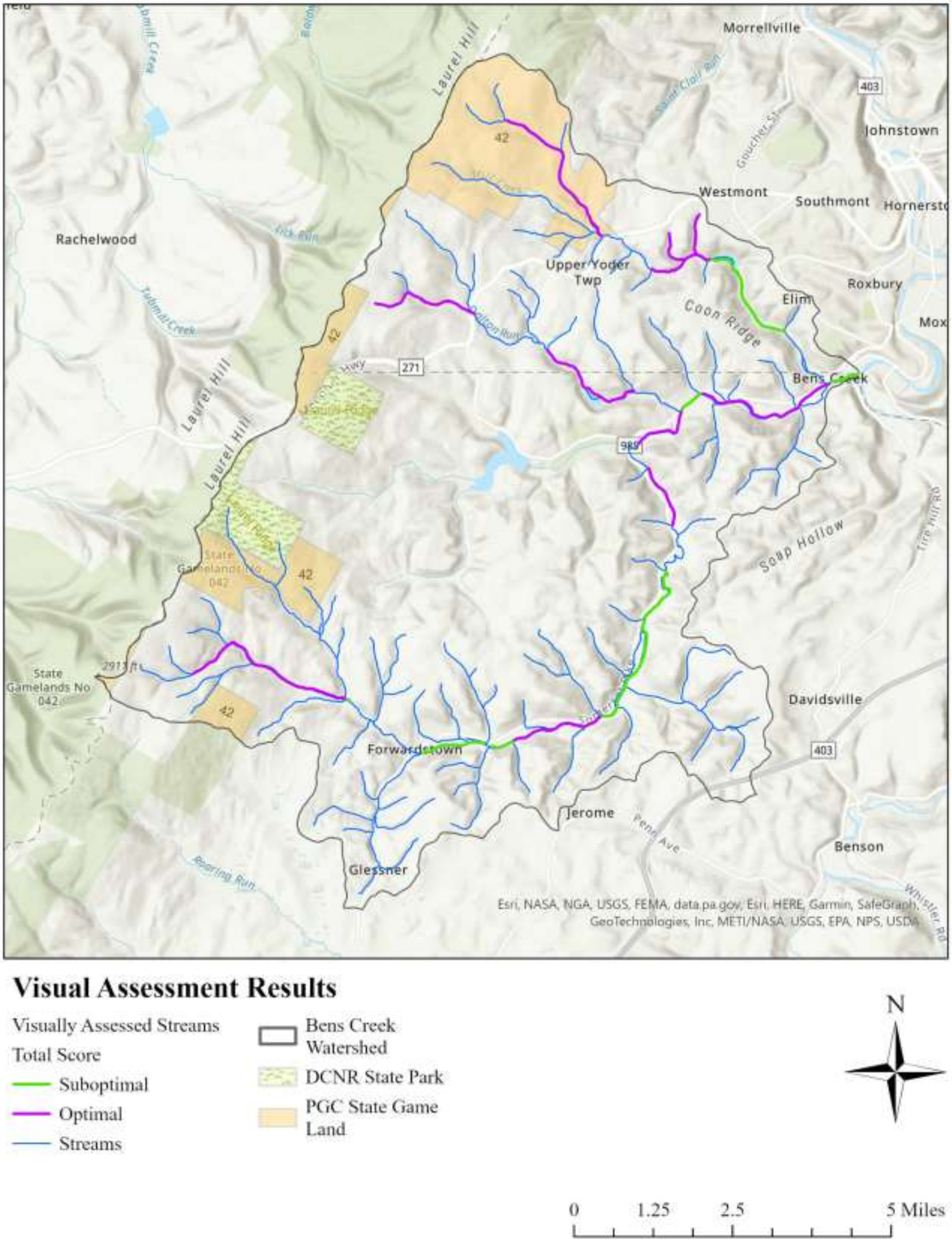


FIGURE 5 – VISUAL ASSESSMENT RESULTS

Water Quality Overview

Knowing about the existing water quality conditions throughout various sites in the watershed will help with the overall evaluation of the Bens Creek watershed. The following information provides descriptions about the water quality parameters that were analyzed for the project.

Water Quality Parameters

- **Temperature** influences dissolved oxygen levels, rate of photosynthesis by aquatic plants, metabolic rates of aquatic organisms, and sensitivity of organisms to toxins, parasites, and diseases. Temperature can be controlled by the amount of vegetative cover along stream banks, sediment levels, and waste distribution into a stream.
- **pH** is a measurement of how acidic or basic water is. Acidic water (less than 7.0) or basic water (greater than 7.0) has the ability to impair aquatic life. Most aquatic organisms are able to tolerate small fluctuations in this parameter but as a general rule of thumb, a pH of less than 6.0 or greater than 8.0 will affect aquatic communities.
- **Conductivity** is a measure of the ability of water to pass an electrical current. Conductivity in streams and rivers is affected primarily by the geology of the area through which the water flows.

Water Quality Sampling Effort & Results

WPC staff completed in-field water quality sampling during the visual assessment of the watershed, with samples being taken at the top and bottom of each stream segment. The data for all the monitoring sites was reviewed and summarized. Table 3 lists the data information that was collected on water quality. Much of the information showed expected trends and water quality fluctuations, but there were some areas where results varied. Some of these variations can be explained through weather events and other known circumstances about the surrounding area; however, there are some areas where without further monitoring, an explanation about the results cannot be done with any amount of certainty. Future efforts should include continued analysis of the current data while expanding the dataset through more monitoring.

TABLE 3 - WATER QUALITY SAMPLING RESULTS

Stream Name	GIS ID	Date	pH (ToR)	pH (BoR)	Temp. (ToR)	Temp. (BoR)	Cond. (ToR)	Cond. (BoR)
Little Mill Creek	9333	3/30/2022	5.7	7.1	7.5	5.7	27.0	28.9
Little Mill Creek	9372	3/30/2022	6.2	6.3	5.7	3.5	29.1	28.6
Mill Creek	9375	3/30/2022	6.4	7.4	5.1	5.3	28.6	210.0
Trib 45105 To Mill Creek	9388	3/25/2022	7.8	8.2	6.8	6.6	643.0	346.0
Mill Creek	9393	3/25/2022	7.6	7.8	6.5	6.4	137.8	106.3
Trib 45106 To Mill Creek	9394	3/25/2022	7.9	7.7	6.7	6.1	307.0	247.0
Mill Creek	9396	3/25/2022	7.8	7.6	6.7	6.7	107.7	109.6
Mill Creek	9401	3/25/2022	7.6	7.7	6.8	6.7	103.2	99.9
Trib 45131 To Dalton Run	9424	5/9/2022	5.0	5.0	8.7	8.6	28.6	29.0
Dalton Run	9428	5/9/2022	5.0	6.3	8.6	9.4	28.7	25.5
Mill Creek	9439	3/25/2022	7.6	0.0	6.7	0.0	109.6	0.0
Bens Creek	9466	5/31/2022	8.4	8.5	17.2	19.3	125.0	430.0
Dalton Run	9479	5/9/2022	7.4	7.4	10.1	10.6	58.9	60.3
Bens Creek	9482	5/19/2022	8.5	8.6	13.5	13.8	328.0	327.0
Bens Creek	9484	5/19/2022	8.5	8.5	12.8	12.9	334.0	332.0
Bens Creek	9485	5/19/2022	8.5	8.5	12.9	13.5	332.0	328.0
Bens Creek	9489	5/31/2022	8.4	8.6	15.2	18.3	235.0	488.0
Bens Creek	9494	5/19/2022	7.9	8.3	10.7	12.5	96.9	338.0
Bens Creek	9499	5/31/2022	8.4	8.4	16.7	17.1	501.0	489.0
Bens Creek	9514	5/19/2022	8.3	8.4	12.5	12.9	418.0	392.0
South Fork Bens Creek	9644	4/29/2022	7.9	8.0	9.2	11.7	366.0	359.0
South Fork Bens Creek	9657	4/29/2022	7.9	7.8	8.8	9.2	370.0	365.0
South Fork Bens Creek	9672	4/8/2022	6.2	6.5	7.4	7.7	20.6	25.7
Trib 45178 To South Fork Bens Creek	9674	4/8/2022	6.4	6.4	7.3	7.4	25.0	24.5
South Fork Bens Creek	9688	4/29/2022	8.1	7.9	7.7	8.2	335.0	369.0
South Fork Bens Creek	9694	4/8/2022	6.6	6.9	7.1	7.4	29.9	29.4
South Fork Bens Creek	9695	4/8/2022	6.8	7.0	7.0	7.6	31.4	28.7
South Fork Bens Creek	9701	4/29/2022	7.4	7.5	7.2	7.3	385.0	381.0
South Fork Bens Creek	9715	4/29/2022	7.7	7.4	6.2	7.2	257.0	385.0
South Fork Bens Creek	9722	4/29/2022	5.6	7.0	6.2	6.9	223.0	390.0
South Fork Bens Creek	9724	4/11/2022	7.5	7.3	7.9	9.0	103.7	111.9
South Fork Bens Creek	9737	4/11/2022	7.7	7.5	6.9	7.9	108.0	103.7
South Fork Bens Creek	9741	4/11/2022	7.7	7.9	5.0	6.0	97.5	110.3
South Fork Bens Creek	9746	4/11/2022	7.9	7.7	6.0	6.9	110.3	108.0
South Fork Bens Creek	9750	4/11/2022	7.5	7.8	5.3	5.5	43.7	98.8
South Fork Bens Creek	10843	5/31/2022	8.8	8.6	19.8	20.4	577.0	573.0
* ToR = Top of Reach; BoR = Bottom of Reach								

Fish Survey Overview

In an effort to document current conditions in the Bens Creek watershed, WPC staff conducted four electrofishing surveys on June 13, 2022, with assistance from SCD staff and MLTU volunteers. Unfortunately, an isolated thunderstorm hit the area overnight, causing elevated flows and turbidity throughout the watershed, which limited the effectiveness of the electrofishing surveys. One of the goals of the electrofishing surveys was to document the presence of wild brown trout in the mainstem of Bens Creek, which is not currently listed as a wild trout stream. The first survey site was the furthest upstream section of mainstem Bens Creek, a 300-meter section below the confluence of the North and South Forks. Despite the poor electrofishing conditions causing several brown trout to be seen but escape capture, multiple age classes of brown trout were collected ranging from 75-500 mm. All brown trout appeared to be wild, with pristine fins, bright red adipose fins, and blue eye spots. Only one hatchery rainbow trout was collected during this survey, despite this section being stocked. Other fish species collected include white sucker, northern hog sucker, blacknose dace, longnose dace, creek chub, greenside darter, fantail darter, mottled sculpin, rock bass, smallmouth bass, largemouth bass, and a redhorse species. The warmwater species collected are suspected to have escaped from the upstream North Fork Reservoir.

Figure 6 – Bens Creek Wild Brown trout captured during electrofishing

Another electrofishing survey was attempted near the mouth of Bens Creek, starting just upstream of the SR 403 bridge near the Old Toll Gate Inn, but this survey was abandoned due to equipment failure of one of the electrofishing units. Stream size and high flows rendered a single electrofishing unit ineffective to complete the survey. Despite the poor conditions, a wild brown trout and two stocked rainbow trout were collected before the survey was abandoned. Other species collected at this site were: white sucker, northern hog sucker, blacknose dace, longnose dace, greenside darter, and smallmouth bass.

Limited to one electrofishing unit and hindered by high flows, Mill Creek was selected as the next survey location. This 100-meter survey was conducted starting at the bridge on Somerset Pike (SR 985) near the mouth of Mill Creek. Only one trout was collected at this site, a 415 mm wild brown. Other species collected include: blacknose dace, longnose dace, creek chub, and greenside darter.

The final 100-meter electrofishing survey was conducted at the mouth of Little Mill Creek on SGL 42. As expected, only brook trout and mottled sculpin were collected in this mountain headwater tributary. Low alkalinity (23.8 umhos) limited the electrofishing efficiency and caused some fish to be missed, but the survey produced seven brook trout in multiple age classes ranging from 50-174 mm.

Aquatic Organism Passage (AOP) Overview

Stream connectivity is important for all aquatic species, but especially important for salmonid species in a number of ways, including access to thermal refuge, access to important spawning habitat, and for eliminating genetic isolation of populations. However, poor design of culverts and bridges (road-stream intersections) can negatively affect stream connectivity. Culverts can act as barriers to fish passage in a number of ways. A culvert can be perched at an elevation above the stream bed, causing fish to have to jump large heights. Aquatic organisms have varying levels of mobility and passable culverts are essential for a connected ecosystem. High-current velocities in culverts can make it impossible for organisms to move through them. Water depth within the culvert can be too shallow or may not provide resting areas for organisms that are migrating upstream. Properly designed and installed culverts also benefit other aquatic species that are less mobile than trout including mussels, hellbenders, other amphibians, reptiles and macroinvertebrates. Poorly designed and/or installed culverts also pose problems for stormwater runoff, infrastructure maintenance and public safety in the event of flooding. Often, an undersized culvert creates a blowout effect downstream, increasing water velocities and streambank erosion. A plugged culvert that cannot pass debris also acts as a dam during high water events, exacerbating flooding and becoming a public safety hazard.

The North Atlantic Aquatic Connectivity Collaborative (NAACC) is a collaboration of individuals from universities, conservation organizations, and state and federal natural resource and transportation departments focused on improving aquatic connectivity across a 13-state region, from Maine to West Virginia. NAACC has developed standardized protocols and training for assessing road-stream crossings (culverts and bridges) and developed a regional database for this field data. The information collected can be used to identify high priority bridges and culverts for upgrade and replacement. All field survey data was collected using the NAACC Stream Crossing Survey Data Form Instruction Guide (NAACC 2016). Data was collected on a Getac 600 tablet and uploaded into the NAACC online database. All data was checked for quality assurance by WPC's L1 Coordinator. Upon entry into the database, all crossings are automatically scored using two scoring systems.

Aquatic Organism Passage Assessment Results

A total of 318 potential road-stream intersections were identified using GIS in the Bens Creek watershed. Due to the large number of potential crossings and limited resources, assessments were focused on Bens Creek mainstem, South Fork, Lower Dalton Run, and larger unnamed tributaries. A total of 51 potential road-stream intersections were evaluated during the assessment, but only crossings that were located on public roadways were scored during the surveys. Crossing on private lanes, culverts on small tributary with no flow, and locations that culverts didn't actually exist were documented but not scored. As a result, a total of 25 road-stream intersections were scored using the NAACC protocol as referenced above. Structure types assessed included single culverts, box culverts, multiple pipe culverts, and bridges. Examples of these structure types can be found in the NAACC Stream Crossing Survey Data Form Instruction Guide available online (NAACC 2016).

FIGURE 7 - A MULTI PIPE CROSSING ON MILL CREEK RESTRICTS AOP

Each assessed culvert receives an AOP Score representing a coarse screening of AOP results. The primary objective of the coarse screen is to identify those crossings that are likely to be a barrier to most or all species and those that are likely to provide something close to full aquatic organism passage. If it is necessary to get a better feel for how bad those crossings are that are labeled as "reduced AOP" one can use the numeric Barrier Evaluation scoring system.

Factors impacting the Barrier Evaluation score of an AOP structure include the position of the structure relative to the stream grade, physical barriers within the culvert, constriction of the natural stream channel, the depth and velocity of the water through the crossing and the presence of natural stream substrate within the structure. Specifically, the grade of the structure refers to the inlet and the outlet of the culvert as a perched or dropped inlet or outlet can significantly reduce the ability of aquatic organism to pass through. Channel constriction and the directly related water depth/velocity present challenges for fish movement upstream during high flows. Constricted crossings also often cause significant erosion, often referred to as the "fire hose effect" notable by an oversized pool at the outlet of the culvert caused by excessive erosion.

The results of the limited culvert assessments show that the majority of the Bens Creek watershed is well connected, other than its large drinking water reservoirs. Figure 8 shows that only one of the assessed crossing was found to be a complete AOP barrier during the assessment. Most of the road-stream intersections on significant waterways in the watershed are bridges with full AOP passage, but additional NAACC surveys should be prioritized to look for AOP barriers in smaller tributaries and headwater locations.

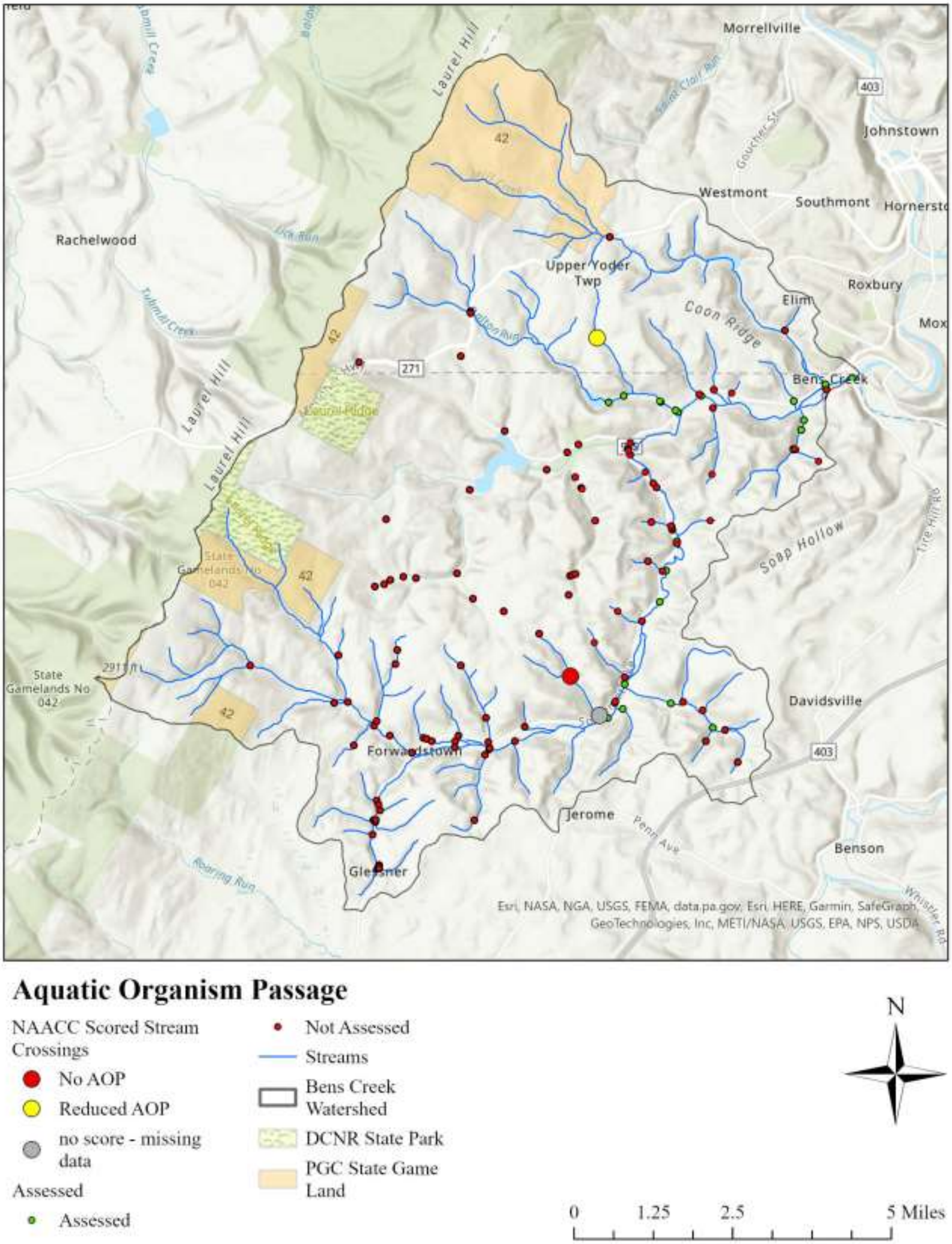


FIGURE 8 – AOP EVALUATION

Areas of Concern & Opportunity

Throughout the Bens Creek watershed, numerous areas of concern, as well as opportunities for improvement, were found and recorded over the course of this study. Specific examples are included below and are organized by location in the watershed. These examples identify important opportunities for improvement, but should not be considered a comprehensive list of all potential projects present in the basin.

South Fork Bens Creek

The headwaters of the South Fork Bens Creek support an isolated Class A brook trout population found above the Conemaugh Township Municipal Authority (CTMA) Reservoir. Although the reservoir is an AOP barrier, it provides quality drinking water to Davidsville and the surrounding communities in Conemaugh Township, Somerset County. A DGR access road parallels the South Fork from the reservoir downstream to its confluence with the North Branch South Fork Bens Creek at the Greater Ferndale Sportmen's Club. A perched culvert on this access road at the first unnamed tributary (UNT 45176) in an AOP barrier that disconnects 1.5 miles of tributary from the South Fork. As a result, this tributary is not known to contain a brook trout population.

Figure 9 - Conemaugh Township Reservoir spillway

Figure 10 - Multiple AOP barriers at Old dam site

Approximately 0.5 miles downstream of the reservoir spillway on the South Fork, is another older, smaller drinking water reservoir that was used prior to the construction of the larger CTMA Reservoir.

If the old dam was removed and restored along with the replacement of the access road culvert, approximately 2 miles of headwater brook trout stream could be reconnected. However, the old dam is also serving as a barrier upstream migration of brown trout, protecting the brook trout population from competition.

The next unnamed tributary (UNT 45175) downstream also has an undersized and slightly perched culvert at the intersection with the access road near its confluence with the

South Fork. While this culvert is not a total AOP barrier, since this tributary is known to support brook trout reproduction, connectivity could be improved if replaced with a properly sized and installed culvert.

Habitat in this entire section could be improved with LWM additions to enhance the native brook trout population. Access road improvements would also reduce sedimentation in this section.

FIGURE 11 - DGR ACCESS ROAD ENCROACHING ON SOUTH FORK HEADWATERS

This section of the South Fork is also currently list as impaired by AMD from the first unnamed tributary (UNT 45176) below the CTMA Reservoir downstream for approximately 1.7 miles due to episodic discharges from the Grove No. 1 mine. However, this impairment listing is likely no longer valid since the stream has improved after the construction of the Lion Mine Passive Treatment system in 2011. This section could likely be delisted if an update survey was completed by PA DEP biologists.

The South Fork is joined by its first named tributary, the North Branch South Fork Bens Creek, just upstream of the bridge on Ferndale Drive at the Sportsmen's Club. This stream crossing was recently improved and now supports full AOP passage. The majority of the North Branch South Fork watershed public land, including portions of SGL 42 and Laurel Ridge State Park, making it a great candidate for LWM additions for habitat improvement.

FIGURE 12 - ACCESS ROAD CULVERT ON UNT 45175 SOUTH FORK BENS CREEK

Just after the South Fork reaches Somerset Pike (SR 985), its confluence with a significant unnamed tributary (UNT 45159), begins PFBC Stocked Trout Water Section 3 of the South Fork. UNT 45159 flows along Somerset Pike (SR 985) for the entire length of its mainstem and is impacted by residential development, including many private driveways and lane crossings of assorted variety. Agriculture is also prevalent in this section of the watershed, which contributes sediment, nutrients, and turbidity to the South Fork during significant rain events. This area of the watershed in Jenner Township also does not have public sewage, so inadequate septic systems likely contribute additional nutrient to the watershed.

LION MINE PASSIVE TREATMENT SYSTEM

The Lion Mine Passive Treatment System is located just downstream of this confluence, nestled between the South Fork and Somerset Pike (SR 985). The history of the treatment system is an interesting story of impairment and recovery.

In March 1969, the Grove No. 1 Mine opened by GM&W Coal Company, who transferred the permit to Lion Mining Company in April 1987. Lion Mining applied for a permit revision in 1991 to add 350 acres to the permit, including undermining the South Fork Bens Creek. After considerable technical review, the mine permit was amended in February 1994, including the detailed monitoring and that the mine pool elevation must not exceed 1,450 feet. Lion Mining acknowledged that they were not authorized to discharge to the Bens Creek watershed and agreed to post a perpetual treatment bond if the mine pool elevation rose above 1,450 feet. At that elevation water from the mine pool did not require treatment.

FIGURE 13 - LION MINE PASSIVE TREATMENT SYSTEM (PHOTO: GOOGLE)

In 1997, Lion Mining Company declared bankruptcy and began to allow the mine pool to flood. However, Lion Mining caught up with their bond submittal schedule, submitted mine seal designs, and resumed mining under subcontractors in late 1999. PA DEP issued a Notice of Violation (NOV) to Lion Mining in February 2001 for the exceeding the mine pool elevation of 1,450 feet, required them to lower the mine pool and submit the perpetual treatment bond. In response to the NOV, Lion Mining requested a permit revision to allow the mine pool to rise to 1,700 feet. The permit revision was issued in June 2001 since PA DEP was not aware of any adverse effects at that time. However, local residents began voicing concerns about mine drainage seeps in the South Fork Bens Creek approximately one mile from the Grove No. 1 portal, just upstream of Ferndale Sportsmen's Club.

In response to complaints by local citizens, Somerset Conservation District, and Ferndale Sportsmen's Club, PA DEP began investigating the mine pool elevation and discharges and their impacts on the stream. In June 2002, PA DEP found Lion Mining responsible for exceeding the permitted mine pool elevation, polluting the stream, and ordered them to lower the mine pool to 1,700 feet. Lion Mining completed drilling a gravity drain borehole and began to dewater the mine pool in June 2003 from an elevation of 1,835 feet. From 2003 through 2005, dewatered and treated at the borehole, but wasn't able to lower the elevation below 1,740 feet.

In January 2006, Lion Mining abandoned the treatment facility and forfeited their bonds, so PA DEP commenced emergency treatment with caustic soda via a contractor. Due to concerns with stability and space limitations of the current treatment system, DEP Office of Surface Mining (OSM) technical staff, Brent Means, and PA Association of Conservation Districts (PACD) engineer, Eric Robertson, designed a larger passive treatment system, which was constructed on private property along the South Fork Bens Creek near Forwardstown using Growing Greener funds.

The new treatment system began operating in February 2011, treating 1,400 gallons per minute (gpm) to a pH of 7.0 and iron under 1.5 mg/l. The new passive treatment system design included a venturi nozzle, and four large oxidation and settling ponds which do not require costly caustic soda, greatly reducing maintenance costs (PA DEP). The new system has greatly improved the water quality of the impacted section of the South Fork Bens Creek and it is likely that this section is a candidate for delisting from DEP Integrated List of Impaired Streams. PA DEP biologists should reevaluate this section to determine if it is now meeting its aquatic life use.

South Fork Bens Creek

The mainstem of South Fork Bens Creek from the confluence at the Lion Mine Treatment System until the Jenner/Conemaugh Township line near Jenners Lane is 1.2-mile section (PFBC Section 3) of Stocked Trout Waters. Although this section is stocked, public access is limited, and it contains a significant population of wild brown trout. This section should be re-surveyed by PFBC to determine if the brown trout density has reached Class A status and evaluate if stocking should still occur. Localized areas of bank erosion are found in this section, which could be remedied to reduce sedimentation and improve habitat. The section downstream of Brehm Road is also a good area for instream habitat improvement.

FIGURE 14 – BANK EROSION NEAR PRIVATE POND ALONG SOUTH FORK

Upon entering Conemaugh Township at Jenners Lane, South Fork Bens Creek is designated as a Class A wild brown trout fishery for 3.4 miles until it reaches Keafer Hill Road. While this section supports a Class A fishery, the first 2.6 miles of this section is currently listed as impaired due to AMD. Multiple untreated AMD discharges are found along the South Fork as it enters the community of Thomas Mills. The Rock Tunnel AMD Treatment System is also located in this section.

Rock Tunnel Passive Treatment System

The Rock Tunnel Project, completed in 1993, was the first passive treatment system constructed in the Stonycreek River watershed and the first AMD treatment effort coordinated by the Stonycreek-Conemaugh River Improvement Project (SCRIP). Due to operation and maintenance needs and limitations to the original system, it was first rehabilitated and reconstructed in 2002, but was still ineffective at completely abating the water quality issues.

In 2014, SCD undertook an extensive upgrade and reconstruction effort on the treatment system. According to SCD, the Rock Tunnel rehabilitation project involved the reconstruction of the existing abandoned mine passive treatment system that was insufficiently treating a historic mine discharge. The project was funded by the Department of Community and Economic Development and was constructed by Earth Shapers LLC and BioMost Inc. Additional project partners were the NRCS Technical Assistance Group and the Mountain Laurel Chapter of Trout Unlimited.

The project involved removing over 1,600 linear feet of existing wooden baffles and several hundred tons of iron oxide sludge from the system prior to new construction. The new construction included the excavation of onsite sludge drying beds, an aeration pool, 150-foot concrete spillway, settling basin, 300-foot rock level lip spreader, and 18,000 square foot shallow aerobic wetland and importing 3,100 cubic yards of earthen fill. A trompe, or hydro-powered air compressor was also installed to aerate the system. The combination of these components and devices accommodates mine water flows and enhances iron particle management and deposition.

There are five main components to the new system design, a trompe, a concrete spillway, a settling basin, a rock level lip spreader and an engineered wetland. The primary aeration is provided by three separate trompes, which are hydro-powered air compressors that function with no moving parts or electricity. The action of falling water generates air pressure that is captured and used to oxygenate the water, which accelerates iron deposition. The concrete spillway is a secondary form of aeration and reduces the velocity of the mine water by spreading the water over a wide span. The settling basin captures iron particles that drop out of the aerated mine water and can be removed for disposal. A rock level lip spreader provides even flows throughout the system and reduces velocity. The engineered wetland slows the flow of the mine water by creating a tortuous flow path, allowing time for iron deposition. In addition, the biological actions of the wetland store and utilize the iron particles. The redesigned treatment system is currently reducing 100 pounds of iron loading into the South Fork Bens Creek daily, which equates to a reduction of 18.25 tons per year (Shustrick 2015).

FIGURE 15 – UNABATED AMD DISCHARGE LOCATED UPSTREAM FROM ROCK TUNNEL

It is likely that the improvements to the Rock Tunnel system that were completed in 2014-2015 have improved downstream water quality to a point that the listed impairments are no longer valid, or at least greatly reduced. An updated survey from PA DEP should be completed to assess the recovery downstream of Rock Tunnel.

FIGURE 16 – ERODING COAL REFUSE ON STREAMBANK NEAR ROCK TUNNEL

The remaining untreated discharges to the South Fork upstream of Thomas Mills could likely be treated in the vicinity of Rock Tunnel, if additional property could be acquired. The largest of these discharges, shown in Figure 15, needs to be monitored for flow and chemistry to determine the necessary treatment method. A small mine refuse pile on an eroding streambank could also be remediated as part of Rock Tunnel area improvements.

Just downstream from Rock Tunnel, a small unnamed tributary (45145) travelling along Saylor School Road, enters the South Fork at Thomas Mills. This small tributary also supports a Class A brown trout fishery, but a problematic culvert at Dream Road limits AOP and is a good candidate for replacement.

The South Fork has been historically channelized as it flows through the residential area of Thomas Mills resulting in an entrenched stream and disconnected floodplain. Some bank stabilization and riparian buffer enhancement could improve this section. Channelization of the South Fork continues leaving Thomas Mills as Somerset Pike (SR 985) encroaches on the stream, including an extensive section of concrete wall along the left descending streambank.

FIGURE 17 – ENTRENCHED CHANNEL AND DISCONNECTED FLOODPLAIN LIMITS HABITAT

Downstream of Thomas Mills and Moonlite Park Road, the South Fork continues to be channelized, entrenched, and largely disconnected from its floodplain. This section appears to have been historically straightened and relocated against the base of the steep valley wall to the east, likely to develop the floodplain for agriculture. Since this former agricultural land has long been retired, this site would be a good location for a floodplain restoration project to reestablish stream sinuosity and riparian wetlands.

FIGURE 18 – ROAD ENCROACHMENT AND EROSION NEAR BENSCREEK LUTHERAN CHURCH

Habitat on the South Fork improves as the stream begins to regain a more natural flow path, but there are many opportunities for improvement in this section. Multiple areas of localized bank erosion are found as Somerset Pike (SR 985) encroaches on the South Fork.

Bank stabilization and habitat improvement opportunities continue to be prevalent as the Class A section of the South Fork reaches its downstream terminus. This section could also benefit from streambank fencing at a floodplain pasture, and some riparian buffer enhancements through tree planting and live-staking.

At Keafer Hill Road, the management of the South Fork changes again, as the Class A section ends and PFBC's Stocked Trout Water Section 5 begins. For approximately 0.7 miles downstream of Keafer Hill Road, the South Fork is undeveloped with an intact floodplain and riparian wetlands. As a result, angler access is limited and this section is being underutilized as a stocked trout fishery. It's likely that this section would meet Class A status, if it was no longer stocked, and it was resurveyed by PFBC. The undeveloped floodplain is this section also provides the opportunity for habitat enhancements through LWM additions to improve the wild brown trout population.

Residential development in the floodplain begins to impact the South Fork as it reaches the vicinity of Jim & Jimmie's Bar and Grill. An abandoned attempt at a residential stream crossing serves a prime example of the need for proper permitting and installing of stream encroachments (Figure 19). Floodplain connectivity and AOP could be improved by removing this culvert and failing retaining walls.

Downstream of Jim & Jimmie's, the South Fork in largely undeveloped until its confluence with North Fork Bens Creek near Saylor School Road. SCD has recently completed multiple phases of instream habitat improvement in this section utilizing PENNDOT mitigation funding. The most recent project was completed in the summer of 2022, greatly improving habitat, but there are additional opportunities for improvement in this section.

FIGURE 19 – UNPERMITTED AND ABANDONED STREAM ENCROACHMENT ON SOUTH FORK

UPPER BEN CREEK MAINSTEM

From the confluence of the North and South Fork to its mouth, Bens Creek is managed as a Stocked Trout Waters by PFBC and is listed as a CWF, losing the Special Protection status designated to the rest of the watershed upstream. Bens Creek is also no longer classified as a stream supporting natural reproduction at this point. However, anecdotal evidence from local anglers, as well as recent electrofishing surveys indicate that this is no longer the case. WPC and MLTU's electrofishing survey on this section, conducted on June 13, 2022 found multiple age classes of wild brown trout present, while only one stocked rainbow trout was captured. PFBC should re-survey Bens Creek to confirm that the wild brown trout fishery has expanded its range throughout the mainstem and allow the stream to receive the appropriate level of protection.

Instream habitat conditions are largely favorable throughout this section and include a past MLTU improvement project from the late 1990s in the vicinity of Sleek Trucking. Previously-installed habitat devices are near the end of their designed lifespan and this site could be revisited in the future for enhancement.

FIGURE 20 – SOUTH FORK STREAM HABITAT IMPROVEMENT BY SCD

For approximately 0.4 miles downstream of Sleek Trucking, Bens Creek has been historically straightened and channelized to accommodate agricultural development of the floodplain. This floodplain field is currently being utilized as golf driving range. Instream habitat is lacking in this entrenched channel and has the potential for improvement. Just downstream of the driving range, the mouth of Dalton Run enters Bens Creek.

FIGURE 21 – SITE OF OLD MTLU HABITAT PROJECT AT SLEEK TRUCKING ON BENS CREEK

DALTON RUN

The headwaters of Dalton Run drains from the top of the Laurel Ridge on Greater Johnstown Water Authority (GJWA) property until it nears private property along Menoher Boulevard (SR 271). Just downstream from the highway crossing, Dalton Run confluences with O'Conner Run, a small Class A brook trout fishery. As Dalton Run descends off of the Laurel Ridge, it enters a deep hollow, mostly owned by GJWA. At this point, Dalton Run is impounded as a drinking-water supply reservoir for GLWA. The Dalton Run Reservoir is an AOP barrier that disconnects this tributary from the rest of the Bens Creek watershed, but the barrier also protects Dalton Run's brook trout from being invaded by the wild brown trout fishery that is expanding throughout the rest of the Bens Creek watershed. Since Dalton Run is mostly forested and largely undeveloped, the watershed should be prioritized for LWM additions to improve instream habitat for brook trout. This practice would also help reduce sedimentation and improve groundwater recharge upstream to help maintain water levels of the reservoir.

FIGURE 22 – FAVORABLE BROOK TROUT HABITAT ON DALTON RUN

MIDDLE BENS CREEK MAINSTEM

Just downstream of Dalton Run, historic channelization continues as Bens Creek flow between Somerset Pike (SR 985) and a large floodplain crop field until it reaches Shaffer's Covered Bridge at Covered Bridge Road. This easily-accessible section is very popular with local anglers, making it a good location for habitat enhancement. Covered Bridge Road is an unpaved road that parallels an unnamed tributary (UNT 45121) making it a good candidate for DGR improvements.

From Shaffer's Covered Bridge, Bens Creek flows mostly unencumbered for approximately 1.8 miles downstream before its next road-stream intersection at Glessner Road. Although stream access is limited for most of this section, it is also popular with local anglers and contains some of the best habitat of Bens Creek's mainstem. This includes another past MLTU habitat improvement project in the vicinity of the private residence at the end of Meander Lane. While some of these habitat improvement devices are still functional, others have exceeded their lifespan and could be replaced or repaired. Additional areas for habitat improvement are also found downstream of this old project site.

Figure 23 – Site of old MTLU habitat project on Bens Creek

Bens Creek is then joined by an unnamed tributary (UNT 45115) that runs parallel to Grovier Lane in the neighborhood of Ideal. This tributary is currently listed as impaired from on-site wastewater on DEP's Integrated List. However, this impairment listing may no longer be valid since public sewage was installed in the early 2000s. This tributary also supports natural reproduction of trout.

Figure 24 – Entrenched and channelized section of Bens Creek at Kidsport

From the mouth of UNT 45115 until the mouth of Mill Creek, is an approximately 0.5-mile-long section of Bens Creek that is mostly straight and featureless from a habitat perspective. Bens Creek in this section is channelized between Somerset Pike (SR 985) and the Kidsport soccer field complex, and is mostly shallow and over-widened. This section would greatly benefit from the installation of habitat improvement structures. A concrete encased pipeline also impacts Bens Creek in this area.

MILL CREEK

FIGURE 25 – BANK EROSION AT SITE OF FORMER MILL CREEK RESERVOIR

Mill Creek's Exceptional Value headwaters drains from the Laurel Ridge and includes the named subwatershed, Little Mill Creek. Little Mill Creek and Mill Creek headwaters are primarily located on SGL 42 and are largely undeveloped and forested, making the watershed a great candidate for LWM additions to improve habitat for the native brook trout found there. AOP passage could also be improved at the access road culvert just off of Menoher Boulevard (SR 271). The Mill Creek hollow downstream of Menoher Boulevard (SR271) is also mostly forested and undeveloped, and would benefit from LWM additions.

Mill Creek loses its undeveloped, mountain stream characteristics and habitat quality degrades at the site of the old Mill Creek Reservoir. While the removal of the reservoir has greatly improved connectivity and AOP, the impacts of the old dam remain in the form of bank erosion and sedimentation. This site is a great candidate for a floodplain and stream restoration project. Downstream of the old reservoir site, it's historic impact can be seen all the way to Mill Creek's mouth. Bank erosion and channelization are prevalent as the stream begins to parallel Millcreek Hollow Road and is lined by residential development, including Camoset Village mobile home park.

FIGURE 26 – IRON DEPOSITION FROM AMD DISCHARGE AT ST. ANDREW CHURCH

LOWER BENS CREEK MAINSTEM

From the mouth of Mill Creek to Bens Creek's confluence with the Stonycreek River, the mainstem is listed as impaired by AMD. In multiple locations, small AMD seeps emanate from the toe of the left descending streambank in this section, but don't appear to be significantly impairing the stream. The largest of these discharges is found near the mouth of Bens Creek near St. Andrew Catholic Church. This alkaline iron discharge does visually impact the stream for a short distance, but may actually provide a source of cold water as thermal refuge for trout in the heat of the summer. This section would also benefit from habitat improvement structures.

Recommendations & Next Steps

Water quality and wild trout production in the Bens Creek watershed has improved greatly in recent years due to a number of factors. These factors include, but are not limited to, improved AMD treatment at Lion Mine and Rock Tunnel treatment systems, the installation of a public sewage system in Conemaugh Township, and the continued improvement of the receiving waters, the Stonycreek River. These improvements were first realized by PFBC through electrofishing surveys and the establishment of the Class A wild brown trout section of the South Fork Bens Creek in 2018. Although the Class A section was designated in 2018, PFBC continued stocking hatchery trout throughout the South Fork, up to and including the spring of 2022.

The current management of the South Fork Bens Creek broken into small sections and is confusing for local anglers. Within a 5-mile-long section, the South Fork transitions from a wild trout fishery, to a stocked fishery that also supports natural reproduction, to a Class A brown trout fishery (that has been stocked historically), back to a stocked fishery that also supports natural reproduction. The South Fork headwaters is a native brook trout fishery, but competition with wild brown trout is already occurring. This competition is compounded with the addition of hatchery raised trout at PFBC's Stocked Trout Water Section 3 of the South Fork. This 1.2-mile stocked section should be re-surveyed by PFBC to determine if the wild brown trout population is currently meeting the Class A threshold, which is very likely. Angler access to this section is also limited, so the continued stocking of Section 3 should be strongly reconsidered, even if the wild trout density is less than Class A.

As the wild brown trout population continues to improve and expand, Bens Creek is a great location to address issues and implement strategies for the management of wild trout streams identified in PFBC's Strategic Plan for Management of Trout Fisheries in Pennsylvania (2020-2024). The strategies identified in the plan are designed to protect, conserve, and enhance PA's wild trout resources while optimizing fishing opportunities for the Commonwealth's anglers. The priority issues that could be addressed in the Bens Creek watershed include, but aren't limited to, Issues 2, 3, 10, and 11 (PFBC 2020).

Since recent electrofishing surveys and anecdotal information from local anglers indicate that the wild brown trout fishery in the Bens Creek watershed is expanding, it's likely that additional stream sections could be designated as Class A. As Issue 2 states, "This leads to inadequate water quality protection for these streams and inconsistent application of fisheries management strategies" (PFBC 2020).

Issue 3 addresses stream sections that support Class A wild brown trout populations, which are also stocked with trout by the PFBC. These stream sections receive very high early-season angler use targeted at the stocked trout fishery. Updated data describing the biological and social components of these fisheries are needed to inform management of these streams. Strategies identified to address this issue include resurveying the wild brown trout populations and conducting angler use, harvest and opinion surveys to inform fisheries management and adjust management to optimize these fisheries.

Other opportunities to implement the strategic plan in the Bens Creek watershed include Issue 10, which identifies climate change as a threat to wild trout, specifically brook trout. As climate changes continues to threaten PA's only native trout species, conserving brook trout in Bens Creek's headwaters should be a top priority. This can be accomplished by addressing Issue 11, which identifies that the expansion of wild trout populations is impeded in streams where habitat is the primary limiting factor. Strategies to address this issue include: implementing habitat improvement projects on priority wild trout streams, especially those with the greatest resiliency to increased water temperatures from climate change; working with partners to expand the use of large woody debris addition in wild trout streams to improve instream habitat in wild trout streams; and implementing DGLVR project on roadways that have negative impacts to high quality wild trout populations (PFBC 2020).

To summarize these recommendations for the improved management of the Bens Creek watershed:

- PFBC should survey sections above and below the Class A section on the South Fork to determine if additional sections should be classified.
- PFBC should survey Bens Creek to determine if the mainstem is supporting natural trout reproduction.
- PFBC should re-evaluate the current adult trout and fingerling stocking program to determine if and/or where it is needed.

- DEP should re-assess all of the impaired sections in the Bens Creek watershed, since they were last assessed in 2001. It's likely that many of the listed impairments are no longer valid thanks to improvement to Lion Mine and Rock Tunnel treatment system improvement, and the installation of public sewage.

In addition to the opportunities for improved fisheries management, many habitat improvement opportunities are found in Bens Creek. A top priority is the addition of LWM in headwaters, smaller tributaries, and areas with an undeveloped floodplain to increase pool depth and frequency; retain and sort spawning substrate; and provide habitat and thermal refuge during summer months. Fish habitat improvement structures should also be prioritized to improve habitat, address bank erosion, and restore hydrology in larger mainstem sections, areas near infrastructure, and areas with a developed floodplain where LWM additions are not feasible.

This Coldwater Conservation Plan has identified a number of areas for partners seeking to implement restoration projects in the Bens Creek watershed. The completion of visual habitat assessment, aquatic organism passage evaluation and GIS analysis provided valuable information for focusing those efforts. WPC offers the following recommendations for future potential project implementation:

Project(s)	Issue Addressed	Partners
Instream habitat improvement (including large woody material additions)	**Focus will be on identified reaches lacking deep pool habitat and minimal natural debris accumulation**	**SCD, MLTU, PFBC, PGC, DCNR, WPC**
Abandoned Mine Restoration	**Address remaining AMD inputs and refuse piles impacting the South Fork**	**SCD, MLTU, WPC**
Culvert replacement projects	**Utilize NAACC evaluation results to strategically replace inadequate culverts**	**Municipalities, SCD, MLTU, WPC**
Dam Removal Projects	**Determine if any existing dams in the watershed are no longer being utilized and could be removed**	**American Rivers, SCD, MLTU, WPC**
Public dirt and gravel road improvements	**Improve dirt and gravel roads and crossings contributing sediment to the streams**	**Municipalities, SCD, MLTU, WPC**
Access road improvements	**Evaluate access roads and partner with PGC and/or companies maintaining oil & gas wells**	**SCD, MLTU, PGC, WPC, private landowners, resource companies**
Agricultural Best Management Practices	**Work with landowners/operators along Bens Creek and its tributaries to implement sediment and nutrient reduction BMPs (including installation of riparian buffers)**	**SCD, NRCS, MLTU, WPC, private landowners**
Aquatic resource identification & monitoring	**Continue to monitor water quality and fisheries of Bens Creek, potentially including long term monitoring sites, trout redd surveys and additional electrofishing surveys of tributaries**	**PFBC, DEP, SCD, MLTU, WPC**
Landowner Outreach and Engagement for Public Access	**Work with PFBC and/or WPC easement experts to determine eligibility and incentive opportunities for landowners to open their properties for public fishing and/or restoration projects.**	**SCD, MLTU, PFBC, WPC**

Conservation Partners & Potential Funding Sources

The following list is the names of possible conservation partners and/or potential funding sources *(list is not comprehensive and other public and private partners and sources may be applicable)* for the variety of improvement recommendations in this plan:

- Somerset Conservation District (SCD)
- Department of Conservation and Natural Resources (DCNR)
- Department of Environmental Protection (PADEP)
- Environmental Protection Agency (EPA)
- Farm Service Agency (FSA)
- Cambria County Conservation District (CCCD)
- National Fish and Wildlife Foundation (NFWF)
- Natural Resources Conservation Services (NRCS)
- Penn State Extension
- Penn State Center for Dirt and Gravel Road Studies
- Pennsylvania Game Commission (PGC)
- Pennsylvanian Fish and Boat Commission (PFBC)
- Trout Unlimited (TU)
- United Stated Department of Agriculture (USDA)
- Western Pennsylvania Conservancy (WPC)

These conservation partners may be national, state, non-government organization (NGO) or private in nature, but all are dedicated to protecting and improving the environment. There may be funding for a wide variety of environmentally beneficial activities for communities, municipalities, and landowners, including farmers. For instance, installing dirt and gravel road best management practices (culverts, DSA, etc.) may make a road improvement project eligible for grant funding from the Coldwater Heritage Partnership, the DEP Growing Greener Program, and others, since it will also have benefits to the aquatic ecosystem. Coordinating with a variety of partners is likely to increase the chances of a particular project getting funded, as the initiating party can rely on a wide field of expertise. The Western Pennsylvania Conservancy provides technical services to coordinate partners with willing parties to assist with grant applications and project management.

Summary & Conclusions

The Bens Creek watershed is tremendous coldwater resource of the Laurel Highlands, within the greater Johnstown area. This truly unique watershed boasts publicly-assessable Class A sections of both native brook trout and wild brown trout. Fairly uncommon in PA, wild rainbow trout can also be found in areas of the North Fork Bens Creek watershed. Historically, Bens Creek has also been a very popular stocked trout stream, at least seasonally in the springtime. However, due to recent water quality improvements, Bens Creek has the potential to provide year-round wild trout angling opportunities with proper management, continued habitat improvement, and adequate protection from degradation.

The recovery of the Bens Creek watershed could also be a documented success story for AMD remediation, as many currently listed impaired sections would likely be delisted with updated aquatic life surveys. Additional AMD treatment work remains, but the stream has significantly improved following the Lion Mine pollution incident and Rock Tunnel system upgrades.

As Bens Creek continues to improve and wild trout populations expand, raising awareness and informing landowners about wild trout resources and BMPs should allow for implementing additional conservation practices in the watershed. Hopefully, this plan will be used a guide for local stakeholder groups to prioritize and direct further coldwater conservation efforts in this improving watershed.

Literature Cited

Barbour, M.T., J. Gerritsen, B. D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Pennsylvania Department of Environmental Protection. 2022 Intergrated Water Quality Report. https://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/IntegratedWatersReport/Pages/2022-Integrated-Water-Quality-Report.aspx

Pennsylvania Department of Environmental Protection. AMD Passive Treatment System Lion Mining – Grove #1 Deep Mine Discharge: Report, Summary and Timeline.

Pennsylvania Fish and Boat Commission. 2022 Pennsylvania Wild Trout Waters (Natural Reproduction) – November 2022. http://fishandboat.com/trout_repro.pdf

Pennsylvania Fish and Boat Commission. 2020. Strategic Plan for Management of Trout Fisheries in Pennsylvania 2022-2024.

https://www.fishandboat.com/Fish/Fisheries/TroutPlan/Documents/TroutPlan2020.pdf

Shustrick, G. Somerset Conservation District. Rock Tunnel Rehabilitation Project. SCRIP Newsletter 2015.

List of Resources for BMPs relating to Watershed Conservation

North Atlantic Aquatic Connectivity Collaborative
https://streamcontinuity.org/

Pennsylvania Center for Dirt and Gravel Roads
http://www.dirtandgravel.psu.edu/

PA Department of Environmental Protection
http://www.dep.pa.gov/Business/Water/Waterways/Pages/default.aspx

PA Fish and Boat Commission
http://www.fishandboat.com/Pages/default.aspx

Penn State Extension Service
http://extension.psu.edu/natural-resources/water

US Department of Agriculture: Natural Resource Conservation Service Field Office Technical Guide (FOTG)
https://efotg.sc.egov.usda.gov/

Appendices

APPENDIX 1: GENERAL VISUAL ASSESSMENT FIELD DATA & SCORE SHEETS

EXAMPLE ONLY – DATA WAS COLLECTED ELECTRONICALLY USING ARCGIS FIELD MAPS

Big Run Watershed; Jefferson County General Visual Assessment
PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)

STREAM NAME:	GIS ID:
Start: LAT LONG	WATERSHED:
End: LAT LONG	AGENCY: Western Pennsylvania Conservancy
INVESTIGATORS:	REASON for SURVEY: *Big Run Visual Assessment Data Collection*
FORM COMPLETED by:	DATE: ____________ TIME: ________ AM PM

WEATHER CONDITIONS

Now
- ☐ clear/sunny
- ☐ storm (heavy rain)
- ☐ rain (steady rain)
- ☐ showers (intermittent)
- ☐ % cloud cover (circle %)

25% - 50 % - 75% - 100%

Past 24 hours
- ☐ clear/sunny
- ☐ storm (heavy rain)
- ☐ rain (steady rain)
- ☐ showers (intermittent)
- ☐ % cloud cover (circle %)

25% - 50 % - 75% - 100%

Has there been a heavy rain in the last 7 days?

☐ Yes ☐ No

Other ____________________________

STREAM CHARACTERIZATION

Stream Subsystem: ☐ Perennial ☐ Intermittent

Stream Type (*This can be looked up via GIS*): ☐ Coldwater ☐ Warmwater

Stream Gradient: ☐ High (riffle/run prevalent) ☐ Low (glide/pool prevalent)

Segment Type: ☐ Main Stem ☐ Named Tributary ☐ Unnamed Tributary ☐ Other ____________________

IMPROVEMENT OPPORTUNITIES and FEATURES of NOTE

Describe significant features and/or impacts seen in section. Include GPS points when applicable.

☐ Check box if stream is dry

☐ Check box if native/wild trout were observed in segment

Stream Segment Flows through the following Land Type (*Check One*): ☐ Public ☐ Private ☐ Both

POINT TYPE

☐ Reference Photo(s)

	Ref Photo	Latitude (North)	Longitude (West)	Notes
1				
2				

Possible BMP's-
None (N)
Agriculture (Ag)
Abandonded Mine Drainage (AMD)
Bank Stablization (BS)
Culvert Replacement (CR)
Dam Removal (DR)
Dirt & Gravel Road (DGR)
Habitat Improvement (HI)
Mine Belt Deflector (MBD)
Riparian Planting (RP)
Stormwater (SW)
Other (O)

☐ BMP(s) *Describe improvement needs and improvement recommendations:*

	BMP	Latitude (North)	Longitude (West)	Notes
1				
2				
3				
4				
5				

☐ Feature(s) of Note (FoN)

	FoN	Latitude (North)	Longitude (West)	Notes
1				
2				
3				
4				

Segment Accessibility for Implementing Possible BMP's: ☐ Excellent ☐ Good ☐ Poor ☐ In-Accessible

Describe ____

Segment was Assessed: ☐ Entirely ☐ Partially

Describe ____

This sheet was printed on 3/31/2021

WATERSHED FEATURES (within ~100 ft. (~30 m) buffer)

Predominant Surrounding Land-Use (Must = 100%)

☐ Forest ______%
☐ Field/Pasture ______%
☐ Agricultural ______%
☐ Open space (i.e., parks/golf courses) ______%
☐ Commercial/Industrial ______%
☐ Residential ______%
☐ Paved Roads ____%
☐ Dirt and Gravel Roads ______% (TWP, Gas & Logging)
☐ Rail Line ______%
☐ Wetland ______%
☐ Other __________________ ______%

Stormwater Inputs ☐ None

☐ Tile Drain ☐ Road Ditch ☐ Urban Stormwater Pipe
☐ Field Ditch ☐ Overland Flow

D&GR Sediment Contribution (Runoff): ☐ None

☐ Minimal ☐ Moderate ☐ Heavy

Bank revetments: ☐ None

☐ Rip-rap ☐ Gabion ☐ Concrete ☐ Other _______

VEGETATION INFORMATION

NOTE: Bank side determined when facing DOWN Stream

Riparian Zone Width **Riparian Zone Encroachment** ☐ Yes ☐ No

Right Bank: ☐ 0 – 15 feet ☐ 16 – 50 feet ☐ 51 – 150 feet ☐ 150 – 300 feet ☐ Greater than 300 feet
Left Bank: ☐ 0 – 15 feet ☐ 16 – 50 feet ☐ 51 – 150 feet ☐ 150 – 300 feet ☐ Greater than 300 feet

Indicate dominant vegetation type within riparian zone (~18 meter buffer),and record dominant species present:

☐ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous ☐ Invasive - Dominant species present: ______________

Bank Canopy Vegetation:
Right Bank ☐ 100% (Shaded) ☐ 75% ☐ 50% ☐ 25% ☐ 0% (No Cover)
Left Bank ☐ 100% (Shaded) ☐ 75% ☐ 50% ☐ 25% ☐ 0% (No Cover)

Channel Canopy: ☐ Open ☐ Closed

Presence of Large Woody Debris (LWD): ☐ Significant ☐ Moderate ☐ Minimal ☐ None

Presence of aquatic vegetation: ☐ None ☐ Normal ☐ Excessive - Describe: ______________

INSTREAM FEATURES

Average Stream Width _________ ft

Active Streambank Erosion for Segment

☐ None ☐ Minimal ☐ Moderate ☐ Heavy

Surface Velocity: ☐ Slow ☐ Moderate ☐ Fast

Flow Status: ☐ Low ☐ Moderate ☐ High

Springs/Seeps: ☐ Abundant ☐ Minimal ☐ None

Adjacent Wetlands: ☐ Abundant ☐ Minimal ☐ None

Proportion of Stream Morphology Types

☐ Riffle______% ☐ Run______% ☐ Pool______%

Average Number of Riffles in section: ____________

Channelization ☐ No ☐ Yes Length of Straightening ____ft.

Dam Present (Beaver or Human) ☐ Yes ☐ No

Constrictions Present: ☐ None ☐ Culvert ☐ Bridge
☐ Old Abutment ☐ Bedrock Outcrop ☐ Other ________

Stream Ford or Animal Crossing Present ☐ Yes ☐ No

Debris Jam Present ☐ Yes ☐ No

Connectivity to Flood Plain
(Zero percent equals not connected to flood plain)

Right Bank: ☐ 100% ☐ 75% ☐ 50% ☐ 25% ☐ 0%
Left Bank: ☐ 100% ☐ 75% ☐ 50% ☐ 25% ☐ 0%

WATER QUALITY

(During visual assessment use pH and conductivity meters to take reading.)

ToR = top of reach / BoR = bottom of reach

pH ToR__________/__________BoR
H_2O Temp ToR__________/__________BoR (°F or °C)
Conductivity ToR__________/__________BoR (µs)

Turbidity (If not measured)
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Water Odors
☐ Normal/None ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Fishy ☐ Other_________

Water Surface Oils ☐ None

☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☐ Other______________

Overall Water Quality ☐ Excellent ☐ Good ☐ Fair ☐ Poor

Primary source(s) of water quality impact ☐ None

☐ Agriculture ☐ Active Pasture ☐ Sedimentation
☐ Gas Wells ☐ Development ☐ Sewage
☐ Bank Erosion ☐ Pipeline Crossing ☐ AMD
☐ Timber ☐ Other__________

INORGANIC SUBSTRATE COMPONENTS
(Should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	
Cobble	64-256 mm (2.5"-10")	
Gravel	2-64 mm (0.1"-2.5")	
Sand	0.06-2 mm (gritty)	
Silt	0.004-0.06 mm	
Clay	< 0.004 mm (slick)	

Invasive Species Observations
(note any invasive species in reach and list details if possible)

Flora	Fauna
☐ None	☐ None
☐ Barberry	☐ Asiatic clam (Corbicula)
☐ Knotweed	☐ Emerald ash borer
☐ Multiflora rose	☐ Round goby
☐ Mile-a-minute weed	☐ Wooly adelgid
☐ Purple loosestrife	☐ Zebra mussel
☐ __________	☐ Other(s)
☐ Other(s)	__________
__________	__________
__________	

This sheet was printed on 3/31/2021

Big Run Watershed; Jefferson County

General HABITAT ASSESSMENT FIELD DATA SHEET

High or Low Gradient Streams

This sheet can be used for high or low gradient streams, please specify which was scored on score sheet page.

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate/Available Cover **(high and low gradient)**	Greater than 70% (50% for low gradient streams) of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% (30-50% for low gradient streams) mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% (10-30% for low gradient streams) mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% (10% for low gradient streams) stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Score A or B only, not both. **2a. Embeddedness** **(high gradient)**	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2b. Pool Substrate Characterization **(low gradient)**	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or submerged vegetation.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
Score A or B only, not both. **3a. Velocity/Depth Regimes** **(high gradient)**	All 4 velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (slow is <0.3 m/s, deep is >0.5 m).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3b. Pool Variability **(low gradient)**	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition **(high and low gradient)**	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status **(high and low gradient)**	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration (high and low gradient)	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
(Score A or B only, not both.) 7a. Frequency of Riffles (or bends) (high gradient)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
(Score A or B only, not both.) 7b. Channel Sinuosity (low gradient)	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream (high and low gradient)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream (high and low gradient)	More than 90% of the streambank surfaces and immediate riparian zones covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) (high and low gradient)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Big Run Watershed; Jefferson County
General HABITAT ASSESSMENT SCORE SHEET
High or Low Gradient Streams

STREAM NAME:	GIS ID:
Start: LAT LONG	WATERSHED:
End: LAT LONG	AGENCY: Western Pennsylvania Conservancy
INVESTIGATORS:	REASON for SURVEY: *General Visual Assessment Data Collection*
FORM COMPLETED by:	DATE: ______________ TIME: ________ AM PM

Stream Gradient (Select one) ☐ High (riffle/run prevalent) or ☐ Low (glide/pool prevalent)

**Note: If a parameter has an "a" or "b" only score for one or the other, not both.*

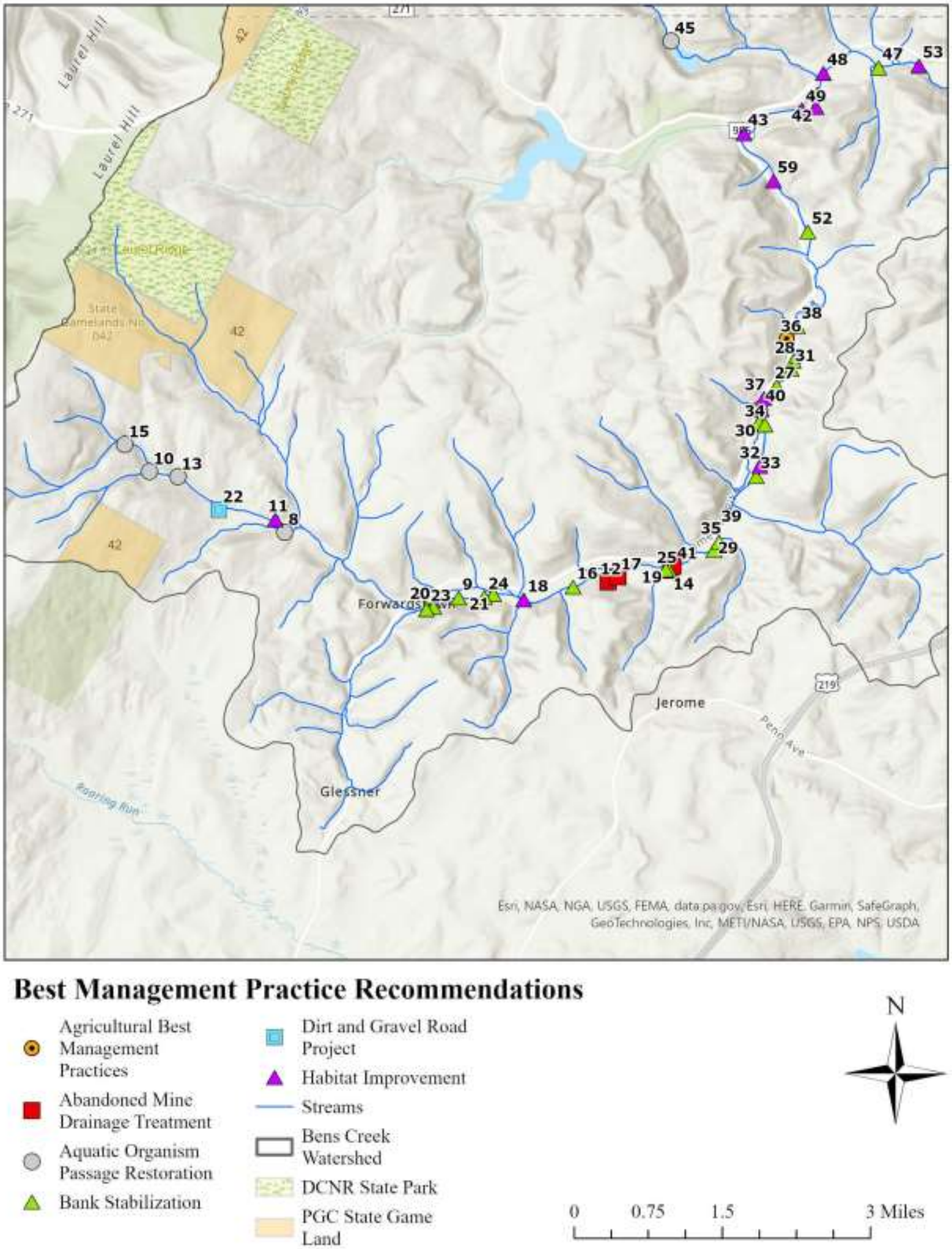
Habitat Parameter	Score	Explanation of Score Given *(Please provide details, especially for lower ratings!)*	
1. Epifaunal Substrate /Available Cover			
*2a. Embeddedness (High) or 2b. Pool Substrate Characterization (Low)			
*3a. Velocity/Depth Regimes (High) or 3b. Pool Variability (Low)			
4. Sediment Deposition			
5. Channel Flow Status			
6. Channel Alteration			
*7a. Frequency of Riffles (or bends) (High) or 7b. Channel Sinuosity (Low)			
8. Bank Stability (score each bank) *Note: determine left or right side by facing downstream*	LB & RB Total	(RB)	
		(LB)	
9. Vegetative Protection (score each bank) *Note: determine left or right side by facing downstream*	LB & RB Total	(RB)	
		(LB)	
10. Riparian Vegetative Zone Width (score each bank riparian zone)	LB & RB Total	(RB)	
		(LB)	
Total Score		**Add all scores and divide by the number of scores given.**	

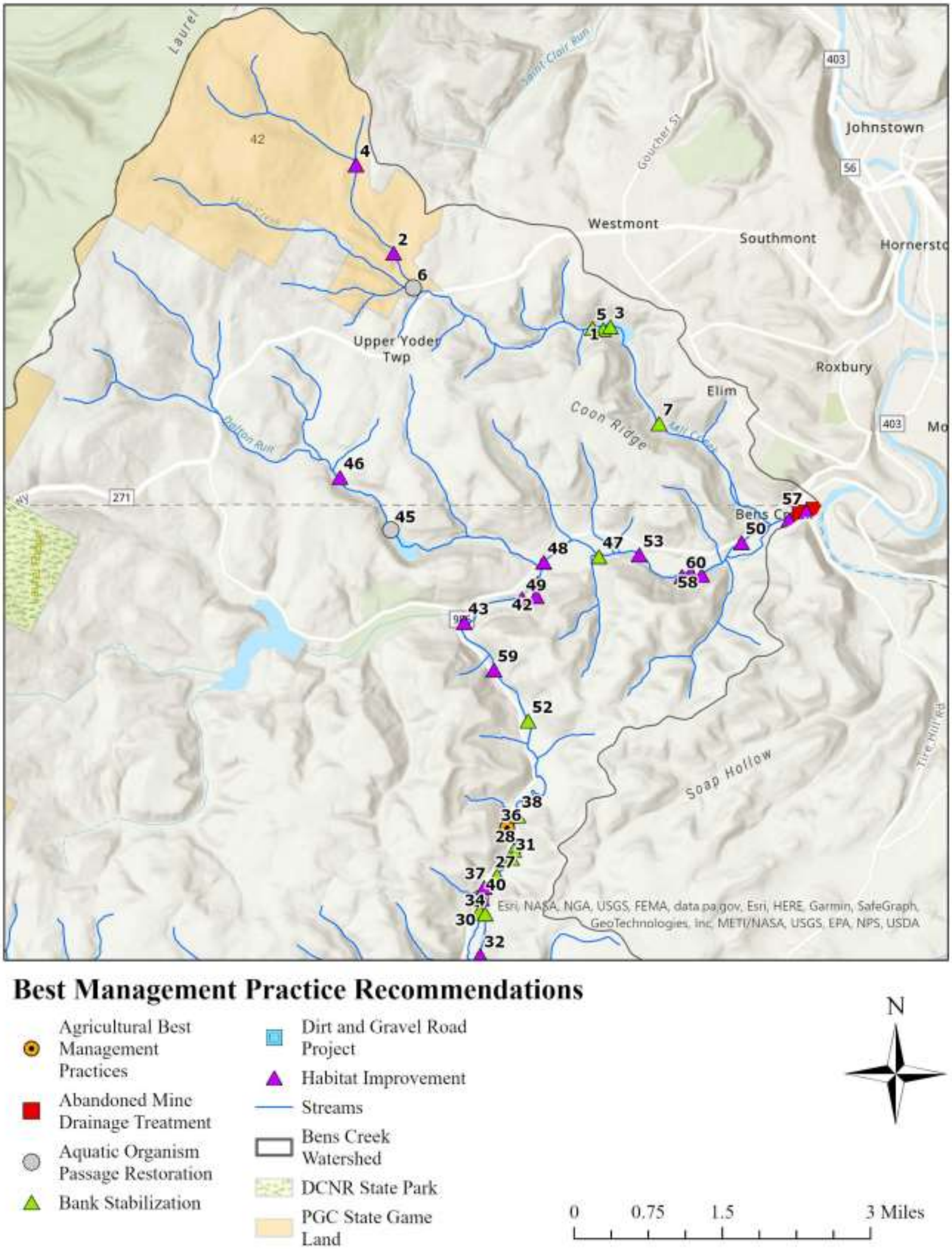
Please include additional notes of back of this sheet.

☐ Check box when data entered

Date entered: ______________

APPENDIX 2: BMP RECOMMENDATIONS FROM VISUAL ASSESSMENT





Best Management Practice Recommendations

Table: BMP Recommendations from Visual Assessment Photo Points

Point	BMP	GIS_ID	Field Notes
1	BS	9439	Bank erosion throughout old dam section
2	HI	9372	LWM project area
3	BS	9439	Potential LWD stabilization area
4	HI	9372	Could use LWM
5	BS	9396	Some bank erosion at top end of old reservoir
6	CR	9372	Half pipe culvert on access road. AOP OK but undersized. Minor erosion
7	BS	9439	Bank erosion near residential area
8	CR	9730	Slightly perched
9	BS	9750	Eroding banks
10	CR	9676	Undersized and perched. Recently replaced.
11	HI	9695	Natural erosion. Good area for LWM
12	AMD	9737	AMD discharge. pH 2.69
13	DR	9695	Old CT dam. Culvert and weir.
14	BS	9724	Eroding refuse bank
15	DR	9672	CT dam
16	BS	9737	Habitat project potential near residential area
17	AMD	9737	Acidic iron seeps. pH 2.78
18	HI	9746	Residential area with berm banks
19	BS	9724	Good location for mod mudsill
20	BS	9750	Natural erosion. Trees almost falling in
21	BS	9741	Severe erosion next to pond. Cabins hanging over stream
22	DGR	9695	Road encroachment. Needs underdrain and DSA. Wood structure at stream bend
23	BS	9750	Old habitat structures with gabion baskets failing
24	BS	9750	Severe erosion at residential area
25	AMD	9724	AMD discharge pH 3.25
26	CR	9647	Perched culvert. Free fall onto cascade
27	BS	9644	Bank erosion
28	BS	9644	Bank erosion
29	BS	9715	Good pool with eroding banks below
30	BS	9657	Eroding bank along road
31	BS	9644	Good bank stabilization project
32	HI	9688	Most of section disconnected from floodplain for historical straightening and berms. Some erosion and habitat could be improved
33	BS	9688	Bank erosion below residential area
34	BS	9688	Bank erosion and buffer planting potential
35	BS	9715	Residential area with berm and bank erosion
36	AG	9644	Pasture in floodplain. Animals with some stream access
37	HI	9644	Large gravel bar choking off outside bend braid. Bank erosion near road
38	BS	9644	Bank stabilization and buffer project
39	RP	9701	Residential area could be buffered. Adequate bridge. Channelized and stabilized along somerset pike

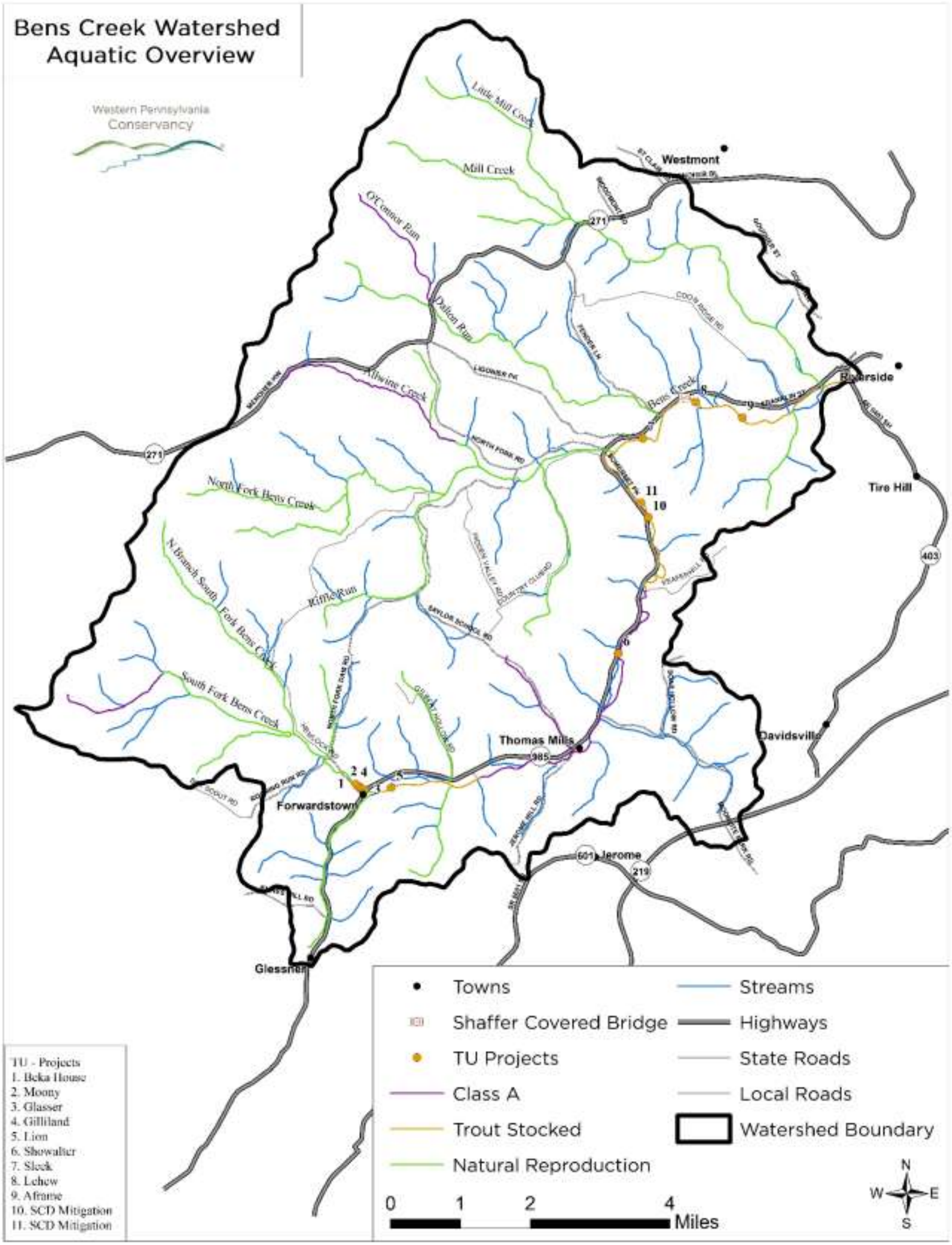
40	HI	9644	Minor erosion. Shallow and wide. Needs habitat
41	AMD	9722	Rock tunnel system discharge and untreated discharge just above
42	HI	9514	Old failing habitat structures
43	HI	9535	Habitat improvement potential. Small AMD seep
44	HI	9514	Could use habitat structures
45	DR	9479	Dalton run dam
46	HI	9479	Good area for LWM
47	BS	9485	Eroding bank at residence
48	HI	9494	Stream bends into road. Could use long mudsill
49	HI	9514	Old failing habitat structures could be replaced
50	HI	9489	Entrenched and eroding. Old exposed pipeline
51	HI	9499	Great mudsill location
52	BS	10843	Minor erosion
53	HI	9499	Small habitat improvement project potential at camp
54	HI	9466	Needs habitat improvement. Wide and shallow
55	AMD	9466	Iron seeps
56	AMD	9466	St Andrew's AMD discharge. Alkaline iron
57	HI	9466	Habitat improvement project at toll gate
58	HI	9499	Wide flat section
59	HI	10843	Minor erosion. Good section for improvement
60	HI	9499	Long flat section

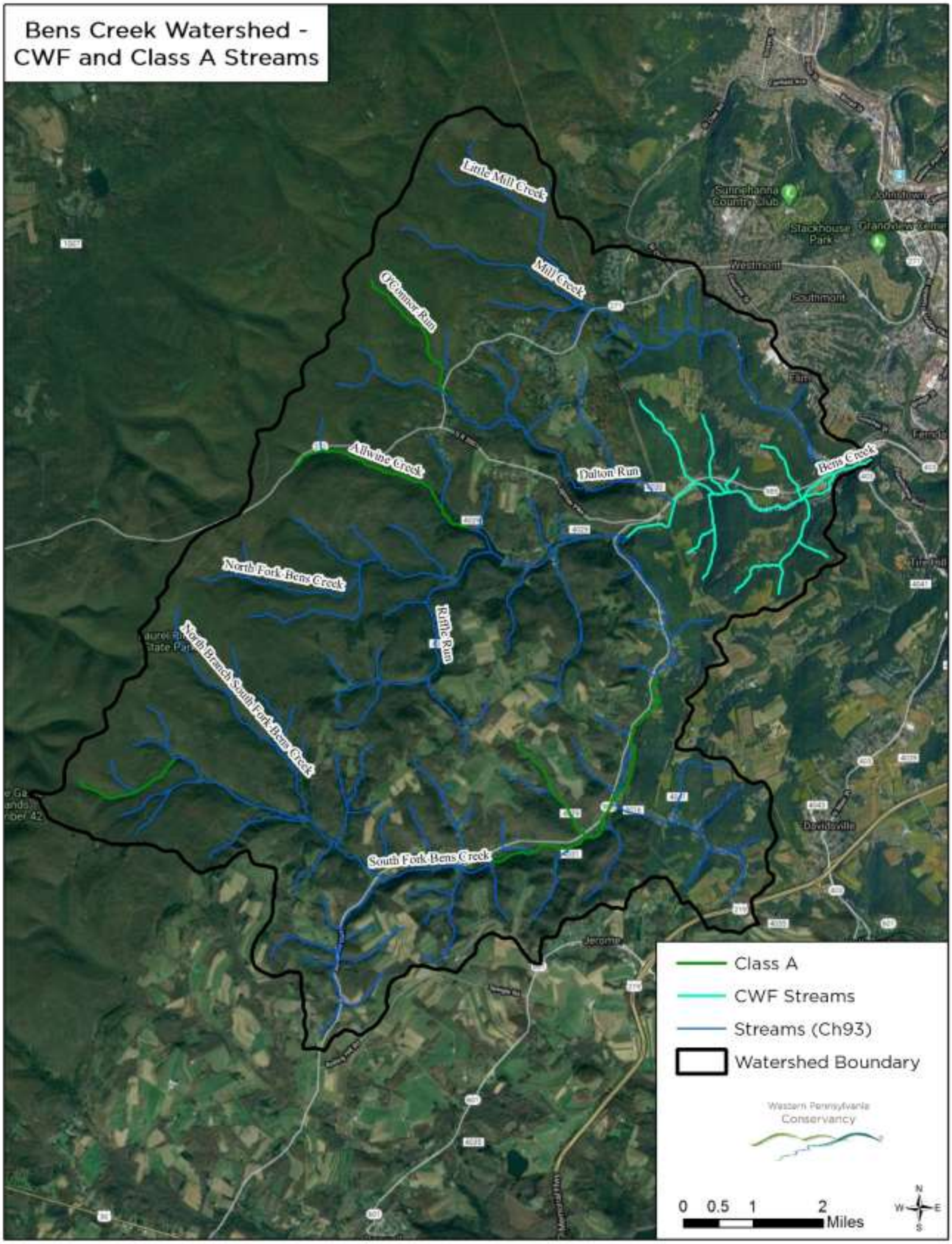

Bens Creek Watershed
Public Input
Em's Subs
Elim
Giant Eagle Supermarket
Old Toll Gate Inn
Lavely Signs
Shaffer's Frosty Freeze
Temporarily closed
Ligonier Pike
985
4029
k Country Club
Jim & Jimmie's
Somerset Pike
4041
Johnstown
Benscreek
Lutheran Church
Storymap Points
TU RIVERS Points
Streams (Ch93)
Watershed Boundary
Western Pennsylvania
Conservancy
0 0.25 0.5 1
Miles

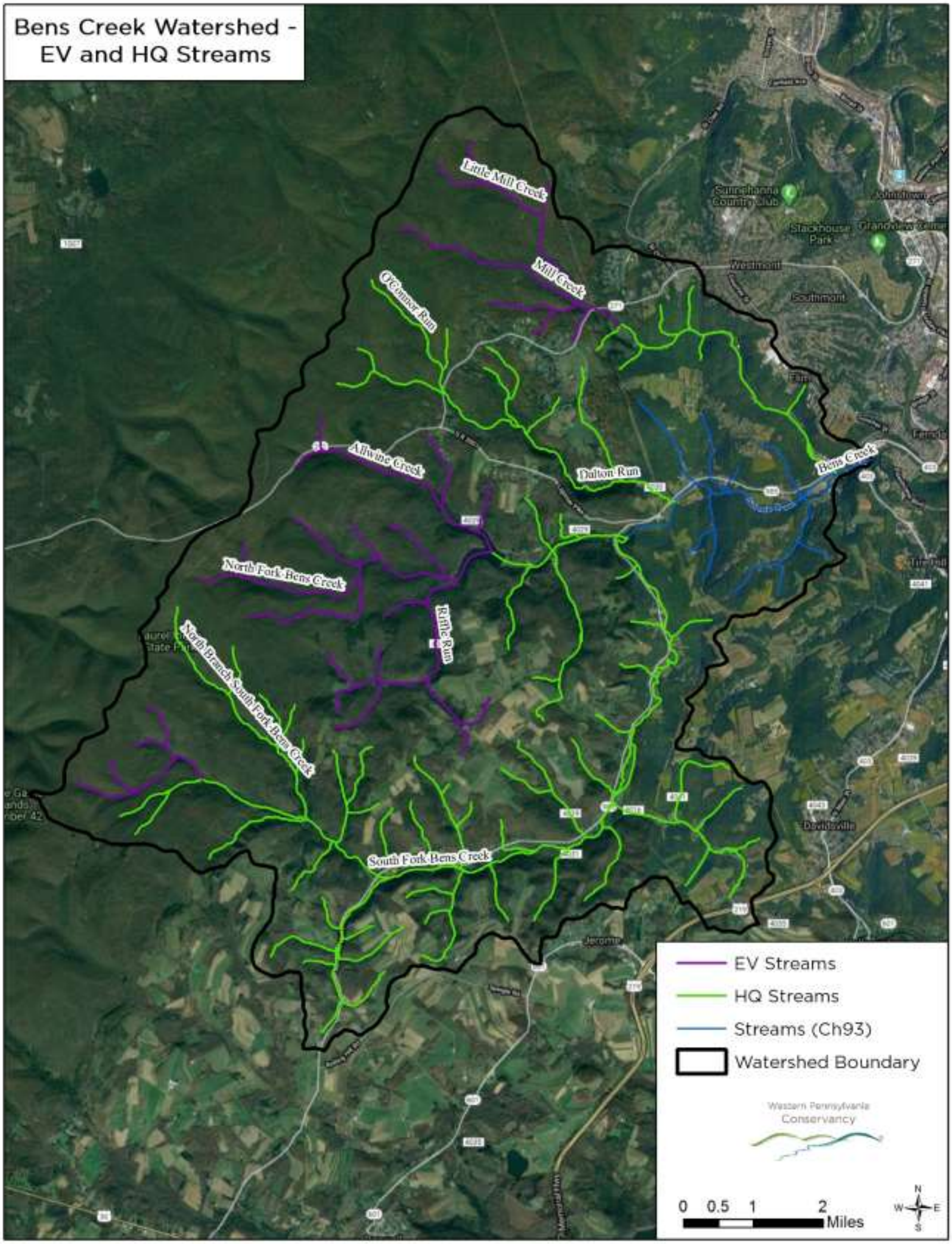
Table: Public Input via TU RIVERS mobile application				
Point	**Waterbody**	**Date**	**Type**	**Survey Notes**
1	the Bens crick	8/14/2019	streambank	Needs lwd
2	Bens creek below a frame	8/14/2019	streambank	Install root wad structures
3	Mill Creek	9/15/2020	instream channel	broken old dam. widened channel with low flow short distance upstream
4	Bens Creek South Fork	10/24/2020	streambank	looks like bank erosion from flooding
5	Bens Creek South Fork	10/24/2020	invasive species	japanese knotweed?
6	Bens Creek South Fork	10/24/2020	fish species	several different sizes, broader backs than trout, about 8 clustered together under bridge on keaferhill road, brownish with dark spots
7	South fork bens creek	4/7/2021	riparian vegetation	this place is a disaster

Table: Public Input via WPC Storymap		
Point	**Date**	**Comments**
8	9/12/2021	This long run adjacent to a deep mine discharge could use improvement. I believe it is an important area for the migratory trout that reside in stony creek. Whether they move up to spawn or for thermal refuge i think creating a more suitable run with more depth and cover (possibly timber) would encourage trout to move up and inhabit this section. Also the deep mine discharge at the mouth could be re-routed?
9	9/12/2021	This dam, although short, i believe could limit the movement of large wild brown trout upstream to spawn or to find thermal refuge during drought. Partial or total removable might be benefitial.
10	9/12/2021	There once was a deep bending hole that always held a nice wild trout or two. Over the past few years the eastern bank has eroded widening the stream channel and reducing the depth. I think doing some bank restoration would greatly improve this holes ability to hold fish.
11	9/12/2021	From the area near jim and jimmys upstream to the outdoor odyssey i believe is some of the best suited habitat for large wild brown trout to thrive and holdover year round. I believe that one of the biggest detriment to the stream in this area is the continuation of stocking. Along with the intermixing of genes, the added angling pressure, and competition, i believe stifles the potential. Bens creek is not a perfect watershed by any means, but i has potential to grow and sustain large wild brown trout, but i dont think that true potential will ever be revealed if fish are continued to be stocked into its already productive water. I also think that choosing a well accessible section of the south fork and advocating for the state to make it a catch and release area might be beneficial.
12	9/12/2021	This long flat pool is a local favorite due to its easy access and gentle current, but its cut directly through the bedrock which lends it to be featureless and lacks the cover and depth to hold wild fish consistently. I think adding some structure such as trees held down by boulders might help add cover to this otherwise featurless water.

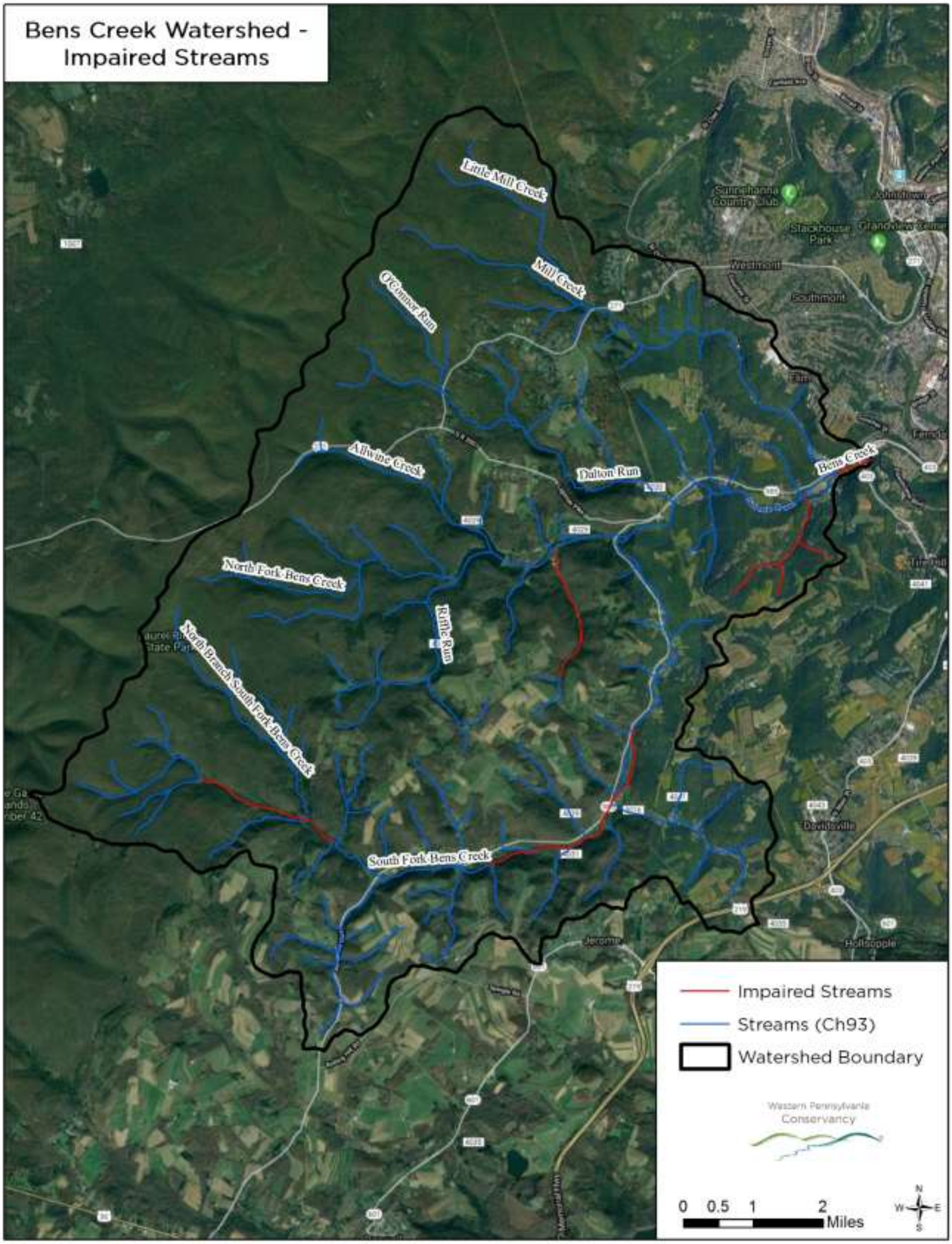
APPENDIX 4: ADDITIONAL WATERSHED MAPS & TABLES

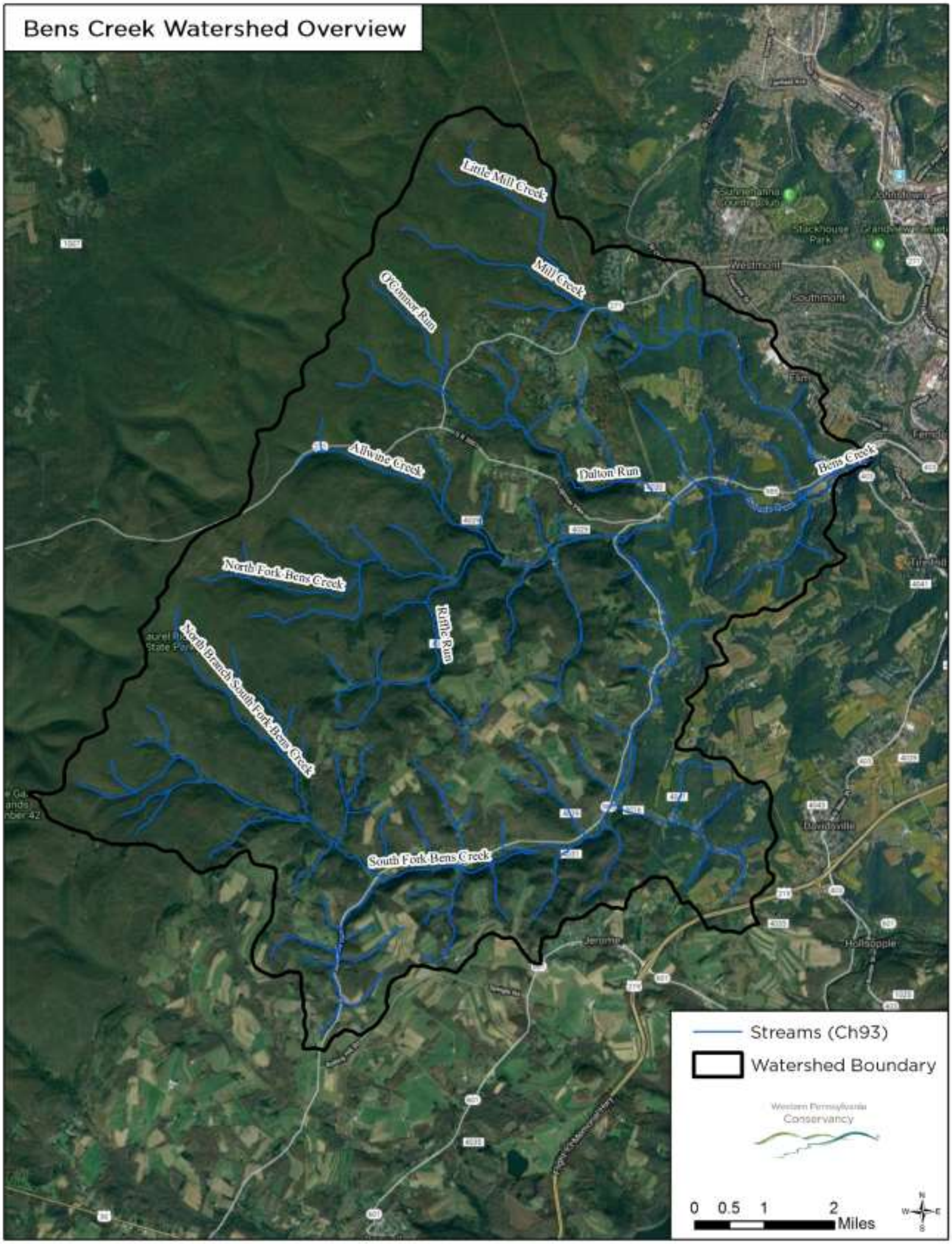


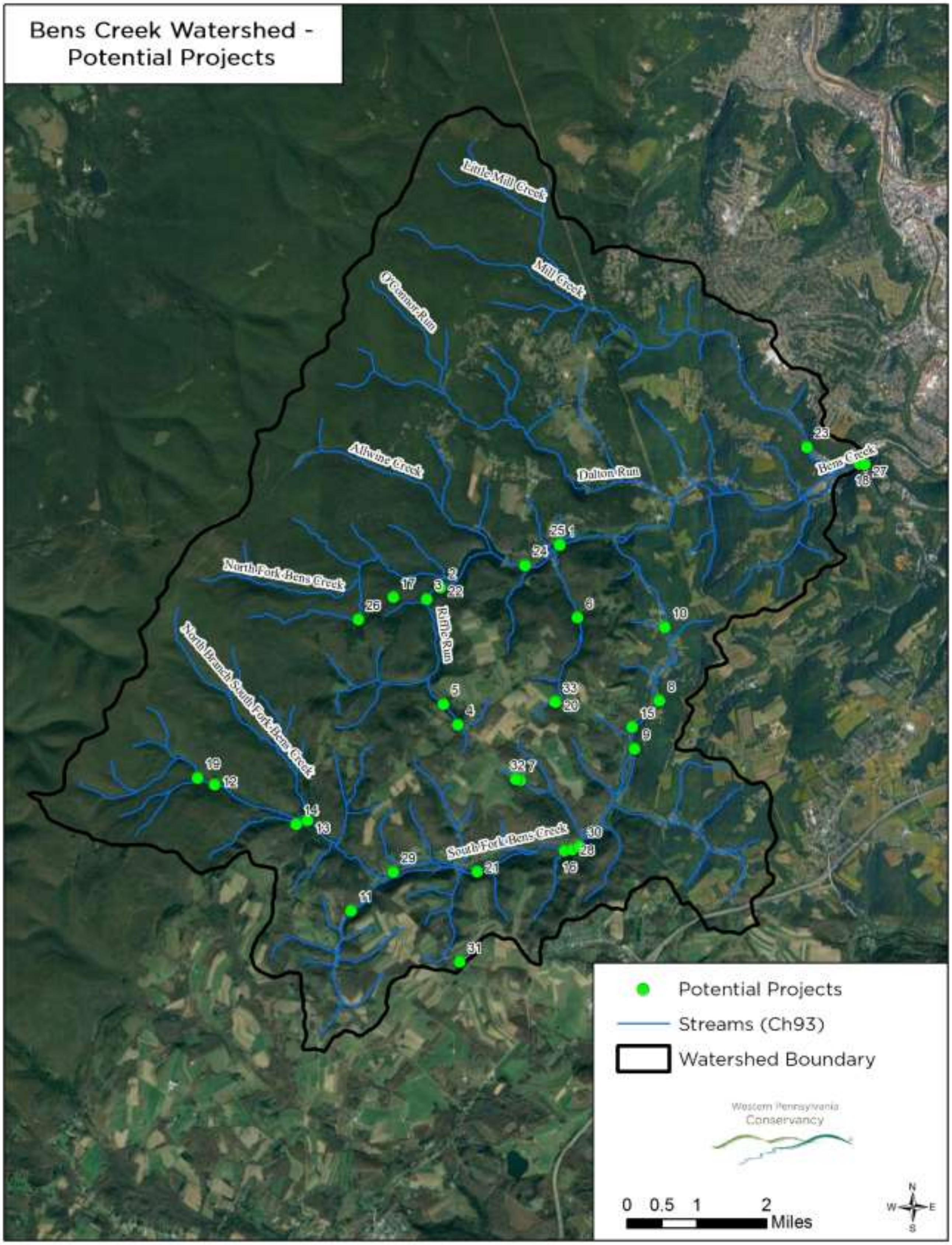

Bens Creek Watershed - CWF and Class A Streams
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Westmont
Southmont
Davidsville
Jerome
Class A
CWF Streams
Streams (Ch93)
Watershed Boundary
Western Pennsylvania Conservancy
0 0.5 1 2 Miles



Bens Creek Watershed - EV and HQ Streams
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Westmont
Southmont
Stackhouse Park
Davidsville
Jerome
EV Streams
HQ Streams
Streams (Ch93)
Watershed Boundary
Western Pennsylvania Conservancy
0 0.5 1 2 Miles


Bens Creek Watershed -
Impaired Streams
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Westmont
Southmont
Stackhouse Park
Davidsville
Jerome
Hollsopple
Impaired Streams
Streams (Ch93)
Watershed Boundary
Western Pennsylvania Conservancy
0 0.5 1 2
Miles


Bens Creek Watershed Overview
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Westmont
Southmont
Johnstown
Stackhouse Park
Davidsville
Jerome
Hollsopple
Streams (Ch93)
Watershed Boundary
Western Pennsylvania Conservancy
0 0.5 1 2
Miles


Bens Creek Watershed - Potential Projects
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Potential Projects
Streams (Ch93)
Watershed Boundary
Western Pennsylvania Conservancy
0 0.5 1 2 Miles

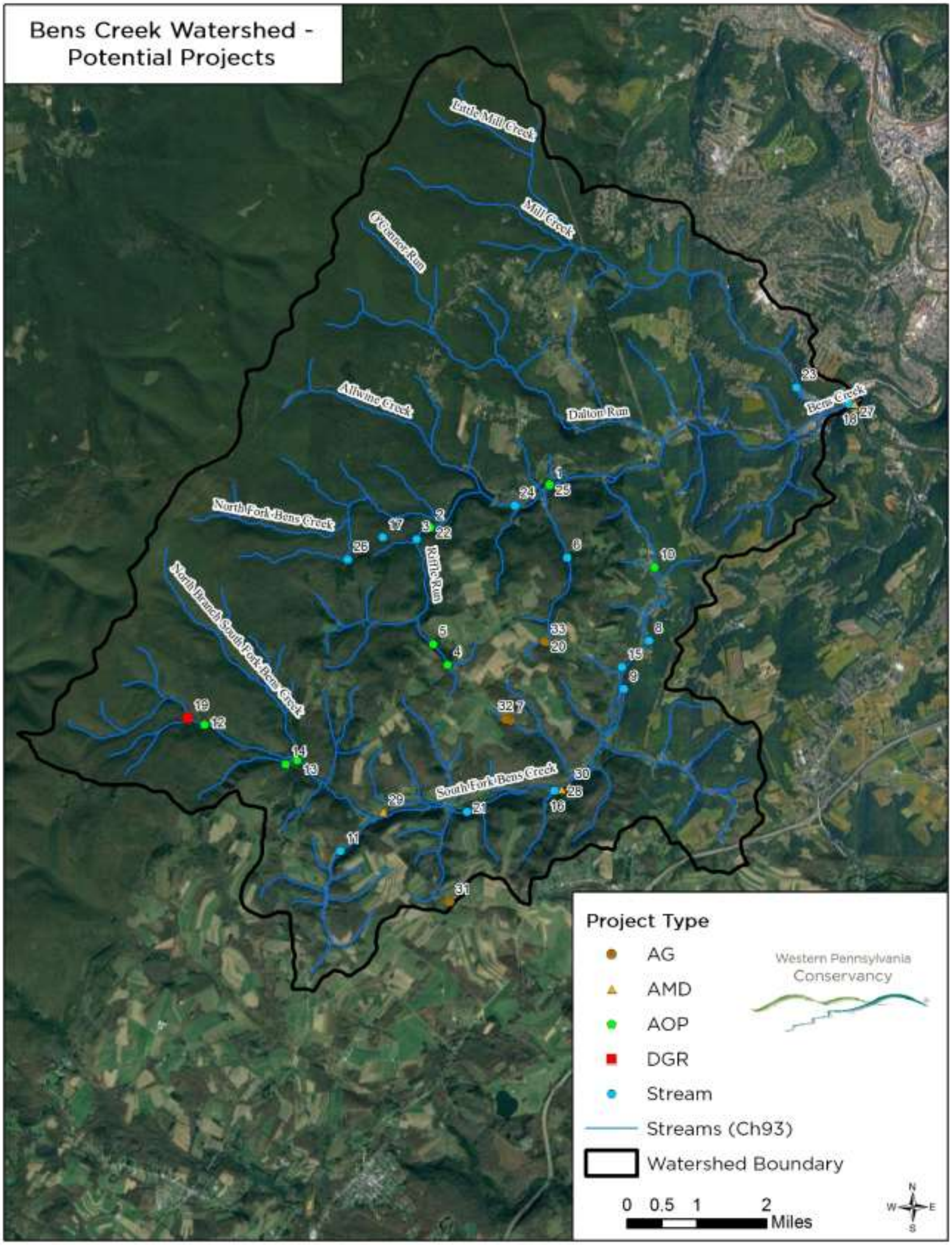
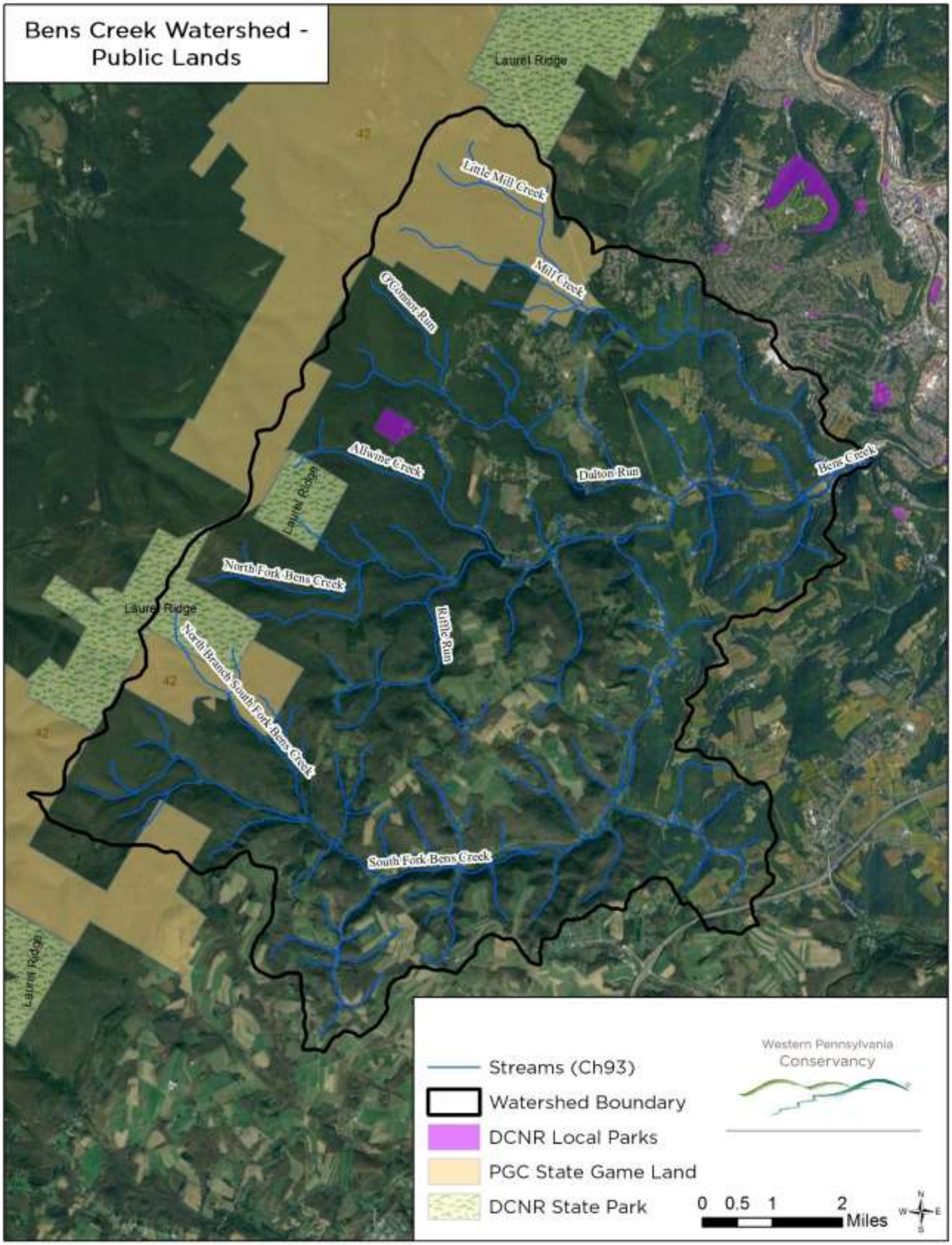
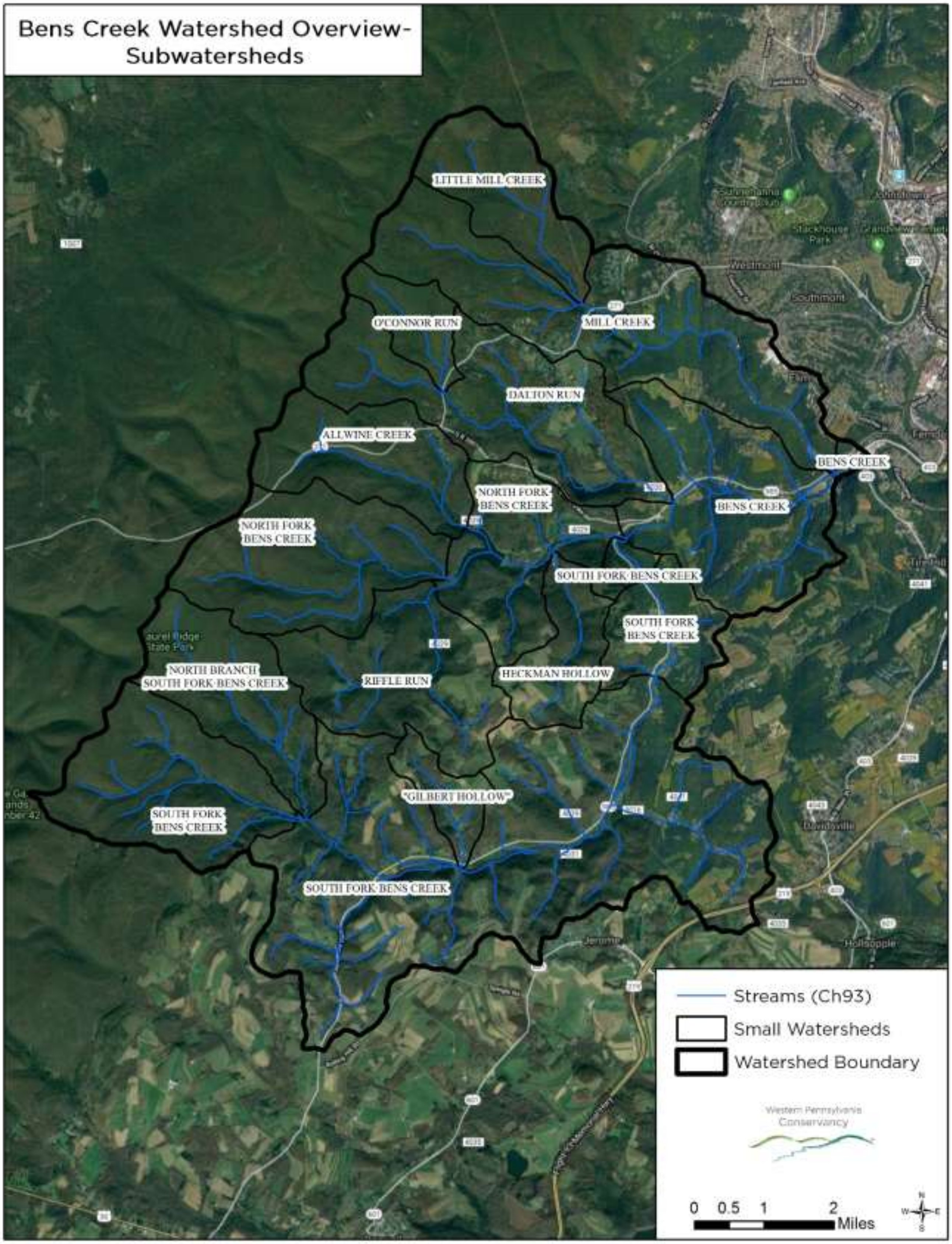

Bens Creek Watershed - Potential Projects
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Project Type
AG
AMD
AOP
DGR
Stream
Streams (Ch93)
Watershed Boundary
0 0.5 1 2 Miles
Western Pennsylvania Conservancy

Table: Potential Projects from MLTU Mapping Project with assistance from SCD & WPC

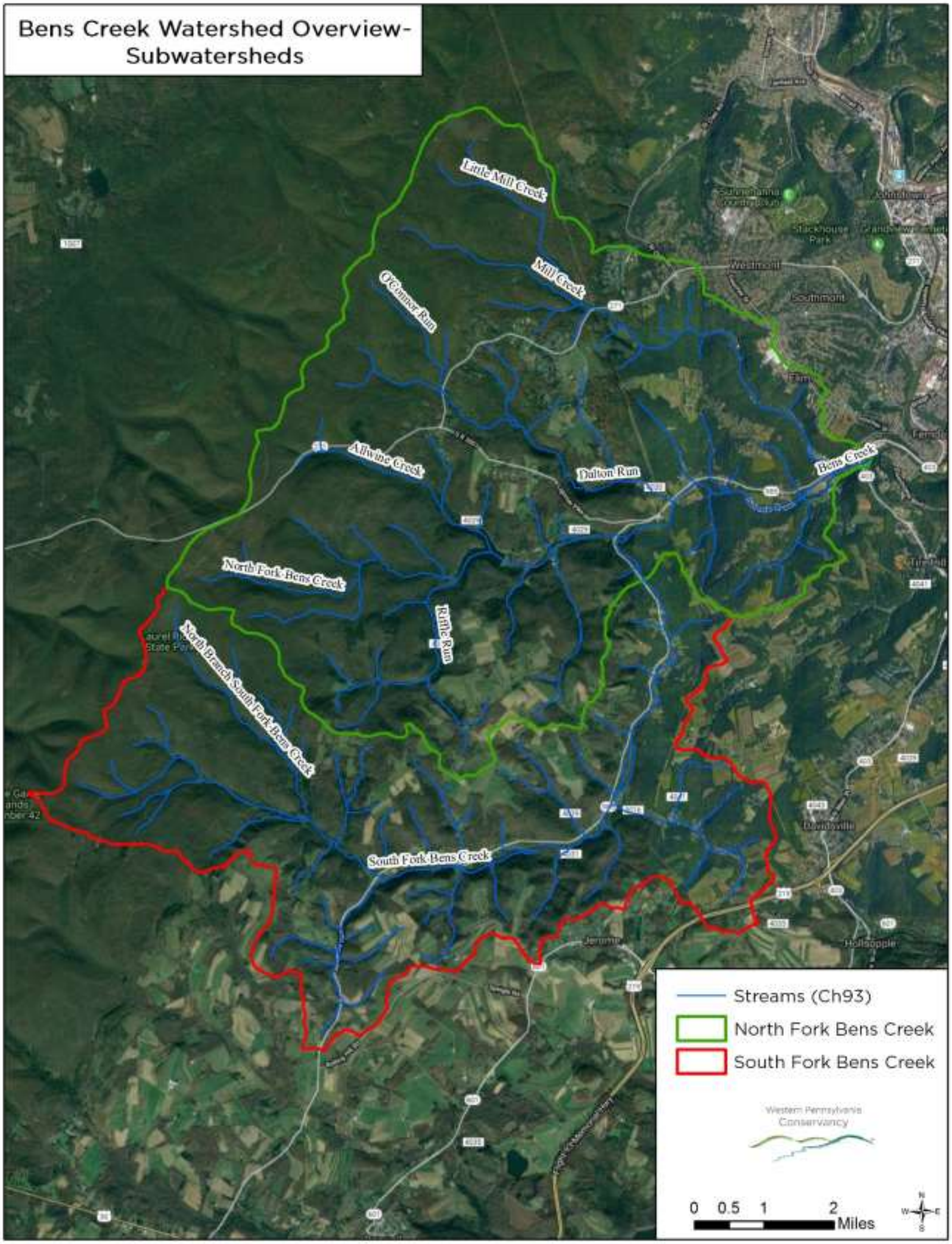
Number	Type	Description	Lat	Long
1	Stream	North Fork tailwater habitat installation and buffers	40.271490	-78.992151
2	AOP	Riffle Run bridge fish passage	40.264814	-79.016963
3	Stream	Riffle Run habitat	40.262990	-79.019807
4	AOP	Riffle Run Edgar Croyle Rd culvert 1	40.243150	-79.013327
5	AOP	Riffle Run Edgar Croyle Rd culvert 2	40.246386	-79.016346
6	Stream	Heckman Hollow erosion upstream of NF golf course	40.260092	-78.988530
7	AG	Dream Rd AG improvement	40.234366	-79.000433
8	Stream	Roxbury Church property erosion	40.246953	-78.971545
9	Stream	Hillside erosion upstream of Showalter property	40.239355	-78.976749
10	AOP	Remove pipe from stream upstream of Jim and Jimmies	40.258547	-78.970444
11	Stream	UNT Bens Cr habitat at stone wall constructed in stream	40.213718	-79.035524
12	AOP	Remove unused Cone. Twp Dam	40.233646	-79.063746
13	AOP	Replace culvert 1 on Ferndale Sportsmen property	40.228018	-79.044525
14	AOP	Replace culvert 2 on Ferndale Sportsmen property	40.227392	-79.046887
15	Stream	SFBC erosion on bend across from Benscreek Church	40.242767	-78.977176
16	Stream	SFBC Lehman property erosion	40.223206	-78.991204
17	Stream	Improve Hemlock Rd at Riffle Run and NFBC	40.263281	-79.026742
18	Stream	Streambank erosion at Toll Gate Inn	40.284355	-78.930066
19	DGR	Improve Cone. Twp acces road to Dam	40.234742	-79.067284
20	Stream	Streambank fencing and buffers on Heckman Hollow	40.246691	-78.993004
21	Stream	Jenner Ln to Brehn Rd stream habitat improvement	40.219891	-79.009313
22	AOP	Remove weir on Alwine Cr	40.264818	-79.016959
23	Stream	Mill Cr stream habitat	40.287020	-78.941005
24	Stream	Conservation release from NF, Dalton, Cone. Twp	40.268339	-78.999433
25	AOP	Remove North Fork golf course water pump and dam	40.271620	-78.992224
26	Stream	NFBC lime dosing at Centennial Sportsmen	40.259777	-79.033989
27	AMD	St Andrews AMD seep	40.284334	-78.928970
28	AMD	Rock Tunnel AMD system	40.223428	-78.989636
29	AMD	Lion Mining AMD system	40.219813	-79.026696
30	AMD	Jerome Hill Rd AMD seep	40.223923	-78.988130
31	AG	Miller Farm AG improvements	40.205619	-79.012955
32	AG	Dream Rd AG land improvements	40.234533	-79.001340
33	AG	Lost Valley Rd AG improvements	40.246742	-78.993215

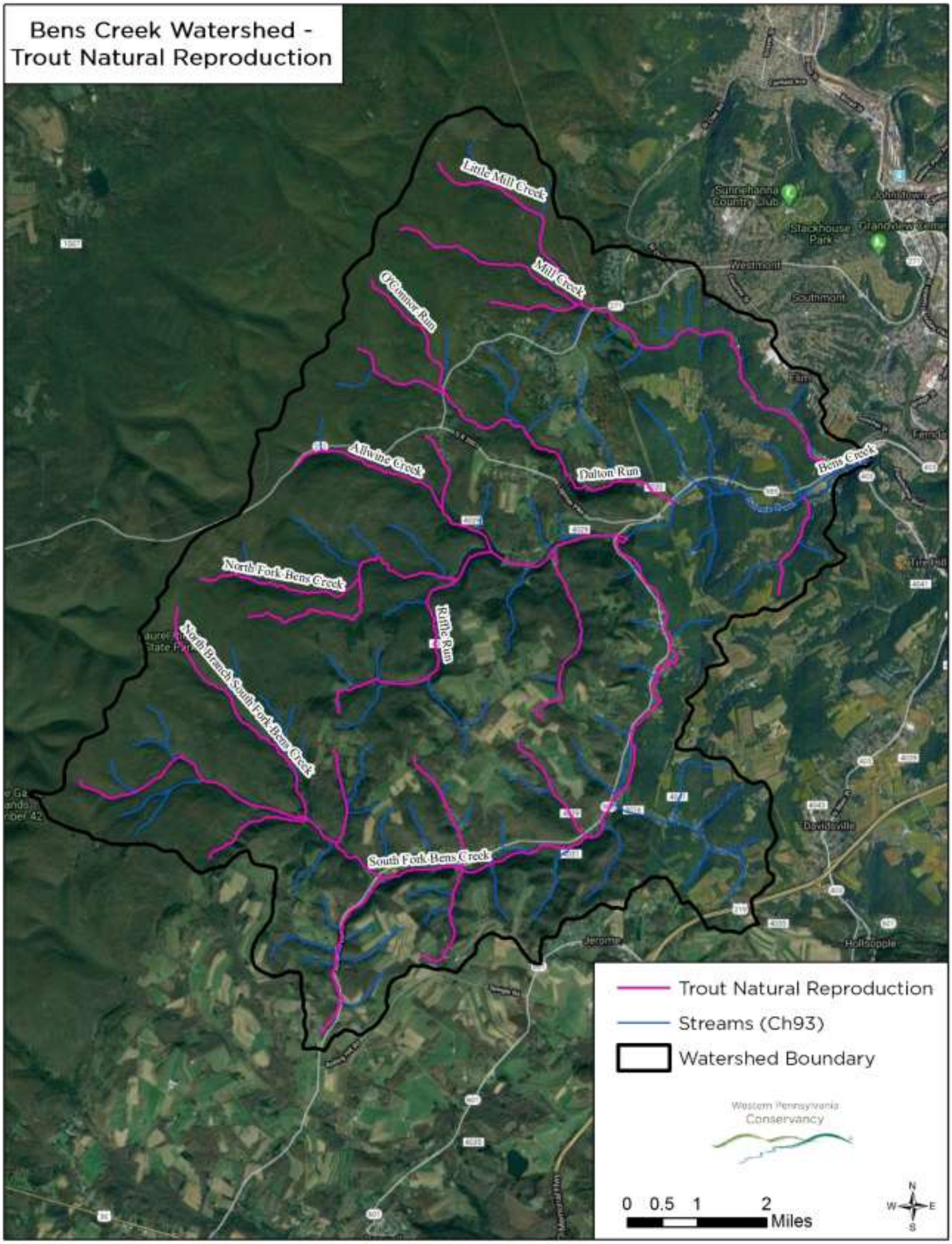


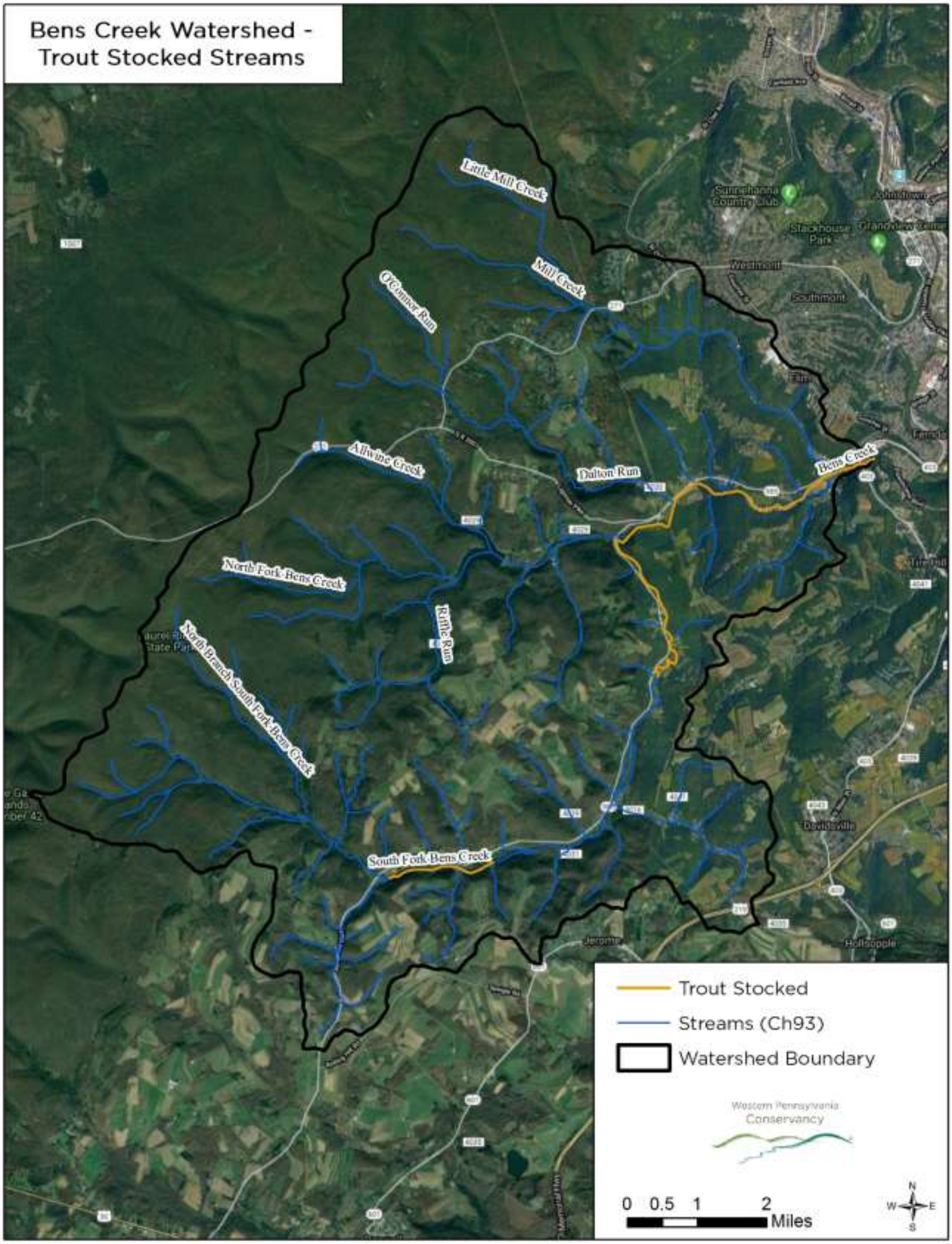
Bens Creek Watershed -
Public Lands
Laurel Ridge
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Laurel Ridge
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Streams (Ch93)
Watershed Boundary
DCNR Local Parks
PGC State Game Land
DCNR State Park
Western Pennsylvania
Conservancy
0 0.5 1 2
Miles

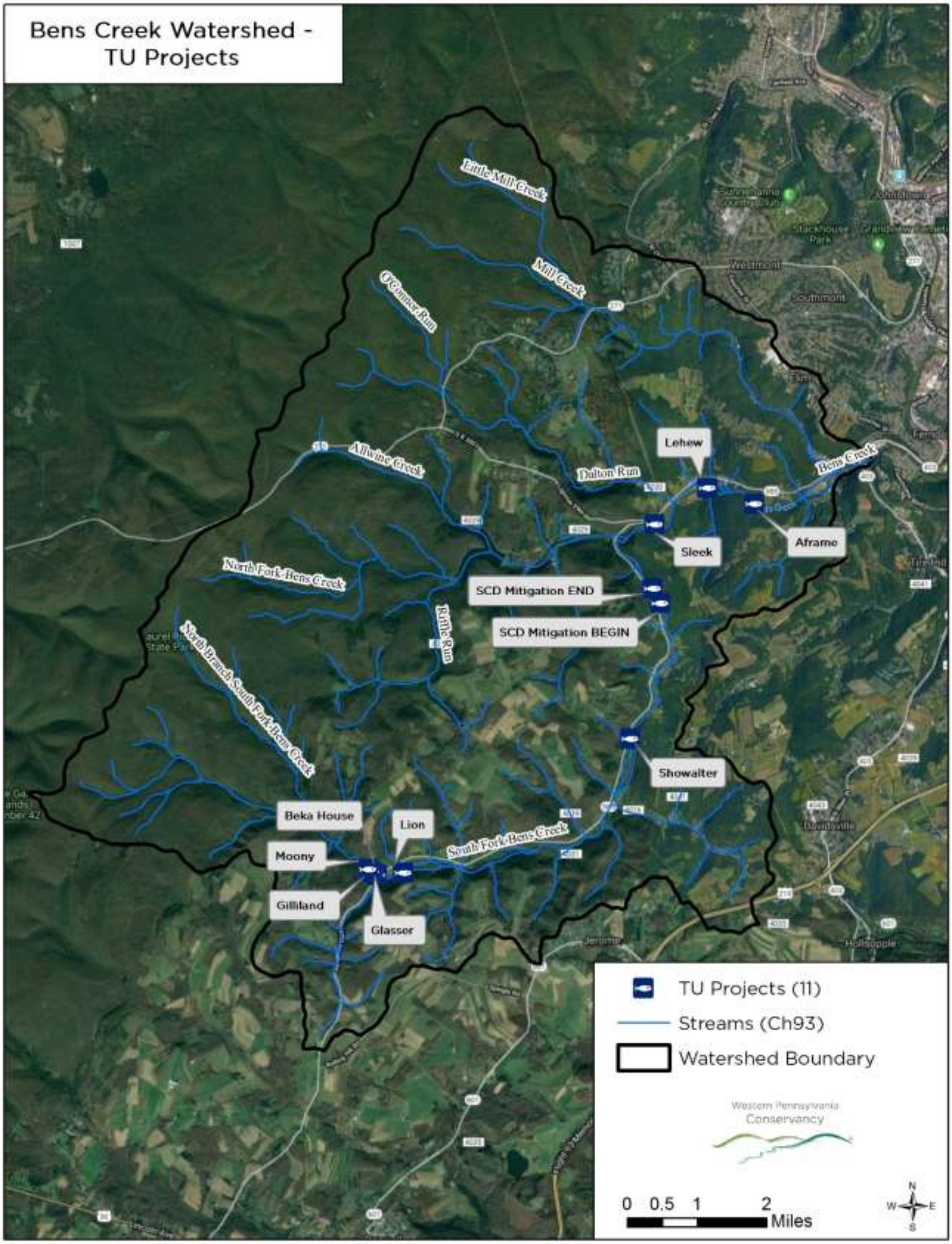


Bens Creek Watershed Overview-
Subwatersheds
LITTLE MILL CREEK
MILL CREEK
O'CONNOR RUN
DALTON RUN
ALLWINE CREEK
BENS CREEK
NORTH FORK
BENS CREEK
NORTH FORK
BENS CREEK
BENS CREEK
SOUTH FORK BENS CREEK
SOUTH FORK
BENS CREEK
NORTH BRANCH
SOUTH FORK BENS CREEK
RIFFLE RUN
HECKMAN HOLLOW
"GILBERT HOLLOW"
SOUTH FORK
BENS CREEK
SOUTH FORK BENS CREEK
Westmont
Southmont
Davidsville
Jerome
Hollsopple
Streams (Ch93)
Small Watersheds
Watershed Boundary
Western Pennsylvania
Conservancy
0 0.5 1 2
Miles

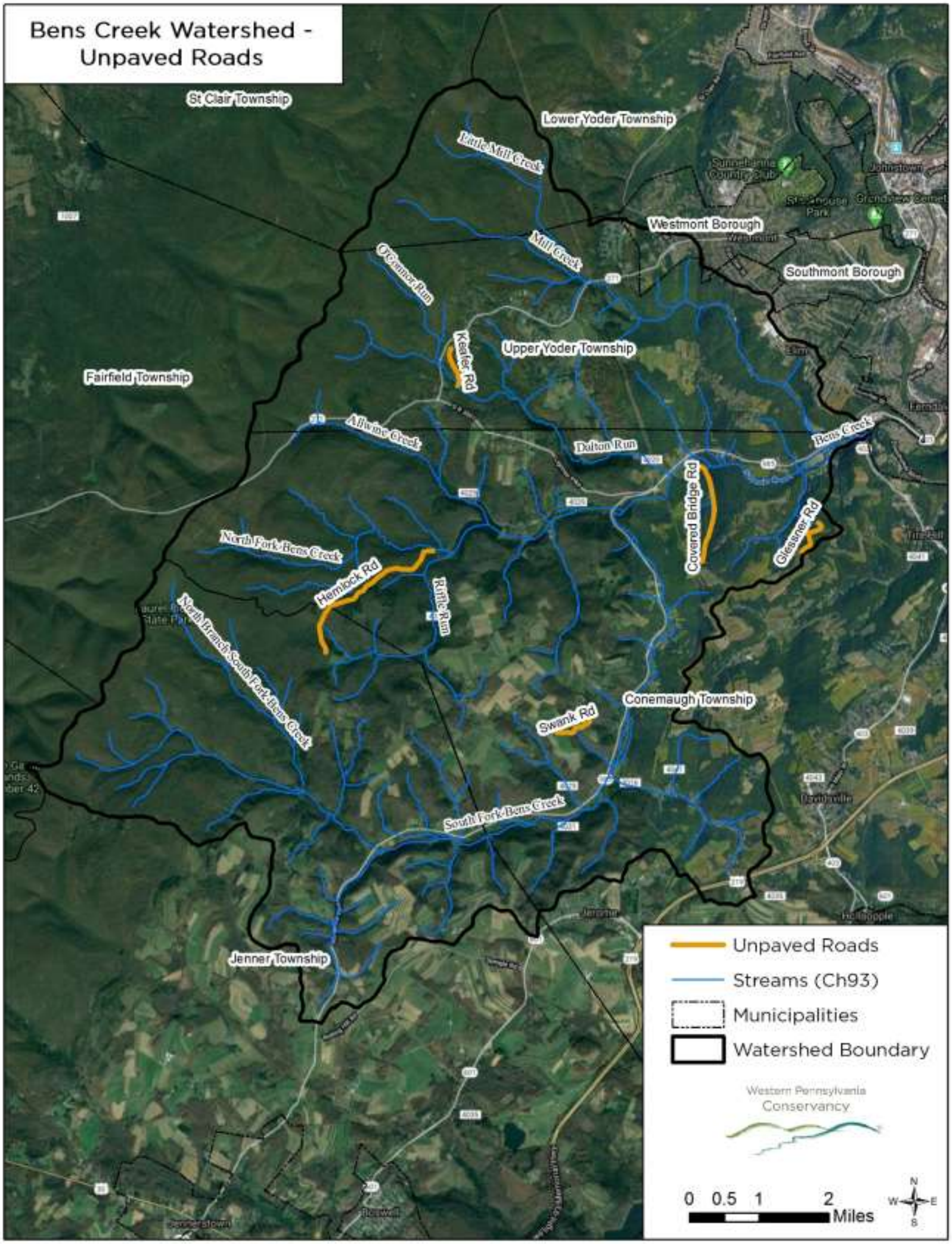

Bens Creek Watershed Overview-
Subwatersheds
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Westmont
Southmont
Davidsville
Jerome
Hollsopple
Streams (Ch93)
North Fork Bens Creek
South Fork Bens Creek
Western Pennsylvania Conservancy
0 0.5 1 2 Miles


Bens Creek Watershed -
Trout Natural Reproduction
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Westmont
Southmont
Stackhouse Park
Davidsville
Jerome
Hollsopple
Trout Natural Reproduction
Streams (Ch93)
Watershed Boundary
Western Pennsylvania Conservancy
0 0.5 1 2
Miles


Bens Creek Watershed -
Trout Stocked Streams
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
Riffle Run
North Branch South Fork Bens Creek
South Fork Bens Creek
Westmont
Southmont
Davidsville
Hollsopple
Jerome
Trout Stocked
Streams (Ch93)
Watershed Boundary
Western Pennsylvania
Conservancy
0 0.5 1 2
Miles



Bens Creek Watershed - TU Projects
Little Mill Creek
Mill Creek
O'Connor Run
Allwine Creek
Dalton Run
Bens Creek
North Fork Bens Creek
North Branch South Fork Bens Creek
Riffle Run
South Fork Bens Creek
Lehew
Sleek
Aframe
SCD Mitigation END
SCD Mitigation BEGIN
Showalter
Beka House
Lion
Moony
Gilliland
Glasser
Westmont
Southmont
Davidsville
Jerome
Hollsopple
TU Projects (11)
Streams (Ch93)
Watershed Boundary
Western Pennsylvania Conservancy
0 0.5 1 2
Miles
N
W
E
S


Bens Creek Watershed -
Unpaved Roads
St Clair Township
Lower Yoder Township
Little Mill Creek
Westmont Borough
Southmont Borough
Mill Creek
O'Connor Run
Keefer Rd
Upper Yoder Township
Fairfield Township
Allwine Creek
Dalton Run
Bens Creek
Covered Bridge Rd
Glessner Rd
North Fork Bens Creek
Hemlock Rd
Riffle Run
North Branch South Fork Bens Creek
Conemaugh Township
Swank Rd
South Fork Bens Creek
Jenner Township
Unpaved Roads
Streams (Ch93)
Municipalities
Watershed Boundary
Western Pennsylvania
Conservancy
0 0.5 1 2
Miles