Sinnemahoning Portage Creek In-Stream Habitat Assessment

December 2013

Western Pennsylvania Conservancy

Introduction

Sinnemahoning Portage Creek is located in portions of northern Cameron, southeastern McKean, and western Potter counties, Pennsylvania. The watershed serves as part of the boundary between the Ohio River and Susquehanna River drainage basins. Sinnemahoning Portage Creek, which drains to the Susquehanna River, and its sister watershed to the north—Allegheny Portage Creek—which drains to the Ohio River, served as major transportation routes by Native Americans traveling between the two major watersheds; hence the similar names associated with the adjacent sub-basins. The Sinnemahoning Portage Creek watershed drains approximately 70 square miles of mostly forested land (92%) and contains 160 miles of streams (Figure 3). Approximately 50% of the watershed is publicly owned, with some major land holdings secured by private forestry interests and the majority of remaining private lands are comprised of smaller parcels situated mostly along the stream valleys.

Forestry products have historically been the main industry within the watershed and continue to be a major economic driver. With the advent of horizontal drilling and exploitation of Marcellus shale for natural gas extraction, drilling and transport of gas has become a significant economic driver as well. The expansion of exploration, extraction and transport of gas has put additional strains on roads and highways within the watershed. A railroad line follows Sinnemahoning Portage Creek for most of its length. Construction of the railroad, highways and roads within the valleys along many of the streams has altered the natural processes associated with fluvial systems, often preventing the streams from fully utilizing their natural floodplains. These man-made alterations cause the stream to be constricted during high flows, which can lead to erosion problems within the stream channel. In some instances, the stream channel has been altered to allow for easier transportation infrastructure construction.

In the summer of 2006, a train derailment within the headwaters of Sinnemahoning Portage Creek near the village of Gardeau caused highly toxic levels of sodium hydroxide to enter the stream (Figure 1). A massive fish kill, along 11 miles of Sinnemahoning Portage Creek, an additional 20 miles of the Driftwood Branch of Sinnemahoning Creek, and several more miles of the Sinnemahoning Creek mainstem occurred. As part of the settlement with the railroad company for damages resulting from the spill, funding became available to address environmental concerns within Sinnemahoning Portage Creek and surrounding watersheds. It is part of that funding that provided for the visual assessment that was performed by Western Pennsylvania Conservancy on Sinnemahoning Portage Creek that is the focus of this report. The purpose of the assessment was to provide a baseline understanding of the physical in-stream habitat of the watershed and to document current water quality conditions.

Water quality within Sinnemahoning Portage Creek is very good, with many segments designated as Exceptional Value, or High Quality Cold Water Fisheries. In addition, many of the streams support native brook trout populations with natural reproduction occurring regularly. None of the streams within the watershed have been designated as impaired by the Pennsylvania Department of Environmental Protection (DEP).

Abandoned mine drainage (AMD) is not a major influence within the watershed, as the amount of bituminous coal is sparse within the watershed. The primary pollution source within Sinnemahoning Portage Creek watershed is sedimentation from unstable streambanks and dirt and gravel roads.

Because of the remote character of much of the watershed, many of the headwater tributaries are only accessible by foot and therefore remain pristine. Aquatic habitat within Sinnemahoning Portage Creek is generally good, although some portions of the mainstem lower in the watershed have been somewhat channelized or altered to create areas with shallow runs and little cover. More remote areas of the watershed contain a good variety of habitat, with large woody debris (LWD) serving as a significant habitat type. Within the lower reaches of the watershed, LWD represents a much smaller percentage of the available habitat as the stream gets wider and velocity decreases.

According to the modified United States Environmental Protection Agency (EPA) Rapid Bioassessment Protocol (RBP), which was used to complete the assessment, the average rating of a Sinnemahoning Portage Creek watershed segment was suboptimal. However, many of the suboptimal ratings were in the upper range, indicating that, overall, the watershed is in excellent condition.

Figure 1. Sinnemahoning Portage Creek valley near the location of the train derailment

Assessment Methodology

This study of Sinnemahoning Portage Creek utilized the EPA RBP for habitat assessment (Appendix 1). Field surveys were completed between March 2011 and October 2013, spanning multiple field seasons and completed by numerous staff of the Western Pennsylvania Conservancy Watershed Conservation Program (WPC). This report is a synthesis of collected data, field observations, notes on water quality, potential impairment sources and descriptions of potential restoration projects (Figure 2). The report is intended to be complimented by the Geographic Information System (GIS) developed as a second deliverable for the project. The project area for this assessment is shown in Figure 3.

Figure 2. pH, water temperature and conductivity were some of the water quality parameters collected at each stream segment

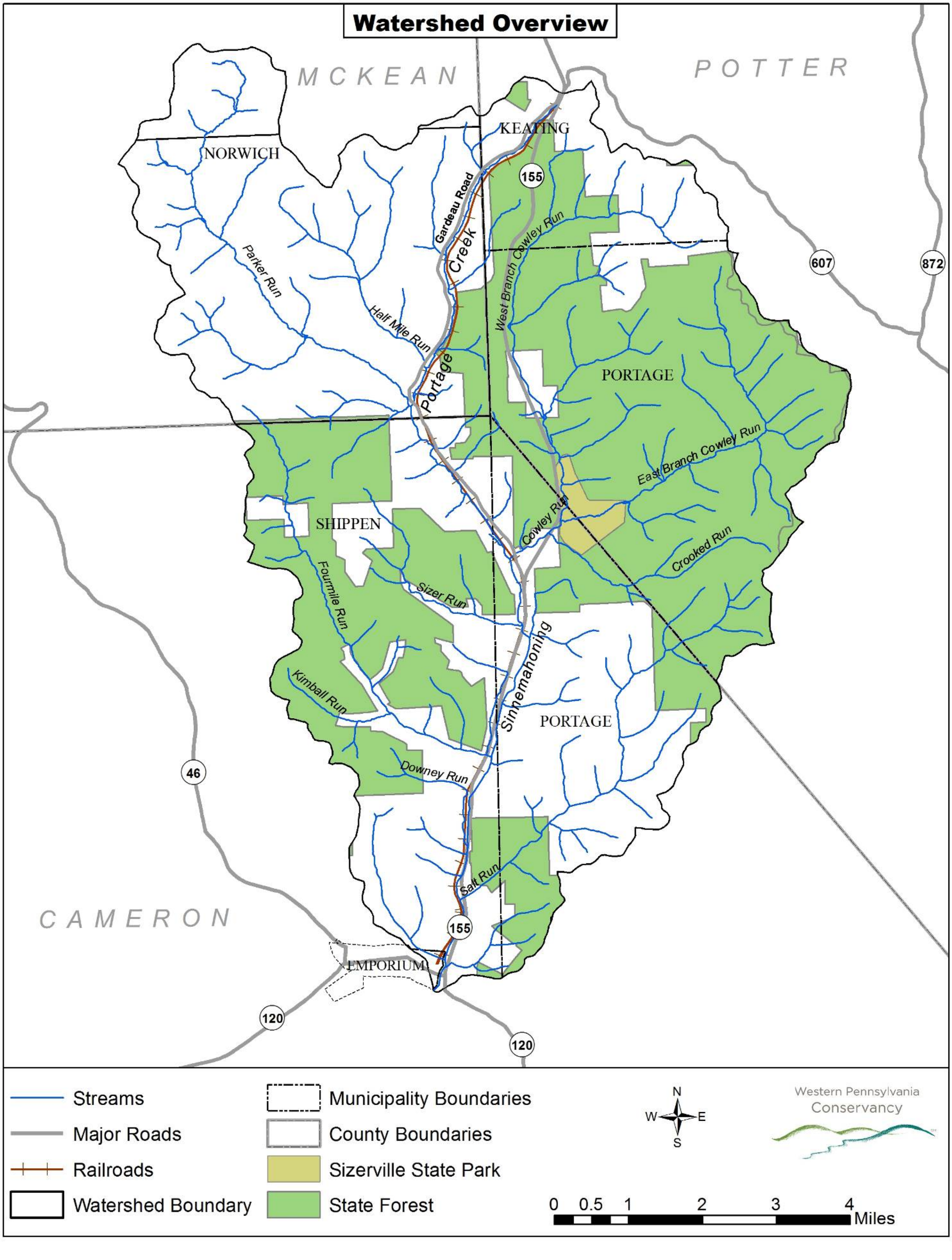

Figure 3. Project area for the assessment and report

Subwatershed Summary Organization

In order to organize the habitat assessment data into a usable and understandable manner, the stream reaches of Sinnemahoning Portage Creek have been grouped into subwatersheds. In the case of stream segments that flow directly into the mainstem Sinnemahoning Portage Creek and are not identified as a subwatershed, those segments will be grouped with the mainstem and detailed in that section. The subwatersheds are listed in order from the headwaters to the mouth as follows, Half Mile Run, Parker Run, Cowley Run, Sizer Run, Fourmile Run and Salt Run. Due to the fact that Cowley Run is an exceptionally large subwatershed within the Sinnemahoning Portage Creek watershed, it is more useful to describe the East Branch and West Branch of the creek separately as detailed below in the subwatershed summaries.

Stream segments are referenced by name, and where appropriate, segment ID, which is the unique identifier given by the GIS to each segment as a means for data organization. Stream segments, or reaches, in this study are defined as a single stretch of flowing water from tributary to tributary. The GIS ID is not hierarchical, as it was derived by using an existing unique number within the stream data layer and utilizing that number as a means to join the spatial data in the GIS with the tabular data collected during the course of the assessment. As seen in Figure 4, stream segment 1269 begins at the confluence of segment 1988 and segment 1856, and extends downstream until segment 1458 enters; thus, delineating the individual stream reach assessed. More information on this methodology can be obtained by reviewing the EPA RBP (Appendix 1).

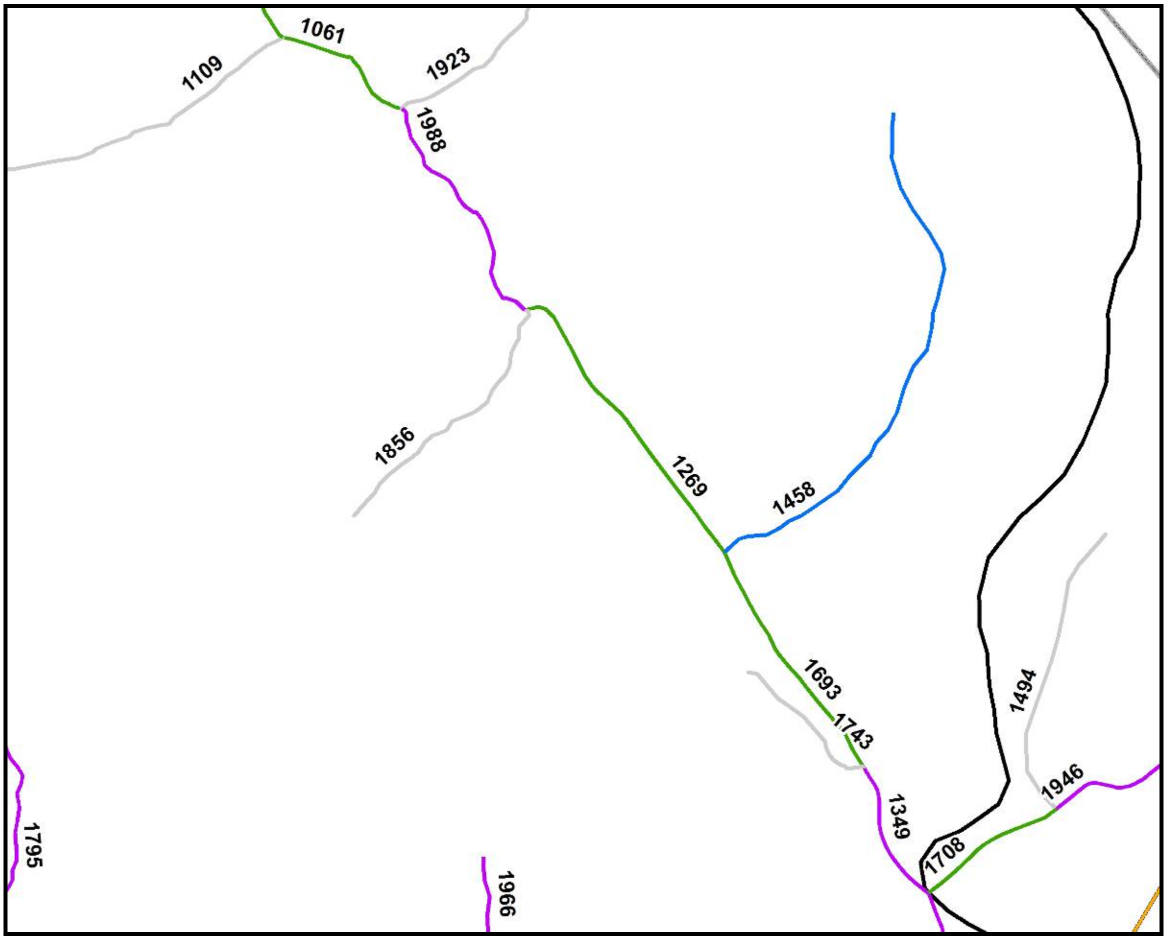

Figure 4. Assessment segments as delineated from reach to reach by the GIS database

The focus of this report is directed to stream segments that are in need of improvement and are also accessible enough to permit such improvements by heavy equipment and contractors. While there are segments in the headwaters of the watershed that were noted as needing habitat improvements, these locations are not feasible as project locations for the type of streambank restoration and habitat improvement projects of the scale typically completed by the Pennsylvania Fish and Boat Commission (PFBC) due to both stream size and accessibility.

Each subwatershed summary includes an identification of use as identified by DEP Chapter 93 Designated Use (Figure 5), extent of wild trout natural reproduction as identified by the PFBC (Figure 6) and land ownership represented as a percentage public or private, as identified by WPC. Following that, is an overview of subwatershed characteristics, primary impairments and potential projects. Photographs of specific attributes and issues are included as applicable for each of the subwatershed locations. Concluding each summary, is a table of the segments assessed within the subwatershed, scores given for each for category and the overall score. Green highlights indicate a categorical score of Optimal, with numerical scores ranging from 16 to 20. Red highlighting indicates a score of Marginal or a numerical score from six to 10. There were no segments in the watershed that were identified as being in Poor condition for overall score (zero to five score). More information on individual segments can be obtained by referencing the segment ID and referring to notes in the GIS database.

Document Note:

Due to the time span over which this data was collected and the static nature of the data itself, there may be scores and summaries that do not accurately reflect the current conditions of the segments. Changes in reach conditions were observed even as fieldwork was being conducted. Some reaches had improvement work done after the assessment of the reach, while others had changes in land use or habitat that may have lowered reach ranking. Moreover, this entire document should be used as a general guide and watershed summary. Any improvements made or new degradation points should be taken into account when planning restoration projects.

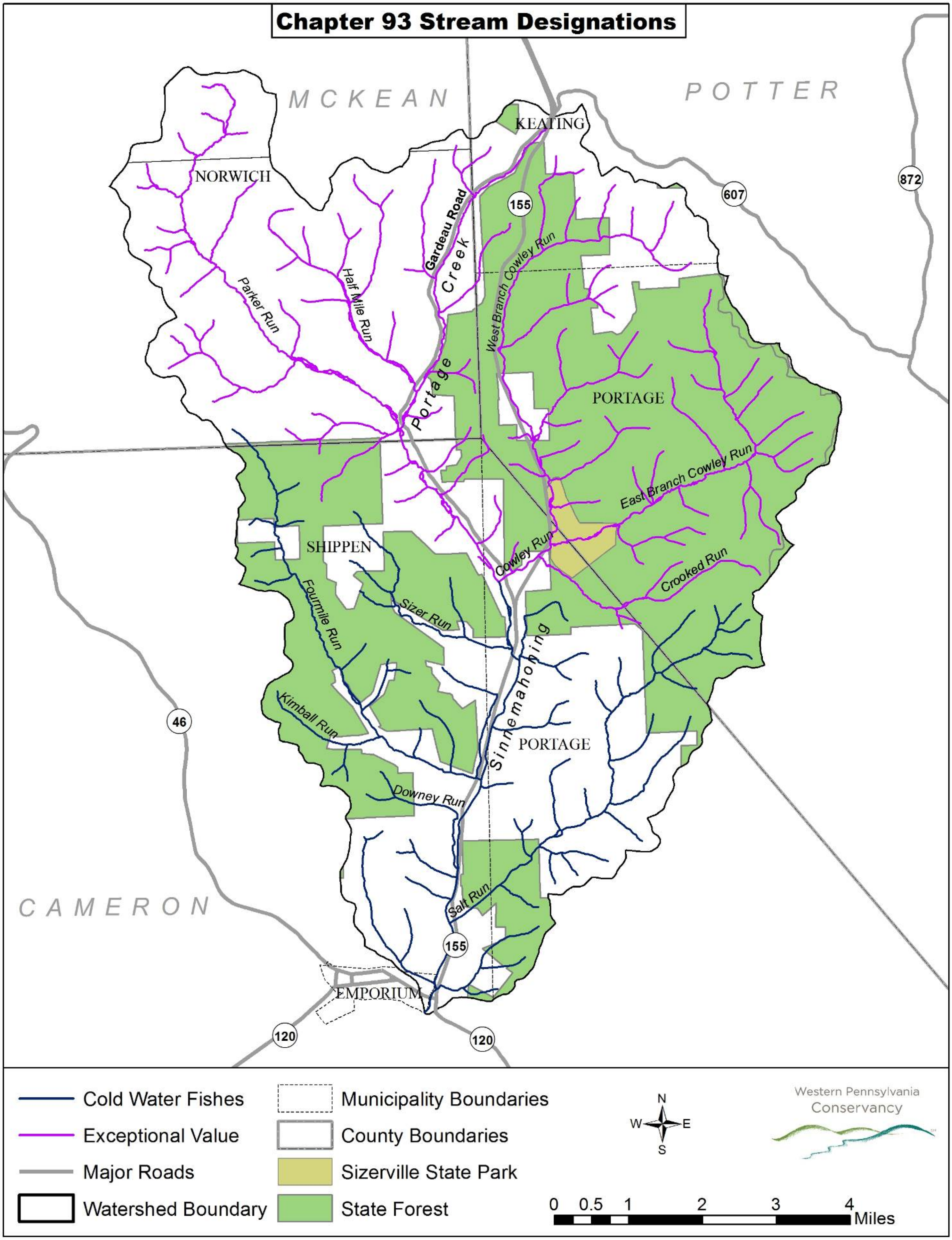

Figure 5. PA DEP Chapter 93 stream designations

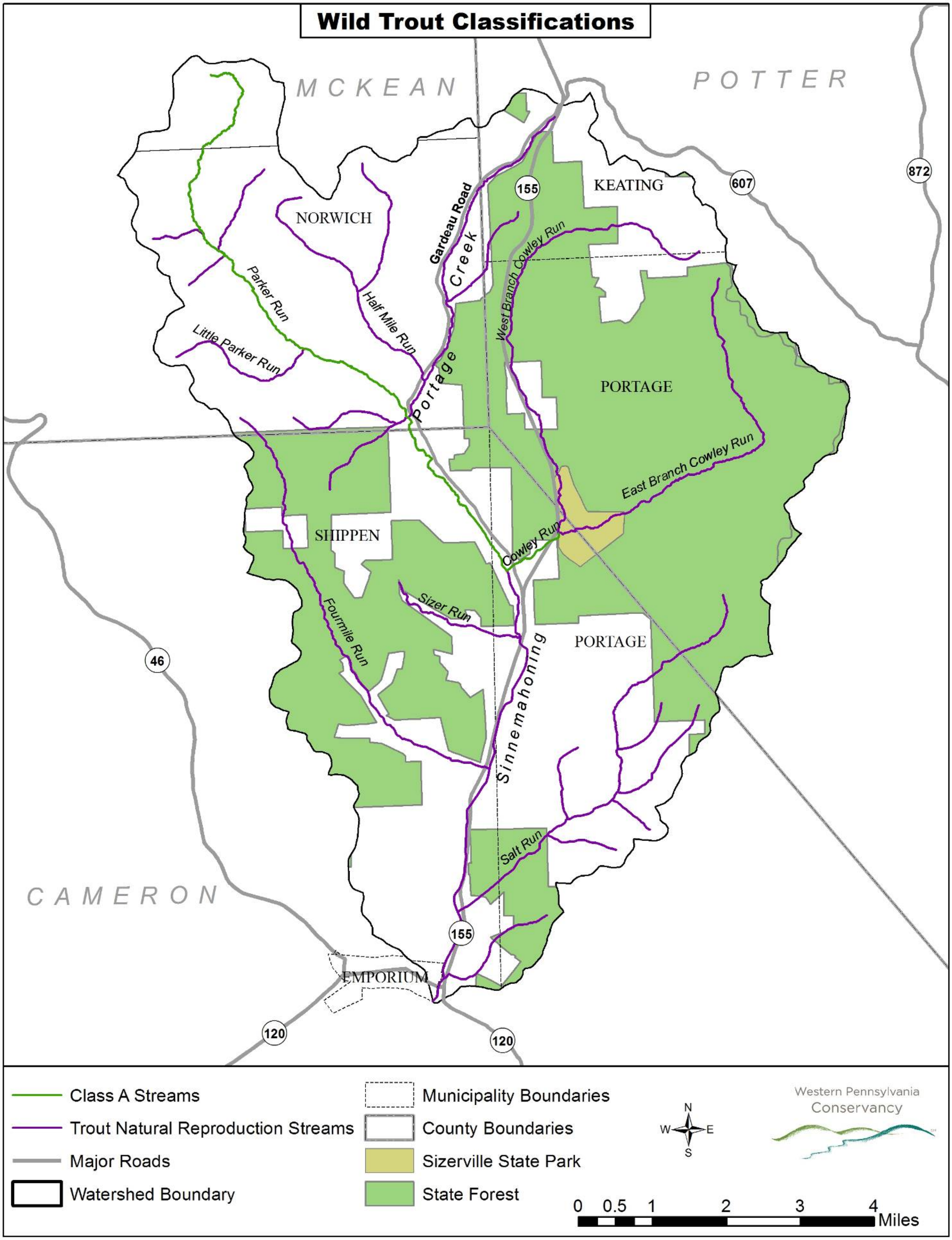

Figure 6. PFBC wild trout population data

<u>**Overall Watershed Conditions**</u>

Primary Impacts

During the course of completing this assessment, primary impacts to the stream segment were noted on the score sheet. These impacts were based upon observations of the stream channel, riparian zone and adjacent land use. The categories include Active Pasture, Agriculture, Acid Precipitation, Bank Erosion, Development and Sedimentation. It is important to note that there are potentially other impacts to the stream segments and that this categorization was made based on a visual assessment of conditions. The following maps (Figures 7–14) give a good overview of conditions in the entire Sinnemahoning Portage Creek watershed, but more detail can be found in both the subwatershed reports and individual segment score sheets in the included Access database, as well as by utilizing the GIS built for this project.

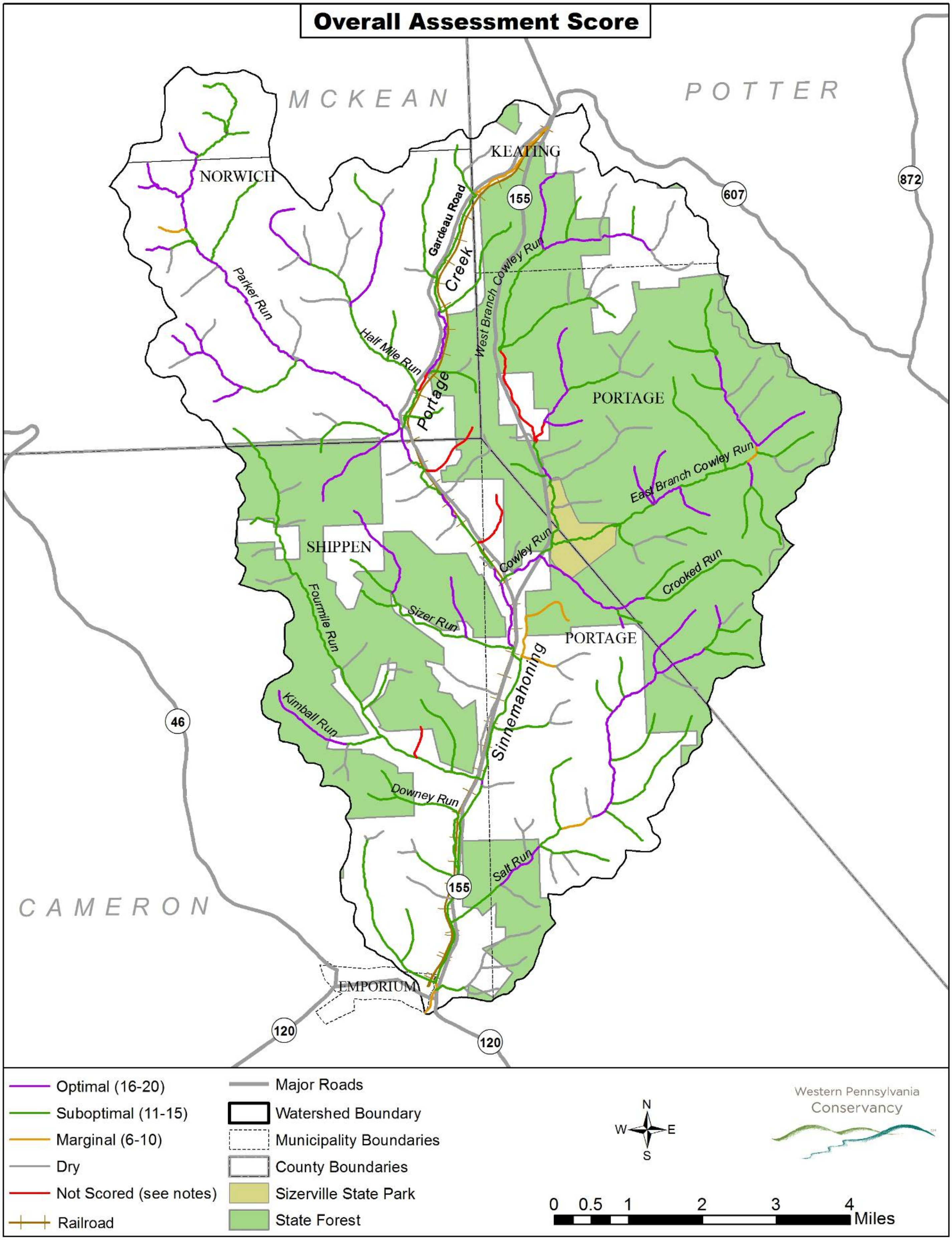

Figure 7. Overall in-stream habitat score by stream segment

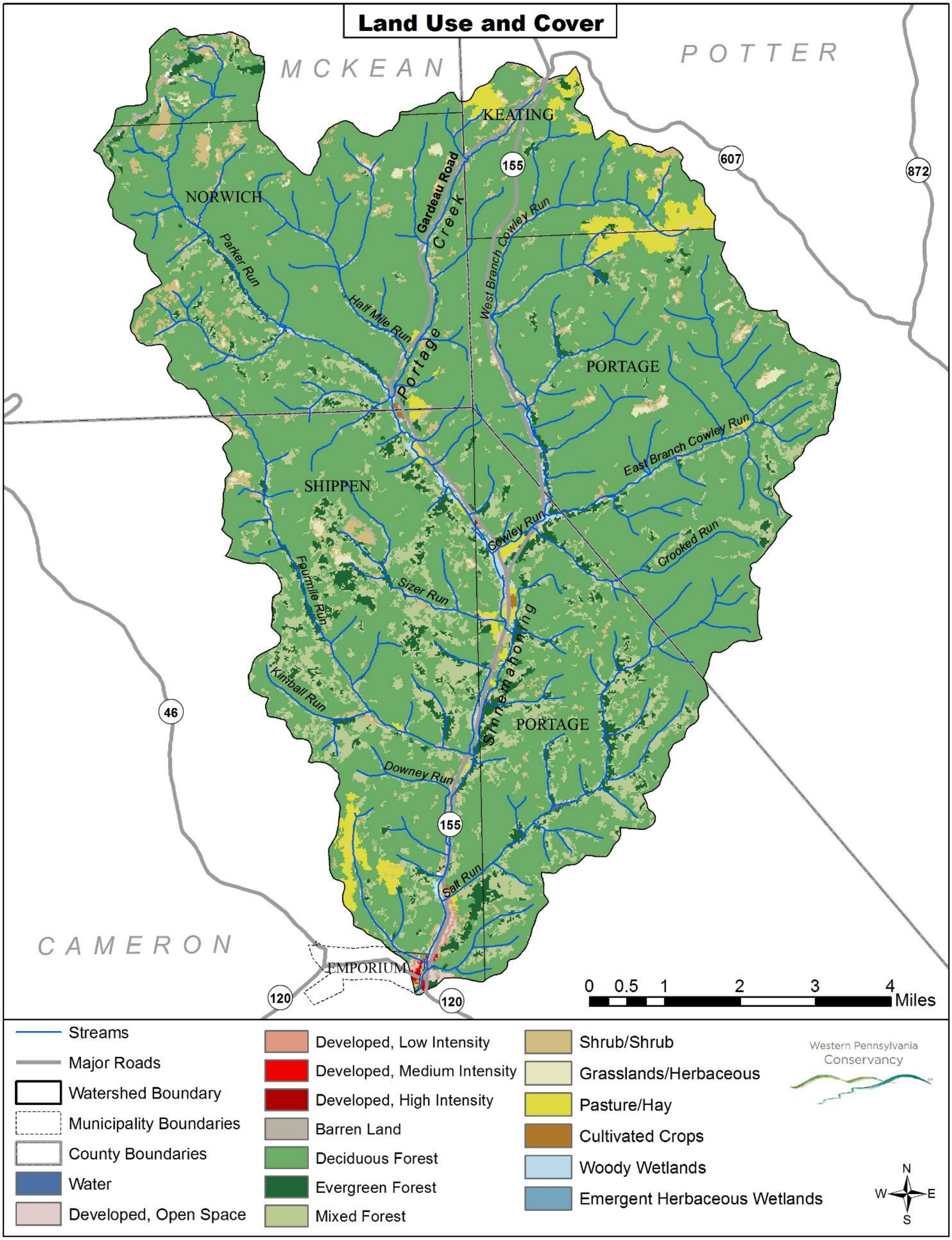

Figure 8. Land use land cover in the Sinnemahoning Portage Creek watershed (2006)

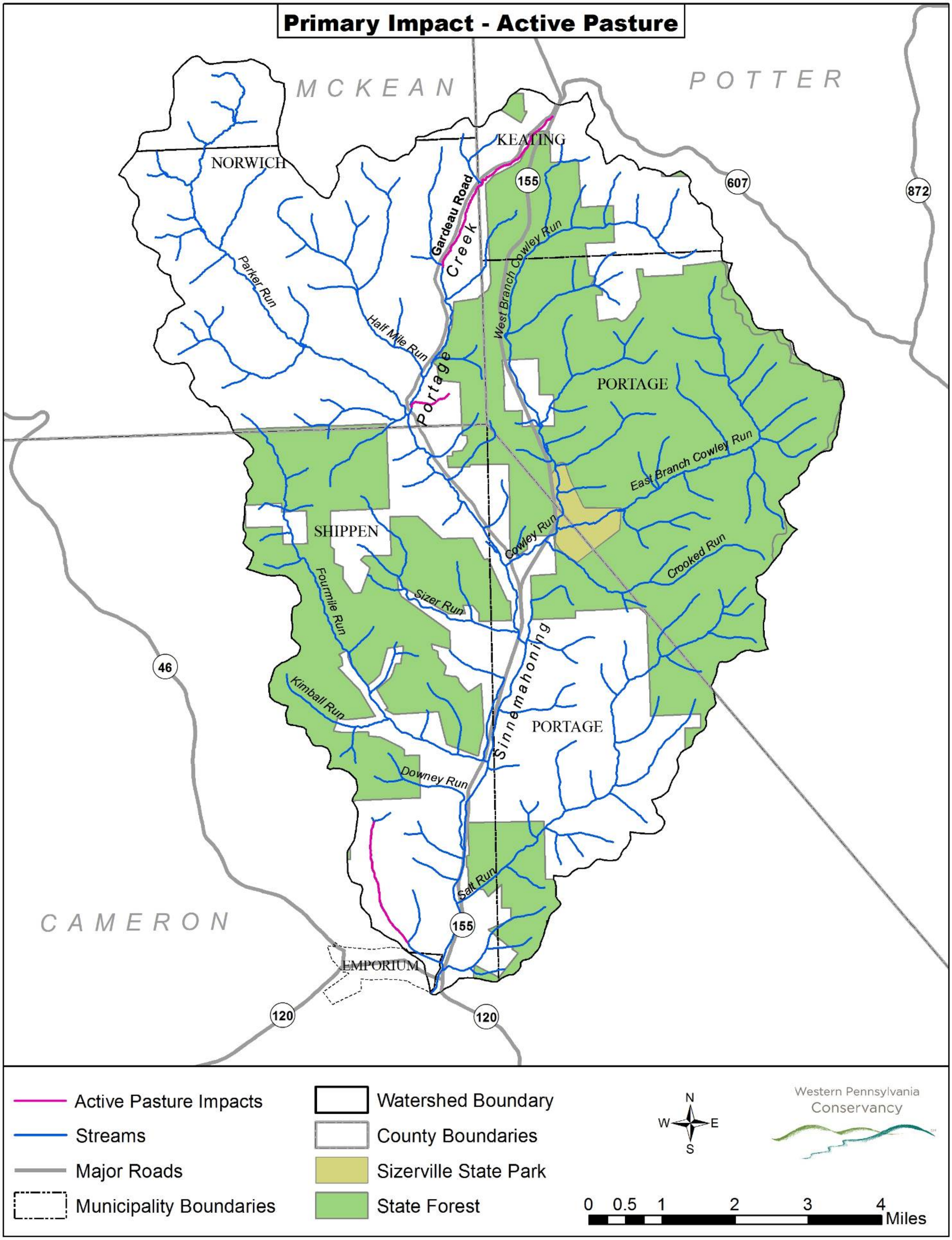

Figure 9. Assessed segments where active pasture impacts were noted

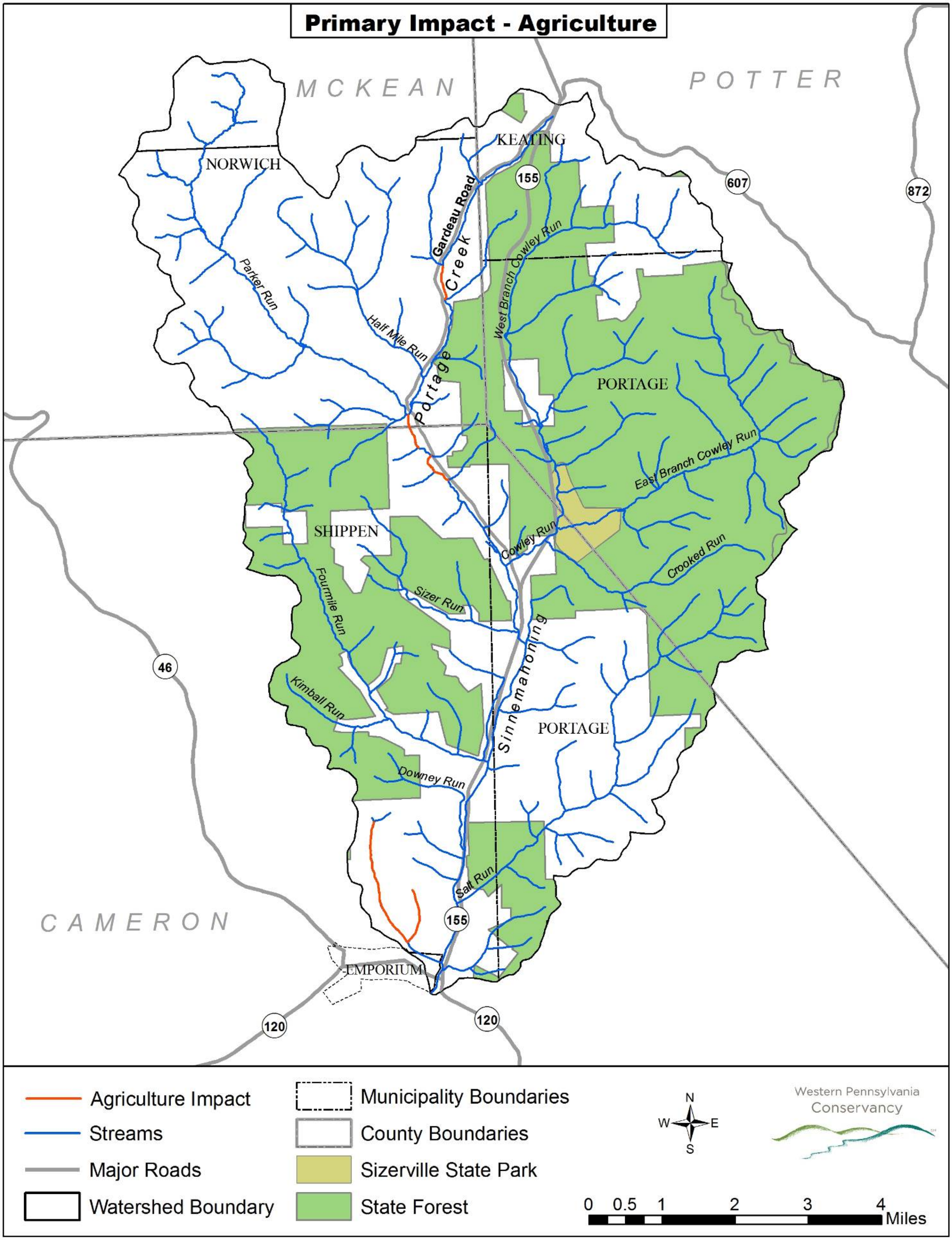

Figure 10. Assessed segments where agricultural impacts were noted

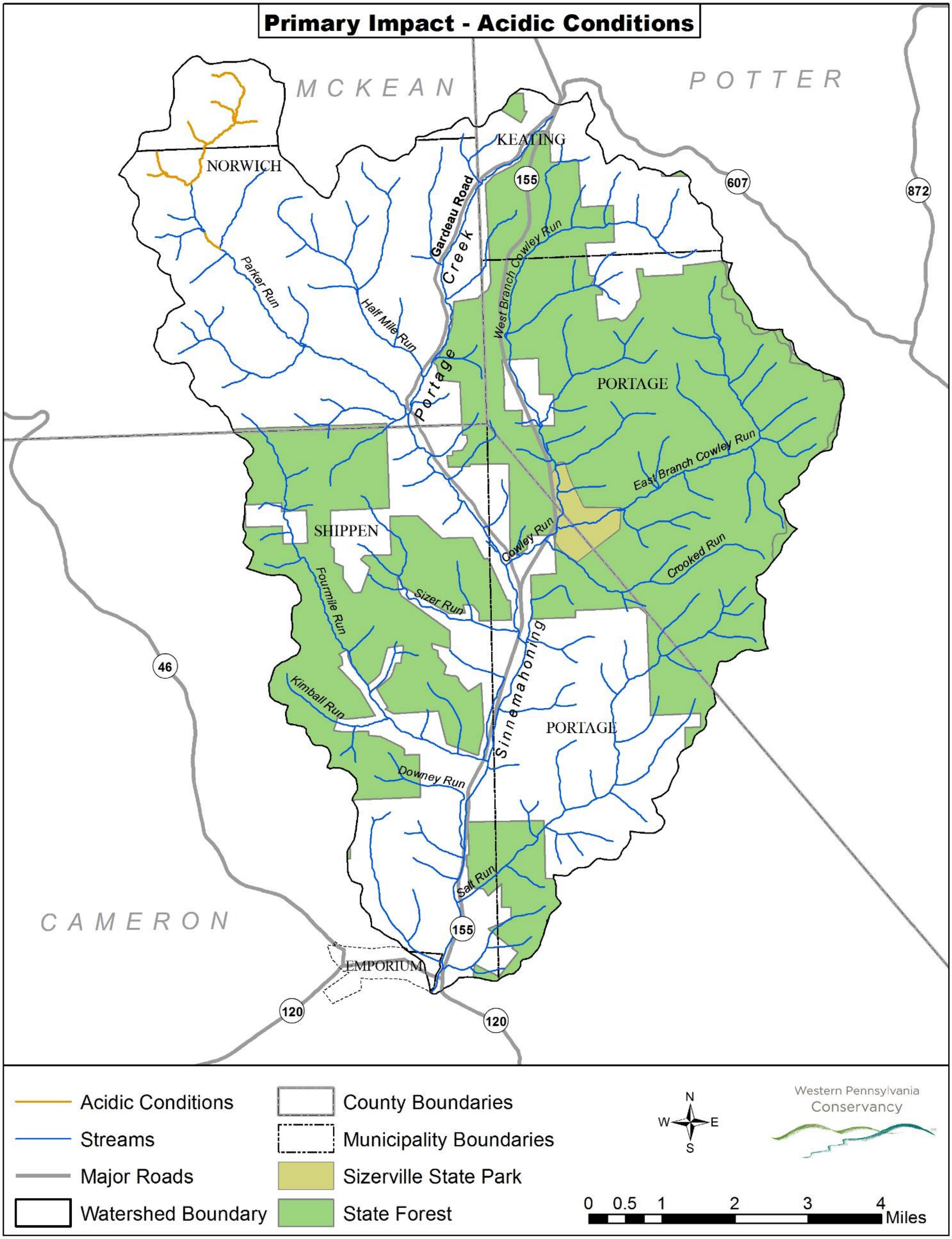

Figure 11. Assessed segments where acidic condition impacts were noted

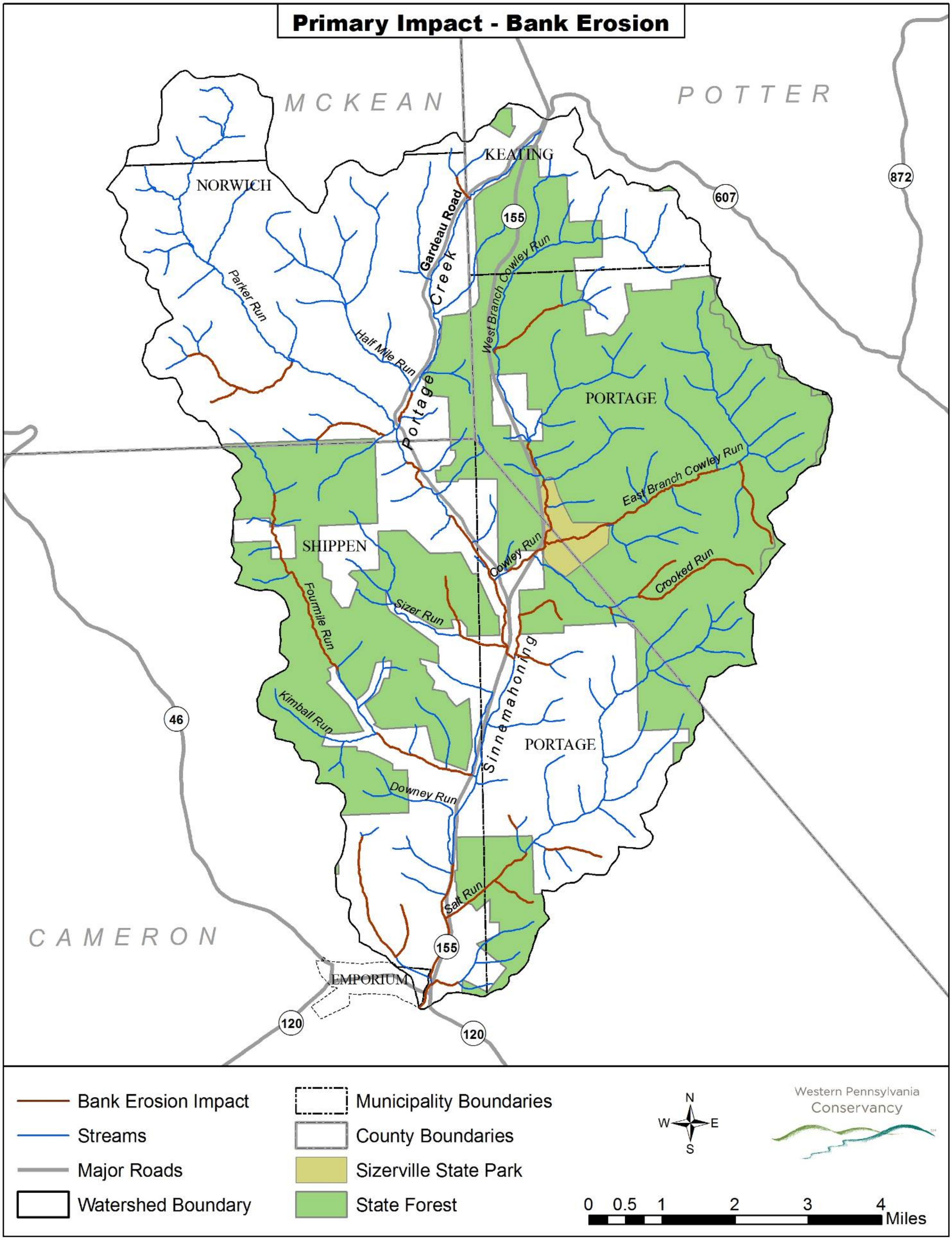

Figure 12. Assessed segments where bank erosion impacts were noted

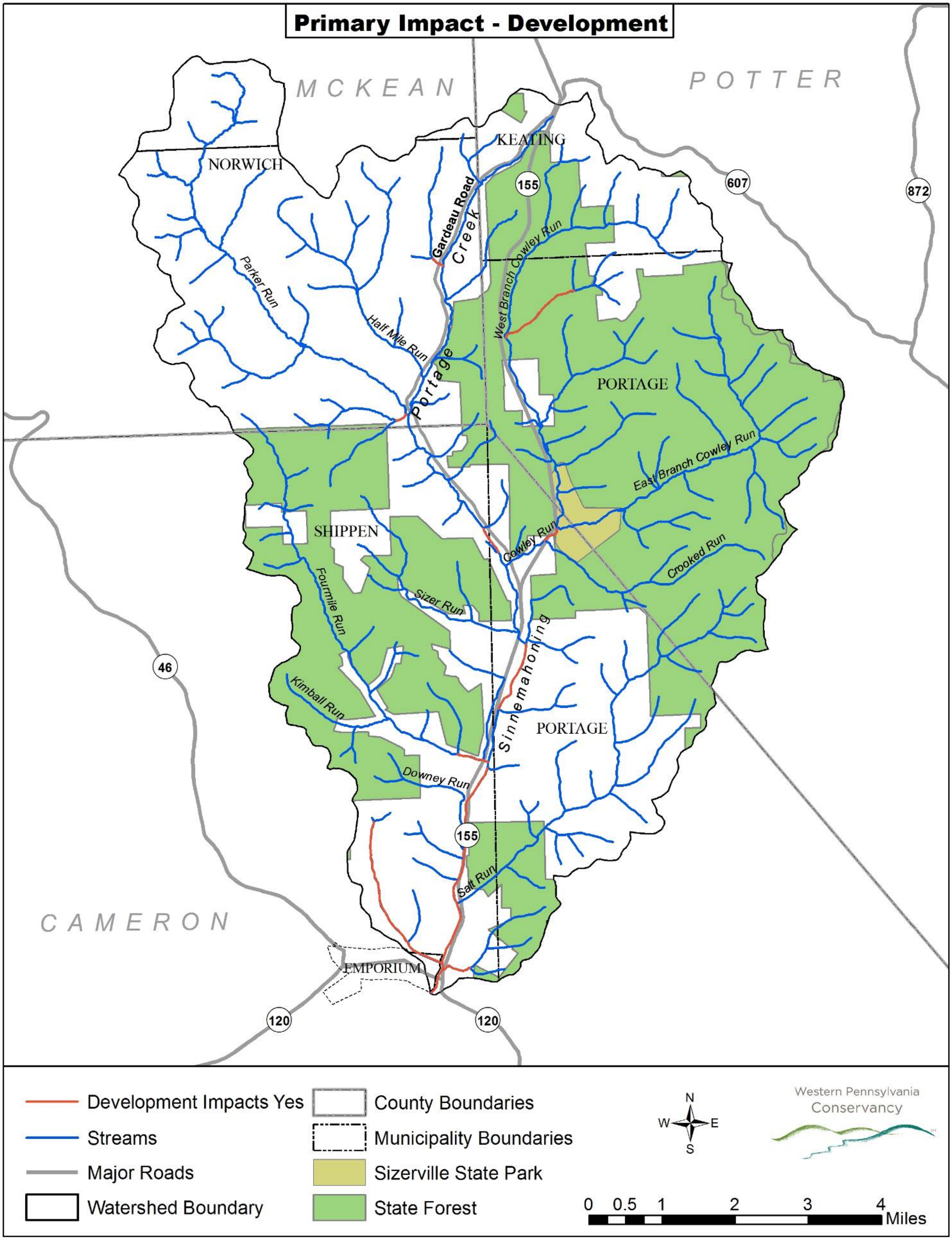

Figure 13. Assessed segments where development impacts were noted

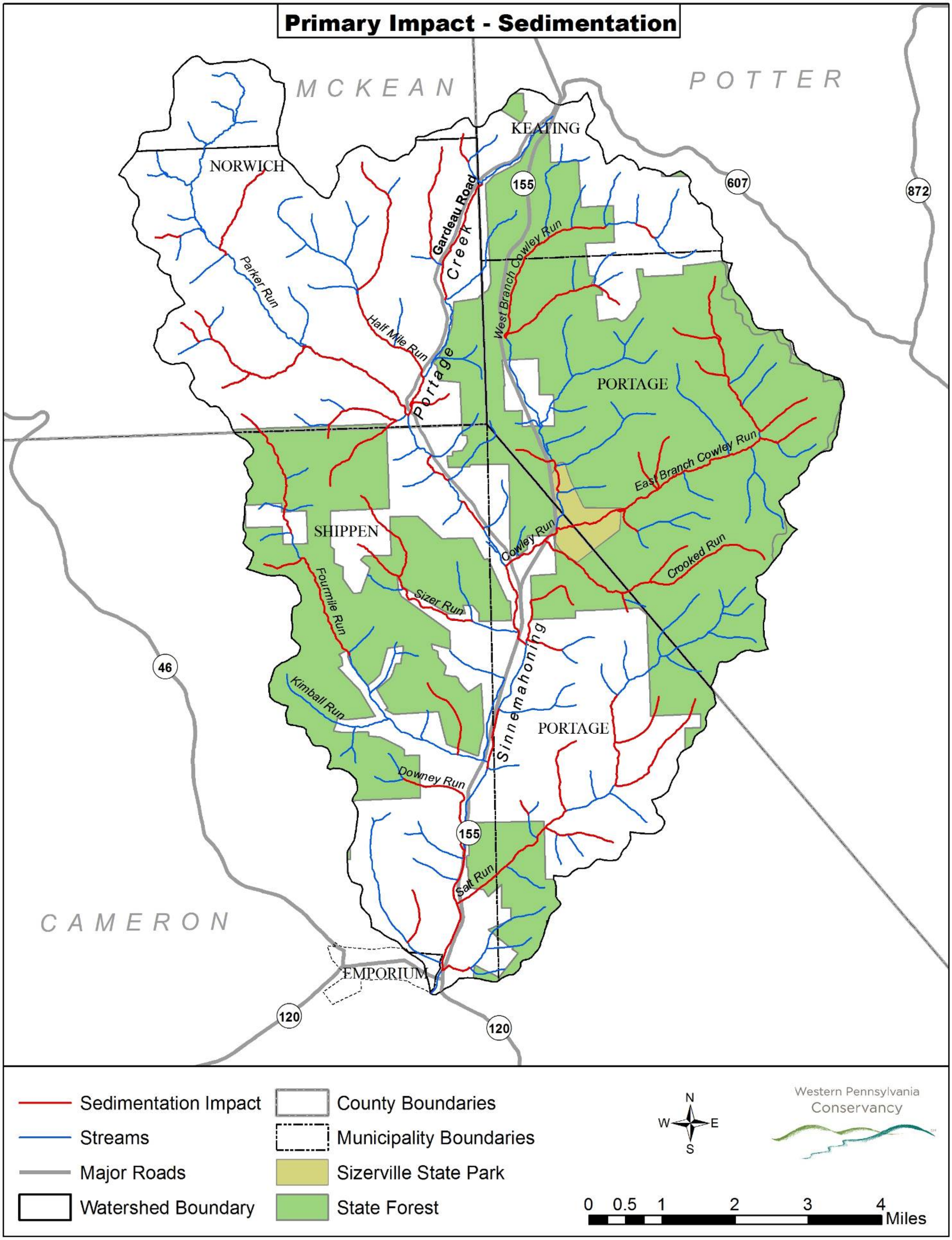

Figure 14. Assessed segments where development impacts were noted

Stream-Road Intersections

During the course of this assessment, notes were taken referencing constrictions due to bridges and culverts. This information is contained in the Access database and the GIS. In an effort to elaborate on this information, WPC completed a stream-road intersection inventory. Using GIS and several data layers, an analysis was completed that identified points where the stream data layer was intersected by a road layer. Due to the coarse scale of the data, field verification was then completed to the best extent possible. The resulting inventory identified 43 culverts of various sizes and condition in the watershed (Figure 16). These were verified on state and local roads, as well as State Forest and private roads to the extent that access to the site was possible. While not entirely comprehensive, the information provides a good starting point for improving stormwater capacity and aquatic organism passage in the watershed. The map below also depicts segments that were identified as having culverts during the course of the assessment, but may not have been verified. More information on those segments can be found in the Access database and the Excel file included with this report.

Figure 15. WPC staff performed a basic culvert inventory

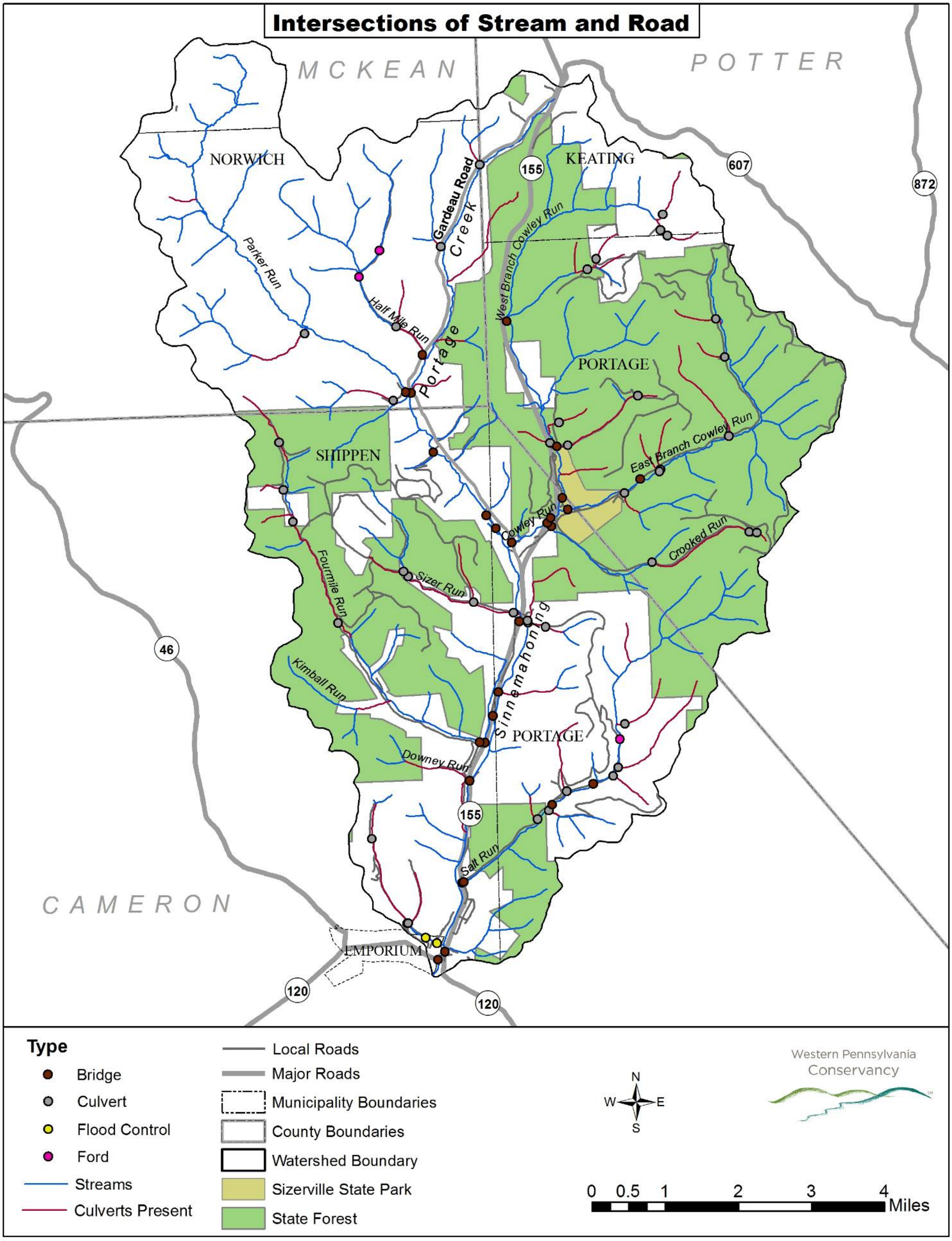

Figure 16. Assessed segments with stream-road intersections

I. Half Mile Run Subwatershed

Chapter 93 Designation: Exceptional Value
Class A Wild Trout: N/A
Wild Trout (Natural Reproduction): Half Mile Run, Left Branch Half Mile Run, Right Branch Half Mile Run
Land Ownership: 100% Private

Subwatershed Characteristics

The Half Mile Run subwatershed is comprised of 10 scored segments of assessed stream, including the Left Branch, Right Branch and one unnamed tributary, totaling 6.4 miles in length (Figure 19, Table 1). Seven segments in this subwatershed were ephemeral and dry when surveyed so they were not evaluated. Of the 10 segments assessed, five were scored as Optimal and five were scored as Suboptimal. Land use in this subwatershed was primarily forest (average of 94% of land use), with only minimal development in the form of field/pasture and seasonal residences. Connectivity to the floodplain was largely intact, with only two segments being less than 100% connected; and in the areas with a disconnect, there is minimal potential for human impacts from flooding.

Primary Impairments

Moderate sediment contributions to the streams were noted due to a dirt and gravel road (gated and locked) that runs parallel for a majority of the mainstem of Half Mile Run before splitting and following along the two branches. Generally, the road maintains a distance from the stream channel; however, it is affecting the riparian zone for its length. The road also fords the stream at multiple locations, creating potential sources of increased sedimentation (Figure 17). Sediment deposition was evident enough on segment 1904 for the reach to be scored as Marginal for that category; however, the minimal use this road receives is likely why the issue is not more severe. Potential stormwater inputs from road ditches are also contributing sediment to the stream. Dirt and gravel road projects were mentioned as possible improvement opportunities in the places were the road is impacting the stream, therefore it is likely this will be a top priority project for improvements to Half Mile Run.

Figure 17. Ford on segment 193, Right Branch of Half Mile Run

Potential Projects

Bank stability and riparian vegetation scores for the subwatershed were all in the Suboptimal or Optimal range. However, there was photographic documentation of eroding banks, the most severe being on segment 1236 (Figure 18).

Figure 18. Actively eroding bank on segment 1236

The categories that received the lowest scores were velocity/depth regimes and channel flow status, indicating potential habitat improvement projects. Channel braiding is a likely reason for these lower scores, as available flow struggles to fill overly-wide multiple channels. Potential habitat improvement projects could be related to increasing LWD in the stream. A lack of pool habitat or slow-deep/fast-deep depth regimes was noted on several segments (1236, 1338, and 1794). Due to an average stream width less than 12 feet for all segments in the subwatershed, large scale improvement projects are not probable until the first section of the stream before the mouth (1568). This section shows evidence of being channelized and is crossed by a road bridge approximately 400 feet upstream from the mouth. This segment would also be a good candidate for streambank stabilization projects, as there is evidence of erosion and stability issues as well as excellent access via Gardeau Road.

Segment 1079 had a small impoundment that forms a pond adjacent to a camp, increasing sediment deposition upstream. This segment also shows small signs of AMD seeps through iron build-up, but the impact of these seeps is local and minimal. Due to its location in the headwaters of the Right Branch of Half Mile Run, it is not likely to be a high priority project. This segment could also benefit from an improved riparian buffer, as the camp owners are mowing to the top of the streambank. Segments identified as having a need for improvement are shown on Figure 20.

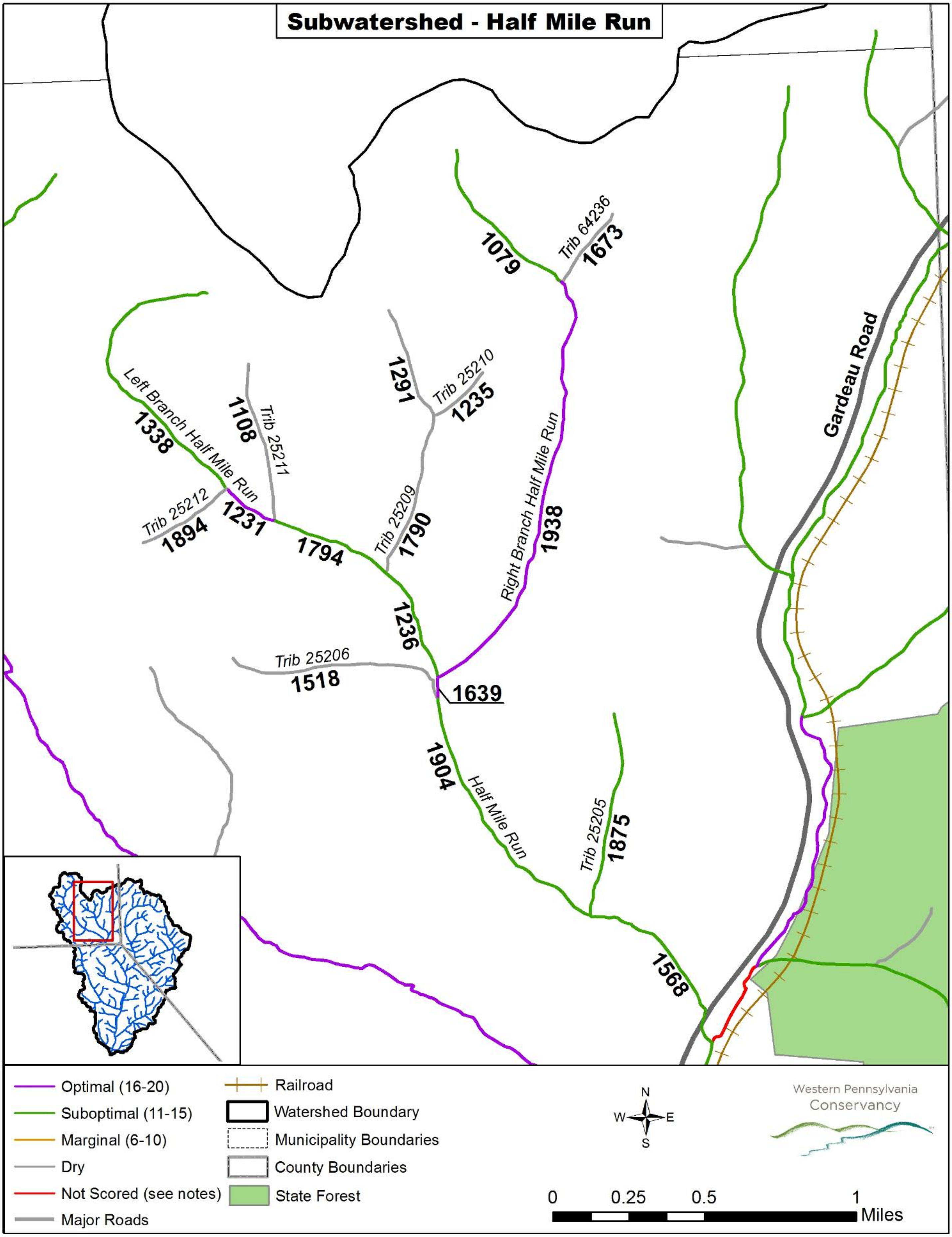

Figure 19. Assessed segments in the Half Mile Run subwatershed.

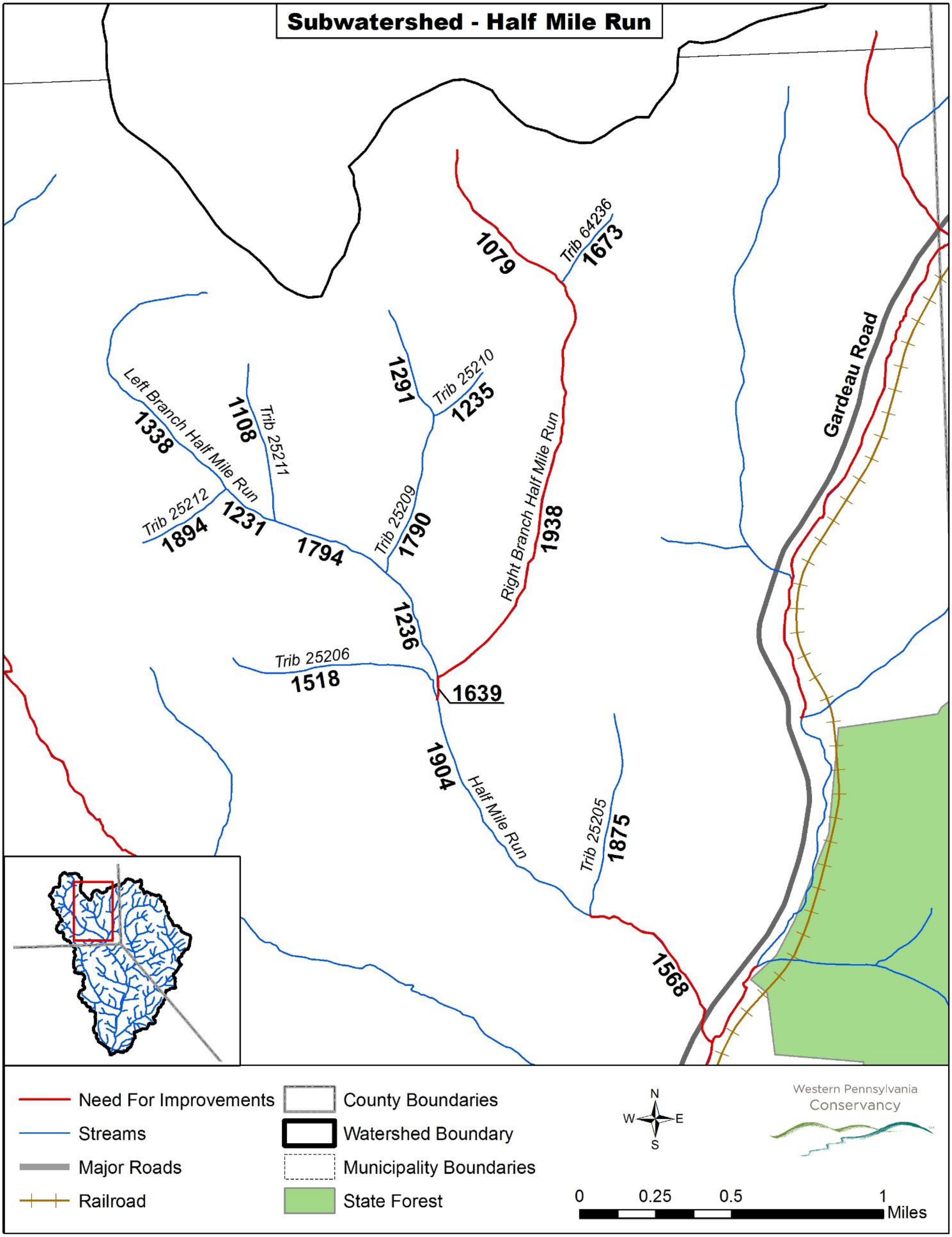

Figure 20. Segments needing improvement in the Half Mile Run subwatershed.

Table 1. Summary Scores for Half Mile Run Subwatershed

Name	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Score
Half Mile Run	0.40	1236	13	16	10	15	13	17	15	14	14	14	14.0	Suboptimal
Half Mile Run	0.65	1568	18	14	19	11	14	10	17	16	14	12	14.5	Suboptimal
Half Mile Run	0.07	1639	16	17	18	15	16	17	18	13	15	16	16.1	Optimal
Half Mile Run	0.92	1904	18	9	16	10	10	17	16	16	16	18	13.6	Suboptimal
Left Branch Half Mile Run	0.20	1231	18	16	14	15	17	18	16	18	18	18	16.8	Optimal
Left Branch Half Mile Run	1.04	1338	16	16	9	15	10	18	17	16	18	18	15.3	Optimal
Left Branch Half Mile Run	0.41	1794	13	16	10	16	12	18	18	14	13	17	14.7	Suboptimal
Right Branch Half Mile Run	0.59	1079	16	14	16	16	14	13	16	16	16	14	15.2	Suboptimal
Right Branch Half Mile Run	1.48	1938	18	17	18	16	16	15	18	14	16	15	16.3	Optimal
UNT 25205 to Half Mile Run	0.68	1875	12	16	5	15	7	15	5	18	18	16	12.7	Suboptimal

II. Parker Run Subwatershed

Chapter 93 Designation: Exceptional Value
Class A Wild Trout: Parker Run (headwaters to mouth)
Wild Trout (Natural Reproduction): Parker Run, North Branch Indian Run, South Branch Indian Run, Little Parker Run, Stone Chimney Hollow, O'Brien Hollow, Doubler Hollow
Land Ownership: 94% Private, 6% Elk State Forest

Subwatershed Characteristics

The Parker Run subwatershed is the second-largest subwatershed of Sinnemahoning Portage Creek. Thirty-four segments were assessed, totaling 19.8 miles in length (Figure 25 and Table 2). Seven segments in this subwatershed were dry and were not evaluated. Of the 34 segments assessed, 20 were scored as optimal, 13 as Suboptimal and one as Marginal (Figure 25). Parker Run mainstem and a majority of its tributaries flow through property owned by large timber management companies. Erosion and sedimentation regulations are being maintained and there was very little evidence of forestry being an impact to in-stream habitat. Few exceptions to this were noted and will be discussed below. Due to the majority of the land in this subwatershed being owned and managed by timber companies, specifically FORECON Inc. and Hancock Resource Management Group, it is not expected that future development will impact the stream.

Land use in the riparian zone for the stream segments of the Parker Run subwatershed was predominately forest (mean = 88%), with 3% field/pasture, 1 % residential, 6% dirt & gravel roads and 2% wetland. Features of note were active beaver ponds on the mainstem of Parker Run, especially along segments 1237 and 1549.

Primary Impairments

Generally, Parker Run subwatershed was found to be in excellent condition. The streams in this section featured an abundance of available habitat, a complete series of depth regimes, and minimal riparian disturbance. Sedimentation issues could result from adjacent dirt & gravel roads in the watershed; however, there is usually an adequate buffer between the roads and stream segments throughout the watershed. One notable issue would be a ford on Parker Run at the upstream extent of segment 1982. This ford is no longer being used, but is still likely contributing sediment to the stream. Also in this area—one of the few in the subwatershed that showed evidence of recent timbering activity—is a culvert pipe on segment 1149 that is completely blocked by woody debris and stream substrate (Figure 21). This segment is short and held water only to the bottom end of the blocked culvert; however, trout were observed in the pool directly below the pipe outlet. Excessive sediment was noted in the reaches where beavers were active; however, due to it being natural, it is not likely these will be of interest for restoration activity by PFBC.

Figure 21. Debris choked culvert on segment 1149

The Parker Run subwatershed was the subject of an assessment and management plan completed by Trout Unlimited and Hedin Environmental for the McKean County Conservation District in 2011. This report indicated that acid deposition and historic coal mining are impacts to the water quality of Parker Run (Figure 22). Visual evidence of coal mining was noted by staff during our assessment, but based on the report mentioned above, it is unlikely that any restoration efforts related to coal activity would happen in the watershed for at least 15 years. More information on this topic can be found by reviewing the *Parker Run Assessment and Management Plan*, available from the McKean County Conservation District.

Figure 22. Iron seep in the headwaters of Parker Run, segment 1177

Potential Projects

The largest and likely most expensive project in the Parker Run subwatershed is the replacement of culverts on Little Parker Run. This location is the site of multiple pipe culverts underneath a road crossing that is collapsing, is poorly aligned and is choked with debris (Figure 23). Replacing this culvert will improve aquatic organism passage to more than three miles of upstream habitat. WPC has been in contact with the landowner and received permission to pursue funding to replace this culvert and will likely do so during the summer of 2014. Additional locations were noted throughout the watershed that could benefit from culvert improvements or upgrades. McKean County Conservation District is planning to implement dirt & gravel roads improvements in the watershed and will be a valuable partner in completing these projects.

Figure 23. Debris choked culvert on Little Parker Run

The North and South Branches of Indian Run, which enter Parker Run near its confluence with Sinnemahoning Portage Creek, is the site of two potential projects. Dirt & gravel roads in this section access areas away from the riparian zone but intersect the tributaries at two locations. One location is a ford that could be stabilized near the bottom of segment 1691. A culvert replacement project to enhance aquatic organism passage on segment 1637 (Figure 24) would also be feasible, especially due to easy access using the intersecting road. These roads are private, see limited vehicular traffic, and are used primarily by leasers to access the property. Due to the close proximity of these project sites, they could be completed at the same time, reducing sediment impacts to Indian Run and re-opening more than one mile of the North Branch of Indian Run for fish passage. Most of this property is managed by FORECON, Inc. out of Smethport, PA, and preliminary discussions regarding improvement projects were favorable.

Figure 24. Potential culvert replacement project on segment 1637

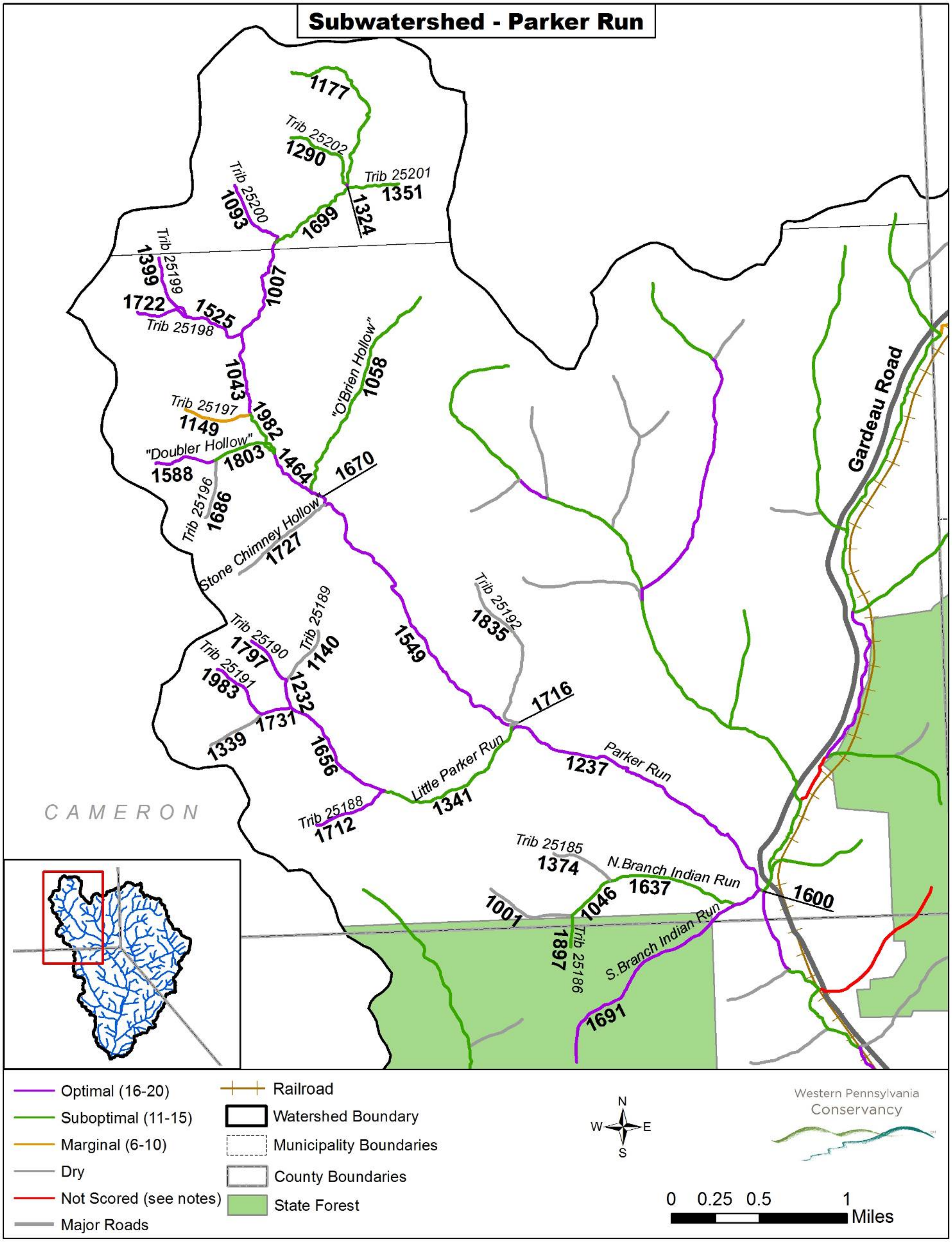

Figure 25. Assessed segments in the Parker Run subwatershed

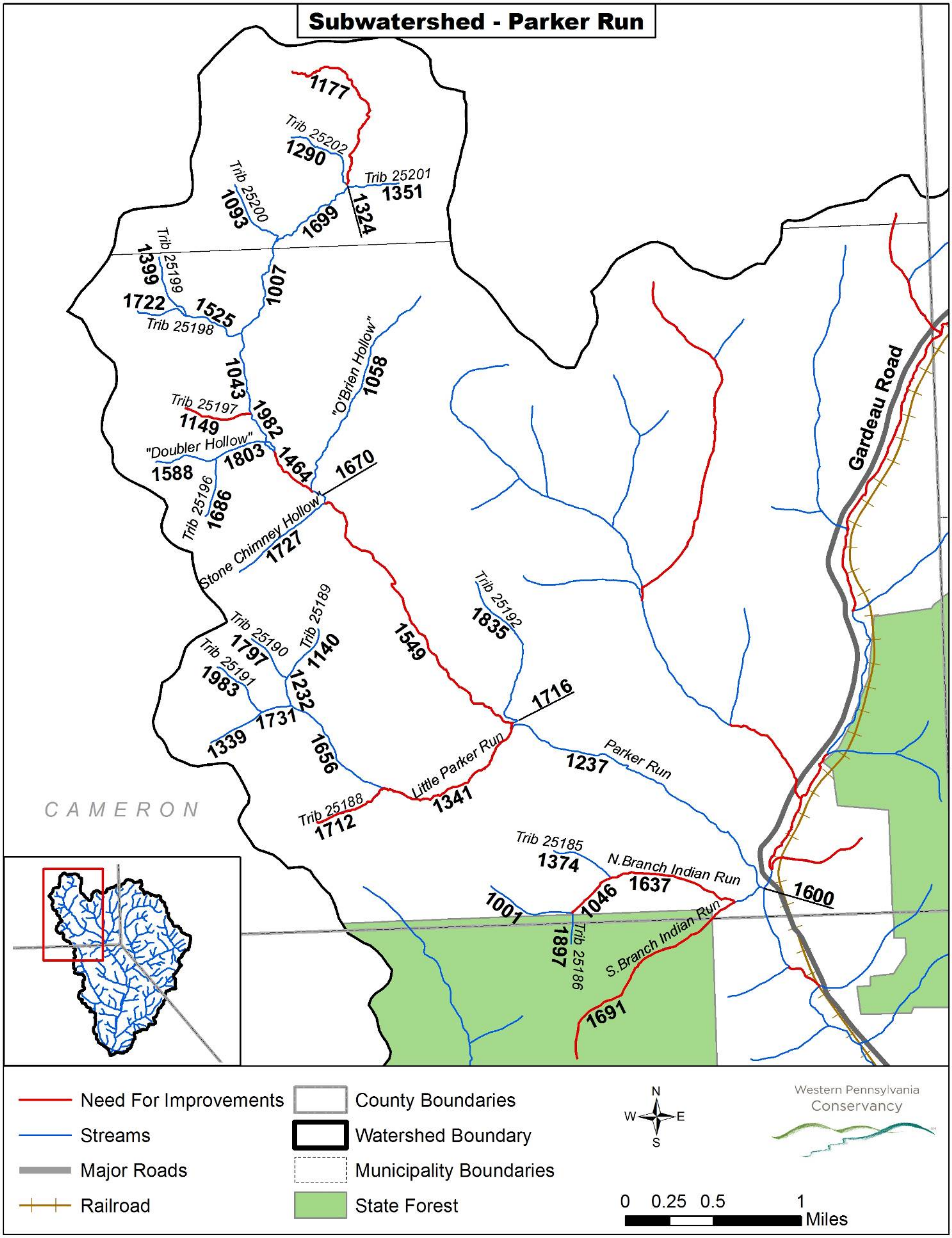

Figure 26. Segments needing improvement in the Parker Run subwatershed

Table 2. Summary Scores for Parker Run Subwatershed

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Score
"Doubler Hollow"	0.36	1588	18	16	13	16	17	19	17	18	18	16	16.8	Optimal
"Doubler Hollow”	0.39	1803	16	15	9	9	14	17	16	14	14	13	12.2	Suboptimal
"O'Brien Hollow"	1.35	1058	16	13	16	13	16	16	18	14	16	16	15.4	Suboptimal
Little Parker Run	0.75	1656	18	18	19	17	16	19	18	16	16	18	17.4	Optimal
Little Parker Run	0.17	1731	18	17	18	15	15	17	18	17	17	18	17.0	Optimal
Little Parker Run	0.94	1341	18	16	15	16	15	13	19	16	18	16	15.2	Suboptimal
North Branch Indian Run	0.31	1046	17	15	12	14	9	18	7	18	18	19	14.7	Suboptimal
North Branch Indian Run	0.74	1637	17	14	13	14	9	15	4	18	18	17	13.9	Suboptimal
Parker Run	0.63	1007	20	19	20	18	18	20	19	18	18	20	19.0	Optimal
Parker Run	0.48	1043	19	18	18	16	18	18	18	18	15	18	17.6	Optimal
Parker Run	1.86	1237	16	15	18	16	15	15	18	15	16	17	16.1	Optimal
Parker Run	0.00	1324	16	15	10	15	17	18	18	18	18	18	16.3	Optimal
Parker Run	0.33	1464	17	15	18	16	17	18	18	16	16	15	16.5	Optimal
Parker Run	1.82	1549	18	17	17	16	16	17	18	14	16	18	16.7	Optimal
Parker Run	0.12	1670	18	14	18	14	18	19	18	18	18	16	17.1	Optimal
Parker Run	1.10	1177	11	18	9	17	18	15	11	18	18	10	14.5	Suboptimal
Parker Run	0.03	1600	18	18	5	18	20	20	5	18	18	18	15.8	Suboptimal
Parker Run	0.58	1699	18	17	18	16	14	14	17	14	15	16	15.9	Suboptimal
Parker Run	0.00	1716	10	8	15	10	16	13	8	14	18	12	12.4	Suboptimal
Parker Run	0.29	1982	18	14	18	14	14	18	18	14	16	15	15.9	Suboptimal
South Branch Indian Run	0.18	1619	16	15	15	16	15	20	18	17	18	18	16.8	Optimal
South Branch Indian Run	1.37	1691	19	18	19	18	15	19	20	18	18	18	18.2	Optimal
UNT 25186 to North Branch Indian Run	0.18	1897	17	15	12	14	9	18	7	18	18	20	14.8	Suboptimal
UNT 25188 to Little Parker Run	0.45	1712	18	17	16	17	18	15	17	18	18	16	17.0	Optimal
UNT 25189 to Little Parker Run	0.16	1232	19	18	15	18	18	19	18	18	18	15	17.6	Optimal

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Score
UNT 25190 to Little Parker Run	0.32	1797	19	18	16	17	16	19	18	17	17	15	17.2	Optimal
UNT 25191 to Little Parker Run	0.38	1983	17	17	16	14	16	17	18	17	17	16	16.5	Optimal
UNT 25197 to Parker Run	0.39	1149	6	10	6	12	11	8	11	16	16	12	10.8	Marginal
UNT 25198 to Parker Run	0.37	1525	19	16	18	15	16	18	18	18	16	18	17.2	Optimal
UNT 25198 to Parker Run	0.31	1722	17	18	15	16	17	19	16	18	18	18	17.2	Optimal
UNT 25199 to Parker Run	0.40	1399	16	15	13	16	17	18	18	18	17	18	16.6	Optimal
UNT 25200 to Parker Run	0.45	1093	18	16	15	16	17	19	19	18	16	18	17.2	Optimal
UNT 25201 to Parker Run	0.29	1351	9	17	8	13	6	18	12	13	10	18	12.4	Suboptimal
UNT 25202 to Parker Run	0.51	1290	16	11	10	9	11	16	16	12	16	12	12.9	Suboptimal

III. Cowley Run Subwatershed

Chapter 93 Designation: Exceptional Value
Class A Wild Trout: Cowley Run (confluence of East Branch and West Branch Cowley Run to mouth)
Wild Trout (Natural Reproduction): Cowley Run (confluence of East Branch and West Branch Cowley Run to mouth)
Land Ownership: 10% Private, 89% Elk State Forest, 1% Sizerville State Park

Subwatershed Characteristics

Cowley Run proper is one of the smallest subwatersheds in number of segments (Figure 29 and Table 3), despite being a large watershed. This is due to the East Branch and West Branch being discussed within separate sections. Only one major tributary—Crooked Run—enters Cowley Run in this subwatershed. Cowley Run subwatershed is made up of 10 stream segments, four with a total score in the Optimal range and six with a total score in the Suboptimal range totaling 5.85 miles in length. The land cover of the Cowley Run subwatershed adjacent to the stream reaches averaged 83% forest, 6% field/pasture, 6% residential, 2.5% paved roads and 2.5% dirt & gravel roads. This development, while minimal, does have an impact on riparian zone width throughout the subwatershed.

This section of Cowley Run is intersected by roads at two locations and a railroad bridge near the mouth. Crooked Run also has two road bridges crossing it near the bottom of the reach. Multiple culverts on Crooked Run Road could be a concern; however, the system is low-flow/intermittent/rain runoff dependent at those locations, hence making it a low priority. This road parallels Crooked Run for a majority of the stream reach but generally maintains an adequate buffer to reduce potential sedimentation and erosion impacts.

Primary Impairments

Bank stability impacts to Cowley Run are primarily related to upstream channelization and stream stabilization efforts on the East Branch of Cowley Run. Increased water velocity has been addressed by utilizing rip-rap along the banks of Cowley Run (Figure 27). This has reduced erosion to a degree; however, erosion remains a primary concern at locations that have not been stabilized in this fashion. Riparian zone encroachment is also an issue on Cowley Run mainstem due to residential and seasonal homes; however, it tends to be limited to the left descending bank of the stream on all three segments (1708, 1824, and 1946). During the assessment, landowners along these three segments expressed an interest in cooperating with local and agency interests in improving streamside and in-stream habitats. Section 1946 was noted as having significant LWD present throughout the reach; however, the property adjacent to the stream is for sale and could have an impact on this section in the future.

Figure 27. Rip-rap stabilization and riparian zone encroachment on Cowley Run, segment 1708

Potential Projects

Streambank stabilization and restoration on section 1824 are recommended (Figure 30), with one caveat. Due to stabilization efforts and channelization on the East Branch of Cowley Run, improvements to streambanks on this section of Cowley Run can only be completely successful once upstream improvements are made. Riparian buffer plantings on sections 1708 and 1946 are recommended (Figure 28). An additional streambank protection project would be to consider the purchase of the land that is for sale along Cowley Run to ensure that the quality habitat on the section is protected into perpetuity. Additional in-stream habitat could also be improved within the shallow and wide segments within Cowley Run.

Figure 28, Potential riparian planting project site on Cowley Run, segment 1946

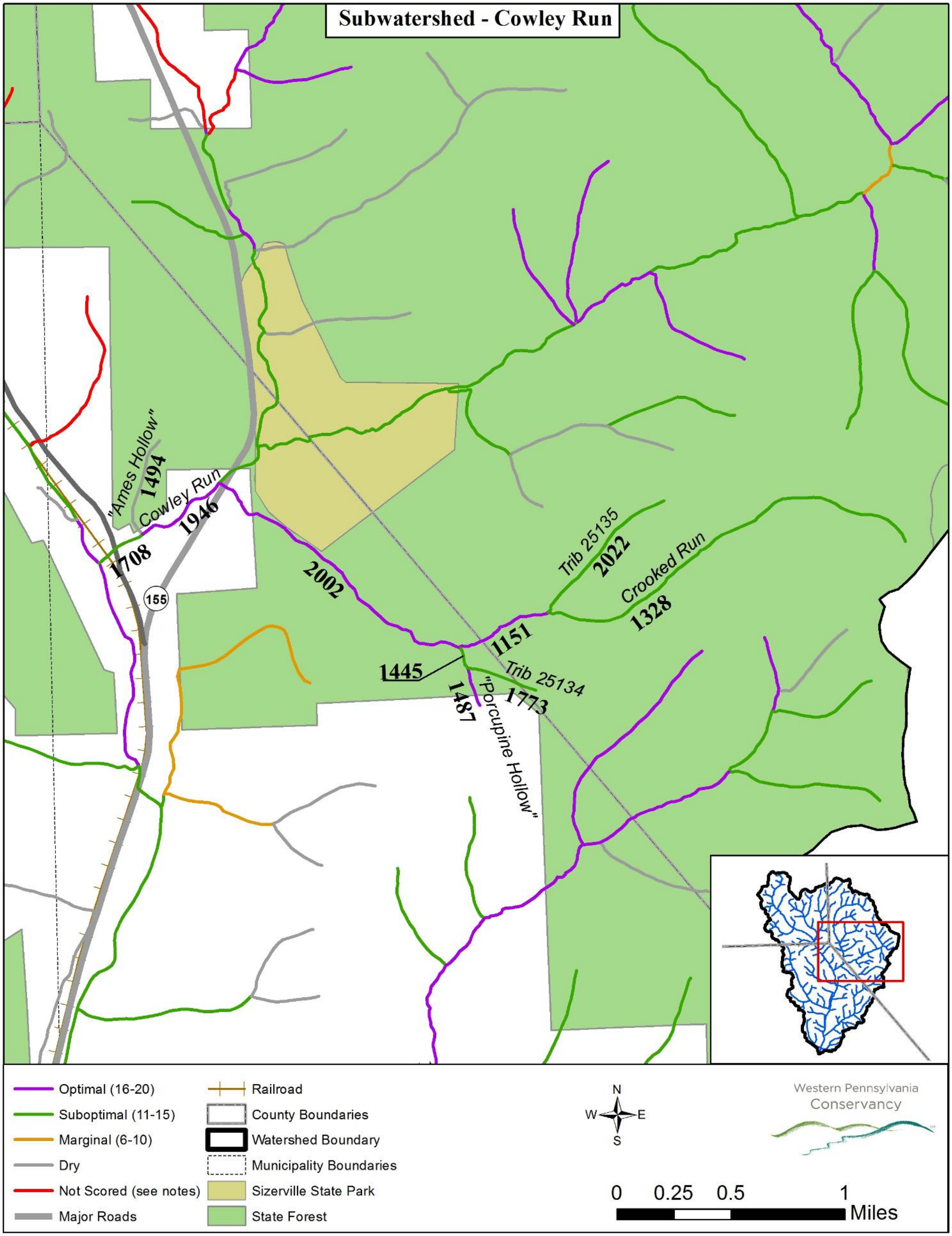

Figure 29. Assessed segments in the Cowley Run subwatershed

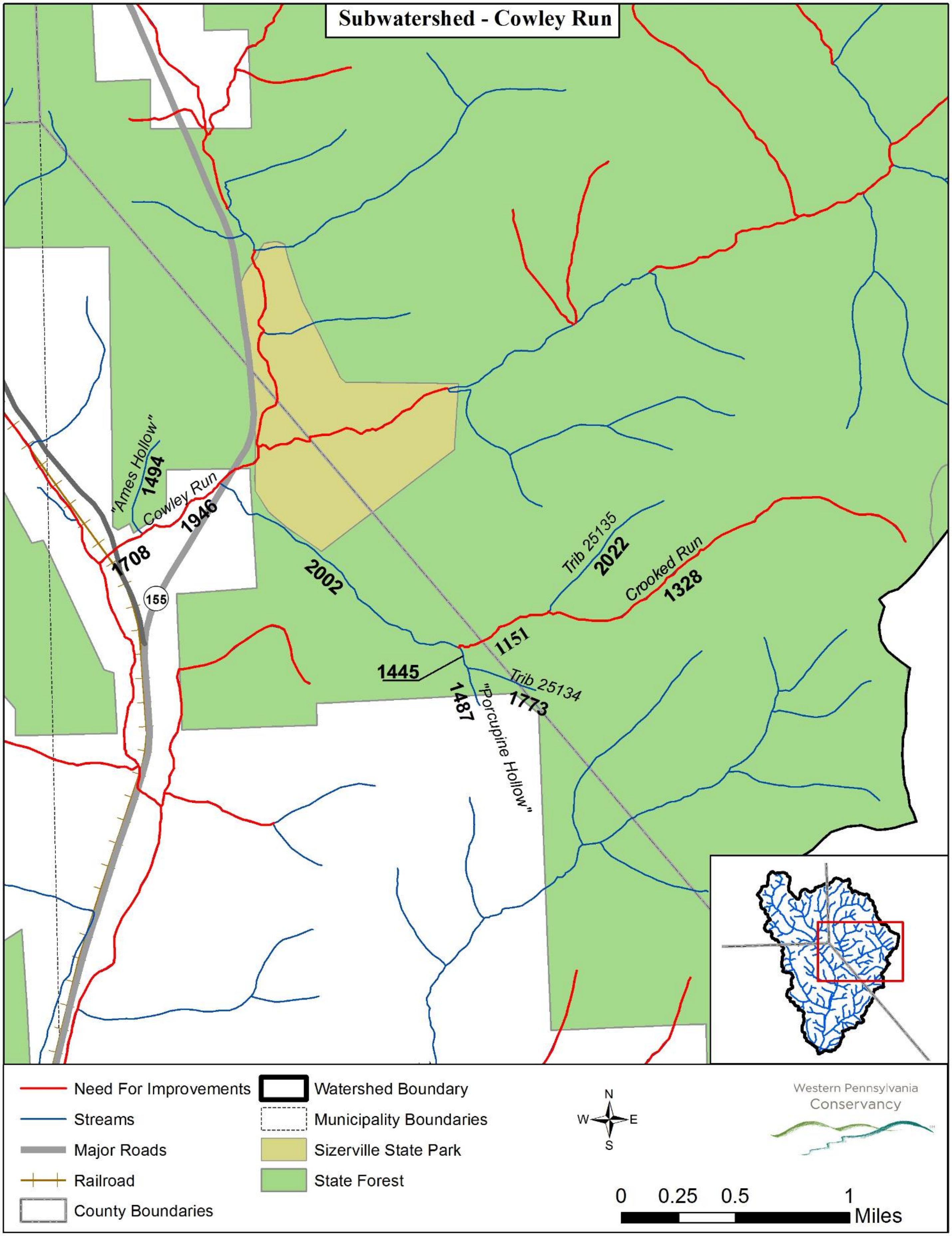

Figure 30. Segments needing improvement in the Cowley Run Creek subwatershed

Table 3. Summary Scores for Cowley Run Subwatershed

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	**Score**
"Porcupine Hollow"	0.11	1445	11	13	13	10	13	16	10	17	18	20	14.1	Suboptimal
"Porcupine Hollow"	0.17	1487	18	16	13	12	18	19	15	19	20	19	16.9	Optimal
Cowley Run	0.23	1708	11	19	13	19	17	12	15	16	18	11	15.1	Suboptimal
Cowley Run	0.26	1824	16	18	15	14	14	14	18	17	11	14	15.1	Suboptimal
Cowley Run	0.43	1946	19	19	18	19	18	19	17	17	18	17	16.4	Optimal
Crooked Run	0.44	1151	17	17	16	12	14	18	16	17	19	19	16.5	Optimal
Crooked Run	1.82	1328	14	14	15	13	14	14	13	17	16	14	14.4	Suboptimal
Crooked Run	1.35	2002	18	18	18	11	13	15	16	18	18	17	16.2	Optimal
UNT 25134 to "Porcupine Hollow"	0.31	1773	11	13	14	13	15	20	13	10	20	20	15.9	Suboptimal
UNT 25135 to Crooked Run	0.72	2022	4	16	15	14	6	13	16	10	17	17	12.8	Suboptimal

IV. West Branch Cowley Run Subwatershed

Chapter 93 Designation: Exceptional Value
Class A Wild Trout: N/A
Wild Trout (Natural Reproduction): West Branch Cowley Run (headwaters to mouth)
Land Ownership: 30% Private, 54% Elk State Forest, 16% Sizerville State Park

Subwatershed Characteristics

The assessed segments of the West Branch of Cowley Run total 12.8 miles in length (Table 4). Two segments—1985 and 1191—were not assessed due to being denied access by the private landowners. Of the assessed segments, 13 were scored overall as Suboptimal and 11 as Optimal (Figure 30). Forest dominated the stream segment land use at 84%, with other categories including open space (4%), residential (1%), paved roads (6%) and dirt & gravel roads (0.5%) making up most of the remainder. However, 4.5% was land use indicated as "other" with the description of the land use along those reaches (1927 and 1605) being "meadow." This land use, specifically on segment 1927, refers to an area that is likely the result of beaver activity.

The West Branch subwatershed is comprised of four distinct sections. The lower end of the subwatershed flows through Sizerville State Park and is impacted by the development related to that facility (Figure 31). Upstream of the park is a short section of Elk State Forest and then the stream crosses multiple residential areas, some year-round and some seasonal. These locations were posted, and therefore, not assessed directly. However, on visual inspection from the nearby road, it can be noted that there are parts of the stream that have some active mowing along the bank and the riparian buffer is limited to mature trees mainly but does have abundant shrub growth. It is possible that landowner engagement would be more successful once project funds are in hand. However, it's unlikely these reaches would be open for public access. Above the residential areas, the stream returns to Elk State Forest land and regains a riparian buffer, improved in-stream habitat, and of course, public access. Finally, the headwaters of the West Branch of Cowley Run are almost primarily residential with culverts at multiple locations, riparian development and other activities associated with human impacts. The uppermost tributaries are mostly ephemeral (1162 and 1292) and have little need for improvement.

Figure 31. Gabion baskets and riprap serve as bank stabilization on segment 1002

Primary Impairments

Roads and highways parallel the West Branch of Cowley Run for most of its length. This impacts riparian buffer width; however, there is not a solution short of decommissioning major roads, which is highly unlikely. Streambank instability and erosion are the major limiting factors on the West Branch of Cowley Run. The segments that flow through Sizerville State Park are impacted by adjacent roads, minimalized riparian buffers, development in the floodplain and previous bank stabilization projects. Gabion baskets and riprap used along segment 1002 in locations where roads encroach on the stream are not effective and likely exacerbating issues downstream. Bank instability was noted throughout Sizerville State Park on the West Branch. Poor riparian buffers were noted throughout the subwatershed, specifically on segments 1985 and 1927. Segment 1927 located entirely on state forest land was given a score of six for riparian vegetation. Grasses, ferns and shrubs were the primary vegetation in the riparian area for this reach, and while those provide some stabilization benefits, overhead cover, bank stability and in-stream habitat would benefit from larger species. In addition, it is likely this section was impacted by previous beaver activity. Other marginal scores were given to first-order tributaries to the West Branch of Cowley Run (segments 1747, 1566, 1803, 1370 and 1294); conversely, these segments are not very accessible nor of significant size. Sediment deposition on segment 1179 was significant and likely the result of upstream landscape alterations noted in the headwaters (Figure 32).

Figure 32. Activities in the headwaters to the West Branch Cowley Run are sources of sediment downstream

Potential Projects

Bank stabilization efforts on the lower reaches of the West Branch of Cowley Run are the priority projects in this subwatershed. The Cameron County Conservation District is cooperating with Sizerville State Park to complete projects on segment 1943 near the park campground. Additional streambank restoration and stabilization is also recommended on segment 1002. Fish habitat being included as a component of the restoration efforts would greatly improve epifaunal substrate and available cover. Segments in need of improvement are identified on Figure 35.

Riparian buffer enhancement would benefit the West Branch along segments in the state park and on the private property upstream, segment 1985. Segment 1927 would be an excellent location for a riparian planting project due to the segment being wholly contained by state forest land (Figure 33). Access would be a challenge for the upper portion of the reach and would require that planting equipment and materials be packed in to complete the restoration project. This project is still recommended to the overall benefit it would have to this segment of the West Branch, as well as downstream reaches.

Figure 33. Segment 1927 would benefit from riparian buffer enhancement

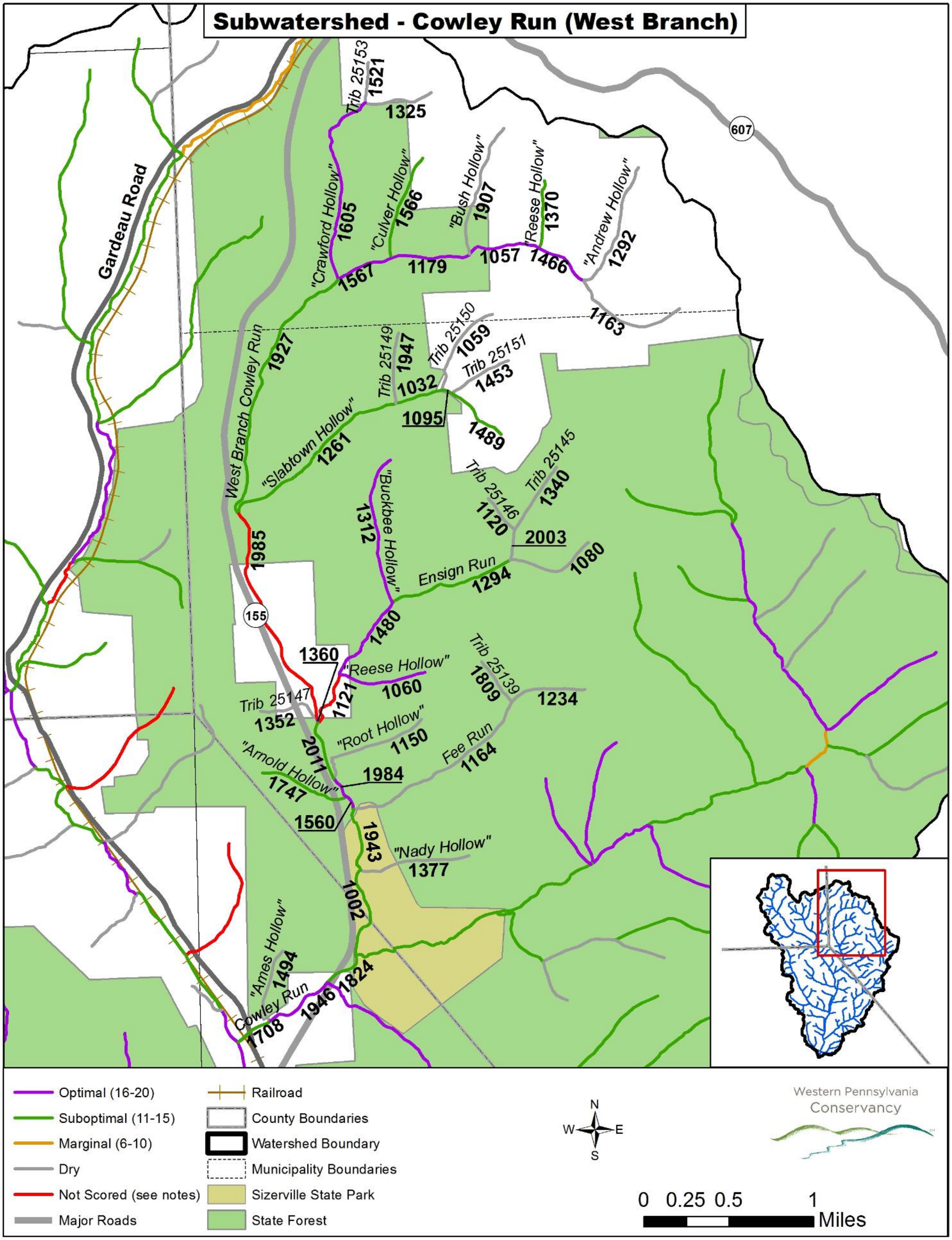

Figure 34. Assessed segments in the West Branch Cowley Run subwatershed

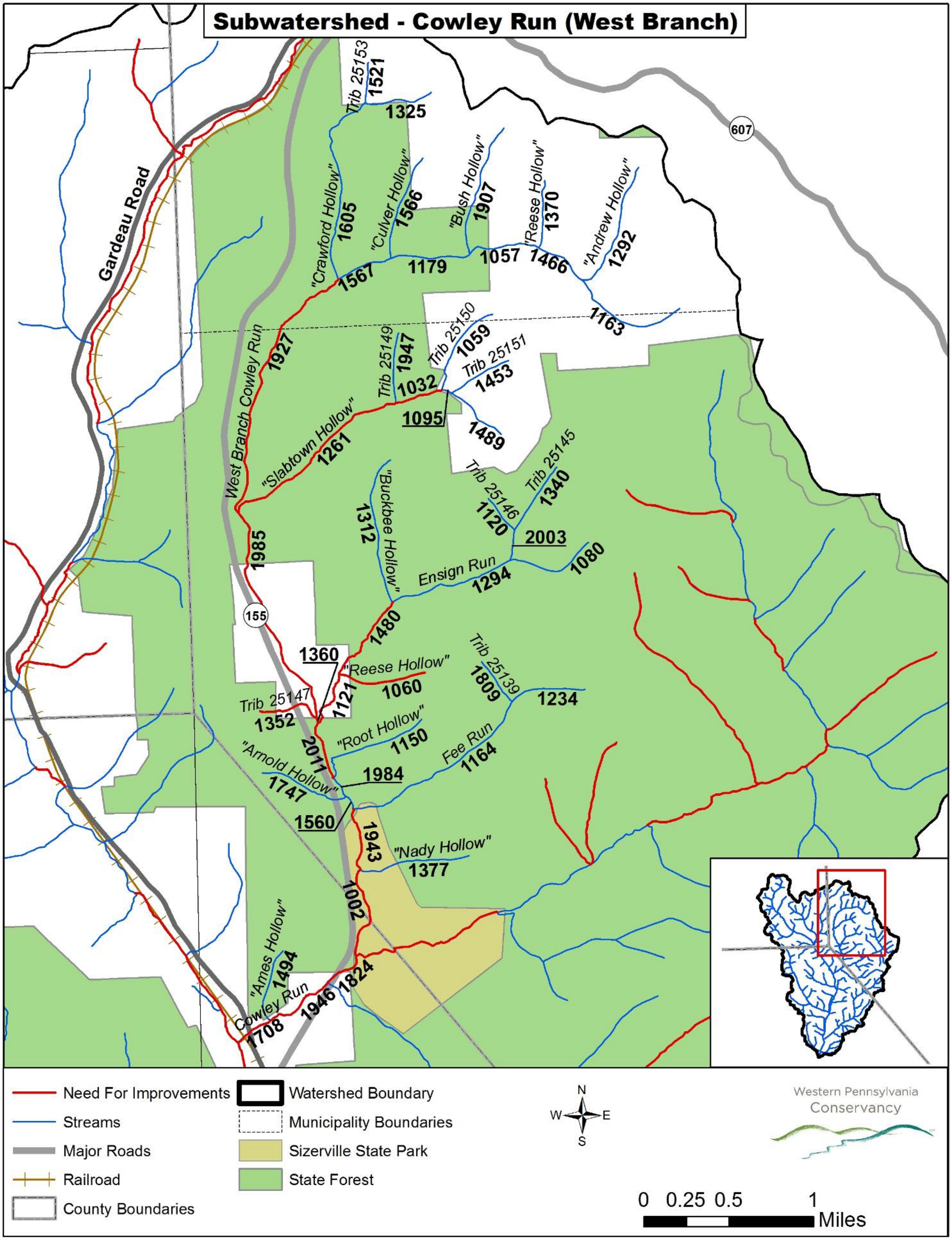

Figure 35. Segments needing improvement in the West Branch Cowley Run subwatershed

Table 4. Summary Scores for the West Branch Cowley Run Subwatershed

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	**Score**
"Arnold Hollow"	0.54	1747	9	12	5	19	12	13	19	20	20	18	14.7	Suboptimal
"Buckbee Hollow"	0.90	1312	17	17	14	16	14	19	18	16	16	18	16.5	Optimal
"Crawford Hollow"	1.19	1605	18	17	17	15	17	19	15	18	18	18	17.2	Optimal
"Culver Hollow"	0.64	1566	16	16	10	14	8	19	14	18	18	18	15.1	Suboptimal
"Doubler Hollow"	0.36	1588	18	16	13	16	17	19	17	18	18	16	16.8	Optimal
"Doubler Hollow"	0.39	1803	16	15	9	9	14	17	16	14	14	13	12.2	Suboptimal
"Reese Hollow"	0.53	1060	16	17	14	16	13	16	18	16	16	18	16.0	Suboptimal
"Reese Hollow"	0.41	1370	10	18	5	18	6	17	14	18	18	18	14.2	Optimal
"Slabtown Hollow"	0.29	1032	17	12	18	8	10	14	16	15	14	15	13.9	Suboptimal
"Slabtown Hollow"	0.06	1095	18	13	15	14	15	18	16	17	18	15	15.9	Suboptimal
"Slabtown Hollow"	1.19	1261	17	16	15	15	15	13	19	13	15	14	15.2	Suboptimal
"Slabtown Hollow"	0.39	1489	18	12	15	13	15	17	16	17	18	12	15.3	Suboptimal
Ensign Run	0.55	1480	19	18	17	15	11	18	18	16	18	18	16.8	Suboptimal
Ensign Run	0.76	1294	19	18	10	9	8	19	19	16	18	20	15.6	Optimal
West Branch Cowley Run	0.44	1057	18	18	18	15	17	19	18	17	17	18	17.5	Suboptimal
West Branch Cowley Run	0.48	1179	18	16	18	6	17	19	18	18	18	18	16.6	Optimal
West Branch Cowley Run	0.03	1360	18	17	15	15	11	19	19	18	20	19	17.1	Optimal
West Branch Cowley Run	0.33	1466	18	18	15	14	18	19	16	18	18	16	17.0	Optimal
West Branch Cowley Run	0.09	1560	19	17	15	19	18	15	18	18	20	19	17.8	Optimal
West Branch Cowley Run	0.34	1567	19	15	19	15	18	19	19	15	17	18	17.4	Optimal
West Branch Cowley Run	0.13	1984	19	18	20	19	19	20	19	19	20	18	19.1	Optimal
West Branch Cowley Run	0.58	1002	16	17	16	18	15	14	17	14	11	12	15.0	Optimal
West Branch Cowley Run	1.63	1927	14	13	17	12	15	16	15	12	14	6	13.4	Suboptimal
West Branch Cowley Run	0.39	1943	16	17	17	12	13	18	17	11	13	14	14.8	Suboptimal
West Branch Cowley Run	0.36	2011	18	16	15	13	14	16	14	17	17	15	15.5	Suboptimal

V. East Branch Cowley Run Subwatershed

Chapter 93 Designation: Exceptional Value
Class A Wild Trout: N/A
Wild Trout (Natural Reproduction): West Branch Cowley Run (headwaters to mouth)
Land Ownership: 82% Elk State Forest, 18% Sizerville State Park

Subwatershed Characteristics

The most telling statistic for the East Branch Cowley Run subwatershed is that it is composed entirely of public land. The majority of this land is state forest with the remainder being operated as part of Sizerville State Park. This has ramifications, both positive and negative, on both land use and potential projects.

Twenty-seven segments were assessed in this subwatershed; 10 scored as Optimal overall, 15 as Suboptimal and two as Marginal (Figure 34 and Table 5). The total length of streams assessed in this subwatershed was 15.5 miles. The East Branch of Cowley Run is paralleled for its length by Cowley Run Road, which is a paved road in the state park and becomes dirt & gravel once crossing into Elk State Forest. Following a similar course, is a power line that parallels and intersects the mainstem and multiple tributaries of the East Branch for seven miles. There is also a large beaver complex that encompasses segments 1362 and 1633 (Figure 36).

Figure 36. Beaver complex along segment 1633, East Branch Cowley Run

Land use along segments in the East Branch subwatershed was composed primarily of forest (82%), dirt & gravel roads (7%) and open space (6%). Other categories noted were commercial/industrial (likely the state park regional equipment center), residential, paved roads and wetland; each averaged less than 1% of segment land use. Worth mentioning, was frequent notation of Japanese barberry, an invasive plant, throughout this subwatershed. Coordination with Elk State Forest managers and the Sinnemahoning Invasive Plant Management Area to eradicate this species is highly recommended and has been attempted in some spots. Japanese barberry is a pervasive spreader, and once it dominates a riparian zone, it does not permit native vegetation to regrow. Streambank stabilization projects have been completed in Sizerville State Park utilizing gabion baskets in the lower reach and log cross vanes in the upper reach of segment 1090 (Figure 37).

Figure 37. Streambank stabilization using gabion baskets in Sizerville State Park, segment 1090

Primary Impairments

Despite the East Branch subwatershed being composed primarily of forest, there are a number of impairments that could be addressed. First and foremost, the streambank stabilization measures that have been utilized in Sizerville State Park, while protecting the immediate bank during high flows, have exacerbated erosion and sedimentation issues (Figure 38). Channelization with gabion baskets on this reach (segment 1090) accelerates water velocity due to being smooth and fairly straight. This segment also is completely devoid of epifaunal substrate. Access to the stream for recreational use is significantly restricted in an area of potential recreational utilization.

Figure 38. Severe bank stability issues evident with this failed mudsill along stream segment 1090

Upstream of the lower bridge on East Cowley Run, it appears the stream channel was moved at some point in time, perhaps to maximize recreational use for picnics. An apparent unnatural berm can be observed along this section of stream. Several areas against the high bank and on the opposite bank toward the picnic area were eroding. Within this section of the park, the stream appears to jump its channel at several locations during high flows, causing additional erosion in areas away from the normal flow channel (Figure 39). It appears the stream may be trying to re-establish a more meandering pattern within the floodplain. The park uses the area for picnicking, and therefore, competition for space exists.

Figure 39. Evidence of stream channelization and resulting erosion on segment

Beyond the boundary of the state park, the most prevalent issue is the presence of the power line that runs along the mainstem of East Cowley Run. The utility line and subsequent maintenance have limited the width of the riparian zone. This is notable on segments 1181, 1362, 1375, 1559 and 1633, but most apparent on segment 1481 where the wide power line right-of-way completely intersects the stream before continuing uphill towards Ridge Road (Figure 40). Segment 1481 has an overall score of Marginal due to the effects of the power line on the riparian area and resulting impacts to in-stream habitat. Canopy cover is limited, epifaunal substrate lacking, embeddedness abundant and the channel is very mobile, due to the lack of stabilizing elements.

Figure 40. Power line right-of-way maintenance has a significant impact on segment 1481

Dirt & gravel road impacts are notable on the East branch of Cowley Run. On the lower segments, there are a number of locations where the stream and road are in close proximity (Figure 41), within several feet in some cases. This increases sedimentation of the stream as the riparian buffer has been compromised; streambank stability is also a concern. Stream flow undercutting the roadbed was noted along segment 1362. Segment 1559 received a Marginal overall score due to the proximity of the road and utility line. Resulting impacts to riparian buffer width, in-stream habitat and bank stability due to the adjacent road were identified by field staff.

Figure 41. Dirt & gravel road impacts on riparian zone width, stream segment 1559

Potential Projects

Re-establishment of a natural stream channel and reconnection of the stream to the floodplain near the mouth of the East Branch is recommended. Addressing erosion areas upstream of the bridge to the camping area (downstream most bridge over East Cowley Run) will reduce the amount of sediment in the stream. Some channel blocking structures or additional measures to better control or redirect the stream during high flow could also likely be constructed to help reduce erosion at high flow. Construction of devices that allow the stream channel to meander more naturally would reduce erosion outside the present channel at high flows. There may also be opportunities to reduce runoff from the road and adjacent drainage ways within this section.

There are many sections of the road that would be improved with different management practices, most specifically along segments 1481 and 1559. As well, the location of the utility line cannot be changed, but the management of the land under the line could be improved through the control of invasive species, which can take hold due to routine clearing. The placement of low-growing shrubs and native grasses and wildflowers would allow the clearings to provide better habitat for the wildlife and add to bank stability in the reach. Habitat enhancement projects on the entire East Branch mainstem would be beneficial for the stream, provided care is taken not to reduce the already limited riparian buffer along many of the reaches. Additionally, aquatic organism passage projects on tributaries to the East Branch would improve habitat options for in-stream species (Figure 42).

Figure 42. WPC staff evaulate a potential culvert replacement project on segment 1838

Segments in need of improvements in the East Branch Cowley Run watershed can be found on the following map (Figure 44).

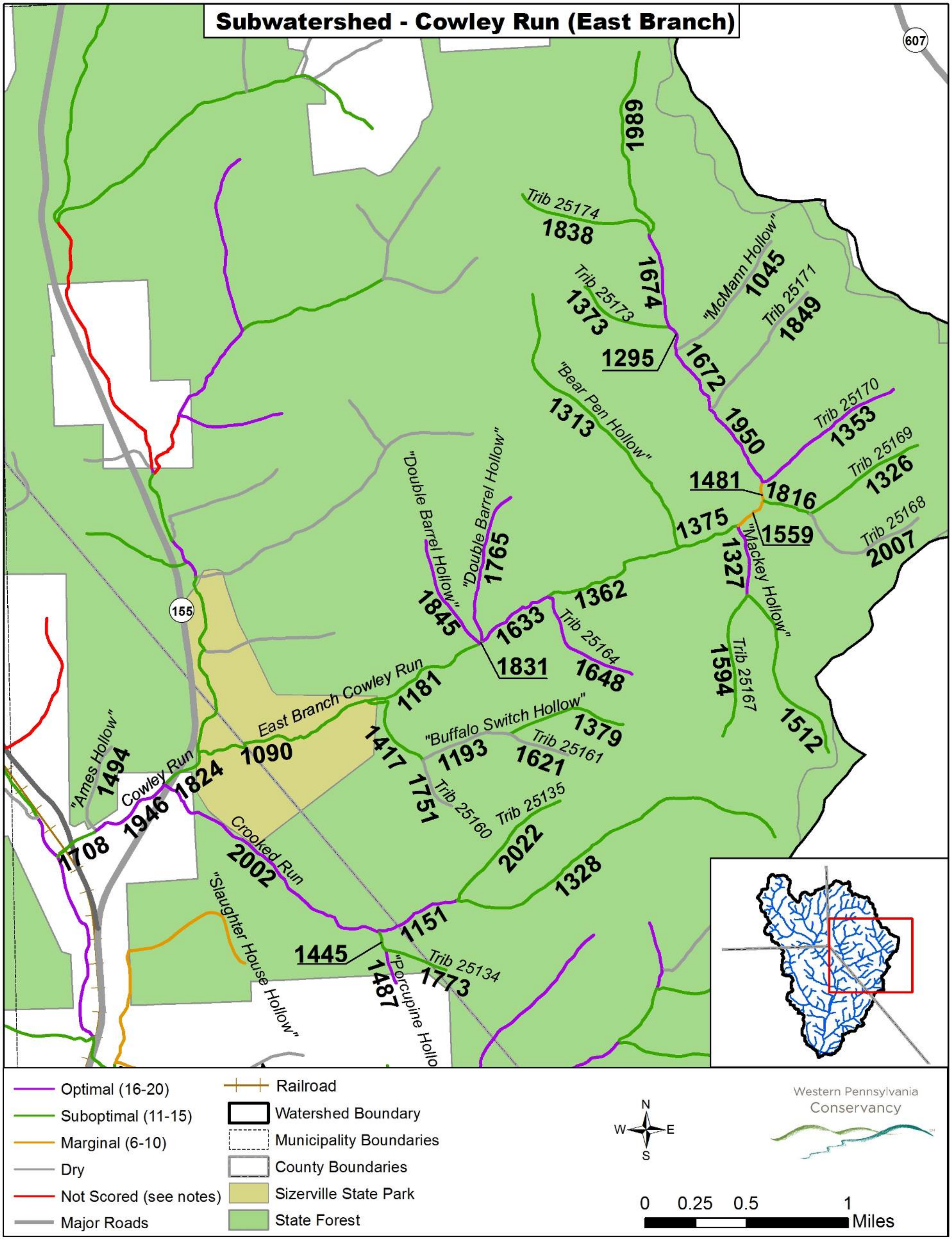

Figure 43. Assessed segments in the East Branch Cowley Run subwatershed

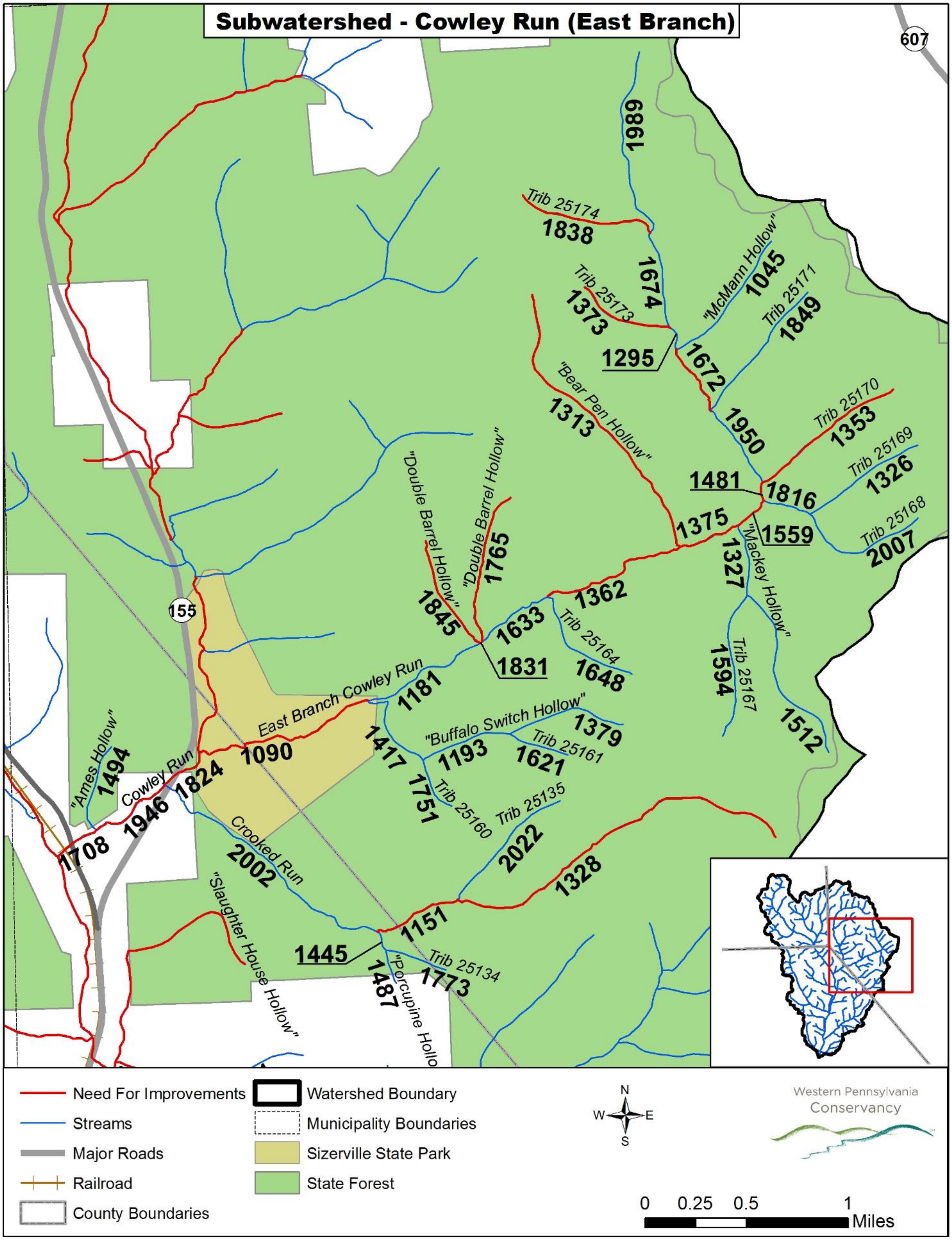

Figure 44. Segments needing improvement in the East Branch Cowley Run subwatershed

Table 5. Summary Scores for the East Branch Cowley Run Subwatershed

	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	**Score**
"Bear Pen Hollow"	1.55	1313	18	17	13	15	10	18	13	18	18	18	15.8	Suboptimal
"Buffalo Switch Hollow"	0.60	1379	3	18	1	19	0	20	13	18	20	20	13.2	Suboptimal
"Buffalo Switch Hollow"	0.49	1417	15	16	9	14	7	16	14	15	20	19	14.5	Suboptimal
"Double Barrel Hollow"	0.77	1765	17	17	16	17	17	15	18	17	18	18	17.1	Optimal
"Double Barrel Hollow"	0.59	1845	18	16	16	16	17	15	18	17	18	18	16.9	Optimal
"Mackey Hollow"	0.36	1327	17	17	16	14	10	20	18	14	16	20	16.4	Optimal
"Mackey Hollow"	0.95	1512	10	16	10	14	7	20	16	18	18	20	14.9	Suboptimal
East Branch Cowley Run	0.95	1090	16	18	16	15	13	12	17	13	14	15	15.9	Suboptimal
East Branch Cowley Run	0.65	1181	18	13	17	13	17	14	14	17	12	14	14.9	Suboptimal
East Branch Cowley Run	0.12	1295	15	18	15	17	13	19	19	20	19	19	17.4	Optimal
East Branch Cowley Run	0.75	1362	14	11	14	10	17	13	17	16	12	12	13.6	Suboptimal
East Branch Cowley Run	0.31	1375	17	15	18	15	14	16	16	14	14	14	15.3	Suboptimal
East Branch Cowley Run	0.10	1481	5	3	6	4	13	13	3	14	12	2	7.5	Marginal
East Branch Cowley Run	0.18	1559	8	5	15	5	10	14	13	13	13	10	10.8	Marginal
East Branch Cowley Run	0.42	1633	16	12	13	12	17	19	18	18	18	17	16.0	Optimal
East Branch Cowley Run	0.37	1672	19	18	18	16	13	19	19	19	18	18	17.7	Optimal
East Branch Cowley Run	0.49	1674	18	17	17	15	12	19	19	18	18	17	17.1	Optimal
East Branch Cowley Run	0.00	1831	13	9	7	6	18	19	7	18	14	18	12.9	Suboptimal
East Branch Cowley Run	0.44	1950	19	17	19	11	16	19	19	17	18	15	17.0	Optimal
East Branch Cowley Run	0.97	1989	18	16	15	13	13	17	16	16	16	15	15.5	Suboptimal
Trib 25164 to East Branch Cowley Run	0.62	1648	18	16	15	18	16	16	18	20	18	18	17.3	Optimal
Trib 25167 to "Mackey Hollow"	0.74	1594	11	17	12	15	8	20	15	18	18	20	15.5	Suboptimal
Trib 25168 to East Branch Cowley Run	0.24	1816	18	16	14	13	7	19	17	16	15	20	15.5	Suboptimal
Trib 25169 of East Branch Cowley Run	0.63	1326	14	13	10	11	8	19	15	18	18	20	14.6	Suboptimal
Trib 25170 to East Branch Cowley Run	0.80	1353	19	15	10	14	10	20	17	20	20	19	16.4	Optimal
Trib 25173 to East Branch Cowley Run	0.50	1373	15	16	13	18	12	16	5	18	18	18	14.9	Suboptimal
Trib 25174 to East Branch Cowley Run	0.70	1838	18	19	7	15	5	13	13	18	18	18	14.4	Suboptimal

VI. Sizer Run Subwatershed

Chapter 93 Designation: Cold Water Fishes
Class A Wild Trout: N/A
Wild Trout (Natural Reproduction): Sizer Run (confluence of Stoney Pitch Draft & Butler Hollow to mouth)
Land Ownership: 82% Elk State Forest, 18% Sizerville State Park

Subwatershed Characteristics

Segments assessed in the Sizer Run subwatershed totaled 5.6 miles in length. Two tributaries were scored as Optimal overall, four segments scored as Suboptimal (Figure 47 and Table 6). Sizer Run follows a similar pattern to others in the watershed, with concentrated development near the mouth in the form of residential and seasonal camps being the primary land use type. All of the tributaries to Sizer Run flow out of state forest land. A total of 72% of the land use in the subwatershed was forest, 11% open space, 8% residential, 3% paved roads and 6% dirt & gravel roads.

Primary Impairments

Issues identified in the Sizer Run watershed were centered on development. Stormwater inputs from road ditches are prevalent throughout the subwatershed. Sediment contribution was notable throughout this subwatershed, especially heavy on segment 1380. Sizer Run Road parallels the stream for much its length, specifically along segments 1347 and 1949, often coming within several feet of the stream and limiting the riparian buffer along the left streambank (Figure 45). Stream channel constrictions from driveways and camp roads were numerous, with the highest concentration being along segment 1347. This residential development also impacts the width of the riparian zone. Evidence of stream channelization was noted on multiple segments, as well as an overall lack of pool habitat throughout the subwatershed.

Figure 45. Sizer Run Road limits riparian zone width on the upper portion of segment 1949

Potential Projects

Sizer Run would benefit from improved road drainage. Large amounts of deposited sediment were noted on segment 1380, which parallels Sizer Run Road. Additional heavy sediment accumulation was noted along segment 1949 at the location where the stream runs close to the road along its left bank before being culverted under the road. While this culvert was likely sized properly and does not create a fish barrier, the pool at its outlet had significant amounts of fine sediment deposition. One culvert that does create a significant fish barrier is located just upstream of the mouth of Sizer Run (Figure 46). This culvert passes under Sizer Run Road, which at this location is still paved. The culvert is quite large and a replacement project would likely be challenging and costly; however, improving fish passage at this location would benefit the entire Sizer Run subwatershed. Sizer Run watershed, while small, could certainly benefit from restoration projects along its mainstem (Figure 48).

Figure 46. Potential aquatic organism passage improvement project on segment 1347

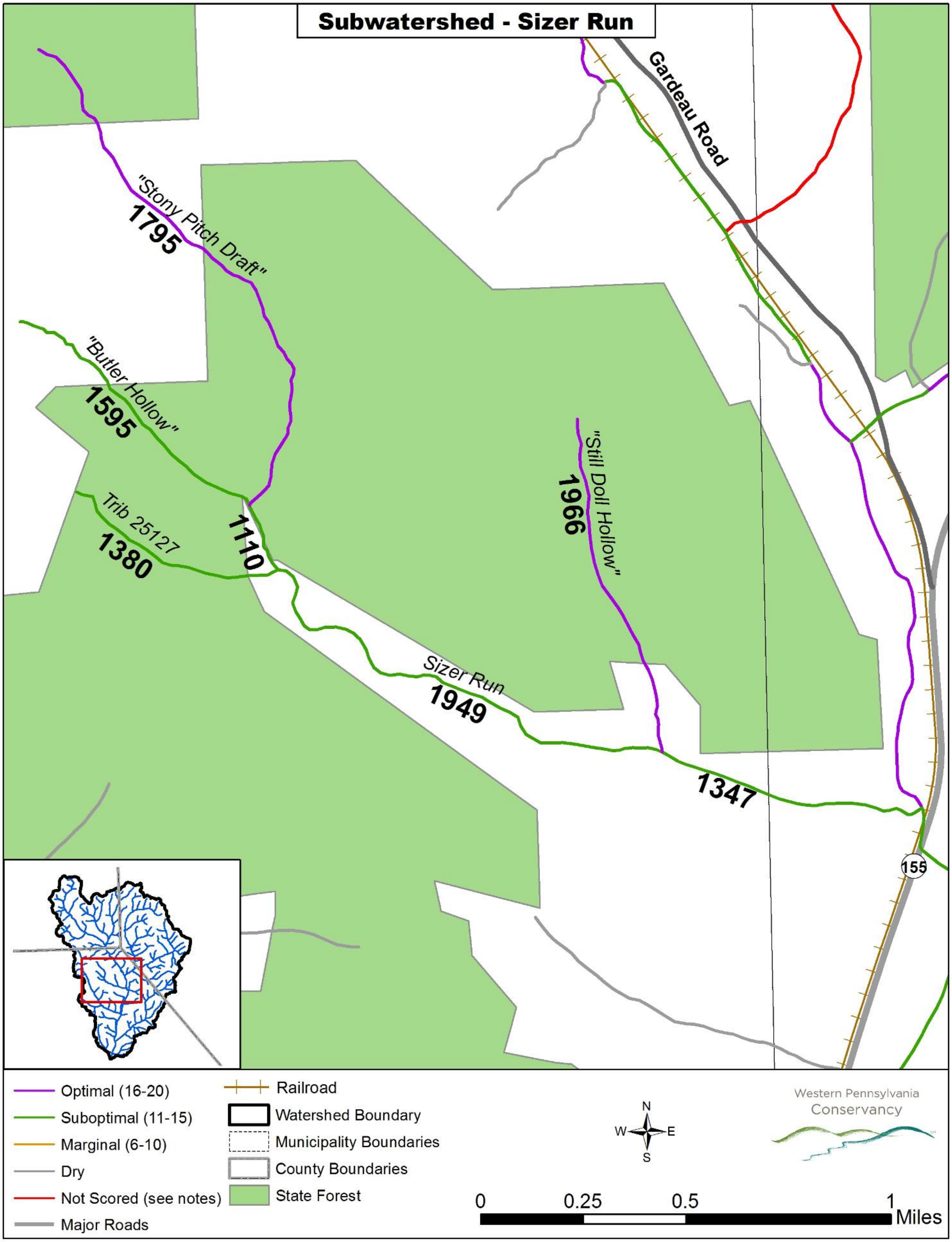

Figure 47. Assessed segments in the Sizer Run subwatershed

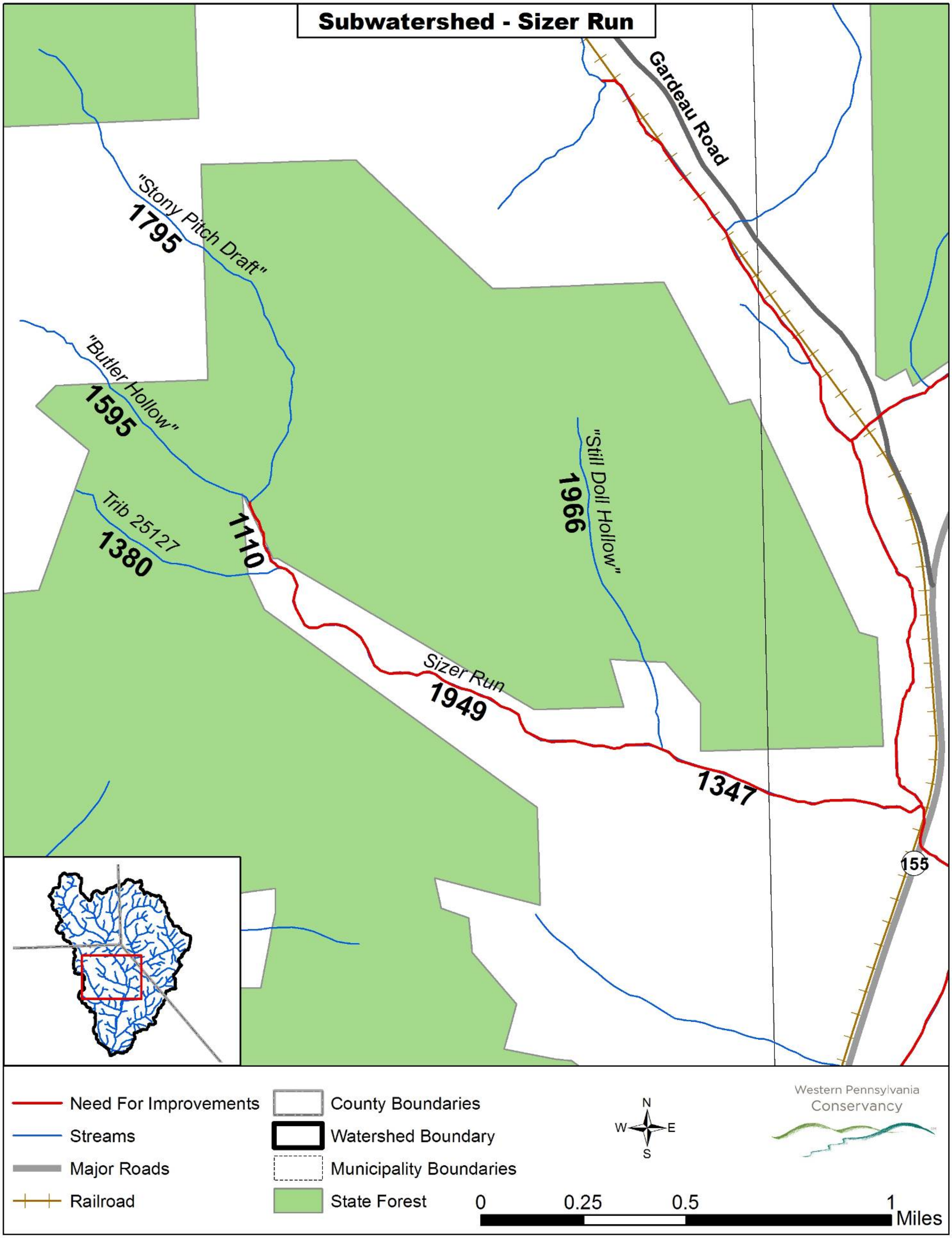

Figure 48. Segments needing improvement in the Sizer Run subwatershed

Table 6. Summary Scores for the Sizer Run Subwatershed

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Score
"Butler Hollow"	0.74	1595	17	14	15	12	16	16	12	18	18	17	15.5	Suboptimal
"Still Doll Hollow"	0.86	1966	19	18	10	18	18	16	17	16	18	18	16.8	Optimal
"Stony Pitch Draft"	1.41	1795	17	15	15	12	16	19	19	18	18	19	16.8	Optimal
Sizer Run	0.18	1110	16	15	15	11	10	13	14	16	16	16	14.0	Suboptimal
Sizer Run	0.67	1347	14	16	14	15	18	16	18	16	17	14	15.8	Suboptimal
Sizer Run	1.17	1949	14	16	14	14	18	16	17	16	16	13	15.5	Suboptimal
Trib 25127 to Sizer Run	0.57	1380	15	8	14	10	16	17	17	16	16	13	14.2	Suboptimal

VII. Fourmile Run Subwatershed

Chapter 93 Designation: Cold Water Fishes
Class A Wild Trout: NA
Wild Trout (Natural Reproduction): Fourmile Run (headwaters to mouth)
Land Ownership: 57% Elk State Forest, 43% Private

Subwatershed Characteristics

Fourmile Run subwatershed is comprised of 16 segments totaling 10.5 miles in length.
Of the assessed reaches, 15 segments were Suboptimal. The upper reach of Kimball Run was the only segment in this subwatershed that scored in the Optimal category (Figure 52 and Table 7). Krebs Hollow, segment 1862, was not assessed due to access concerns.

Despite the stream segments being primarily forest (66%), impacts of other land use are apparent. These land use categories include 8 % field/pasture, 14.5% residential, 2.5% paved roads, 6% dirt & gravel roads, 3% other. The 1% of "other" in this case was due to active logging on Elk State Forest along the upper reaches of segment 1844. The logging had no immediate effect on in-stream habitat; however, it was within the riparian buffer area and subsequently noted.

Residential land use is one of the primary contributors to this subwatershed. Access lanes, driveways and small bridges constrict Fourmile Run at locations throughout its length from headwaters to mouth (Figure 49). The majority of residential use near the mouth appears to be year-round, trending towards seasonal hunting and fishing camps as one progresses upstream. Concrete has been used throughout the lower reaches as a means of bank stabilization on segments 1932, 1847 and 1250. Evidence of channelization was noted throughout the subwatershed as well.

Figure 49. Development impacts near the mouth of Fourmile Run

Primary Impacts

There are a number of impacts to Fourmile Run that vary primarily due to the segment location in the watershed. At the lower end of the subwatershed, closer to the mouth and Route 155, degradation is driven by residential land use. Lawn mowing and streambank “maintenance” have limited the riparian zone width. Roads and utility lines intersect the lower reaches, most notable on segment 1932. This segment is also intersected by the railroad bridge, which passes over the segment at its most downstream extent (Figure 50). Channelization of the stream channel has accelerated erosion. Some measures have been taken by landowners to combat the effects, but they are merely addressing the symptom and not the cause of the issue.

Dirt & gravel road sediment contribution, road ditches and culverts are the main source of impacts in the upper portions of the Fourmile Run subwatershed. Fourmile Run Road is adjacent to the stream for most of its length in the upper reaches and becomes a dirt & gravel road along segment 1153. This transition marks an increase in sedimentation impacts and embeddedness. Segment 1153 is also one of the segments that had low scores for both vegetative bank protection and riparian vegetation zone. Seasonal residences now dominate the riparian land use; however, lawn maintenance is still a concern.

Figure 50. Minimized riparian buffer and railroad encroachment on segment 1932

Potential Projects

Similarly to primary impacts in Fourmile Run, potential projects in this subwatershed can be grouped into two regions. The lower parts of the watershed would benefit from streambank stabilization and fish habitat improvement projects. Stabilization measures have been implemented downstream of the railroad bridge on segment 1932. This work could potentially be extended upstream. Segment 1208, specifically, was good overall, but had marginal scores for in-stream habitat. Improving this reach, as well as other reaches in the lower part of Fourmile Run, will require the engagement of numerous landowners and could prove to be a beneficial project. These reaches are composed of a multitude of small parcels, and to have any significant improvement completed, large scale projects are desired. Landowner education and outreach is also recommended, specifically regarding the benefits of riparian buffers and streambank vegetation.

Projects in the upper reaches of Fourmile Run should address dirt & gravel road inputs (Figure 51). The adjacent road offers easy access to the Fourmile Run for improvement projects, but also limits the width of the riparian zone (Figure 51). There are not many options for increasing the distance of the road from the stream, due to the cost of such a project and the topography of the stream valley. Therefore, small scale habitat improvement projects, improving dirt & gravel road drainage and storm water inputs would bring Suboptimal reaches such as segment 2009 into the Optimal range. Four culverts of varying size were identified on Fourmile Run. Additionally, there are two road bridges at the lower end of the reach, as well as an overpass for the railroad.

Further evaluating these sites for both flood water capacity and aquatic organism passage is recommended.

Figure 51. Improving riparian buffers and dirt & gravel road sites is essential in the Fourmile Run subwatershed

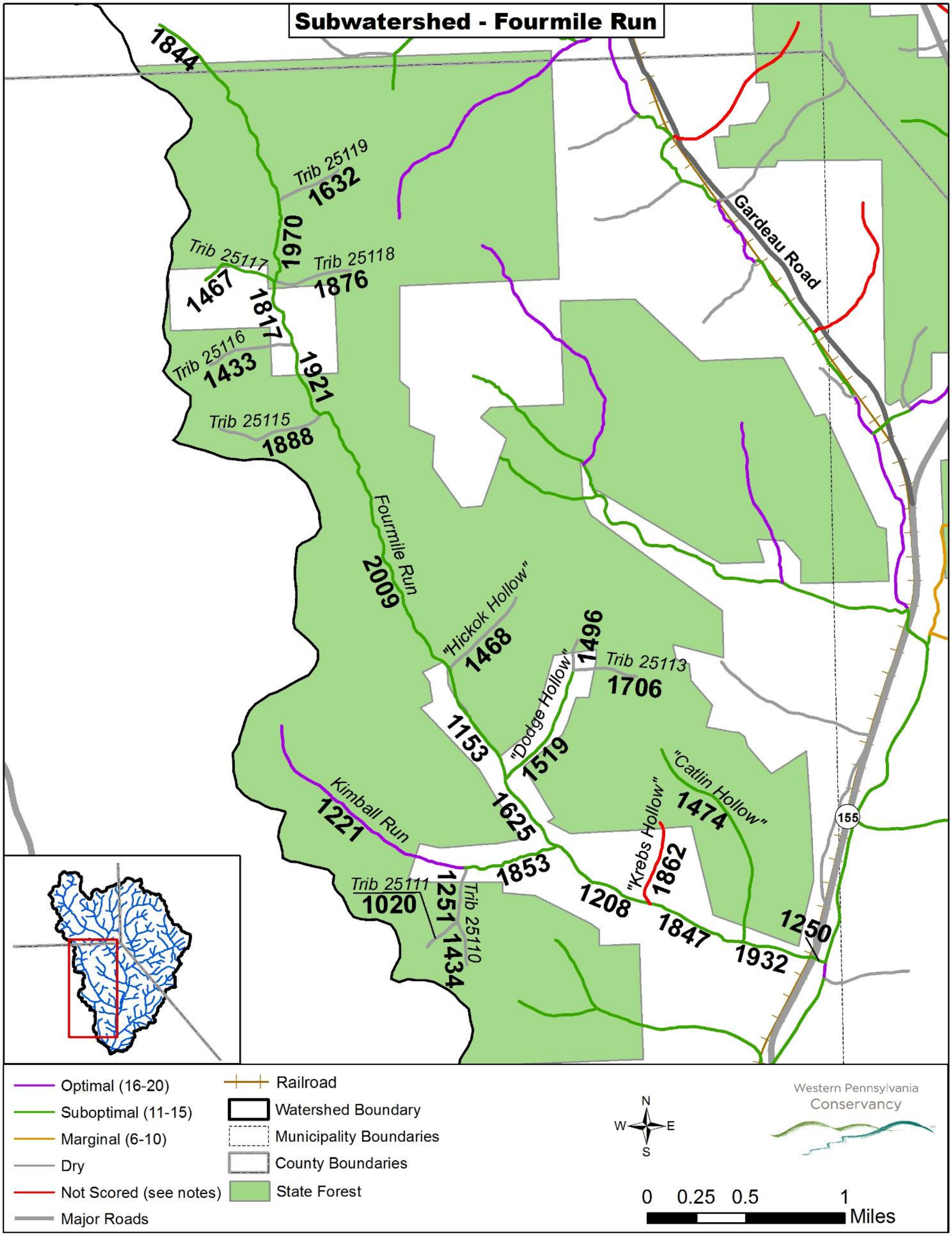

Figure 52. Assessed segments in the Fourmile Run subwatershed

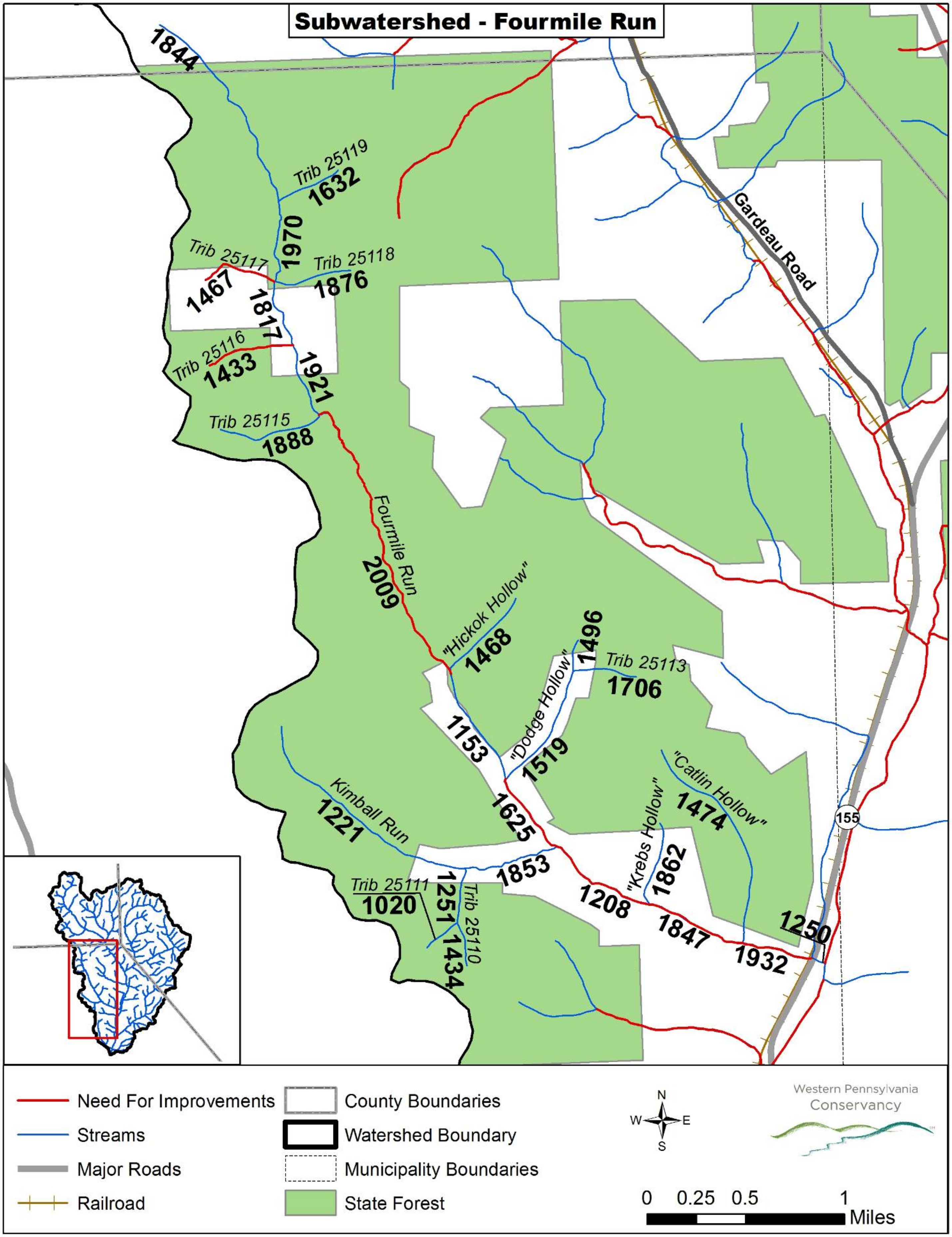

Figure 53. Segments needing improvement in the Fourmile Run subwatershed

Table 7. Summary Scores for the Fourmile Run Subwatershed

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Sceow
Fourmile Run	0.62	1153	16	17	16	18	18	14	17	17	6	8	14.7	Suboptimal
Fourmile Run	0.58	1208	17	16	14	15	15	15	17	16	16	17	15.8	Suboptimal
Kimball Run	1.26	1221	19	18	18	17	10	19	15	18	20	20	17.0	Optimal
Fourmile Run	0.07	1250	17	15	14	14	15	12	16	18	16	8	14.5	Suboptimal
Trib 25117 to Fourmile Run	0.40	1467	7	8	13	14	16	13	11	20	18	13	12.3	Suboptimal
"Catlin Hollow"	1.17	1474	13	17	10	14	7	14	10	15	15	14	12.9	Suboptimal
"Dodge Hollow"	0.67	1519	17	17	10	12	6	15	15	15	15	16	13.8	Suboptimal
Fourmile Run	0.44	1625	17	17	16	18	19	14	18	17	6	8	15.0	Suboptimal
Fourmile Run	0.36	1817	14	13	15	18	17	14	13	18	18	11	15.1	Suboptimal
Fourmile Run	1.14	1844	17	16	13	15	13	15	17	16	16	17	15.5	Suboptimal
Fourmile Run	0.52	1847	17	16	14	14	15	15	17	14	16	15	15.3	Suboptimal
Kimball Run	0.50	1853	15	16	14	16	17	11	16	16	14	12	14.7	Suboptimal
Fourmile Run	0.40	1921	14	15	13	16	16	14	13	16	16	12	14.4	Suboptimal
Fourmile Run	0.36	1932	18	16	13	15	16	13	18	7	9	10	13.5	Suboptimal
Fourmile Run	0.44	1970	17	16	14	15	15	18	17	18	16	18	15.3	Suboptimal
Fourmile Run	1.58	2009	15	13	11	13	12	15	18	14	14	11	13.6	Suboptimal

VIII. Salt Run Subwatershed

Chapter 93 Designation: Cold Water Fishes
Class A Wild Trout: N/A
Wild Trout (Natural Reproduction): Salt Run (headwaters to mouth), Rednor Hollow, Bucher Hollow, Russell Hollow, Wheatfield Hollow
Land Ownership: 38% Elk State Forest, 62% Private

Subwatershed Characteristics

Salt Run is owned almost entirely by the Emporium Water Company or under the jurisdiction of Elk State Forest. The land use in this subwatershed is primarily forest (93%), field/pasture (1%), and 5% dirt & gravel roads. There are a number of miles of dirt & gravel roads that traverse the subwatershed, and the effects of these roads are apparent in the stream reaches assessed. A large reservoir, the primary water supply for the water company creates an upstream barrier in the lower reaches but also enables the existence of a population of wild reproducing rainbow trout, as documented by an electrofishing survey completed by WPC in 2012.

Twenty-eight segments were assessed in this subwatershed, totaling 15.2 miles of stream. All of the segments fell in the Optimal or Suboptimal category, with the average score being 15.3 or at the highest level of Suboptimal (Figure 57 and Table 8). The exception was stream segment 1530, which represents the reach encompassing Salt Run Reservoir. As the assessment protocol is developed with conditions for flowing water as the target, with a score of 9.1, this segment is forced into the Marginal category (Figure 54). Not including this segment brings the average score up to 15.5, so the reach is not a detriment to the overall subwatershed in-stream habitat and the reservoir is essential as a water supply for the town of Emporium.

Figure 54. Segment 1530 looking downstream towards the Salt Run Reservoir outlet

Fish habitat structures have been installed in segment 1721, which represents the last section of mainstem Salt Run from below the reservoir to its confluence with Sinnemahoning Portage Creek. The lower reaches of this segment is designated as a kids-only fishing area.

Primary Impairments

Overall, the Salt Run watershed is in great condition. Salt Run is impacted primarily by the dirt & gravel road network that accesses different regions of the subwatershed. These roads aren't necessarily in poor condition; however, as built infrastructure, they do contribute sediment to the stream, constrain tributary flow when put into culverts under the road and limit the riparian buffer width. The bulk of these impacts are concentrated on the lower reaches of the watershed. As the stream reaches go into the headwaters, roads are fewer as well as being further from the stream. Of the in-stream habitat parameters scored, sediment deposition was the one category with consistently Suboptimal scores. Segment 1721 has evidence of being channelized in the past and streambank erosion is still an issue on the reach (Figure 55).

Figure 55. Segment 1721 has in-stream devices to create pools, but streambank erosion is still an issue

Potential Projects

Salt Run and its tributaries are generally comprised of stream reaches with good in-stream habitat. There was a great diversity of channel structure by reach throughout the watershed (Figure 56). One item that was noted consistently was a general lack of the deep flow regimes, either slow-deep or fast-deep and in a few cases both regimes were lacking. Improvement projects could include pool creation utilizing large woody debris installation or informally known as the "chop & drop" style of restoration project.

Drainage along the roads was considered to be inadequate, as there were very long reaches without any drains and cross pipes to control runoff. Additionally, some of the outlets of the pipes that were in place were not constructed properly to protect from erosion. The dirt roads within the lower watershed should be assessed for proper drainage and stabilized outlets according to dirt and gravel road best management practices and upgraded where necessary

Culvert replacement projects would also benefit this subwatershed. While the majority of the culverts are new and in good condition structurally, they are undersized and not ideal for aquatic organism passage or high flow conditions. Within the lower watershed, several old stream structures, such a jack dams were installed at some point in the past. Erosion was noted at several of these structures where the arms of the structures meet the banks. All previously installed structures should be evaluated for erosion and stability and repairs made where necessary.

Riparian buffer plantings would also be recommended on locations in the upper reaches, but especially along segment 1721. Some planting has been completed there, but more trees or shrubs could be added while still allowing access to the stream for fishing. The Emporium Water Company has been very cooperative with the completion of this assessment, both on their property and with developing contacts with other landowners. They will be an excellent and willing partner for future projects in the Salt Run watershed (Figure 58).

Figure 56. Deep pool and large woody debris on segment 1066

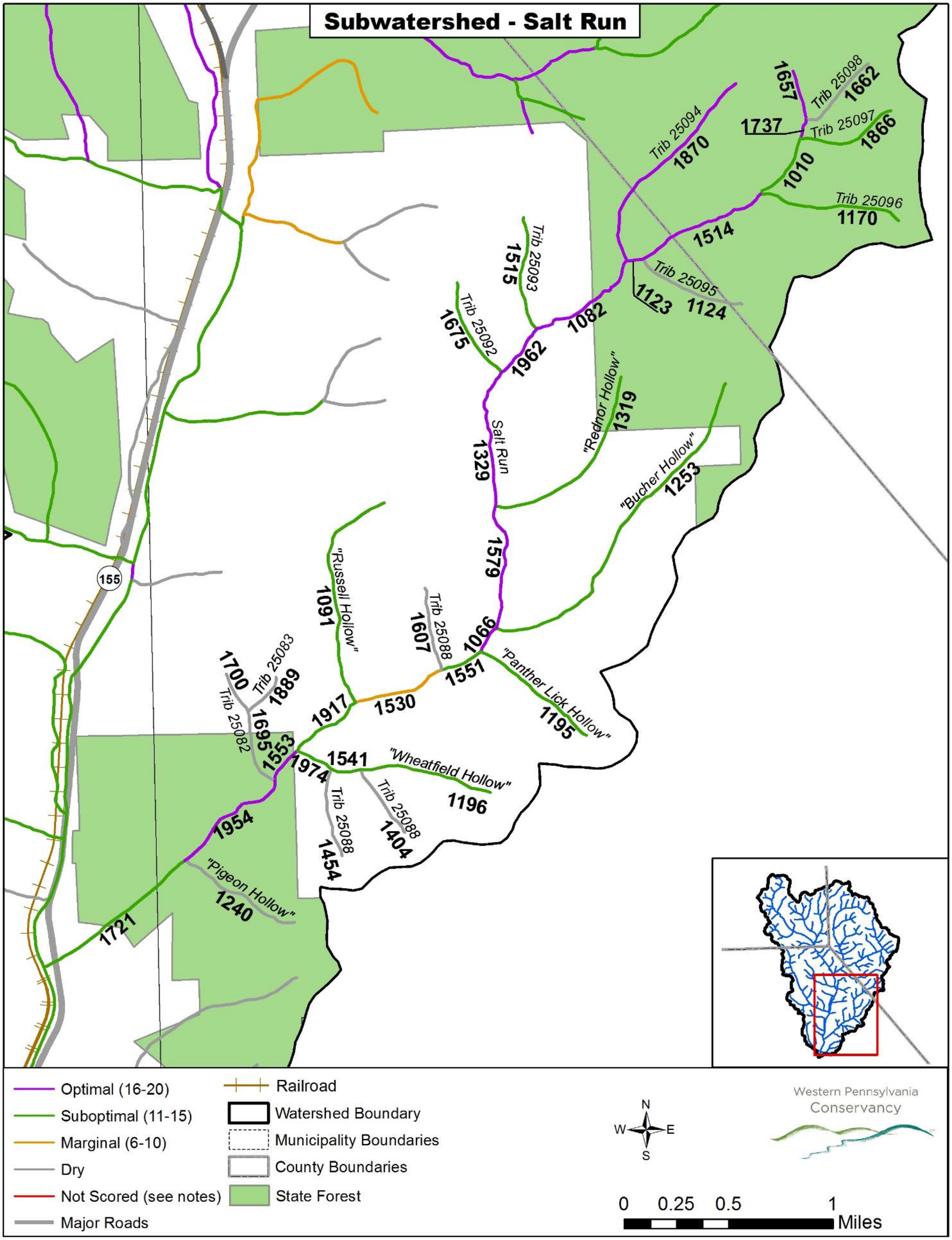

Figure 57. Assessed segments in the Salt Run subwatershed

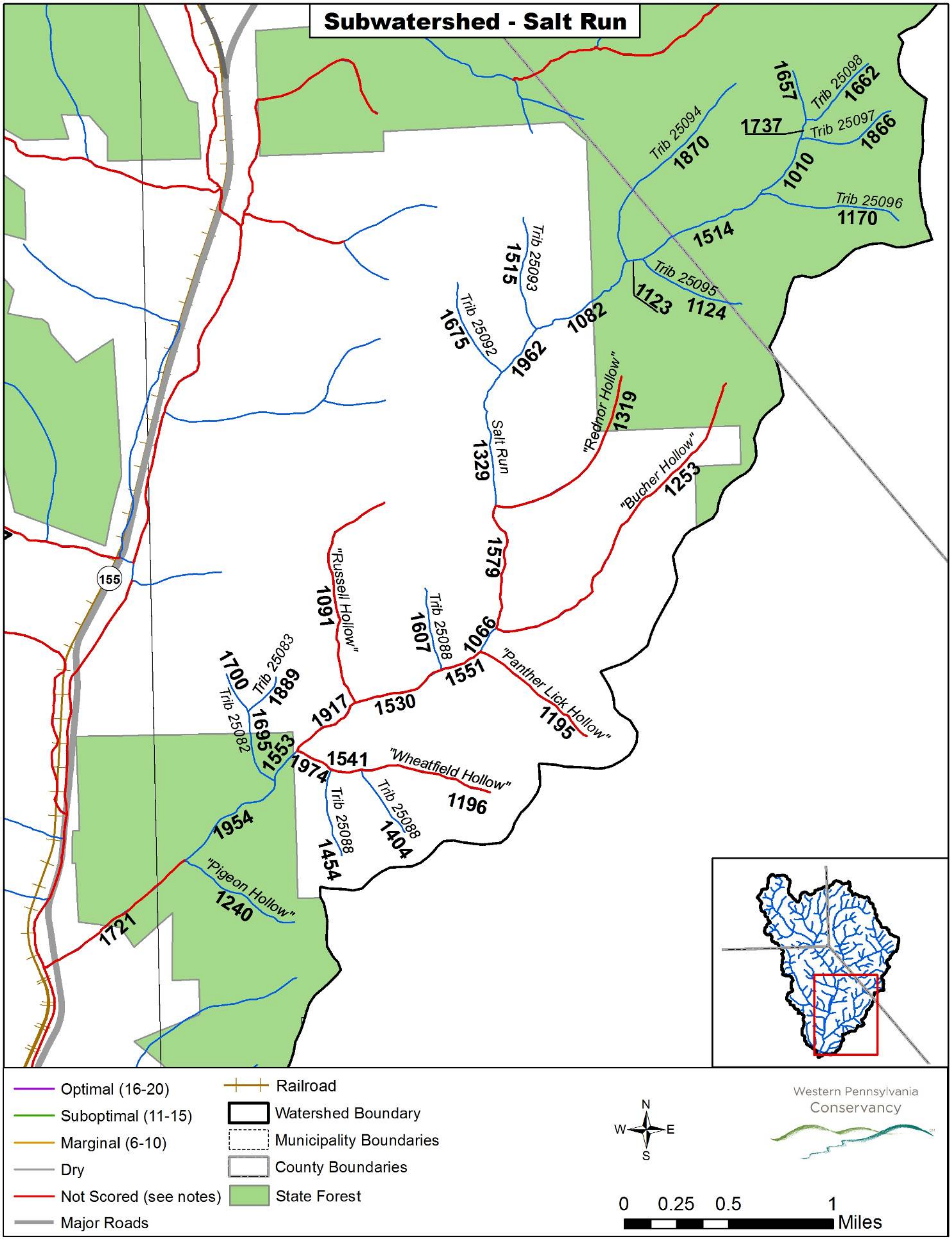

Figure 58. Segments needing improvement in the Salt Run subwatershed

Table 8. Summary Scores for the Salt Run Subwatershed

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Score
"Bucher Hollow"	1.74	1253	16	15	15	13	13	15	14	16	16	16	14.9	Suboptimal
"Panther Lick Hollow"	0.66	1195	18	18	14	15	14	13	15	12	14	14	14.7	Suboptimal
"Rednor Hollow"	0.96	1319	16	13	13	11	11	15	13	18	18	18	14.6	Suboptimal
"Russell Hollow"	1.13	1091	17	18	13	13	11	13	11	16	16	16	14.4	Suboptimal
"Wheatfield Hollow"	0.64	1196	17	15	5	5	18	16	17	15	14	12	13.4	Suboptimal
"Wheatfield Hollow"	0.15	1541	17	15	5	5	18	16	17	15	14	12	13.4	Suboptimal
"Wheatfield Hollow"	0.18	1974	15	14	13	12	15	13	13	12	15	12	13.4	Suboptimal
Salt Run	0.35	1010	15	16	15	15	13	17	16	14	17	20	15.7	Suboptimal
Salt Run	0.14	1066	18	17	17	17	17	18	17	17	17	16	17.1	Optimal
Salt Run	0.59	1082	19	16	19	15	10	20	18	16	16	20	16.9	Optimal
Salt Run	0.08	1123	19	18	14	16	15	20	16	18	18	18	17.2	Optimal
Salt Run	0.68	1329	18	17	18	17	18	19	18	16	18	19	17.8	Optimal
Salt Run	0.66	1514	19	17	15	15	14	19	20	16	15	20	17.0	Optimal
Salt Run	0.45	1530	8	5	5	10	16	5	6	14	11	11	9.1	Marginal
Salt Run	0.21	1551	16	15	17	15	18	15	18	13	13	13	15.3	Optimal
Salt Run	0.19	1553	17	17	14	15	15	17	16	16	16	16	17.5	Optimal
Salt Run	0.62	1579	18	17	18	17	18	18	18	16	16	14	17.0	Optimal
Salt Run	0.24	1657	18	18	15	16	17	20	15	14	16	20	16.9	Optimal
Salt Run	0.85	1721	15	12	10	14	17	14	15	7	14	9	12.7	Suboptimal
Salt Run	0.10	1737	17	19	15	18	16	20	16	16	14	20	17.1	Optimal
Salt Run	0.38	1917	15	16	16	15	17	12	15	13	11	8	13.9	Suboptimal
Salt Run	0.61	1954	18	18	15	14	15	19	17	17	18	19	17.0	Optimal
Salt Run	0.27	1962	18	17	20	17	13	19	20	16	16	20	17.6	Optimal
Tribe 25092 to Salt Run	0.50	1675	14	16	10	10	11	18	11	11	11	20	13.2	Suboptimal

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequenc y of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Score
Trib 25093 to Salt Run	0.56	1515	18	16	10	13	9	15	10	13	15	16	13.7	Suboptimal
Trib 25094 to Salt Run	1.09	1870	19	15	20	17	18	20	17	17	18	18	17.9	Optimal
Trib 25096 to Salt Run	0.70	1170	16	17	10	18	9	17	15	16	18	20	15.6	Suboptimal
Trib 25097 to Salt Run	0.50	1866	14	16	9	13	14	17	8	13	13	20	13.7	Suboptimal

IX. Sinnemahoning Portage Creek Subwatershed – Section 1

Chapter 93 Designation: Exceptional Value
Class A Wild Trout: N/A
Wild Trout (Natural Reproduction): Sinnemahoning Portage Creek (headwaters to mouth) Big Fill Hollow (headwaters to mouth)
Land Ownership: 93% Private, 7 % Elk State Forest

Subwatershed Characteristics

The upper subwatershed of Sinnemahoning Portage Creek represents the reaches of the mainstem and contributing small tributaries from the headwaters to its confluence with Parker Run. This subwatershed is almost entirely private land, with only the left bank of segment 1650, the upstream section of 1311, and all of segment 1462 being located on Elk State Forest. Of the 13 assessed segments, 11 segments were scored overall as Suboptimal, one segment as Optimal and one as Marginal (Figure 62 and Table 9). Segment 1262 was not assessed due to accessibility issues.

Land use along the stream segments of the subwatershed was 54% forest, 21% field/pasture, 10% residential, 3% paved roads, 2% dirt & gravel roads, 4% rail line and 1% wetland. Paved roads and the rail line parallel the mainstem for its entire length (Figure 59). Culverts on segment 1260 and 1139 present potential fish passage issues, as well. This is also the subwatershed were the train derailment took place; however, little evidence remains of the incident from 2006.

Figure 59. Open fields provide limited riparian vegetation or canopy cover along segment 1431

Primary Impacts

Despite being in the headwaters of the watershed, this system is one of the more heavily human-impacted subwatersheds. Road ditches, culverts, rip rap and concrete stabilization measures were noted throughout. Significant riparian zone encroachment was evident on a majority of the reaches, with some areas being maintained as fields and pasture. The most severe issues were along segment 1698, near the small village of Gardeau, where there is a concentration of residential development. Segment 1804 was also limited by riparian zone mowing and vegetation removal (Figure 60). The overall lack of canopy cover in this subwatershed has a significant impact downstream, as water temperature were elevated along these reaches and are not improved by coldwater contributions from tributaries, especially in the warm summer months.

Figure 60. Erosion issues and riparian devegetation on segment 1804

Channelization of the stream channel was evident on the uppermost reach of Sinnemahoning Portage Creek, segment 1094. This area is significantly more developed than the reaches immediately downstream. More than 100 feet per segment had been altered on tributaries 1311, 1462, and 1798, partly due to the railroad intersecting the stream segments, but also as a result of adjacent pasturing. Stream segment 1260 also showed evidence of stream channel straightening, bank stabilization and maintenance.

Potential Projects

The primary focus of improvement projects for the upper subwatershed of Sinnemahoning Portage Creek should be on the establishment of riparian buffers. Almost every segment in this region could benefit from streamside planting projects. Smaller parcels along 1804 would be an excellent target for this work due to the highly impacted riparian zone. Engaging landowners will be challenging due to the majority of the residences being seasonal camps and vacation homes. The larger tracts along the mainstem (segments 1431, 1509, and 1650) may be an easier opportunity and would be suitable for larger scale restoration.

The upper-most stream of the watershed, segment 1094, was scored as Marginal and could certainly benefit from a comprehensive improvement effort (Figure 61). The parcels on this reach are small and primarily residential. Road ditches, access road and driveway culverts are prevalent, as well as channelization of the stream. Excessive algae presence was noted on the substrate, as well as significant embeddedness and sediment deposition, especially for a location in the immediate headwaters. Mitigating these effects establish a precedent of high quality in-stream habitat projects but may not be a top priority due to its location at the very top of the watershed (Figure 63).

Figure 61. Sinnemahoning Portage Creek begins as a ditch that runs adjacent to the rail line

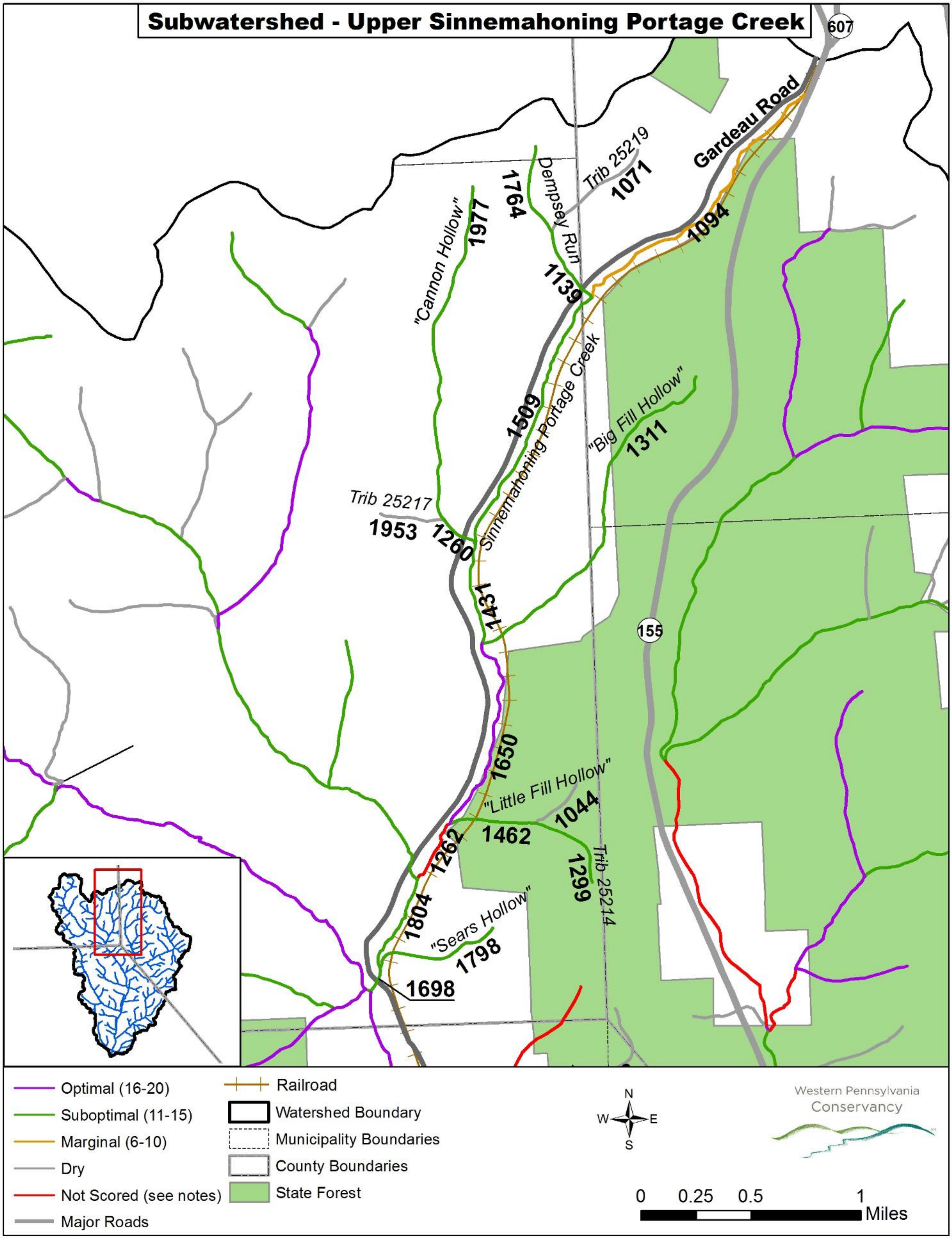

Figure 62. Assessed segments in the upper Sinnemahoning Portage Creek subwatershed

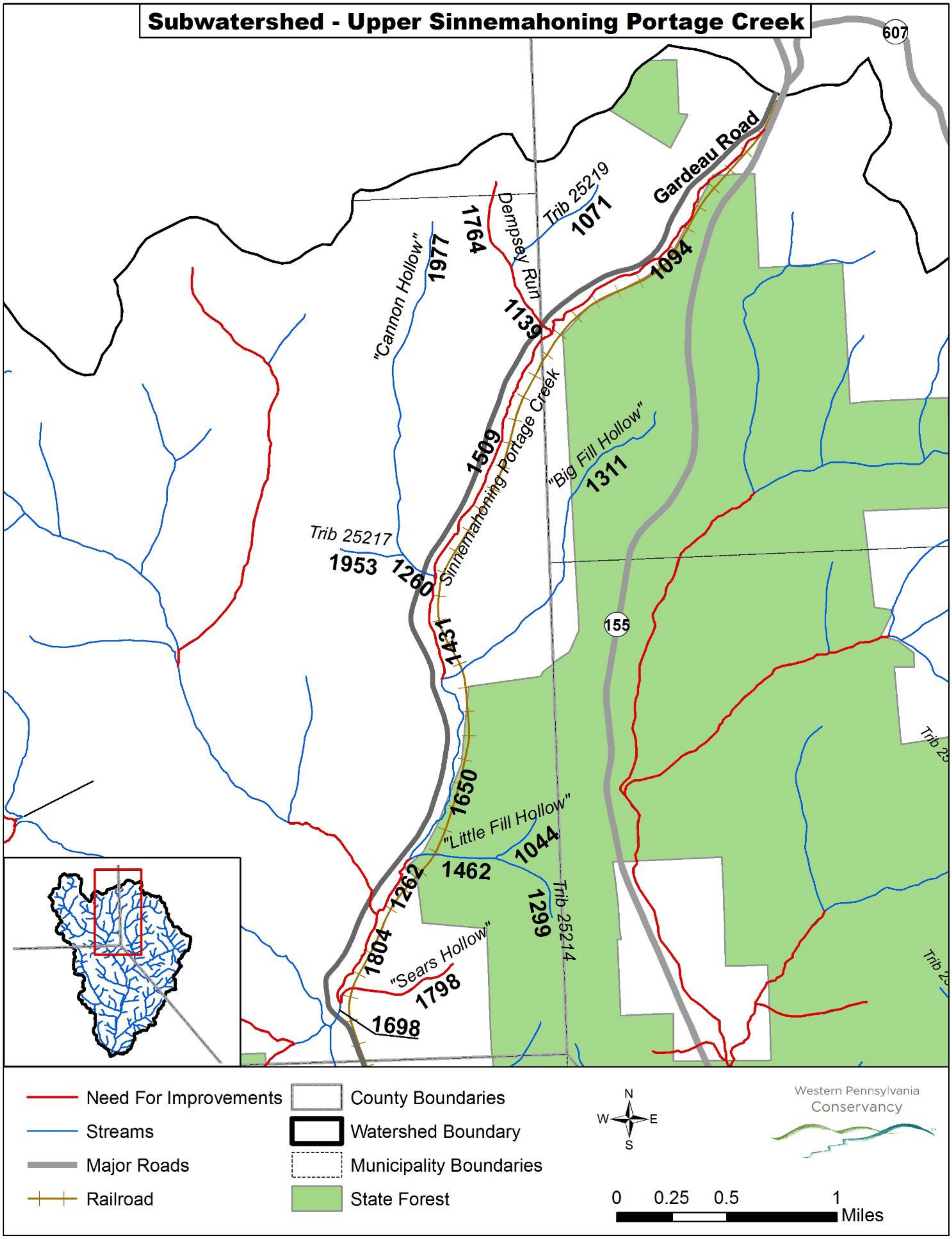

Figure 63. Segments needing improvement in the upper Sinnemahoning Portage Creek subwatershed

Table 9. Summary Scores for the upper Sinnemahoning Portage Creek Subwatershed

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Score
"Big Fill Hollow"	1.70	1311	17	17	10	16	6	12	16	12	10	16	13.2	Suboptimal
"Cannon Hollow"	0.19	1260	14	15	9	14	14	8	11	16	9	11	12.1	Suboptimal
"Cannon Hollow"	1.58	1977	15	11	10	9	14	14	15	14	16	16	13.4	Suboptimal
"Little Fill Hollow"	0.40	1462	18	18	14	14	14	12	16	16	18	14	15.4	Suboptimal
"Sears Hollow"	0.61	1798	15	5	15	10	6	11	16	13	12	13	11.6	Suboptimal
Dempsey Run	0.36	1139	17	15	15	16	15	15	17	16	16	16	15.8	Suboptimal
Dempsey Run	0.43	1764	17	16	15	16	16	13	16	14	16	16	15.5	Suboptimal
Sinnemahoning Portage Creek	1.42	1094	7	9	7	6	9	13	12	16	16	11	10.6	Marginal
Sinnemahoning Portage Creek	0.47	1431	15	16	14	13	16	16	18	14	16	13	15.1	Suboptimal
Sinnemahoning Portage Creek	1.29	1509	16	16	14	13	16	16	18	16	16	13	15.4	Suboptimal
Sinnemahoning Portage Creek	0.95	1650	18	18	18	17	17	15	18	16	16	14	16.7	Optimal
Sinnemahoning Portage Creek	0.13	1698	16	15	15	14	18	15	16	16	18	14	15.7	Suboptimal
Sinnemahoning Portage Creek	0.46	1804	15	15	16	14	16	17	13	12	12	13	14.2	Suboptimal
Trib 25214 to "Little Fill Hollow"	0.42	1299	16	16	10	10	10	19	15	16	18	20	15.0	Suboptimal

X. Sinnemahoning Portage Creek Subwatershed – Section 2

Chapter 93 Designation: Exceptional Value
Class A Wild Trout: Confluence with Parker Run to confluence with Cowley Run
Wild Trout (Natural Reproduction): Confluence with Parker Run to confluence with Cowley Run
Land Ownership: 100% Private

Subwatershed Characteristics

The smallest subwatershed for this project, Sinnemahoning Portage Creek mainstem from the confluence with Parker Run to the confluence of Cowley Run, is comprised of eight stream segments (Figure 66 and Table 10). Two tributaries were not assessed due to access issues and five tributaries were dry at time of survey. In this subwatershed, Sinnemahoning Portage Creek has access to a very wide floodplain, with the railroad and Gardeau Road both being on the left bank for the entire length. There were several locations were the railroad grade has encroached on the stream and rip rap armoring has been employed for stabilization (Figure 64). Habitat improvement and stabilization devices of various ages were seen on multiple stream segments. Recent streambank restoration work has been completed by the Cameron County Conservation District in this subwatershed. Despite the wide floodplain, land use has certainly limited the riparian zone width in this subwatershed. Several sections have riparian zones of only 16 to 50 feet and zone width on segment 1850 ranged zero to 15 feet for its entire length. Even along segments with wider riparian zones, the dominant species of vegetation was shrubs, limiting canopy cover.

Segments in this subwatershed featured frequent braiding and bending. Beaver activity was observed, adding different structural elements to the multiple channels created as the stream meanders across the floodplain. That activity also had a negative impact on the channel alteration and sediment deposition scores on segment 1061; however, due to these being the result of natural processes; the scores shouldn’t be considered too severe.

Figure 64. Rip rap stabilization measures along the railroad grade on segment 1269

Riparian land use in this subwatershed contained an average of 31% forest, 3% agriculture, 14% residential, 2% paved roads, 6% dirt & gravel roads, 14% railroad and 2% wetland. A total of 28% of the average riparian land use was given to the “other” category, with notes on multiple segments identifying brushy, scrubby meadows and fields. Active pasturing was noted along segment 1850 and 1061, with a stabilized stream crossing in place on segment 1850. Road and field ditches contribute flow to most of the segments in this subwatershed. Dirt and gravel road sediment contribution was minimal.

Primary Impairments

An overall lack of a forested riparian buffer is the most detrimental characteristic noted throughout this subwatershed. Segments 1269, 1693, 1741 and 1850 each had scores in the Marginal range for riparian zone width. In fact, other than the issues related to beaver activity mentioned above, only those categories that relate directly to the riparian zone (bank stability and vegetative protection) were found to be in poor condition. Water temperature impacts, especially in a subwatershed that receives little additional cold water contribution from tributaries, are especially exacerbated due to a lack of good canopy cover from a forested riparian zone. In its lower reaches, the stream is more constrained by the railroad and residential development and working with those landowners for improvement projects is highly recommended. The reaches of this subwatershed that are removed from residential or agricultural activity have excellent in-stream habitat with a diversity of epifaunal substrates, all depth regimes present and excellent canopy cover. Improvements made to segments that are on the margin could raise this entire subwatershed to the Optimal level.

Potential Projects

Riparian zone vegetation enhancement should be the focus of restoration projects in this subwatershed (Figure 67). Cooperative landowners already interested in agricultural best management practices would make excellent partners in accomplishing this goal. Previous and ongoing streambank restoration projects are being completed by the Cameron County Conservation District. These efforts should be continued, especially in areas where bank stability is still a concern or where stabilization devices are not being effective. Segment 1693 (Figure 65) would be well suited to streambank restoration due to its severely eroding banks, as well as being accessible from adjacent camp lanes.

Figure 65. Streambank erosion and failed stabilization efforts on segment 1693

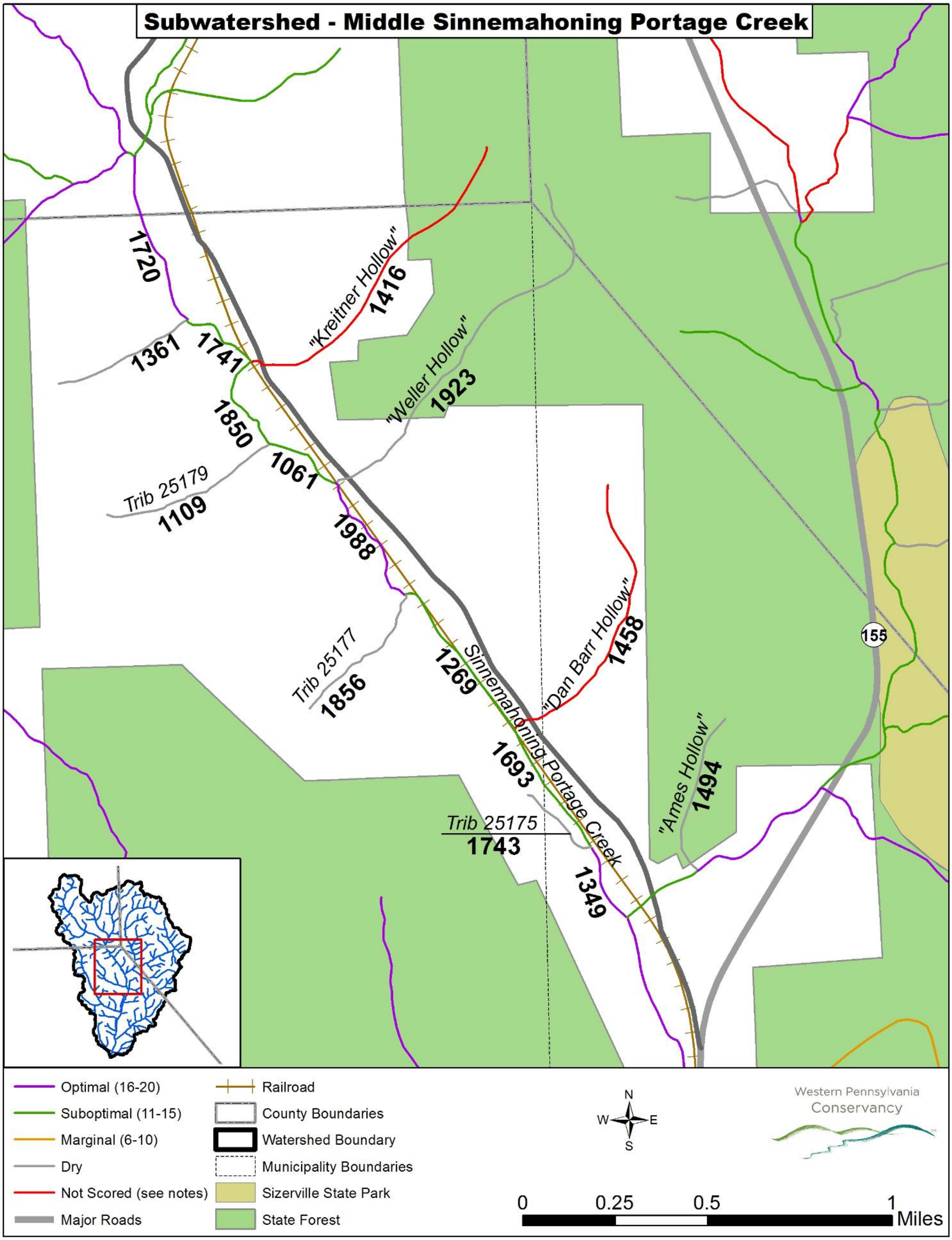

Figure 66. Assessed segments in the middle Sinnemahoning Portage Creek subwatershed

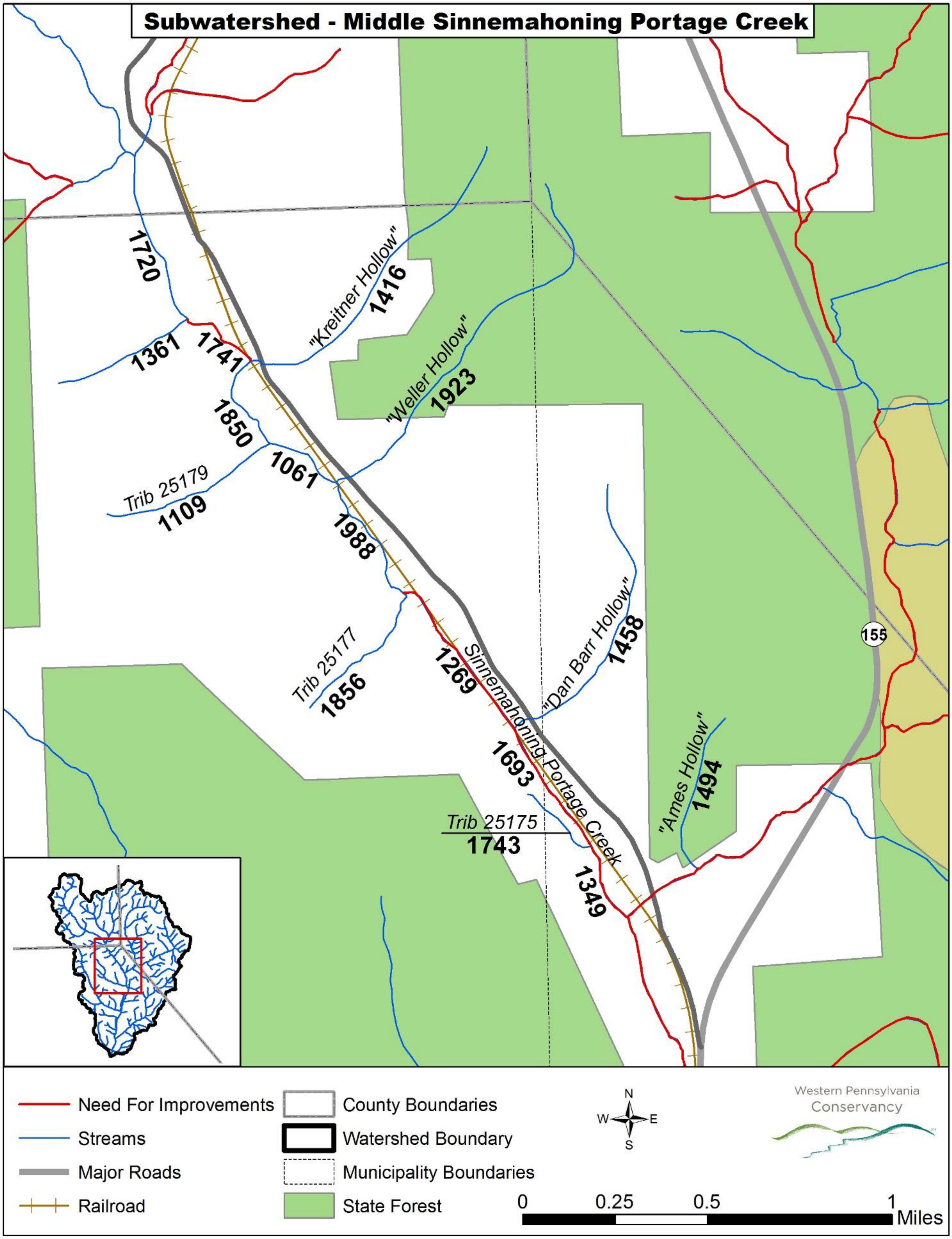

Figure 67. Segments needing improvement in the middle Sinnemahoning Portage Creek subwatershed

Table 10. Summary Scores for the upper Sinnemahoning Portage Creek Subwatershed

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Score
Sinnemahoning Portage Creek	0.22	1061	14	14	13	10	16	10	13	14	17	12	13.3	Suboptimal
Sinnemahoning Portage Creek	0.49	1269	16	16	15	14	16	13	13	11	10	7	13.1	Suboptimal
Sinnemahoning Portage Creek	0.22	1349	19	19	17	15	15	18	18	17	18	19	17.5	Optimal
Sinnemahoning Portage Creek	0.38	1693	14	15	15	13	17	13	13	10	11	8	12.9	Suboptimal
Sinnemahoning Portage Creek	0.48	1720	18	17	16	17	16	15	14	17	16	14	16.0	Optimal
Sinnemahoning Portage Creek	0.23	1741	16	16	14	16	18	14	18	17	16	10	15.5	Suboptimal
Sinnemahoning Portage Creek	0.28	1850	14	16	14	14	16	14	15	16	17	8	14.4	Suboptimal
Sinnemahoning Portage Creek	0.38	1988	19	19	19	18	16	16	20	16	16	15	17.4	Optimal

XI. Sinnemahoning Portage Creek Subwatershed – Section 3

Chapter 93 Designation: Cold Water Fishes
Class A Wild Trout: NA
Wild Trout (Natural Reproduction): Confluence of Cowley Run to mouth
Land Ownership: 90% Private, 10% Elk State Forest

Subwatershed Characteristics

The lower subwatershed of Sinnemahoning Portage Creek is comprised of 23 stream segments totaling 16.7 miles in length. Of these segments, three had an overall score in the Optimal range and four were in the Marginal range (Figure 71and Table 11). The remaining 16 segments were classified as Suboptimal. There were six stream reaches within the Suboptimal range that had three or more marginal scores in the in-stream habitat assessment categories. The segments in the marginal category reflect the increased development, channel alteration and decreased in-stream habitat quality.

Land use in the adjacent to the stream segments of this subwatershed averaged 49% forest, 5% field/pasture, 3% agriculture, 3% open space, 3% commercial/industrial, 17% residential, 10% paved roads, 3% dirt & gravel roads, 6% rail line and 1% wetland. Stream encroachment is rampant in this subwatershed, from a variety of sources, culminating with the residential/commercial/industrial landscape that surrounds the mainstem of Sinnemahoning Portage Creek as it flows through Emporium before joining the Driftwood Branch.

Primary Impairments

This subwatershed has a number of bank revetments throughout, including concrete, riprap, and even railroad tie stabilization. The riparian zone width is minimal, except on the upper portions of tributaries that flow into forested land. Even in those cases, the left or right streambank riparian zone that is fairly intact is marginalized by poor zone width on the opposite bank. Channel alteration, stream straightening and substrate dredging were all evident in different parts of this subwatershed. Residential property maintenance and "stream cleaning" have had significant impact to the mainstem, but the issue is more prevalent on the tributaries, more specifically segment 1051, 1382 and 1623 (Figure 68), but including other reaches as well. Segments 1382 and 1623 suffer severely from human alternation including stream channel relocation, channel straightening, dirt & gravel road inputs and riparian buffer removal.
The channel here has been altered in several locations from its natural state through substrate removal, which in turn does not allow for the streambanks directly along the main water channel to support vegetation. The lack of the vegetation and substrate removal causes the stream channel to appear over widened, but yet still not have proper connectivity to the adjacent flood plain due to entrenchment. This is a problem because in high flow events there in nothing, i.e. no bends, substrate or vegetation, to slow the speed of the water. Without the energy being dissipated into the surrounding flood plain the force of the water exiting the Sinnemahoning Portage Creek watershed is contributing to sediment and erosion problems well beyond its confluence with the Driftwood Branch of Sinnemahoning Creek, a prime example of this is the bank erosion opposite the confluence and the deep pool at the mouth of Sinnemahoning Portage.

Figure 68. Stream channelization and riparian buffer removal on segment 1382

Plank Road Hollow is the site of a DEP Flood Control Project that impounds the stream and constrains it to a concrete channel before it passes under the rail yard near Emporium (Figure 69). Upstream of this segment, evidence of channelization, multiple undersized culverts, road grading and ditching and agricultural practices all contribute to erosion and sedimentation issues.

Figure 69. The Plank Road Hollow Flood Control Project has created a straight, unnatural channel on segment

Potential Projects

This subwatershed, more specifically the mainstem of Sinnemahoning Portage Creek, is negatively impacted from a lack of riparian vegetation and poor bank stability. Historic channelization has greatly limited deep water habitat and epifaunal substrate, as well as exacerbating braiding and stream bed substrate transport. In fact, gravel and cobble movement, has been incorrectly faulted for ongoing flooding issues in the great Sinnemahoning Creek watershed, spurring a political movement for stream maintenance, in the form of vegetation removal and dredging. These practices are not recommended for these segments. Modification in stream channel structure, including the installation of bends and streambank stabilization devices, and allowing the stream to use the adjacent flood plains when possible would aid in stream energy dissipation thus reducing sediment migration and bank erosion within and below the watershed.

Fish habitat improvement and bank stabilization projects throughout the mainstem reaches of Sinnemahoning Portage Creek would be beneficial. Currently, Cameron County Conservation District has already completed several projects on segment 1526 (Figure 70), which was scored overall as Marginal due to a lack of habitat. Ongoing work on many reaches could include additional physical projects, as well as invasive species eradication and riparian buffer establishment. Partnerships with organizations such as the Sinnemahoning Invasive Plant Management Area (SIPMA) will be vital in accomplishing these projects. Segments needing improvement can be identified using Figure 72.

Figure 70. Log cross vane project completed by Cameron County Conservation District on segment 1526

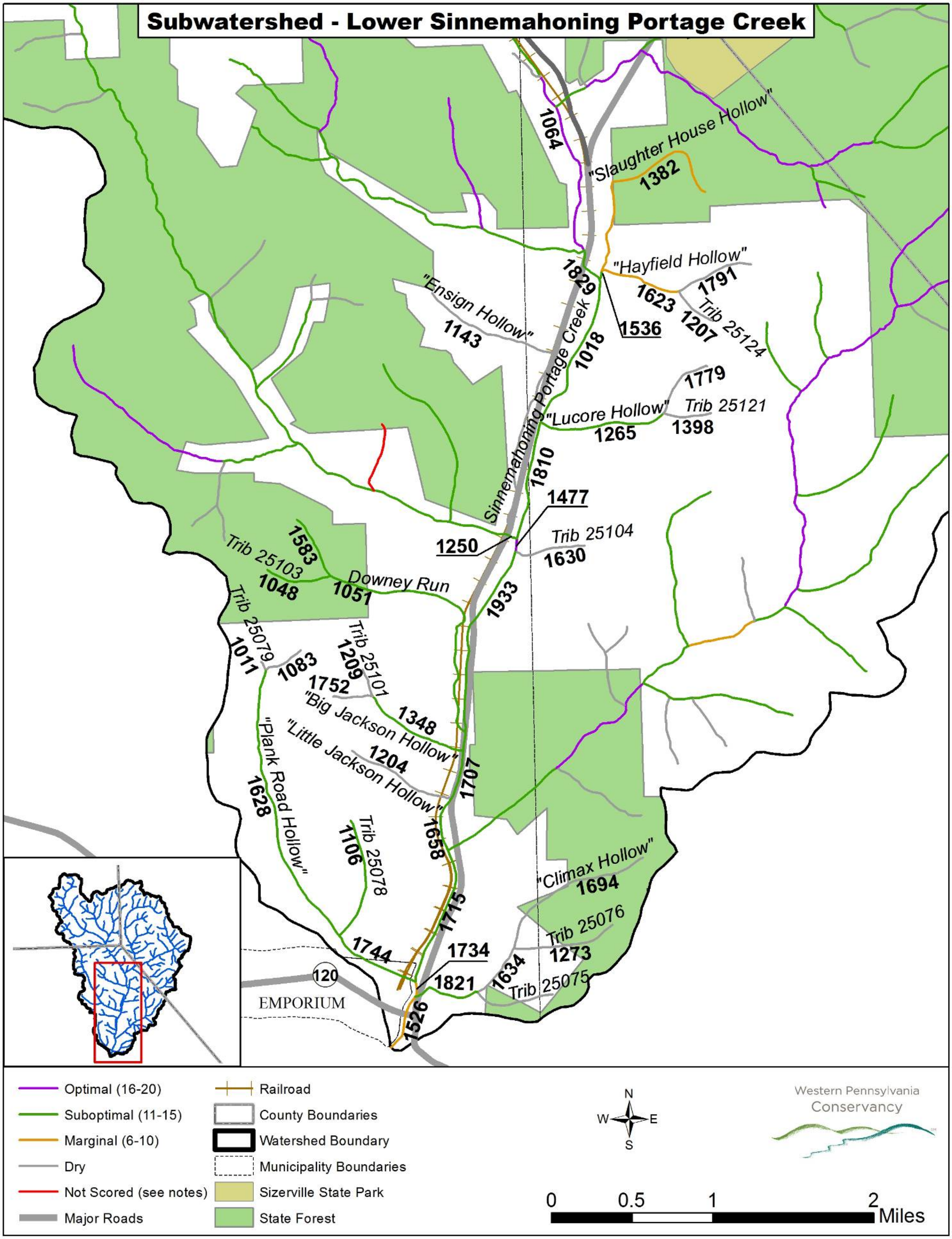

Figure 71. Assessed segments in the lower Sinnemahoning Portage Creek subwatershed

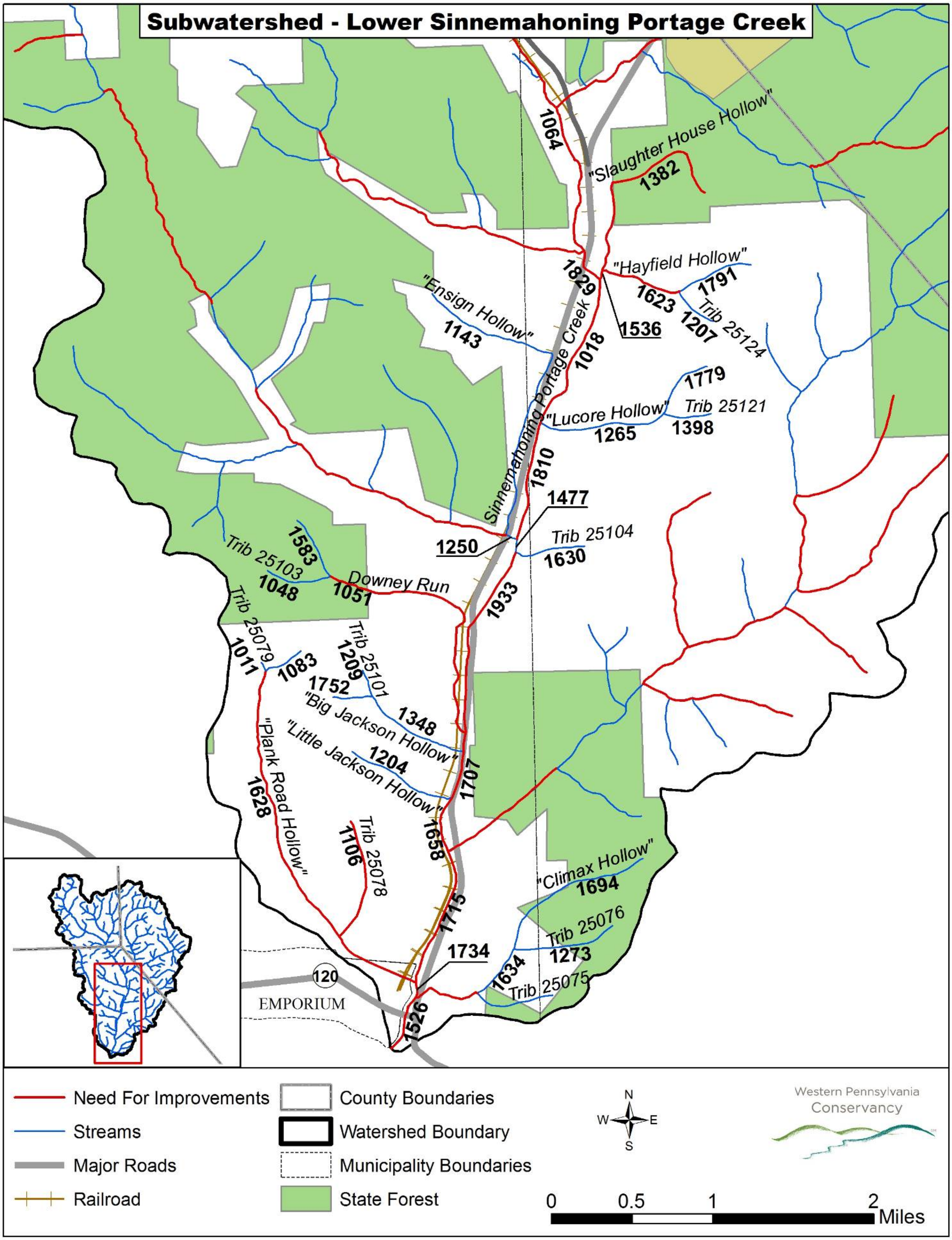

Figure 72. Segments needing improvement in the lower Sinnemahoning Portage Creek subwatershed

Table 11. Summary Scores for the lower Sinnemahoning Portage Creek Subwatershed

NAME	Length (Miles)	GIS_ID	Epifaunal Substrate	Embedd-edness	Velocity/ Depth Regimes	Sediment Deposition	Channel Flow Status	Channel Alteration	Frequency of Riffles	Bank Stability	Vegetative Protection	Riparian Vegetation	Total Score	Score
"Big Jackson Hollow"	0.68	1348	18	16	14	17	9	15	16	16	16	15	15.2	Suboptimal
"Climax Hollow"	0.43	1821	18	15	10	13	8	10	18	7	9	10	11.8	Suboptimal
"Hayfield Hollow"	0.51	1623	6	13	5	5	6	10	15	9	13	10	9.0	Marginal
"Lucore Hollow"	0.80	1265	16	17	12	16	16	14	12	16	16	16	15.0	Suboptimal
"Plank Road Hollow"	1.80	1628	12	17	15	15	13	12	17	11	13	10	13.5	Suboptimal
"Plank Road Hollow"	0.57	1744	10	14	10	15	15	8	12	15	8	3	11.0	Suboptimal
"Slaughter House Hollow"	1.36	1382	3	11	8	11	11	6	7	14	16	15	10.2	Marginal
"Slaughter House Hollow"	0.06	1536	14	16	8	15	11	16	14	14	16	14	13.8	Suboptimal
Downey Run	1.69	1051	18	16	15	17	9	11	12	13	14	14	13.9	Suboptimal
Downey Run	0.41	1583	16	17	10	16	6	19	10	16	18	20	14.8	Suboptimal
Sinnemahoning Portage Creek	1.00	1018	14	18	15	17	15	14	15	14	12	13	14.7	Suboptimal
Sinnemahoning Portage Creek	0.97	1064	16	16	17	16	15	15	7	19	19	17	16.7	Optimal
Sinnemahoning Portage Creek	0.08	1477	16	17	19	19	18	20	18	19	20	18	18.4	Optimal
Sinnemahoning Portage Creek	0.37	1526	10	17	16	5	11	8	17	10	5	4	10.3	Marginal
Sinnemahoning Portage Creek	0.36	1658	14	19	15	18	16	12	18	10	12	5	13.9	Suboptimal
Sinnemahoning Portage Creek	0.30	1707	14	18	11	15	16	16	17	14	14	6	14.1	Suboptimal
Sinnemahoning Portage Creek	0.88	1715	8	13	16	14	13	9	17	6	10	4	11.0	Suboptimal
Sinnemahoning Portage Creek	0.10	1734	5	17	5	5	8	14	4	12	9	6	8.5	Marginal
Sinnemahoning Portage Creek	0.75	1810	13	17	14	18	14	13	12	13	15	12	14.1	Suboptimal
Sinnemahoning Portage Creek	0.23	1829	15	11	18	17	16	15	13	17	13	14	14.9	Suboptimal
Sinnemahoning Portage Creek	1.21	1933	13	18	17	17	17	11	18	15	15	8	14.9	Suboptimal
Trib 25078 to "Plank Road Hollow"	0.00	1106	16	18	15	16	13	15	18	12	11	14	14.8	Suboptimal
Trib 25103 to Downey Run	0.42	1048	16	16	10	14	6	19	10	14	18	20	14.3	Suboptimal

Conclusions

An incredible amount of work was completed in order to collect all of the necessary field data for this project. Staff walked an un-told number of miles on steep and un-even terrain to identify potential restoration locations and to document pristine areas as well. By reviewing all of the data collected on instream habitat the majority of the locations that are having erosion and sedimentation issues could benefit greatly from dirt & gravel road improvement, riparian buffer establishment and enhancement. In addition, fish passage projects will allow for greatly enhanced fish populations from a genetic, as well as biodiversity, standpoint. These locations act as bottlenecks, which restrict fish passage and can often be mitigated be a well-designed culvert replacement project. Access to complete streambank stabilization projects is good in many locations throughout the watershed. By first completing the outreach to landowners to access stream reaches for the visual assessment portion of the project, many contacts have been made in the watershed. Generally landowners were supportive of the project and those could be the first round of stabilization projects completed in the coming years. Development of a GIS to support this project has established an excellent starting point for restoration work. By utilizing the deliverables of this project, program partners are in a great position to implement the recommendations of this report.

Attachment 1: EPA Rapidbioassessment Score Sheet

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	**GIS ID #** __________
SEGMENT ID	**STREAM CLASS**
LAT ______________ **LONG** ______________	**RIVER BASIN**
STORET # N/A	**AGENCY** Western Pennsylvania Conservancy
INVESTIGATORS	

FORM COMPLETED BY	**DATE** ___________________ **TIME** __________ **AM PM**	**REASON FOR SURVEY** Visual Assessment

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal Substrate & Available Cover	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
2. Embeddedness	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
3. Velocity/ Depth Regimes	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
4. Sediment Deposition	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	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 ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	**Condition Category**			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	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
7. Frequency of Riffles (or bends)	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
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream**	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**	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)	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

Total Score ________

HABITAT ASSESSMENT SCORE SHEET
HIGH GRADIENT STREAM

STREAM NAME	**SEGMENT ID**	
GIS ID # __________	**STREAM CLASS**	
LAT ______________ LONG ______________	**RIVER BASIN**	
STORET # N/A	**AGENCY** Western Pennsylvania Conservancy	
INVESTIGATORS		
FORM COMPLETED BY	**DATE __________________** **TIME _________ AM PM**	**REASON FOR SURVEY** Visual Assessment

Habitat Parameter	Score	Explanation of Score Given *(Complete especially for poor rating)*	
1. Epifaunal Substrate /Available Cover			
2. Embeddedness			
3. Velocity/ Depth Regimes			
4. Sediment Deposition			
5. Channel Flow Status			
6. Channel Alteration			
7. Frequency of Riffles (or bends)			
8. Bank Stability **(score each bank)** ***Note: determine left or right side by facing downstream***	**Total of LB & RB**	**(LB)**	
		(RB)	
9. Vegetative Protection **(score each bank)** ***Note: determine left or right side by facing downstream***	**Total of LB & RB**	**(LB)**	
		(RB)	
10. Riparian Vegetative Zone Width	**Total of LB & RB**	**(LB)**	

(score each bank riparian zone)		**(RB)**	
Total Score		**Add all scores and divide by the number of scores given.**	