LOYALHANNA CREEK WATERSHED

Assessment and Restoration Plan

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Acknowledgements

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WATERSHED ASSESSMENT WRITING TEAM

Author - Carole Wright, Loyalhanna Watershed Association
Editor - Angela Zimmers, Western Pennsylvania Conservancy
Maps - Eli Long, Western Pennsylvania Conservancy
Review - Watershed Assessment Advisory Committee

WATERSHED ASSESSMENT ADVISORY COMMITTEE

Drew Banas	Loyalhanna Watershed Association
Craig Barras	Westmoreland Conservation District (2002-2003)
Mike Barrik	Westmoreland Conservation District (2003-2005)
Floyd Eiseman	Loyalhanna Watershed Association Board Member
Jeff Fliss	Department of Environmental Protection
Wesley Gordon	Loyalhanna Watershed Association Board Member
Ron Horansky	Department of Environmental Protection
Mark Killar	Western Pennsylvania Conservancy
Beth Langham	Saint Vincent College
John Matviya	Department of Environmental Protection/LWA Board Member
Rosemary Reilly	U.S. Army Corps of Engineers
Carole Wright	Loyalhanna Watershed Association
Benjamin Wright	Western Pennsylvania Conservancy

WATERSHED ASSESSMENT VOLUNTEERS

Hank Balles	Trout Unlimited/Loyalhanna Watershed Association
Scott Balles	Western Pennsylvania Conservancy Summer Intern (2003)
Sam Banales	Loyalhanna Watershed Association
Angela Belli	Saint Vincent College
Hillary Bright	Western Pennsylvania Conservancy AmeriCorps Intern (2004)
Roger Brown	Loyalhanna Watershed Association
Susie Carmichael	Westmoreland Conservation District
Tammy Colt	Loyalhanna Watershed Association AmeriCorps Intern (2003)
Carly Colt	Loyalhanna Watershed Association
Dr. Daryle Fish	Saint Vincent College
Jamie Heinzman	Loyalhanna Watershed Association AmeriCorps Intern (2004-2005)
Melanie Holowaty	Loyalhanna Watershed Association AmeriCorps Intern (2002-2003)
Cathy Johnston	Loyalhanna Watershed Association
Scott Minster	Forbes Trail Trout Unlimited/Loyalhanna Watershed Association
Laura Riddle	Saint Vincent College AmeriCorps Intern (2003-2004)
Roz Robataille	Loyalhanna Watershed Association
Alysha Trexler	Western Pennsylvania Conservancy AmeriCorps Intern (2004)

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Thank you to all of the following individuals who spent countless hours walking and assessing the 2,500 miles of stream in the Loyalhanna Creek Watershed…through wind, rain, snow, sub-zero temperatures, and boiling hot temperatures.

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Craig Barras
Sam Banales
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Carly Colt
Dr. Daryle Fish
Melanie Holowaty
Mark Killar
Beth Langham
Scott Minster
Nick Pinizzotto
Laura Riddle
Roz Robataille
Alysha Trexler
Benjamin Wright
Carole Wright

Abbreviations

ALK	Alkalinity (water quality measurement)
AMD	Abandoned Mine Drainage
BMP	Best Management Practice
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CUP	California University of Pennsylvania
CWA	Clean Water Act
CWF	Cold Water Fishery
DU	Ducks Unlimited
EQIP	Environmental Quality Incentives Program
EV	Exceptional Value
FSA	Farm Service Agency
FTTU	Forbes Trail Trout Unlimited
HQ-CWF	High Quality Cold Water Fishery
LWA	Loyalhanna Watershed Association
NRCS	Natural Resource Conservation Service
OSM	Office of Surface Mining
PACD	Pennsylvania Association of Conservation Districts
PAFBC	Pennsylvania Fish and Boat Commission
PAGC	Pennsylvania Game Commission
PNR	Powdermill Nature Reserve
PSCE	Penn State Cooperative Extension
RAMP	Rural Abandoned Mine Project
SVC	Saint Vincent College
TDS	Total Dissolved Solids
TSF	Trout Stocked Fishery
TSS	Total Suspended Solids
UNT	Un-named Tributary
USACE	United States Army Corps of Engineers
USDA RUS	United States Dept. of Agriculture Rural Utility Service
WCD	Westmoreland Conservation District
WHIP	Wildlife Habitat Improvement Project
WPCAMR	Western Pennsylvania Coalition for Abandoned Mine Reclamation
WPCWAC	Western Pennsylvania Conservancy Watershed Assistance Center
WPWP	Western Pennsylvania Watershed Program
WREN	League of Women Voters Water Resources Education Network
WWF	Warm Water Fishery

INTRODUCTION

a. Project Background & Overview
b. How To Use This Report
c. Watershed Background
d. Overall Highest Ranked Restoration Priorities for the Loyalhanna Creek Watershed

Introduction

Project Background and Overview

Project Background

The Loyalhanna Watershed Association (LWA) was formed in 1971 to address the environmental challenges impacting the Loyalhanna Creek Watershed. Recently the LWA identified a need to formulate a comprehensive plan to address the multiple of water quality challenges facing the Loyalhanna Creek Watershed. With 2,500 miles of stream within 300 square miles, future remediation and actions need to be well planned. Please see Map I.1 for the geographic location of the Loyalhanna Creek Watershed.

Loyalhanna Creek in Darlington near Ligonier.

In the winter of 2002, the LWA applied for funding to complete this watershed assessment and restoration plan (WARP). With guidance from the Western Pennsylvania Conservancy's Watershed Assistance Center (WPCWAC), the application was submitted with a modest budget and aggressive goals. Funding in the amount of $98,000 was received from the PA Department of Environmental Protection Growing Greener Program in the summer of 2002.

The LWA chose to complete the project in-house with contracted services through WPCWAC. This would allow LWA employees, members and volunteers to become intimately familiar with the watershed and have an active role in completing this important project.

Project Overview

The following is an overview of the project. The overview briefly describes each step of the WARP and how it was completed.

Project Planning

In September of 2002, project work began with the identification and prioritizing of goals. The WPCWAC and the LWA established the following objectives to guide the assessment and restoration plan:

1. Locate and map the location of impaired sites within the watershed.
2. Prioritize streams for remediation.
3. Gather basic water chemistry to show overall change of water quality throughout the length of the watershed.
4. Increase community awareness.

In the late fall of 2002, individuals from organizations involved with the protection, conservation, and restoration of the Loyalhanna Creek Watershed were invited to join the planning process. Facilitated

Overall Location of the Loyalhanna Creek Watershed

Map I.1

- Interstates
- US Routes
- Streams
- Boroughs and Cities
- Township Boundaries
- Loyalhanna Creek Watershed

Watershed Assistance Center

2.5 1.25 0 2.5 Miles

Murrysville
Delmont
Blairsville
119
22
Derry
Latrobe
Greensburg
119
Ligonier
030
Jennerstown
Mount Pleasant
076
219

by the WPCWAC, the group developed goals and priorities that would further focus the project. Most specifically, they narrowed down the specific impairments that would be noted during project fieldwork. Those impairments were selected based upon known impacts in the watershed and the potential for remediation given current knowledge, resources, and technology. The priority impairments are as follows:

1. Abandoned Mine Drainage and its cumulative effects
2. Nutrient Enrichment (agricultural non-point source pollution)
3. Riparian Zone Degradation
4. Erosion and Channel Alteration

Japanese knotweed presence and the impact of sewage would be identified during fieldwork; however, they would not be addressed in the same manner within the restoration plan. It was determined that remediation of either problem was beyond the current scope and mission of the LWA. Any identified impacts would be noted and brought to the attention of the appropriate organizations.

Committee Organization

Following the first meeting of stakeholders, the LWA organized an advisory committee that would guide the project. Organizations represented on the committee included: Westmoreland Conservation District (WCD), Pennsylvania Fish and Boat Commission (PAFBC), United States Army Corps of Engineers (USACE), Pennsylvania Department of Environmental Protection (DEP) , Saint Vincent College (SVC) and the USDA Natural Resource Conservation Service (NRCS). For a complete list of advisory committee members, please refer to Appendix 1.

Study Design

The advisory committee, LWA, and WPCWAC formulated a study design, project protocol and overall timeline for project progression. The study design established fieldwork methods. Given the size of the watershed, it was determined that a visual assessment would be the most efficient way to carry out the watershed assessment. Please refer to Appendix 2 for the study design and protocol.

To provide a framework for fieldwork, WPCWAC adapted the USDA Visual Assessment Protocol. Specifically, the adapted format was changed to include categories for project priorities. The visual assessment included investigation of channel condition, riparian zone, canopy cover, bank stability, water appearance, nutrient enrichment, fish barriers, embeddedness, fish cover, macroinvertebrate habitat, abandoned mine drainage presence, sewage presence, manure presence, and the presence of Japanese Knotweed. Please refer to Appendix 2 for the Visual Assessment format utilized.

Background Data Collection

Prior to the start of fieldwork, it was necessary to collect and review all existing data for the Loyalhanna Creek Watershed. Information was collected from the DEP, PAFBC Office in Somerset, U.S. Army Corps of Engineers, Saint Vincent College, Westmoreland Conservation District and other miscellaneous sources. The existing data guided the progression of fieldwork and the extent to which particular tributaries and streams would be explored.

A WPCWAC staff member talks with a group of volunteers at Mill Creek in Ligonier.

Fieldwork Training

Assessment fieldwork was kicked off in June of 2003 with a volunteer training attended by more than 30 individuals. Led by the WPCWAC, the training was successful and created a corps of volunteers that were helpful during assessment fieldwork in the

summer of 2003. Volunteer assistance waned as fieldwork progressed into the winter of 2004 and the remaining fieldwork was completed by the LWA and WPCWAC.

Fieldwork

With 2,500 miles of stream to assess, the advisory committee, LWA, and WPCWAC decided to divide the Loyalhanna Creek Watershed into separate sections. (Map I.2) The division of the watershed into sections and subwatersheds made fieldwork less daunting and created an effective system for fieldwork. Three sections were created (Maps I.2.A, I.2.B, I.2.C). Each section and each subwatershed was assessed separately.

Fieldwork began in each subwatershed with the visual assessment protocol. Volunteers, LWA staff, and WPCWAC viewed the subwatershed on foot. Not only was the stream itself examined, notes were made regarding field pH, weather conditions, land use, land ownership and other important information.

In some cases, additional fieldwork was needed and water samples were collected for chemical analysis. Those samples were only to be taken in the event that an unknown pollution source was discovered. Please refer to Appendix 2 for the visual assessment protocol.

Data Management

Throughout the assessment process, data sheets and maps were reviewed and organized by the advisory committee, LWA staff, and WPCWAC. Visual assessment data was entered into an Excel spreadsheet allowing for future data manipulation and use. Hard copies of all data were checked and filed.

Utilizing assessment findings, a stream monitoring program was established in the fall of 2003. The mouths of each subwatershed were incorporated into a quarterly sampling program as they were assessed. This was done in order to establish baseline data for the entire watershed, which until this point, did not exist. In addition, as fieldwork progressed downstream, samples were taken along the Loyalhanna Creek main stem. Sample results assisted in the confirmation of visual assessment findings. In addition, samples served as an overall check to ensure that a major issue was not overlooked during fieldwork. For water quality data please refer to individual subwatershed reports and to Appendix 3.

Data Organization and Report Writing

The advisory committee took a key role in the data organization and report writing phase of the project. Utilizing field data, water quality data, and historical information, the assessment and restoration plan was compiled. The advisory committee read, reviewed and revised the plan section by section. Input from multiple organizations was critical to ensure accuracy and clarity in reporting findings. In addition, the committee was central to the formulation of restoration objectives for impacted streams and the prioritization of restoration.

In the winter of 2005, a draft of the plan was circulated beyond the advisory committee for additional comments. And finally in the winter of 2006, the completed Loyalhanna Creek Watershed Assessment and Restoration Plan was released to the watershed community.

Project Implementation

The Loyalhanna Creek Watershed Assessment and Restoration Plan is intended for use by multiple organizations and individuals throughout the watershed. Recommendations included throughout

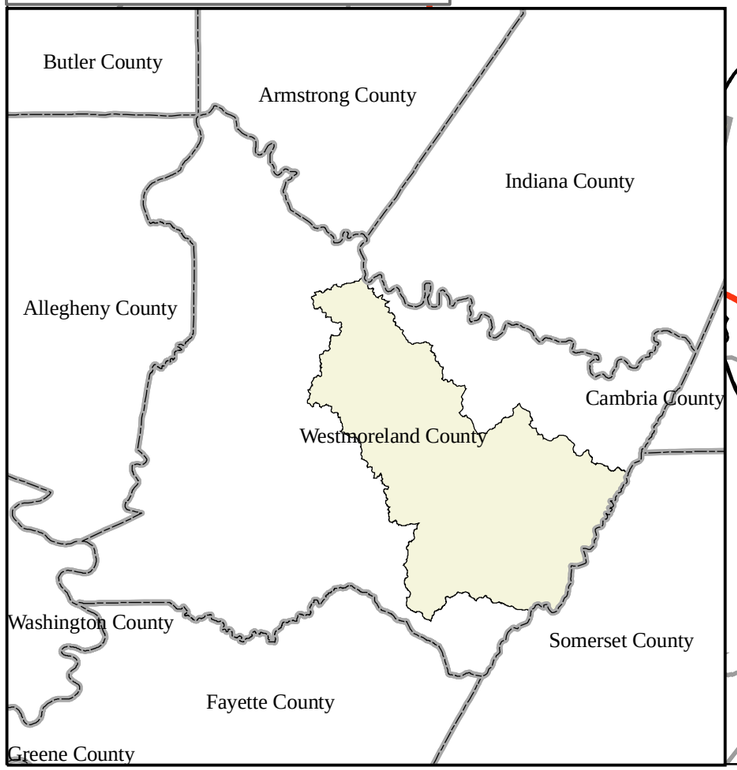
Overall Location of the Loyalhanna Creek Watershed

Map I.2

- Interstates
- US Routes
- Streams
- Boroughs and Cities
- Township Boundaries
- Lower Section
- Middle Section
- Upper Section

Western Pennsylvania Conservancy
Watershed Assistance Center

2.5 1.25 0 2.5 Miles



Murrysville
Delmont
Blairsville
Greensburg
Derry
Latrobe
Ligonier
Jennerstown
Mount Pleasant
119
22
030
076
219

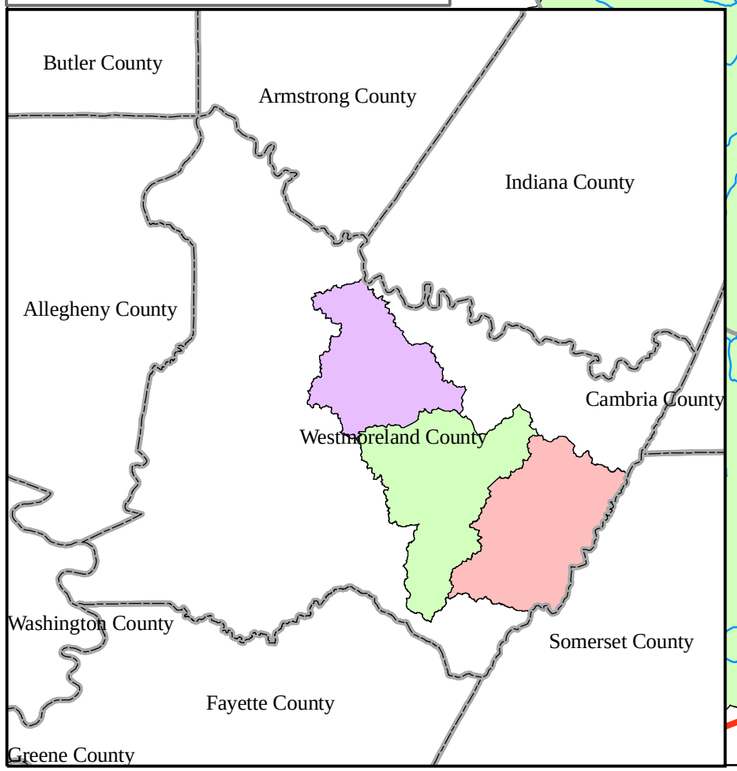
Upper Section of the Loyalhanna Creek Watershed

Map I.2.A

- Interstates
- US Routes
- Streams
- Boroughs and Cities
- Township Boundaries
- Lower Section
- Middle Section
- Upper Section

Western Pennsylvania Conservancy
Watershed Assistance Center

0.75 0.375 0 0.75 Miles



Latrobe
Youngstown
Ligonier
Laurel Mountain
Jennerstown
30
76
70

Middle Section of the Loyalhanna Creek Watershed

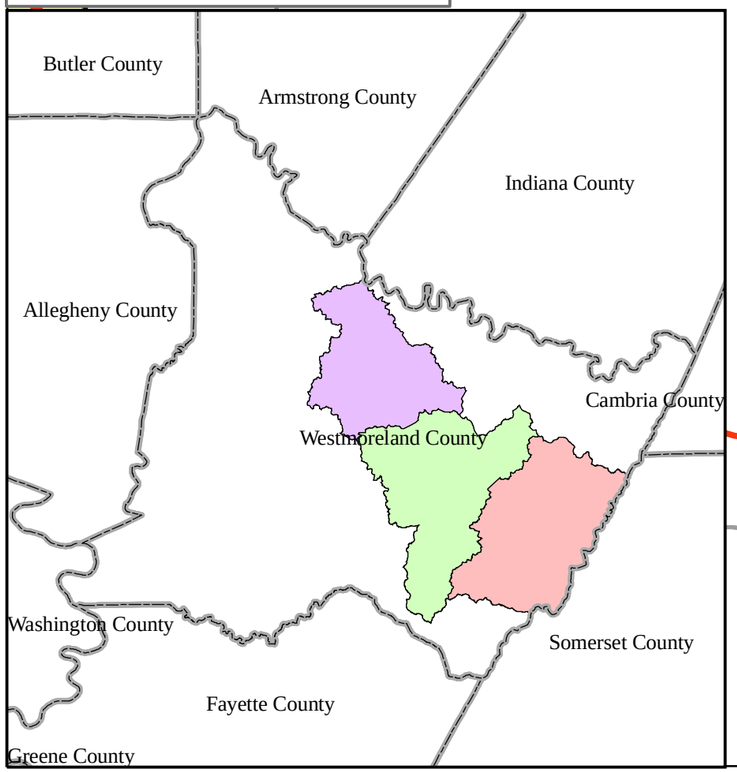
Map I.2.B

- Interstates
- US Routes
- Streams
- Boroughs and Cities
- Township Boundaries
- Lower Section
- Middle Section
- Upper Section

Western Pennsylvania Conservancy
Watershed Assistance Center

0.9 0.45 0 0.9 Miles

Derry
Latrobe
Youngstown
Ligonier
Laurel Mountain
Donegal
30
76
70



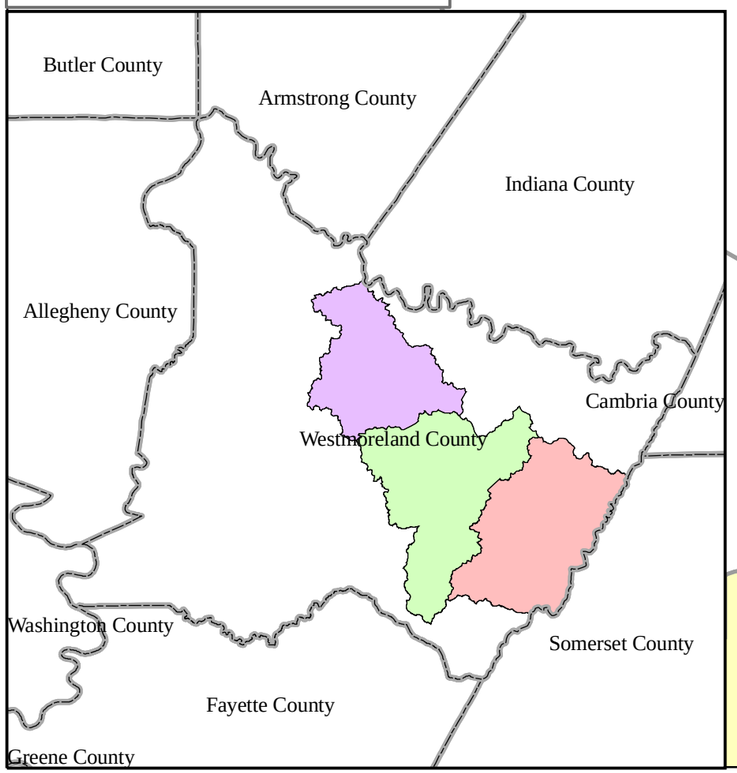
Lower Section of the Loyalhanna Creek Watershed

Map I.2.C

- Interstates
- US Routes
- Streams
- Boroughs and Cities
- Township Boundaries
- Lower Section
- Middle Section
- Upper Section

Western Pennsylvania Conservancy
Watershed Assistance Center

0.7 0.35 0 0.7 Miles

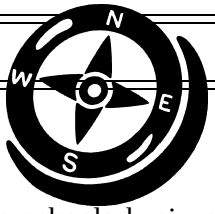


Saltsburg
Delmont
Blairsville
New Alexandria
Greensburg
Derry
Latrobe
22
119

the report are geared for use by landowners, municipalities, schools, businesses, and environmental organizations. This document is designed to serve as a guide for future restoration and remediation efforts. It will be circulated in hard copy throughout the watershed. In addition, it will be made available on the Internet and in CD format. Due to the diverse population of individuals that will use the document, is written in language applicable to all degrees, backgrounds, and levels of expertise.

Introduction

How To Use The Report



Recommendations for Use

This report is intended for use by conservation organizations, municipalities, schools, businesses, and landowners. It is designed to be used in a variety of methods. Each section and each subwatershed report can be used individually or in combination. Restoration recommendations are made at the subwatershed level, at the watershed section level and overall watershed level.

The LWA, WPCWAC, and Advisory Committee recommend reading and reviewing the plan in the following manner:

1. Read the Introduction to obtain the appropriate background information and tools (pages I.1 – I.11).
2. Review the list of restoration priorities for the entire Loyalhanna Creek Watershed (pages I.12 – I.23).
3. Identify which section of the Loyalhanna Creek Watershed you are concerned with (upper, middle, or lower).
4. Review the overall report and list of restoration priorities for that section.
5. Identify which subwatershed within that section you are concerned with.
6. Read and review that subwatershed report.
7. Refer to figures, tables, and charts within that report that will identify restoration priorities for that subwatershed.

Report Outline

The report is designed so it can be used in its entirety or so that each separate section can stand-alone. Each section of the report contains the following segments:

Overall Section Report – Provides information, statistics, and overall restoration priorities for the entire section (upper, middle or lower).
Subwatershed Reports – Each section (upper, middle, lower) contains multiple subwatershed reports. The subwatershed reports all provide information, statistics, and overall restoration priorities for each subwatershed. Each of the subwatershed reports includes the following information and tools:

1. Map 1 – General Location: Locates the subwatershed within the Loyalhanna Creek Watershed. Major roads and towns are show on the map to provide overall location and orientation.

2. General Description: Describes the overall location of the subwatershed and its surrounding landscape. Provides a "snapshot" of the subwatershed and its characteristics.

3. Review of Historic Information: Lists historic sources utilized and referred to before, during, and after the visual assessment of the subwatershed.

4. Visual Assessment Summary: Detailed description of what was found and recorded during the visual assessment. Specific overall ratings for the subwatershed are listed within this section.

5. Map 2 – Overall Ratings: Identifies overall ratings given to streams and stream sections within that sub-watershed. Those ratings will be reflected as green for excellent, blue for good, yellow for fair and red for poor.

6. Table - Water Quality Data: Chart showing water quality data obtained during the assessment. Sample frequency will vary in each subwatershed area. The section also includes analysis of water quality data.

7. Conclusions –Summary of the subwatershed report and its overall qualities.

8. Recommendations – Overall recommendations for the subwatershed. The recommendations are not specific to one particular impact, tributary or stream segment. Instead, they are focused upon the entire subwatershed.

9. Figure 2 – Overall Restoration Priorities: The chart exhibits the overall restoration priority for the entire subwatershed. The restoration categories are based upon the five limiting factor categories outlined in the Study Design; erosion and channel alteration, riparian zone degradation, compromised fish and macroinvertebrate habitat, nutrient enrichment, and AMD. Values were obtained by taking the average score in each category and subtracting it from 10, which is a perfect score. Refer to Appendix 2 for the Study Design.

10. Table – Impacted Stream Segments and Restoration Suggestions: As described in the Study Design, the visual assessment scores were organized into five categories. (Refer to the Study Design in Appendix 2 to learn more about this process.) Those categories are erosion and channel alteration, riparian zone degradation, compromised fish and macroinvertebrate habitat, nutrient enrichment, and AMD. Streams or stream sections that received an average score below 5.0 in any of those categories are noted. Receiving a score below 5.0 in any category indicates that the category is a limiting factor for that stream or stream segment. Those stream sections are highlighted within this Table. It describes the stream section, limiting factor, offers suggestions for remediation, identifies possible funding sources and assigns a priority rating for remediation of that stream section.

11. Map 3 – Limiting Factors: Correlates with the above table. Shows the major limiting factor for each stream or stream section. Stream segments are labeled on a corresponding map. Although there may be more than one limiting factor for a particular stream segment, only the lowest scoring one appears on the map.

Data, Field Sheets and Notes

The assessment process produced a large number of field assessment sheets. Those sheets contain detailed notes and scores in the format put forth by the Assessment Protocol described in the previous section. Those assessment sheets are available at the Loyalhanna Watershed Association in Ligonier, PA. To obtain copies or to view those sheets, please contact the office.

Prior to the start of the assessment, background data was collected from a variety of sources. The background data helped to guide the fieldwork, especially in areas where assessors were not as familiar with the creeks and streams being assessed. The background data is available at the Loyalhanna Watershed Association in Ligonier, PA.

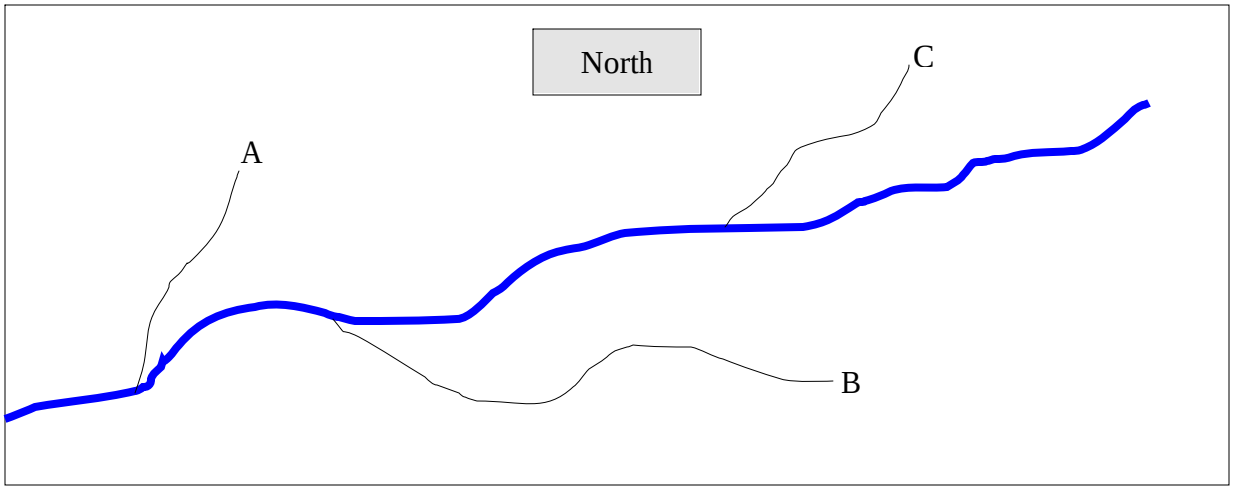
There was a large amount of background data available at the DEP Bureau of Mining office in Armburst, PA. The Advisory Committee decided it would be overwhelming and irrelevant to collect of the data available there. Instead, data was collected from 1995 to the present. Most of the data included file folders from various surface mining operations.

Other data was collected from the PA Fish and Boat Commission that had completed several fish surveys throughout the Upper Watershed. Once again, faced with a large amount of data, the Advisory Committee suggested focusing on just the most recent data.

The Loyalhanna Creek Scarlift Report, although created in 1971, was the most comprehensive piece of historical data that was utilized. It offered great historical perspective and identified mine drainage impacts that the LWA and its partners noted.

Naming of Stream Sections

Prior to the start of fieldwork, a system for naming the assessed stream section was devised. This system was used consistently throughout the entire assessment process. When naming stream sections, assessors started the naming at the mouth and proceeded upstream. Traveling upstream, the first stream encountered would be named with the number one and would be identified as to which direction it entered from. If the stream were named, its name would be used. If there were no name for the stream, it would be named an Un-named Tributary or UNT. Please see the example drawn below for a more complete explanation.



Using the diagram above, the bold blue line is called Blue Stream and it is the main stem section. The first stream encountered is labeled A, and it enters Blue Stream from the north. It is an un-named tributary and therefore will be labeled Blue Stream UNT1N. Moving upstream, the next stream to enter Blue Stream is labeled B. It is also an un-named tributary and it enters from the south. That stream will be named Blue Stream UNT1S, because it is the first stream entering from the south. The last stream shown, labeled C, enters from the north and is also not named. Because it is the second stream entering from the north, it will be named, Blue Stream UNT2N.

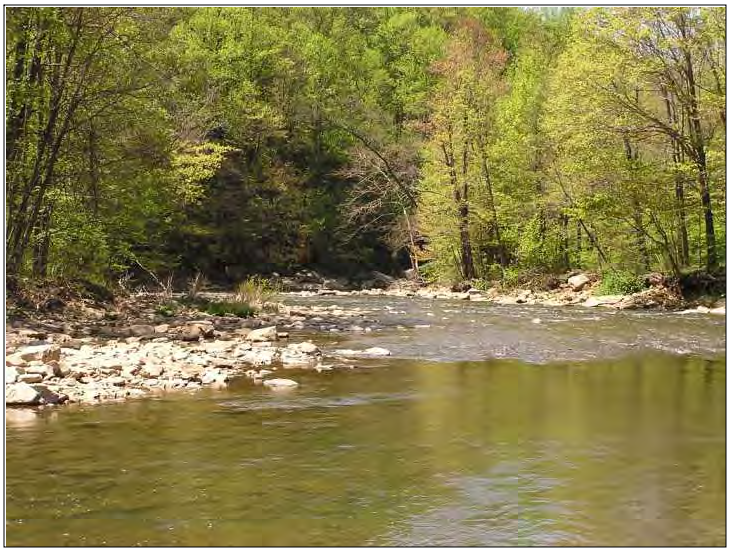
In naming the streams, abbreviations were used multiple times. All of those abbreviations will be listed and identified in Appendix 4.

Introduction

Watershed Background

General Watershed Description

The 300 square-mile Loyalhanna Creek Watershed is located in the eastern portion of Westmoreland County (Map I.1). It originates upon Laurel Ridge just southeast of Ligonier. The Loyalhanna Creek flows west through Ligonier and on toward the City of Latrobe. In Latrobe, the Loyalhanna Creek turns northwest as it passes through downtown. Beyond Latrobe, the creek continues to flow northwest as it skirts the community of New Alexandria. Finally, the Loyalhanna Creek joins the Conemaugh River in Saltsburg to form the Kiskiminetas River.



The Loyalhanna Creek as it flows through the Loyalhanna Gorge between Ligonier and Latrobe.

The Loyalhanna Creek flows through an area rich with natural resources and diverse landscapes. Its 2,500 miles of stream flow through seven townships and eleven boroughs. The land surrounding the watershed creeks and streams is rural, semi-rural, forested and agricultural. This landscape is interrupted only in the City of Latrobe, where homes, industry, and businesses surround the creek.

The Loyalhanna Creek Watershed is situated in a region underlain by rich deposits of bituminous coal. At one time, the communities surrounding the watershed were booming with coal and coke production. Some of the thriving coal patch towns are small rural communities today. In addition to coal mining, agriculture was widespread throughout the watershed. Small family farms still blanket watershed hills, especially in its middle section. In contrast, a recreational region surrounds the headwater area of the watershed. Protected state forestlands, game lands, and private tracts of land encompass watershed streams. That region has been protected since the boom of the coal mining industry and has remained relatively undisturbed since that time.

Geology of the Watershed

During the Mississippian and Pennsylvanian epochs of the Carboniferous period, western Pennsylvania was alternately open water, lake and lush swamp. Materials deposited during that geologic time period comprise the current exposed sedimentary rocks that currently exist throughout the Loyalhanna Creek Watershed. Coal deposits, common to this region are the fossil remains of the lush swamp environment, while the related sandstones, limestones and shales are remains of former marine and lake environments. [1]

The two principle coal seams that underlay the Loyalhanna Creek Watershed are the Pittsburgh and Upper Freeport seams. The Pittsburgh coal seam lies at the base of the Monongahela Formation and

[1] Scarlift Report, December 1972, Project No. SL-122

the Upper Freeport coal seam is located at the top of the Allegheny Formation. Between the two seams is the Conemaugh Formation, which contains mostly shales and some sandstone.

At one time, the Pittsburgh coal seam covered the Loyalhanna Creek Watershed region. Much of the coal eroded away and four synclinal structures bearing Pittsburgh coal remain. They are known as the Elders Ridge Syncline, Greensburg Syncline, Latrobe Syncline, and Ligonier Syncline. The Elders Ridge Syncline is a 4.4-mile seam located near the town of Slickville. It flanks both sides of the Getty Run Subwatershed. The Greensburg Syncline underlies 15 square miles and it extends from Greensburg north to New Alexandria. It is within the Whitethorn Creek and Crabtree Creek Subwatersheds. The Latrobe Syncline underlies 25 square miles of the watershed. It encompasses portions of Unity Township and Derry Township near the City of Latrobe. The Ligonier Syncline, located in Ligonier and Fairfield Townships, is two separate coal formations that underlie 4.4 square miles of hillside.

The Freeport Coal seam is found underneath most of the Loyalhanna Creek Watershed. This is only the exception within the higher elevations of Chestnut Ridge where it has been eroded away. Chestnut Ridge contains large deposits of Loyalhanna Limestone that were mined and continue to be mined today.

Much of the Pittsburgh Coal seam was mined or depleted in the early 1900s. Because the coal seam was close to the surface in many areas within the watershed, it was economically feasible to mine. The majority of the mines within the watershed were not self-draining except for those located in the Elders Ridge Syncline. Pumping was required to prevent flooding.

Coal tipple at the Andrico No.5 Mine near New Alexandria, PA

As the mining industry dwindled within the Loyalhanna Creek Watershed, the abandoned mines were left to flood and drain through old mine openings, shafts, and air ways. That draining water, exposed to acid bearing overburden material in the mines, contained high levels of metals, sulfates, and acidity. Also referred to as abandoned mine drainage (AMD), the draining water quickly became a serious pollutant to waterways within the Loyalhanna Creek Watershed.

Important Watershed Features

The Loyalhanna Creek Watershed is intersected by two ridgelines that run north to south. The two ridges, Chestnut Ridge and Laurel Ridge are the most western high points in Pennsylvania. Laurel Ridge is located on the eastern border of Westmoreland County. It is the headwater region of the Loyalhanna Creek watershed. Multiple streams originate from spring sources that trickle from limestone and sandstone outcroppings at the crest of the ridge. It is in this headwater area that the Loyalhanna Creek is the most pristine, protected, and enjoyed.

As the Loyalhanna Creek flows in between Ligonier and Latrobe, it passes through geologic formation called the Loyalhanna Gorge. The Loyalhanna Creek formed the gorge as it eroded through the limestone and sandstone that comprise Chestnut Ridge. The ridge runs parallel to Laurel Ridge extending from the southern border of Pennsylvania and north into Indiana County.

Two major recreation areas are located within the middle and lower section of the watershed. Keystone Lake, managed by the Pennsylvania Department of Conservation and Natural Resources

(DCNR) is designated for fishing, boating and swimming. Loyalhanna Lake, managed by the USACE, is a flood control area designated for boating, fishing and some swimming.

The Loyalhanna Lake is formed as a result of the Loyalhanna Dam, impounded in 1942 in order to control floodwaters. The flood control property maintained for the dam extends from the outskirts of the Latrobe and downstream to the Loyalhanna Dam, which is located 4 miles upstream from the mouth of the Loyalhanna Creek. The 2,500 acres of flood control property surrounding the main stem of the Loyalhanna Creek is owned by the USACE and leased for recreational use by the Pennsylvania Game Commission (PAGC).

Water Quality

Despite abundant forests and protected land in the headwaters and natural areas throughout its middle section, the Loyalhanna Creek Watershed is impacted by a series of challenges including abandoned mine drainage, sedimentation as a result of erosion, and nutrient loading. The combination of historic coal mining, farming and development threaten the overall water quality of the Loyalhanna Creek Watershed.

Abandoned Mine Drainage (AMD)

Most of the Loyalhanna Creek Watershed is underlain with the Pittsburgh Coal seam, which is part of the Monongahela formation. This seam of coal was heavily mined in the late 1800s and the early 1900s. The presence of the Pittsburgh Coal seam was important to the growth and economy of the Loyalhanna Creek Watershed and surrounding region. Multiple watershed communities were founded due to the coal and coke industry. In the early 1900s deep mines were operating in and around Ligonier, Latrobe, Baggaley, Whitney, Hostetter, Superior, Peanut, Crabtree, Hannastown, Forbes Road, New Alexandria, and Slickville. By the late 1920s and early 1930s, coal resources where depleted and many mines where abandoned. Water was left to fill and drain from the mines. It is this draining water that created, and continues to create, water pollution problems in the Loyalhanna Creek Watershed.

The formation of abandoned mine drainage occurs when rocks in the abandoned mines are exposed to water and oxygen. Through a series of chemical reactions, minerals from the exposed rocks are dissolved and carried with the water out of the mine. Because of the reactions that occur, the water draining from the mines can be very acidic (pH 2.0 - 4.0) or close to neutral (pH 6.0 - 7.0). It will also carry with it different metals in different concentrations. The most common metals found in Loyalhanna Creek streams are iron and aluminum. The characteristics of the abandoned mine drainage will vary depending upon the geology and hydrology of the area from which it originates.

Three major abandoned mine discharges contribute more than 2 tons of iron oxide sediment into the Loyalhanna Creek each day. Multiple acidic discharges make an additional contribution of metals into several tributary streams devouring stream life as they flow. In the 1972 Scarlift Report, a majority of the discharges were impacting the Loyalhanna Creek Watershed that are making impacts today.

Sedimentation As A Result of Erosion

With the exception of headwater streams located in high elevation forests, most streams within the Loyalhanna Creek Watershed exhibit erosion due to degraded riparian areas and lack of canopy cover. The action of landowners and municipalities throughout the community has had the largest impact upon the stability of stream banks. Riparian vegetation is absent where streams flow through open farm fields, manicured lawns and downtown areas. In addition, stream channel alteration is a common practice to make way for roads and homes.

Nutrient Loading

Agricultural operations and household sewage contribute nutrients such as phosphorus and nitrogen to waterways within the Loyalhanna Creek Watershed. Manure and fertilizers found on agricultural lands can make their way to streams through run-off or livestock contact with streams. Household sewage often enters streams from homes with failing or non-existent septic systems. Both problems are abundant within the watershed. The presence of nutrient growth is noticeable on the cobble and gravel that compose the substrates of many tributary streams.

Introduction

Loyalhanna Creek Watershed Highest Restoration Priorities

The Watershed Assessment Advisory Committee developed a list of the **highest** restoration priorities for the entire Loyalhanna Creek Watershed. Those priorities were identified during an **extensive** review process that ranked impacted stream segments according to water quality impact, potential for remediation, and cost for remediation.

Table I.1 briefly describes the highest restoration priorities briefly. Table I.2 lists and describes the highest restoration priorities in detail. The priorities are separated into four major categories according to those identified during the watershed assessment planning process. Those categories are Abandoned Mine Drainage, Erosion and Channel Alteration, Riparian Zone Degradation and Habitat Degradation, and Nutrient Enrichment. The table describes the impacted stream segment, location, general restoration steps, estimated cost level, and other relevant information. The segments are listed in no particular order or ranking. Each stream or stream segment listed rates equally as a HIGH priority.

It is important to note that in the time since fieldwork was completed for this plan, several priority projects have already been started. Each of those projects are referenced and described in Appendix 5.

Table I.1: Loyalhanna Creek Highest Restoration Priorites

Category	Stream/Stream Segment	Restoration Required
AMD	Loyalhanna Creek in downtown Latrobe (MIDLOYG)	Remediate AMD Discharges located throughout the stretch of stream that contribute more than 400 gpm of iron-laden mine water to the Loyalhanna Creek.
AMD	Saxman Run (SAXA and SAXD)	Remediate 3 large AMD Discharges located in the headwaters and close to the mouth. Combined the discharges contribute more than 9,000 gpm of iron-laden mine water the Loyalhanna Creek.
AMD	Crabtree Creek (CRBA and CRBE)	Address two very different AMD flows that contribute significant amounts of metals and flow to Crabtree Creek. One discharge (Crabtree) is the largest in the watershed.
AMD	Union Run (UNIONB)	Investigate, monitor, and eventually remediate discharges throughout Union Run. Until now, they have gone nearly unnoticed.
AMD	Getty Run	The entire subwatershed is impacted by AMD. The challenge is so overwhelming that it is unfortunately placed on the back-burner. However, this subwatershed should be continually monitored and kept in mind when new technology for treatment emerges.
Nutrient Enrichment	Hannas Run, Laughlintown Run, Upper Loyalhanna Creek	Areas surrounding Ligonier Borough do not have public sewerage. Waterways are impacted by the presence of waste flowing into the stream. Sewerage and better maintenance of septic systems is needed.
Nutrient Enrichment	Crabtree Creek	In addition to being impacted by AMD, Crabtree Creek is also impacted by sewage. Sewerage is needed in the communities surrounding Crabtree Creek

Nutrient Enrichment	Whitethorn	Installation of agricultural BMPs throughout the entire subwatershed. With programs such as CREP, this should be a top priority that can be turned over to agencies such as the WPC and USDA who are handling CREP sign-ups and eligibility.
Riparian Degradation and Habitat Degradation	Upper Loyalhanna Creek Tributaries	Educate landowners regarding the impact they have on water quality by removing riparian vegetation.
Riparian Degradation and Habitat Degradation	Upper Loyalhanna Creek	Promote the importance of land conservation and protection. Work with and support WPC.
Riparian Degradation and Habitat Degradation	Ninemile Run Headwater Tributaries to the West	Educate landowners regarding the impact they have on water quality by removing riparian vegetation. Especially golf course owner and developer.
Riparian Degradation and Habitat Degradation	Entire Watershed	Initiate a watershed-wide campaign to stress the importance of riparian vegetation. Create a model that can be used during outreach events.
Erosion and Channel Alteration	Mill Creek (sections I-F)	Support and work with TU to remediate several heavily eroded areas throughout the Mill Creek Subwatershed.
Erosion and Channel Alteration	Fourmile Run	Beginning with the headwater area, address erosion occurring through the entire subwatershed. Much of this can be accomplished with the installation of agricultural BMPs.
Erosion and Channel Alteration	Ninemile Run	Address erosion occurring throughout the entire subwatershed.
Erosion and Channel Alteration	Upper Loyalhanna Creek Section A	Investigate cause of erosion occurring in section A of the main stem of the Upper Loyalhanna Creek Watershed. Work with TU and landowners to address eroded sections.

Table I.2: Loyalhanna Creek Watershed Highest Restoration Priorities Described

Abandoned Mine Drainage

Stream or Stream Segment Name	Description of Impact	Remediation Strategy	Partners and Funding Sources	Cost and Feasibility
MIDLOYG The main stem section of the Loyalhanna Creek where it flows through downtown Latrobe. *Please refer to the Middle Loyalhanna Subwatershed Report for more information.*	Several AMD sites are located within this stream segment. (Latrobe Discharge, Adelphoi Borehole, Adelphoi Pipe, and Unity Discharge.) Together they contribute 400-600 gallons of AMD to the Loyalhanna Creek each minute. Each of them is generally alkaline, but located in areas where remediation is difficult. Especially the Unity Discharge, which pours into a storm drain. The origin of the discharge is not confirmed but believed to be the Latrobe Mine and Coke Works in Lloydsville. For discharge locations and water quality data, please refer to Appendix 3.	1. Continue to seek funding for and further develop the Latrobe Foundation Property Project with a goal of treating the three discharges. (Refer to Appendix 5) 2. Assess the Unity Discharge to determine its source and characteristics. There is a possible site for the treatment of the discharge at an old water treatment plant for an abandoned factory in that location. It could be used if the discharge could be routed to that site and if the facility would be useable.	**Partners:** DEP, OSM, SVC, Unity Township, City of Latrobe, local businesses. **Funding Sources:** OSM, Section 319(upon TMDL completion), DEP Growing Greener, Local Private (Latrobe Brewery, Timken, Kennametal, McKenna Foundation)	**Cost:** Medium – High **Feasibility:** Medium Due to the location of the each of the discharges, treatment will be difficult. That problem is partially solved by the Latrobe Foundation Property Project. It includes the development of an alternative treatment site for all discharges except Unity. It will be an extensive project to determine the pathway the discharge takes and to pinpoint its origin. In addition, finding a location for its treatment will be a challenge. This is where Unity Township, the City of Latrobe, and local businesses will be critical partners.

Stream or Stream Segment Name	Description of Impact	Remediation Strategy	Partners and Funding Sources	Cost and Feasibility
SAXA Main stem section of Saxman Run that extends upstream from the mouth to Snydertown. *Please refer to the Saxman Run Subwatershed Report for more information.*	The section includes two large discharges, Upper Saxman and Lower Saxman. Both discharges are involved in separate projects that will eventually lead to the treatment of the discharges. (Refer to Appendix 5) Upper Saxman was relocated in 2004. Since that relocation, the flow of the discharge has been measured at 1200gpm to 7000gpm. With an average pH of 5.4, the discharge will contribute anywhere from 800 to 1800 pounds of iron to the stream each day. Lower Saxman was captured in 2003 and re-routed. A small portion of the 1800 gpm flow passes through an experimental treatment system (Refer to Appendix 5) and the remaining amount enters the stream through a 12-inch diameter pipe. Lower Saxman compounds the effect of the discharge upstream and adds an additional 1000 pounds of iron oxide to the stream each day. For discharge locations and detailed water quality data, please refer to Appendix 3.	1. It will be important to continue to push for new and innovative ways to eliminate the impact of the two large discharges in this segment upon the Loyalhanna Creek. Remediation of this stream segment is already underway. However, current projects are experimental. 2. The community surrounding the Saxman Run Subwatershed should be made aware of the significance of the project. Community outreach through public meetings, door-to-door distribution of information, and flyer distribution should be a top priority during this project. There are several companies and small businesses that reside within the subwatershed that may be financially supportive of the projects.	**Partners:** DEP, OSM, SVC, USACE, Hedin Environmental, Latrobe Municipal Authority, City of Latrobe, Derry Township **Funding Sources:** OSM, Section 319 (with completion of TMDL), Growing Greener, Local Funding (Derry Construction, Allvac, etc.)	**Cost:** High **Feasibility:** Low-Medium Additional projects resulting in the treatment of the discharges in section will add to the already high cost projects in place. And because new technology is needed for treatment to occur, overall feasibility is low. Regardless, the impact of this segment upon the Loyalhanna Creek Watershed is so high, that it is important to pursue funding and alternative treatment options.

Stream or Stream Segment Name	Description of Impact	Remediation Strategy	Partners and Funding Sources	Cost and Feasibility
SAXD Main stem section of Saxman Run that flows through a residential area in West Derry. *Please refer to the Saxman Run Subwatershed Report for more information.*	The West Derry Discharge impacts this section of stream. With an average pH of 2.9, the discharge has high levels of aluminum and iron. Its flow has been measured between 200gpm and 600gpm. Upon entering the Saxman Run main stem, the discharge causes a major drop in pH and iron oxide begins to precipitate and coat the stream bottom. The pH of Saxman Run remains low until reaching the Upper and Lower Saxman Run discharges. The West Derry Discharge originates from the old Francis Mine. The discharge was moved during surface mining to its current location.	1. Hold meeting with experts in the AMD Treatment field to discuss treatment options for this discharge with high acidity and high aluminum content. 2. Discuss property use/purchase with the landowners surrounding the discharge. 3. More carefully monitor the overall impact of the discharge on Saxman Run. 4. Develop a concept and projected timeline for treatment of the discharge.	**Partners:** OSM, DEP, USACE, SVC, Derry Township, Local business owners, local community members. **Funding Sources:** Growing Greener, OSM, Section 319 (with TMDL completion), local private	**Cost:** High **Feasibility:** Low Impacts to the Saxman Run Subwatershed begin with this discharge. It is important that plans be made for treatment of this discharge. It creates as much of an impact as the other discharges combined due to its high acidity and high metal content.
CRBA Main stem section of Crabtree Creek that extends from the mouth of Crabtree Creek to the Crabtree Fire Hall. *Please refer to the Crabtree Creek Subwatershed report for more information.*	The Crabtree Discharge impacts this section of stream. With an average flow of 3500gpm, it is the largest discharge in the Loyalhanna Creek Watershed. Each day it adds more than 3300 pounds of iron oxide to the stream each day. Iron staining is visible from the discharge point to the mouth of Crabtree Creek. At the mouth, it turns the Loyalhanna Creek main stem orange. That impact remains until the Loyalhanna Creek pools to form Loyalhanna Lake.	1. Plans are underway remediate the Crabtree Discharge. The remediation is part of a large project incorporating a variety of remediation efforts into one treatment project. It will include nutrient management, resource recovery and AMD treatment. That effort is led by a large committee of individuals from a variety of environmental and conservation organizations. To date, funding has been requested to complete a feasibility study and business plan for the project. Please refer to Appendix 5 for detailed information about this project.	**Partners:** OSM, USACE, PSCE, DEP, SVC, USDARUS, Unity Township, Hempfield Township, Salem Township, Derry Township, WPWP, Jon Deitz et al **Funding Sources:** Private, Federal, State	**Cost:** Very High **Feasibility:** Low-Medium The costs of the proposed project have been very high. However, due to the combination of multiple resources and treatment options, those costs are within reach. The project is possible due to the combined efforts of the partners and the support of the community.

Stream or Stream Segment Name	Description of Impact	Remediation Strategy	Partners and Funding Sources	Cost and Feasibility
CRBE Main stem section of Crabtree Creek that is located in Forbes Road. It flows along the base of a large coal refuse pile. *Please refer to the Crabtree Creek Subwatershed report for more information*	Run-off from the large coal refuse pile is seeping into the stream. There is one large seep and multiple smaller seeps that appear to flow in heavy rain. Aluminum precipitate is visible where the seeps meet the main stem of Crabtree Creek. All of the seeps are acidic in nature. The coal refuse pile was slated for removal and reclamation as a part of RAMP in the late 1970s and early 1980s. However, the landowner was not willing to proceed. Sources indicate that the landowner has not accepted multiple offers for removal by area power plants.	1. Investigate options for action with and/or against the landowner for the impact that the coal refuse pile is having upon the stream. 2. Work with BAMR to determine options for removal and remediation of the site.	**Partners:** DEP, BAMR, OSM, Local Community, Landowner **Funding Sources:** State, Federal	**Cost:** Medium **Feasibility:** Medium If the landowner can and will cooperate with the LWA and the DEP, removal is quite feasible. Removal of the pile would eliminate the seeping discharges that impact the stream.
UNIONB and UNIONUNT4N UNIONB is a mainstem section of Union Run that begins at Uschak Road and ends at Panizzi Road. UNIONUNT4N is a tributary that originates in the town of Superior and joins Union Run at Panizzi Road.	UNIONB is a stream segment that is heavily impacted by AMD. Within the section, three significant acidic discharges enter the stream contributing high levels of metals. Two of those discharges are located where UNT3N meets the mainstem. The two discharges are seasonal and flow more during the spring. The third discharge is located at Panizzi Road. The Panizzi Road discharge is actually a series of seeps that are also seasonal showing more flow in the spring. UNIONUNT4N is a large tributary to Union Run that joins the	1. Further investigate and sample all of the discharges regularly for a period of at least one year. Continue that sampling while taking the collected data to begin preliminary planning for remediation. 2. With further data and information, develop course of action for treatment using experts in the field of AMD treatment and coalmine reclamation. 3. Investigate the reclamation of UNIONUNT4N and the coal refuse pile that it flows through along Superior Road.	**Partners:** DEP, OSM, Derry Township, landowners **Funding Sources:** Section 319 (TMDL completed), Growing Greener	**Cost:** Low initial cost, high long-term **Feasibility:** Medium The initial investigation of this section of stream will only take time on the part of the LWA. Once more information is gathered regarding the history and state of the discharges, a plan can be developed.

Please refer to the Crabtree Creek Subwatershed report for more information	mainstem at the intersection of Panizzi Road and Superior Road. The tributary contains significant AMD sources. Most notably a tributary, UNT1N, that originates at what is believed to be an old deep mine area. The tributary had a field pH of 4.0. UNT4N also flows through an area that was surface mined. Coal refuse is still present and chunks of coal are scattered throughout the stream substrate.			
Stream or Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Partners and Funding Sources**	**Cost and Feasibility**
GETTY RUN The final subwatershed to enter the Loyalhanna Creek before it joins with the Conemaugh to for the Kiskiminetas. It originates in the community of Slickville. *Please refer to the Getty Run Subwatershed report for more information.*	The entire Getty Run Subwatershed is impacted by AMD. The main stem maintains a pH no higher than 3.0 for its entire length. Upon reaching the Loyalhanna Creek, it creates a plume of orange and white that remains visible to the mouth of the Loyalhanna Creek. Four tributaries, UNT3N, UNT4N, UNT5N, and UNT6N have mine discharges as their source. Additional discharges enter the mainstem in and around the community of Slickville.	1. Develop a long-range plan for the Getty Run Subwatershed that involves periodic monitoring of the discharges and the main stem. 2. It is suggested that monitoring should take place once a year to ensure no significant overall changes in the water chemistry of the watershed. 3. LWA should develop a relationship with the community of Slickville and residents along the stream. Awareness and community support will go a long way to helping with future remediation.	**Partners:** Salem Township, DEP, OSM **Funding Sources:** Section 319 (TMDL completed), Growing Greener, OSM	**Cost:** Low initially and high long-term. **Feasibility:** Low The Scarlift Report stated that achieving water quality improvement in the Getty Run Subwatershed would be difficult due to its topography and geology. It is recommended that Getty Run remain a high priority, but that it becomes more of a long-term project. It remains the most degraded stream in the entire watershed.

Nutrient Enrichment				
Stream or Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Partners and Funding Sources**	**Cost and Feasibility**
HANNAS RUN, LAUGH-LINTOWN RUN, UPPER LOYALHANNA CREEK *For more information, please visit the subwatershed reports for each stream mentioned.*	Communities surrounding the stream segments and streams are in need of community sewerage. The communities of Wilpen, Laughlintown, and Waterford have multiple cases where human waste is directly entering the stream. In addition to those communities, sewage is impacting the stream just at the borders of Ligonier Borough where sewerage is not available.	1. Support the community application currently in place to develop sewerage in those communities. 2. Assist the township and other municipal bodies in promoting the value of sewerage. 3. Take the opportunity to educate community members about the impacts of human waste upon streams.	**Partners:** Ligonier Township, Ligonier Borough, DEP, USDARUS **Funding Sources:** N/A	**Cost:** Low **Feasibility:** High The only cost in addressing this impact is that of time required of the LWA to participate in meetings and public events to promote the project once it is funded and approved. It is very likely that this installation of sewerage will take place.
CRABTREE CREEK *For more information, please visit the subwatershed reports for each stream mentioned.*	None of the communities surrounding Crabtree Creek have public access to sewerage. As a result, human waste enters the stream in many sections.	1. In conjunction with the project to treat the Crabtree Creek Discharge, the installation of sewerage will be addressed. (Appendix 5) 2. Assist the townships and other municipal bodies in promoting the value of sewerage and its importance to water quality.	**Partners:** Hempfield Township, Unity Township, Salem Township, USDARUS, PSCE, WCD, SVC, Jon Dietz et al, **Funding Sources:** N/A – addressed by USDARUS loan program	**Cost:** High **Feasibility:** High It is very feasible that a sewerage system can be installed in the Crabtree Community. That system, however, will be combined with other water quality treatment components including the treatment of AMD. Please refer to Appendix 5 for a description of the proposed project.

Stream or Stream Segment Name	Description of Impact	Remediation Strategy	Partners and Funding Sources	Cost and Feasibility
WHITETHORN CREEK *For more information, please visit the subwatershed reports for Whitethorn Creek.*	The Westmoreland Conservation District is currently working to address agricultural impacts with the Whitethorn Creek Subwatershed. Despite current efforts, Whitethorn Creek still contains one of the largest agricultural impacts in the watershed. Multiple farming operations with grazing livestock contribute large amounts of sediment and nutrients to Whitethorn Creek, especially in section D.	1. Support and promote agricultural BMP projects and funding available to farmers. This should be done in partnership with organizations with established programs such as WCD, WPC, and USDA. 2. Encourage WCD to monitor progress through water quality monitoring on and ongoing basis.	**Partners:** DEP, WCD, USDA, PSCE, WPC, PAGC **Funding Sources:** Federal (i.e.: CREP), State, Private	**Cost:** Low-Medium due to the amount of funding available. **Feasibility:** High The most challenging aspect of addressing this impact will be to establish landowner support. Multiple programs are currently in place to assist in remediating this section of stream.
Riparian Zone Degradation/Habitat Degradation				
Tributaries within the Upper Loyalhanna Creek Section *For more information please refer to the Upper Loyalhanna Creek Subwatershed Report.*	Many of the unnamed tributaries entering the Loyalhanna Creek in the upper section have a lack of riparian vegetation. This is primarily due to the action of landowners. Landowners remove stream side riparian vegetation to maintain manicured lawns and fields. This action also affects the amount of habitat available for stream life.	1. Educate landowners in the upper watershed about the importance of maintaining riparian vegetation close to and around streams. 2. The following items are suggested outreach methods to utilize: Door to door information campaign, targeted mailing, public meetings, etc.	**Partners:** DEP, PNR, Ligonier Township, Cook Township, Donegal Township, FTTU **Funding Sources:** WREN, PACD, Other source headwater funding initiatives	**Cost:** Low **Feasibility:** High Protecting water quality in headwater tributaries is important. So much of that can be done by increasing awareness. This can be done with a small cash investment, but requires a large time investment.

Stream or Stream Segment Name	Description of Impact	Remediation Strategy	Partners and Funding Sources	Cost and Feasibility
Upper Loyalhanna Creek Section *For more information, please refer to the Upper Loyalhanna Creek Introduction and subwatershed reports.*	The upper section of the Loyalhanna Creek Watershed contains open space, greenways, forests, and high quality streams. Future and continued protection of this important area is critical.	1. Educate landowners regarding the importance of the open space, high quality streams, forests, etc in the upper section of the watershed. 2. Partner with other organizations carrying out land conservation initiatives in the region and support their efforts. 3. Be a watershed "watchdog". Be aware of critical properties on the market, monitor land use, and stay aware of current issues related to land.	**Partners:** WPC, Westmoreland County AgPreservation, Ligonier Township, Cook Township, PNR **Funding Sources:** N/A	**Cost:** Low **Feasibility:** High Protecting headwater streams is a high priority. Land conservation is a key component in that protection.
Ninemile Run headwater tributaries entering from the west *For more information please refer to the Ninemile Run Subwatershed Report.*	New developments, farms, and a golf course surround the headwater tributaries in the Ninemile Run Subwatershed. Each has removed riparian stream side vegetation. This area continues to grow and develop quickly. In addition, erosion as a result of lack of streamside vegetation increases sediment loads downstream and in the Loyalhanna Creek.	1. Talk with the township, landowners and developers about current and future growth. Determine how much more will take place in the area. 2. Educate landowners about the importance of riparian vegetation. Explain the impacts of removal and alternatives for compromise with golf course and developers. 3. If future development is possible, explore options for preservation of remaining land to help preserve the open space buffer that remains around the streams.	**Partners:** Unity Township, WCD, WPC, Westmoreland County AgPreservation **Funding Sources:** State, Federal	**Cost: Low** **Feasibility: High** The Ninemile Run Subwatershed has the capability to hold quality stream life in the upper tributaries. Outreach and education can go a long way in decreasing this impact.

Stream or Stream Segment Name	Description of Impact	Remediation Strategy	Partners and Funding Sources	Cost and Feasibility
All Stream Segments	It is made clear throughout the entire watershed assessment that landowners do not realize the impact they have upon streams. The most common impact to streams was lack of riparian vegetation; especially where streams flow through yards, manicured lawns, and open mowed fields.	1. Initiate campaign throughout the watershed focusing upon the importance of riparian vegetation along stream banks. 2. Create a demonstration display that can be used at public meetings and in public venues to educate landowners.	**Partners:** SVC, WCD, WPC **Funding Sources:** WREN, PACD, Growing Greener, Private, Lowes, Walmart	**Cost:** Low **Feasibility:** High Funding would be required to construct a working model for demonstration. This model could be created by students or in partnership with students from local universities.
Erosion and Channel Alteration				
Mill Creek Sections I-F *For more information refer to the Mill Creek Subwatershed Report.*	Throughout the reach of stream that includes sections I-F, there is significant erosion occurring. The erosion is caused by multiple factors including, lack of riparian vegetation, high flood water events, landowners, etc.	1. Support FTTU with efforts to remediate several areas where erosion is occurring. FTTU completed an assessment of Mill Creek separately from this assessment. As a result of that assessment, they have initiated several remediation projects throughout this area on Mill Creek.	**Partners:** FTTU, WCD, WPC, Ligonier Township **Funding Sources:** Federal, Private, Growing Greener, DNCR, TU	**Cost:** Medium-High **Feasibility:** High The largest hurdle in this project will be encouraging and gaining the support of landowners.
Fourmile Run *For more information refer to the Fourmile Run Subwatershed Report.*	Throughout the subwatershed there are many cases of erosion. The erosion is occurring as a result of two common impacts, agriculture and landowners. In addition, there is a large amount of sediment entering the stream during storm events. That sediment is coming from primarily grazing areas, open fields, and dirt/gravel roads.	1. Begin work in the headwaters and move downstream. 2. Partner with organizations such as the PAFBC and WCD that already are doing work within the subwatershed. 3. Closely evaluate the Fourmile Run Subwatershed Report and prioritize stream segments to focus upon.	**Partners:** FTTU, PAFBC, WCD **Funding Sources:** State, Federal, Growing Greener	**Cost:** Medium **Feasibility:** High Beginning in the headwaters is critical. This subwatershed is large and a haphazard approach may not produce favorable outcomes compared to dollars spent.

Stream or Stream Segment Name	Description of Impact	Remediation Strategy	Partners and Funding Sources	Cost and Feasibility
Ninemile Run *For more information please refer to the Ninemile Run Subwatershed Report.*	Erosion is prevalent throughout the entire subwatershed. In the headwaters, it occurs in an area that is developed with new homes and a golf course. In the middle section, it is occurring in an area where homes surround the stream and landowners have removed vegetation from stream banks. In the lower section, another golf course creates favorable conditions for erosion. The erosion occurring throughout the subwatershed is immediately apparent at the mouth where large amounts of sediment and mud are present in the substrate and along the stream banks.	1. Work from the headwaters downstream. 2. Initiate community outreach. Focus especially upon the golf course ownership and developers. 3. Discuss with Unity Township a strategy for taking action throughout the subwatershed. 4. Monitor the Ninemile Run Subwatershed on a regular basis for TDS, TSS. Work with Capstone Class to possible insert this monitoring into existing program.	**Partners:** Unity Township, WCD, Capstone Class **Funding Sources:** Growing Greener, Local Business, Private	**Cost:** Low-Medium **Feasibility:** High Creating a monitoring program would require funding/cost for sampling**.**
Upper Loyalhanna Creek Main Stem *For more information please refer to the Upper Loyalhanna Creek Subwatershed Report.*	Erosion is occurring throughout the section A of the main stem of the Upper Loyalhanna Creek Watershed. This section spans from the confluence of Laughlintown Run and the Loyalhanna Creek, through Ligonier, and to the end of the Upper Loyalhanna Creek section. The entire stretch of stream is impacted by various erosion-causing factors including channelization by roadways, limited riparian zone, historic erosion controls that are failing, and the influence of entering streams such as small tributaries and Mill Creek.	1. Assess all eroding areas within the section. 2. Work from the upper most section downstream. 3. Begin monitoring the main stem of the Loyalhanna Creek for TDS, TSS, amount of sediment deposited throughout the section, and amount of stream bank lost over time to erosion. 4. Determine the effect of upstream influences upon the rate of erosion. For example, the confluence with Mill Creek and channelization.	**Partners:** Ligonier Borough, Forbes Trail Trout Unlimited, WCD, PAFBC **Funding Sources:** State, Federal, Private	**Cost:** Medium – High **Feasibility:** High The monitoring program to quantify the amount of erosion and overall impact from the erosion will require time and some cost for equipment.

UPPER LOYALHANNA CREEK WATERSHED

a. Upper Loyalhanna Creek Subwatershed
b. Powdermill Run
c. Linn Run
d. Rolling Rock Creek
e. Laughlintown Run
f. Mill Creek
g. Hannas Run
h. Twomile Run

SECTION 1
UPPER LOYALHANNA CREEK WATERSHED

Overall Restoration Priorities for the Upper Loyalhanna Creek Section

- Continue to monitor and improve Friedline Mine passive treatment system in the Powdermill Run Subwatershed.
- Remediate AMD discharge on MILLUNT4N that originates from old WPA Mine Seal.
- Support and promote the installation of sewerage in and around Ligonier to address nutrient impacts in the Laughlintown Run Subwatershed, Hannas Run Subwatershed, and along the Loyalhanna Creek main stem.
- Promote land conservation and protection throughout the entire Upper Loyalhanna Creek section.
- Initiate community outreach program to educate landowners about the importance of enhancing and maintaining stream side vegetation.
- Address agricultural impacts in the headwaters of the Loyalhanna Creek. Livestock access to the stream is causing erosion and sedimentation.
- Investigate and determine BMPs for the eroding bank throughout section A of the Loyalhanna Creek main stem. It is felt that upstream impacts could be exacerbating the erosion.

106.94
SQUARE MILES

Section 1 – Upper Loyalhanna Creek Watershed

General Description

The upper section of the Loyalhanna Creek Watershed extends from the headwaters in Stahlstown to downstream of the main stem confluence with Twomile Run. Flowing through four municipalities - Donegal Township, Cook Township, Ligonier Township, and Ligonier Borough - the Upper Loyalhanna Creek section is surrounded by a rural landscape. Bordered by Laurel Ridge to the east and Chestnut Ridge to the west, the upper section is contained within what is known as the Ligonier Valley. The valley is characterized by its rolling fields and forested land scattered with homes, estates, and farms. Only Ligonier Borough exhibits a population concentration.

The Upper Loyalhanna Creek section is comprised of six named tributaries and 20 unnamed tributaries. For the purpose of the assessment, each of the named tributaries was assessed separately. The main stem of the Loyalhanna Creek and its unnamed tributaries was assessed as a separate section. In addition, Hannas Run, which is part of the Mill Creek Subwatershed, was assessed separately. Therefore, the following subwatershed reports are included within Section 1:

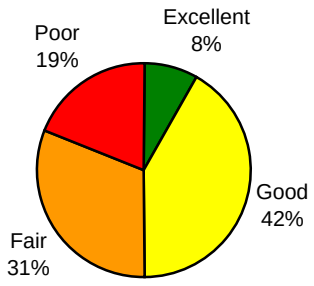
- Upper Loyalhanna Creek Main Stem and Unnamed Tributaries
- Powdermill Run
- Linn Run
- Rolling Rock Creek
- Laughlintown Run
- Mill Creek
- Hannas Run
- Twomile Run

Overall Visual Assessment Summary

The visual assessment of the Upper Loyalhanna Creek Watershed was completed in the spring and summer of 2003. As depicted in Figure 1.1, 8% of the upper watershed received an excellent rating, 42% received a good rating, 31% received a fair rating, and 19% received a poor rating. An average score of 7.31 was given to the entire upper section, which is a good rating overall.

Assessment ratings for the Upper Loyalhanna Creek Watershed reflect a limited number of major impacts when compared with the other watershed sections. Stream segments that are of high quality or impacted are described in detail within each subwatershed report found throughout this section. Stream ratings are depicted in Map 1.2.

Figure 1.1: Upper Loyalhanna Creek Watershed Overall Ratings



Latrobe
Youngstown
Ligonier
Stahlstown
Jennerstown
Hannas Run Subwatershed
Mill Creek Subwatershed
Two Mile Run Subwatershed
Laurel Mountain
Laughlintown Subwatershed
Upper Loyalhnna Creek Subwatershed
Rolling Rock Creek Subwatershed
Powdermill Run Subwatershed
Linn Run Subwatershed
217
30
711
271
381
130
76
70
N

Streams
Major Roads
Boroughs and Cities
Mill Creek Subwatershed
Hannas Run Subwatershed
Powdermill Run Subwatershed
Rolling Rock Creek Subwatershed
Linn Run Subwatershed
Two Mile Run Subwatershed
Laughlintown Run Subwatershed
Upper Loyalhanna Creek Subwatershed

Upper Loyalhanna Creek Watershed

Map 1.1

Western Pennsylvania Conservancy • Est. 1932 •
Watershed Assistance Center

1 0.5 0 1 Miles

Latrobe
Youngstown
Ligonier
Hannas Run Subwatershed
Mill Creek Subwatershed
Two Mile Run Subwatershed
Laughlintown Subwatershed
Laurel Mountain
Upper Loyalhnna Creek Subwatershed
Rolling Rock Creek Subwatershed
Powdermill Run Subwatershed
Linn Run Subwatershed
Stahlstown
Jennerstown
217
30
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HRWESTC
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HRUNT5WB
HRUNT4W
HRD
HRE
HRUNT3E
HRB
HRA
MILLUNT1NC
MILLUNT4NC
MILLUNT3N
MILLUNT2N
MILLUNT5N
OWLHOLLOWB
MACKB
MACUNT5E
MACKA
MILLA
MILLB
MILLD
MILLGRIB
MILLPIPB
MILLGRID
MILLSFKA
MILLNFKA
MILLMIDA
UPLOYA
UPLOYUNT1E
UPLOYUNT2E
UPLOYUNT1.5W
UPLOYUNT2W
ZIMMA
TMRA
TMRUNT3W
TMRUNT2E
TMRUNT3EB
TMRUNT3EC
TMRUNT6W
TMRB
TMRC
LAUGHC
LAUGHA
LAUGHB
MCCULL
MILLSFKB
NAUGA
NAUGB
FURN
UPLOYUNT3E
LINNA
UPLOYUNT5W
UPLOYUNT6W
UPLOYUNT7W
UPLOYUNT8W
UPLOYUNT9W
UPLOYC
UPLOYD
UPLOYE
UPLOYUNT7E6
PHOEBE
PMILLA
PREI
ROCK
LINNB
LINNC
LINNUNT1E
LINND
GROVE
PMILLB
ROLLROCK
N

- Poor
- Fair
- Good
- Excellent
- Streams
- Major Roads
- Boroughs and Cities
- Mill Creek Subwatershed
- Hannas Run Subwatershed
- Powdermill Run Subwatershed
- Rolling Rock Creek Subwatershed
- Linn Run Subwatershed
- Two Mile Run Subwatershed
- Laughlintown Run Subwatershed
- Upper Loyalhanna Creek Subwatershed

Upper Loyalhanna Creek Watershed: Overall Ratings

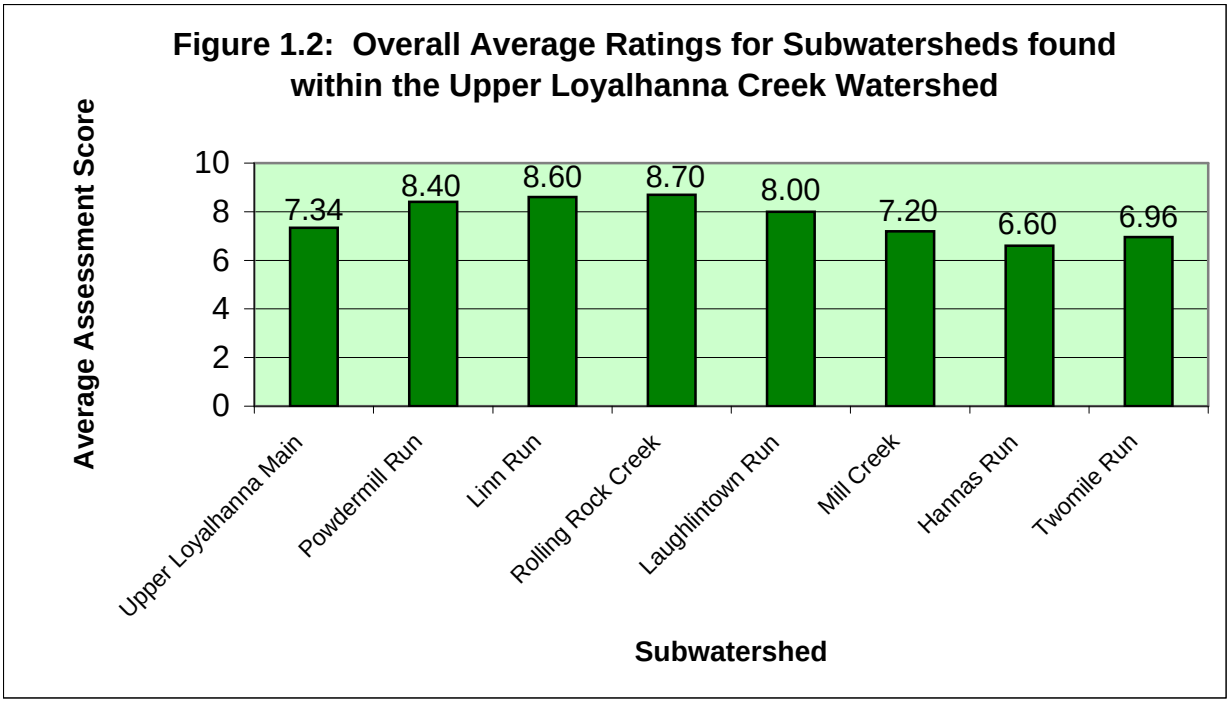
Map 1.2

1 0.5 0 1 Miles

Western Pennsylvania Conservancy • Est. 1932 •

Watershed Assistance Center

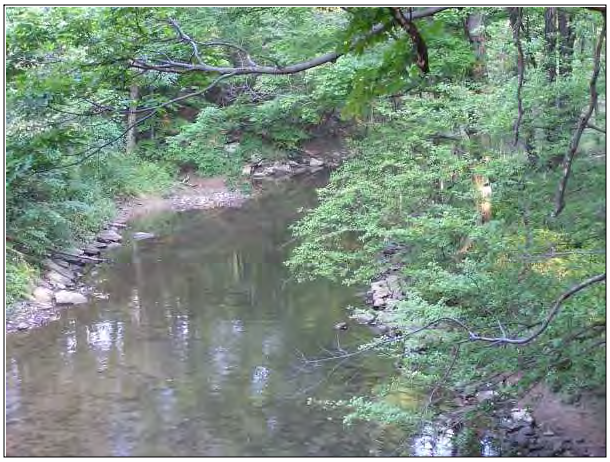
Figure 1.2 exhibits the average overall rating for each subwatershed located within the Upper Loyalhanna Creek Watershed section. Only two of the subwatersheds rated fair, Hannas Run and Twomile Run. It is those two subwatersheds that contained the most frequent occurrence of limiting factor impacts.



Overall Conclusions

The two most common impacts found in the Upper Loyalhanna Creek Watershed were riparian zone degradation and erosion. Those impacts were apparent when observing the substrate of the Loyalhanna Creek main stem, which contained higher than normal levels of silt and sediment. In most cases, the action of individual landowners creates both impacts. Specifically, landowners remove streamside riparian vegetation that has the ability to hold soil in place and filter runoff flowing into streams.

In conclusion, it is important for conservation organizations to provide outreach and education to watershed community members. Increasing awareness about steps individual landowners can take to protect waterways will help to improve the overall quality of the Upper Loyalhanna Creek.



Loyalhanna Creek main stem, looking downstream from the Route 381 Bridge in Rector

SECTION 1.A
UPPER LOYALHANNA CREEK WATERSHED

Section 1.A

Upper Loyalhanna Creek Main Stem and Unnamed Tributaries

General Description

The Upper Loyalhanna Creek Subwatershed includes the area that drains the western slope of Laurel Ridge within Donegal, Cook, and Ligonier townships. This 107 square-mile section of the watershed extends from the Loyalhanna Creek headwaters to the western end of Ligonier Borough, where it ends just after a confluence with Twomile Run. The headwaters of the Loyalhanna Creek emerge from an old springhouse found upon a farm property in Stahlstown, east of Route 711 on Jones Mills Road.

Loyalhanna Creek headwaters appear from an old springhouse on a farm in Stahlstown

Donegal, Cook, and Ligonier townships, which surround the upper section of the Loyalhanna Creek Watershed, are primarily rural communities. A mix of active and non-active farm fields, forested properties, and private homes comprise a majority of the landscape.

Historically, livestock operations were common throughout the area, but in recent years, many farm properties have been purchased and phased out of agricultural practice. In some instances, fields once used for grazing are still mowed for hay. In others, properties have moved through natural succession and are now overgrown with various trees, shrubs, and often, multiflora rose.

The upper section of the Loyalhanna Creek includes six named tributaries and 20 unnamed tributaries. The named tributaries include Powdermill Run, Linn Run, Rolling Rock Creek, Laughlintown Run, Mill Creek, and Twomile Run. For the purpose of the assessment, each of the named tributaries was assessed and reported separately. The following pages contain specific descriptions regarding the findings within those specific subwatershed tributaries. The smaller, unnamed tributaries and the main stem of the Upper Loyalhanna Creek section were assessed together.

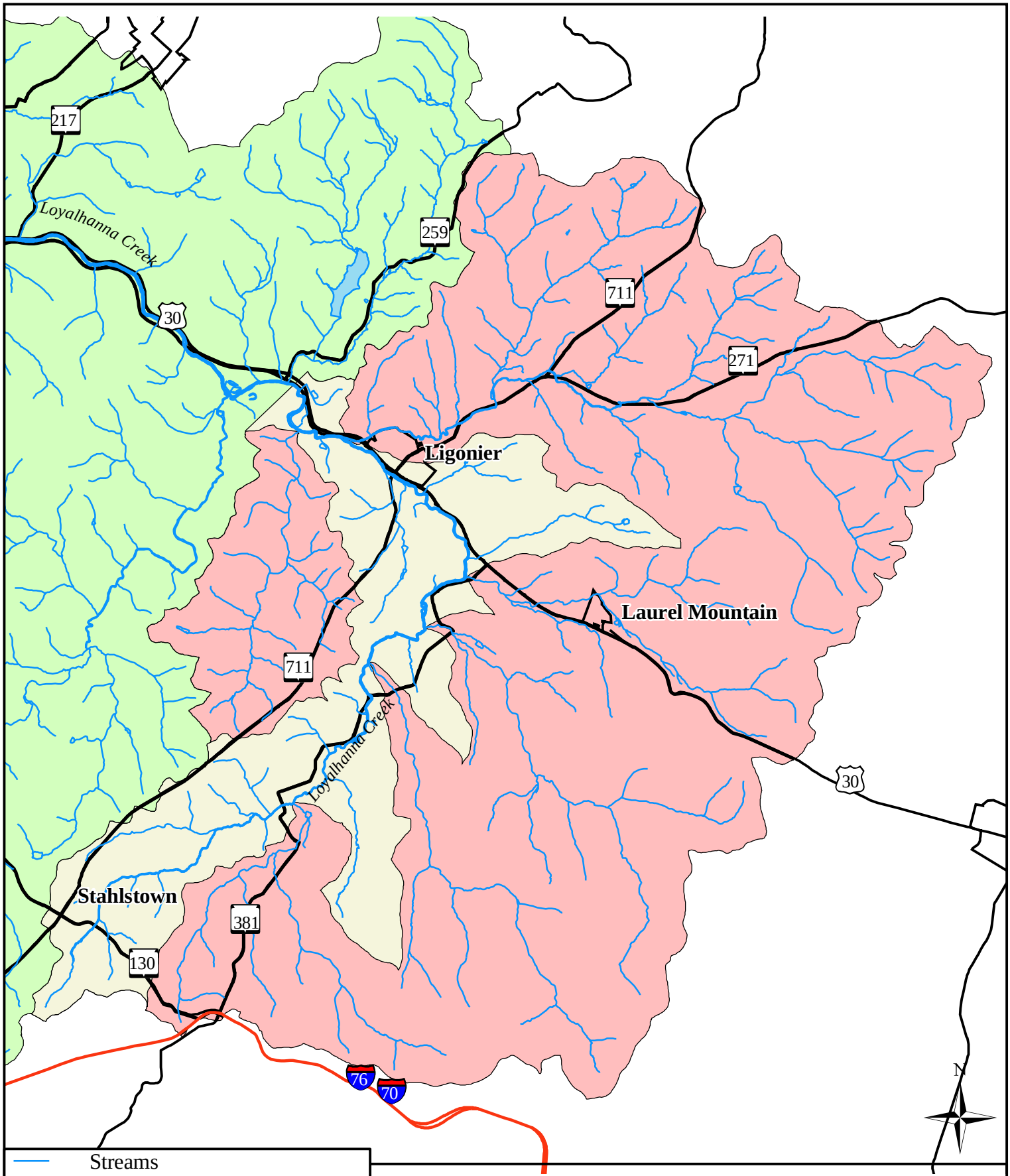
From the headwaters, the Loyalhanna Creek flows through a mix of private residences, active farms, and forested areas. A series of unnamed tributaries enter the main stem from the west and the east and the Loyalhanna Creek flows northwest.

Approximately 5.5 miles downstream from the headwaters, the first named tributary to join the Loyalhanna Creek is **Powdermill Run**. This subwatershed flows from Laurel Ridge into the Loyalhanna Creek Main Stem Creek main stem through a largely forested area. Powdermill Run is classified as a High Quality Cold Water Fishery (HQ-CWF) and was rated good overall during the visual assessment.

After the confluence with Powdermill Run, the Loyalhanna Creek continues to flow northwest, adjacent to Route 381. Summer cottages are scattered along the streambank and many surrounding hillsides are actively grazed or used for hay production.

As the Loyalhanna Creek arrives in the community of Rector, it passes underneath the Route 381 Bridge. Downstream of the Route 381 Bridge, the Loyalhanna Creek flows through properties owned and managed by Rolling Rock Farms. Flanked by a steep bank on the west side, the Loyalhanna Creek meanders through a forested area containing a mix of pine and deciduous trees.

One-half mile downstream of the Route 381 Bridge, **Linn Run** joins the Loyalhanna Creek. It originates upon Laurel Ridge and flows through state forest and state park lands. The stream rolls over large boulders underneath a canopy thick with mountain laurel, hemlock, and other evergreen trees. Due



Upper Loyalhanna Creek Subwatershed: Overall Location

Map 1.A.1

Western Pennsylvania Conservancy
Watershed Assistance Center

1 0.5 0 1 Miles

to insufficient buffering capacity, the main stem and tributaries to Linn Run are impacted by acid deposition. Those impacts are most often associated with high rainfall amounts. Linn Run was rated good overall during the assessment fieldwork and is classified as a HQ-CWF.

After its confluence with Linn Run, the Loyalhanna Creek continues to flow through private properties behind Rolling Rock Farms. As it approaches Ligonier, it curves toward Route 381 and runs parallel to it until a confluence with **Laughlintown Run**. Laughlintown Run enters the Loyalhanna Creek from the east, 2.5 miles downstream of the Linn Run confluence. The flow from Laughlintown Run originates on Laurel Ridge above the small community of Laughlintown. This subwatershed contains Furnace Run, one of only three Exceptional Value (EV) streams in the entire Loyalhanna Creek Watershed.

Downstream of its confluence with Laughlintown Run, the Loyalhanna Creek turns west and flows into Ligonier Borough parallel to Route 30. Although very few residences line the creek, areas surrounding it are blanketed with homes and businesses. After passing underneath the Route 711 Bridge, the Loyalhanna Creek is designated as a Delayed Harvest Area. Maintained and stocked by the PA Fish and Boat Commission (PAFBC), the area stretches from the Route 711 Bridge, 1.7 miles downstream to the confluence with Twomile Run. A few of those structures are still intact today. Additionally, the stretch includes a historic swinging bridge that local residents used to cross the Loyalhanna Creek prior to the installation of reliable bridges.

On the western outskirts of Ligonier Borough, **Mill Creek** joins the Loyalhanna Creek. This confluence occurs approximately 200 yards past the Ligonier sewage treatment facility located on Route 30. Mill Creek is a large subwatershed that enters the Loyalhanna Creek from the northeast. It is a HQ-CWF that originates upon Laurel Ridge in State Game Lands #43. Two of its three headwater branches are classified EV.

Following its confluence with Mill Creek, the Upper Loyalhanna Creek continues to flow eastward and parallel to Route 30 out of Ligonier. The landscape changes to a field and forest mix before it meets the final named tributary to enter in the upper watershed section.

One-half mile downstream of the Mill Creek confluence, **Twomile Run** flows into the Loyalhanna Creek. The mouth of Twomile Run is located directly behind the historic Ice Pond and Lady of the Lake Bed and Breakfast on Route 30 East. Twomile Run drains a 7.7 square-mile area, making it the smallest named tributary to enter the Loyalhanna Creek in the upper section.

The Upper Loyalhanna Creek main stem is classified as a Cold Water Fishery (CWF). For geographic location of this subwatershed, please refer to Map 1.A.1 .

Review of Historic Information

Limited historic data is available for the Upper Loyalhanna Creek Subwatershed. This is due primarily to the fact that previous research and studies have been focused upon the larger named tributaries flowing into the Loyalhanna Creek.

PA Fish and Boat Commission (PAFBC)

In June of 2002, the PAFBC assessed the main stem of the Loyalhanna Creek in three different areas. The assessment was completed to collect baseline inventory on a section of stream not previously studied and to conduct a re-inventory of the catchable trout-stocked sections.

The first section assessed extended from the headwaters to the mouth of Zimmerman Run, a small tributary located close to Ligonier Beach on Route 30. The section was not stocked with trout and had never been surveyed by the PAFBC. In the section, two areas were sampled with physical, chemical, and biological methods. Site 1 was located 20 meters downstream of T-501 (Seaton Road) bridge. Site 2 was located 20 meters downstream of the Route 381 Bridge. At the first site, pH was 7.3 and assessors noted considerable silt within the substrate. Seven fish species were collected, including two wild brown trout.

At the second site, pH declined to 7.1 and sediment became dominant in the substrate. A total of 19 fish species and one mudpuppy were collected at site 2.

The second section assessed extended from Zimmerman Run to the Route 711 Bridge in Ligonier. One site sampled within this section showed a pH of 7.1 and 21 fish species. Sediment was still present, but not as dominant within the stream substrate.

The third section assessed was located between the Route 711 Bridge and the confluence with Mill Creek directly behind the Ligonier sewage treatment plant. Water quality at the site produced a pH of 7.2 and 21 fish species were collected. This section is classified as a Delayed Harvest – Artificial Lures Only portion of the Loyalhanna Creek.

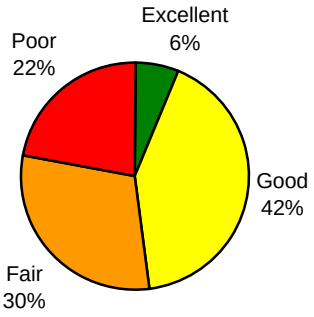
Recommendations made by the PAFBC included the need to reduce sediment and siltation throughout the watershed. Fish habitat would be improved significantly in the Loyalhanna Creek above Ligonier if sediment could be decreased by reducing residential development and by stabilizing streambanks.

Visual Assessment Summary

Visual Assessment Findings

The Upper Loyalhanna Creek Subwatershed was assessed in early June of 2003. The assessment included the main stem and all unnamed tributaries. A total of 33 stream sections were assessed. As depicted in Figure 1.A.1, 6% of those sections rated excellent, 42% rated good, 30% rated fair, and 22% rated poor. The average score received during assessment is 7.34, which is a fair rating overall. That fair rating reflects the presence of stream impacts relating mostly to sediment, erosion, and lack of riparian vegetation. Individual stream ratings are depicted in Map 1.A.2.

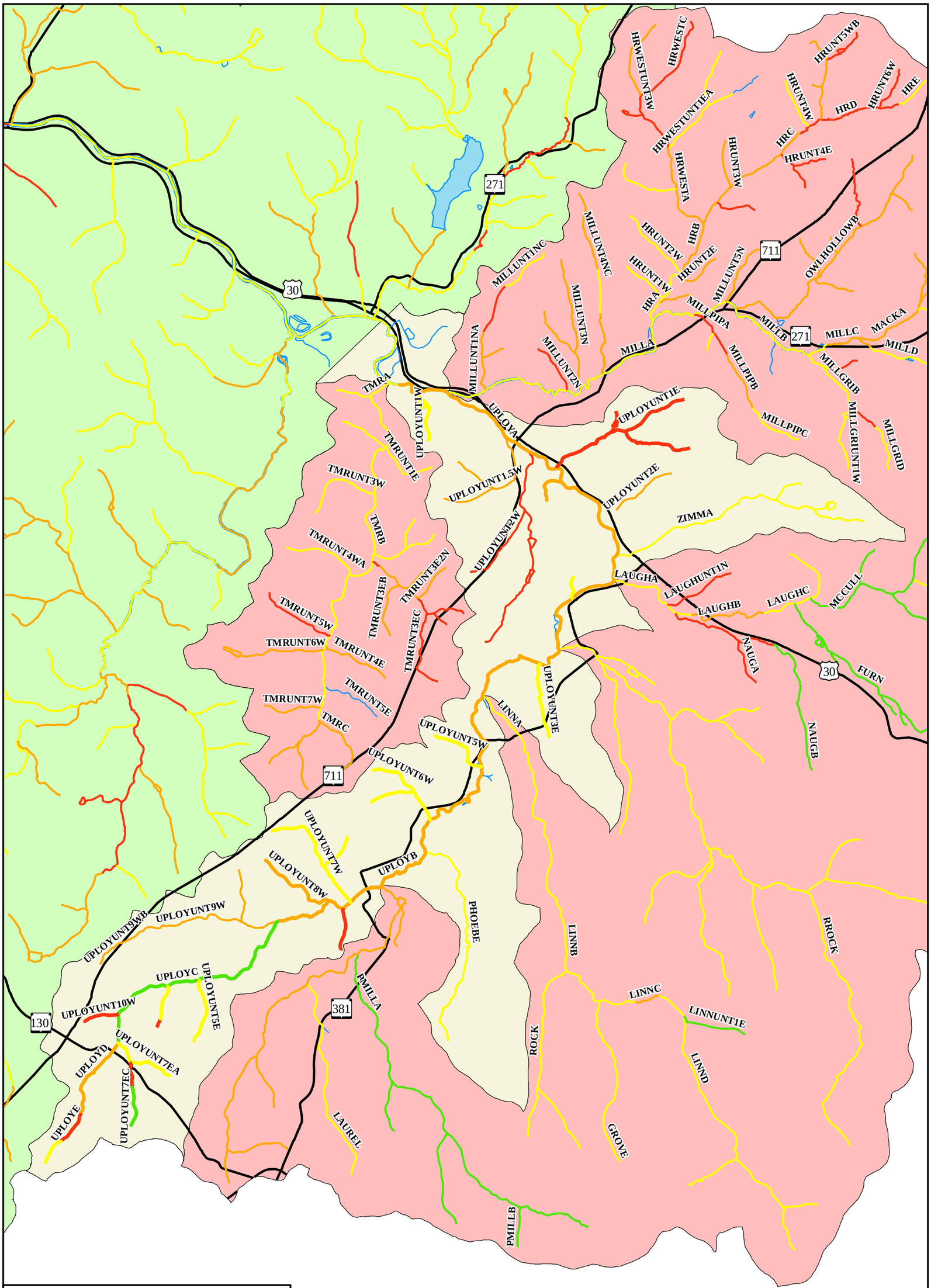
Figure 1.A.1: Visual Assessment Ratings for the Upper Loyalhanna Creek Subwatershed and Unnamed Tributaries



Visual Assessment Description

Upper Loyalhanna Creek Main Stem

As mentioned previously, the headwaters of the Loyalhanna Creek originate from a springhouse on a beef farm. Immediately, the Loyalhanna Creek passes through an area where cows have direct access and minimal riparian vegetation is present. Continuing downstream, the Loyalhanna Creek encounters very little residential impact, and is surrounded by good canopy cover and good riparian vegetation at its banks. This trend persists until Powdermill Run flows into the Loyalhanna Creek. At that point, the Loyalhanna Creek passes through an area with grazing cattle and hay operations. The farm surrounds the Loyalhanna Creek on both sides and some cattle have access to springs and tributaries that feed directly into the main stem. The farm occupies approximately 500 feet of streambank. Downstream of the farm, the Loyalhanna Creek retreats under the cover of an oak and silver maple canopy as it flows north.



Poor
Fair
Good
Excellent
Major Roads
Upper Loyalhanna Creek Subwatershed
Upper Section

Upper Loyalhanna Creek Subwatershed: Overall Rating

Map 1.A.2

Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center

1 0.5 0 1 Miles

Just past the Route 381 Bridge in Rector, the Loyalhanna Creek deposits a large amount of sediment as the stream velocity slows. Sediment collects on the substrate until Linn Run flows into the Loyalhanna Creek, approximately one-half mile downstream of the bridge. Following the meeting with Linn Run, the Loyalhanna Creek meanders through Rolling Rock Farms.

When the Loyalhanna Creek enters downtown Ligonier, residential impacts to the stream are immediately apparent. Homes, businesses, and roads surround the stream on both sides. Several pipes discharge wastewater into the Loyalhanna Creek as it flows. In addition, the Loyalhanna Creek takes in runoff from the heavily traveled roads, such as Route 30 and Route 711. Canopy cover remains mediocre through Ligonier and does not return in full effect until the Loyalhanna Creek passes out of Ligonier. The final section of stream shows erosion along streambanks. The erosion could be the result of manmade impacts upstream and the constricting effect that Route 30 has had on the Loyalhanna Creek throughout the years.

The main stem section of the Upper Loyalhanna Creek Subwatershed finishes where the Twomile Run Subwatershed enters. The most notable impacts within the Upper Loyalhanna Creek Subwatershed include erosion, sedimentation, and mediocre canopy cover.

Unnamed Tributaries to the Upper Loyalhanna Creek

Similar to the main stem, most of the unnamed tributaries to the Upper Loyalhanna Creek main stem are also impacted by erosion, sedimentation, and lack of canopy cover. The actions of landowners along many of the tributaries create problems for the stream. Manicured lawns, dirt and gravel driveways, and failing septic systems contribute non-point source pollutants.

Close to the headwaters of the Loyalhanna Creek, a series of tributaries drain into the main stem from the west. These tributaries all flow through a similar landscape, which consists of large tracts of privately owned properties. The tributaries are surrounded by good canopy cover and riparian areas.

UNT2W, enters the Loyalhanna Creek just northwest of the intersection of Route 30 and Route 711. This particular tributary originates within the Laurel Valley Golf Course and is absent of sufficient riparian vegetation and canopy cover. UNT1E, a tributary that enters the Loyalhanna Creek just upstream of the intersection of East Main Street and Route 30, originates in fields and then passes through a densely residential area where a landowner has piled the streambanks with large amounts of trash.

Water Quality

Three water samples were taken along the main stem of the Loyalhanna Creek in the upper section. The sites were selected utilizing knowledge of the landscape, accessibility, known impacts, and major tributary location. Water quality samples indicate limited detectable impacts. In general, there is an overall increase in pH and alkalinity as the stream grows in size and flows northward. In addition, in some months, there is a slight increase in total dissolved solids. Sample dates showing those trends, were dates that included high rainfall. Please refer to Tables 1.A.1, 1.A.2, and 1.A.3 for water quality information.

Table 1.A.1: Sample Site LWA-A Seaton Road Bridge					
Date Sampled	**pH**	**Alk. mg/L**	**TSS mg/L**	**TDS mg/L**	**Iron mg/L**
8/25/03	7.33	35.0	det.	151.0	<0.06
10/28/03	6.83	22.0	3.0	81.0	0.2
2/23/04	6.72	15.0	det.	102.0	<0.06
5/24/04	6.73	33.0	13.0	68.0	<0.06
8/25/04	7.13	31.0	6.0	82.0	<0.06
10/25/05	7.10	39.0	1.0	NA	<0.06

The first of the three samples, LWA-A is taken at the Seaton Road Bridge in Stahlstown.

Sample Location: The sample point can be reached by traveling north from Ligonier on Route 711 and turning left onto Seaton Road. The bridge is painted red and located approximately 1.4 miles from Route 711.

Table 1.A.2: Sample Site LWA-B Route 381 Bridge					
Date Sampled	**pH**	**Alk. mg/L**	**TSS mg/L**	**TDS mg/L**	**Iron mg/L**
8/25/03	7.11	26.0	3.0	104.0	<0.06
10/28/03	6.86	19.0	3.0	75.0	0.2
2/23/04	6.56	15.0	det.	96.0	<0.06
5/24/04	6.84	20.0	6.0	60.0	<0.06
8/25/04	7.00	26.0	2.0	69.0	<0.06
10/25/04	6.95	36.0	<1.0	111.0	0.1

The second sample, LWA-B, is taken at the Route 381 Bridge in Rector.

Sample Location: The sample point can be reached by traveling north on Route 711 from Ligonier and turning left at the Darlington crossroads onto Route 381. Continue 1.5 miles to the large, grated bridge over the Loyalhanna Creek.

Table 1.A.3: Sample Site LWA-C Twomile Run Downstream					
Date Sampled	**pH**	**Alk. mg/L**	**TSS mg/L**	**TDS mg/L**	**Iron mg/L**
10/28/03	7.31	40.0	det.	106.0	0.2
2/23/04	6.78	22.0	det.	116.0	<0.06
5/24/04	7.03	26.0	6.0	74.0	<0.06
8/25/04	7.07	36.0	1.0	90.0	<0.06
10/25/04	6.98	48.0	1.0	141.0	0.1

The final sample point, LWA-C is taken just downstream from the mouth of Twomile Run where the upper section ends.

Sample Location: The sample point can be reached from Route 30 East. Turn right onto Twomile Run Road right after the Lady of the Lake Bed and Breakfast. Continue one-half mile and stop at the bridge over Twomile Run. Follow Twomile Run downstream 100 yards to its confluence with the Loyalhanna Creek Main Stem.

Conclusions

The Upper Loyalhanna Creek main stem and its unnamed tributaries received an overall score of 7.34, which is a fair rating. The impacts creating the fair rating are moderate and can be addressed first and foremost with education and outreach to landowners throughout the area.

The presence of sediment in the main stem substrate and the findings of assessment volunteers indicated fair amounts of erosion throughout the entire watershed section. As mentioned by the PAFBC, this was also their finding in 2000 when completing an inventory of the same section of stream.

There is a need for outreach that highlights the importance of streamside riparian vegetation and management of land with highly erodible soils.

The headwater section of the Upper Loyalhanna Creek main stem contains a series of farms that contribute sediment and nutrient loading to the stream via small tributaries. Agricultural best

management practices (BMPs) could significantly improve these tributaries and eliminate a portion of the sediment and nutrient impact.

Improvements made to major tributaries entering the Loyalhanna Creek main stem will also improve its overall quality. The most critical improvement will be increased communication of positive land management and conservation practices to landowners located throughout the Upper Loyalhanna Creek Watershed area.

Recommendations

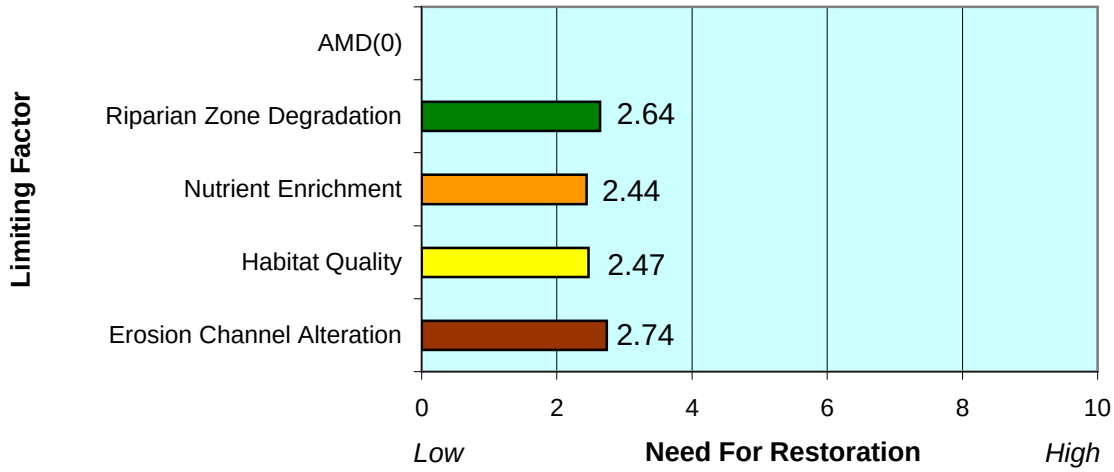
The following overall recommendations are made for the Upper Loyalhanna Creek Main Stem and its unnamed tributaries:

- Educate landowners about the importance of riparian vegetation, canopy cover, and stream habitat.
- Encourage the continued and future protection of land surrounding the Upper Loyalhanna Creek Watershed area. Work with Western Pennsylvania Conservancy's (WPC) Land Protection department to identify key areas for protection that, if protected, would have a favorable impact upon the Loyalhanna Creek.
- Support and promote the installation of sewerage within Ligonier Township.
- Work with the local chapter of Trout Unlimited and the PAFBC to identify and remediate areas of serious erosion.
- Install BMPs on various farms in the headwater sections to eliminate sediment and nutrient loading.

Overall Restoration Priorities

Figure 1.A.2 exhibits overall restoration priorities for the entire subwatershed. As indicated, the limiting factor that received the highest restoration priority rating is erosion and channel alteration. The remaining limiting factors are close in priority rating.

Figure 1.A.2: Restoration Priorities for the Upper Loyalhanna Creek Subwatershed and Unnamed Tributaries



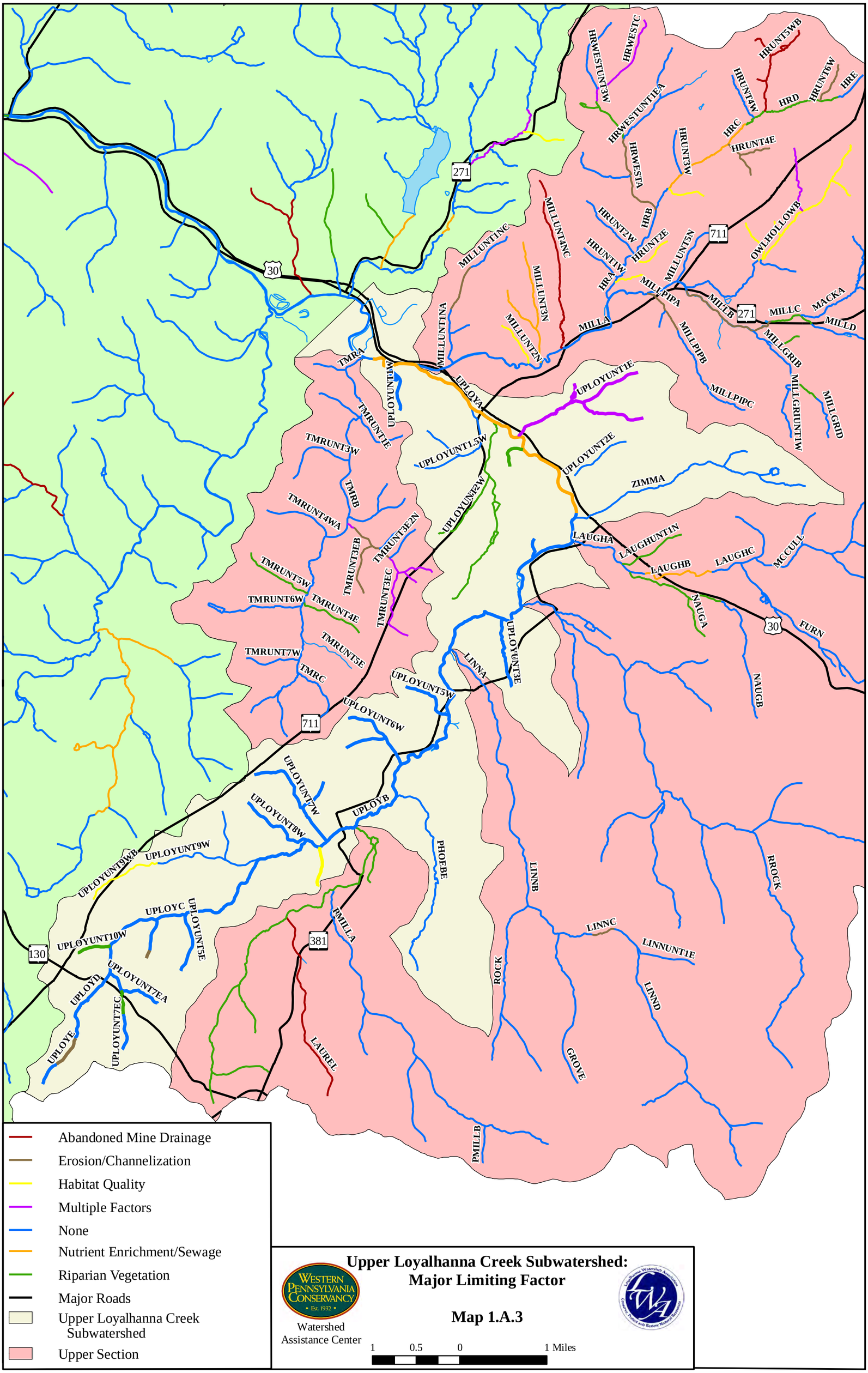
Restoration Suggestions for Individual Stream Segments

Ten stream sections within the Upper Loyalhanna Creek Subwatershed and Unnamed Tributaries received scores indicating a notable impact. The limiting factors identified were erosion and channel alteration, compromised fish and macroinvertebrate habitat, nutrient enrichment, and riparian vegetation degradation. Please refer to Table 1.A.4 and Map 1.A.3 for impact description and segment locations.

Table 1.A.4: Impacted Stream Segments and Restoration Suggestions for the Upper Loyalhanna Creek Subwatershed and Unnamed Tributaries

LIMITING FACTOR: Riparian Vegetation Degradation

Stream Segment Name	Description of Impact	Remediation Strategy	Possible Funding Sources	Priority Rating
UPLOYE *Main stem section very close to the headwaters that flows through farm pasture and wetland area.*	Riparian zone is heavily impacted by livestock that have access to the stream. Grazing occurs along the entire section.	1. Educate landowners. 2. Work with farmer to install agricultural BMPs. Possible Partners: WPC, WCD, FSA, PAGC, DEP	Growing Greener, CREP, WHIP, EQIP, CUP	Medium – High (due to headwater location)


HRWESTC
HRWESTUNT3W
HRWESTUNT1EA
HRWESTA
HRUNT5WB
HRUNT4W
HRUNT6W
HRE
HRD
HRC
HRUNT4E
HRUNT3W
271
MILLUNT1NC
MILLUNT4NC
MILLUNTINA
MILLUNT3N
MILLUNT2N
HRUNT2W
HRB
HRUNT2E
HRUNT1W
HRA
MILLUNT5N
711
OWLHOLLOWB
MILLP1PA
MILLB
MILLC
MACKA
MILLD
MILLA
MILLP1PB
MILLP1PC
MILLGRIB
MILLGRIUNT1W
MILLGRID
30
TMRA
TMRUNT1W
UPLOYUNT1W
UPLOYA
UPLOYUNT1E
TMRUNT1E
TMRUNT3W
UPLOYUNT1.5W
UPLOYUNT2E
ZIMMA
TMRB
TMRUNT4WA
UPLOYUNT2W
TMRUNT3E2N
TMRUNT3EB
LAUGHA
LAUGHUNT1N
LAUGHB
LAUGHC
MCCULL
TMRUNT5W
TMRUNT6W
TMRUNT4E
TMRUNT3EC
NAUGA
FURN
TMRUNT7W
TMRUNT5E
TMRC
LINNA
UPLOYUNT3E
UPLOYUNT5W
NAUGB
UPLOYUNT6W
711
UPLOYUNT7W
UPLOYUNT8W
UPLOYB
PHOEBE
LINNB
RROCK
UPLOYUNT9WB
UPLOYUNT9W
UPLOYC
UPLOYUNT5E
LINNC
LINNUNT1E
130
UPLOYUNT10W
381
PMILLA
UPLOYD
UPLOYUNT7EA
ROCK
LINND
UPLOYE
UPLOYUNT7EC
LAUREL
GROVE
PMILLB
Abandoned Mine Drainage
Erosion/Channelization
Habitat Quality
Multiple Factors
None
Nutrient Enrichment/Sewage
Riparian Vegetation
Major Roads
Upper Loyalhanna Creek Subwatershed
Upper Section
Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center
Upper Loyalhanna Creek Subwatershed:
Major Limiting Factor
Map 1.A.3
1 0.5 0 1 Miles

UPLOUUNT1EB *Medium-sized tributary to the main stem. The section flows through residential area and mowed field on the eastern end of Ligonier.*	Lawns are mowed to banks and no trees are present along streambanks to provide adequate canopy cover. This results in bank instability and less available food source for macroinvertebrates and fish.	1. Educate landowners. 2. Restore riparian area and encourage landowners to plant trees and shrubs along streambanks. Possible Partners: WCD, DEP, Ligonier Township, FTTU	Growing Greener, Private	Low – Medium
UPLOYUNT1EA *Medium-sized tributary to the Loyalhanna Creek main stem. Flows through a residential area on the eastern end of Ligonier Borough entering the Loyalhanna Creek Creek close to Ruthie's Diner.*	Lawns are mowed to banks and very few trees are located along the streambank.	1. Educate landowners. 2. Restore riparian area by planting trees and shrubs along streambanks. Possible Partners: Ligonier Township, FTTU, DEP, WCD	Growing Greener, Private	Low – Medium
UPLOYUNT2W *Small tributary with 5- to 8-ft. active channel width. It drains two small ponds, one located within a golf course.*	Very little riparian vegetation or canopy cover is present along streambanks.	1. Educate landowners. 2. Work with golf course to remediate riparian vegetation. Possible Partners: Ligonier Township, FTTU, PAFBC, DEP	Growing Greener, Private	Low
UPLOYUNT3W *Tiny tributary with 5-ft. active channel width. It drains one small pond and flows through a field and residential area.*	Very little riparian vegetation or canopy cover is present along streambanks.	1. Educate landowners. 2. Work with other landowners to remediate riparian vegetation. Possible Partners: Ligonier Township, WCD, FTTU, DEP	Growing Greener, Private	Low
UPLOYUNT7EB *Small tributary that enters the main stem close to the headwaters. The section flows through a residential area.*	All riparian vegetation has been removed from the streambanks with lawnmower.	1. Educate landowners. 2. Work with landowner to return vegetation to streambank. Possible Partners: WCD, PAFBC, DEP, Cook Township	Growing Greener, Private	Low – Medium

LIMITING FACTOR: Compromised Fish and Macroinvertebrate Habitat				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
UPLOYUNT2W *Small tributary with 5- to 8-ft. active channel width. It drains two small ponds, one located within a golf course.*	Due to lack of riparian vegetation, there is little habitat and food source available for macroinvertebrates and/or small fish.	1. Educate landowners. 2. Work with golf course to remediate riparian zone, thus returning food and habitat source for stream life. Possible Partners: PAFBC, FTTU, WCD	Growing Greener, Private	Low
UPLOYUNT4E *Small tributary with 3- to 6-ft. active channel width. Originates in a farm pond and continues through a farm field.*	Cows have full access to stream as it flows through a grazed field. Action by grazing animals has created much silt and sediment along stream bottom removing significant habitat areas and food sources.	1. Educate landowners. 2. Work with farmer to install agricultural BMPs. Possible Partners: WPC, WCD, PAGC, FSA, NRCS	Growing Greener, CREP, WHIP, EQIP, CUP	Low – Medium
UPLOYUNT7EB *Small tributary that enters the main stem close to the headwaters. The section flows through a residential area.*	Due to lack of riparian vegetation and silty substrate, very little habitat or food source can be found through this stream section.	1. Educate landowner. 2. Work with landowner to first remediate riparian area. Possible Partners: WCD, DEP, PAFBC, Cook Township	Growing Greener, Private	Low – Medium
UPLOYUNT9WB *Medium-sized tributary with an active channel width of 3 to 5 ft. The section begins close to Route 711 and crosses underneath the road.*	Culverts from roads create fish barriers. Substrate is dominated by silt and small gravel; no cobble present for habitat structure.	1. Further investigate stream substrate. 2. Check culverts for effectivity and investigate whether or not they can be fixed or modified to allow for passage of fish and stream life. Possible Partners: Cook Township, PennDOT, DEP, PAFBC, WCD	Growing Greener, Private	Low

LIMITING FACTOR: Nutrient Enrichment				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
UPLOYA *Main stem section that begins at the intersection of Route 381 and Route 30 and ends just after the entrance of Twomile Run. The section has an active channel width of 75 ft. and flows parallel to Route 30 through Ligonier.*	Several sewage inputs were noted along the section, emanating mostly from small businesses.	1. Educate business owners about BMPs for septic systems. 2. Encourage Ligonier Township to install sewerage for the community. Possible Partners: Ligonier Township, RUS	Federal, Private	Medium – High
UPLOYE *Main stem section very close to the headwaters that flow through farm pasture and wetland area.*	Grazing cows have access to stream. Manure is present in and around the stream channel area.	1. Work with farmers to install agricultural BMPs to eliminate nutrient loading source for headwaters of the Loyalhanna. Possible Partners: WPC, WCD, PAGC, FSA, NRCS	Growing Greener, CREP, WHIP, EQIP, CUP	High
UPLOYUNT4E *Small tributary with 3- to 6-ft. active channel width. Originates in a farm pond and continues through a farm field.*	Cows have full access to the stream for a majority of its length. Manure is present in and around the stream.	1. Work with farmers to install agricultural BMPs to eliminate nutrient loading source. Possible Partners: WPC, WCD, PAGC, NRCS, FSA	Growing Greener, CREP, WHIP, CUP, Private	Low
LIMITING FACTOR: Erosion and Channel Alteration				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
UPLOYE *Main stem section very close to the headwaters that flow through farm pasture and wetland area.*	Grazing cows with access to the stream have trampled streambanks and removed vegetation that would otherwise support streambanks.	1. Work with farmers to install agricultural BMPs to eliminate nutrient loading source for headwaters of the Loyalhanna Creek . Possible Partners: WPC, WCD, PAGC, FSA, NRCS	Growing Greener, CREP, WHIP, EQIP, CUP	High

UPLOYUNT1EA *Medium-sized tributary to the Loyalhanna Creek Main Stem. Flows through a residential area on the eastern end of Ligonier Borough entering the Loyalhanna Creek close to Ruthie's Diner.*	The stream has been channelized in multiple locations to be moved underneath roads and through residential yards. Banks are highly eroded with very little stabilization by riparian vegetation.	1. Educate landowners. 2. Work with township to address channelization of the stream. 3. Remediate riparian zone to stabilize banks. Possible Partners: WCD, Ligonier Township, PAFBC	Growing Greener, Private	Low
UPLOYUNT4E *Small tributary with 3- to 6-ft. active channel width. Originates in a farm pond and continues through a farm field.*	The stream is highly channelized as it makes its way through a grazed field in and out of ponds. The substrate is extremely silty with very little gravel or cobble showing. Cows have full access to the stream for a majority of its length.	1. Work with farmers to install agricultural BMPs to remediate streambanks and channel. Possible Partners: WPC, WCD, PAGC, NRCS, FSA, PAFBC	Growing Greener, CREP, WHIP, CUP, Private	Low – Medium
UPLOYUNT6EB *Tiny tributary located close to the headwaters. The section flows through a grazed field and forest.*	Cows have direct access to the stream for grazing. The grazed streambanks are extremely steep. Erosion is heavy through stream section and there is considerable sediment in the water.	1. Work with landowner to install agricultural BMPs to remediate streambanks and channel. Possible Partners: WPC, WCD, PAGC, NRCS, FSA, PAFBC	Growing Greener, CREP, WHIP, CUP, Private	Low – Medium

SECTION 1.B
POWDERMILL RUN

Section 1.B

Powdermill Run Subwatershed

General Description

The 9.2 square-mile Powdermill Run Subwatershed is located in the southeast corner of Cook Township. Powdermill Run flows northwest from Laurel Ridge following Route 381 North to Ligonier. The entire Powdermill Run Subwatershed is located within Cook Township. Powdermill Run enters the Loyalhanna Creek main stem just downstream of the junction of Allen Road and Route 381. The Powdermill Run Subwatershed is separated into three major branches - White Oak Run, Laurel Run, and the Powdermill Run main stem.

The main stem of **Powdermill Run** begins in a heavily forested area on Laurel Ridge. It flows northwest toward Route 381, through a hardwood and pine forest. The main stem of Powdermill Run, from the headwaters to its confluence with White Oak Run, is located entirely within Powdermill Nature Reserve. The reserve is a protected field station for the Carnegie Museum of Natural History. The Powdermill Run main stem is the site of extensive research, including, but not limited to, birds, shrews, salamanders, crayfish, and macroinvertebrates.

White Oak Run is a major tributary that flows into the Powdermill Run main stem behind the Nimick Nature Center at Powdermill Nature Reserve on Route 381. The tributary originates from a hillside very close to where Route 130, Route 381, and the Pennsylvania Turnpike intersect. White Oak Run flows through a forested area consisting of mixed hardwoods, briars, and multiflora rose. Close to its confluence with the Powdermill Run main stem, White Oak Run flows adjacent to farm properties. White Oak Run is designated a CWF.

Laurel Run, also a CWF, enters White Oak Run prior to its confluence with the Powdermill Run main stem. The headwaters of Laurel Run are located just above a pond on a property located northeast of the Pennsylvania Turnpike and Route 381. Downstream of the property, Laurel Run retreats into a mature hardwood forest consisting of a mix of pine, oak, and maple.

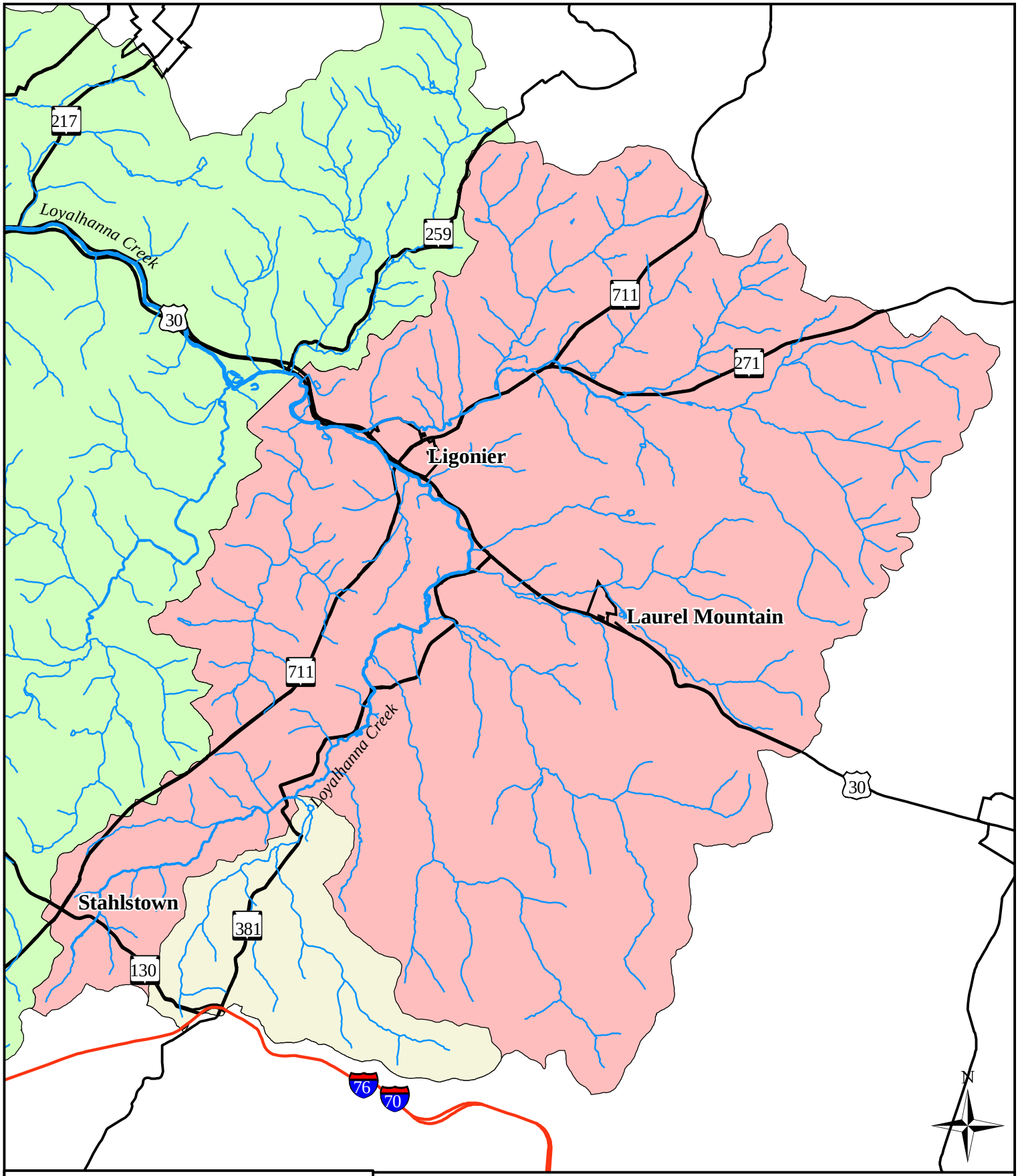
Laurel Run is impacted by abandoned mine drainage (AMD) from the headwaters and downstream at the site of the historic Friedline Farm, where a discharge seeps from an abandoned 600-foot drift mine. The Friedline property is located approximately 500 yards upstream from where Laurel Run passes underneath Route 381. A Successive Alkalinity Producing System (SAPS) is located at the drainage site.

Laurel Run is also impacted by acid deposition. According to a report completed by Dr. William Kimmel of California University of Pennsylvania, Laurel Run possesses a low buffering capacity and, as a result, it is vulnerable to drastic pH decreases when given small inputs of acid.

Please refer to Map 1.B.1 for the geographic location of the Powdermill Run Subwatershed.

Review of Historic Information

Because a majority of the Powdermill Run Subwatershed falls within Powdermill Nature Reserve, a biological field station, a great deal of historic information is available. This is especially true



Streams
Major Roads
Boroughs and Cities
Powdermill Run Subwatershed
Upper Section

Powdermill Run Subwatershed: Overall Location

Map 1.B.1

Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center

1 0.5 0 1 Miles

for Laurel Run, where AMD and acid deposition impacts have led to several biological studies of the stream. Information and data from past and present scientific studies can be obtained by contacting Powdermill Nature Reserve.

PA Fish and Boat Commission (PAFBC)

The PAFBC conducted a fish survey of White Oak Run and Laurel Run in July 1989 in order to document social, physical, chemical, and biological data.

During the study on White Oak Run, PAFBC found a heavily eroded stream with water quality conducive to a cold-water fish community. Fish shocking produced brown trout, white suckers, mottled sculpin, bluegill, red side dace, creek chubs, and black nose dace. All brown trout collected were young-of-year. There is no conclusion mentioned as to why this occurred. PAFBC indicated that the presence of warm-water fishes was due to migration of fish from adjacent farm ponds. PAFBC water quality measurements for the 1989 study were as follows: pH = 7.3, Alkalinity = 33 mg/L, Hardness = 60 mg/L, and Temperature = 21.6 (C).

During fish shocking on Laurel Run, no fish were found, but crayfish were present. The PAFBC speculated that the absence of fish was due to acidic water quality conditions produced by acid deposition. PAFBC water quality measurements for the 1989 study were as follows: pH = 6.1, Alkalinity = 1 mg/L, Hardness = 23 mg/L, and Temperature = 18 (C). There was no mention of AMD in the report.

Office of Surface Mining (OSM)

The Office of Surface Mining surveyed AMD in Laurel Run, reporting their results to the Loyalhanna Watershed Association (LWA) in 1995. OSM listed three AMD sources: two seeps at the headwaters and a discharge from the Friedline Mine, an abandoned house coal mine. The upper seeps were low in pH and flow.

DEP Bureau of Abandoned Mine Reclamation (BAMR) Pyrolusite Bed

A pyrolusite treatment system was installed to treat one of the Laurel Run headwater seeps in 1997. The system consists of a limestone-filled bed, where the limestone is inoculated with aerobic microorganisms provided under a contract with Allegheny Mineral Abatement. The beds are preceded by small aerobic wetlands to provide nutrients for the microorganisms and to provide some initial treatment of the water. The seep at the Laurel Run headwaters is a 30-gallon per minute (gpm) discharge with low iron and aluminum concentrations and moderate acidity and manganese levels. Water quality data is available at the LWA Offices.

DEP Bureau of Abandoned Mine Reclamation (BAMR) Steel Slag Bed

In 2004, BAMR constructed an alkalinity-producing steel slag bad at the Friedline Mine. The purpose of the steel slag bed is to generate additional alkalinity for the treatment system following flow through both SAPS. Water is captured from Laurel Run upstream of Friedline Mine, piped through the steel slag and mixed with the effluent from the second SAPS within the treatment system. Water quality data is available at the LWA Office.

Loyalhanna Watershed Association (LWA)

In 1997, a passive treatment system was constructed to treat the discharge seeping from the abandoned Friedline Mine. The Successive Alkalinity Producing System (SAPS, settling ponds, and wetlands that were constructed, work to neutralize the acid and cause the precipitation of iron and

aluminum. The system and the stream have been monitored monthly by the LWA for the standard AMD parameters. Please refer to Appendix 3 for water quality data.

The Friedline Mine SAPS system functions well, but Laurel Run remains impacted by its effluent, which still contains acidity and aluminum.

California University of Pennsylvania

In a study completed by Dr. William Kimmel of California University of Pennsylvania it is stated that current mitigation strategies on Laurel Run, including the SAPS and pyrolusite bed, are not sufficient to improve water quality enough to sustain healthy benthic macroinvertebrate and fish communities. The combination of acid deposition and acid seeps existing within the Laurel Run watershed maintain a low-pH stream with high metal content.

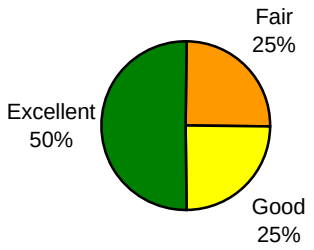
In a fish and macroinvertebrate study of Laurel Run, organisms collected were depressed in comparison to Powdermill Run. The macroinvertebrate and fish communities of Laurel Run are dominated by acid-tolerant species. It was found that no viable fish communities exist above the Friedline Mine drainage and a transient community exists below the Friedline Mine drainage. Dr. Kimmel has suggested on multiple occasions that the acid mitigation strategy for Laurel Run be reviewed and re-evaluated.

Visual Assessment Summary

Visual Assessment Findings

The Powdermill Run subwatershed was assessed in the middle of July 2003. A total of four stream segments were assessed. As depicted in Figure 1.B.1, 50% of the subwatershed received an excellent rating, 25% received a good rating, and 25% received a fair rating. An average score of 8.40 was given to the entire subwatershed, which is a good rating overall. The favorable rating reflects the quality of the subwatershed and the presence of very few limiting factors within the main stem and its tributaries. Individual stream ratings are depicted in Map 1.B.2.

Figure 1.B.1: Visual Assessment Ratings for the Powerdmill Run Subwatershed



Visual Assessment Description

Powdermill Run

The main stem of Powdermill Run received an excellent visual assessment rating. This rating is a result of good canopy cover and riparian vegetation, excellent habitat quality, and the absence of impacts from AMD and excessive nutrients.

Powdermill Run originates in a heavily forested area on Laurel Mountain. The stream flows northwest toward Route 381 maintaining a forested buffer its entire length. The stream flows over a substrate dominated by cobble and some small boulders. Mountain laurel is scattered along the streambank, which has very little erosion. The main stem of Powdermill Run passes underneath Route

UPLOYUNT8W
UPLOYB
UPLOYUNT9W
UPLOYUNT9WB
711
UPLOYUNT4E
PHOEBE
LINNA
LINNB
RROCK
LINNC
LINND
UPLOYUNT10W
UPLOYUNT6EA
UPLOYUNT5E
381
PMILLA
UPLOYC
UPLOYD
UPLOYUNT7EA
UPLOYUNT7EC
WHITE OAK
ROCK
LAUREL
PMILLB
GROVE
UPLOVE
76
70

Poor
Fair
Good
Excellent
Major Roads
Powdermill Run Subwatershed
Upper Section

Powdermill Run Subwatershed: Overall Rating

Map 1.B.2

Watershed Assistance Center

0.5 0.25 0 0.5 Miles

N

381 in the small town of Weavermill. At this point, the landscape surrounding Powdermill Run changes slightly. The forest changes from predominately pine to predominately hardwood deciduous trees. Where White Oak Run flows into Powdermill Run, the landscape surrounding the stream contains rolling pastures and hayfields.

White Oak Run

White Oak Run, a main tributary branch of Powdermill Run, received fair ratings during fieldwork. In contrast to the main stem of Powdermill Run, White Oak Run flows through a successional forest with a less dense canopy. The substrate is dominated by a combination of cobble and gravel and contains a considerable amount of silt. It is assumed that the silt is a result of the combination of agricultural operations and gravel roads in its headwaters.

Laurel Run

Laurel Run, a tributary to White Oak Run, received a good rating during fieldwork. Similar to the main stem of Powdermill Run, Laurel Run flows beneath an excellent canopy and its banks are protected by good amounts of riparian vegetation. The substrate of Laurel Run is dominated by boulders and contains a fair amount of silt. The presence of silt could be attributed to the headwaters where flow originates in a farm field. Laurel Run is impacted by AMD at the Friedline Mine site, approximately 500 yards upstream from where Laurel Run crosses underneath Route 381. As previously mentioned, the discharge is treated by a SAPS. Water flowing from the abandoned Friedline mine has a pH of 2.9 and very high concentrations of aluminum. There is very little visual evidence of AMD where the effluent from the Friedline Mine treatment system intersects the main stem of Laurel Run.

Conclusions

Overall, the Powdermill Run Subwatershed is beautiful and it should remain protected far into the future. There are two areas of concern within the subwatershed. White Oak Run has an unusual amount of sediment primarily due to dirt and gravel road runoff in its headwaters. Laurel Run continues to be impacted by acidic sources, including mine drainage and rainwater. Both impacts should be monitored and addressed in the future.

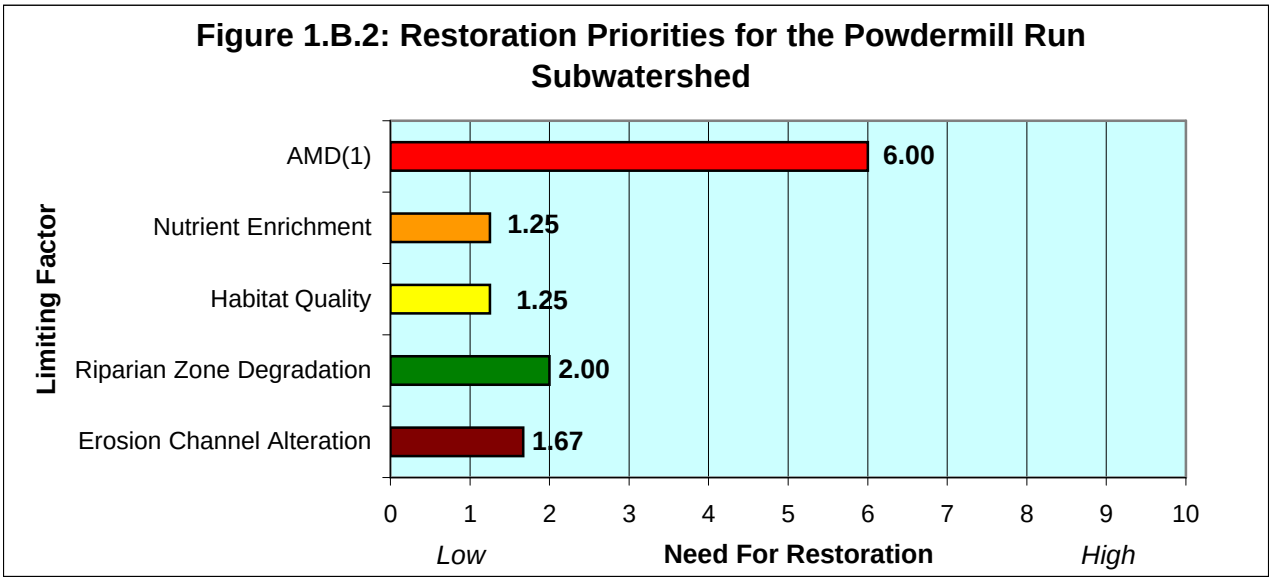
Recommendations

The following recommendations are made for the Powdermill Run Subwatershed:

- Investigate and assess the impact of dirt and gravel road runoff.
- Encourage and support the continued protection of the subwatershed.
- Educate landowners about the impact created by poorly maintained dirt and gravel driveways, lanes, and roads.
- Continue to explore and install treatment options for the acidic impacts upon Laurel Run.
- Determine overall impact of Laurel Run upon its receiving stream, White Oak Run, and the impact upon the main stem of the Loyalhanna.

Overall Restoration Priorities

Figure 1.B.2 exhibits overall restoration priorities for the entire subwatershed. As indicated, the limiting factor that received the highest restoration priority rating was AMD. One source of AMD, the Friedline Mine discharge, is present. That source is currently being treated, although its presence is still notable. All other limiting factors rated low.



Restoration Suggestions For Individual Stream Segments

During the assessment, there were no visual indicators of impaired reaches of stream in this subwatershed. The assessed stream segments did not receive scores identifying limiting factors.

UPLOYUNT8W
UPLOYB
UPLOYUNT9W
UPLOYUNT9WB
711
UPLOYUNT4E
PHOEBE
LINNA
RROCK
LINNB
UPLOYUNT6EA
UPLOYUNT5E
PMILLA
381
LINNC
UPLOYUNT10W
UPLOYC
LINND
UPLOYD
UPLOYUNT7EA
WHITE OAK
ROCK
UPLOYUNT7EC
LAUREL
PMILLB
GROVE
UPLOYE
76
70
N
Abandoned Mine Drainage
Erosion/Channelization
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None
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Powdermill Run Subwatershed
Upper Section
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Watershed Assistance Center
Powdermill Run Subwatershed: Major Limiting Factor
Map 1.B.3
0.5 0.25 0 0.5 Miles

SECTION 1.C
LINN RUN

Section 1.C

Linn Run Subwatershed

General Description

The Linn Run Subwatershed is a 9.8 square-mile area that is located primarily within Linn Run State Park and Forbes State Forest. Southeast of Ligonier, the main stem flows northwest from its headwaters on the summit of Laurel Mountain to its mouth, 100 yards downstream from where it crosses underneath Route 381 in downtown Rector. The Linn Run Subwatershed is classified as a HQ-CWF and is a popular destination for fishing, hiking, biking, and snowmobiling.

Looking upstream at Linn Run from the Route 381 Bridge in Rector

Linn Run begins at the junction of Linn Run Road and Laurel Summit Road on Laurel Mountain. From that point, the stream travels down a steep gradient surrounded by mountain laurel and pine. Fish Run, Rock Run, and Grove Run are three major tributaries that enter the Linn Run main stem.

Fish Run is a very small tributary stream that enters Linn Run, close to the headwaters, from the southwest. In the early 1900s, this stream was used as a watering station by steam engines. They traveled to Laurel Summit carrying logs at first, and then sightseeing passengers. Fish Run drains a steep hollow on state forest property.

Grove Run is the second named tributary that enters Linn Run from the southwest. It is larger than Fish Run and drains a steep hollow. Its headwaters are located within state forest property, but the mouth is located within the state park. Large hemlock trees and abundant mountain laurel dominate the drainage area of Grove Run.

Rock Run, the final named tributary to Linn Run, enters the main stem from the southwest as well. It flows through a less steep terrain and is located mostly within the state park with headwaters originating within private property. Although it is located very close to Grove Run, it flows through a forest with more hardwoods and fewer pine trees.

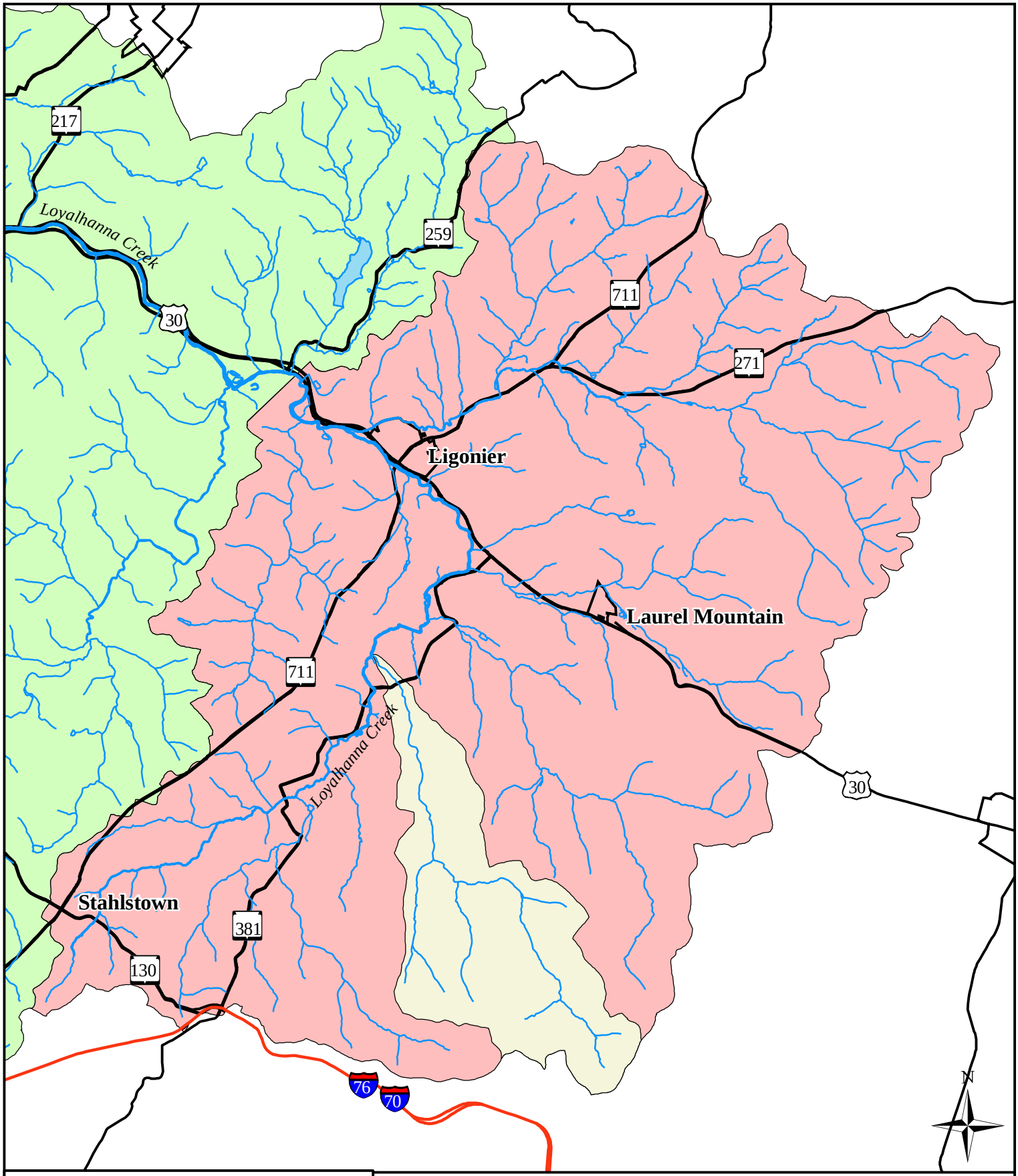
Please refer to Map 1.C.1 for the geographical location of this subwatershed.

Review of Historic Data

The Linn Run Subwatershed is contained within Linn Run State Park and Forbes State Forest. Byers and Allen Lumber Company heavily logged the entire area in the early 1900s. In 1909, the property was purchased by the state. Today, the landscape has been reforested and is managed by the PA Department of Conservation and Natural Resources (DCNR).

Penn State University

A number of studies have been completed in the Linn Run Subwatershed to examine the impact of acid deposition. In 1984, Dr. William Sharpe of Penn State University noted that the upper one-third of Linn Run and its tributaries were devoid of fish. The lower two-thirds of the stream contained some fish populations. Multiple studies found that Linn Run is subject to episodes of low pH and high metal



Streams
Major Roads
Boroughs and Cities
Linn Run Subwatershed
Upper Section

Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center

Linn Run Subwatershed: Overall Location

Map 1.C.1

1 0.5 0 1 Miles

Loyalhanna Watershed Association
Conserve, Protect and Restore Natural Resources

concentrations during periods of high flow. The episodic events during heavy rain have resulted in fish mortality.

Laurel Mountain, and subsequently, the Linn Run drainage area, receives the highest annual precipitation in the state and the highest wet deposition of sulfates and hydrogen ions in the northeast. According to Dr. Sharpe, the stream substrate and surrounding soils offer no buffering capacity.

Loyalhanna Watershed Association (LWA)

In 1984, the LWA and Linn Run State Park drilled alkaline wells to pump water into Linn Run. Three wells still operate today and are each capable of delivering 125 gpm of alkaline water to the stream. The installation of the wells has allowed for seasonal stocking of the stream.

PA Fish and Boat Commission (PAFBC)

A study completed by the PAFBC in September of 1997 resulted in the discovery of a reproducing population of brook trout. Several age classes were found, including very healthy young-of-year fish. The PAFBC concluded that the addition of alkaline water to Linn Run has aided in the fish population increase. Compared to a survey completed in 1978, the PAFBC noted a significant change in water quality.

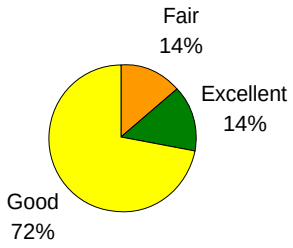
It was recommended that current management practices associated with Linn Run continue and that it be stocked with only brook trout in order to protect the wild brook trout population.

Visual Assessment Summary

Visual Assessment Findings

The assessment of Linn Run was completed in early June of 2003. A total of seven stream segments were assessed. As depicted in Figure 1.C.1, 72% of the subwatershed received a good rating, 14% received an excellent rating, and 14% received a fair rating. An average score of 8.6 was given to the entire subwatershed, which is a good rating overall. That overall good rating reflects good streamside vegetation and the lack of excessive visual impacts. Individual stream ratings are depicted in Map 1.C.2.

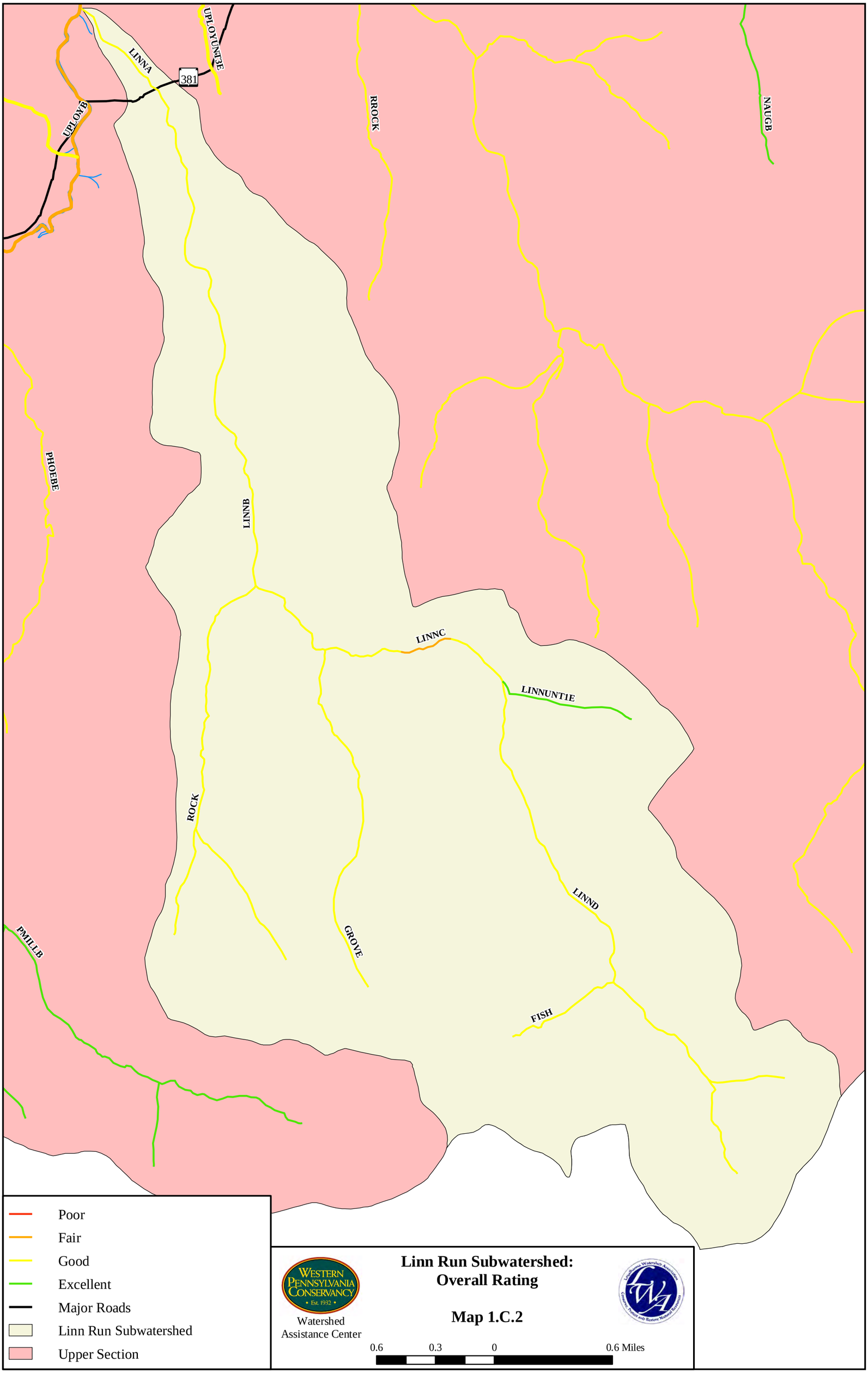
Figure 1.C.1: Visual Assessment Ratings for the Linn Run Subwatershed



Visual Assessment Description

Linn Run Main Stem

The headwaters of Linn Run are a spring source that can be found on top of Laurel Mountain adjacent to Summit Road. From the headwaters, Linn Run flows northwest and parallel to Summit Road toward the small village of Rector. Excellent vegetation and canopy cover consisting of pine, hardwoods, and mountain laurel surround the stream through this section. This vegetation is present until the stream reaches the cabin area maintained for campers at Linn Run State Park. Upon reaching the cabin area, Linn Run loses some of its riparian vegetation and suffers from foot and car traffic around its banks.


LINNA
381
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PHOEBE
LINNB
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LINNUNT1E
ROCK
GROVE
LINND
FMILLB
FISH
Poor
Fair
Good
Excellent
Major Roads
Linn Run Subwatershed
Upper Section
Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center
Linn Run Subwatershed:
Overall Rating
Map 1.C.2
0.6 0.3 0 0.6 Miles

Downstream of the cabin area, several step dams have been installed to create pools for fish. Some of the dams are intact, while others have lost integrity. For visual assessment purposes, the dams were noted as fish barriers and therefore influenced the assessed score for that stream section.

Throughout the length of stream within the Linn Run State Park area, there are several large eroding banks. Assessment observations indicate that high flow volumes could cause the erosion during heavy rain events.

After leaving Linn Run State Park, Linn Run flows into the community of Rector. Nutrient loading from sewage is present on several occasions as the main stem of Linn Run flows through the residential portion of the community. Downstream of the Route 381 Bridge near the Rector Post Office. Linn Run flows through a canopy of large pine trees and oak trees until meeting the Loyalhanna Creek.

Grove Run, Fish Run, and Rock Run

Only one of the three named tributaries entering Linn Run—Rock Run—exhibited notable impacts. Rock Run is a small tributary that enters Linn Run from the west. The tributary originates on private property bordering state forest. The stream has a very low pH as a result of acid deposition. In 2003, the field pH of the stream was 4.9. The local Trout Unlimited chapter will carry out a limestone dosing of the stream to increase alkalinity and pH of Rock Run. Information about that project can be obtained at the LWA office.

Water Quality

The mouth of Linn Run was sampled throughout the assessment. Water quality indicated very few impacts. The effects of acid deposition and lack of buffering capacity are reflected in the low pH readings taken in the late winter and spring.

Table 1.C.1: Sample Site LWA-3 Linn Run

Date Sampled	pH	Alk. (mg/L)	TSS (mg/L)	TDS (mg/L)	Iron (mg/L)
2/23/04	6.06	7	<3	37	<0.06
5/24/04	5.94	6	5	31	<0.06
8/25/04	6.46	11	0	37	<0.06
10/25/04	6.35	8	1	35	<0.06

Sample Location: Sample site can be accessed by traveling Route 381 East from Route 711 in Ligonier. Drive approximately two miles into the town of Rector. The bridge is located before the Rector Post Office. Sample taken directly from the bridge.

Conclusions

The Linn Run Subwatershed has been the topic of many studies involving the impact of acid deposition upon southwestern Pennsylvania streams. As mentioned, its most significant impacts are episodic rain events that lower pH and increase metals. Linn Run's susceptibility to acid deposition is due to its lack of buffering capacity.

Work to be completed in Linn Run in the future should involve consultation with organizations and individuals who have completed previous studies and work.

Recommendations

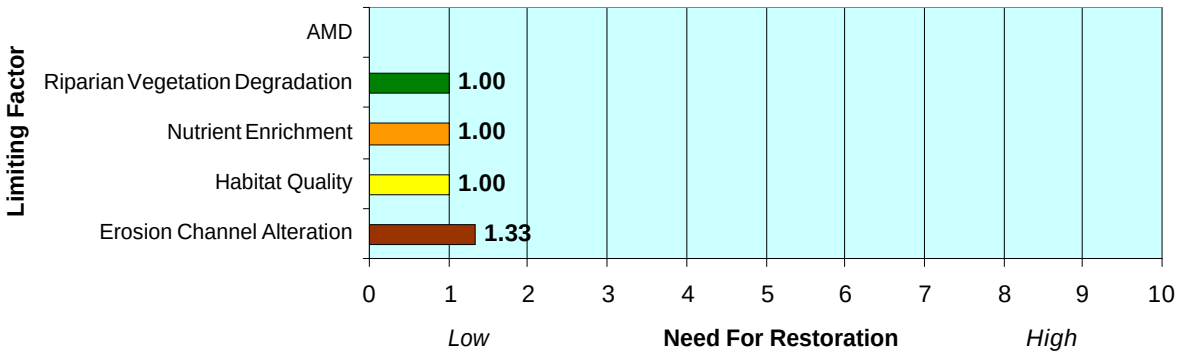
The overall recommendations for the Linn Run Subwatershed are as follows:

- Support the continued management and protection of land surrounding the subwatershed area by Linn Run State Park and Forbes State Forest.
- Monitor and determine the overall benefit of alkaline-producing wells located along the main stem of Linn Run.
- Educate visitors to Linn Run State Park about the water quality and impacts from acid deposition.
- Support Forbes Trail Trout Unlimited in limestone dosing currently taking place on Rock Run.

Overall Restoration Priorities

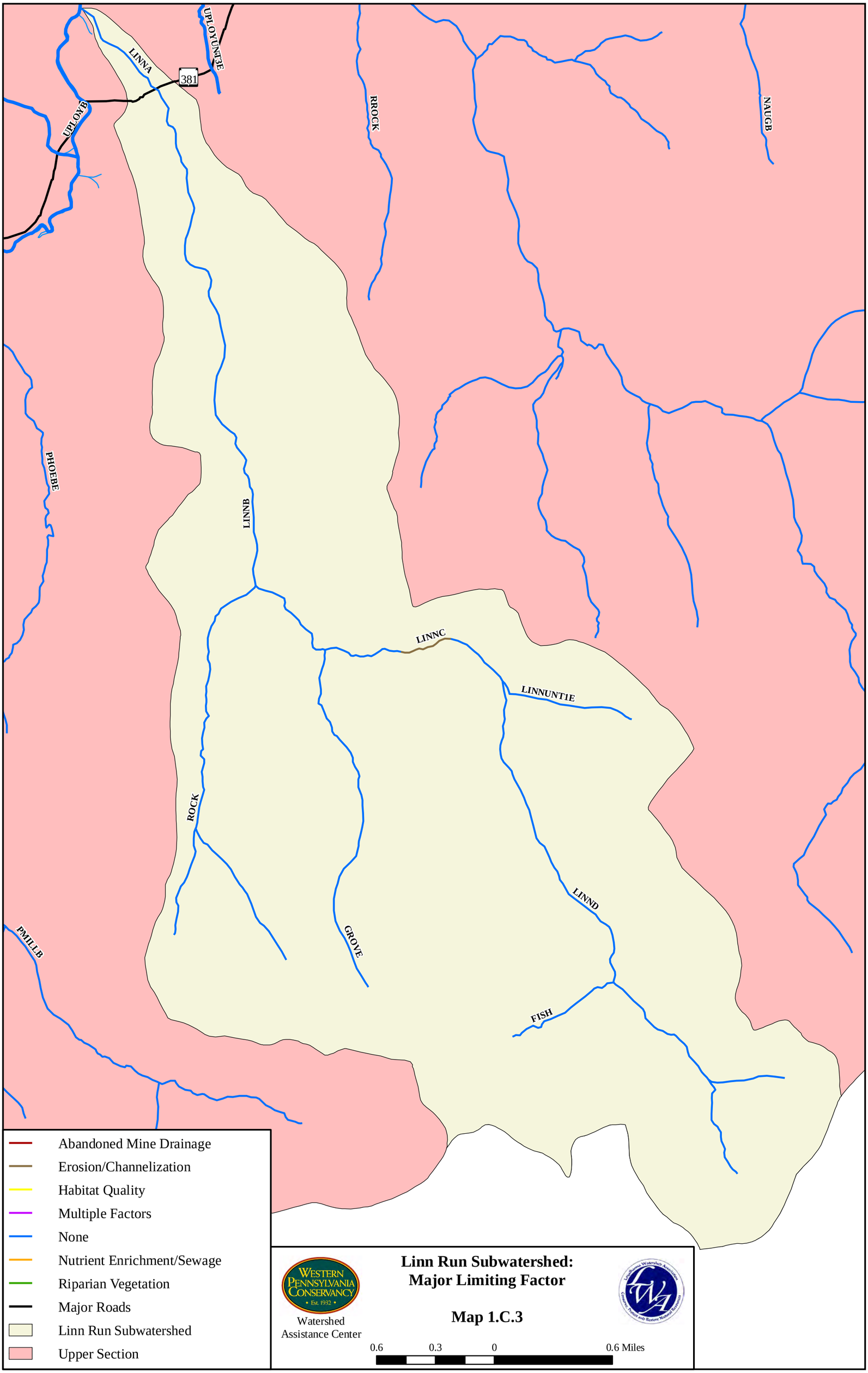
Figure 1.C.2 exhibits overall restoration priorities for the entire subwatershed. As indicated, the limiting factor that received the highest restoration priority rating was erosion and channel alteration.

Figure 1.C.2: Restoration Priorities for the Linn Run Subwatershed



Restoration Suggestions For Individual Stream Segments

During the assessment, there were no visual indicators of impaired reaches of stream in this subwatershed. The assessed stream segments did not receive scores identifying limiting factors.


LINNA
381
UPLOYUNT3E
UPLOYB
RROCK
NAUGB
PHOEBE
LINNB
LINNC
LINNUNT1E
ROCK
GROVE
LINND
FMILLB
FISH
Abandoned Mine Drainage
Erosion/Channelization
Habitat Quality
Multiple Factors
None
Nutrient Enrichment/Sewage
Riparian Vegetation
Major Roads
Linn Run Subwatershed
Upper Section
Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center
Linn Run Subwatershed:
Major Limiting Factor
Map 1.C.3
0.6 0.3 0 0.6 Miles

SECTION 1.D
ROLLING ROCK CREEK

Section 1.D

Rolling Rock Creek Subwatershed

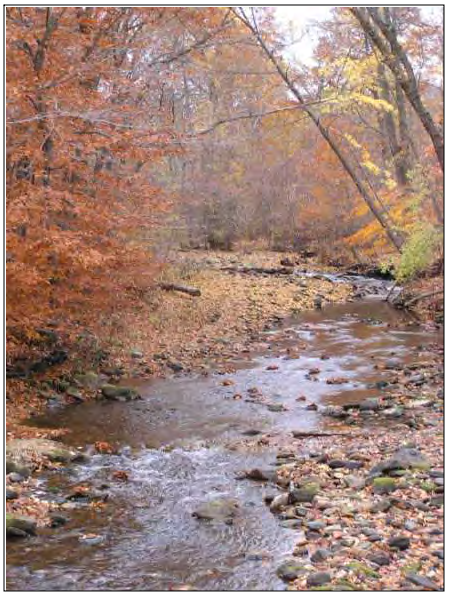
General Description

The 13.1 square-mile Rolling Rock Creek Subwatershed is located east of Ligonier, south of Route 30 and east of Route 381. Rolling Rock Creek flows west to meet the main stem of the Loyalhanna Creek, directly behind the offices of Rolling Rock Farms on Route 381.

The headwaters of Rolling Rock Creek consist of two major branches—Silver Mine Hollow and the main stem branch. Both branches originate high upon Laurel Mountain and travel through steep hollows abundant with conifers and mountain laurel.

Silver Mine Hollow begins on top of Laurel Mountain along the Silver Mine Hollow hiking trail found on the Rector-Edie Road. Its source is a spring that seeps out on Forbes State Forest property and flows northward, crossing onto private property to meet the main stem branch of Rolling Rock Creek.

The **Main Stem Branch** begins very close to Laurel Mountain Ski Village, a community found south of Route 30 on top of Laurel Mountain. This branch flows west, meeting Silver Mine Hollow just below Laurel Mountain Ski Area. The ski area, when in operation, utilizes water from the main stem branch for snowmaking. At the time of assessment, the ski area was not in operation.



Looking upstream from the Route 381 Bridge at Rolling Rock Creek

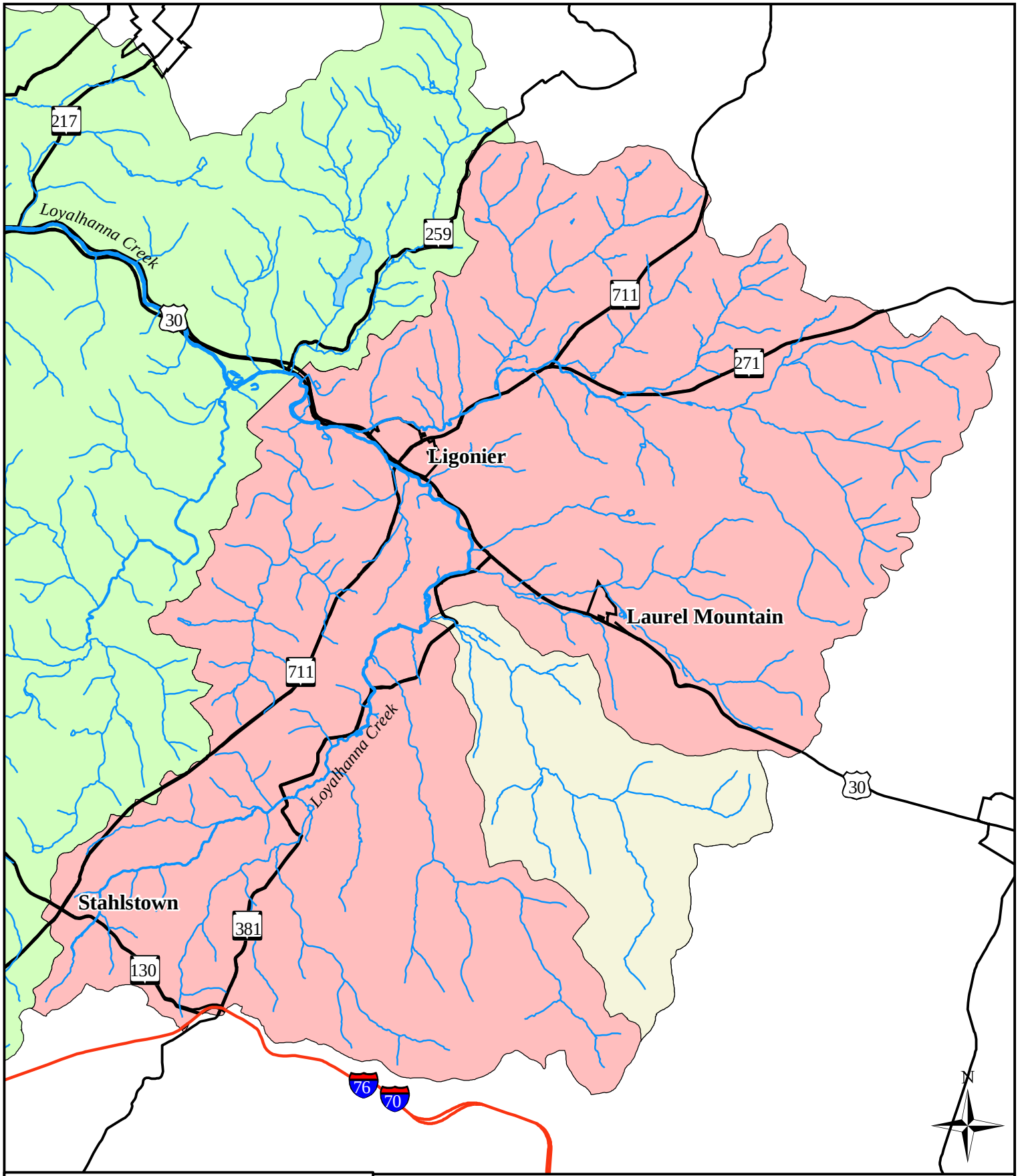
The land within the Rolling Rock Creek Subwatershed is almost entirely private property. It is owned and maintained by Rolling Rock Farms and other private owners. Only the extreme headwaters are not in private ownership, but rather are found within Laurel Mountain State Park and Forbes State Forest. Rolling Rock Farms manages the heavily forested area for timber, deer, and other game wildlife. In addition, Rolling Rock Club operates a small nursery used to stock trout into various sections of the main stem of the creek. The Rolling Rock Creek Subwatershed is very well protected by the landowners and classified as a HQ-CWF. For geographic location of this subwatershed, please refer to Map 1.D.1.

Review of Historic Information

To date, there is limited historic information available to the public regarding the Rolling Rock Creek Subwatershed. Since much of the land is privately owned, there have been very few public studies completed within the subwatershed.

Visual Assessment Summary

Access to Rolling Rock Creek is limited due to private ownership. In order to complete a visual assessment of the stream, it was accessed with the permission of the Mellon family and Rolling Rock Farms. The manager of Rolling Rock Farms led an assessment volunteer on a tour of the subwatershed via a stream access road. The entire subwatershed received an average score of 8.7 and an overall visual assessment rating of good.



Streams
Major Roads
Boroughs and Cities
Rolling Rock Creek Subwatershed
Upper Section

Rolling Rock Creek Subwatershed: Overall Location

Map 1.D.1

Western Pennsylvania Conservancy
Watershed Assistance Center

1 0.5 0 1 Miles

Rolling Rock Creek is a heavily forested stream, filled with boulders, cobble, and small pools. There is abundant habitat for fish and macroinvertebrates. Sufficient canopy cover dominated by hemlock keeps the stream well shaded; however, the riparian vegetation area is less sufficient. It is speculated that riparian vegetation could be limited by deer browse, a stifling canopy, or heavy foot traffic along the streambanks.

Although there is no evidence of excessive channelization or excessive streambank erosion within the subwatershed, where the stream passes underneath Route 381 a small amount of riprap was applied to the streambank for erosion control. This section is very small and appears to be insignificant when evaluating overall water quality.

In order to provide good fish habitat throughout the length of the stream, Rolling Rock Club hatchery employees have installed a series of step dams. In addition, covered pools are utilized in different sections to raise fingerlings for release into the main stem of the creek. The good rating received by Rolling Rock Creek is a result of good canopy cover, excellent habitat quality, and the absence of impacts from AMD, sewage, or agriculture.

Water Quality Data

Rolling Rock Creek was sampled close to its mouth throughout the assessment. Water quality indicated very few impacts. The lower pH reading in May of 2004 should be noted; samples were taken close to significant rainfall. The low alkalinity reading indicates that perhaps Rolling Rock Creek was impacted by acid deposition at the time of sampling. Similar to Linn Run, Rolling Rock Creek will encounter episodic impacts from acid deposition.

Table 1.D.1: Sample Site LWA-2 Rolling Rock Creek

Date Sampled	pH	Alk. mg/L	TSS mg/L	TDS mg/L	Iron mg/L
2/23/04	7.02	32		157	<0.06
5/24/04	6.20	9	6	39	<0.06
8/25/04	6.60	14	4	40	<0.06
10/25/04	6.59	21	<0.1	49	<0.06

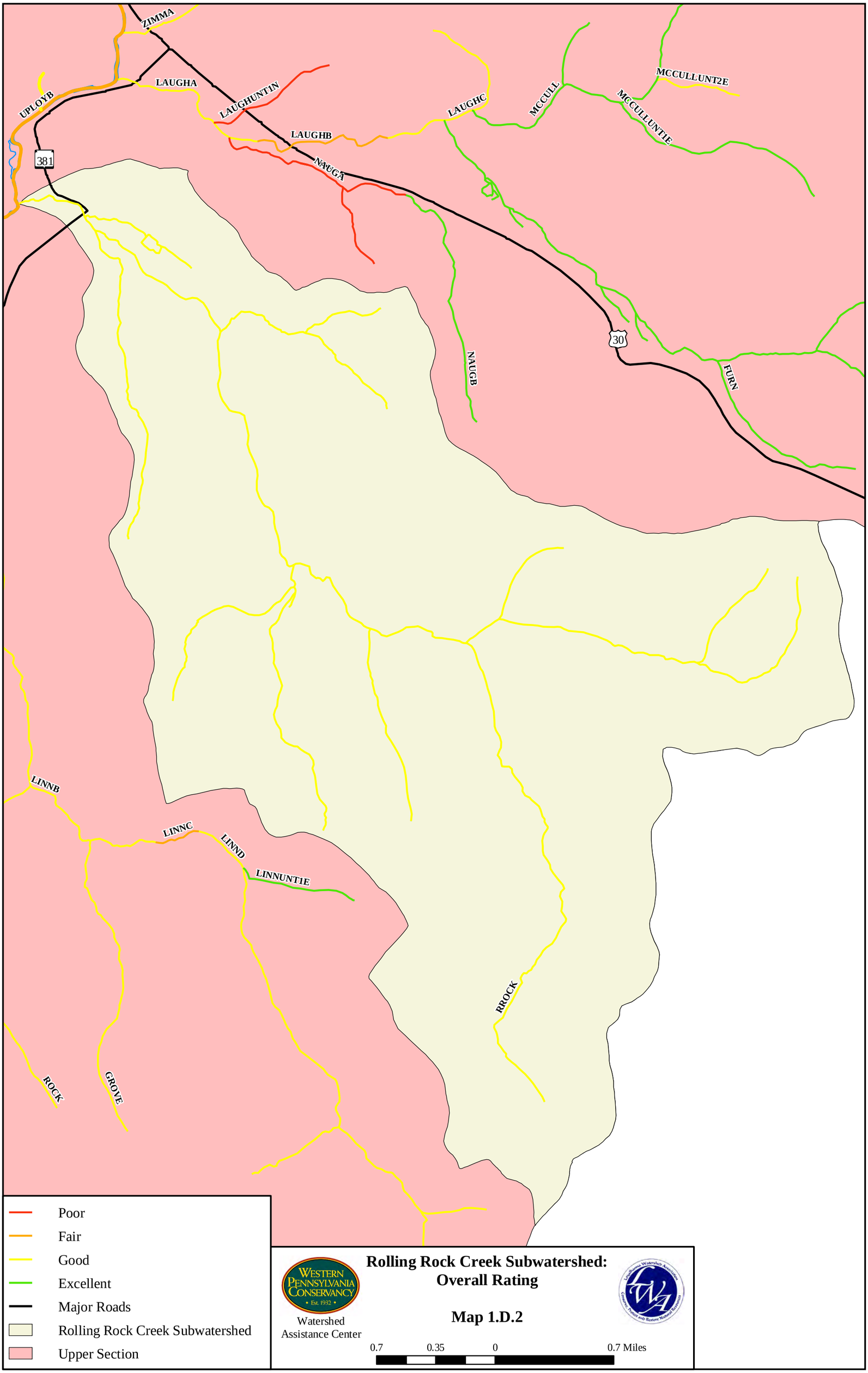
Sampling Location: The sample was taken from the Route 381 Bridge across the main stem of Rolling Rock Creek. The site can be accessed by turning onto to Route 381 West from Route 30 East outside of Ligonier. Travel approximately two miles to a stop sign. Bridge is located immediately to the right.

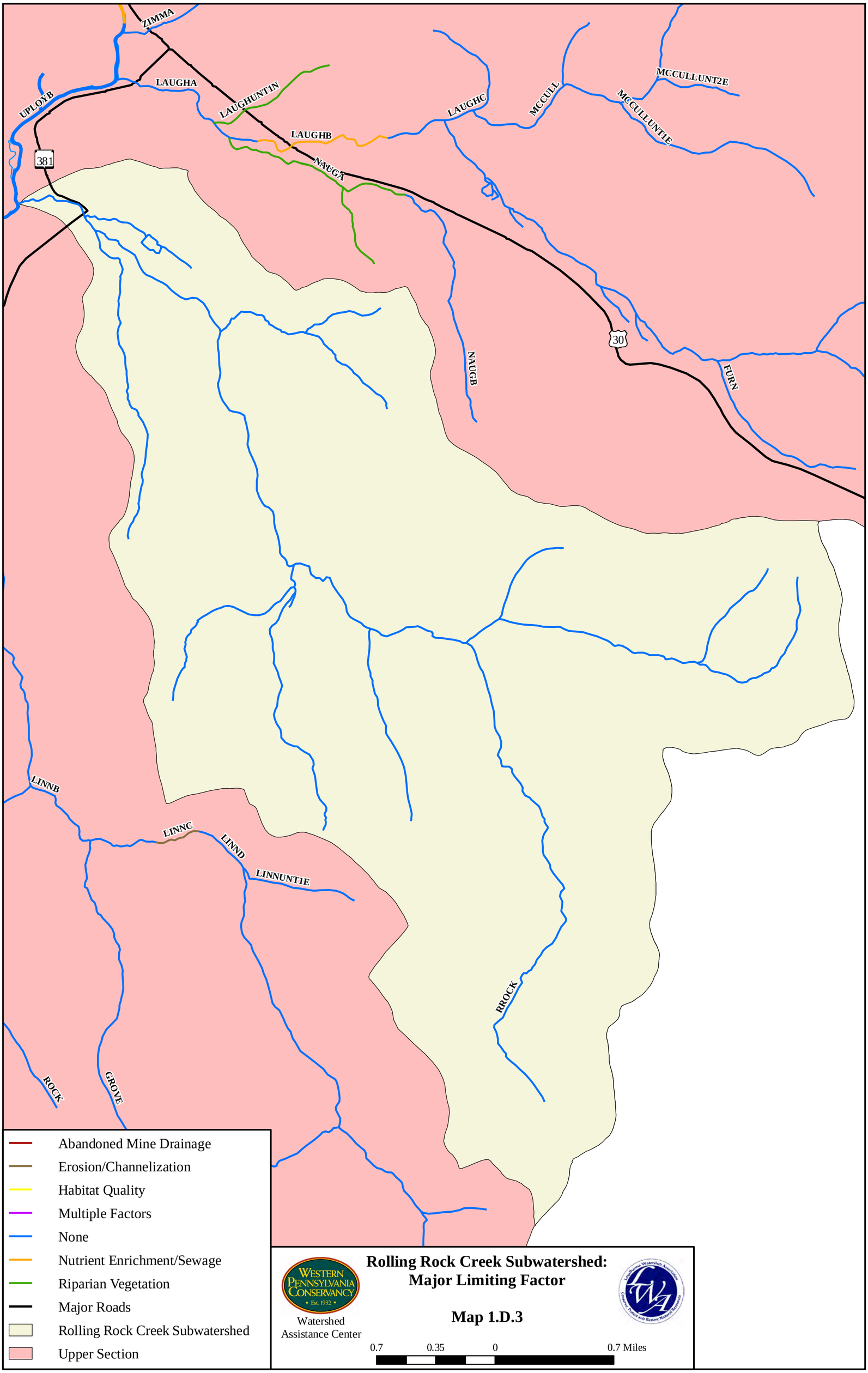
Conclusions

Rolling Rock Creek is a stream that boasts characteristics and quality unique to this region of Pennsylvania. Its overall good rating is a reflection of the care taken to protect it as a natural resource.

Recommendations

It is recommended that efforts be made to continue the protection of the Rolling Rock Creek Subwatershed. If possible, it would be advantageous and important to talk with private landowners and work to obtain more historic information pertaining to the subwatershed area.


ZIMMA
LAUGHA
LAUGHUNT1N
UPLOYB
381
LAUGHB
NAUGA
LAUGHC
MCCULL
MCCULLUNT2E
MCCULLUNT1E
30
NAUGB
FURN
LINNB
LINNC
LINND
LINNUNT1E
RROCK
ROCK
GROVE
Poor
Fair
Good
Excellent
Major Roads
Rolling Rock Creek Subwatershed
Upper Section
Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center
Rolling Rock Creek Subwatershed:
Overall Rating
Map 1.D.2
0.7
0.35
0
0.7 Miles


ZIMMA
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UPLOYB
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MCCULL
MCCULLUNT2E
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30
NAUGB
FURN
LINNB
LINNC
LINND
LINNUNT1E
RROCK
ROCK
GROVE
Abandoned Mine Drainage
Erosion/Channelization
Habitat Quality
Multiple Factors
None
Nutrient Enrichment/Sewage
Riparian Vegetation
Major Roads
Rolling Rock Creek Subwatershed
Upper Section
Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center
Rolling Rock Creek Subwatershed:
Major Limiting Factor
Map 1.D.3
0.7
0.35
0
0.7 Miles

SECTION 1.E
LAUGHLINTOWN RUN

Section 1.E

Laughlintown Run Subwatershed

General Description

The 11.73 square-mile Laughlintown Run Subwatershed is located in and around the small residential area of Laughlintown. Laughlintown Run and its tributary streams flow west from Laurel Ridge, through the community of Laughlintown, and onward to meet the Loyalhanna Creek after passing under Route 381.

Laughlintown Run consists of the main stem and three headwater streams that meet to form a main branch of Laughlintown Run very close to Route 30 in Laughlintown. The headwaters of the **Laughlintown Run Main Stem** are located north of Laughlintown and the village of Laurel Mountain Borough. The stream flows through private properties underneath a thick canopy dominated by hemlock.

Laughlintown Run looking upstream from the Route 381 Bridge

McCullen Run originates on Laurel Ridge north of Route 30 and north of Furnace Run. It joins Laughlintown Run north of Laurel Mountain Borough after passing underneath the Laughlintown-Waterford Road. McCullen Run, a HQ-CWF, drops through a steep terrain as it flows west. A majority of McCullen Run flows through land dense with conifers and mountain laurel, which has been conserved by the Laughlintown Protective Association (LPA). The Old Forbes Road, traveled by soldiers occupying Fort Ligonier, crosses one of its branches. Today, the Old Forbes Road is utilized by members of the LPA when hunting and hiking.

Following the confluence with McCullen Run, Laughlintown Run meets Furnace Run. **Furnace Run**, rated an EV stream, begins on top of Laurel Ridge on the northern side of Route 30. As it flows west, the stream drops through steep terrain covered with pine trees and mountain laurel. Except for a very small private community, Furnace Run moves through protected and private properties until it flows into Laughlintown Run just behind the village of Laurel Mountain Borough.

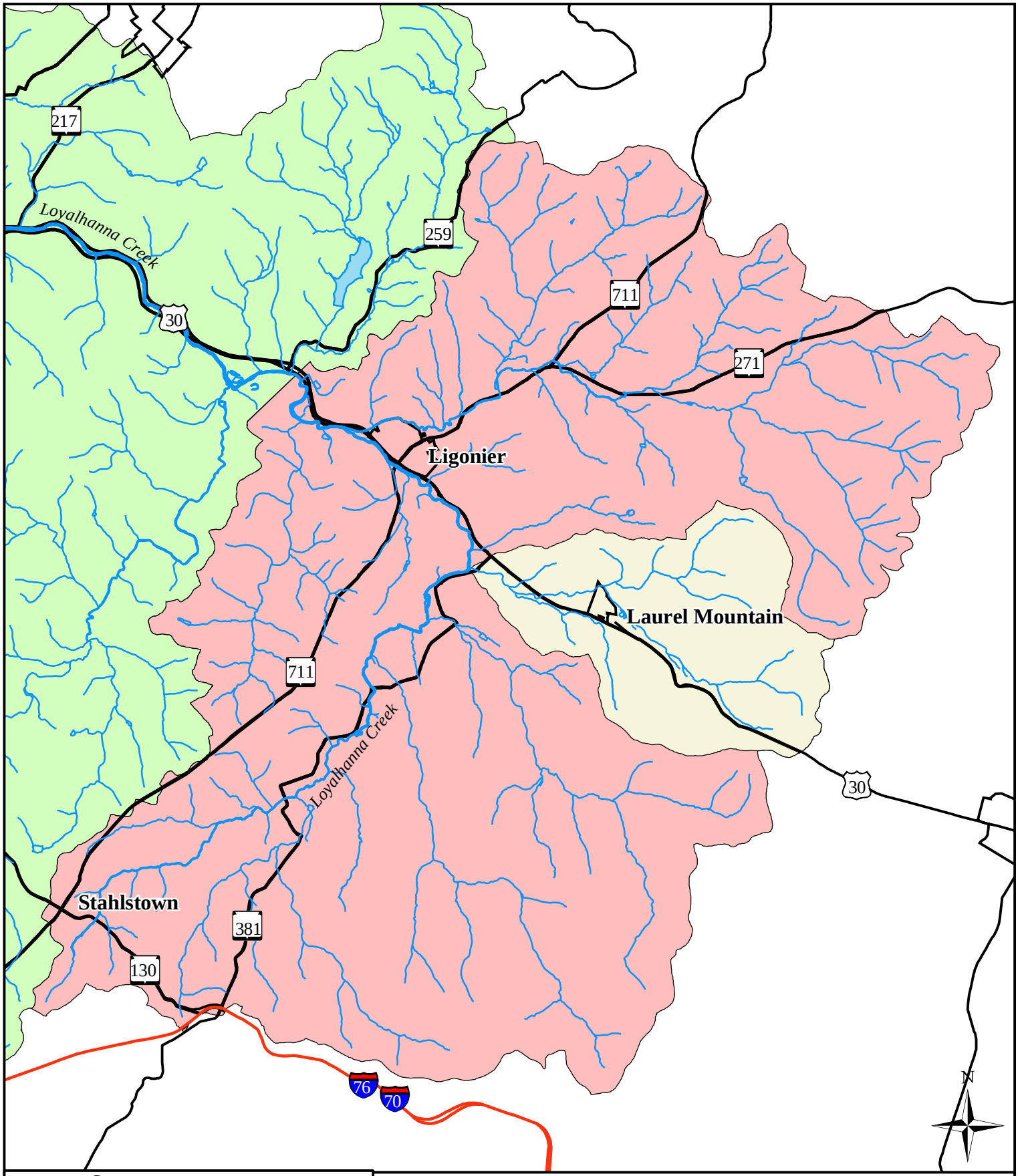
Naugle Run, the third of Laughlintown Run's branches, starts on private property south of Route 30. Much smaller than the other two streams, it has a short journey through dense forest and is then quickly exposed to residences as it flows through Laughlintown. Naugle Run is the last of the three streams to join with Laughlintown Run prior to it meeting with the Loyalhanna Creek. It joins Laughlintown Run just as the stream passes out of the residential area.

Please refer to Map 1.E.1 for the geographic location of this subwatershed.

Review of Historic Information

PA Department of Environmental Protection (DEP)

A report from the PA Department of Environmental Resources (DER), dated 1983, reports the results of a fish and macroinvertebrate survey conducted on **Laughlintown Run** and **Furnace Run**. The report noted high stonefly diversity. Additionally, five fish species were collected; most notable was evidence of natural reproduction of rainbow and brook trout. Chemical analysis for the water samples demonstrated that the pH was between 6.3 and 6.8, which was considered normal for streams in this area.



Streams
Major Roads
Boroughs and Cities
Laughlintown Run Subwatershed
Upper Section

Laughlintown Run Subwatershed: Overall Location

Map 1.E.1

Western Pennsylvania Conservancy
Watershed Assistance Center

1 0.5 0 1 Miles

The report also mentions that the DER investigated a fish kill in a Furnace Run tributary in 1980, the result of a truck accident that spilled tanning chemicals into the stream. As of 1983, macroinvertebrate diversity and density were high, although no population values were reported.

PA Fish and Boat Commission (PAFBC)

Furnace Run: The PAFBC conducted a fish survey of Furnace Run on May 13-14, 1992. The purpose of the survey was related to Ligonier Borough's water allocation permit, since Furnace Run and two wells supply the Ligonier Borough Reservoir. In this study, fish density was reduced downstream of the surface water intake point when compared to that above the taking point. In addition, young-of-year rainbow trout were collected upstream of the taking point, but were absent downstream. This evidence suggests that reduced stream flow downstream of the taking point has impacted the fish community. Macroinvertebrate diversity was high at all survey sites. The PAFBC recommended that conservation releases (as required by the permit) remain at then-current levels, as opposed to being decreased. They also suggested that Ligonier Borough rely on water from their two wells at times when stream flow falls below conservation release levels.

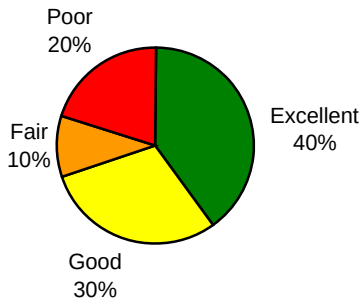
In January 1993, the PAFBC surveyed Furnace Run (report dated February 22, 1993). The purpose of the investigation was to determine the impact of a PennDOT project on Route 30 (SR 0300). Sediment from the project was entering an unnamed tributary of Furnace Run. Heavy sediment deposits were observed in the tributary but not in Furnace Run. The results of electro-fishing surveys in Furnace Run showed that the sediment was not impacting the fish community. Nine fish species were collected upstream from the confluence with the tributary, and 17 species were collected downstream.

Visual Assessment Summary

Visual Assessment Findings

The visual assessment of the Laughlintown Run Subwatershed was completed in July of 2003. A total of 11 stream sections were assessed. As depicted in Figure 1.E.1, 40% of the subwatershed received an excellent rating, 30% received a good rating, 10% received a fair rating, and 20% rated poor. The fair and poor ratings given to Laughlintown Run are a result of degraded riparian zones and suspected sewage in the residential areas of Laughlintown. Individual stream ratings are depicted in Map 1.E.2.

Figure 1.E.1: Visual Assessment Ratings for the Laughlintown Run Subwatershed



Visual Assessment Description

Laughlintown Run Main Stem

The main stem of Laughlintown Run experiences very few visual impacts until it reaches the community of Laughlintown, at which point the canopy cover becomes less dense. This decreases shade available to the stream, as well as habitat and food resources provided by the canopy for stream life. In addition, properties adjacent to the stream are absent of significant streamside vegetation. This contributes to, and increases the potential for, the erosion of streambanks. Many landowners choose to

UPLOYUNT2E
UPLOYA
ZIMMA
30
UPLOYUNT2W
UPLOYUNT4W
LAUGHUNT1N
LAUGHC
MCCULLUNT1N
MCCULL
MCCULLUNT2E
MILLSFKB
LAUGHA
LAUGHB
MCCULLUNT1E
381
NAUGA
UPLOYB
UPLOYUNT3E
RROCK
NAUGB
30
FURN
N

Poor
Fair
Good
Excellent
Major Roads
Laughlintown Run Subwatershed
Upper Section

Laughlintown Run Subwatershed:
Overall Rating

Map 1.E.2

Watershed Assistance Center

0.5 0.25 0 0.5 Miles

mow lawns directly to the streambank. Close to the mouth, the streamside vegetation recovers and full canopy returns. However, some of the riparian vegetation includes the invasive species Japanese knotweed. Although not highly prevalent throughout this subwatershed, its presence does indicate a challenge.

Multiple flowing pipe inputs were noted during the assessment. A majority of those were found in the residential area of Laughlintown. Downstream of Laughlintown, nutrient enrichment in the form of algae on the substrate was prevalent. In combination with the discovery of multiple flowing pipes in the Laughlintown community, this led assessors to believe that sewage is impacting Laughlintown Run. This is further confirmed by historical knowledge and the lack of sewerage within the community.

Furnace Run

Overall, Furnace Run was rated excellent. This rating is indicative of excellent canopy cover, riparian vegetation, habitat, and substrate. Furnace Run is one of just four streams in the Loyalhanna Creek Watershed that is classified as an EV stream.

Naugle Run

Similar to the main stem of the Laughlintown Run, Naugle Run originates in an area with good canopy cover and streamside vegetation. In the headwaters of Naugle Run, the substrate is free of excessive sediments or nutrient enrichment. Its quality changes as it moves through a concentration of homes in Laughlintown. The stream is channelized, canopy cover is removed, and riparian vegetation becomes minimal. Until it reaches its confluence with the Laughlintown Run main stem, Naugle Run becomes inundated with flow from several pipes outputting water with field pH ranging from 8.5 to 9.5.

Water Quality Data

The mouth of Laughlintown Run was sampled throughout the assessment. Water quality indicated very few impacts. Coliform samples taken in October of 2003 show a presence of total and fecal coliforms that are both within acceptable levels. No further samples were taken along Laughlintown Run.

Table 1.E.1: Sample Site LWA-1
Laughlintown Run

Date Sampled	pH	Alk (mg/L)	TSS (mg/L)	TDS (mg/L)	Iron (mg/L)	Total Coliform (per 100 mL)	Fecal Coliform (per 100 mL)
8/25/03	6.72	21	3	112	- - -	- - -	- - -
10/29/03	6.53	14	3	68	0.2	3400*	550*
2/23/04	6.54	18	3	99	<0.06	- - -	- - -
5/24/04	6.58	13	6	63	<0.06	- - -	- - -
8/25/04	6.60	19	7	74	<0.06	- - -	- - -

- - - parameter not analyzed

* Sample completed by the DEP Bureau of Laboratories

Sample Location: Sample taken from the Route 381 Bridge over Laughlintown Run. The site can be accessed by turning onto Route 381 toward Rector from Route 30.

Conclusions

The headwater streams within the Laughlintown Run Subwatershed all rated good or excellent during the visual assessment. Those headwater drainage areas are picturesque and maintain favorable conditions for waters to flow through.

The community of Laughlintown changes the characteristic and quality of the stream with two major impacts—nutrient loading from human waste and degradation of riparian vegetation. In addition, algal growth flourishes on the stream substrate all the way to the mouth of Laughlintown Run and continues to proliferate in the Loyalhanna Creek main stem past the confluence.

Recommendations

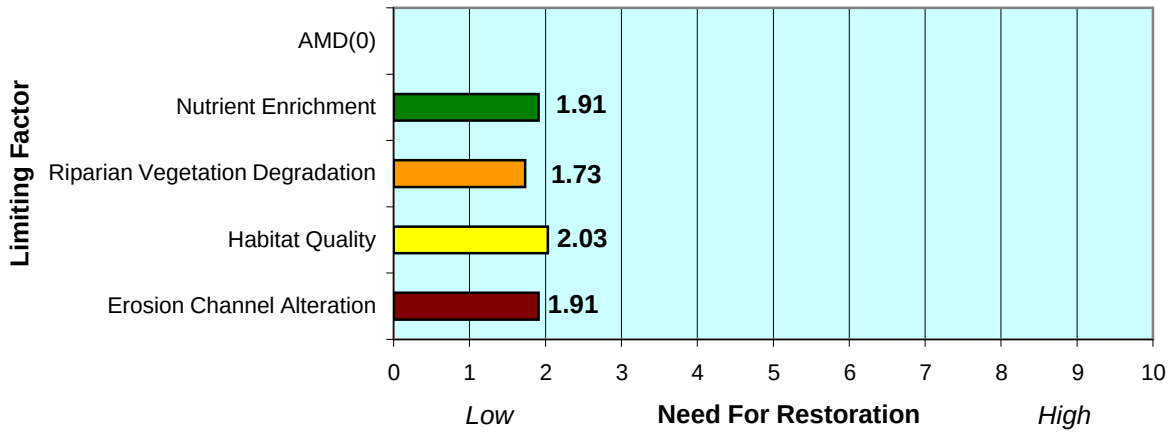
The following recommendations are made for the Laughlintown Run Subwatershed:

- Encourage the continued protection of headwater streams and educate landowners regarding the value of those headwater streams.
- Educate landowners about the importance of riparian vegetation and canopy cover.
- Support, promote, and encourage the installation of sewage collection and treatment within Laughlintown and Laurel Mountain Borough.

Overall Restoration Priorities

Figure 1.E.2 exhibits overall restoration priorities for the entire subwatershed. As indicated, the limiting factor that received the highest restoration priority was habitat quality. None of the overall priority ratings are high, nor do they indicate a glaring need for water quality restoration.

Figure 1.E.2: Restoration Priorities for the Laughlintown Run Subwatershed



Restoration Suggestions for Individual Stream Segments

Three stream sections within the Laughlintown Run subwatershed received visual assessment scores indicating a notable impact. The limiting factors identified were riparian vegetation degradation, nutrient enrichment, and habitat quality degradation. Please refer to Table 1.E.2 and Map 1.E.3 for impact description and stream segment locations.

Table 1.E.2: Impacted Stream Segments and Restoration Suggestions for the Laughlintown Run Subwatershed				
LIMITING FACTOR: Riparian Vegetation Degradation				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
LaughUNT1N *A very small tributary that drains a hillside. After flowing through an open field it cuts underneath Route 30 and continues on to meet Laughlintown Run.*	The streamside is absent of significant riparian vegetation. The field through which it flows is mowed for hay seasonally.	1. Educate landowner. 2. Plantings, or allow growth for recovery of vegetation. Possible Partners: WCD, PNR, Ligonier Township, FSA, PAGC	CREP, CRP, WHIP, EQIP, Growing Greener	Low
Naugle A *Main stem section of Naugle Run, a large tributary to Laughlintown Run. The section flows behind homes and businesses located in downtown Laughlintown.*	Due to the presence of multiple homes right along the streambank, riparian vegetation is extremely limited. Very few trees are available to provide stream canopy cover. In addition, homeowners mow lawns directly to streambanks.	1. Educate landowners. 2. Plantings, or allow growth for recovery of vegetation. Possible Partners: WCD, PNR, Ligonier Township	Growing Greener, Private Sources	Low – Medium
LIMITING FACTOR: Compromised Fish and Macroinvertebrate Habitat				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
Laugh UNT1N *A very small tributary that drains a hillside. After flowing through an open field it cuts underneath Route 30 and continues on to meet Laughlintown Run.*	Stream substrate is mostly sand and small gravel, which provides little habitat for stream life. Lack of riparian vegetation eliminates possible food sources.	1. Educate landowner. 2. Remediate riparian zone, for food source and elimination of erosion causing unfavorable substrate. Possible Partners: WCD, PNR, Ligonier Township, FSA	Growing Greener, CREP, CRP, WHIP	Low

UPLOYUNT2E
UPLOYA
ZIMMA
30
UPLOYUNT2W
UPLOYUNT4W
381
LAUGHUNT1N
LAUGHA
LAUGHB
LAUGHC
MCCULLUNT1N
MCCULL
MCCULLUNT2E
MCCULLUNT1E
MILLSFKB
UPLOYB
NAUGA
UPLOYUNT3E
RROCK
NAUGB
30
FURN
N

Abandoned Mine Drainage
Erosion/Channelization
Habitat Quality
Multiple Factors
None
Nutrient Enrichment/Sewage
Riparian Vegetation
Major Roads
Laughlintown Run Subwatershed
Upper Section

Laughlintown Run Subwatershed:
Major Limiting Factor

Map 1.E.3

Western Pennsylvania Conservancy
Watershed Assistance Center

0.5 0.25 0 0.5 Miles

LIMITING FACTOR: Nutrient Enrichment				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
Laugh B *Main stem section of Laughlintown Run that flows through a populated area in Laughlintown. It flows behind many homes that are built close to the stream.*	Several pipes were discovered with varying levels of flow. In most cases, the flow had a bad odor and was black or gray in color. The general pH reading taken at such pipes was between 9.8 and 10.5.	1. Educate landowner about BMPs for septic system management. 2. Encourage Ligonier Township to install sewerage for the community. Possible Partners: Ligonier Township, PSCE, DEP	Federal funding for sewerage	Medium – High
LIMITING FACTOR: Erosion and Channel Alteration				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
Laugh UNT1N *A very small tributary that drains a hillside. After flowing through an open field it cuts underneath Route 30 and continues on to meet Laughlintown Run.*	Stream was channelized away from a telephone pole and driveway to accommodate Route 30. Streambanks are eroded as the stream takes a sharp turn where it was channelized underneath Route 30. Erosion is apparent for a majority of stream length.	1. Educate landowner. 2. Stabilize banks by planting small trees and shrubs. Possible Partners: Ligonier Township, DEP, WCD	Growing Greener	Low

SECTION 1.F
MILL CREEK

Section 1.F

Mill Creek Subwatershed

General Description

The 25.7 square-mile Mill Creek Subwatershed is located in Ligonier Township. Its headwaters consist of three separate branches that flow west and drain Laurel Ridge south of Route 271. The three headwater branches join in the town of Waterford to form the Mill Creek main stem. From Waterford, Mill Creek flows west, passing through Ligonier Borough. After crossing underneath Route 30, Mill Creek meets the Loyalhanna Creek behind the Ligonier water treatment facility.

Several named tributaries are included in the Mill Creek subwatershed: North Branch, Middle Branch, South Branch, Macks Run, and Hannas Run. Due to its size, Hannas Run was assessed and reported separately.

Great blue heron near the mouth of Mill Creek in downtown Ligonier

North Branch, Middle Branch, and South Branch collectively form the headwaters of Mill Creek. They each flow west off Laurel Ridge through extremely steep terrain until they join to form the main stem of Mill Creek in Waterford.

North Branch is the least steep of the headwater branches and is the only branch that encounters a residential area as it flows. It flows close to Route 271 and is located within the southeast corner of Fairfield Township. It is surrounded by a forest comprised of hardwoods and scattered mountain laurel. North Branch is classified a HQ-CWF.

Middle Branch is the largest of the three headwater branches. It drains Sugar Camp Hill and a portion of State Game Lands #42. The two forks of the Middle Branch extend through steep hollows thick with mountain laurel and hemlock. The stream meets the North Branch just east of Waterford. Middle Branch is classified as an EV stream.

South Branch also drains State Game Lands #42 and, similar to the Middle Branch, flows through steep terrain filled with mountain laurel and hemlock. The South Branch empties into the Ligonier Township Reservoir and is classified as an EV stream.

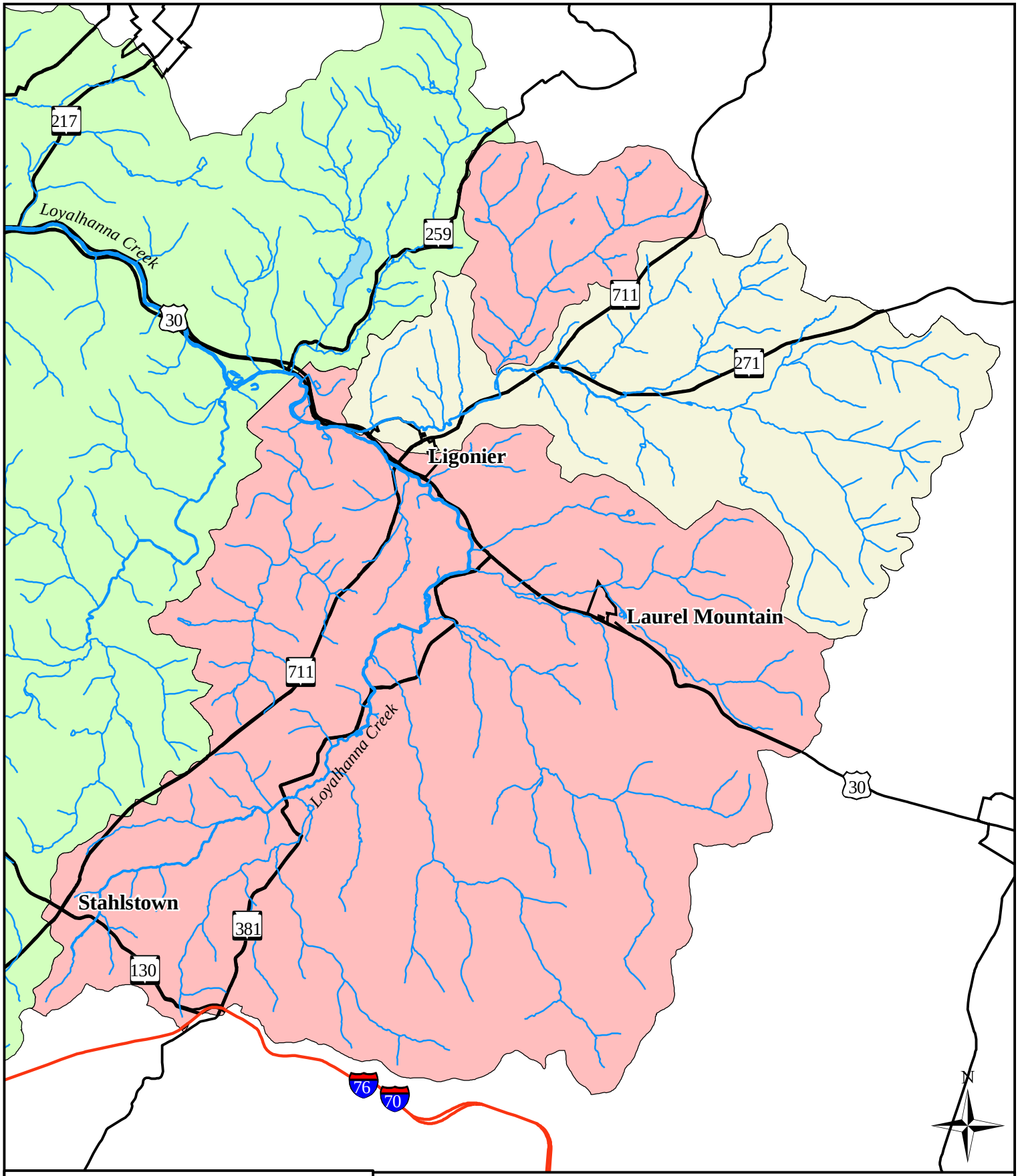
Macks Run flows south into the Mill Creek main stem in Waterford. It drains a small valley that can be accessed via Hannawalt Way Road and Harvey Road. Its headwaters are located at the border of Fairfield and Ligonier townships, east of Route 711. Pastures, hayfields, and cornfields are mixed with residences throughout the length of the stream. Fields not in use have begun to fill with shrubs, small trees, and multiflora rose. Macks Run is classified as a CWF.

Please refer to Map 1.F.1 for the geographic location of this subwatershed.

Review of Historic Information

PA Fish and Boat Commission (PAFBC)

The PAFBC conducted a fish survey of Mill Creek in 1981. In the upper section, above the confluence with Hannas Run, 11 species, including brown and brook trout, were collected. The report also noted that macroinvertebrate diversity was poor. In the lower section, below Hannas Run, only three fish species, including brown trout, were collected. Macroinvertebrate diversity was fair, and chemical



Streams
Major Roads
Boroughs and Cities
Mill Creek Subwatershed
Upper Section

Mill Creek Subwatershed: Overall Location

Map 1.F.1

Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center

1 0.5 0 1 Miles

Loyalhanna Watershed Association
Conserve, Protect and Restore Natural Resources

analysis demonstrated the impact of agricultural and mining activity along this section of stream. Recommendations made in the 1981 report included the conservation of the reproducing trout populations in the upper section and to maintain the value of the warm-water fishery in the lower section.

Scarlift Report

The Scarlift Report identified three acidic discharges flowing in the Mill Creek Subwatershed. When located in 1972, they discharged into one unnamed tributary to Mill Creek. That tributary (UNT4N) drains into Mill Creek from the north, entering Mill Creek at the intersection of Peoples Road and Route 711. The Scarlift Report stated that extensive exploration would need to be carried out in order to determine a remediation method. Please refer to the table below for a list and current status of the discharges.

Mill Creek Subwatershed Discharges Catalogued During Scarlift

Scarlift Discharge Number	Current Discharge Name	Description of Discharge and Location
5262	None	Seepage that entered a small, unnamed tributary to Mill Creek. The tributary flows south between the Marker farm and Ligonier Camp and Conference Center. Today, there is no visible seepage at the point where it was located during fieldwork for the Scarlift Report.
5263	None	Flow from a partially reclaimed strip mine. The discharge flowed at 100 gpm with a pH of 3.1. The Scarlift Report indicated that this discharge was somewhere close to the border of the Marker farm and Old Colony Sportsmen's property. It flowed into the same tributary as 5262. During assessment fieldwork in 2003, no visible signs of the discharge were located.
5264	None	Discharge flowed from an abandoned drift mine airshaft opening. The discharge flowed at approximately 40 gpm with a pH of 3.0. The shaft served Irwin Gas Company Mines 1, 2, and 3. The opening was located to the right of Peoples Road near the Old Colony Sportsmen's property. During the assessment in 2003, no visible signs of the discharge were located.

U.S. Army Corps of Engineers (USACE)

In 1983, the USACE performed water quality sampling in the Mill Creek Subwatershed. Samples were taken in Waterford below the confluence with Macks Run and above the confluence with Hannas

Run. Field pH of the stream was 7.1 and the laboratory pH was 6.39. None of the data collected raised any concern with the USACE or other agencies within the watershed.

PA Department of Environmental Protection (DEP)

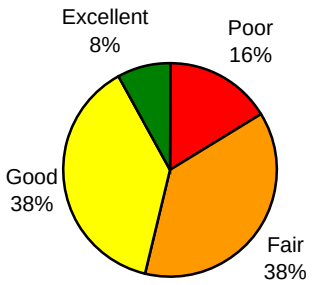
Various surface mining operations were carried out in the Mill Creek Subwatershed throughout the late 1980s and early 1990s. DEP inspectors made numerous water sample collections at those sites. Only one site discharged water containing AMD. That surface mine was located on the hilltop above the McConnaughey and Shirey farms on the western end of Ligonier. Prior to surface mining, this particular discharge flowed at 50 to 80 gpm. Following mining, that flow was decreased. To date, a small discharge remains at that site and it flows at less than 1 gpm. Aluminum precipitate is noticeable, but the receiving unnamed tributary exhibits no visual impact.

Visual Assessment Summary

Visual Assessment Findings

The visual assessment of the Mill Creek Subwatershed was completed in late June and early July of 2003. A total of 42 stream segments were assessed. As depicted in Figure 1.F.1, the Mill Creek Subwatershed was given the following overall ratings, 8% of the subwatershed was rated excellent, 38% good, 38% fair and 16% poor. The average score given for stream sections and tributaries was 7.2, which is a fair rating overall. This rating is a reflection of multiple impacts throughout the length of Mill Creek and its tributaries, including compromised riparian vegetation areas, lack of canopy cover, sewage, poor habitat, embeddedness, channelization, erosion, and AMD. Individual stream ratings are depicted in Map 1.F.2.

Figure 1.F.1: Visual Assessment Ratings for the Mill Creek Subwatershed



Visual Assessment Description

Mill Creek Main Stem and Unnamed Tributaries

Throughout the Mill Creek Subwatershed there are multiple homeowners who do not maintain adequate amounts of vegetation along their waterway banks. This is especially apparent along many of the small, unnamed tributaries that enter Mill Creek in its lower section through Ligonier Borough. In addition, many of those tributaries are channelized underneath roads, around roads, and through private yards. Channelization and lack of streamside vegetation are two factors that can contribute to increased erosion. Those impacts, partnered with the impact of livestock operations, make erosion a significant impact to the Mill Creek main stem.

Many sections of Mill Creek are impacted by sewage. Direct pipes are present and nutrient enrichment, in the form of algae, is present along the stream bottom. The Waterford and Oak Grove communities do not have sewerage and as a result, many private systems are failing.

HRWESTUNT1EA
HRUNT4W
HRD
HRE
HRC
HRUNT3W
HRUNT4E
HRWESTUNT1W
HRWESTA
OWLUNT1W
MACUNT5E
MACKUNT2W
HRUNT2W
HRB
HRUNT2E
MACKB
MACKUNT3E
HRUNT1W
HRA
MILLUNT5N
OWLHOLLOWB
OWLHOLLOWA
MACKUNT2E
MILLUNT4NC
MILLUNT1NC
MILLUNT1NB
MILLUNT3N
MILLUNT4NA
MACKUNT1E
MACKA
MILLNFKA
MILLUNT1NA
MILLUNT2N
MILLA
MILLPIPA
MILLB
MILLC
MILLD
MILLGRIB
MILLPIPB
MILLGRIC
MILLSFKA
MILLPIPC
MILLGRIUNT1W
MILLGRID
MILLMIDA
UPLOYUNT1E
UPLOYUNT1W
UPLOYA
UPLOYUNT1.5W
UPLOYUNT2E
ZIMMA
UPLOYUNT2W
MCCULLUNT1N
MCCULL
MCCULLUNT2E
LAUGHA
LAUGHUNT1N
LAUGHC
MILLSFKB
LAUGHB
MCCULLUNT1E
217
30
711
271
381

Poor
Fair
Good
Excellent
Major Roads
Mill Creek Subwatershed
Upper Section

Mill Creek Subwatershed:
Overall Rating

Map 1.F.2

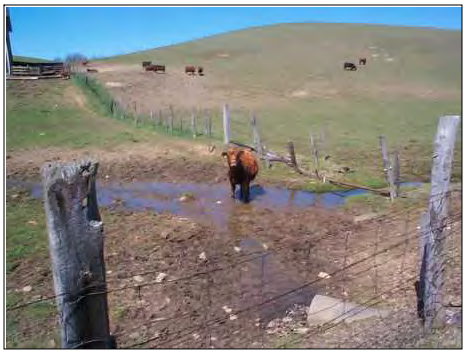
Watershed Assistance Center

0.8 0.4 0 0.8 Miles

N

UNT 1N, 2N, 3N, and 4N

Upstream from the mouth, the first four unnamed tributaries that enter Mill Creek from the north have more impacts than other waterways within the subwatershed. The first two are heavily impacted by agricultural operations where livestock have direct access to the stream for more than 2,000 feet. Surrounding pastures and fields are steep and grazed or mowed, creating the potential for soil erosion.



Part of a livestock operation impacting the first unnamed tributary to Mill Creek, UNT1N

UNT4N originates in a privately owned field above the intersection of Peoples and Myers School roads. Given the history of the area, assessors concluded that the stream originates from the abandoned deep mines in that area. From Myers School Road, the stream flows underneath Myers School Road where it has a pH of 3.2. That pH is consistent as the stream continues through a wooded area owned by a local sportsmen's association. Coke ovens and old mining buildings still line the stream. The pH remains acidic until the entry of an alkaline stream from the east. With a pH of 7.1, this stream creates iron and aluminum precipitate as it meets the acidic tributary. In addition to one other alkaline intermittent stream, a series of wetlands naturally treat the acidic water. Because of dams left by beavers, wetlands have formed and are allowing for the precipitation of metals suspended in the tributary. Below the wetland, the stream's pH is 5.6. At the stream's mouth, the pH is 6.8. No iron or aluminum staining is noticeable at the mouth or below the sportsmen's property.

North Branch, Middle Branch, and South Branch

The headwaters of Mill Creek rated extremely high during fieldwork. These excellent ratings reflect high-quality habitat, riparian zones, canopy cover, substrate, and the lack of visible impacts. Only the North Branch was noted for having challenges related to past logging operations close to the headwaters. That logging could be the source of excess silt present in the North Branch. All three headwater branches are well protected by state and private landowners.

Macks Run

Overall, this tributary to Mill Creek rated fair. The rating is a reflection of the moderate impact of agriculture and residential land use throughout the length of the stream. Multiple residences close to the mouth mow lawns directly to the bank, removing riparian vegetation. Steep pasture and cornfields surround the middle section of the tributary. Livestock do not have access to the stream until the extreme headwaters where a large horse farm is located. A majority of stream sections within the Macks Run tributary contain significant amounts of silt and sediment.

Water Quality

The mouth of Mill Creek was sampled throughout the assessment. Water quality indicated limited impacts related to sediment and nutrient loading. Total dissolved solids were significant and fluctuated greatly from sample to sample. Total and fecal coliform samples taken in October of 2003 show a presence of coliforms that is within the acceptable level. No further samples were taken along Mill Creek.

Table 1.F.1: Sample Site LWA-5 Mill Creek							
Date Sampled	pH	Alk. (mg/L)	TSS (mg/L)	TDS (mg/L)	Iron (mg/L)	Total Coliform (per 100ml)	Fecal Coliform (per 100ml)
8/25/03	7.45	42	3	284	- - -	- - -	- - -
10/29/03	7.18	42	3	137	0.3	3100.0*	1200.0*
2/23/04	7.02	32	- - -	157	<0.06	- - -	- - -
5/25/04	6.84	27	7	92	<0.06	- - -	- - -
8/25/04	7.08	45	1	154	<0.06	- - -	- - -

- - - parameter not analyzed

* Sample analyzed by the DEP Bureau of Laboratories

Sample Location: Taken from the bridge over Mill Creek next to the Mobile gas station on West Main Street in Ligonier.

Conclusions

As noted, the overall rating for the Mill Creek Subwatershed was fair, with an average stream segment score of 7.2. The Forbes Trail Trout Unlimited Chapter (FTTU) completed a detailed conservation plan for the Mill Creek Subwatershed in the spring of 2005. Additional restoration projects are highlighted within that report.

Japanese knotweed is present along the banks of Mill Creek, and many of its tributaries, especially close to the mouth. Although it is not yet rampant, it could create a larger problem if it is not addressed in the near future.

Failing septic systems in the communities surrounding Mill Creek did have a visible impact upon the stream. Many flowing pipes were noted, as well as algal growth in certain stream stretches. The Ligonier area is currently in the process of obtaining funding to move forward with sewerage for portions of the subwatershed.

Only one unnamed tributary to Mill Creek was impacted by AMD. UNT4N enters Mill Creek downstream of Ligonier Camp and Conference Center. The stream, although very acidic at the source, does not have an impact upon the receiving main stem of Mill Creek.

Despite the impacts to Mill Creek, there is a population of stocked and reproducing fish populations. If addressed in a timely fashion, many of the impacts to Mill Creek can be handled, remediated, and restored to improve the overall health of Mill Creek.

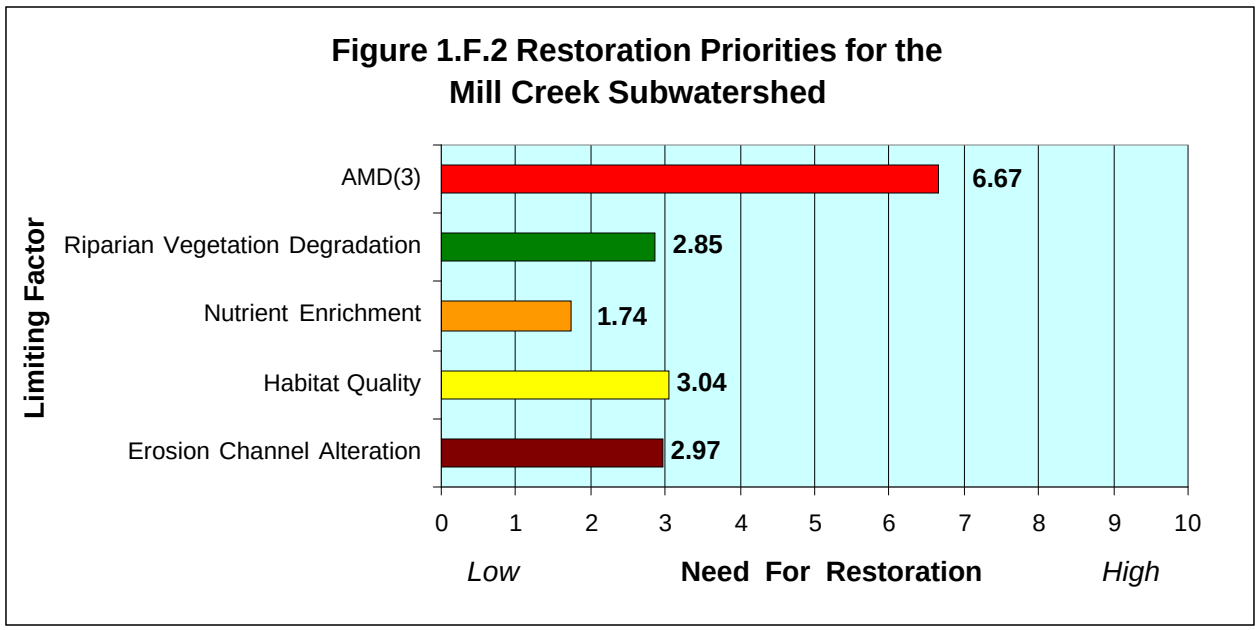
Recommendations

The Mill Creek Subwatershed is diverse in its impacts and challenges. The following overall recommendations are made for the entire subwatershed and its tributaries:

- Encourage the continued protection of Mill Creek headwater streams flowing from Laurel Ridge.
- Educate private landowners about the importance of riparian vegetation, canopy cover, and stream habitat.
- Support and promote the installation of sewage collection within Ligonier Township.
- Talk with and involve local farmers in the streambank fencing programs available through state, private, and federal funds.
- Further investigate, rate, and catalogue erosion problems.
- Investigate the source of AMD on UNT4N and options for remediation.

Overall Restoration Priorities

Figure 1.F.2 exhibits overall restoration priorities for the entire subwatershed. As indicated, the limiting factor that received the highest restoration priority was AMD. One source of AMD was located within the subwatershed. It is located in the headwaters of UNT4N and impacts 75% of the tributary. Habitat quality and erosion and channel alteration also received higher ratings for restoration priority.



Restoration Suggestions For Individual Stream Segments

Fifteen stream sections within the Mill Creek Subwatershed received visual assessment scores indicating a notable impact. The limiting factors identified were erosion and channel alteration, compromised fish and macroinvertebrate habitat, nutrient enrichment, riparian vegetation degradation, and AMD. Please refer to Table 1.F.2 and Map 1.F.3 for impact description and segment locations.

Table 1.F.2: Impacted Stream Segments and Restoration Suggestions for the Mill Creek Subwatershed

LIMITING FACTOR: Riparian Vegetation Degradation

Stream Segment Name	Description of Impact	Remediation Strategy	Possible Funding Sources	Priority Rating
MILLC *Main stem stream section traveling through residential area.*	This section of Mill Creek travels through Waterford where many homeowners have removed the riparian vegetation.	1. Educate landowners about the value of riparian vegetation. Possible Partners: Ligonier Township, PNR, WCD	WREN, PACD, Growing Greener, Private	Low

HRWESTUNT1E4A
HRUNT4W
HRD
HRE
HRUNT3W
HRC
HRUNT4E
HRWESTUNT1W
HRWESTA
OWLUNT1W
217
711
MACUNT5E
MACKUNT2W
MILLUNT4NC
HRUNT2W
HRB
HRUNT2E
MACKB
MACKUNT3E
MILLUNT1NC
HRUNT1W
HRA
MILLUNT5N
OWLHOLLOWB
OWLHOLLOWA
MACKUNT2E
MILLUNT1NB
MILLUNT3N
MILLUNT4NA
MACKA
MACKUNT1E
271
MILLNFKA
MILLUNT1NA
MILLA
MILLPIPA
MILLB
MILLC
MILLD
MILLGRIB
MILLUNT2N
30
UPLOYUNT1E
MILLPIPB
MILLSFKA
UPLOYUNT1W
MILLPIPC
MILLGRIC
MILLGRIUNT1W
MILLGRID
UPLOYA
MILLMIDA
UPLOYUNT1.5W
711
UPLOYUNT2E
ZIMMA
MILLSFKB
LAUGHA
30
381
LAUGHUNT1N
MCCULLUNT1N
MCCULL
MCCULLUNT2E
LAUGHC
LAUGHB
MCCULLUNT1E

Abandoned Mine Drainage
Erosion/Channelization
Habitat Quality
Multiple Factors
None
Nutrient Enrichment/Sewage
Riparian Vegetation
Major Roads
Mill Creek Subwatershed
Upper Section

Mill Creek Subwatershed:
Major Limiting Factor

Map 1.F.3

Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center

Laurel Highlands Watershed Association
Conserve, Protect and Restore Natural Resources

0.8 0.4 0 0.8 Miles

N

MILLUNT1NB *Small tributary that flows through farm where livestock have access to the stream.*	Stream segment is absent of riparian vegetation due to livestock access to the stream.	1. Educate landowner. 2. Install BMPs to allow for the return of vegetation. Possible Partners: WPC, WCD, DU, CUP, NRCS	Growing Greener, CREP, WHIP, EQIP	Medium – High
MILLUNT2N *Small tributary traveling through an old hayfield.*	The stream travels through old hayfield where little or no canopy or significant riparian vegetation is present.	1. Educate landowner. Possible Partners: Ligonier Township, PNR, WCD	WREN, PACD, Growing Greener, Private	Low
MILLGRIC *Small tributary flowing through residential area.*	Tributary section flows through a residential area where homeowners have removed the riparian vegetation and canopy cover.	1. Educate landowners. Possible Partners: Ligonier Township, PNR, WCD	WREN, PACD, Growing Greener, Private	Low
MILLGRIUNT1EB *An extremely small stream section that flows into MillGRIC. It is surrounded by residences.*	Section flows through a residential area where homeowners have removed riparian vegetation and canopy cover.	1. Educate landowners. Possible Partners: Ligonier Township, PNR, WCD	WREN, PACD, Growing Greener, Private	Low
MACKB *Main stem section that flows through farm that is currently in operation. Fields are maintained for hay production.*	Landowner mows banks to stream edge. No canopy cover present. Livestock do not have access to the stream.	1. Educate landowner. 2. Introduce landowner to BMPs that can protect the stream and filter runoff entering the stream from fields and barnyard. Possible Partners: WPC, WCD, DU, CUP, NRCS	Growing Greener, CREP, EQIP, WHIP	Low – Medium
OWLHOLLOWB *Main stem section of Owl Hollow tributary that flows through area surrounded by farm fields.*	Section is surrounded by farm fields where grass is mowed directly to streambank.	1. Educate landowners. Possible Partners: Ligonier Township, PNR, WCD	WREN, PACD, Growing Greener	Low

OWLUNT1W *Small tributary to Owl Hollow. It flows through an area with a cluster of residences.*	Stream flows underneath and parallel to road. It is surrounded by residences and fields where landowners clear riparian vegetation from streambanks.	1. Educate landowners. Possible Partners: Ligonier Township, PNR, WCD	WREN, PACD, Growing Greener	Low
LIMITING FACTOR: Compromised Fish and Macroinvertebrate Habitat				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
MILLGRIC *Small tributary flowing through residential area.*	Section flows through an area with no riparian vegetation and very little canopy cover; therefore very little food source available. Substrate is dominated by a silt/sand mix.	1. Address riparian degradation to return food source. 2. Educate landowners. Possible Partners: Ligonier Township, PNR, WCD	WREN, PACD, Growing Greener	Low
MILLGRIUNT1EB *An extremely small stream section that flows into MillGRIC. It is surrounded by residences.*	Section flows through residential area with very little vegetation surrounding banks. Substrate is dominated by gravel and sand.	1. Address riparian degradation. 2. Educate landowners. Possible Partners: Ligonier Township, PNR, WCD	WREN, PACD, Growing Greener	Low
MILLPIPA *Small tributary that flows through an area with a cluster of residences found close to the stream.*	Limited amount of vegetation present along stream section. Residential area. Substrate is dominated by silt. Cement slabs replace cobbles and gravel.	1. Address riparian degradation and presence of concrete in substrate. 2. Educate landowners. Possible Partners: Ligonier Township, PNR, WCD	WREN, PACD, Growing Greener	Low
MACKB *Main stem section that flows through farm. Fields are maintained for hay production.*	Degraded riparian zone due to agricultural operation. Substrate dominated by gravel providing little or no habitat structure.	1. Address riparian zone degradation. 2. Educate landowner. Possible Partners: WCD, PNR, Ligonier Township, WPC,	Growing Greener, PACD, CREP, WHIP, EQIP	Low – Medium

OWLHOLLOWB *Main stem section of Owl Hollow tributary that flows through area surrounded by farm fields.*	Section substrate dominated by sand. Lack of riparian vegetation and canopy cover eliminates possible food source. Surrounded by open fields used for hay.	1. Address riparian zone degradation. 2. Investigate source of sand in substrate. 3. Educate landowner. Possible Partners: Ligonier Township, WCD, PNR, WPC, NRCS	Growing Greener, PACD, CREP	Low
OWLUNT1W *Small tributary to Owl Hollow. It flows through an area with a cluster of residences.*	Degraded riparian zone due to agriculture. Little canopy cover. Stream passes underneath roads through culverts that create fish barriers. Substrate dominated by silt.	1. Address riparian degradation. 2. Educate landowners. Possible Partners: Ligonier Township, WCD, WPC, PNR, NRCS	Growing Greener, PACD, CREP, WHIP, EQIP	Low
LIMITING FACTOR: Erosion and Channel Alteration				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
MILLB *Main stem section of stream that travels through an area with few residences. Multiple tributaries enter the section throughout its length.*	Some channelization has occurred through this section.	1. Educate township and landowners. Possible Partners: Ligonier Township, WCD	DEP	Low
MILLPIPA *Small tributary that flows through an area with a cluster of residences found close to the stream.*	Channelization of stream section with concrete blocks.	1. Investigate reason for channelization. 2. Educate township and landowners. Possible Partners: Ligonier Township, WCD	DEP	Low

MILLUNT1NB *Small tributary that flows through farm where livestock have access to the stream.*	Agricultural operation surrounds section. Banks are trampled and eroding. Riparian vegetation mowed to stream edge.	1. Educate landowner. 2. Install BMPs, such as streambank fencing and stabilized crossings. Possible Partners: WCD, WPC, DU, CUP, NRCS, DEP	Growing Greener, CUP, CREP, WHIP, EQIP	Medium – High
MILLUNT2N *Small tributary traveling through an old hayfield.*	Banks eroded. Section is extremely embedded. Stream is surrounded by hayfields and has little canopy and vegetation surrounding banks.	1. Educate landowners. 2. Address degradation of riparian zone. Possible Partners: Ligonier Township, WCD, PNR	Growing Greener, WREN, PACD	Low
MILLUNT3N *Small tributary that originates at Peoples Road. Flows east toward Mill Creek main stem through a dairy farm.*	Agricultural operation surrounds section. Stream has been channelized and moved. Substrate is embedded.	1. Educate landowner. 2. Install BMPs, such as streambank fencing and stabilized crossings, to eliminate livestock access to the stream. Possible Partners: WPC, WCD, DU, CUP, NRCS, DEP	Growing Greener, CUP, CREP, WHIP, EQIP	Medium – High
LIMITING FACTOR: Nutrient Enrichment				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
MILLUNT1NB *Small tributary that flows through farm where livestock have access to the stream.*	Agricultural operation surrounds section. Livestock has direct access to the stream.	1. Educate landowner. 2. Install agricultural BMPs. Possible Partners: WPC, WCD, NRCS, DU, CUP, DEP	Growing Greener, CUP, CREP, WHIP, EQIP	Medium
MILLUNT3NA *Small tributary that originates at Peoples Road. Flows east toward Mill Creek main stem through a dairy farm.*	Dairy farm operator allows livestock to access stream. Manure is spread in fields very close to the flowing stream.	1. Educate landowner. 2. Install agricultural BMPs. Possible Partners: WPC, WCD, NRCS, DU, CUP, DEP	Growing Greener, CUP, CREP, State, Federal	Medium

LIMITING FACTOR: Abandoned Mine Drainage				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
MILLUNT4N A – C *Small tributary that originates at the intersection of Myers School Road and Peoples Road. It flows through sportsmen's association just south of the conference center.*	Section source is thought to be a WPA mine seal. Entire reach is impacted. pH is 3.2 at source and rises to 6.8 at mouth. Iron and aluminum precipitate visible.	1. Educate landowner at source and surrounding stream. 2. Further investigate source. 3. Re-mine source area. Possible Partners: DEP, BAMR, Ligonier Township	Growing Greener	Medium – High

SECTION 1.G
HANNAS RUN

Section 1.G

Hannas Run Subwatershed

General Description

The 7.13 square-mile Hannas Run Subwatershed is located in the northwest corner of Ligonier Township, north of Route 30, east of Route 259, and west of Route 711. The headwaters of the western branching section of the subwatershed begin very close to Route 259. Alternatively, the main branch of the subwatershed starts within yards of Route 711, north of Ligonier. Hannas Run flows southward and meets Mill Creek, a large tributary to the Loyalhanna Creek, just outside of Ligonier Borough behind the Ligonier Camp and Conference Center located on Route 711 North.

WPC staff member at the headwaters of Hannas Run

The headwaters, tributaries, and main stem of Hannas Run flow through a hilly landscape. In contrast to neighboring subwatersheds east of Ligonier, the Hannas Run Subwatershed consists of fewer forested areas and more open fields. A majority of the subwatershed flows through a rural area comprised of residential dwellings and active and non-active farm properties. The only exception to this is the small town of Wilpen, which sits about three-quarters of the way through the subwatershed. Most of its residents live either right beside the main stem of Hannas Run or beside one of its tributaries.

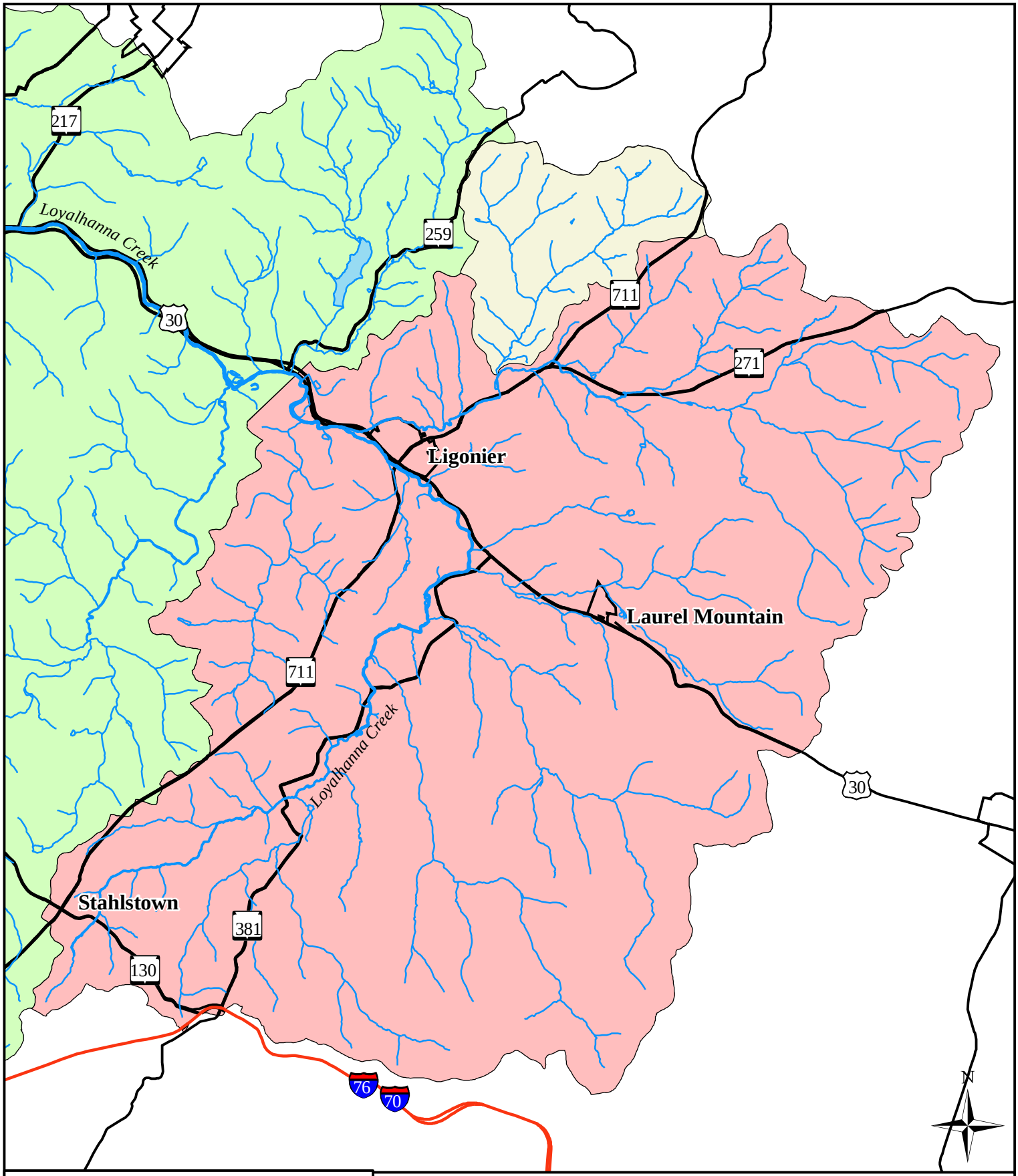
Hannas Run is classified as a CWF. Please refer to Map 1.G.1 for the geographic location of this subwatershed.

Review of Historic Data

General Description

The Hannas Run Subwatershed is notable because of its coal mining history. In its prime, the Wilpen area had approximately four operating deep mines. In the 1930s, a majority of the water that flowed from Hannas Run was acidic and laden with iron due to the water draining from active and abandoned mines. During the Roosevelt administration of the 1930s, Works Progress Administration (WPA) mine seals were installed in an attempt to alleviate the detrimental impact created by discharges from operating deep mines. They were effective but could not compensate for the large overall impact coal mining caused. Major surface mining operations in the 1970s, 1980s, and 1990s removed much of the coal that served as the conduit for creating abandoned mine discharges. There are a few areas where abandoned coke ovens remain and, in one instance, there is still an abandoned mine entrance intact and visible. Active surface mines, reclaimed mines, abandoned strip mines, and old deep mines all exist within this subwatershed.

The quality of the water found in the Hannas Run Subwatershed today has dramatically improved from the early 1900s. More stringent environmental regulations, combined with re-mining and other technological advances have made a tremendous difference in the water quality found in the Hannas Run subwatershed. Based on the current appearance of streams within the subwatershed, it would be difficult



Streams
Major Roads
Boroughs and Cities
Hannas Run Subwatershed
Upper Section

Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center

Hannas Run Subwatershed: Overall Location

Map 1.G.1

1 0.5 0 1 Miles

Loyalhanna Watershed Association
Conserve, Protect and Restore Natural Resources

to imagine that most of the headwater streams found in Hannas Run originate from deep-mined areas. These areas, now stripped of their coal, have become more viable.

PA Department of Environmental Protection (DEP)

The reports from the DEP highlight water quality issues related to strip mines in the area. Active and reclaimed strip mines were all in compliance with DEP water quality standards. Files can be viewed by contacting the regional DEP office or the Loyalhanna Watershed Association.

Scarlift Report

The Scarlift Report shows the location of eight AMD discharges in Hannas Run. Those discharges all emanated from abandoned underground and drift mines. Many of the discharges are currently controlled by WPA mine seals installed in the 1930s or are no longer present today.

PA Fish and Boat Commission (PAFBC)

In 1979 and 1991, PAFBC conducted fish surveys in Hannas Run. Nine species were collected in 1979; 10 species were collected in 1991. The fish collected were both native and introduced species, including brown trout and rainbow trout. Evidence of trout reproduction was also noted. The pH of Hannas Run was consistent across the years for which PAFBC data exists (1975, 1979, 1991).

Visual Assessment Summary

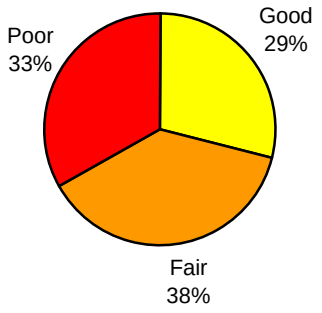
Visual Assessment Findings

The visual assessment of Hannas Run Subwatershed was completed in June of 2003. Stream levels were just beginning to recover from two years of drought conditions.

A total of 25 stream segments were assessed. As depicted in Figure 1.G.1, 29% of the stream received a good rating, 38% received a fair rating, and 33% poor.

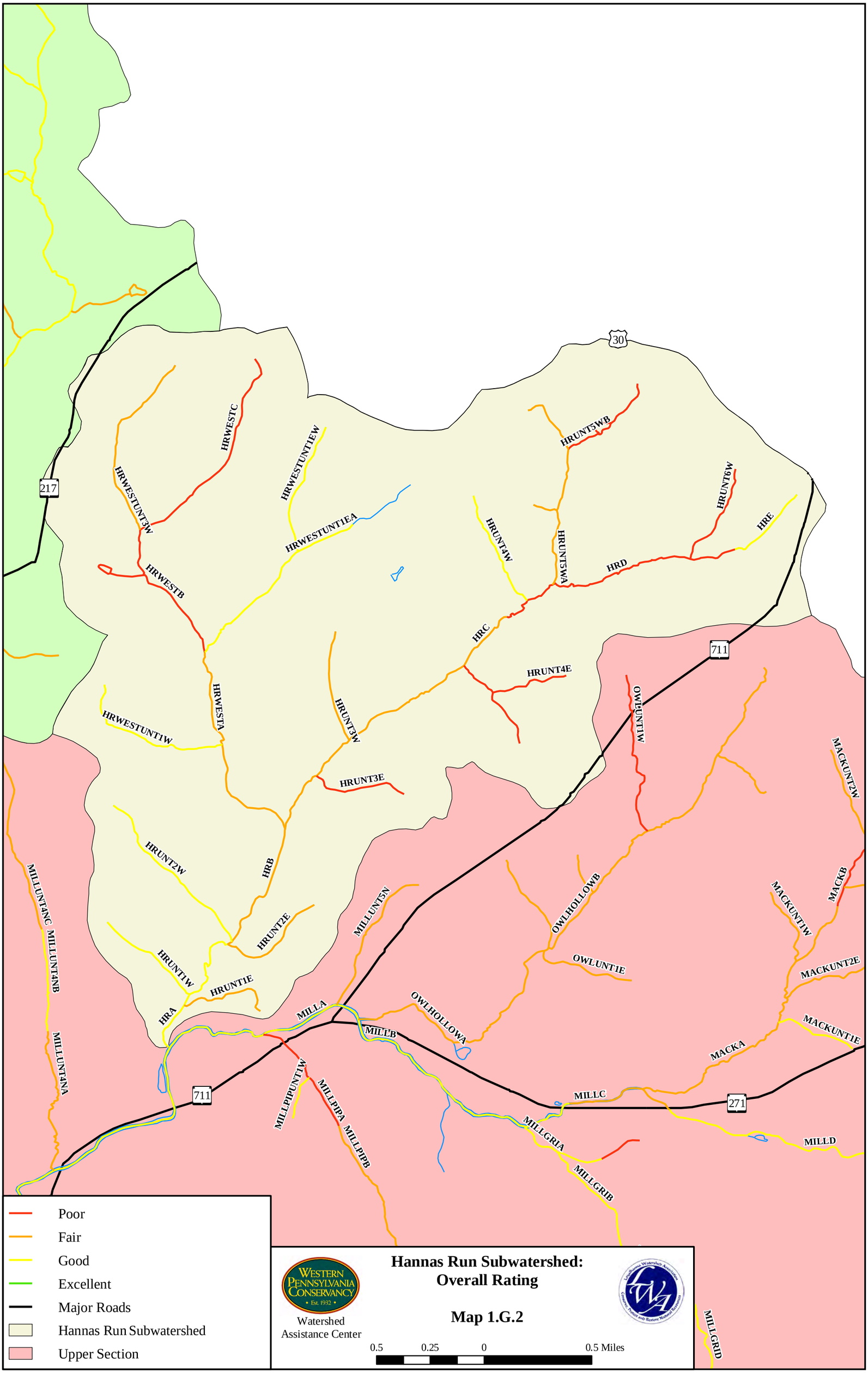
The overall fair rating given to the Hannas Run Subwatershed reflects the impact of AMD, degraded streamside riparian areas, and nutrient enrichment. Individual stream ratings are depicted in Map 1.G.2.

Figure 1.G.1: Visual Assessment Ratings For the Hannas Run Subwatershed



Visual Assessment Description

Lack of in-stream fish and macroinvertebrate cover contribute to poor ratings given for habitat quality. In the case of Hannas Run, this appeared to be a direct result of the effect erosion has had on the stream and the channel. Eroding banks, caused by past and current agricultural use and lack of viable riparian areas along residential and rural sections, have allowed sediment to enter the streams. The presence of sediment increases embeddedness, covering viable habitat structures that support


30
217
711
271
HRWESTC
HRWESTUNT1EW
HRWESTUNT3W
HRWESTUNT1EA
HRWESTB
HRWESTA
HRWESTUNT1W
HRUNT5WB
HRUNT6W
HRE
HRUNT4W
HRUNT5WA
HRD
HRC
HRUNT4E
HRUNT3W
HRUNT3E
HRUNT2W
HRB
HRUNT2E
HRUNT1W
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MACKUNT2W
MACKB
MACKUNT1W
MACKUNT2E
MACKA
MACKUNT1E
Poor
Fair
Good
Excellent
Major Roads
Hannas Run Subwatershed
Upper Section
Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center
Hannas Run Subwatershed:
Overall Rating
Map 1.G.2
0.5 0.25 0 0.5 Miles

macroinvertebrate and fish communities. This sediment covers habitat types including cobble, woody debris, gravel, and other parts of the substrate. The combination of the above factors appears to have the most significant effect on the subwatershed. Sediment and lack of riparian areas are evident throughout the subwatershed, but become increasingly evident through the town of Wilpen and in the western most headwater tributary of the watershed. The combination of these effects on headwater areas has a lasting effect on the entire subwatershed.

Assessment scores and notes reflect the presence of small amounts of AMD. For example, in the headwaters of the west branch, AMD is located above a heavily pastured area shown in the photo below. The mine drainage impact dissipates below the area where cattle have full access to the stream. The overall impact of AMD upon receiving streams is minimal, and usually originates from a failing WPA mine seal. This was specifically the case along Tosh Road, where a failing WPA mine seal seeps mine drainage that had a field pH of 4.0. Despite a low field pH, the drainage does not show a visible impact once it reaches its receiving stream, HRWESTUNT1N. Although the immediate effects of AMD are evident in these areas, the overall effect of mine drainage is not apparent in the main stem of Hannas Run. The small amount of mine drainage that enters is quickly diluted by other, cleaner influences. An old mine entrance is located at the end of Ruth Road in Wilpen. Bony piles around the mine seep with acidic water; however, there is no evidence at this time that the acidic water is reaching the main stem of Hannas Run.

WPC staff member shown in mine drainage area on Hannas Run (HRWESTC)

Suspected sewage inputs are present throughout the subwatershed. Algal growth, pungent odor, and suspected output pipes were noticeable, especially close to the community of Wilpen. No municipal sewage system is available for the community and many homes appear to have failing or insufficient septic systems.

Agricultural land uses historically dominated the Hannas Run Subwatershed. Today, open fields remain that were once grazed by herds of dairy and beef cattle. There has been some recovery of riparian areas in those sections, but there is still significant progress to be made. Four current farming operations have a significant impact upon streams traveling through pasture or fields. The largest of the four farms (HRD) is included in the Riparian Restoration and Protection Initiative coordinated by WPC. Agricultural BMPs will be constructed and installed throughout the property in order to improve water quality.

Water Quality Data

Table 1.G.1: Sample Site LWA-4 Hannas Run

Date Sampled	pH (mg/L)	Alk. (mg/L)	TSS (mg/L)	TDS (mg/L)	Iron (mg/L)
2/23/04	7.39	78.0	- - -	342.0	<0.06
5/24/04	7.46	113.0	7.0	379.0	<0.06
8/25/04	7.40	113.0	4.0	428.0	<0.06
10/25/04	7.53	114.0	<1.0	519.0	<0.06

Water quality samples were taken close to the mouth of Hannas Run throughout the assessment. Results for total dissolved solids (TDS) were significant and supported visual assessment data, which indicated impacts from erosion and degraded riparian areas.

Sample Location: Water samples are taken 1,000 yards from the mouth of Hannas Run on a quarterly basis. Permission to access the site has been obtained from the Ligonier Camp and Conference Center.

Conclusions

The Hannas Run Subwatershed has made a significant recovery in the past 20 to 30 years. In conversations with local landowners, assessors discovered that the stream was colored orange at one time. This coloring, which happened in the early 1900s, would have coincided with the many active deep mines operating at the time. Despite its recovery, Hannas Run still requires work for additional improvement. The construction of a municipal sewage system in the Wilpen area would be advantageous. In addition, addressing the lack of significant riparian vegetation zones throughout the entire watershed would also be helpful.

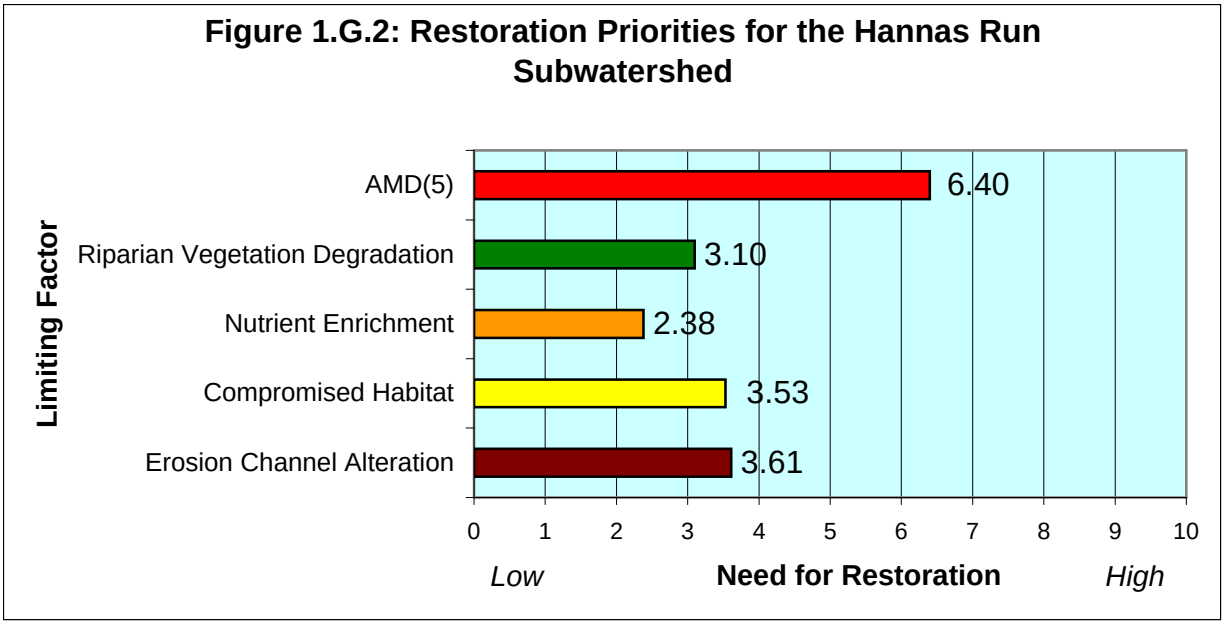
Recommendations

The following recommendations are made for the Hannas Run Subwatershed:

- Support, promote, and encourage improvement of existing septic systems. Partner with resource providers who can provide guidance to individuals who would like to improve their systems. Encourage township officials to explore installation of a sewage treatment system for Wilpen.
- Educate landowners about the importance of riparian vegetation by distributing information and holding workshops.
- Locate, GPS, and sample every WPA mine seal within the watershed.
- Encourage the protection of large tracts of land within Hannas Run.
- Investigate the safety and stability of the existing mine entrance on Ruth Road in Wilpen.

Overall Restoration Priorities

Figure 1.G.2 exhibits restoration priorities for the entire subwatershed. As indicated, the limiting factor that rated the highest for restoration need is AMD. In addition, erosion and channel alteration and habitat quality degradation also rated high. The high rating for AMD is a reflection of five different sites where mine drainage was located. Despite this high rating, it is important to note that overall, the five AMD sources do not have a significant impact upon receiving streams.



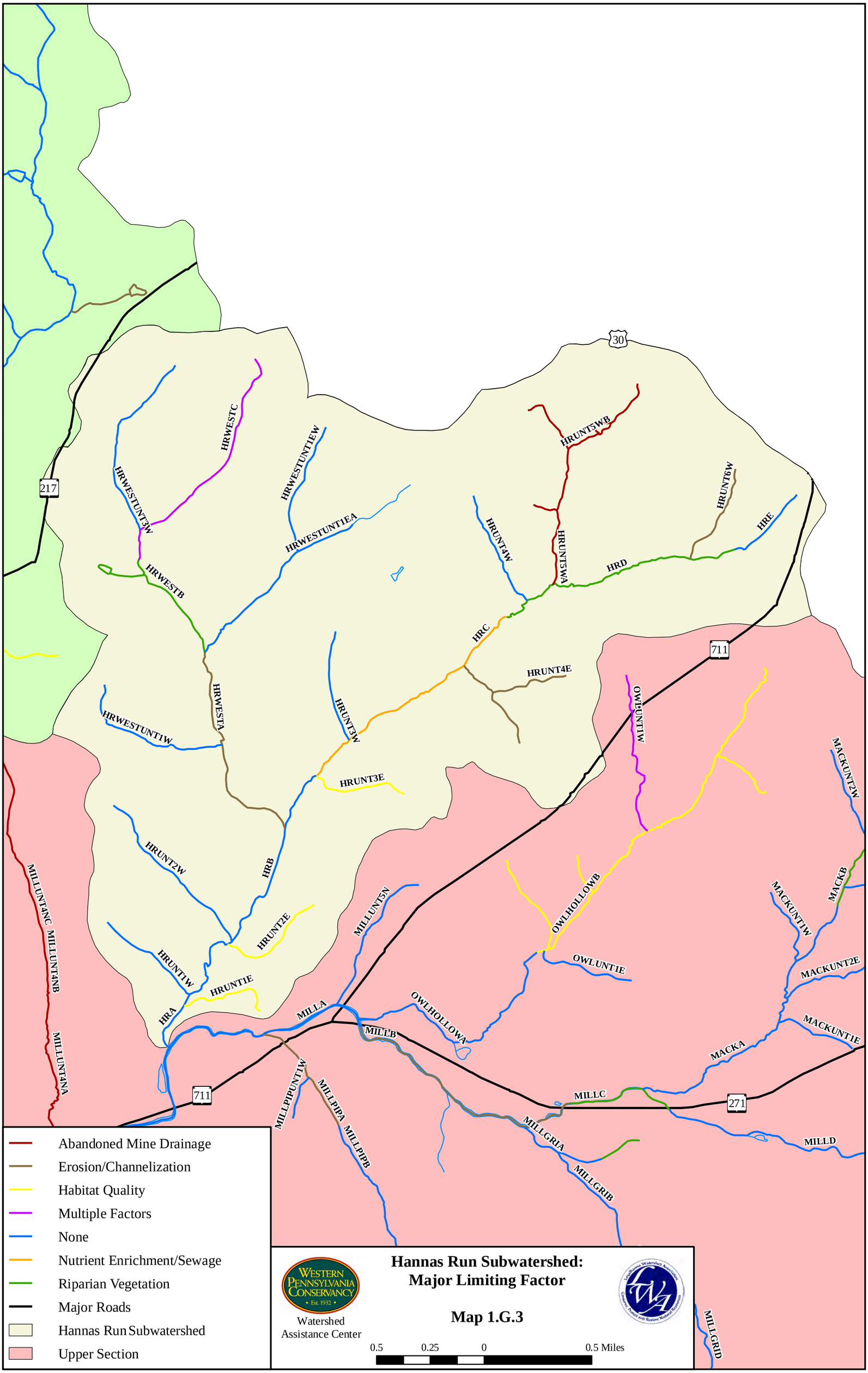
Restoration Suggestions for Individual Stream Segments

Fourteen stream sections within the Hannas Run Subwatershed received scores identifying limiting factors. The limiting factors identified were erosion and channel alteration, compromised fish and macroinvertebrate habitat, nutrient enrichment, riparian vegetation degradation, and AMD. Please refer to Table 1.G.2 and Map 1.G.3 for impact description and segment locations.

Table 1.G.2: Impacted Stream Segments and Restoration Suggestions for the Hannas Run Subwatershed

LIMITING FACTOR: Riparian Vegetation Degradation

Stream Segment Name	Description of Impact	Remediation Strategy	Possible Funding Sources	Priority Rating
HRD *Main stem section of Hannas Run flowing through a heavily grazed area and agricultural operation.*	Very little riparian vegetation is present. Streambanks are barely covered with low grasses. Few trees provide canopy cover.	1. Educate landowner. 2. Plantings to allow growth and recovery of riparian vegetation. 3. Work with farmer to install BMPs to eliminate livestock access to vegetation around streambanks. Possible Partners: WCD, WPC, DU, NRCS, PGC, CUP	Growing Greener, CREP, CUP, WPC	Medium – High


30
217
711
271
HRWESTC
HRWESTUNT1EW
HRWESTUNT3W
HRWESTUNT1EA
HRWESTB
HRWESTA
HRWESTUNT1W
HRUNT5WB
HRUNT6W
HRE
HRUNT4W
HRUNT5WA
HRD
HRC
HRUNT4E
HRUNT3W
HRUNT3E
HRUNT2W
HRB
HRUNT2E
HRUNT1W
HRUNT1E
HRA
MILLUNT4NC
MILLUNT4NB
MILLUNT4NA
MILLUNT5N
MILLA
MILLB
MILLPIPUNT1W
MILLPIPA
MILLPIPB
OWLUNT1W
OWLHOLLOWB
OWLUNT1E
OWLHOLLOWA
MACKUNT2W
MACKB
MACKUNT1W
MACKUNT2E
MACKA
MACKUNT1E
MILLC
MILLGRIA
MILLGRIB
MILLD
MILLGRID
Abandoned Mine Drainage
Erosion/Channelization
Habitat Quality
Multiple Factors
None
Nutrient Enrichment/Sewage
Riparian Vegetation
Major Roads
Hannas Run Subwatershed
Upper Section
Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center
Hannas Run Subwatershed:
Major Limiting Factor
Map 1.G.3
0.5 0.25 0 0.5 Miles

HRUNT3E *Small tributary flowing through a rural residential area close to St. Anne's Church Road.*	Lawns are manicured directly to the streambank; very little vegetation found along bank. Little or no canopy cover is present in the lower part, very few in upper parts.	1. Educate landowner. 2. Plantings to allow growth and recovery of riparian vegetation. Possible Partners: WCD, DEP, Ligonier Township, PNR	Growing Greener, WREN, Private Sources	Low
HRUNT4E *Small tributary flowing through a rural residential area. Flows parallel to Ramsey Road.*	Riparian zone is present, but poor. Some canopy cover is present. Landowners manicure lawns to the streambank.	1. Educate landowners. 2. Plantings to allow growth and recovery of riparian vegetation. Possible Partners: WCD, DEP, Ligonier Township, PNR	Growing Greener, WREN, Private Sources	Low
HRUNT5WB *Headwater branch of UNT5W. Flows through shrubby area and wetland.*	Riparian zone is degraded and little canopy cover present.	1. Educate landowner. 2. Plantings to allow growth and recovery of riparian vegetation. Possible Partners: WCD, DEP, Ligonier Township, PNR	Growing Greener, WREN, Private Sources	Low
HRWESTB *Main stem section of the west branch of Hannas Run flowing through fields and residences.*	Degraded riparian zone. Vegetation is limited due to landowner actions. Canopy cover is limited as well.	1. Educate landowner. 2. Plantings to allow growth and recovery of riparian vegetation. Possible Partners: WCD, DEP, Ligonier Township, PNR	Growing Greener, WREN, Private Sources	Low
HRWESTC *Main stem section of the west branch of Hannas Run that extends to the headwaters. It originates in a farm pasture and continues through fields until its end.*	Streambank vegetation is practically non-existent, as is canopy cover. Cows have full access to the stream for a majority of the stream section.	1. Educate landowner. 2. Work with farmer to install BMPs to eliminate livestock access to vegetation around streambanks. Possible Partners: WPC, WCD, NRCS, DEP	Growing Greener, CREP, WHIP, WPC, CUP	Medium

LIMITING FACTOR: Compromised Fish and Macroinvertebrate Habitat				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
HRD *Main stem section of Hannas Run flowing through a heavily grazed pasture.*	Stream substrate is dominated by sand and silt. Lack of riparian vegetation and canopy cover eliminates food source and/or habitat.	1. Work with landowner to install BMPs to eliminate livestock access to the stream, allowing for streambank recovery and restoration of riparian area. 2. Investigate other possible sources of sediment that eliminates habitat. Possible Partners: WCD, WPC, NRCS, PGC, DEP	Growing Greener, WREN, CREP, WPC, CUP	Medium – High
HRUNT1E *Very small stream section flowing through a swampy, forested, wetland area.*	Stream substrate is dominated by silt. Habitat limited due to absence of cobbles, woody debris, and other resources.	1. Investigate silt source upstream. Possible Partners: WCD, WPC	DEP, PACD	Low
HRUNT2E *Very small stream section flowing through forested, wetland area.*	Stream substrate is dominated by silt. Habitat is limited due to absence of cobbles, woody debris, and other habitat resources.	1. Investigate silt source upstream. Possible Partners: WCD, WPC	DEP, PACD	Low
HRUNT3E *Small tributary flowing through a rural residential area close to St. Anne's Church Road.*	Substrate is dominated by silt. Habitat is limited due to absence of cobbles. Poor riparian zone and moderate canopy cover limit food source.	1. Further investigate silt source upstream. 2. Educate landowner about the values of riparian vegetation to stream quality and habitat sources. Possible Partners: WCD, WPC	WREN, DEP, PACD	Low
HRUNT4E *Small tributary flowing through a rural residential area. Flows parallel to Ramsey Road.*	Half of the stream channel is concrete. Silt present on channel bottom. Moderate riparian zone and canopy cover limit food source.	1. Investigate purpose of concrete channel. 2. Educate landowners. Possible Partners: WCD, WPC	WREN, PACD, DEP	Low

HRUNT5WB *Headwater branch of UNT5W. Flows through shrubby area and wetland.*	Habitat is limited due to silty sediment and limited riparian vegetation area.	1. Educate landowner. 2. Encourage landowner to allow vegetation to cover banks and trees to grow to create canopy. Possible Partners: WCD, WPC	WREN, PACD, DEP	
HRWESTC *Main stem section of the west branch of Hannas Run that extends to the headwaters. It originates in a farm pasture and continues through fields until the section end.*	Fish and macroinvertebrate habitat is extremely limited due to silty substrate. Rocks and gravel are more than 50% embedded. Lack of vegetation surrounding the streambank eliminates possible food sources.	1. Educate landowner. 2. Encourage landowner to allow vegetation to recover. 3. Install agricultural BMPs to address riparian degradation by livestock, therefore allowing the return of vegetative food source. Possible Partners: WCD, WPC, DEP	Growing Greener, WPC, CREP, CUP, NRCS, WHIP	Medium
HRWESTUNT1EB *Headwater section of UNT1EB that originates in an old surface-mined area. Stream flows through fields dominated by shrubs and small plants.*	Fish and macroinvertebrate habitat and food source are scarce. Lack of canopy cover eliminates possible food sources and stream substrate is impacted by AMD. The substrate is dominated by gravel and sand.	1. Determine source of AMD pollution. 2. Work with landowner to remediate and return riparian vegetation and canopy cover. Possible Partners: WCD, DEP, WPC	Growing Greener, PACD, WREN	Medium
LIMITING FACTOR: Nutrient Enrichment				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
HRC *Main stem section of Hannas Run flowing through the community of Wilpen.*	Several pipes were located throughout the stream section. Most of those pipes were discharging water into the stream.	1. Encourage municipalities to install sewerage in Wilpen. 2. Educate citizens about BMPs for septic systems. Possible Partners: PSCE, Ligonier Township	DEP	Medium – High

HRUNT4E *Small tributary flowing through a rural residential area. Flows parallel to Ramsey Road.*	In the upper portion of the tributary, some sewage was evident. The sources were several failing leech fields seeping water with high pH and high odor.	1. Educate homeowners about BMPs for septic systems. Possible Partners: WCD, PSCE, Ligonier Township	DEP, WREN	Medium
HRWESTC *Main stem section of the west branch of Hannas Run that extends to the headwaters. It originates in a farm pasture and continues through fields until the section end.*	Livestock have full access to this stream section and contribute manure to the stream. Nutrient growth is apparent on the substrate throughout the entire stream section.	1. Educate landowner about the impact of nutrient loading. 2. Work with landowner to install agricultural BMPs to eliminate livestock from the stream. Possible Partners: WCD, WPC, DEP	Growing Greener, WPC, CREP, CUP, NRCS, WHIP	Medium
LIMITING FACTOR: Erosion and Channel Alteration				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
HRD *Main stem section of Hannas Run flowing through a heavily grazed pasture.*	With very little riparian zone or canopy cover, this stream section has unprotected banks that are eroding. The stream substrate is dominated by sand and silt and is therefore more than 50% embedded.	1. Work with landowner to remediate streambanks, riparian vegetation, and canopy cover. Possible Partners: WCD, WPC, NRCS, DEP	Growing Greener, PACD	Medium – High
HRUNT3E *Small tributary flowing through a rural residential area close to St. Anne's Church Road.*	This tributary stream is mostly channelized and partially underground. Its very high banks are eroding. The stream substrate is dominated by silt and sand and is therefore more than 50% embedded.	1. Educate landowners. 2. Determine reason for channelization of the stream. 3. Work with landowners to remediate streambanks. Possible Partners: WCD, WPC, DEP	Growing Greener, PACD, WREN	Low – Medium

HRUNT5WB *Headwater branch of UNT5W. Flows through shrubby area and wetland.*	With poor riparian vegetation and canopy cover, this stream section has unprotected and eroding banks. The stream has been channelized and the stream substrate is 30% embedded.	1. Determine cause of vegetation loss and channelization. 2. Educate landowners and work with them to remediate erosion and channel condition. Possible Partners: DEP, WCD, WPC	Growing Greener, PACD	Low
HRUNT6W *A tributary that is in the headwaters of Hannas Run. It flows through a farm pasture.*	Evidence of livestock access to the stream was apparent upon assessment; however, no cattle were present. The stream section has eroding banks and a substrate dominated by sand, silt, and mud.	1. Determine livestock impact and work with landowner to eliminate livestock access to the stream. 2. Install agricultural BMPs. Possible Partners: WPC, WCD, NRCS, DEP, CUP	Growing Greener, WPC, NRCS, CREP, CUP, WHIP	Low – Medium
HRWESTA *Main stem section of the west branch of Hannas Run. Flows through mixed forest and residential area.*	Channelization occurs due to roadway and several homeowner actions. Erosion is evident throughout the entire stream section, but most specifically close to the mouth where the stream is closest to the road.	1. Investigate erosion. 2. Educate and work with landowners to remediate erosion. Possible Partners: WCD, WPC, DEP	Growing Greener, PACD	Low
HRWESTB *Main stem section of the west branch of Hannas Run. Stream flows close to road and through an open field.*	Lack of riparian vegetation and canopy cover leave the streambank unprotected, causing erosion. Where the stream comes close to the road, channelization has occurred.	1. Educate and work with landowner to remediate riparian vegetation and erosion. Possible Partners: WCD, WPC, DEP	Growing Greener, PACD	Low

HRWESTC *Main stem section of the west branch of Hannas Run that extends to the headwaters. It originates in a farm pasture and continues through fields until the section end.*	Grazing cattle have full access to the stream. Action of cattle has degraded banks. Absence of canopy cover or riparian vegetation has eliminated protection for the streambank. Stream substrate is dominated by sand and mud and is more than 50% embedded.	1. Work with landowner to remove access of cattle to the stream and to remediate riparian vegetation. Possible Partners: WPC, WCD, NRCS, CUP, DEP	Growing Greener, CREP, WHIP, CUP, WPC	Medium
LIMITING FACTOR: Abandoned Mine Drainage				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
HRWESTC *Main stem section of the west branch of Hannas Run that extends to the headwaters. It originates in a farm pasture and continues through fields until the section end.*	Mine drainage seep in the headwaters of the stream. Passes through wetland area and pasture. A pH of 4.1 was measured in the wetland. Below the wetland and the grazing area, iron staining dissipates and pH turns less acidic, reading 6.5 – 7.0.	1. Investigate mine drainage source and determine remediation possibilities. 2. Take field samples once above and below discharge to determine impact. Possible Partners: WPC, WCD, DEP	N/A	Low – Medium
HRUNT5WA *Lower section of UNT5W that flows through scrubby, forest area with no residences.*	Coke ovens were found along the stream section. It is presumed that they are part of the old Fort Palmer deep mine. Small mine drainage flowing into the stream. It originates at a functioning WPA mine seal. A pH of 7.5 was measured at the site. Drainage does not show or indicate impact upon receiving stream.	1. Map WPA mine seal. Possible Partners: WPC, DEP	N/A	Low

HRUNT5WB *Headwater branch of UNT5W originating to the east. Flows through shrubby area and wetland.*	A small flow was noted entering from the east. With a pH of 7.6, the flow originates at a WPA mine seal. This stream is also within the boundaries of the Fort Palmer deep mine area.	1. Map WPA mine seal. Possible Partners: WPC, DEP	N/A	Low
HRUNT5WC *Headwater branch of UNT5W originating from the west. Flows through a field thick with shrubs and small trees.*	Stream flows through the Fort Palmer deep mine area. Evidence of surface mining also apparent. Small mine drainages enter from the east side, originating at WPA mine seals. A pH of 7.6 was measured at the seals indicating good function.	1. Map WPA mine seals. Possible Partners: WPC, DEP	NA	Low

SECTION 1.H
TWOMILE RUN

Section 1.H

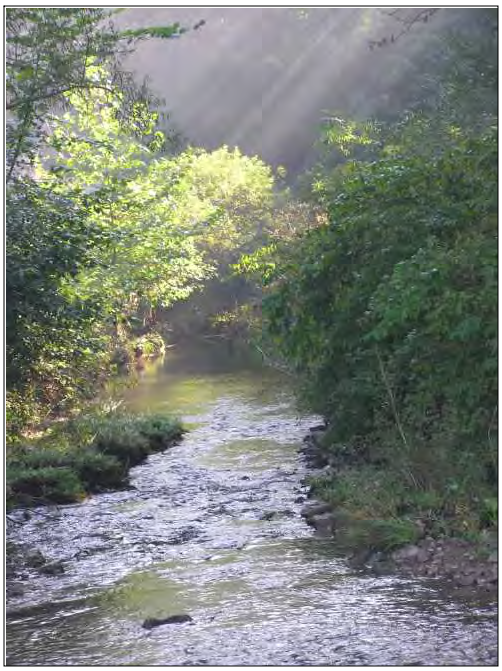
Twomile Run Subwatershed

General Description

Twomile Run Subwatershed is located in Ligonier Township south of Route 30 and west of Route 711. It flows southward through a 7.7 square-mile area to meet the Loyalhanna Creek main stem upstream of Lady of the Lake Bed and Breakfast. This confluence is approximately one-half mile downstream of the Ligonier water treatment facility and Ligonier Borough.

The headwaters of Twomile Run are found within Pleasant Grove, a small community located along Route 711, north of the Darlington/Rector crossroads. As Twomile Run flows south, it gathers volume from several unnamed tributaries that enter from the east and west. Many of the tributaries pass through, or begin as ponds on, private properties. Unnamed tributaries entering from the west flow from a small ridge running north-south that separates the Twomile Run and Fourmile Run subwatershed areas. Unnamed tributaries entering from the east flow from a series of hills dominated by active and non-active farming operations.

The Twomile Run Subwatershed is classified as a CWF. Because it flows through mostly private lands, it is not usually accessed by the public for fishing. Please refer to Map 1.H.1 for the geographic location of this subwatershed.



Looking upstream at Twomile Run from the Twomile Run Road Bridge

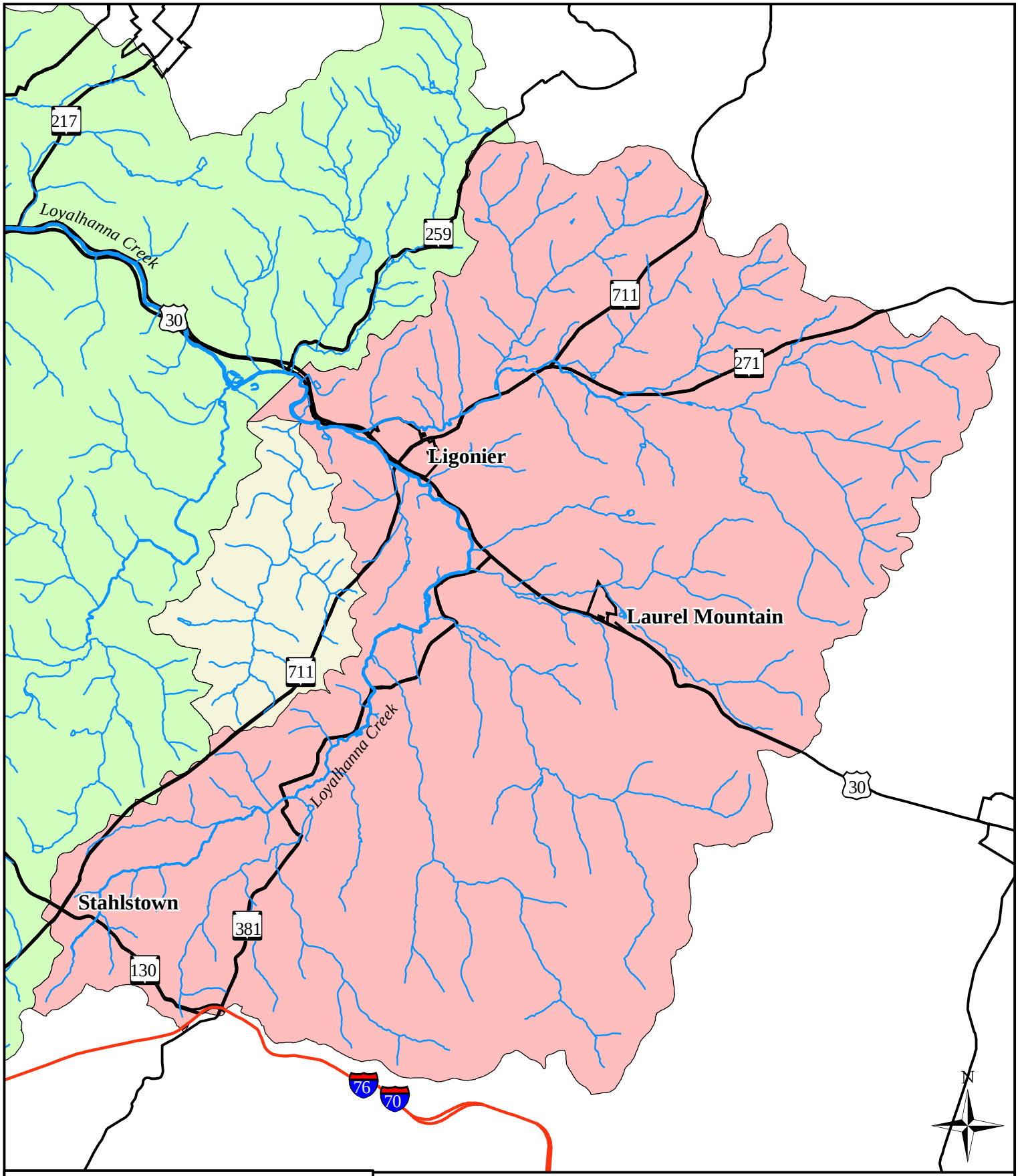
Review of Historic Data

To date, no historical data has been collected for the Twomile Run Subwatershed. Current information shows no evidence of past deep mining or surface mining.

Visual Assessment Summary

Visual Assessment Findings

The visual assessment of the Twomile Run Subwatershed was conducted in June of 2003. A total of 19 stream segments were assessed. As depicted in Figure 1.H.1, 53% of the subwatershed was rated good, 31% rated fair, and 16% rated poor. The average score given for stream sections was a 6.96, which is a fair rating overall. This rating is a reflection of impacts, including lack of riparian vegetation, erosion, nutrient enrichment, and sewage. Individual stream segment ratings are depicted in Map 1.H.2.



Streams
Major Roads
Boroughs and Cities
Two Mile Run Subwatershed
Upper Section

Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center

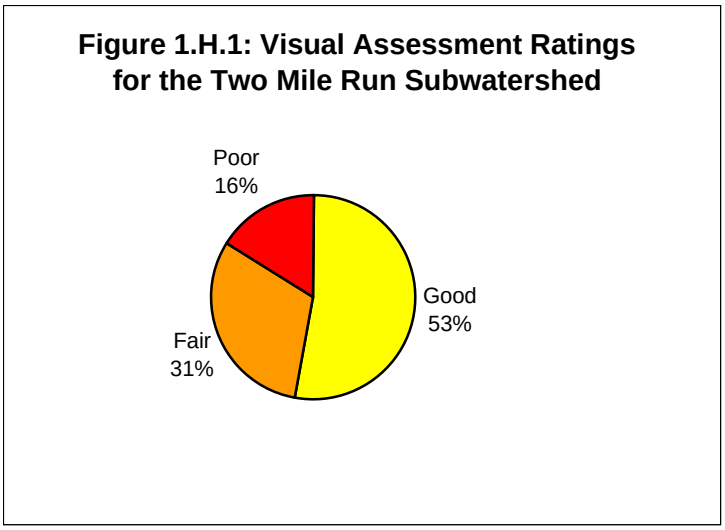
Two Mile Run Subwatershed: Overall Location

Map 1.H.1

1 0.5 0 1 Miles

Loyalhanna Watershed Association
Conserve, Protect and Restore Natural Resources

Visual Assessment Description



Gravel and cobble dominate the substrate of Twomile Run and its tributaries. Silt and sediment are also present, especially in the unnamed tributaries entering from the east that originate in active and non-active farm fields.

From the headwaters to the mouth of the Twomile Run Subwatershed there are multiple landowners who do not maintain adequate vegetation along their streambanks. This can affect habitat, cause erosion, and change the substrate of the stream by adding sediment and silt. In many instances, eroding banks dominated private yards where landowners had removed riparian vegetation. This impact was most apparent along the third unnamed tributary entering Twomile Run from the east (UNT3E). Its headwaters originate on a private golf course and cross Route 711. With very little to slow the flow of water in heavy rains, stream velocity has eroded several banks downstream prior to its confluence with the main stem.

Nutrient enrichment, or the presence of algal growth on stream substrate, was noted on several occasions. Visual assessment volunteers also encountered questionable pipes adding water to the stream. The nutrient enrichment and visible pipes were most notable in the lower section of the subwatershed, closer to the mouth.

Due to the location of the Twomile Run Subwatershed, it receives road runoff from Route 711, as well as multiple state and township roads. The road runoff adds more sediment, gravel, and treatment substances to the Twomile Run substrate. This impact is most apparent upon UN3E, where streams encounter Route 711 prior to meeting the Twomile Run main stem.

The overall fair rating received by the Twomile Run Subwatershed directly reflects the extent of compromised riparian zones and erosion.

Water Quality

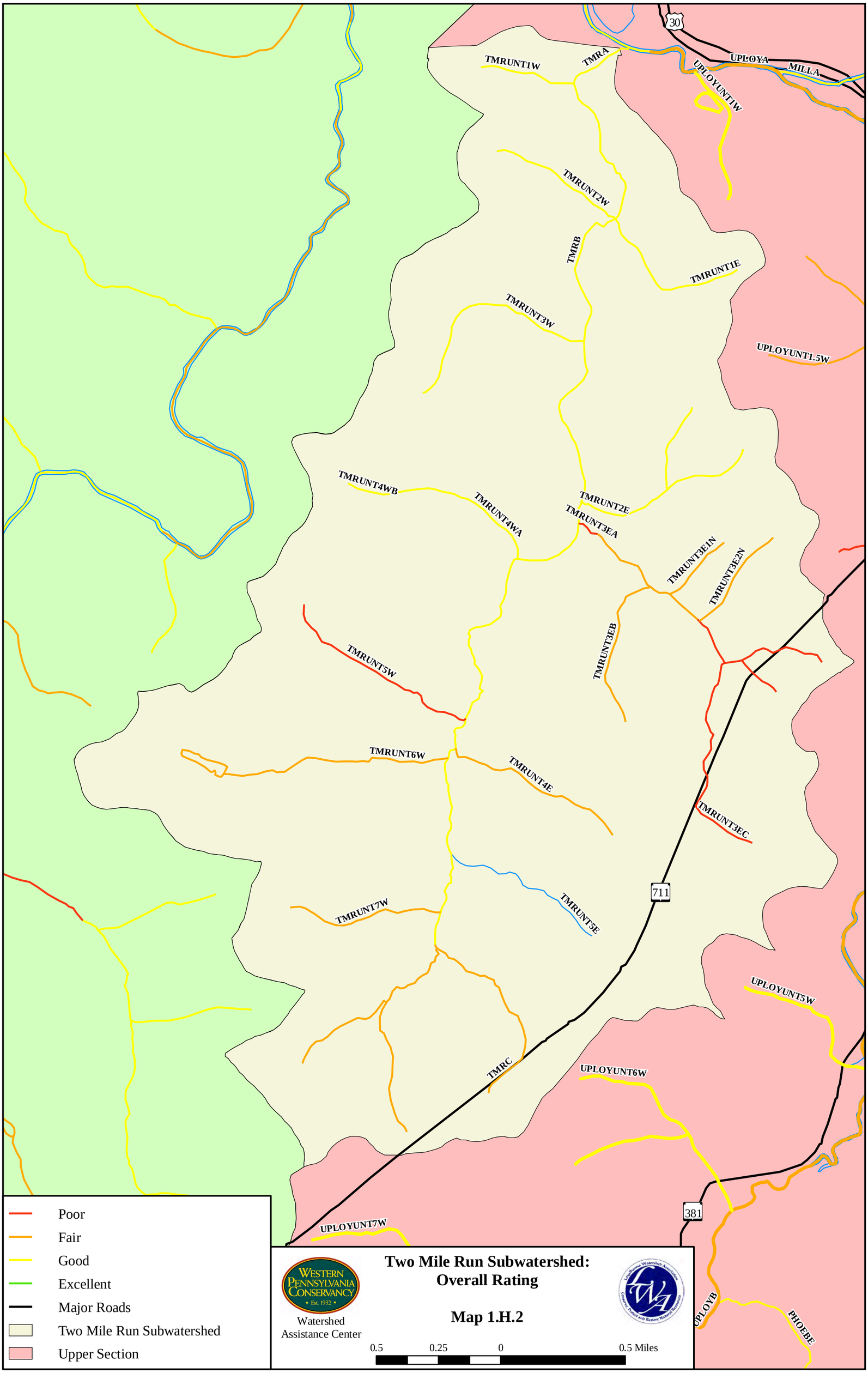
Table 1.H.1: Sample Site LWA-6
Twomile Run

Date Sampled	pH (mg/L)	Alk. (mg/L)	TSS (mg/L)	TDS (mg/L)	Iron (mg/L)	Total Coliform (per 100ml)	Fecal Coliform (per 100ml)
8/25/03	7.62	71.0	3.0	206.0	<0.06	- - -	- - -
10/29/03	7.44	44.0	3.0	110.0	0.2	2600.0*	360.0*
2/23/04	6.84	29.0		119.0	<0.06	- - -	- - -
5/24/04	6.99	39.0	5.0	86.0	<0.06	- - -	- - -
8/25/04	7.08	47.0	2.0	91.0	<0.06	- - -	- - -

* Sample completed by DEP Bureau of Laboratories

The mouth of Twomile Run was sampled throughout the assessment. Water quality results indicate very few impacts. Total and fecal coliform samples taken in October of 2003 show a presence of coliforms that is within the acceptable level.

Sample Location: Travel east on Route 30 and turn right onto Twomile Run Road immediately after Lady of the Lake Bed and Breakfast. The road will cross the Loyalhanna Creek and the sample site is at the next bridge over Twomile Run.


30
TMRUNT1W
TMRA
UPLOYA
MILLA
UPLOYUNT1W
TMRUNT2W
TMRB
TMRUNT1E
TMRUNT3W
UPLOYUNT1.5W
TMRUNT4WB
TMRUNT4WA
TMRUNT2E
TMRUNT3EA
TMRUNT3E1N
TMRUNT3E2N
TMRUNT3EB
TMRUNT5W
TMRUNT6W
TMRUNT4E
TMRUNT3EC
711
TMRUNT7W
TMRUNT5E
UPLOYUNT5W
TMRC
UPLOYUNT6W
381
UPLOYUNT7W
UPLOYB
PHOEBE
Poor
Fair
Good
Excellent
Major Roads
Two Mile Run Subwatershed
Upper Section
Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center
Two Mile Run Subwatershed:
Overall Rating
Map 1.H.2
0.5
0.25
0
0.5 Miles

Conclusions

Twomile Run carries a large amount of sediment from the landscape surrounding subwatershed streams. Impacts can be addressed but will require the cooperation of multiple landowners within the subwatershed whose current land-management practices are negatively impacting the stream.

During the assessment there was no historical data collected for the Twomile Run Subwatershed. As noted in the recommendations, it will be important to encourage further investigation of this subwatershed by the state and/or private organizations.

Recommendations

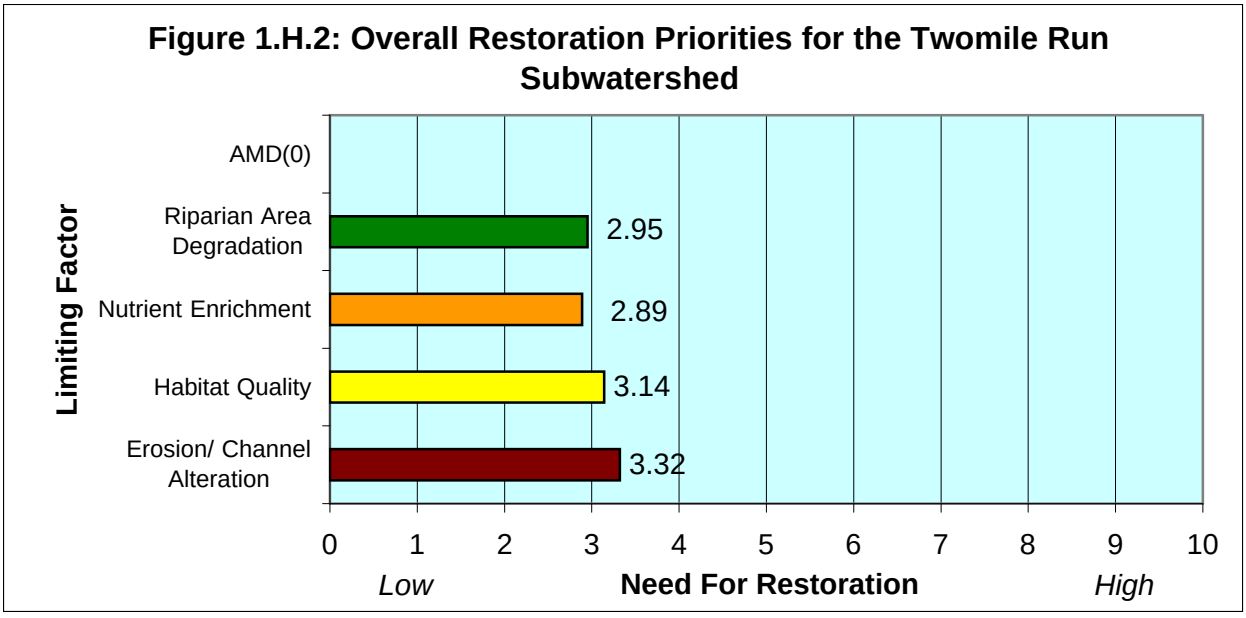
The Twomile Run Subwatershed has the potential for improvement via the coordinated efforts of local conservation organizations and landowners. The following overall recommendations are made for the entire subwatershed and its tributaries:

- Educate private landowners about the importance of riparian buffer zones, canopy cover, and stream habitat.
- Work with private landowners to establish streambank stabilization on most severely impacted sections.
- Encourage PAFBC to complete a survey of the stream for background data and overall information.
- Educate landowners about proper maintenance of septic systems, utilizing current program provided by Penn State Cooperative Extension.
- Work with landowners to eliminate overwhelming presence of multiflora rose.

Overall Restoration Priorities

Figure 1.H.2 exhibits overall restoration priorities for the entire subwatershed. As indicated, the limiting factor that received the highest restoration priority is erosion and channel alteration. This supports visual assessment findings that noted large amounts of sediment in the substrate of subwatershed streams.

Figure 1.H.2: Overall Restoration Priorities for the Twomile Run Subwatershed



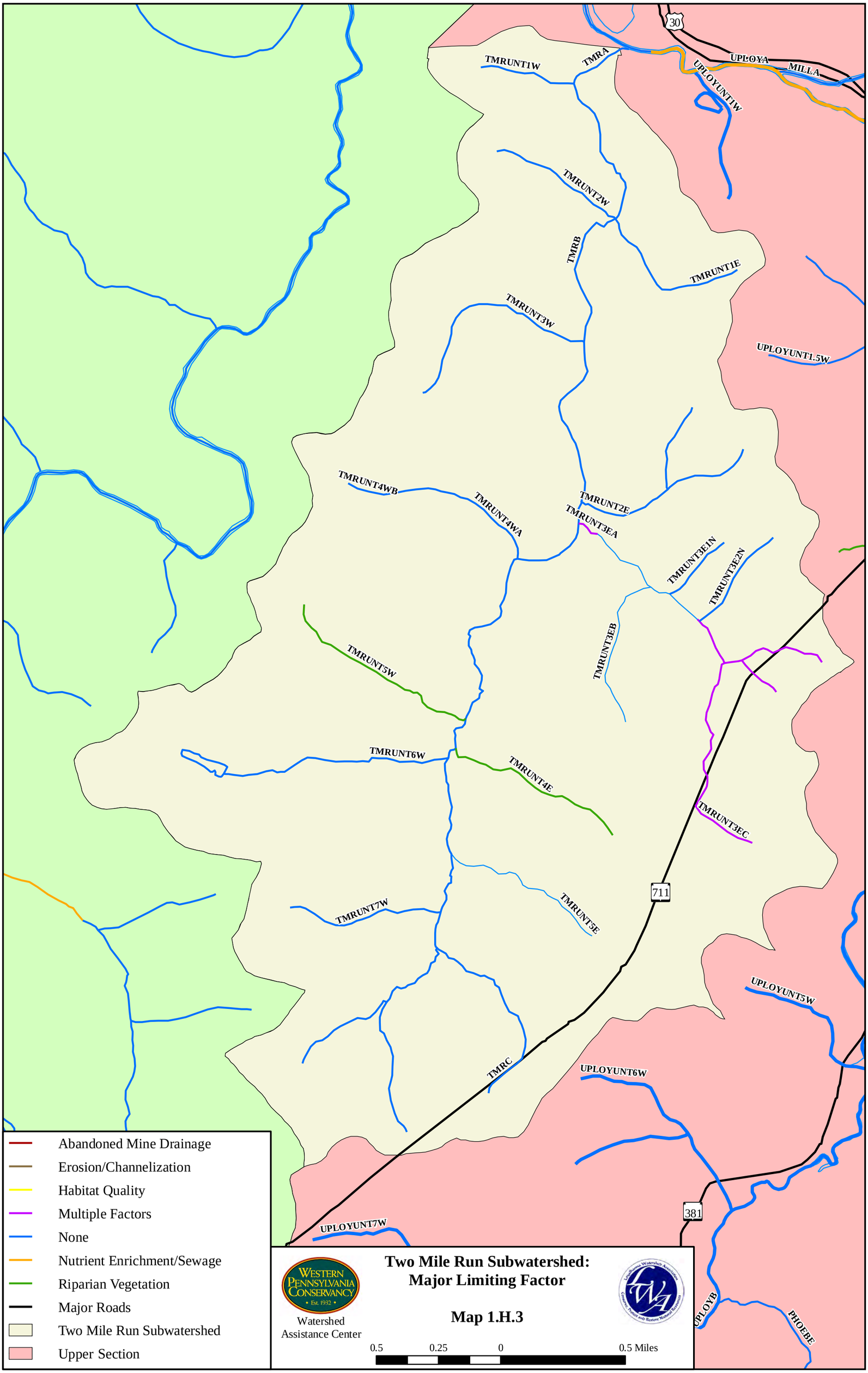
Restoration Suggestions for Individual Stream Segments

Six stream sections within the Twomile Run Subwatershed received scores identifying limiting factors. The limiting factors identified were erosion and channel alteration, riparian vegetation degradation, nutrient enrichment, and habitat quality degradation. Please refer to Table 1.H.2 and Map 1.H.3 for impact description and stream segment locations.

Table 1.H.2: Impacted Stream Segments and Restoration Suggestions for the Twomile Run Subwatershed

LIMITING FACTOR: Riparian Vegetation Degradation

Stream Segment Name	Description of Impact	Remediation Strategy	Possible Funding Sources	Priority Rating
TMR A *Main stem section that flows through residential area and horse farm.*	Very little streambank vegetation and/or canopy cover are found through the stream section, most notably in the area occupied by the horse farm.	1. Educate landowner. 2. Remediate riparian area and work with landowner to remove access of horses to the stream. Possible Partners: DEP, WCD, WPC	Growing Greener, WPC, CUP, CREP	Medium
TMR UNT3EA *Section of small tributary at its mouth that flows through a residential area and lawn.*	Limited riparian vegetation because landowner has mowed lawns to the streambank. Canopy cover is also limited.	1. Educate landowner. 2. Replant riparian area along streambank. Possible Partners: DEP, WCD, WPC	Growing Greener, Private	Low
TMR UNT3EC *Headwater section of a small tributary that originates along Route 711 at Ligonier Country Club.*	The stream is lacking riparian vegetation along the banks. Landowners have cut grass right to the bank of the stream. Very few trees surround the area through which the stream flows.	1. Educate landowner. 2. Replant riparian area and plant trees to encourage the recovery of the canopy cover for the stream. Possible Partners: DEP, WCD, WPC	Growing Greener, Private	Low – Medium
TMR UNT5W *A small tributary that flows through some old and active farm fields.*	The riparian vegetation surrounding the streambank is mostly grass. Canopy cover is severely compromised with few trees found throughout the section.	1. Educate landowners. 2. Replant riparian area. Possible Partners: DEP, WCD, WPC	Growing Greener, Private	Low – Medium


30
TMRUNT1W
TMRA
UPLOYA
MILLA
UPLOYUNT1W
TMRUNT2W
TMRB
TMRUNT1E
TMRUNT3W
UPLOYUNT1.5W
TMRUNT4WB
TMRUNT4WA
TMRUNT2E
TMRUNT3EA
TMRUNT3E1N
TMRUNT3E2N
TMRUNT3EB
TMRUNT5W
TMRUNT6W
TMRUNT4E
TMRUNT3EC
711
TMRUNT7W
TMRUNT5E
UPLOYUNT5W
TMRC
UPLOYUNT6W
381
UPLOYUNT7W
UPLOYB
PHOEBE
Abandoned Mine Drainage
Erosion/Channelization
Habitat Quality
Multiple Factors
None
Nutrient Enrichment/Sewage
Riparian Vegetation
Major Roads
Two Mile Run Subwatershed
Upper Section
Western Pennsylvania Conservancy
Est. 1932
Watershed Assistance Center
Two Mile Run Subwatershed:
Major Limiting Factor
Map 1.H.3
0.5
0.25
0
0.5 Miles

LIMITING FACTOR: Compromised Fish and Macroinvertebrate Habitat				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
TMR A *Main stem section that flows through residential area and horse farm.*	Due to limited riparian zone and lack of canopy cover, this stream offers no food source. A substrate choked with sediment also impedes the settling of stream life.	1. Educate landowners. 2. Remediate riparian area and work with landowner to remove access of horses to the stream. Possible Partners: DEP, WCD, WPC	Growing Greener, WPC, CUP, CREP	Medium
TMR UNT3EA *Section of small tributary at its mouth that flows through a residential area and lawn.*	Due to limited riparian zone and lack of canopy cover, this stream offers no food source. The substrate has a significant amount of sediment and is more than 40% embedded.	1. Educate landowner. 2. Replant riparian area along streambank. Possible Partners: DEP, WCD, WPC	Growing Greener, Private	Low
TMR UNT3EC *Headwater section of a small tributary that originates along Route 711 at Ligonier Country Club.*	Lack of riparian zone vegetation and canopy cover has eliminated a significant food source for macroinvertebrates and thus, small fish. The substrate is more than 40% embedded with sediments, and various culverts serve as fish barriers.	1. Educate landowner. 2. Replant riparian area and plant trees to encourage the recovery of the canopy cover for the stream. Possible Partners: DEP, WCD, WPC	Growing Greener, Private	Low – Medium
TMR UNT5W *A small tributary that flows through some old and active farm fields.*	Due to limited riparian zone vegetation and lack of canopy cover, this stream offers very little food source. The absence of a canopy also creates water temperature differences that can inhibit the presence of certain stream life.	1. Educate landowner. 2. Replant riparian area. Possible Partners: DEP, WCD, WPC	Growing Greener, Private	Low – Medium

LIMITING FACTOR: Erosion and Channel Alteration				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
TMR A *Main stem section that flows through residential area and horse farm.*	The action of horses along the banks and lack of vegetation to stabilize the banks has allowed for erosion. The stream channel is undefined as it meanders through the trampled area occupied by the horses.	1. Educate landowner. 2. Remove access of horses to the stream and remediate the riparian area. Stabilize banks with trees, shrubs, and other vegetation. Possible Partners: DEP, NRCS, PSCE, WCD, CUP, WPC	Growing Greener, CREP, WPC, Private	Medium
TMR UNT3EA *Section of small tributary at its mouth that flows through a residential area and lawn.*	Frequent erosion is taking place along outside bends. Eroding banks are high with little or no vegetation to stabilize. Landowner mows to the banks.	1. Educate landowner. 2. Stabilize banks with trees, shrubs, and other vegetation. Possible Partners: DEP, WCD, WPC	Growing Greener, Private	Low
TMR UNT3EC *Headwater section of a small tributary that originates along Route 711 at Ligonier Country Club.*	The headwaters of the stream are located in a golf course area, where little or no vegetation bolsters streambanks. Erosion has occurred throughout the entire stream section.	1. Educate landowner. 2. Determine remediation technique that would benefit the entire tributary. Possible Partners: WCD, WPC, DEP, NRCS	Growing Greener, Private	Low – Medium
TMR UNT5W *A small tributary that flows through some old and active farm fields.*	Erosion has occurred along the length of this tributary. Very little vegetation present to stabilize banks.	1. Educate landowner. 2. Riparian vegetation replanting along streambanks. Possible Partners: WCD, WPC, DEP	Growing Greener, Private	Low – Medium
TMRUNT4E *Tributary flows through hobby golf course.*	The channel of the stream has been altered to accommodate the golf course. Erosion has occurred in many locations, some of which has been remedied with rip rap.	1. Educate landowner. 2. Determine strategy to address erosion and the altered channel. Possible Partners: DEP, WCD, WPC	Growing Greener, Private	Low

LIMITING FACTOR: Nutrient Enrichment				
Stream Segment Name	**Description of Impact**	**Remediation Strategy**	**Possible Funding Sources**	**Priority Rating**
TMR A *Main stem section that flows through residential area and horse farm.*	Sewage discharges were noted at several locations along this section. Nutrient enrichment and algal growth was present along the stream substrate. Horses at farm have full access to the stream.	1. Educate landowners. 2. Work with landowners to install and initiate BMPs for failing septic systems to remediate portions of the problem. Possible Partners: DEP, WCD, WPC, Ligonier Township, PSCE	Local, Private, Growing Greener, WREN, PACD, CREP, CUP	Medium
TMR UNT3EA *Section of small tributary at its mouth that flows through a residential area and lawn.*	Nutrient enrichment and algal growth was noted along the stream substrate. The source of nutrients could be failing septic systems and/or golf course fertilizers.	1. Investigate source of nutrients. 2. Educate landowners. Possible Partners: DEP, WCD, WPC, PSCE, Ligonier Township	Growing Greener, WREN, PACD, Local, Private	Low
TMR UNT3EC *Headwater section of a small tributary that originates along Route 711 at Ligonier Country Club.*	Nutrient enrichment and algal growth was noted along the stream substrate. The source of nutrients could be from failing septic systems and/or golf course fertilizers.	1. Investigate source of nutrients. 2. Educate landowners. Possible Partners: DEP, WCD, WPC, PSCE, Ligonier Township	Growing Greener, WREN, PACD, Local, Private	Low
TMR UNT5W *A small tributary that flows through some old and active farm fields. A small number of cattle are grazing and have access to intermittent headwater streams.*	Some algal growth was noted along the substrate of the tributary. The active farm in its headwaters is most likely the source of the nutrient loading.	1. Educate landowners. 2. Install agricultural BMPs to remove access of cattle to the stream. Possible Partners: DEP, WPC, WCD, NRCS, CUP	Growing Greener, Private, Local, CREP, CUP	Low