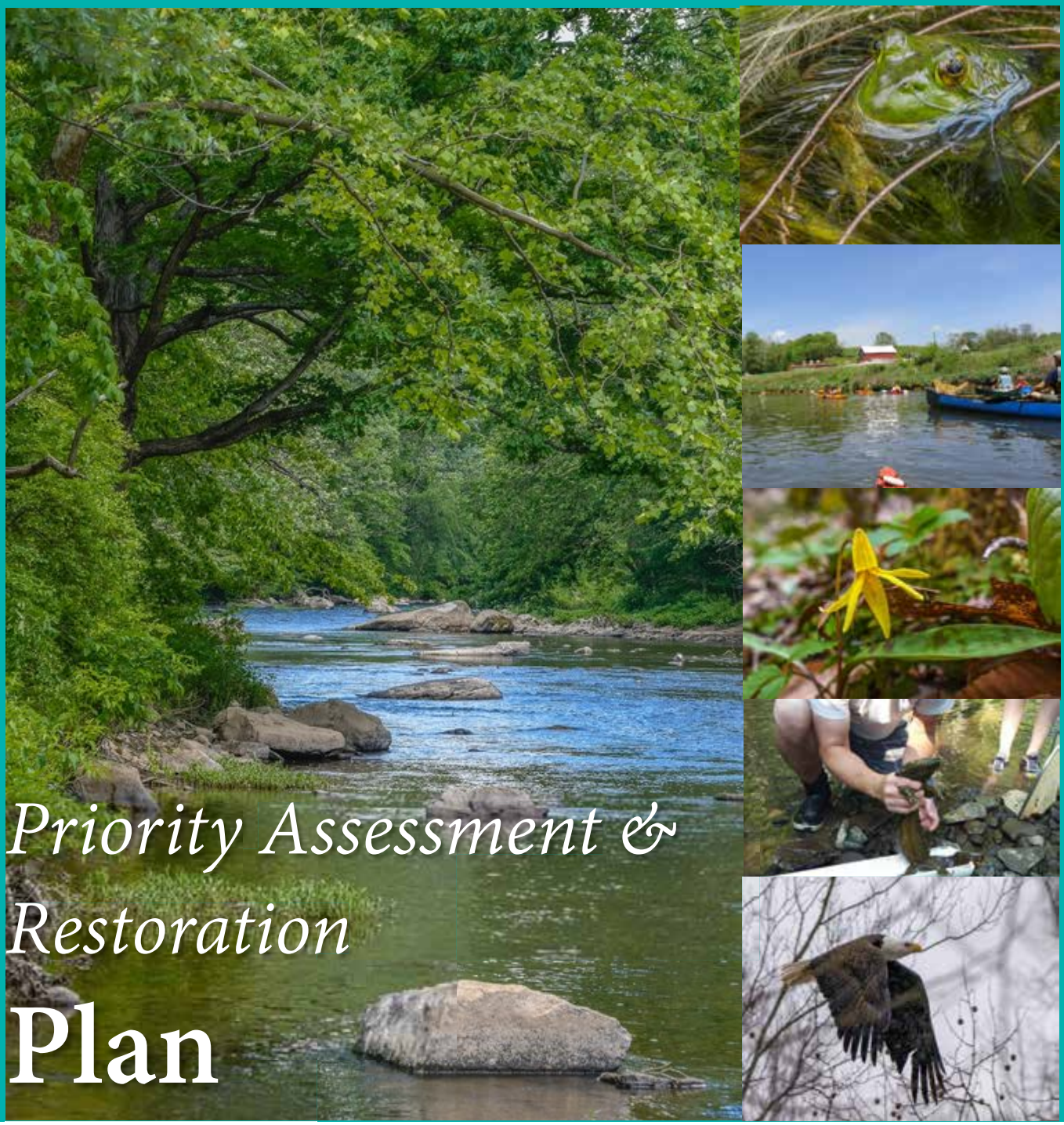
LOYALHANNA CREEK WATERSHED



Priority Assessment & Restoration

Plan

A project of the Loyalhanna Watershed Association, with technical assistance provided by the Western Pennsylvania Conservancy.

June, 2021

The Loyalhanna Watershed Association

The Loyalhanna Watershed Association, Inc. (LWA) was formed in 1971 by a group of concerned community members with a charitable, educational and scientific vision. For 50 years, LWA has strived to achieve this vision via via the coordinated efforts of over 1,500 members, a dedicated board of directors and staff and the support of several partnering organziations. Today, LWA is one of Pennsylvania's leading environmental groups focused on a regional watershed framework to advance its goals of conservation and community involvement.

A group of LWA Board Members assist with an electrofishing demonstration.

Comprised of over 2,500 miles of waterways draining approximately 300 square miles of land, the Loyalhanna Creek Watershed flows north from its headwaters on Laurel Ridge, to the confluence with the Conemaugh River in Saltsburg, Westmoreland County, PA. People living within the watershed enjoy exceptionally high quality natural assets, as well as experience some of the most challenging environmental threats. Because of this, LWA's primary objectives remain to protect and improve area waterways, conserve land parcels and riparian corridors near the Loyalhanna Creek and its tributaries, provide educational opportunities to students of all ages and backgrounds on the natural environment and foster a watershed stewardship ethic in communities within the watershed.

The Loyalhanna Watershed Association's headquarters is located on a preserved 123-acre farm in Ligonier, PA.

Table of Contents

Plan Background & Purpose

In 2020, LWA and partners from the Western Pennsylvania Conservancy (WPC) embarked on an ambitious project to visually re-assess 100 miles of streams within the Loyalhanna Creek Watershed. The purpose of this re-assessment effort was to further examine the health of the streams/stream segments that were identified as **"Restoration Priorities"** from the original *Loyalhanna Creek Watershed Assessment and Restoration Plan* completed in 2005. Priority streams were selected within the upper, middle and lower sections of the watershed and were evaluated through visual assessment, water quality analysis and aquatic species investigations.

An abundance of water quality improvement projects have been completed by LWA and partners since the initial assessment. These projects include streambank/habitat restoration, abandoned mine drainage (AMD) treatment, agricultural best management practices, aquatic barrier removals, stream access (recreational) improvements, riparian plantings, riparian land protection easements, municipal sewage installation, and dirt and gravel road improvements. LWA has leveraged over $3.6 million in grant funding from federal, state and private sources for these projects since the initial assessment was completed.

The main goal of this project was to evaluate the impacts the restoration projects completed within these stream segments have made over the 15-year period since the initial plan and identify potential new restoration areas to help guide future improvement efforts. Funding for the ***Loyalhanna Creek Watershed Priority Assessment & Restoration Plan*** was provided through a generous grant awarded from the Richard King Mellon Foundation in 2018.

Assessment Methods & Project Design

For the purpose of this assessment, the EPA Rapid Bioassessment Habitat Assessment and Physical Characteristics Protocol was selected for the visual assessment of high gradient streams within the Loyalhanna Creek Watershed. This assessment protocol is one in which WPC and many other watershed organizations have adopted for consistency and comprehensive purposes and includes the investigation of channel conditions, riparian zones, canopy cover, bank stability, water appearance, nutrient enrichment, fish barriers, embeddedness, aquatic habitat and invasive species.

Albeit, the EPA assessment protocol is very similar to the USDA version previously used for the 2005 assessment, however some differences arise within the individual scoring for each segment. The EPA method is newer and more effective in gathering a holistic look at individual stream reach segments and accurately representing them with an appropriate score for comparison purposes. This score then can then easily be interpreted to focus future restoration needs and efforts. In the field, WPC staff used Ipads with a customized GIS based Collector Application to record the EPA assessment data and other pertinent information, while spatially relating the information and photographs to document the entire assessment process.

Along with the visual assessment scoring, WPC also developed an online ArcGIS.com live web-based map to be utilized in future restoration planning. This web map has many different layers (past project locations, field population surveys, collector points with photos, impacts, and stream quality information, etc.) which will serve as a warehouse for prioritizing and guiding protection and restoration projects. When combining this data with the visual assessment results, a comprehensive watershed wide plan can be observed instantly and real time.

Eastern Hellbender Salamander

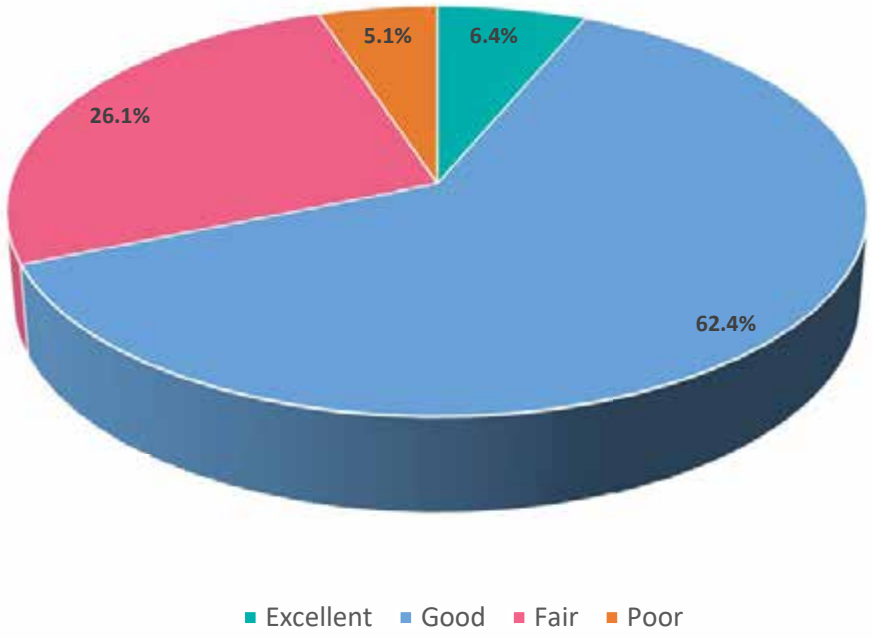
Aquatic species of interest were also investigated as part of this reassessment project. Collaboration with the Pennsylvania Game Commission and Roanoke College provided additional data through an investigation into historically known streams within the watershed that previously supported Eastern Hellbender Salamander populations utilizing eDNA analysis. Freshwater mussel surveys were conducted by WPC through timed visual searches and quadrate sampling of stream substrate. Electrofishing studies were conducted by LWA on several headwater tributaries to determine the presence of native Eastern Brook Trout populations.

Summary of Findings

The Loyalhanna Creek Watershed Priority Assessment & Restoration Plan examines potential restoration strategies on a total of 14 individual streams/stream segments that were identified as high-priority waterways from the original 2005 Assessment. These include the entire length or portions of waterways located within the upper, middle and lower watershed sub-sections. Specifically, the following named waterways were re-assessed: **Upper Watershed** – Loyalhanna Creek (Headwaters to Two Mile Run confluence), Laughlintown Run, Hannas Run and Mill Creek; **Middle Watershed** – Loyalhanna Creek (Two Mile Run confluence to Saxman Run confluence), Fourmile Run, Miller Run, Ninemile Run and Saxman Run; **Lower Watershed** – Loyalhanna Creek (Saxman Run confluence to mouth), Union Run, Crabtree Creek, Whitethorn Creek and Getty Run. New Restoration Strategies were formulated using field data, water quality data, background information, and the potential working partnerships with federal, state and local agencies.

Figure 1 depicts the current health of these priority waterways from the 2020 re-assessment. Overall, the results indicate that 6.4% of the surveyed streams have excellent quality, 62.4% showed good quality, 26.1% were in the fair quality range and only 5.1% rated poorly.

Figure 1: Assessment Results 2020



Since the completion of the original assessment in 2005, additional plans examining the water quality and overall health of the Loyalhanna Creek Watershed have also been published. Specifically, the 2017 publication by the Conemaugh Valley Conservancy, "State of the Kiski-Conemaugh River Watershed: Community Shift" and the 2019 publication by a collaboration of non-profit groups from the Laurel Highlands region entitled, "Valuing Clean Water: Ecosystem Service Values in the Loyalhanna-Conemaugh and Youghiogheny River Watersheds."

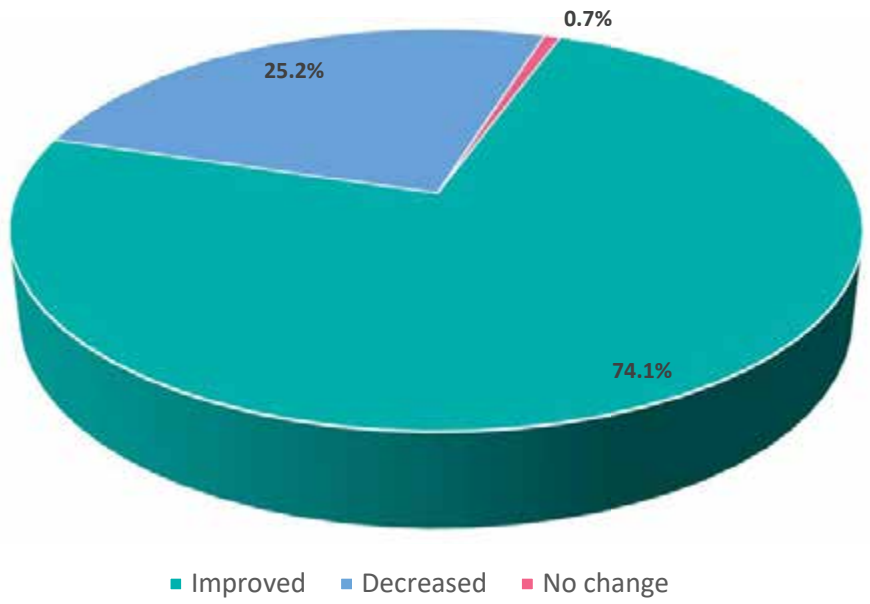
Eastern Brook Trout

The Conemaugh Valley Conservancy's study further referenced the extensive bank stabilization and habitat enhancement projects completed by LWA within the Upper Watershed section along the Loyalhanna Creek from 2011 – 2014, and concluded that "the habitat structures have improved the available habitat as evidenced by the increase in species collected. Both surveys collected holdover hatchery trout, indicating that this section of stream remains cold enough to support a year-round put-and-take fishery." (M. Reckner, 2017). The Laurel Highlands study concluded that the Loyalhanna Creek and its eight HUC12-level subwatersheds have a combined ecosystem service value provided to residents and visitors as a dollar amount of $277,896,133 annually.

When comparing the same streams/stream segments between the 2005 and 2020 assessment plans, it was noted that 74.1% of these streams showed improved water quality, 25.2% showed a decline in water quality and 0.7% showed no change in water quality over the past 15 years.

Figure 2 reflects the change in the overall health of the priority waterways from the 2005 and 2020 assessments.

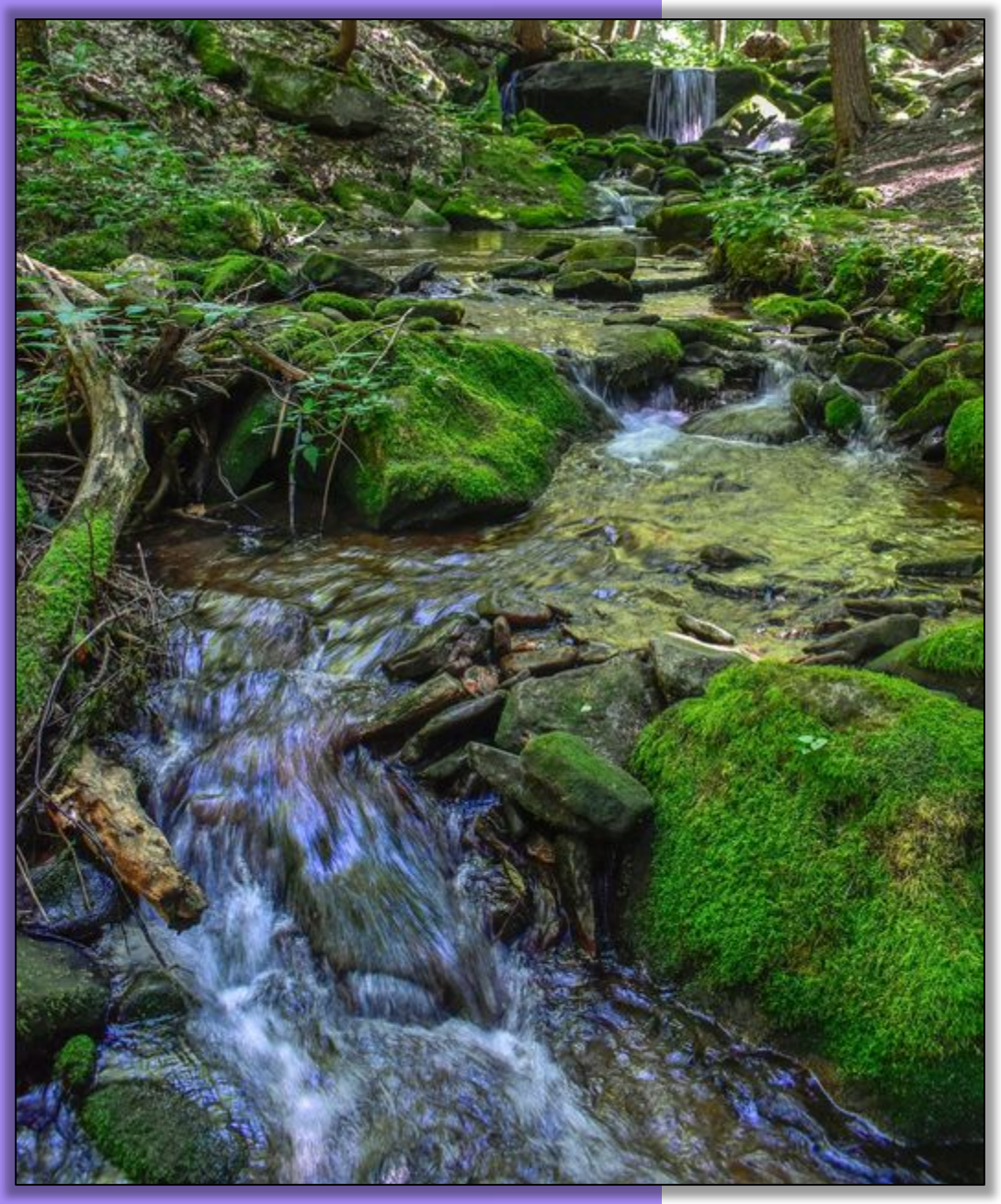
Figure 2: Overall Health of Priority Waterways 2005 vs 2020



While the original Assessment focused on four major impact categories (Abandoned Mine Drainage, Nutrient Enrichment, Riparian and Habitat Degradation and Erosion and Channel Alteration), the revised Plan expanded these categories to encompass the following six impact categories: ***Abandoned Mine Drainage, Nutrient Enrichment (Agricultural & Sewage), Riparian Habitat Degradation & Invasive Species Control, Stream Channel Conditions (Aquatic Organism Passageway), In-Stream Habitat & Erosion, and Recreational Use Potential.*** These expanded categories better reflect the restoration work that has been completed since the time of the original assessment, as well as the current factors in assessment protocols.

The following chart highlights the restoration strategies recommended for the priority streams that were re-assessed for this plan. Future remediation efforts in the Loyalhanna Creek Watershed should be addressed considering these priorities.

Category	Stream / Stream Segment	Restoration Strategy
AMD	Saxman Run	Investigate treatment options for two discharges to Saxman Run located along trib 5643 (Lower & Upper Saxman Discharges).
AMD	Crabtree Creek	Pursue plan to remediate the primary "Crabtree Discharge" source located behind the Crabtree Volunteer Fire Department.
AMD	Union Run	Further investigate, monitor and develop plan to remediate discharges throughout the subwatershed.
AMD	Getty Run	Further investigate the discharge sources along Getty Run.
AMD	Miller Run	Investigate source of AMD impairment on opposite side of SR217 just above Kingston Supply.
AMD	Mill Creek	Investigate source of AMD impairments on MILLUNT2N 5937 and MILLUNT3N 5958 near Peoples Road in Ligonier Township.
Nutrient Enrichment (Agricultural & Sewage)	Mill Creek	Work with Ligonier Township to develop a viable wastewater treatment facility servicing nearby communities no yet connected to a municipal treatment facility along Mill Creek.
Nutrient Enrichment (Agricultural & Sewage)	Fourmile Run	Work with local agricultural operators to install various best management practices.Possible involvement with EQIP/CREP programs.
Nutrient Enrichment (Agricultural & Sewage)	Upper Loyalhanna Creek	Work with local agricultural operators to install various best management practices.Possible involvement with EQIP/CREP programs.
Riparian Habitat Degradation & Invasive Species Control	Entire Watershed	Initiate a watershed-wide approach to educate landowners about the importance of maintaining vegetated riparian zones and invasive plant species control within riparian areas.
Riparian Habitat Degradation & Invasive Species Control	Upper Loyalhanna Creek	Promote and maintain the goal of land conservation and protection of parcels along the Loyalhanna Creek and headwater tributaries for long-term water quality improvements.
Riparian Habitat Degradation & Invasive Species Control	Fourmile Run	Work with area landowners to convey the importance of adequate vegetated riparian zones and invasive plant species control.
Stream Channel Conditions (Aquatic Organism Passageway)	Mill Creek	Educate landowners to remove dams across Mill Creek to re-establish aquatic organism passage at near Mill Road in Ligonier Township.
Stream Channel Conditions (Aquatic Organism Passageway)	Middle Loyalhanna Creek	Work with local partners to remove the Kingston Dam and other aquatic organism passage barriers through the Loyalhanna Gorge.
Stream Channel Conditions (Aquatic Organism Passageway)	Miller Run	Work with local partners to remove aquatic organism passage barriers near the confluence with the Loyalhanna below Kingston Dam.
In-Stream Habitat & Erosion	Whitethorn Creek	Begin a new initiative to stabilize heavily eroding streambanks prevalent throughout the subwatershed.
In-Stream Habitat & Erosion	Upper Loyalhanna Creek	Address eroding streambanks and need for in-stream habitat features throughout the Upper Loyalhanna Creek.
In-Stream Habitat & Erosion	Mill Creek	Address eroding streambanks and need for in-stream habitat features throughout the subwatershed.
In-Stream Habitat & Erosion	Fourmile Run	Address eroding streambanks and need for in-stream habitat features throughout the subwatershed.
In-Stream Habitat & Erosion	Ninemile Run	Address eroding streambanks and need for in-stream habitat features throughout the subwatershed.
Recreational Use	Middle & Lower Loyalhanna Creek	Work with local conservation and recreational partners to enhance stream access and outdoor recreational use via trails, parks, etc.



Upper Loyalhanna Creek Watershed

Loyalhanna Creek Mainstem

(Headwaters to Two Mile Run)

General Description

Linn Run

For the purpose of this assessment, the Loyalhanna Watershed was separated into three geographically distinct sections; Upper, Middle and Lower. The sections were delineated based upon their drainage patterns from the major ridge systems within Westmoreland County. The upper Loyalhanna section includes the area that drains the western slope of Laurel Ridge within Cook and Ligonier Townships and includes six named tributaries and twenty un-named tributaries. The named tributaries include, Powdermill Run, Linn Run, Rolling Rock Creek, Laughlintown Run, Mill Creek and Two Mile Run. This 107 square mile section of the watershed extends from the headwaters to western end of Ligonier Borough, where it ends just after a confluence with Two Mile Run. The headwaters of the Loyalhanna emerge from an old springhouse found upon a farm property in Stahlstown, east of S.R. 711 along Jones Mills Road.

The upper Loyalhanna Creek contains some of the most scenic sections found within the entire watershed. Many of its tributaries originate from the Laurel Ridge that runs in a north-south direction on the border of Westmoreland and Somerset Counties. Characterized by thick mountain laurel, plentiful conifers and hardwoods, Laurel Ridge is a popular recreation area with many hiking, biking, skiing and snowmobile trails. Streams draining Laurel Ridge typically cascade through steep hollows well protected by state agencies and private landowners.

The mainstem section of the Loyalhanna winds its way through a varied landscape including farms, large estates and cottages. It does not encounter a large population concentration along its banks until it flows into the community of Ligonier close to the intersection of S.R. 381 and S.R. 30. Ligonier Borough has the largest population concentration within the upper section.

Ligonier and Cook Townships, which surround the upper section of the Loyalhanna are mostly rural communities. A mix of active and non-active farm fields, forested properties and private estates comprise a majority of the landscape. Originally settling in the area for summer recreation, many individuals and families have now settled permanently in Ligonier because of its small town country charm and beauty. Large treks of land are occupied by private landowners in the southern region of the town. Those properties are well maintained and provide good protection for streams passing through.

Historically, livestock operations were common throughout the area. Although, 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 production. In others, properties have moved through natural succession and are now overgrown with various trees, shrubs and often times, multiflora rose and other invasive plant species.

A series of un-named tributaries enter the mainstem from the west and the east as the Loyalhanna flows northwest. Two of those tributaries were rated poorly and noted for possible impacts. The first is the first un-named tributary downstream to enter the Loyalhanna mainstem from the east. It passes through a small cluster of homes that have removed riparian vegetation from banks, enabling erosion to occur. The second un-named tributary is the next to enter the mainstem downstream of the headwaters. It originates at the intersection of S.R. 711 and Bethel Church Road, and then quickly passes underneath S.R. 711 to flow eastward to meet the Loyalhanna. It passes through two small farms and many private yards. For a majority of its length, it has eroding banks and very little riparian vegetation.

Approximately 5.5 miles downstream from the headwaters, the first named tributary that joins the Loyalhanna is Powdermill Run. This sub-watershed flows from Laurel Ridge into the Loyalhanna mainstem through a largely forested area. Upon combining with the Loyalhanna mainstem, the width of the Loyalhanna mainstem increases, as does the overall volume of flow. Powdermill Run is a High Quality Cold Water Fishery that was rated good overall. However, the Powdermill Run sub-watershed does contribute sediment into the Loyalhanna through the erosion of many dirt and gravel roads within the area.

Trout Lily's abound along the banks of the Loyalhanna

After its confluence with Powdermill Run, the Loyalhanna continues to flow northwest adjacent to S.R. 381. The area surrounding the creek is mostly forested with a mix of sycamore, oak and other deciduous trees. Summer cottages sparsely populate the stream bank and many surrounding hillsides are actively grazed or used for hay production. Very few un-named tributaries join the mainstem, and those that do, contribute very little flow and are intermittent.

As the Loyalhanna mainstem arrives in the community of Rector, it passes underneath the S.R. 381 bridge. Downstream of the bridge, the Loyalhanna retreats into properties owned and managed by Rolling Rock Farms. Flanked by a steep bank on the western side, the Loyalhanna meanders through a forested area thick with a mix of pine and deciduous trees.

One half mile downstream of the S.R. 381 bridge, Linn Run joins the Loyalhanna mainstem. It originates upon Laurel Ridge and flows through state forest and state park lands. Linn Run is a mountain stream that descends through a steep hollow following Linn Road that leads to the summit of Laurel Ridge. The stream rolls over large boulders underneath a canopy thick with mountain laurel, hemlock and other evergreen trees. Due to insufficient buffering capacity, the mainstem 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 field work and is classified as a High Quality Cold Water Fishery.

After its confluence with Linn Run, the Loyalhanna continues to flow through private properties behind Rolling Rock Farms. As it nears Ligonier Borough, it curves toward S.R. 381 and runs parallel to it until a confluence with **Laughlintown Run**. Laughlintown Run enters the Loyalhanna mainstem 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 sub-watershed contains Furnace Run, one of three exceptional value streams in the upper section. Laughlintown Run contributes significant volume to the Loyalhanna prior to its journey into downtown Ligonier.

Downstream of its confluence with Laughlintown Run, the Loyalhanna takes a turn to the west and flows into Ligonier Borough parallel to S.R. 30. Although very few residences line the creek, areas surrounding it are blanketed with homes and businesses. After passing underneath the S.R. 711 bridge, the Loyalhanna mainstem is designated as a Delayed Harvest Area. Maintained and stocked by the PA Fish & Boat Commission, the area stretches from the S.R. 711 bridge, 1.7 miles downstream to the confluence with Two Mile Run. The area is used heavily by local and visiting anglers of all ages and was recognized recently as a “Keystone Select Trout Waterway” by the PA Fish & Boat Commission.

Agriculture remains a key part of the area landscape

Hannas Run is located in the northwest corner of Ligonier Township, north of S.R. 30 and west of S.R. 711. The headwaters, tributaries and mainstem of this stream flow through hilly landscape consisting of few forested areas. The majority of this open-field subwatershed flows through a rural area with several non-active farms. Hannas Run continues to flow southward where it meets Mill Creek just outside of Ligonier Borough.

On the western outskirts of Ligonier Borough, **Mill Creek** joins the Loyalhanna. This confluence occurs approximately 200 yards past the Ligonier Sewage Treatment facility located on S.R. 30. Mill Creek is a large sub-watershed that enters the Loyalhanna from the northeast. It is a High Quality Cold Water Fishery that originates upon Laurel Ridge in State Game Lands #43. Two of its three headwater branches are classified exceptional value. Land use within the Mill Creek sub-watershed varies greatly and includes private properties, state properties, township properties, farms, residential areas and historic coal mining industry.

Following its confluence with Mill Creek, the upper Loyalhanna continues to flow eastward and parallel to S.R. 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, **Two Mile Run** flows into the upper Loyalhanna. The mouth of Two Mile Run is located directly behind the historic Ice Pond, now owned by Ligonier Camp and Conference Center, on S.R. 30 eastbound. Two Mile Run drains a 7.7 square mile area, making it the smallest named tributary to enter the Loyalhanna. It drains an area mixed with private residences, farms and estates. Many of its tributaries originate in decorative and/or farm ponds. The Loyalhanna Creek from its source to Laughlintown Run is classified as a HQ-CWF; from Laughlintown Run to Fourmile Run, it is classified as a CWF.

Overview of Historic Data/Projects

Being the largest section assessed (in stream miles) and supporting a variety of recreational opportunities, this section of stream has been a focal point for enhancement. Approximately 20 individual stream bank and in-stream habitat restoration projects have been completed along over 5 miles of Upper Loyalhanna Creek mainstem over the last 15 years. Also, numerous riparian plantings, recreational stream access improvements, and two municipal wastewater collection and treatment systems have been installed since the original assessment in 2005. These projects have shown a significant positive impact on water quality within this section and have greatly enhanced area recreational opportunities. Yet still, additional sources of excessive sedimentation and nutrient loading were noted through this re-assessment, along with the expanded growth of many invasive plant species.

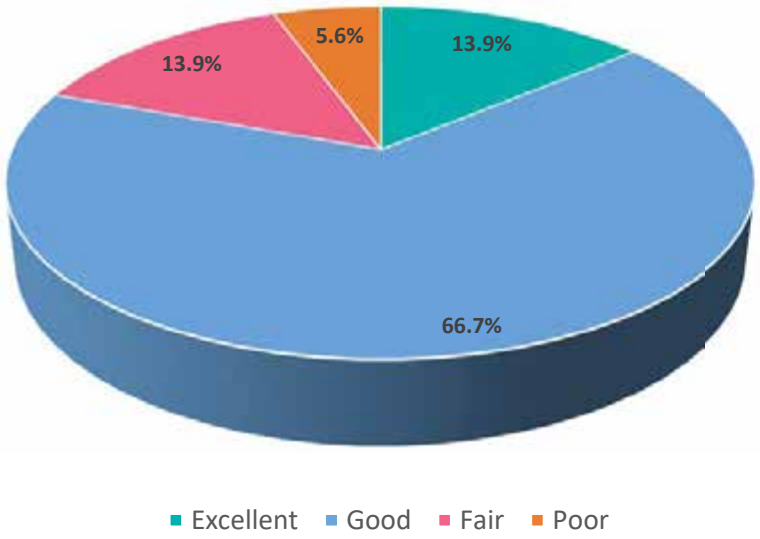
- In the study, “State of the Kiski-Conemaugh River Watershed: Community Shift”, four sites along the Loyalhanna Creek mainstem were surveyed for fish populations in 2015 to determine biological comparisons. These sites included two within the Upper Watershed: Site 1 - Loyalhanna at Seaton Road, and Site 2 - Loyalhanna near Two Mile confluence.

- In 2000 and 2009, the Pennsylvania Fish & Boat Commission conducted surveys at these sites. Most notably, an increase in the diversity of fish species was found in the upper Loyalhanna section at Site 2, which was determined to be one of the most biologically diverse stream sections within the Kiskiminetas River Basin.

- The “Valuing Clean Water: Ecosystem Service Values in the Loyalhanna-Conemaugh and Youghiogheny River Watersheds” study concluded that the Upper Loyalhanna Creek and its headwaters area has a combined value of the ecosystem services provided to residents and visitors as a dollar amount of $76,222,793 annually.

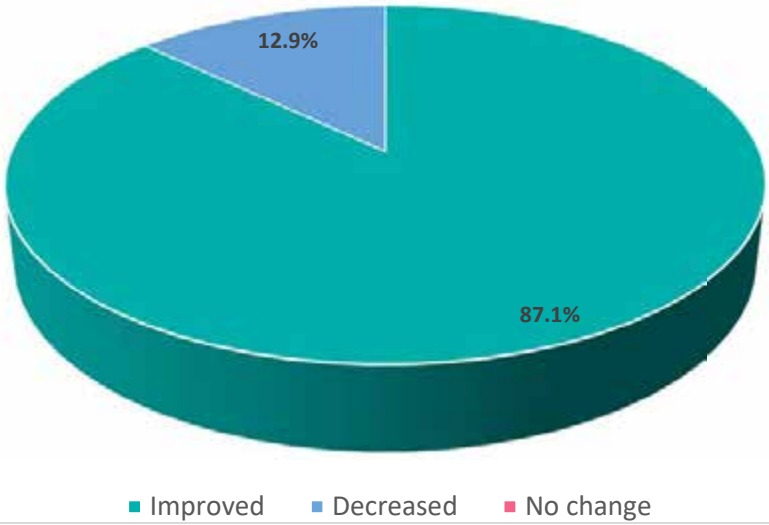
Assessment Results & Comparison

Figure 3: 2020 Upper Loyalhanna Assessment Results



Portions of the Upper Loyalhanna Creek drainage area assessed are in varying conditions, with 80% being good to excellent. Streambank restoration and agricultural BMP's installed previously are proving to be effective tools for water quality improvement. Many of the developed areas have significant riparian zone encroachment (roads and residential houses) which reduce the effectiveness of a functional riparian buffers. Areas of active streambank erosion should be rectified to improve water quality, and aquatic life. Additional restoration efforts should focus on agricultural bmp's in the upper portions of the watershed (southwest of Rector) to enhance or establish buffered streams.

Figure 4: Upper Loyalhanna Overall Comparison 2005 vs 2020



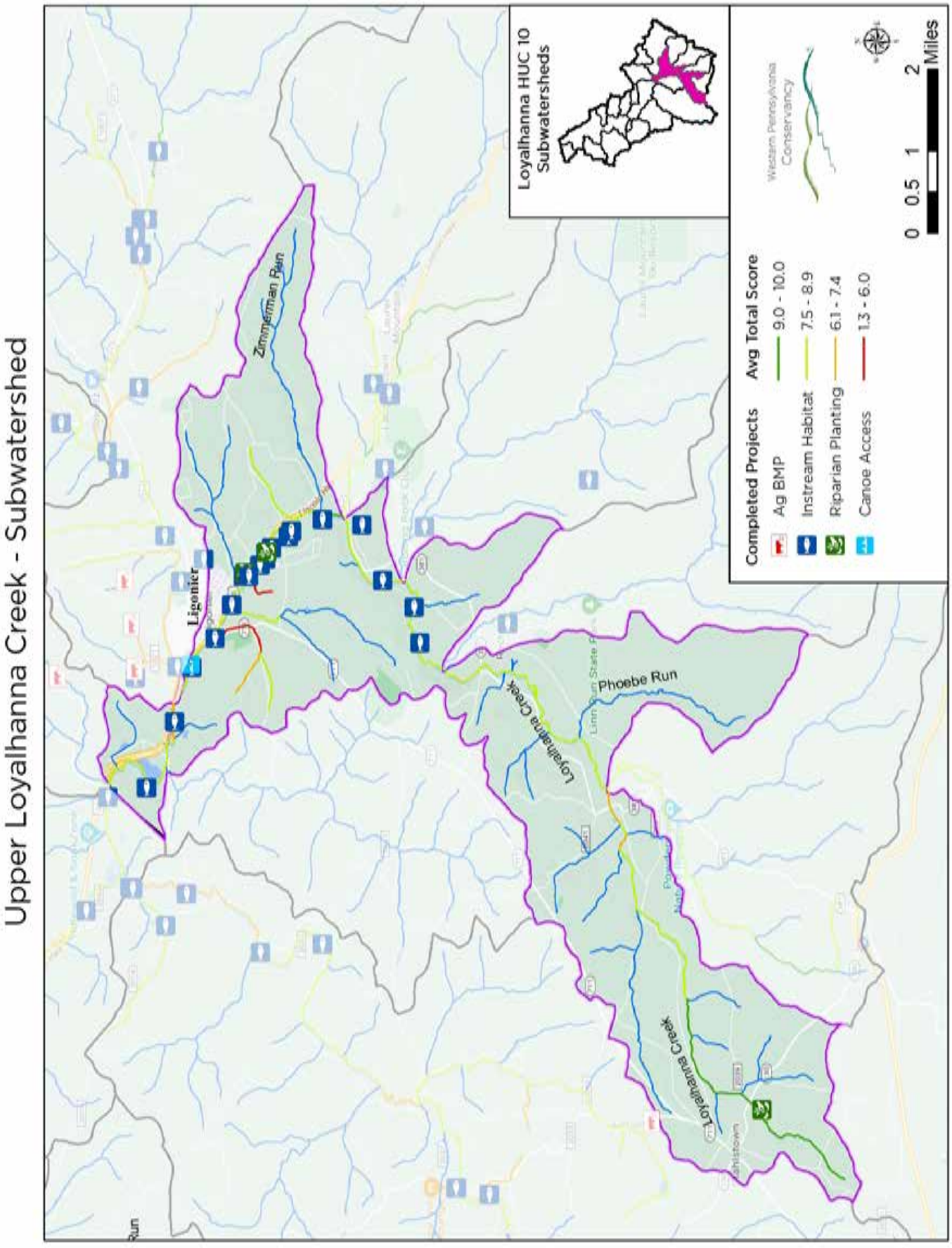
Restoration Priorities

The results of this re-assessment showed that much of mainstem of Upper Loyalhanna Creek has generally improved in overall water quality compared to the 2005 assessment. However, some of the smaller unnamed tributaries and headwater portions of Loyalhanna Creek have degraded. Future restoration efforts should focus on these impacted lower scoring areas and implement agricultural best management practices, streambank stabilization, and riparian enhancement projects where further indicated. Also, landowners should be educated about the importance of stream buffers and not mow/trim to the edge of the stream. Several invasive species, predominantly Japanese Knotweed and the fingernail clam, were commonly observed throughout the assessment. Refer to the following details listed on Table 1 and depicted on Map 1 for impact description, assessed segment locations and recommended restoration strategies.

Table 1: Restoration Strategies for the Upper Loyalhanna Creek Mainstem

Stream Segment Name	Description of Impact	Restoration Strategy
UPLOYUNT1.5W 6027 *UNT to southern side of Loyalhanna, parallels SR 711*	In-Stream Habitat & Erosion	Educate landowners. Install streambank restoration devices and riparian plantings
UPLOYUNT1W 6033 *UNT on southwestern side of Loyalhanna, through Laurel Valley Golf Course*	AMD; Riparian Habitat Degradation & Invasive Species Control	Investigate sources of possible AMD iron staining, enhance riparian buffer
UPLOYB 6232 *Mainstem Loyalhanna, above SR 381 by Allen Road*	Nutrient Enrichment	Work with local agricultural operators/large tract landowners to install various best management practices
UPLOYB 6231 *Mainstem Loyalhanna, above SR 381 by Allen Road*	Nutrient Enrichment	Work with local agricultural operators/large tract landowners to install various best management practices
UPLOYB 6227 *Mainstem Loyalhanna, above and below SR 381 by Allen Road*	Nutrient Enrichment; In-Stream Habitat & Erosion	Work with local agricultural operators/large tract landowners to install various best management practices
UPLOYB 6236 *Mainstem Loyalhanna, above SR 381 by Allen Road*	Nutrient Enrichment	Work with local agricultural operators/large tract landowners to install various best management practices
UPLOYB 6032 *UNT to Loyalhanna, upper portion along Freeman Road*	Nutrient Enrichment	Work with local agricultural operators/large tract landowners to install various best management practices
UPLOYE 6299 *Loyalhanna mainstem near Oak Road in headwaters*	Nutrient Enrichment	Work with local agricultural operators/large tract landowners to install various best management practices
Multiple segments	In-Stream Habitat& Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques

Map 1: Assessed Stream Segments within the Upper Loyalhanna Creek Watershed



Laughlintown Run

General Description

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

Laughlintown Run consists of the mainstem and three headwater streams (McCullen Run, Furnace Run, and Naugle Run) that meet to form a main branch of Laughlintown Run very close to S.R. 30 in Laughlintown. The Laughlintown Run subwatershed is fairly remote and mostly encompasses excellent water quality. Laughlintown Run is classified as a HQ-CWF.

Eroded streambank along Laughlintown Run

Overview of Historic Data/Projects

To date, three streambank restoration projects have been installed within the Laughlintown Run basin since the original assessment in 2005. These projects are located within the residential area of Laughlintown on private properties bordering the stream where severe bank erosion was occurring. These projects were implemented to address excess sediment loading into Laughlintown Run, as well as stabilize the bank areas approximate to existing residential structures.

- In 2021, the Municipal Authority of Westmoreland County removed the 1940s-era concrete reservoir structure that once provided water for residents in Laughlintown and Ligonier. The concrete spillway and sloped basin were removed and the area re-graded and restored to allow Furnace Run to flow through the area unobstructed.

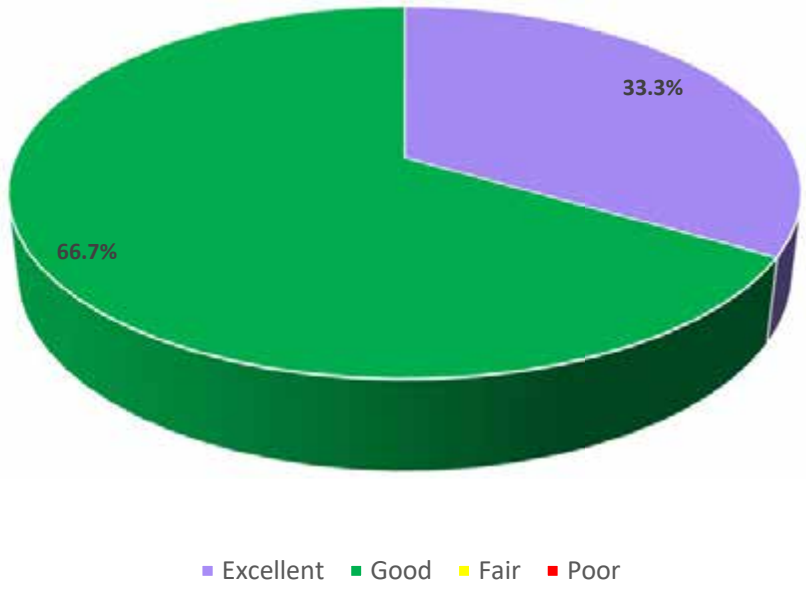
- In January 1993, the PAFBC surveyed Furnace Run (report dated February 22, 1993). The purpose of the investigation was to determine the impact of a PennDOT project on S.R. 30. Sediment from the project was entering an unnamed tributary of Furnace Run. Heavy sediment deposits were observed in the tributary 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 tributary, and 17 species were collected downstream.

- A report from the PA Department of Environmental Resources (DER), dated 1983, reports the results of a fish and macroinvertebrate study conducted on Laughlintown Run and Furnace Run. The report noted high stonefly diversity. Additionally, five species of fish 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.

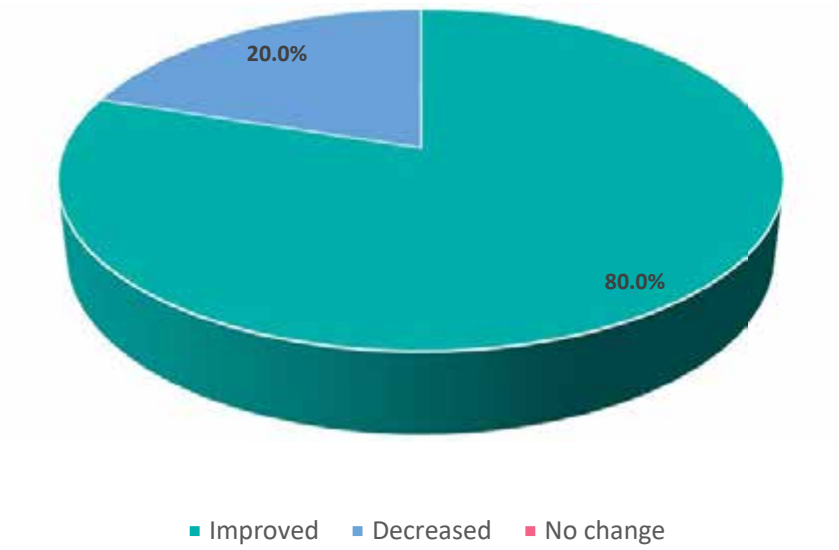
Assessment Results & Comparison

Figure 5: 2020 Laughlintown Run Assessment Results



Overall, the portions of Laughlintown Run that were re-assessed in this study are in good to excellent condition. The previously installed streambank restoration projects are functioning well. Many of the developed areas have significant riparian zone encroachment (roads and residential houses), which reduce the effectiveness of functional riparian buffers. Additionally, untreated sewage from failed on-lot systems continue to degrade the Laughlintown Run mainstem, despite a recent municipal sewerage project within portions of Laughlintown.

Figure 6: Laughlintown Run Overall Comparison 2005 vs 2020



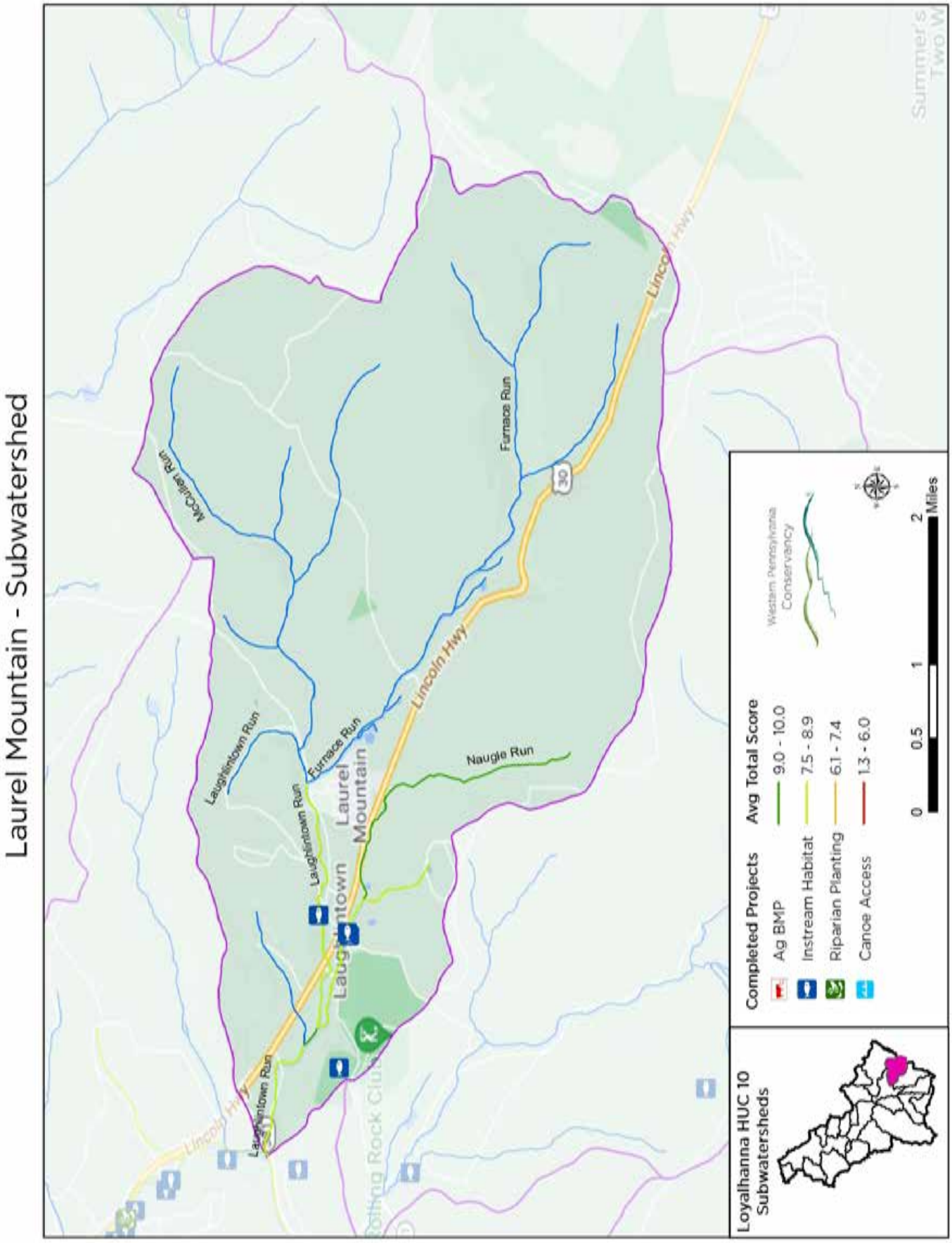
Restoration Priorities

From the updated assessment, much of the Laughlintown Run subwatershed has generally improved in overall water quality. Future restoration efforts should focus on these impacted lower scoring areas and implement sewage treatment, streambank stabilization, and riparian enhancement projects. Also, landowners bordering Laughlintown Run should be educated about the importance of planting/maintaining adequate stream buffers and not mow/trim to the edge of the stream. Refer to the following details listed on Table 2 and depicted on Map 2 for impact description, assessed segment locations and recommended restoration strategies.

Table 2: Restoration Strategies for Laughlintown Run

Stream Segment Name	Description of Impact	Restoration Strategy
NAUGB 6181 *Eastern side of Laughlintown, on south side of Rt 30*	Nutrient Enrichment	Investigate sources of possible failing septic systems and odor of raw sewage
NAUGA 6105 *Middle of Laughlintown, on south side of Rt 30*	Stream Chanel Conditions; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques
LAUGHB 6113 *Northern side of Laughlintown*	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques

Map 2: Assessed Stream Segments within the Laughlintown Run/Laurel Mountain Subwatershed



Hannas Run

General Description

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

Eroded, silty banks are prevalent along Hannas Run

The headwaters, tributaries and mainstem of Hannas Run flow through and around a very hilly landscape. In contrast to neighboring sub-watersheds east of Ligonier, the Hannas Run watershed consists of fewer forested areas and more open fields. A majority of the watershed flows through a rural area comprised of residential dwellings and active and non-active farm properties. The only exception to this is the small historic coal patch town of Wilpen, which sits about three quarters of the way through the subwatershed. Hannas Run is classified as a CWF.

Overview of Historic Data/Projects

The Hannas Run subwatershed is historically notable because of its coal mining history. In its prime, the Wilpen area boasted approximately 4 operating deep mines. In the 1930's the majority of the water that flowed from Hannas Run was laden with iron and acidity due to poor environmental regulations and exploitation of the area's resource. During the Roosevelt administration, 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, 80s and 90s 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 area today has dramatically improved from the early 1900's. More stringent environmental regulations combined with re-mining and other technological advances have made a tremendous difference in the water quality of Hannas Run. Based on their appearance, it would be difficult to

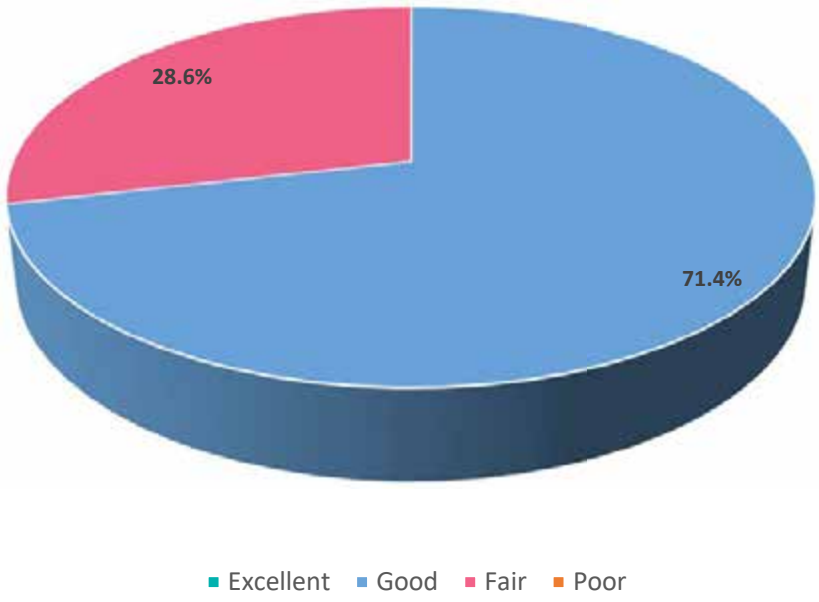
imagine that most of the headwater streams found in this watershed originate from deep mined areas. These areas, now stripped of their coal, have begun to restore themselves to a viable fishery.

To date, LWA and partners have completed one large fish habitat enhancement and streambank restoration and riparian planting project within the lower portion of Hannas Run since the original assessment.

- Old reports from the DEP highlight water quality issues related to strip mines in the area. Active and reclaimed strip mines are all in compliance with DEP water quality standards. Files can be viewed by contacting the regional DEP office or the Loyalhanna Watershed Association.
- The Scarlift Report from Buchart-Horn Consulting Engineers and Planners shows the locations of eight AMD discharges in Hannas Run. Those discharges all emanated from abandoned underground and drift mines. Many of the discharges are controlled by WPA mine seals installed in the 1930's. Most of the drainages were acidic with high sulfate levels; some also had iron, aluminum, and manganese. Today, the discharges show little impact upon receiving streams.
- In 1979 and 1991, the PFBC conducted fish surveys in Hannas Run. Nine species were collected in 1979; ten species were collected in 1991. The fish assemblage consisted of 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 PFBC data exists (1975, 1979, 1991.)
- From 2004 – present, the Loyalhanna Watershed Association conducted bi-annual macroinvertebrate sampling at multiple locations along the Hannas Run mainstem. Results consistently have shown the health of this waterway as "Good" from the interpretation of the EPT percentages from this sampling.

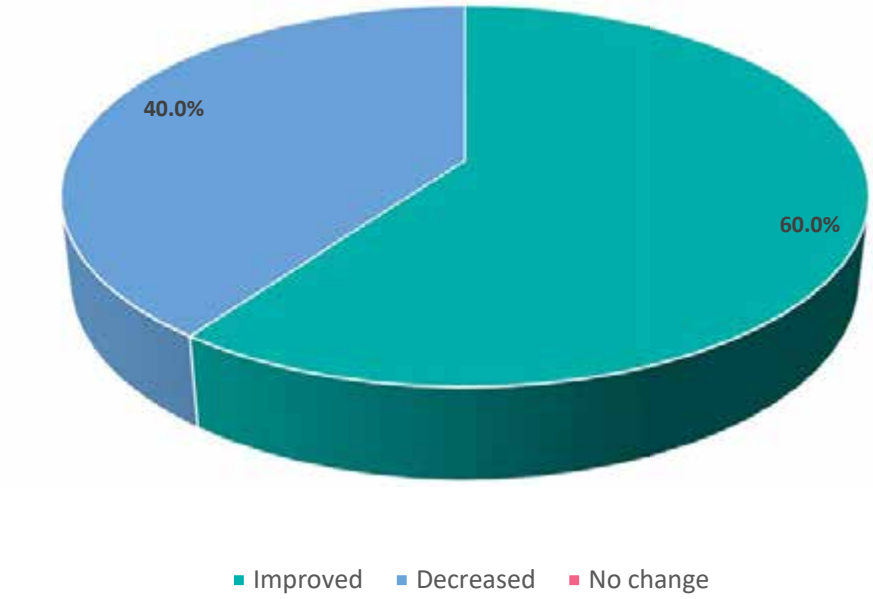
Assessment Results & Comparison

Figure 7: 2020 Hannas Run Assessment Results



Overall the portions of the Hannas Run drainage basin that were re-assessed are predominately in good condition. Water quality impacts such as AMD sources and sediment contributions should be further investigated to mitigate effects. Some of the agricultural areas have significant riparian zone encroachment (fields and pastures) which reduce the effectiveness of a functional riparian buffers. Additionally, many invasive plants such as multiflora rose, barberry, and honeysuckle were noted along areas of streambank.

Figure 8: Hannas Run Overall Comparison 2005 vs 2020



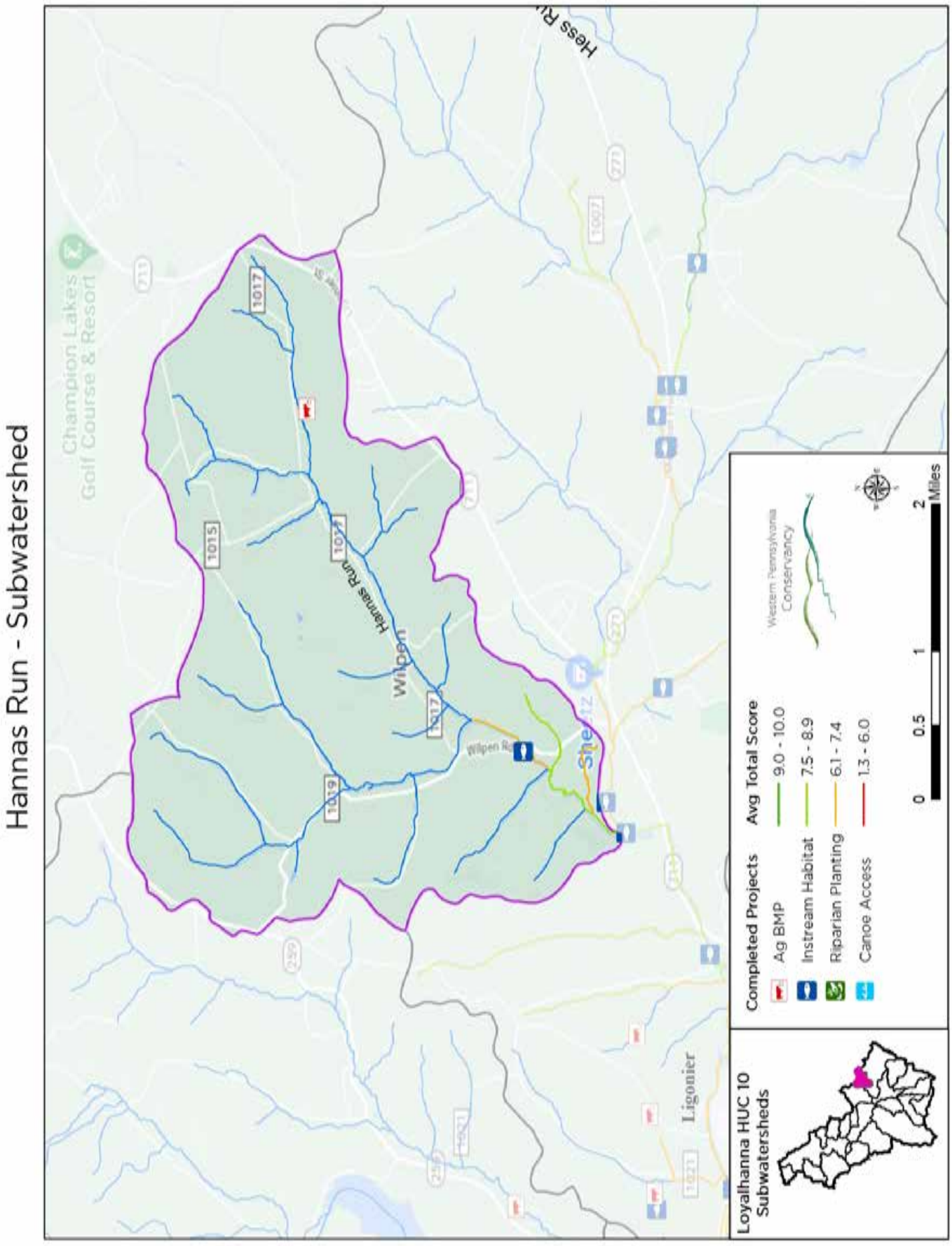
Restoration Priorities

From the updated assessment, much of the re-assessed portions of Hannas Run have generally remained similar to conditions in 2005. Moderate streambank erosion, remnants of AMD impacts, and runoff from agricultural fields seem to be the primary impact sources. Future restoration efforts should focus on these impacted lower scoring areas and investigate AMD sources, agricultural best management practices, streambank stabilization, and riparian enhancement projects. Refer to the following details listed on Table 3 and depicted on Map 3 for impact description, assessed segment location and recommended restoration strategies.

Table 3: Restoration Strategies for Hannas Run

Stream Segment Name	Description of Impact	Restoration Strategy
HRB 5862 *Mainstem Hannas Run flowing across Wilpen Road*	AMD	Investigate sources of AMD
HRA 5881 *Mainstem Hannas Run upstream from confluence with Mill Creek*	AMD	Investigate sources of AMD
HRB 5862 *Mainstem Hannas Run flowing across Wilpen Road*	Nutrient Enrichment	Educate landowners and implement plantings to widen buffer areas
Multiple segments	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration techniques

Map 3: Assessed Stream Segments within the Hannas Run Subwatershed



Mill Creek

General Description

Mill Creek near Ligonier Camp & Conference Center

The 25.7 square mile Mill Creek subwatershed is located in Ligonier Township. The headwaters consist of three separate branches that flow westward and drain Laurel Ridge south of S.R. 271. These headwater branches converge in the town of Waterford to form the Mill Creek mainstem. From Waterford, Mill Creek flows westward, passing through Ligonier Borough. After crossing underneath S.R. 30, Mill Creek meets the Loyalhanna Creek behind the Ligonier Water Treatment facility operated by the Municipal Authority of Westmoreland County.

Several named tributaries are included in the Mill Creek sub-watershed: North Branch, Middle Branch, South Branch, and Macks Run. The Middle and South Forks of Mill Creek are classified as EV; the North Fork is classified as HQ-CWF; and the Mill Creek mainstem is classified as a CWF.

Overview of Historic Data/Projects

Numerous streambank restoration projects have been completed within the Mill Creek subwatershed since the original assessment in 2005. These projects are located throughout the headwaters as well as the middle and lower portions of Mill Creek, and undoubtedly are having a positive impact on streambank erosion problems. Yet still, many additional sources of sedimentation were noted in this re-assessment.

- The PFBC 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) three fish species, including brown trout, were collected. Macroinvertebrate diversity was fair, and chemical 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.

- The Scarlift Report identified four acidic discharges flowing in the Mill Creek Watershed. When located in 1972, they discharged into several un-named tributaries to Mill Creek. Those tributaries drain into Mill Creek from the north and are close to the mouth of the stream. Buchart-Horn explained that each of the discharges were small and neutralized by the alkalinity of the Mill Creek coming from the headwaters.

They recommended re-mining, regrading of spoil piles and mine dumps to eliminate some of the discharge. Since 1972 and the completion of the Scarlift Report, those recommendations have been followed and all but one of the discharges has been eliminated.

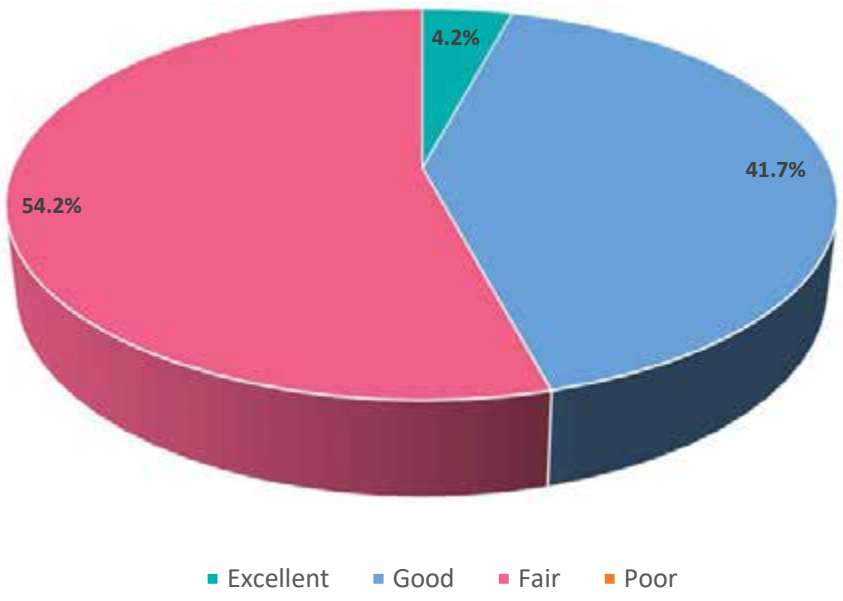
- Various surface mining operations were carried out in the Mill Creek Watershed throughout the late 1980's and 1990's. DEP inspectors made numerous water sample collections at those sites. Only one site discharged water containing abandoned mine drainage. That surface mine was located on the hilltop above the McConnaughey (now The Watershed Farm) and Shirey Farms on the western end of Ligonier. Prior to surface mining, this particular discharge flowed at 50 to 80 gallons per minute. Following mining, that flow was decreased. To date, a small discharge remains at that site and it flows at less than 1 gallon per minute. Aluminum precipitate is noticeable, but the receiving un-named tributary exhibits no impact.

- From 2004 – present, the Loyalhanna Watershed Association conducted bi-annual macroinvertebrate sampling at multiple locations along the Mill Creek mainstem. Results consistently have shown the health of the headwater and middle reaches of this waterway as "Good" from the interpretation of the EPT percentages from this sampling. From this study, the health of the lower reaches indicated a reduction in stream quality with a EPT rating of "Fair."

- The "Valuing Clean Water: Ecosystem Service Values in the Loyalhanna-Conemaugh and Youghiogheny River Watersheds" study concluded that the Mill Creek subwatershed has a value of the ecosystem services provided to residents and visitors as a dollar amount of $24,825,559 annually.

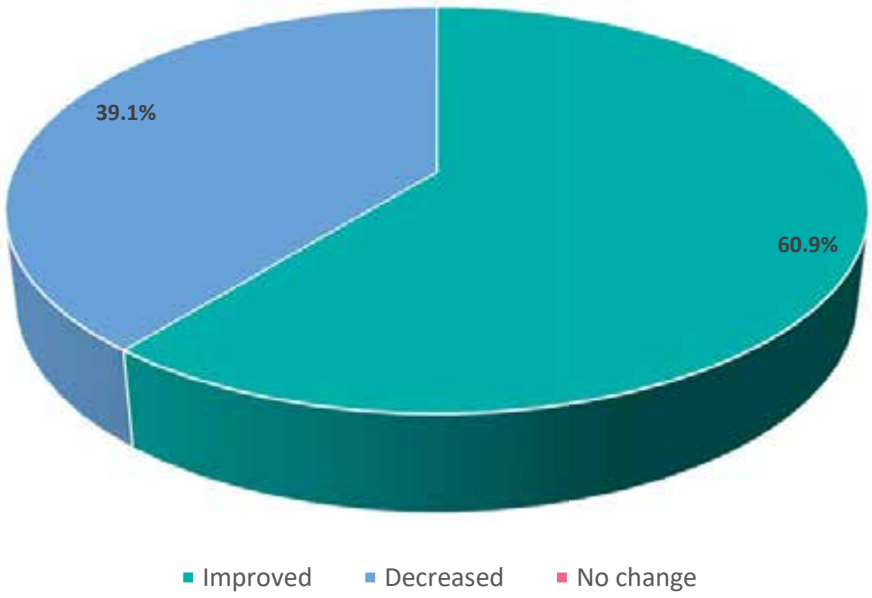
Assessment Results & Comparison

Figure 9: 2020 Mill Creek Assessment Results



Overall, the portions of the Mill Creek subwatershed assessed are in fair to good condition, due to the positive impacts from past streambank restoration and agricultural BMP's being installed within this area. Many of the residential and commercially developed areas along the mainstem in particular have significant riparian zone encroachment (roads and residential houses), which reduce the effectiveness of a functional riparian buffers.

Figure 10: Mill Creek Overall Comparison 2005 vs 2020



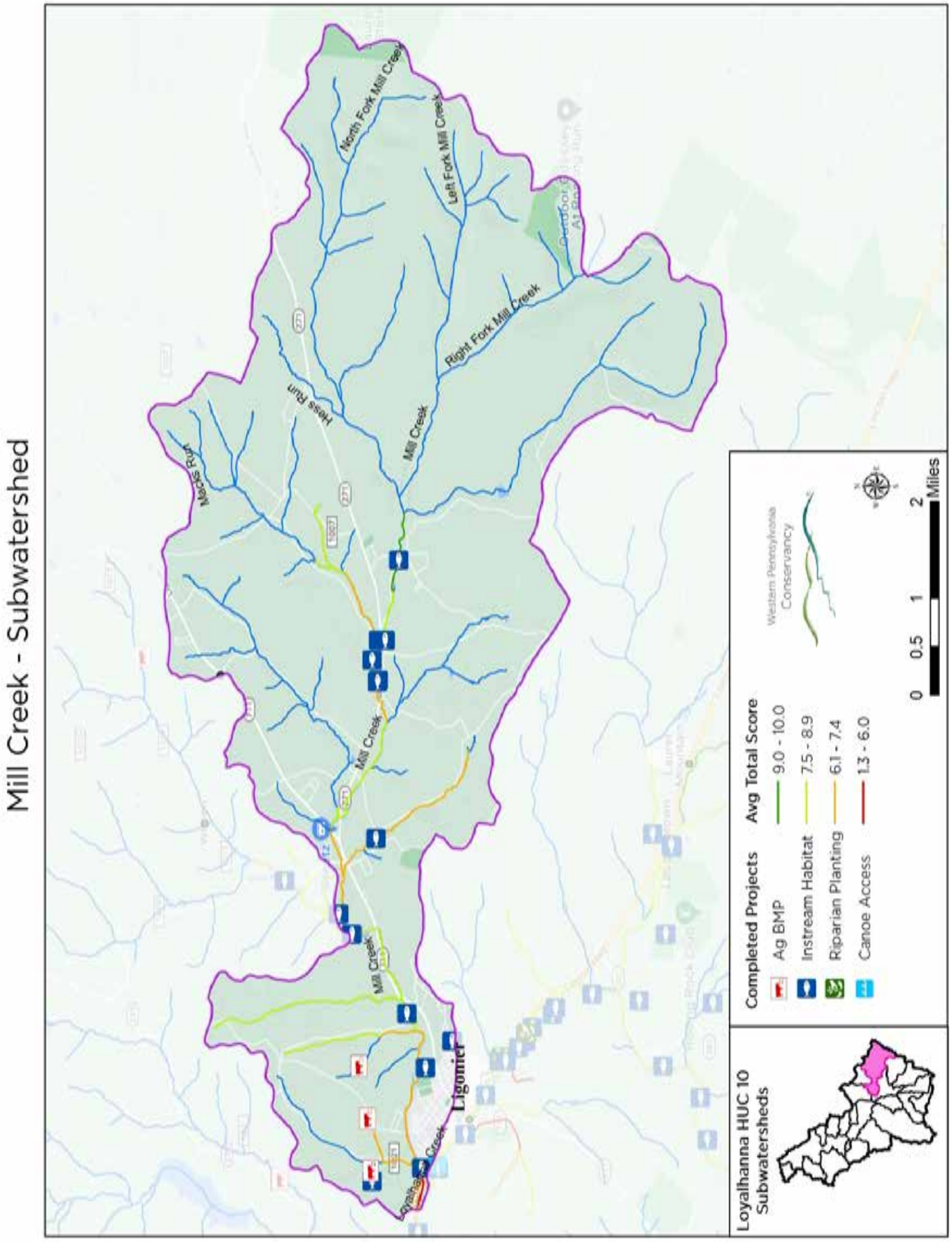
Restoration Priorities

From the updated assessment, it was determined that much of Mill Creek's mainstem has generally degraded in overall water quality, however; many of the tributaries have improved. Future restoration efforts should focus on these impacted lower scoring areas and implement AMD, streambank stabilization, and riparian enhancement projects. The issues of failing on-lot septic systems and lack of municipal wastewater infrastructure as well as dam removals to aid in aquatic organism passageway should also be further investigated. Also, landowners should be educated about the importance of stream buffers and not mow/trim to the edge of the stream. Refer to the following details listed on Table 4 and depicted on Map 4 for impact description, assessed segment locations and recommended restoration strategies.

Table 4: Restoration Strategies for Mill Creek

Stream Segment Name	Description of Impact	Restoration Strategy
MILLD 5952 *In Waterford, along Trout Avenue*	Stream Channel Conditions	Educate landowners. Investigate dam removal to re-open aquatic organism passage
MILLUNT2N 5937 *Trib to north side of Mill Creek, along Peoples Road*	AMD	Investigate sources of AMD
MILLUNT3N 5958 *Trib to north side of Mill Creek, through Ligonier Camp and Conference Center*	AMD	Investigate sources of AMD
MILLD 5952 *In Waterford, along Trout Avenue*	Nutrient Enrichment	Investigate sources of possible failing septic systems
Multiple segments	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques

Map 4: Assessed Stream Segments within the Mill Creek Subwatershed



Middle Loyalhanna Creek Watershed

Loyalhanna Creek Mainstem

(Two Mile Run Confluence to Saxman Run)

General Description

Loyalhanna Creek near confluence with Two Mile Run

The Middle Loyalhanna Creek subwatershed includes the area that drains portion of Ligonier, Unity and Derry Townships. This 14.86 square mile section begins downstream from the Two Mile Run confluence, west of Ligonier, and ends directly downstream of the confluence with Saxman Run, just outside of downtown Latrobe.

Flowing westward out of Ligonier, the middle section meanders through landscape similar to the Upper section. It is surrounded by a mix of forests, fields and rural homesteads. Upon reaching Latrobe, however, the character of the Loyalhanna changes drastically. The landscape becomes crowded with homes, businesses, industry and roads. The creek becomes channelized and water quality impacts increase as a result of that changed landscape.

Six named tributaries and ten un-named tributaries join the main stem of the Loyalhanna Creek in the middle section. The named tributaries include: Fourmile Run, Coalpit Run, Miller Run, Ninemile Run, Monastery Run, Unity Run and Saxman Run.

The beginning of the Middle Loyalhanna Creek subwatershed is located downstream from the confluence of Two Mile Run directly behind the historic Ice Pond property, now owned by Ligonier Camp & Conference Center, outside of Ligonier Borough. From that point, the Loyalhanna flows parallel to S.R. 30 through an area mixed with farm, forest and residences. Approximately one mile downstream, **Coalpit Run** joins the main stem from the north. This subwatershed flows from the east side of Chestnut Ridge draining steep terrain similar in composition to Laurel Ridge. The Coalpit Run subwatershed provides water to the Latrobe Reservoir, main drinking water source for the City of Latrobe.

As the Loyalhanna continues to flow west away from Ligonier, the mainstem passes directly through area attraction, Idlewild Park & SoakZone. Directly downstream of park, **Fourmile Run** enters from the south. Fourmile Run is a large tributary that originates close to the Pennsylvania Turnpike Donegal Interchange. It drains a rural landscape scattered with farms and homes.

Several homes are concentrated along the creek banks between the entrance of Fourmile Run and the opening to the Loyalhanna Gorge. Created by centuries of flowing water, the gorge cuts through the layers of sandstone, limestone and shale that comprise Chestnut Ridge. Its steep banks are scattered with large boulders, deciduous and conifer trees and native wild flowers. Westmoreland County Parks and Recreation owns and protects a majority of the land in and around the gorge. S.R. 30 flanks both sides of the creek and is the main travel route into Latrobe from the east. At one time, the Pennsylvania Railroad traveled the exact same path. Passing through the gorge, Loyalhanna Creek collects flow from four un-named tributaries.

After flowing several miles through the gorge, the Loyalhanna Creek emerges on the western side of Chestnut Ridge on the outskirts of Latrobe. It is slowed as it approaches the Latrobe Municipal Authority's "Kingston Dam" concrete water-intake structure at the junction of S.R. 30 and S.R. 217. In place since the late 1800's, the dam serves as the back-up drinking water supply for the City of Latrobe. An average flow of 335 cubic feet per second passes by the USGS Gauging Station immediately downstream of the dam. **Miller Run**, a small tributary to the middle main stem, enters the Loyalhanna below the Kingston Dam. It flows from the west side of Chestnut Ridge.

Kingston Dam

After winding through an open floodplain area, the Loyalhanna Creek takes a large turn northward toward the City of Latrobe. The mainstem passes underneath the S.R. 982 Bridge and 500 feet downstream, **Ninemile Run** enters from the south. Ninemile Run is a large subwatershed that drains the communities of Whitney, Hostetter, Baggaley and Youngstown. It originates on the west side of Chestnut Ridge south of Latrobe.

As the Loyalhanna Creek enters Latrobe, the creek banks become populated with active and inactive industry, businesses and residences. The presence of past and current industry is apparent on the northeast side of the stream as large steel manufacturing buildings and brownfield areas are visible. Directly across from Legion Keener Park in downtown Latrobe, **Monastery Run**, enters the Loyalhanna Creek from the southeast. This tributary contains a large source of AMD pollution and upon meeting the Loyalhanna, adds iron oxide sediment to the creek. Treatment systems in place since the late 1990s located upstream at Saint Vincent College have significantly reduced the impact of AMD made upon the Loyalhanna from Monastery Run, in addition to the Upper Latrobe Treatment System constructed in 2010 and managed by the Loyalhanna Watershed Association to alleviate the flow from three smaller AMD sources within the same area.

Downstream of the confluence with Monastery Run, the Loyalhanna enters into the heart of the City of Latrobe. The streambank was channelized for flood control by the U.S. Army Corps of Engineers in the 1950s in order to alleviate flooding within the downtown area. The creek remains channelized through a majority of this section.

Iron sludge removal at the Upper Latrobe system

Continuing through Latrobe, the Loyalhanna Creek remains surrounded by homes and/or businesses on both banks. After passing underneath the S.R. 981 Bridge, the Loyalhanna Creek continues to flow through a populated region. Not until reaching the outskirts of the city does population concentration decrease. It is also at this point that channelization becomes less apparent.

Saxman Run is the last tributary to enter the mainstem of the middle Loyalhanna Creek section. Heavily impacted by multiple sources of AMD, Saxman Run contributes a large amount of iron oxide to the creek as it makes its way out of Latrobe. Saxman Run enters the main stem directly behind the Latrobe Sewage Treatment Plant. Immediately following a confluence with Saxman Run, the middle section of the Loyalhanna ends on the outskirts of the City of Latrobe. The Loyalhanna Creek from Fourmile Run to Miller Run is classified as a TSF.

Overview of Historic Data/Projects

The majority of the existing historic information for the Middle Loyalhanna Creek subwatershed focuses primarily upon coal mining and its effects. This is due to the fact that coal mining has had such a significant impact on this portion of the subwatershed. Once the center of major productions of coal, coke, and steel, Latrobe had more than 11 deep mines and 3 steel mills operating during the early part of the 1900's. Most of the community was built around the industry that is no longer central to the area economy.

In addition to the Monastery Run and Upper Latrobe AMD treatment systems, three streambank restoration projects and three recreational and stream access projects have been completed within the Middle Loyalhanna Creek section since the original assessment in 2005. These projects are located on the upper and lower portions respectively.

- In 1994, the PAFBC completed a fish survey of the Loyalhanna Creek in downtown Latrobe. The mainstem was surveyed upstream and downstream from the mouth of Monastery Run. The purpose of the survey was to identify and count fish species in the creek prior to AMD remediation occurring upstream on Monastery Run. Electrofishing in the Loyalhanna Creek upstream section resulted in the collection of twelve species. Small mouth bass and excellent densities of minnows dominated the sample. Downstream of the confluence with Monastery Run, fewer fish were collected and only ten species classified.

- The "Valuing Clean Water: Ecosystem Service Values in the Loyalhanna-Conemaugh and Youghiogheny River Watersheds" study concluded that the Middle Loyalhanna Creek subwatershed has a combined value of the ecosystem services provided to residents and visitors as a dollar amount of $53,393,204 annually.

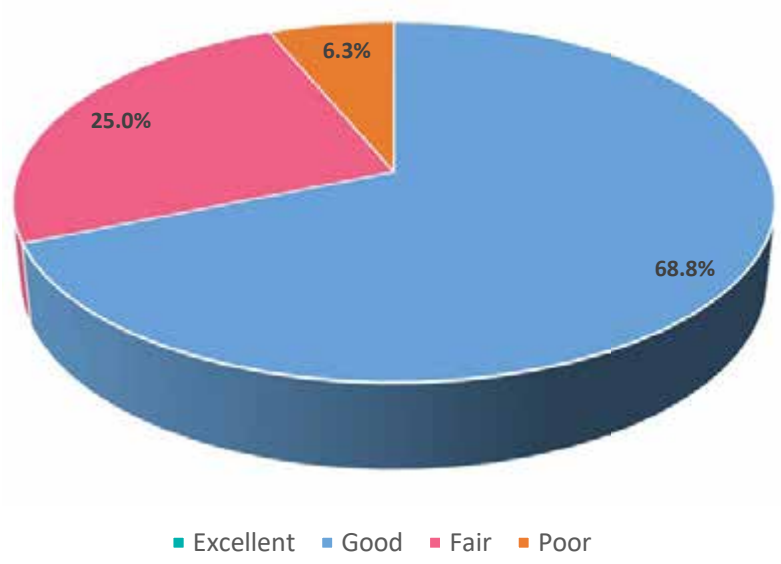
- In the study, “State of the Kiski-Conemaugh River Watershed: Community Shift”, four sites along the Loyalhanna Creek mainstem were surveyed for fish populations in 2015 to determine biological comparisons. These sites included two within the Middle Watershed (Site 3 - Loyalhanna at 982 bridge, Site 4 - Loyalhanna at Cardinal Park.)

- In 2000 and 2009, the Pennsylvania Fish & Boat Commission conducted surveys at these sites. Most notably, an increase in the diversity of fish species was found in the middle Loyalhanna section at Site 3, which was determined to be one of the most biologically diverse stream sections within the Kiskiminetas River Basin.

- In 2015, the Conemaugh Valley Conservancy surveyed Site 3 and collected 23 species of fish. The distribution of species was not identical to the 2009 sampling, but pollution intolerant species such as redhorse, still remained at the site (Reckner, 2017.) At Site 4, 19 species were collected, which included bass. No trout were collected during this August 2015 sampling event.

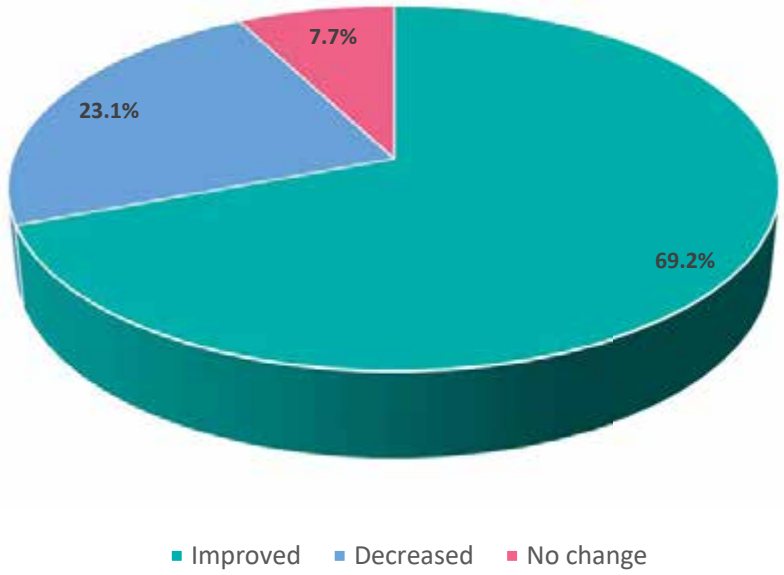
Assessment Results & Comparison

Figure 11: 2020 Middle Loyalhanna Assessment Results



Overall the portions of the Middle Loyalhanna Creek drainage assessed are in mostly good condition. Many of the developed areas have significant riparian zone encroachment (roads and residential houses) which reduce the effectiveness of a functional riparian buffers. One significant aquatic organism passage obstruction is caused by the Kingston Dam. Also, an abundance of invasive Japanese Knotweed is evident along virtually all of the streambanks throughout the Middle Loyalhanna mainstem. Large portions of the stream paralleling S.R. 30, have extensive channelization present.

Figure 12: Middle Loyalhanna Overall Comparison 2005 vs 2020



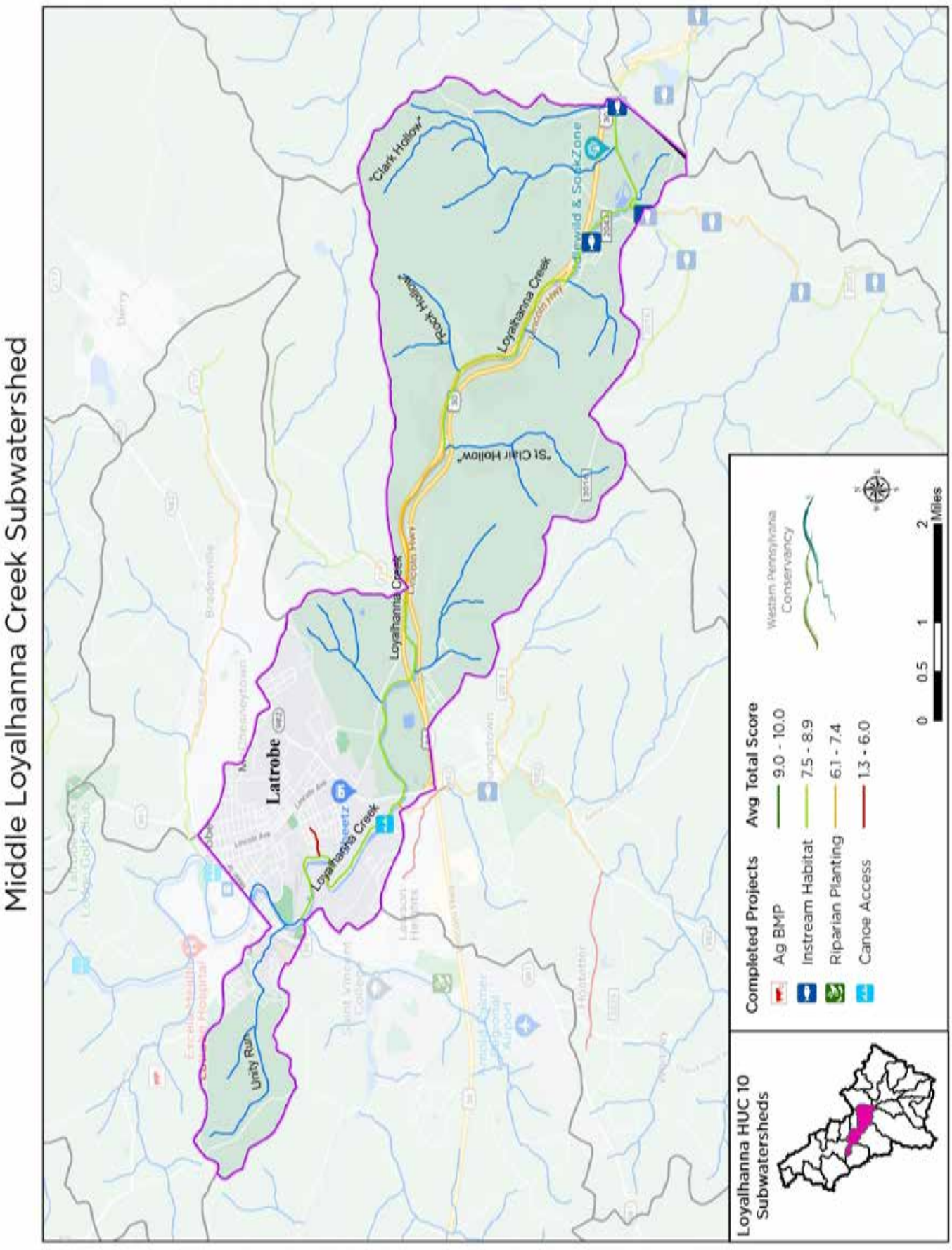
Restoration Priorities

The results of this re-assessment study showed that much of the mainstem of the Middle Loyalhanna Creek has generally improved in overall water quality compared to the 2005 assessment. Future restoration efforts should focus on the impacted lower scoring areas and should include implementing additional AMD treatment where feasible on some of the significant tributary streams, streambank stabilization, and riparian enhancement projects. Also, landowners should be educated about the importance of stream buffers and not to mow/trim to the edge of the stream. Refer to the following details listed on Table 5 and depicted on Map 5 for impact description, assessed segment locations and recommended restoration strategies.

Table 5: Restoration Strategies for the Middle Loyalhanna Creek Mainstem

Stream Segment Name	Description of Impact	Restoration Strategy
MIDLOYC 5773 *Mainstem Loyalhanna at junction of SR 30 and SR 217*	Stream Channel Conditions	Work with local partners to investigate removal of the Kingston Dam as well as other aquatic organism passage barriers through the Gorge and near the confluence with Miller Run
Multiple segments	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques

Map 5: Assessed Stream Segments within the Middle Loyalhanna Creek Watershed



Fourmile Run

General Description

Extensive erosion exists along sections of Fourmile Run

The Fourmile Run subwatershed originates at the intersection of S.R. 711 South and the Pennsylvania Turnpike in Donegal. It is located in Ligonier and Cook Townships south of S.R. 30, west of S.R. 711 and north of the Turnpike. Its 39.74 square miles are a mix of rural and forested landscapes. The watershed is known for Donegal Lake, a recreational use lake via constructed dam close to its headwaters that is managed by the PA Fish & Boat Commission.

The headwaters of Fourmile Run flow from a pond that trickles into a stream and immediately underneath the Turnpike. For approximately one to two miles, the main stem makes its way south through a forest, residential area and finally a farm. Quickly passing underneath S.R. 711, Fourmile Run spills into Donegal Lake. Donegal Lake was built in 1967 to provide recreational angling and non-powered boating. The 90-acre lake was drained in 2016 to undergo a dam rehabilitation project, which was eventually competed in 2020.

At the outflow of Donegal Lake, Fourmile retreats into a forested landscape with scattered streamside residences. Just downstream of the lake outlet, the main stem meanders along the western border of Randall Reserve, a 400-acre area of privately owned protected land. After flowing past the reserve, the stream passes underneath S.R. 130 as it travels east to west. The surrounding landscape continues to be dominated by forest and that forest is consistent until the stream shoots under Bethel Church Road. It is at this point that the stream begins to widen and flow more slowly. A small cluster of residences is concentrated at the intersection of Fourmile Run and Bethel Church Road, many of which sit close to the stream. Downstream of the small community, Fourmile flows through a wide, flat area choked with small trees and scrubby vegetation. As it continues to flow south, it makes its way back into a forested area with steep banks on either side. At this point, the depth and velocity of the stream increases.

Two miles from the mouth, the character of Fourmile Run changes significantly again. This area is at the outskirts of the residential community of Darlington where the stream again moves through another wide, flat area. Permanent and seasonal residences are scattered along the streambanks until it meets the Loyalhanna Creek mainstem. That confluence occurs just upstream of the Idlewild Hill Road Bridge and directly behind the western end of Idlewild and SoakZone Amusement Park. Fourmile Run is classified as a TSF.

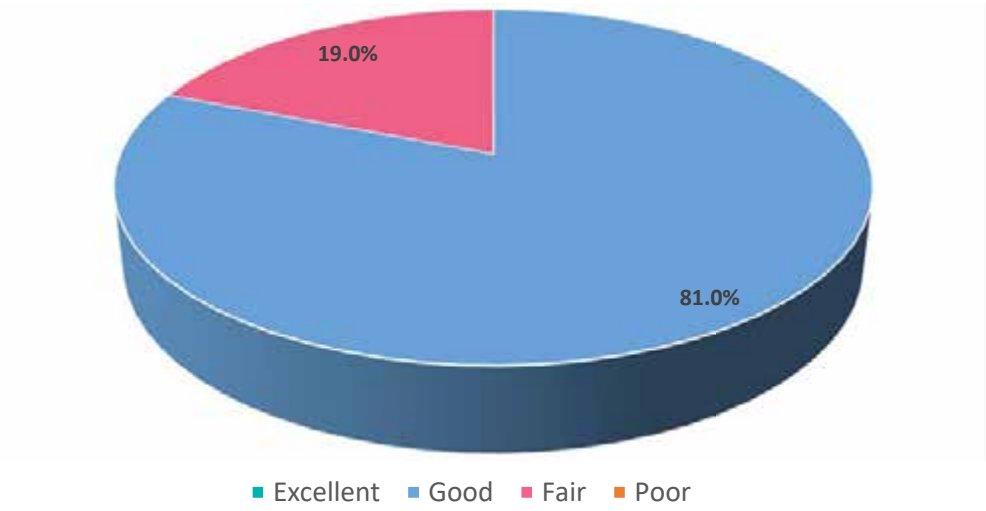
Overview of Historic Data/Projects

Ten streambank restoration projects encompassing an estimated 16,000 feet of stream were completed within the Fourmile Run subwatershed since the original assessment in 2005. These projects are located throughout the middle and lower portions of Fourmile Run, and effectively treat some of the significant streambank erosion problems along this waterway via in-stream structures and restored riparian plantings. Erosion and sedimentation still hinder this large tributary to the Loyalhanna Creek, however the water quality of this stream still remains consistently very good and holds an abundance of aquatic life.

- A fish survey completed in 1987 by the PA Fish & Boat Commission showed good diversity of warm and coldwater fish species. Two sites were sampled along a very long stretch of stream extending from below Donegal Lake toward the community of Darlington. Chemical testing showed that the water was alkaline and had good overall quality. The recommendation was made to upgrade the current Chapter 93 designation of Fourmile Run from Trout Stocked Fishery to High Quality Trout Stocked Fishery. This has not yet occurred.
- The PA Fish & Boat Commission completed a lengthy dam rehabilitation project in 2020, following the complete draining of Donegal Lake that began in 2016 when the previous dam was deemed unsafe. Additional lake habitat structures were added to encourage fish spawning after the lake was refilled. The lake will continue to be managed by the Commission as a trout stocked waterway and beginning in 2020, Commission biologists and hatchery staff will begin to implement multi-year restocking plans on the lake to include the introduction of fingerling-sized warmwater gamefish including largemouth bass, as well as various panfish and minnows.
- Fourmile Run was previously listed as an historic site location within the Loyalhanna Creek Watershed for the presence of the Eastern Hellbender salamander. As such, water samples were collected from a location within the middle-lower section of Fourmile and then filtered to collect eDNA for analysis from project partners from Roanoke College. The laboratory at Roanoke used qPCR technique to amplify and detect the presence of Hellbender eDNA within the samples. Results indicated that the Eastern Hellbender Salamander is present within the sample area in Fourmile Run. Detection levels for the sample collection site were equivalent to the positive field control sample.
- A freshwater mussel survey was also performed within the middle section of Fourmile Run by staff from the Western PA Conservancy in June, 2020. Species found include the Wavyrayed Lampmussel, Flutedshell, Kidneyshell, Creeper, and Spike throughout the survey area. In addition, one Clubshell mussel was identified. This species is listed as endangered and as of 2018, I was not listed previously in Fourmile Run although it had been found in the Loyalhanna Creek.
- The “Valuing Clean Water: Ecosystem Service Values in the Loyalhanna-Conemaugh and Youghiogheny River Watersheds” study concluded that the Fourmile Run subwatershed has a combined value of the ecosystem services provided to residents and visitors as a dollar amount of $34,948,679 annually.

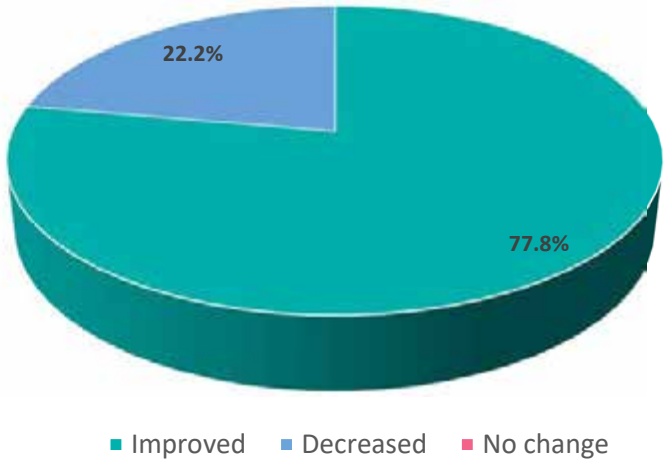
Assessment Results & Comparison

Figure 13: 2020 Fourmile Run Assessment Results



Overall, all portions of the Fourmile Run subwatershed assessed were found to be in good (81%) to fair (19%) condition. Many of the streambank restoration projects completed previously have greatly reduced the amount of sedimentation entering the waterway as well as continue to provide adequate in-stream habitat to allow for thriving fish and macroinvertebrate populations year-round. However, several larger tracts of farmland were identified and needing agricultural BMP's as well as riparian restoration work. The developed areas along the stream also have significant riparian zone encroachment (roads and residential houses) which reduce the effectiveness of a functional riparian buffer.

Figure 14: Fourmile Run Overall Comparison 2005 vs 2020



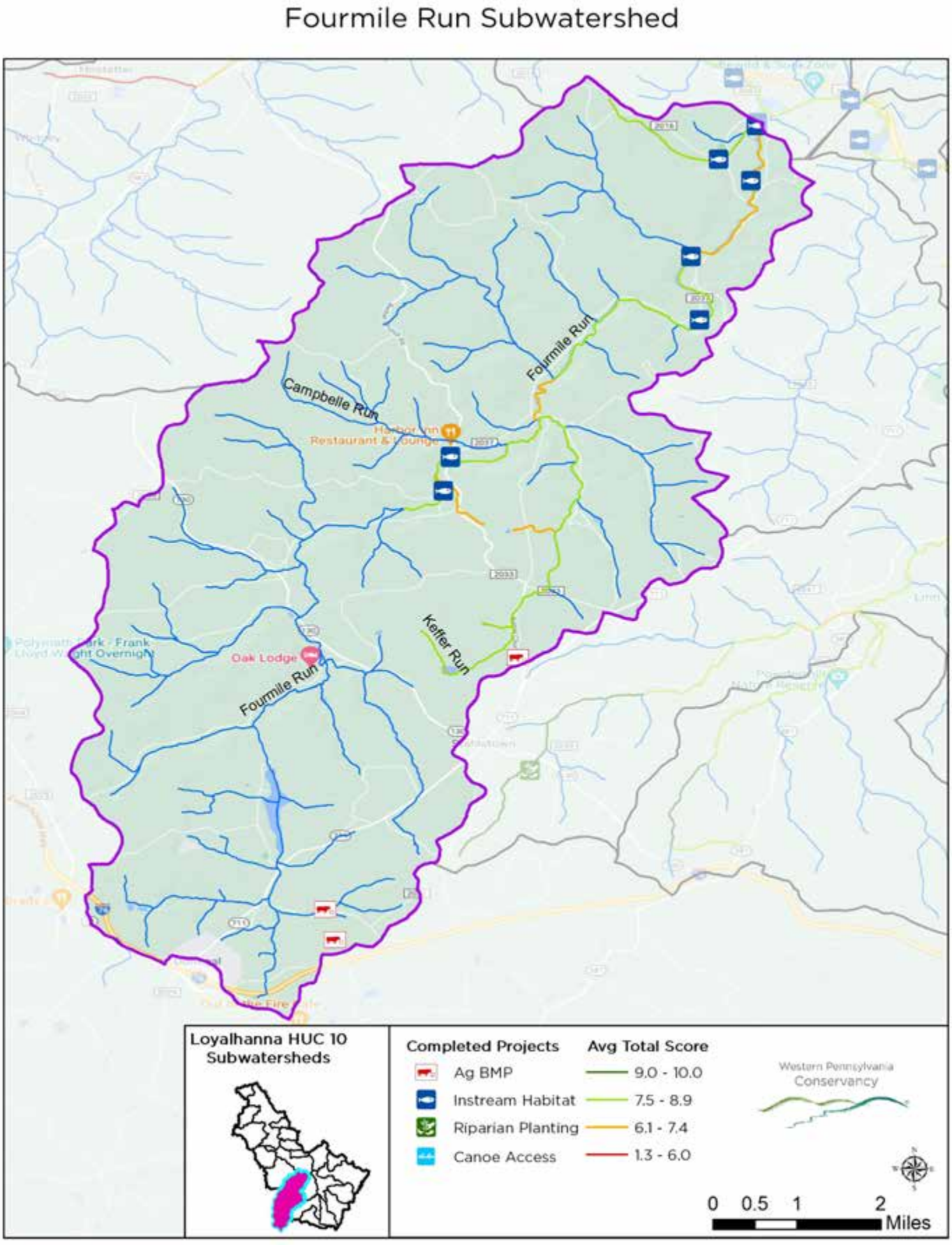
Restoration Priorities

From the updated assessment, while much of the Fourmile Run mainstem, as well as the large tributary Keffer Run, has generally improved in overall water quality, there is still a notable 22% decrease seen in the Fourmile Run subwatershed. Future restoration efforts should focus on these impacted lower scoring areas through the implementation of additional streambank stabilization, and riparian enhancement projects. Several existing culverts and ponds act as aquatic organism passage barriers along the length of the stream, and there are many farms identified as lacking adequate stream buffers. Also, landowners should continue to be educated about the importance of maintaining stream buffers and not mow/trim to the edge of the stream. Refer to the following details listed on Table 6 and depicted on Map 6 for impact description, assessed segment locations and recommended restoration strategies.

Table 6: Restoration Strategies for Fourmile Run

Stream Segment Name	Description of Impact	Restoration Strategy
FMRF 6100 *Along Fourmile Run Road, above Kline Road*	Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement riparian planting techniques
FMRKRB 6170 *Fourmile mainstem along UP Church Road and Labrador Drive*	In-Stream Habitat & Erosion	Implement streambank restoration and riparian planting techniques
FMRE 6063 *Along Darlington Road and Fourmile Run Road*	Nutrient Enrichment; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement riparian planting techniques
FMRKRB 6152 *Keffer Run mainstem along UP Church Road*	Nutrient Enrichment; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement riparian planting techniques
FMRKRB 6188 *UNT to Keffer Run, crossing Mansville Rd*	Nutrient Enrichment; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement riparian planting techniques
Multiple segments	Stream Channel Conditions (Aquatic Organism Passageway)	Investigate potential culvert replacements
Multiple segments	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques

Map 6: Assessed Stream Segments within the Fourmile Run Subwatershed



Miller Run

General Description

Miller Run is a small named tributary in the Middle Loyalhanna Creek Watershed. This 3.57 square mile watershed drains the western slope of Chestnut Ridge to meet the Loyalhanna Creek main stem at the junction of S.R. 30 and S.R. 217. In its headwaters, a large reservoir is fed by multiple headwater spring sources emanating from limestone rock outcroppings. After pouring from the reservoirs, Miller Run cascades through a heavily forested hollow west toward Latrobe. The waterway does not encounter much infrastructure until it reaches the former industrial plant previously operated by Kennametal and small cluster of homes along S.R. 217. Some channelization occurs in this area and the substrate contains more gravel and silt as it begins to lose some of the riparian area that had been present for most of its length. Upon passing underneath S.R. 217, Miller Run turns south and flows passed the Latrobe Municipal Authority headquarters to meet the Loyalhanna Creek mainstem. This confluence occurs directly below the Kingston Dam. It is near this point where the stream substrate shows an increase in sediment. In addition, the majority of the riparian area that is left is choked with Japanese Knotweed.

Unknown discharge into Miller Run

The Miller Run watershed landscape shows evidence of past surface and deep mining operations. The flooded workings of the Frances Deep Mine are located underneath portions of the watershed. In addition, two deep mine entry points are indicated on USGS Topographic maps. From its headwaters to where it meets S.R. 217, recent mining operations have extracted coal from the ground. Despite past and current mining, Miller Run shows no significant evidence of impacts from mine drainage. Miller Run is classified as a HQ-CWF.

Overview of Historic Data/Projects

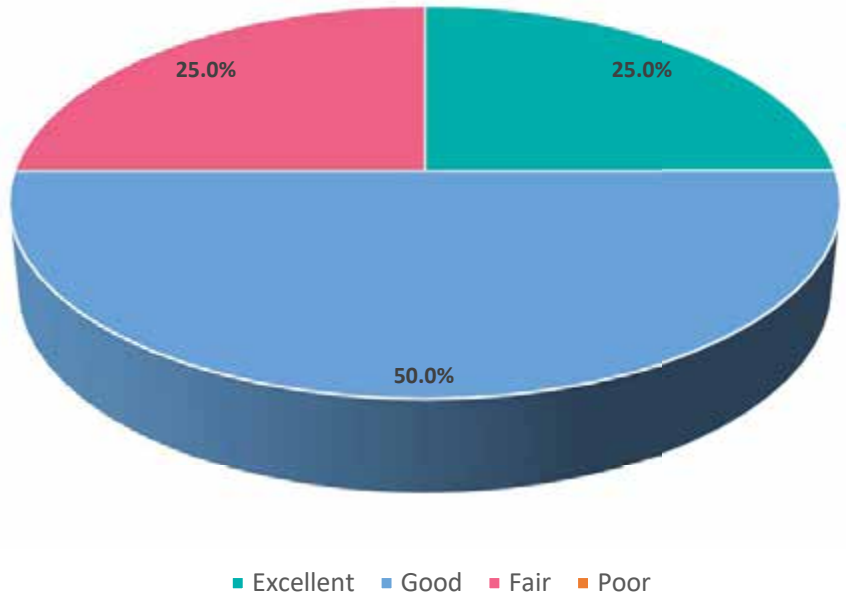
- In 1983, Miller Run was assessed by the PA Fish & Boat Commission. They reported chemical composition changes from the ridge source of the stream to the valley. Recorded pH values included 6.4 and 6.6 at two different locations. Invertebrates within the sampled section were not too numerous, but sensitive taxa dominated the sample. In the upper portion of the watershed, only three fish species were collected; creek chubs, sculpin and blacknose dace. Close to the mouth, however, brown trout and brook trout were collected. The conclusion of the assessment was that Miller Run remain designated a High Quality Fishery.

- Multiple surface mining and re-mining operations occurred throughout the Miller Run watershed. Various reports are available regarding each of those different operations. In 2000-2003, three separate operations occurred; one at the extreme headwaters and two in the middle section.

- The Scarlift Report identified two acidic seeps within the Miller Run subwatershed. Both were small, emanating from failing mine seals and abandoned shafts. The more significant seep was found from an old seal emptying into Miller Run close to the intersection of S.R. 30 and S.R. 217. Although this seal was supposedly repaired, it is recommended to investigate this further to determine if a leak is still occurring here.

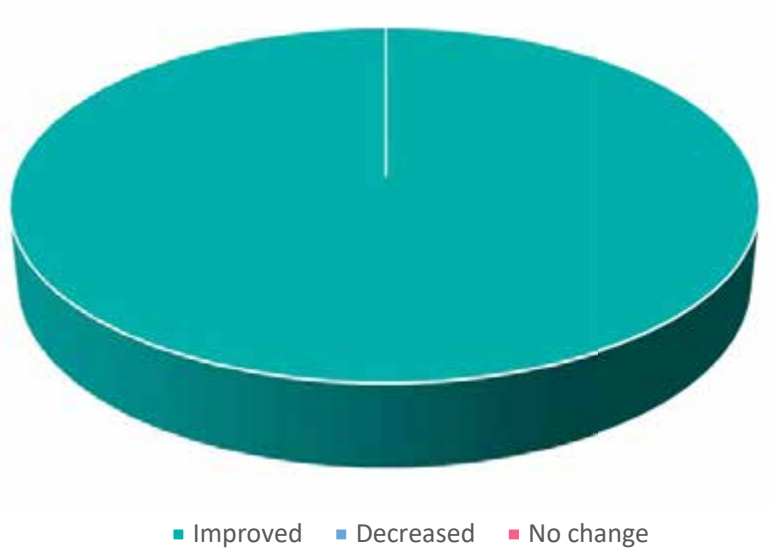
Assessment Results & Comparison

Figure 15: 2020 Miller Run Assessment Results



Overall, the portions of the Miller Run drainage assessed are in good condition. An aquatic organism passage barrier and potential AMD seep are located in the lower portion of the watershed near the confluence with the Loyalhanna Creek. Many of the developed areas have significant riparian zone encroachment (roads and residential houses) which reduce the effectiveness of a functional riparian buffer and the heavy presence of invasive, mainly Japanese Knotweed, comprise any existing buffer within the lower portion of Miller Run. The stream is also channelized in the lower portion.

Figure 16: Miller Run Overall Comparison 2005 vs 2020



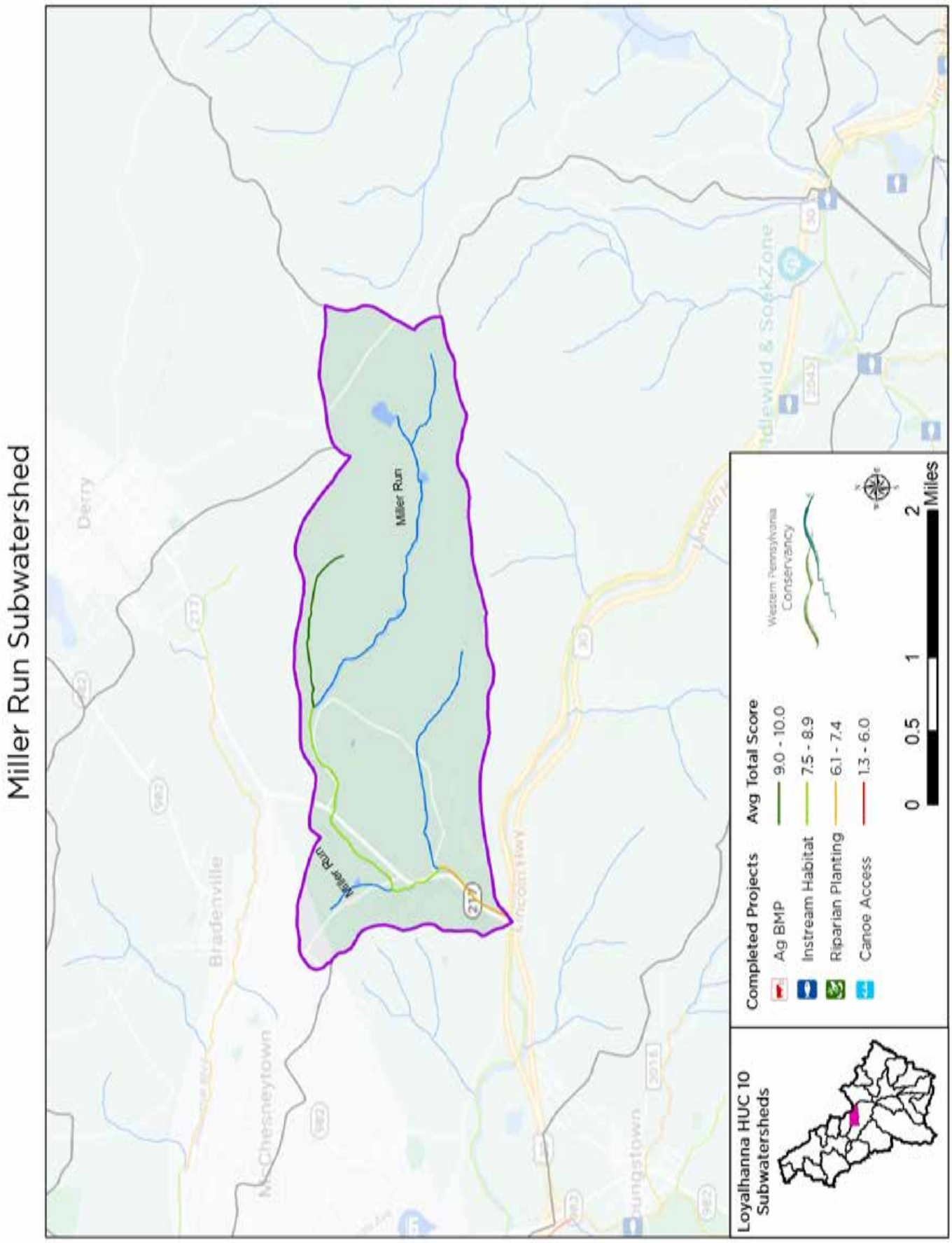
Restoration Priorities

From the updated assessment, much of mainstem Miller Run has generally improved in overall water quality. Future restoration efforts should focus on these impacted lower scoring areas and investigate sources of AMD, as well as implement streambank stabilization, aquatic organism passage, invasive species control and riparian enhancement projects. Also, landowners should be educated about the importance of stream buffers and not mow/trim to the edge of the stream. Refer to the following details listed on Table 7 and depicted on Map 7 for impact description, assessed segment locations and recommended restoration strategies.

Table 7: Restoration Strategies for Miller Run

Stream Segment Name	Description of Impact	Restoration Strategy
MILLRA 5737 *Lower segment of Miler Run along SR 217, above confluence with Loyalhanna*	Stream Channel Conditions (Aquatic Organism Passageway)	Investigate concrete barrier at mouth of Miller Run in relation to Kingston Dam removal to re-open aquatic organism passage within this section
MILLRA 5737 *Lower segment of Miller Run along SR 217, above confluence with Loyalhanna*	AMD	Investigate sources of AMD pollution from old mine seal
Multiple segments	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and riparian buffer plantings. Invasive species control at lower segment near mouth

Map 7: Assessed Stream Segments within the Miller Run Subwatershed



Ninemile Run

General Description

The 19.85 square mile Ninemile Run subwatershed is located in the southeast corner of Unity Township. Ninemile Run and its tributaries drain the western slope of Chestnut Ridge and flow through the communities of Lycippus, Whitney, Baggaley and Youngstown. The headwaters of Ninemile Run are located just east of the community of Lycippus along S.R. 130. Spring sources emanating from rocky hillsides create the mainstem which then flows north along the base of Chestnut Ridge. It collects flow from fourteen named and un-named tributaries as it follows S.R. 982 toward Latrobe.

Hostetter AMD Treatment Project

From the headwaters, Ninemile Run immediately flows into a rural landscape. It is this landscape that dominates the watershed until it reaches the Loyalhanna Creek mainstem. After leaving Lycippus, Ninemile Run passes through the communities of Whitney, Baggaley and Hostetter. Each of the communities are historic mining areas where coal mining once dominated the landscape. The three towns still show small remnants of their historic mining operations. Only one tributary, flowing from Hostetter, shows signs of AMD as a result of the deep mining that took place.

After passing through those small communities, Ninemile Run winds through the privately-owned Latrobe Country Club. Upon reaching Youngstown, it skirts the major population concentration and flows west around the community. After quickly flowing through Latrobe Rotary Park at the base of the Greater Latrobe Junior/Senior High School complex, Ninemile Run meets S.R. 30. Large underpasses provide passage for the stream as it moves to meet the Loyalhanna mainstem. That confluence occurs approximately 1,500 yards downstream of S.R. 30 and 500 yards from the S.R. 982 N bridge over the Loyalhanna. Ninemile Run is classified as a WWF, with the exception of one tributary, Indian Camp Run. Indian Camp Run, entering Ninemile Run from the east, is classified as a HQ-CWF.

Overview of Historic Data/Projects

- The Hostetter AMD Treatment Project was completed in 2019 by the PA Department of Environmental Protection. The reclamation effort included the installation of a passive treatment system to address

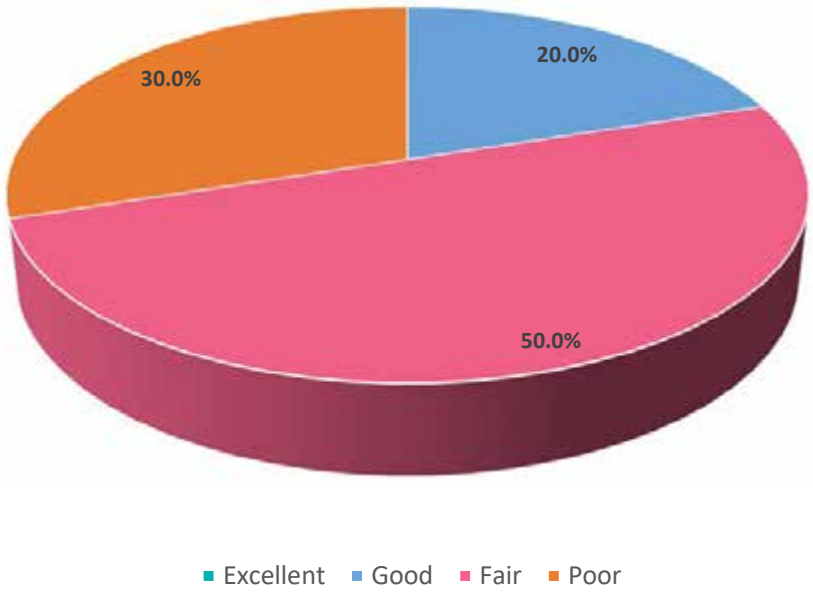
severely degraded AMD issues from a reclaimed area containing substantial coal refuse. An Oxidation Precipitation Channel, horizontal flow limestone bed and settling pond help to stabilize pH levels and remove iron and aluminum from entering an unnamed tributary to Ninemile Run.

- Several streambank restoration projects have been completed along Ninemile Run near Rotary Park in partnership with Greater Latrobe Senior High School Capstone classes and the Western PA Conservancy since the original assessment was completed in 2005. Additional in-stream habitat and streambank erosion projects have been constructed upstream from Rotary Park, and in the community of Whitney. These projects are located throughout the lower portions of Ninemile Run, and help to support the stocked trout fishery.

- The "Valuing Clean Water: Ecosystem Service Values in the Loyalhanna-Conemaugh and Youghiogheny River Watersheds" study concluded that the Ninemile Run subwatershed has a combined value of the ecosystem services provided to residents and visitors as a dollar amount of $19,123,386 annually.

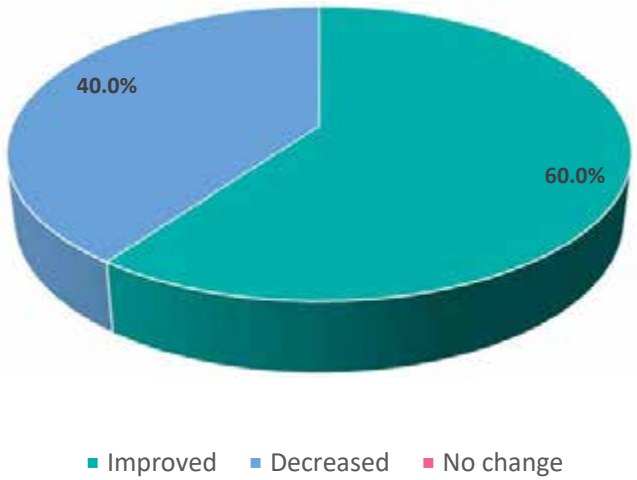
Assessment Results & Comparison

Figure 17: 2020 Ninemile Run Assessment Results



Overall, the portions of the Ninemile Run subwatershed assessed are in fair condition (50%). Past streambank restoration projects that were previously constructed near Rotary Park are functioning well. Many of the developed areas continue to have significant riparian zone encroachment (roads and residential houses) which reduce the effectiveness of riparian buffers. The stream segment flowing through Latrobe Country Club is hindered by aquatic organism passage, streambank erosion, and also lacking riparian buffers from course grooming. A potential discussion with the Club Manager might offer some potential options that would be functional for both purposes. Also, the recently installed AMD treatment system in Hostetter should continue to be monitored in partnership with the PA Department of Environmental Protection.

Figure 18: Ninemile Run Overall Comparison 2005 vs 2020



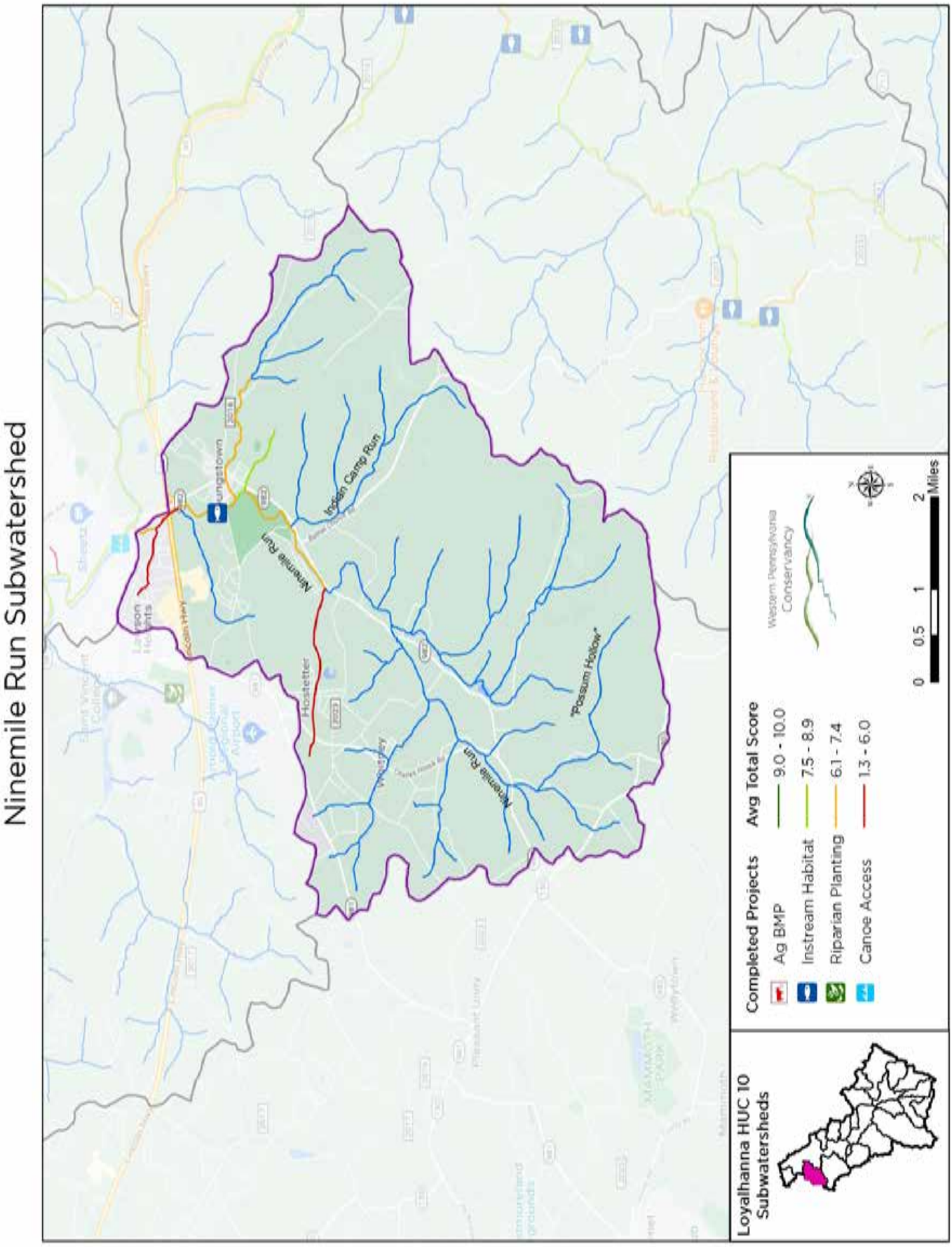
Restoration Priorities

From the updated assessment, about 60% of Ninemile Run has generally improved and 40% has degraded in overall water quality. Future restoration efforts should focus on these impacted lower scoring areas by implementing aquatic organism passageway removal, streambank stabilization projects, and riparian enhancement. Also, landowners should be educated about the importance of stream buffers and not mow/trim to the edge of the stream, in particular, a discussion with Latrobe Country Club. Refer to the following details listed on Table 8 and depicted on Map 8 for impact description, assessed segment locations and recommended restoration strategies.

Table 8: Restoration Strategies for Ninemile Run

Stream Segment Name	Description of Impact	Restoration Strategy
NMRC 5852 *Stream segment through Latrobe Country Club, by SR 982*	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques
NMRC 5852 *Stream segment through Latrobe Country Club, by SR 982*	Stream Channel Conditions (Aquatic Organism Passageway)	Educate landowners. Investigate dam removal to re-open aquatic organism passage
NMRUNT3WA 5872 *UNT to Fourmile Run through Hostetter*	AMD	Monitor newly installed AMD treatment system
NMRA 5774 *Ninemile Run crossing Rt 30*	Nutrient Enrichment	Investigate sources of possible failing septic systems
Multiple segments	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques

Map 8: Assessed Stream Segments within the Ninemile Run Subwatershed



Saxman Run

General Description

The 6.2 square mile Saxman Run subwatershed is located in the southeast portion of Derry Township. Saxman Run and its tributaries flow westward following the Norfolk-Southern Railroad Line. Saxman Run flows through the communities of West Derry, Bradenville, Snydertown and Loyalhanna.

The headwaters of Saxman Run trickle out of a forested hillside south of S.R. 217 in West Derry. The stream briefly flows north to meet S.R. 217 and turns to flow west toward Latrobe. This is the only portion of the entire mainstem that is not impacted by Abandoned Mine Drainage from multiple discharges along its length. However, it is classified as a Warm Water Fishery, despite the lack of aquatic life due to this pollution source.

Saxman Run flowing under the Norfolk Southern Railroad

Upon passing underneath S.R. 217, Saxman Run flows into a residential area where homes and small businesses line the stream. At the intersection of S.R. 217 and Industrial Drive, Saxman Run continues to flow through the community of Bradenville. Close to that intersection, the stream flows through a wetland surrounded by scrubby forest containing shrubs and small trees. At the former Bradenville Elementary School, Saxman Run emerges from the scrub forest and moves into a residential area once again.

Not until passing through the small community of Snydertown does the landscape surrounding Saxman Run change. Residences are replaced by large factories and warehouse buildings, especially on the northern side of the stream. The riparian area surrounding Saxman Run is significant, but dominated by undesirable invasive vegetation such as multiflora rose, Japanese knotweed, and green briar.

Saxman Run breaks away from the Industrial Drive as it intersects with S.R. 981 N. Here, Saxman Run briefly turns north to pass underneath the Norfolk-Southern Railroad. It then flows underneath Lattanzio Road and behind the Latrobe Sewage Treatment Plant. Finally, Saxman Run meets the Loyalhanna Creek mainstem immediately downstream of the sewage treatment plant.

Overview of Historic Data/Projects

At the turn of the 19th century, the Saxman Run subwatershed contained at least three major deep mines and multiple surface mines. According to the 1972 Scarlift Report, there were seventeen known deep mines of

various sizes located within the entire subwatershed. The mines extended from the headwaters to the mouth of the stream and include the Pittsburgh, Upper Freeport, and Freeport coal seams that were all mined extensively. Physical evidence of the strong coal mining presence is sparse and includes mostly patch town homes and small refuse piles. The most visible evidence of coal mining within the subwatershed can be found in the water flowing within Saxman Run. More than 75% of the Saxman Run subwatershed is impacted by AMD. Approximately 90% of the main stem is impacted by AMD.

There are four known discharges within the Saxman Run subwatershed. These include the "West Derry Discharge", an acidic discharge entering Saxman Run near the intersection of Valley Street and S.R. 217, "West Derry Discharge #2", an inconsistent, flowing seep from a suspected mine entry area near the West Derry Discharge location of similar chemistry, "Upper Saxman Discharge", the largest of the four, which currently flows at an average rate of 5,000 gpm unobstructed through a concrete vault/pipe that contains infrastructure related to a hydroelectric pilot project completed by LWA in 2010 near Lattanzio Road, and the "Lower Saxman Discharge", located adjacent to and across Lattanzio Road from the Upper Saxman Discharge.

- Since the summer of 2001, water quality samples have been collected from discharges located within the Saxman Run subwatershed through LWA's water monitoring program.

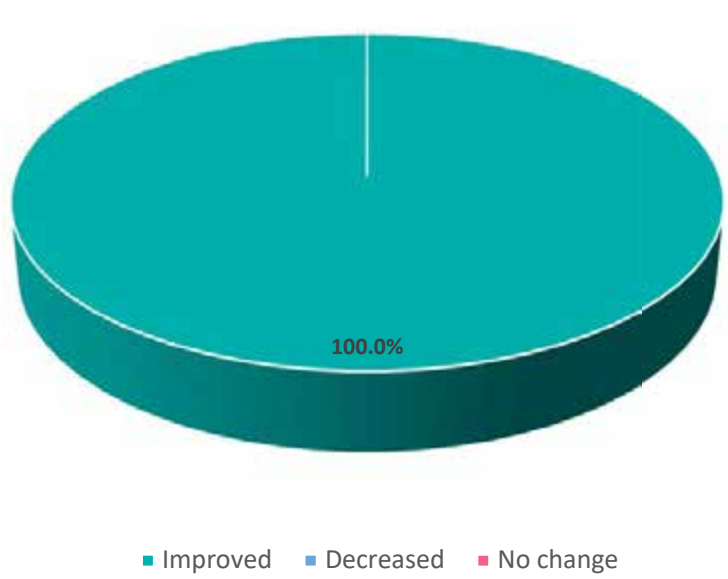
- In 2002, Saint Vincent College received a Growing Greener Grant to operate a pilot project to study innovative treatment of AMD. Using technology designed by Jon Dietz, Saint Vincent College and partners directed a portion of flow from the Lower Saxman Discharge into a special reactor. In that reactor, Activated Iron Sludge (AIS), would accelerate the precipitation of iron oxide from AMD. The project indicated that the reactor successfully accelerated iron oxide removal.

- In 2010, LWA completed a three-year project that involved relocating the Upper Saxman Discharge through a pipeline to a site further downstream near the Latrobe Sewage Treatment Plant in the event that additional land would become available to construct a passive treatment system project in the future. In the process of the relocation, a pilot study, the Saxman Run Hydroelectric Project, was also conducted utilizing the energy of the flowing minewater to produce electricity. A turbine was constructed near the output of the discharge pipe, and approximately 3kW of electricity was successfully generated through the system.

- At the time of this assessment, there are no known watershed restoration projects installed with the Saxman Run subwatershed.

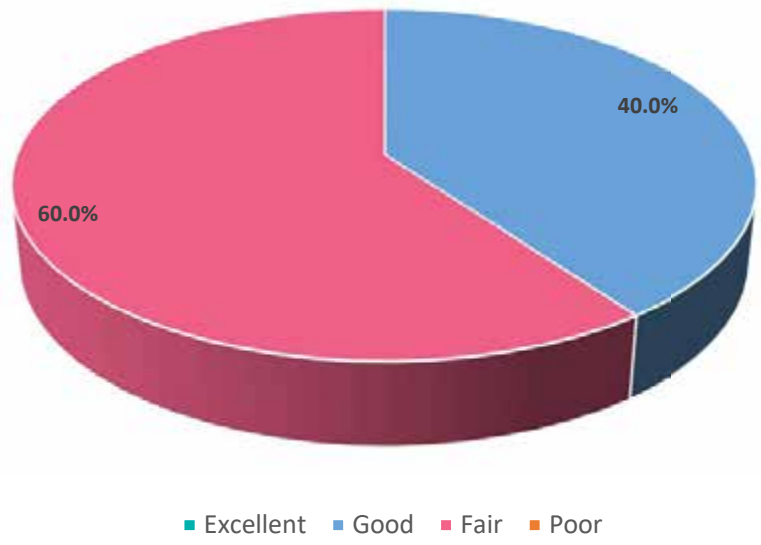
Assessment Results & Comparison

Figure 19: 2020 Saxman Run Assessment Results



Overall, the portions of the Saxman Run drainage assessed are in fair condition. The West Derry, Upper Saxman and Lower Saxman Run AMD Discharges were located through the area that was re-assessed, and future treatment of these should be further investigated. Precipitated iron oxide is apparent throughout the lower reaches of Saxman Run. Developed areas have significant riparian zone encroachment (roads and residential houses) which reduce the effectiveness of a functional riparian buffers.

Figure 20: Saxman Run Overall Comparison 2005 vs 2020



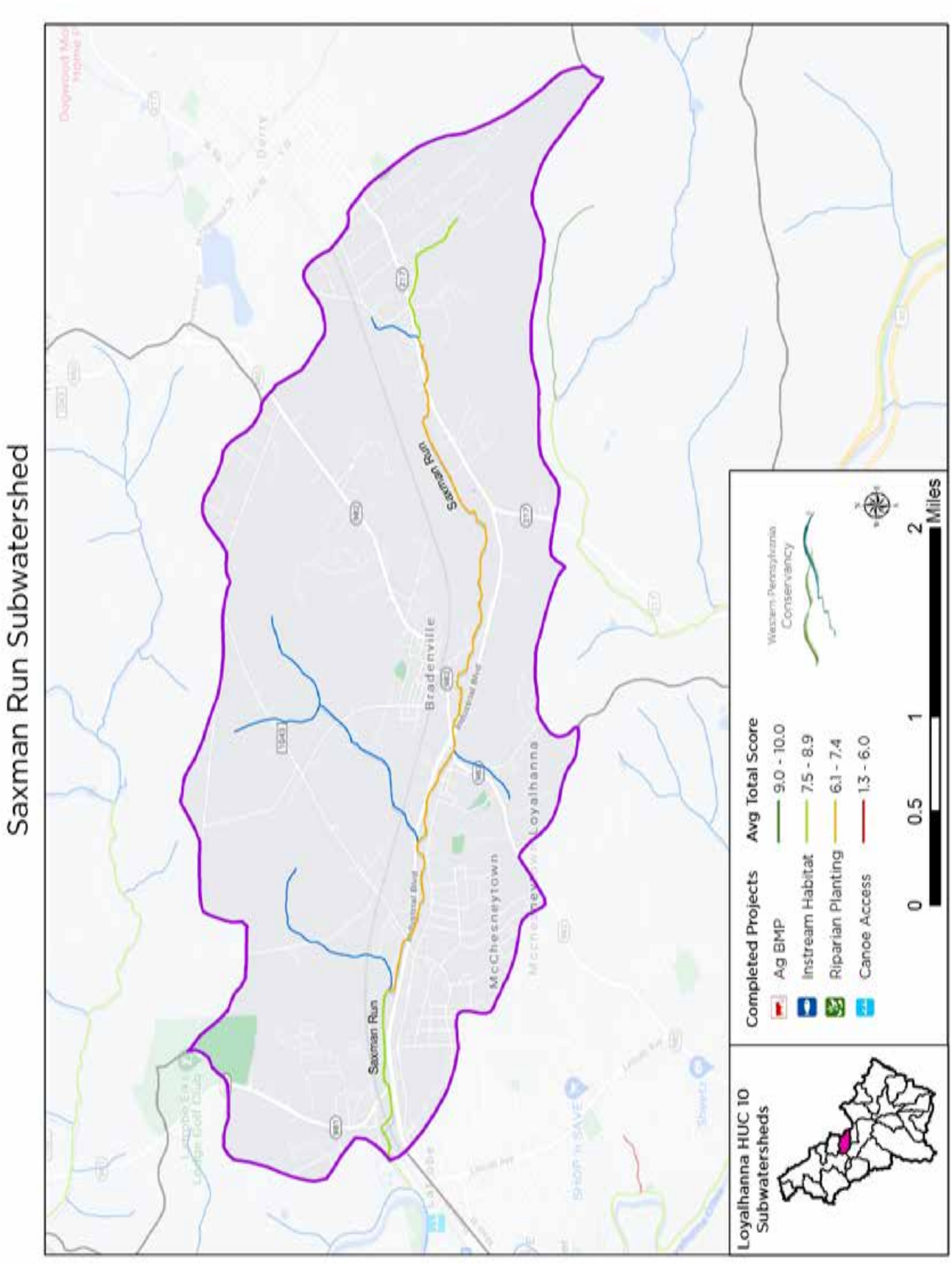
Restoration Priorities

From the updated assessment, mainstem Saxman Run showed a slight improvement in overall water quality. Future restoration efforts should focus on these impacted lower scoring areas and implement mostly AMD treatment projects. Also, landowners should be educated about the importance of stream buffers and not mow/trim to the edge of the stream. Refer to the following details listed on Table 9 and depicted on Map 9 for impact description, assessed segment locations and recommended restoration strategies.

Table 9: Restoration Strategies for Saxman Run

Stream Segment Name	Description of Impact	Restoration Strategy
SAXE 5651 *Headwater portion of Saxman Run, on eastern side of SR 217*	AMD	Investigate potential for AMD treatment
SAXA 5643 *Lower portion of watershed at confluence with Loyalhanna, crossing SR 981*	AMD	Investigate potential for AMD treatment
Multiple segments	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques

Map 9: Assessed Stream Segments within the Saxman Run Subwatershed



Lower Loyalhanna Creek Watershed

Loyalhanna Creek Mainstem

(Saxman Run Confluence to Mouth)

General Description

Recreation has increased greatly along the Lower Loyalhanna Creek

The Lower Loyalhanna Creek subwatershed includes the area that drains portions of Unity, Derry, Hempfield, Salem and Loyalhanna Townships. This 33.95 square mile section begins downstream from the Saxman Run confluence outside of Latrobe and it ends at the mouth of the Loyalhanna Creek in Saltsburg. The Lower Loyalhanna Creek subwatershed is located in the middle-upper portion of Westmoreland County. It extends from the outskirts of the City of Latrobe and flows north through New Alexandria and onto Saltsburg where it meets the Conemaugh River to form the Kiskiminetas River.

Land surrounding a large portion of the Lower Loyalhanna Creek main stem is owned by the US Army Corps of Engineers for the purpose of flood control. The Loyalhanna Dam, 4 miles upstream from the mouth, is a dam that has been in place since 1942 in order to protect downstream towns and cities from floodwaters. Currently, a large portion of the property is leased by the PA Game Commission for wild game hunting and wildlife observation.

The Lower Loyalhanna Creek subwatershed is intersected by three coal seams that were mined heavily at the turn of the 19th century. The Latrobe-Connellsville Syncline, Greensburg Syncline and Elders Ridge Syncline run southwest by northeast across the subwatershed area. As a result of extensive mining within those three coal seams, the Lower Loyalhanna Creek subwatershed is significantly impacted by AMD.

Six named tributaries and twenty-five un-named tributaries join the main stem of the Loyalhanna Creek in the lower section. The named tributaries include: Union Run, McCune Run, Crabtree Creek, Whitethorn Creek, Serviceberry Run and Getty Run. The subwatershed is classified as a WWF with the exception of Serviceberry Run, which is a HQ-CWF. A majority of the subwatershed is listed as an impaired waterway according to the EPA 303d list.

The beginning of the Lower Loyalhanna Creek Subwatershed is located immediately downstream from the confluence of Saxman Run. From that point, the Loyalhanna Creek flows west skirting the northern boundary of Latrobe. Homes line the south bank and intermittent fields and forest line the north bank. After passing underneath the Ligonier Street Bridge (2nd Bridge), the Loyalhanna Creek turns north to flow away from Latrobe.

The landscape surrounding the stream is comprised of open fields, wetland, sycamore and Japanese knotweed. Surrounding hillsides are a mix of agriculture and reclaimed surface mines.

As the Loyalhanna Creek passes underneath the Derbytown Road Bridge (3rd Bridge), the landscape surrounding the stream becomes more forested. Downstream of the bridge, access to the stream becomes limited and very few residences can be found. Approximately one mile downstream of the Derbytown Road Bridge, **Union Run** enters the Loyalhanna Creek main stem from the east. This subwatershed originates in the coal mining towns of Peanut and Superior. Union Run contains iron oxide and aluminum oxide from numerous upstream discharges

Following the confluence with Union Run, the Loyalhanna Creek main stem turns a large corner coming very close to S.R. 981 North. For a short distance, the creek turns to flow west through an area with steep, rocky banks. After the main stem turns north again, it flows past the old 4th Bridge. Large bridge abutments remain in the stream where a road once crossed. Downstream of the old bridge, the landscape surrounding the Loyalhanna Creek main stem flattens and McCune Run enters from the east. McCune Run subwatershed includes Keystone Lake and its tributaries.

Just downstream of the confluence with McCune Run, the Loyalhanna Creek main stem passes underneath the Oasis Bridge (5th Bridge). A wide, flat riparian area encompasses the stream as it continues north to a confluence with **Crabtree Creek**. At the confluence, a large plume of orange water joins with the main stem. The Crabtree Creek subwatershed, originating in the community of Forbes Road to the west, contains the largest AMD discharge in the watershed, which significantly impacts the entire Loyalhanna mainstem from this point.

Following its confluence with Crabtree Creek, the Loyalhanna Creek mainstem flows through the community of New Alexandria and underneath the S.R. 22 Bridge. At this point, the velocity of the water begins to slow significantly due to topography and the approaching flood control dam. Downstream of the bridge, the landscape surrounding the main stem is dominated by sycamore, small trees and small shrubs. Watermarks on trees and surrounding banks indicate high water levels during periods of heavy rain. The riparian area is not only thick with vegetation, but is extremely muddy, wet and not accessible.

Loyalhanna Creek at the confluence with Saxman Run

Approximately one mile downstream from the S.R. 22 Bridge, **Whitethorn Creek** enters from the west. The mouth of Whitethorn Creek forms a small lake as it encounters the Loyalhanna Creek mainstem. Whitethorn Creek originates in the community of Forbes. It is at the confluence of Whitethorn Creek and the Loyalhanna Creek main stem that the boundary of the mainstem begins to expand and Loyalhanna Lake forms as a result of the flood control dam.

The Loyalhanna Lake extends from the mouth of Whitethorn Creek to the dam located at the USACE offices. A mixed hardwood forest surrounds the entire lake. Serviceberry Run enters the lake approximately halfway through its length. As the only HQ-CWF within the Lower Section, it is frequented by anglers.

Below the dam, the Loyalhanna Creek main stem exhibits characteristics similar to main stem sections in the upper portion of the watershed. Surrounded by a hardwood and pine forest, the Loyalhanna winds through an

area with steep hillsides. No residences are found close to the stream, which is difficult to access. One mile downstream from the dam, **Getty Run** enters the main stem from the west. The Getty Run subwatershed originates in the town of Slickville. Multiple upstream acidic AMD impacts make Getty Run a poor quality subwatershed.

Following the confluence with Getty Run, the Loyalhanna Creek takes a large turn and flows underneath the Penn Central Railroad, which is now a rail/trail. At the point where the main stem passes under S.R. 981, it flows into the Conemaugh River. The mouth of the Loyalhanna Creek can be seen from downtown Saltsburg. The Loyalhanna Creek from Miller Run to the confluence with the Conemaugh River is classified as a WWF.

Overview of Historic Data/Projects

Coal mining was a major industry throughout the lower portion of the Loyalhanna Creek Watershed. The communities of Peanut, Superior, Crabtree, Hannastown, Forbes Road, Luxor, New Alexandria, Andrico, Shieldsburg, and Slickville all contained deep coal mines. According to the 1972 Scarlift Report, 61 deep mines and countless surface mines were located throughout the lower section. Of those 61 deep mines, there were approximately 22 major deep and drift mines that were in operation during the early 1900's. Some of those deep mines remained open well into the mid-1900's. The last known operating deep mine was in Luxor, PA. A large refuse pile, coke ovens and outbuildings are still present at the site. The tipple was removed in 2003.

Twenty-six discharges were discovered and catalogued within the Lower Loyalhanna Creek Subwatershed during Scarlift fieldwork. Those discharges were found in Union Run, Crabtree Creek, Whitethorn Creek, and Getty Run. Please refer to the respective subwatershed reports for more information regarding the discharges.

In addition to coal mining, agriculture was, and still is a large industry throughout the lower section of the watershed. Beef and dairy operations still blanket the landscape today. The community of Crabtree is a surviving agricultural community despite a regional decline in farmlands and farming operations. Shale gas drilling operations began in this area several years ago due to the location of the Marcellus Shale region, large tracts of land and proximity to major roads and existing interstate gas line connections. These include the Mariner East 2 Pipeline, which carries natural gas liquids from the Marcellus and Utica Shales in eastern Ohio and Western Pennsylvania to a port along the Delaware River in eastern Pennsylvania. In 2017, several violations during of the construction of the pipeline near the Loyalhanna Lake by pipeline contractor, Sunoco Logistics LP, caused Bentonite slurry to leak into Loyalhanna Lake.

- In May of 1999, the PAFBC completed a fish survey of the Loyalhanna Lake. Using Pennsylvania style trap nets and night electrofishing a wide variety of fish species were collected. White and black crappie fish were the most abundant. The report concluded that turbidity due to suspended flocculants such as iron oxide precipitate and upstream erosion were impacting the growth of pan fish within the lake.
- Since the summer of 2001, water quality samples have been collected from discharges located throughout the Lower Loyalhanna Creek subwatershed by LWA and partners from the Conemaugh Valley Conservancy. Those discharges are located within the Crabtree Creek and Getty Run subwatersheds.
- The "Valuing Clean Water: Ecosystem Service Values in the Loyalhanna-Conemaugh and Youghiogheny River Watersheds" study concluded that the Lower Loyalhanna Creek subwatershed has a combined value of the ecosystem services provided to residents and visitors as a dollar amount of $45,861,191 annually.

- In October 2020, LWA and partners from the PA Fish & Boat Commission's lake habitat division installed 500 short vertical plank boxes and 20 channel catfish spawning boxes at the bottom of the Loyalhanna Lake. This was the largest of its kind ever completed by the Commission. The project was funded from the Mariner 2 East Pipeline penalty fines.

- A new concrete stream access ramp and picnic pavilion were constructed at the stream access site in New Alexandria. "Gray Wing Park" now acts as the put-in and take-out launch site for recreationists floating the Loyalhanna Creek along the Loyalhanna Creek Water Trail managed by LWA.

Assessment Results & Comparison

A small portion of the mainstem Loyalhanna Creek was assessed in 2020, just above the Loyalhanna Lake dam at the confluence with Whitethorn Creek as part of that segment's assessment. Unfortunately, because the stream's composition within this area is more like that of a lake, an accurate reflection in data and scoring could not be obtained for assessment comparison purposes.

Restoration Priorities

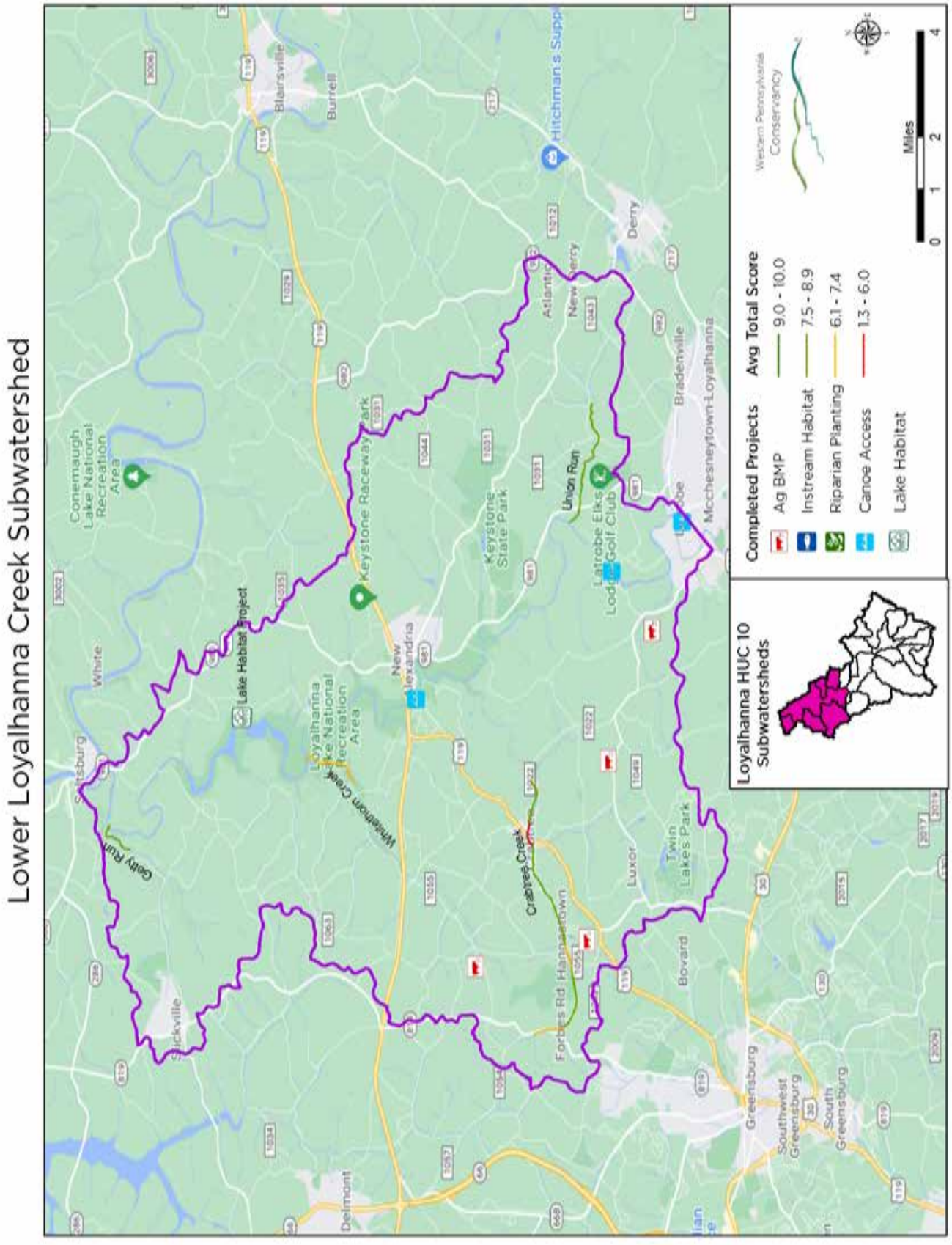
Overall, the portion of the Lower Loyalhanna Creek through this re-assessment reflect many of the impairments and challenges shown throughout the watershed basin. Heavy siltation was evident throughout the assessed reach, as well as virtually all of the overall restoration priorities that were addressed in the original 2005 assessment. Still, with slight improvements noted in some of the tributaries that were re-assessed, restoration work should still be pursued within this section of the basin with the focus in all six restoration categories. From the State of the Kiski-Conemaugh River Watershed: Community Shift study, "the lower Loyalhanna Creek needs to be fully evaluated to determine the most effective means of removing iron. Biological data also needs to be collected from the tributaries and the mainstem in this section to determine the impacts that water quality and iron embeddedness are having on the stream ecosystem" (Reckner, 2017).

Refer to the individually assessed tributary stream segments within this Plan for detailed restoration priorities concentrated within the lower watershed area.

Table 10: Restoration Strategies for the Lower Loyalhanna Creek Mainstem

Stream Segment Name	Description of Impact	Restoration Strategy
Multiple Segments	All Impacts	Additional Evaluation Needed

Map 10: Assessed Stream Segments within the Lower Loyalhanna Creek Watershed



Union Run

General Description

The 7.28 square mile Union Run subwatershed is located in the middle portion of Derry Township. Union Run and its tributaries flow westward toward the Loyalhanna Creek mainstem through the small communities of Peanut, New Derry, Superior, and the outskirts of Latrobe.

Union Run Mainstem

Union Run originates from a spring located in the small town of Peanut on S.R. 982. The stream flows west away from Peanut along the base a forested hillside. The mainstem is joined by two small tributaries that enter from the north. Both tributaries are surrounded by multiple farming operations. Flowing west, Union Run continues to flow through large farms and pastures. At the intersection of Panizzi Road and Androstic Road, a large tributary enters the Union Run mainstem from the northeast. Both communities were the sites of deep coal mines in the early 1900s. AMD is present in the tributary and remains an impact in the Union Run mainstem for the remainder of its length.

Following the intersection of Panizzi Road and Androstic Road, Union Run continues to flow through a mix of forest, field and farmland. Multiflora rose, greenbriar and other shrubs increase in concentration around the streambank, in addition to a high concentration of natural gas activity within this general area of the watershed. This is the case until Union Run reaches S.R. 981. After passing underneath the S.R. 981 Bridge, Union Run retreats into a forested area. This portion of stream is surrounded by property included in the U.S. Army Corps of Engineers flood control project. It is comprised primarily of sycamore, oak and other hardwood trees. Union Run enters the mainstem of the Loyalhanna Creek one half mile from the Bridge.

Overview of Historic Data/Projects

The Union Run Subwatershed was assessed by the PA Department of Environmental Protection in 2002. The subsequent TMDL for Union Run was completed in 2004. According the to TMDL report, 90% of the Union Run subwatershed is impaired by high concentrations of metals, low pH and suspended solids. The pollutants come primarily from abandoned mine drainage discharges within the subwatershed. Only the headwaters of Union Run are meeting TMDLs. The remainder of the watershed is exceeding determined TMDLs.

Water sampling completed during the DEP assessment of the Union Run subwatershed is consistent with assessment fieldwork completed in 2020.

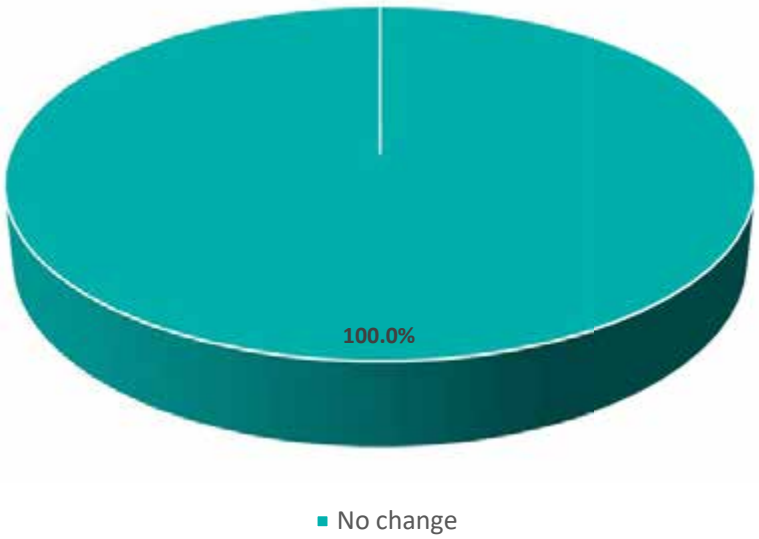
No known restoration projects have been completed within Union Run since the original assessment in 2005.

Assessment Results & Comparison

Figure 21: 2020 Union Run Assessment Results

Overall, the portions of the Union Run assessed are in good condition. AMD discharges seem to be the primary source of water quality impairment within this subwatershed. Many of the developed areas have significant riparian zone encroachment (roads, agriculture, and residential houses) which reduce the effectiveness of a functional riparian buffers.

Figure 22: Union Run Overall Comparison 2005 vs 2020



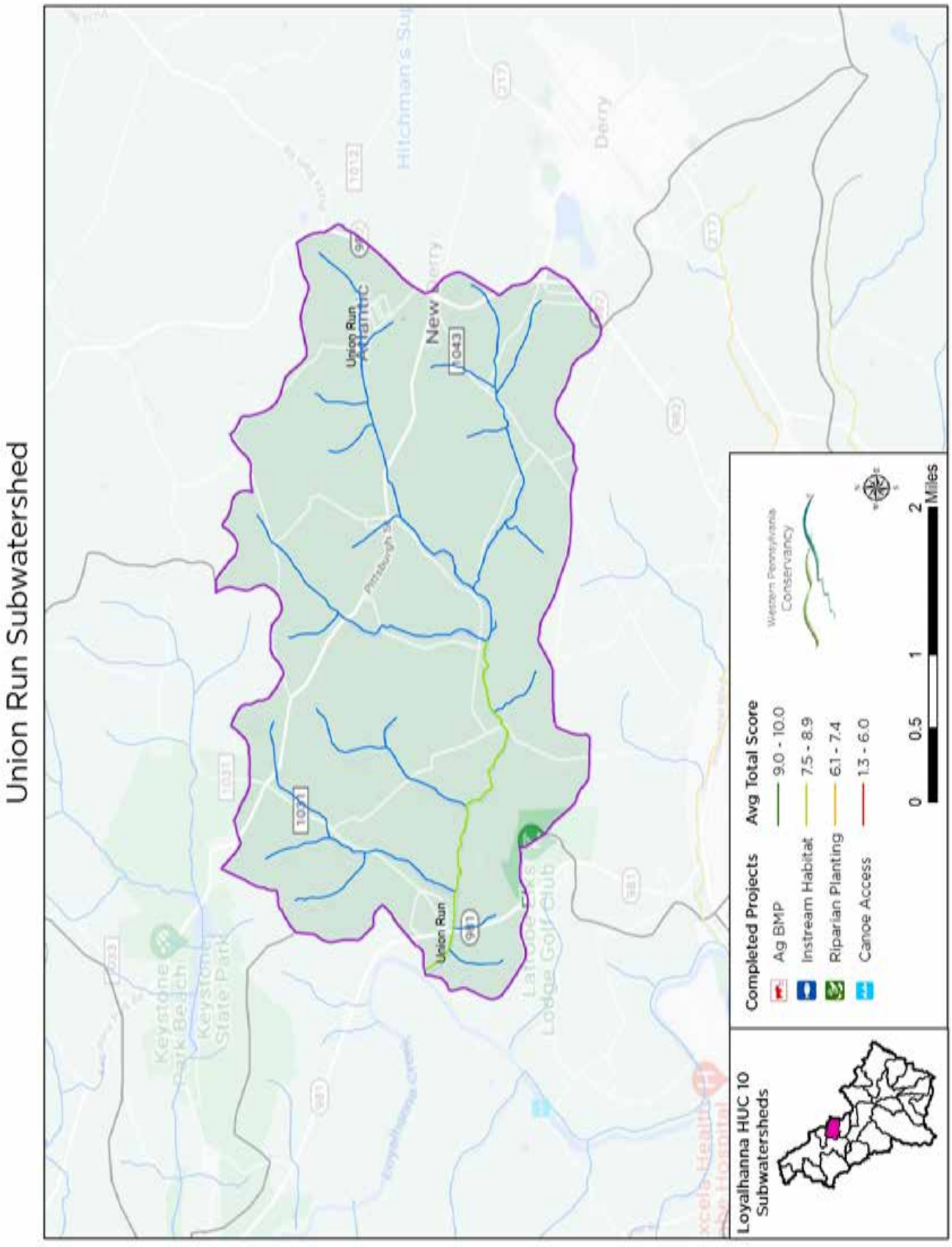
Restoration Priorities

From the updated assessment, much of mainstem Union Run has generally improved in overall water quality. Future restoration efforts should focus on these impacted lower scoring areas and implement AMD and riparian enhancement (tree planting) projects. Also, landowners should be educated about the importance of stream buffers and not mow/trim to the edge of the stream. Refer to the following details listed on Table 11 and depicted on Map 11 for impact description, assessed segment locations and recommended restoration strategies.

Table 11: Restoration Strategies for the Union Run Subwatershed

Stream Segment Name	Description of Impact	Restoration Strategy
UNIONA 5592 Union Run mainstem crossing Uschak Road	Nutrient Enrichment	Educate landowners. Investigate enhancement of riparian buffers
UNIONA 5584 Union Run mainstem paralleling T841	Nutrient Enrichment	Educate landowners. Investigate enhancement of riparian buffers
Multiple segments	AMD	Investigate sources of AMD

Map 11: Assessed Stream Segments and Restoration Strategies for the Union Run Subwatershed



Crabtree Creek

General Description

Crabtree AMD Discharge

The 18.83 square mile Crabtree Creek subwatershed is located in the north central portion of Westmoreland County. The watershed is situated south of S.R. 22 and is intersected by S.R. 119. Crabtree and its tributaries flow through the communities of Forbes Road, Hannastown, Luxor, Crabtree and Greenwald. The Crabtree Creek subwatershed is comprised of the Crabtree Creek mainstem and Little Crabtree Creek, a large tributary.

The main stem of Crabtree Creek originates in the outskirts of Forbes Road, which is part of Salem Township. The headwaters are located adjacent to S.R. 819 as it travels south from S.R. 22 toward Greensburg. The main stem of Crabtree Creek flows south parallel to S.R. 819 through a mix of forest and rural homes. In downtown Forbes Road, a small coal patch town, Crabtree Creek turns to flow east. As Crabtree Creek flows toward Hannastown, streamside vegetation is comprised primarily of Japanese knotweed. Surrounding landscape includes forest, coal refuse and open fields. Just before Hannastown, Crabtree Creek flows past a golf course and housing community, Totteridge. In Hannastown, another coal patch town, Crabtree Creek flows parallel to the old railroad grade and Main Street. A majority of homes in Hannastown are located on the south side of Crabtree Creek. The north side of the creek is occupied by a large open hillside that is a reclaimed coal refuse pile. The pile was associated with the old deep mine in this area.

After leaving Hannastown, Crabtree Creek flow west through an agricultural landscape. Large farms blanket the hillsides surrounding the stream as it moves into the town of Crabtree. In downtown Crabtree, a major tributary, Little Crabtree Creek, enters from the south. Little Crabtree Creek originates in Donohoe, east of the intersection of Donohoe Road and Georges Station Road. Its headwaters are comprised of four small tributaries that collect to form Twin Lakes, two small lakes surrounded by a county park. Downstream of the two lakes, Little Crabtree Creek flows through a rural area and past the community of Luxor, a small coal patch town. For the remaining portion of its length, Little Crabtree Creek is surrounded by a rural landscape including scattered homes, farms and pasture.

Following its confluence with Little Crabtree Creek, the main stem of Crabtree Creek winds underneath S.R. 119. The community of Crabtree, also a coal patch town, surrounds the stream on both sides. As the creek leaves downtown Crabtree, it follows the old Penn Central Railroad grade and flows adjacent to Latrobe-Crabtree Road. Behind the Crabtree Creek Fire Hall, located on Latrobe-Crabtree Road, a large abandoned mine discharge enters the main stem of Crabtree Creek. Downstream of the fire hall and the discharge, the streamside is

overgrown with Japanese knotweed and other shrubs. Surrounding hillsides are open fields, pasture and cropland.

In the small town of Greenwald, a tributary enters the Crabtree Creek Main Stem from the south. The tributary has a small private lake at its mouth known as Lake Dom. Downstream of the confluence with the tributary, Crabtree Creek passes into US Army Corps of Engineers flood control property. Sycamore, silver maple and other small hardwood trees surround the stream as it meanders northeast toward the Loyalhanna Creek. A mix of hardwood trees, Japanese knotweed and shrubs surround the stream until its mouth. Crabtree Creek joins the Loyalhanna Creek 1000 feet downstream from the Oasis Bridge on Oasis Road, Derry Township.

Crabtree Creek is listed on the CWA 303(d) list as an impaired waterway for pH, metals and acidity. The entire subwatershed is classified as a WWF.

Overview of Historic Data/Projects

A majority of the Crabtree Creek subwatershed is underlain by the Pittsburgh Coal Seam. As a result, much the area underneath the subwatershed was mined in the late 1800s and early 1900s. The communities of Luxor, Forbes Road, Hannastown, and Crabtree all contained deep mines that were operated by Jamison Coal and Coke. No deep mines operate today, but there are small remains of those deep mines left in each community. A coal refuse pile, buildings and coke ovens are still present in Luxor, the site of the Jamison No. 1 mine. This mine operated well into the 1950s and later was a coal yard where coal was trucked in and distributed. Old mining buildings and a refuse pile are still a part of Forbes Road, the site of the Jamison No. 3 mine. A large, partially reclaimed refuse pile is located in Hannastown and an old playing field for coal miners is central to downtown Crabtree.

The mines in Crabtree, Hannastown, and Forbes Road were all connected in the years prior to closing. As a result, the water flooding the three abandoned mines discharges at the Crabtree Creek Discharge located behind the Crabtree Fire Hall. The discharge is the largest within the Loyalhanna Creek Watershed, and second largest in Westmoreland County.

Surface mining, re-mining and reclamation took place throughout the Crabtree Creek subwatershed throughout the 1970s and 1980s. The Rural Abandoned Mine Program (RAMP) removed and reclaimed a large coal waste pile in Forbes Road. In addition, two large coal waste piles were covered and partially reclaimed in Crabtree and Hannastown.

Work to monitor and design a successful remediation plan for the Crabtree Creek Discharge has been ongoing for several decades. At present, the Loyalhanna Watershed Association is actively working with the PA Department of Environmental Protection Bureau of Abandoned Mine Reclamation to pursue potential treatment options for the discharge.

- In 1994 and 1999 the PA Fish & Boat Commission completed a fish survey of Upper Twin Lake and Lower Twin Lake at the headwaters of Little Crabtree Creek. The lakes included good populations of largemouth bass, trout and various pan fish species. Recommendations for the lake included continued stocking of rainbow trout, brown trout and channel catfish. In addition, the Commission recommended improving structure for increased growth in the largemouth bass population.
- The US Army Corps of Engineers, PA Department of Environmental Protection and Loyalhanna Watershed Association have conducted extensive water quality samples within the Crabtree Creek

subwatershed. Water quality results are consistent with samples collected during the visual assessment for this Plan. Historic sampling data can be referenced through the LWA water quality database.

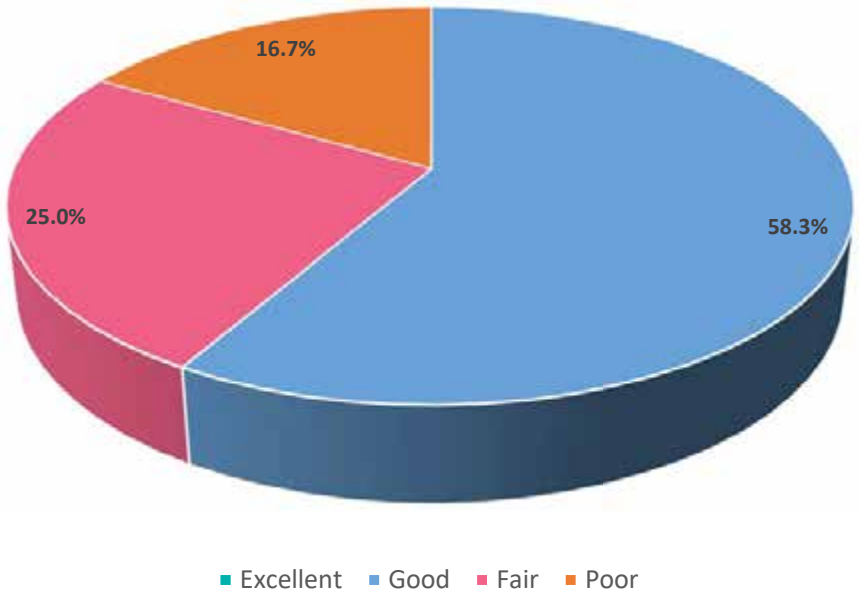
- "An Evaluation Study of the Crabtree Creek AMD Discharge" was completed by Hedin Environmental in 2017 through an AMD Set-Aside Grant through the PA Department of Environmental Protection. In this study, treatment alternatives were developed and evaluated from a cost and benefit prospective. The preferred chemical and passive treatment alternatives were further advanced so that permitting and property ownership at potential treatment locations could be identified.

- In 2019, LWA, working with PA DEP and consultants from Michael Baker International, began a project to design a collection system and transfer pipeline for the Crabtree Creek Discharge. The purpose of this project was to determine if it would be possible to relocate the discharge via a gravity-flow pipeline downstream to a site for passive treatment of the discharge. At the time of this Plan, the Crabtree Creek AMD Restoration Project was nearing completion, providing detailed construction costs and plans for the hopeful future remediation of Crabtree Creek.

- The "Valuing Clean Water: Ecosystem Service Values in the Loyalhanna-Conemaugh and Youghiogheny River Watersheds" study concluded that the Crabtree Creek subwatershed has a combined value of the ecosystem services provided to residents and visitors as a dollar amount of $23,521,320 annually.

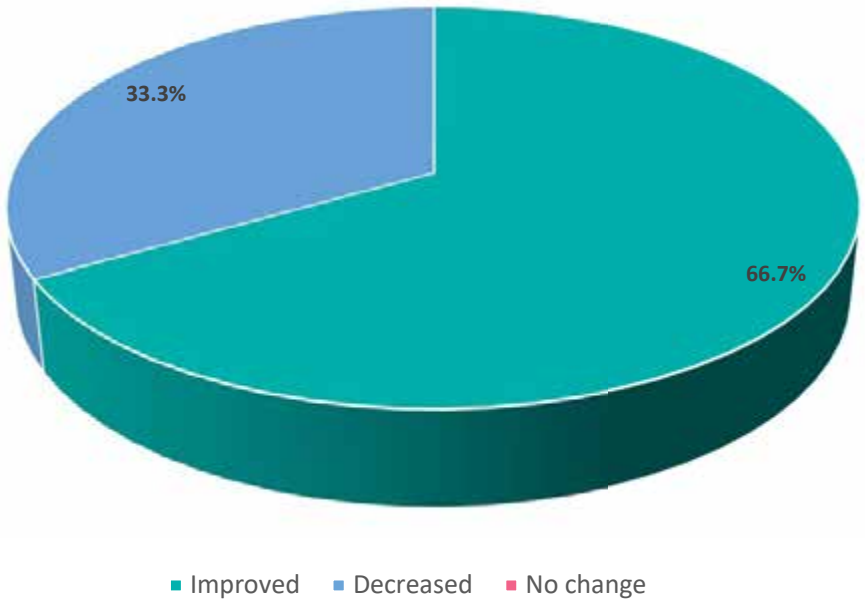
Assessment Results & Comparison

Figure 23: 2020 Crabtree Creek Assessment Results



Overall, the portions of the Crabtree Creek drainage area that was assessed are in good to fair condition. Many of the developed areas have significant riparian zone encroachment (roads and residential houses) which reduce the effectiveness of a functional riparian buffers.

Figure 24: Crabtree Creek Overall Comparison 2005 vs 2020



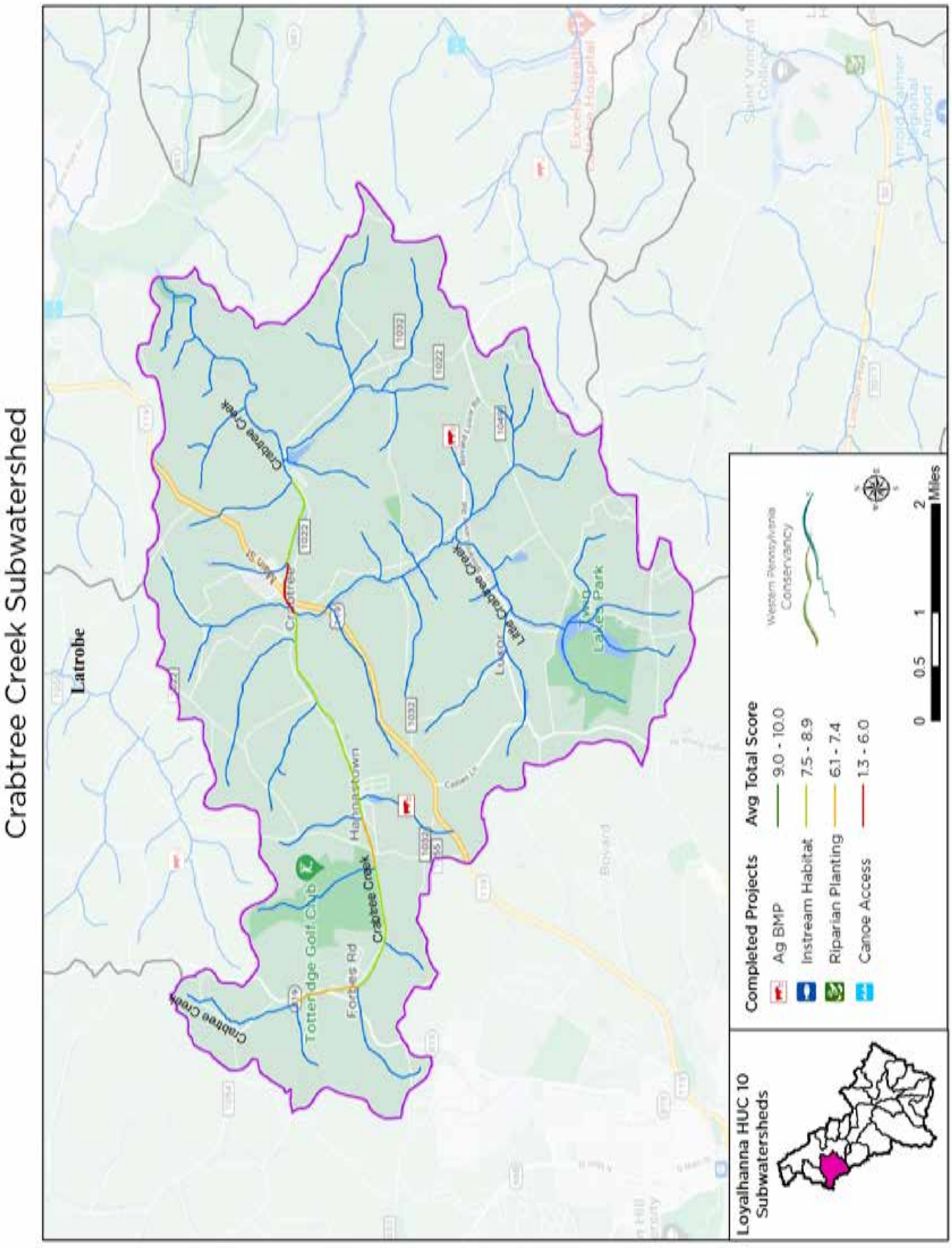
Restoration Priorities

From the updated assessment, much of Crabtree Creek shows general improvement in overall water quality. Future restoration efforts should focus on these impacted lower scoring areas and implement an AMD treatment system for the Crabtree Creek discharge, riparian plantings, streambank stabilization, and invasive species control. Also, landowners should be educated about the importance of stream buffers and not mow/trim to the edge of the stream. Refer to the following details listed on Table 12 and depicted on Map 12 for impact description, assessed segment locations and recommended restoration strategies.

Table 12: Restoration Strategies for Saxman Run

Stream Segment Name	Description of Impact	Restoration Strategy
CRBA 5520 *Mainstream Crabtree Creek, upstream section just above SR 119*	AMD	Investigate sources of AMD not previously identified
Multiple Segments	Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement riparian planting techniques
Multiple segments	In-Stream Habitat & Erosion; Riparian Habitat Degradation & Invasive Species Control	Educate landowners and implement streambank restoration and planting techniques

Map 12: Assessed Stream Segments and Restoration Strategies for the Crabtree Creek Subwatershed



Whitethorn Creek

General Description

Whitethorn Creek Mainstem

The 9.95 square mile Whitethorn Creek Subwatershed is located in Salem Township. The subwatershed is situated in the north-central portion of Westmoreland County in between S.R. 819 and the Loyalhanna Lake.

The headwaters of Whitethorn Creek, a WWF, originate near S.R. 819 and very close to the headwaters of Crabtree Creek. Surrounded by a mix of pasture and hay fields, three small tributaries meet to form the mainstem. The tributaries originate from spring sources on open hillsides. Where Rosewood Road and Kennen Road intersect, the tributaries join to form the Whitethorn Creek mainstem. From that point, Whitethorn Creek flows northeast parallel to Hannastown Road. The surrounding landscape is comprised of agriculture and forest until Whitethorn Creek passes underneath S.R. 22. Downstream of S.R. 22, Whitethorn Creek flows parallel to Whitethorn Road. Through this section, the stream is surrounded mostly forest. The forest is comprised of an even mix of hardwood trees and mixed shrubs. On the south side of the stream, a steep hillside serves as a boundary. In some places, Whitethorn Creek winds past large rock cliffs and large boulders.

Where Whitethorn Creek passes underneath Salem Drive the stream experiences a major change. The velocity of the water slows significantly and the stream channel widens. Small wet areas surround the stream channel, which is contained by a sloping hillside to the north and a steep hillside to the south. Approximately 500 yards downstream from Salem Drive, Whitethorn Creek flows across the USACE flood control boundary. At the mouth of Whitethorn Creek, a lake has formed. The lake is part of the pool formed by the Loyalhanna Dam also slowing the flow of the Loyalhanna Creek. Various water levels are visibly apparent as wetland plants and muddy areas surround the main portion of the lake. Whitethorn Creek is classified as a WWF.

Overview of Historic Data/Projects

A limited amount of historic information was found and collected for the Whitethorn Creek subwatershed. It is a rural area with a landscape dominated by agriculture in the headwaters and forest close to the mouth. The headwater region shares a border with the Crabtree Creek subwatershed's headwaters north of Forbes Road. There was limited surface mining along that border during the 1980s.

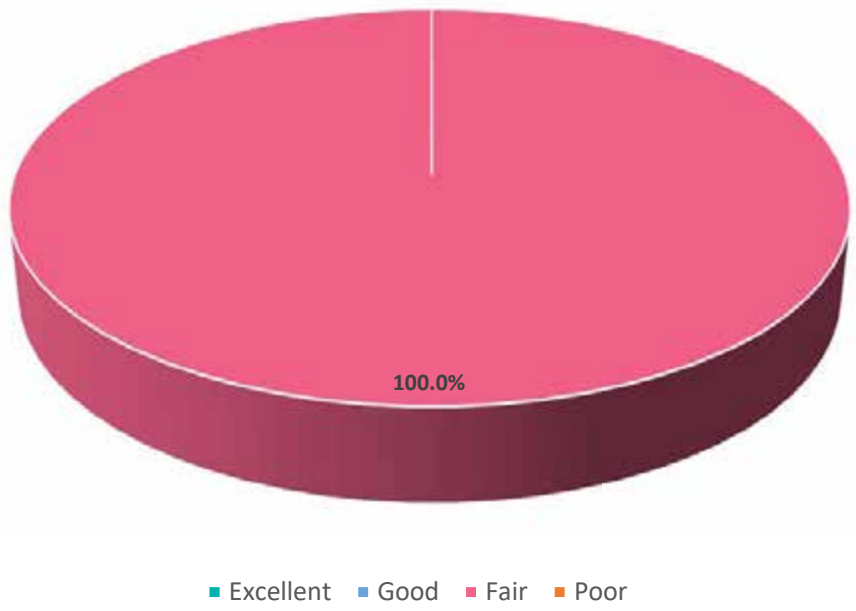
Closer to the mouth of the stream, tributaries draining into Whitethorn Creek originate from the same hillside as a tributary that drains directly to the Loyalhanna Creek. That tributary contains mine drainage originating from old deep mines and surface mines.

- In 2001, the Westmoreland Conservation District completed a chemical and biological study of the Whitethorn Creek subwatershed. The initial survey was completed in order to develop baseline data for an Agricultural Best Management Practices installation that would take place throughout the subwatershed over the next few years. During this survey, the District completed a fish survey, macroinvertebrate survey and chemical water quality samples. The results showed major impacts from agricultural operation in the subwatershed's headwaters. Low numbers of fish and macroinvertebrates occurred as well as high readings for nitrates and phosphates.

Following the initial survey, WCD began the installation of various AgBMPs on the main stem and various tributaries. Water quality sampling was carried out on a monthly basis in order to track the overall change or improvement as a result of the AgBMPs. For more complete information regarding the study can be obtained from the Westmoreland Conservation District.

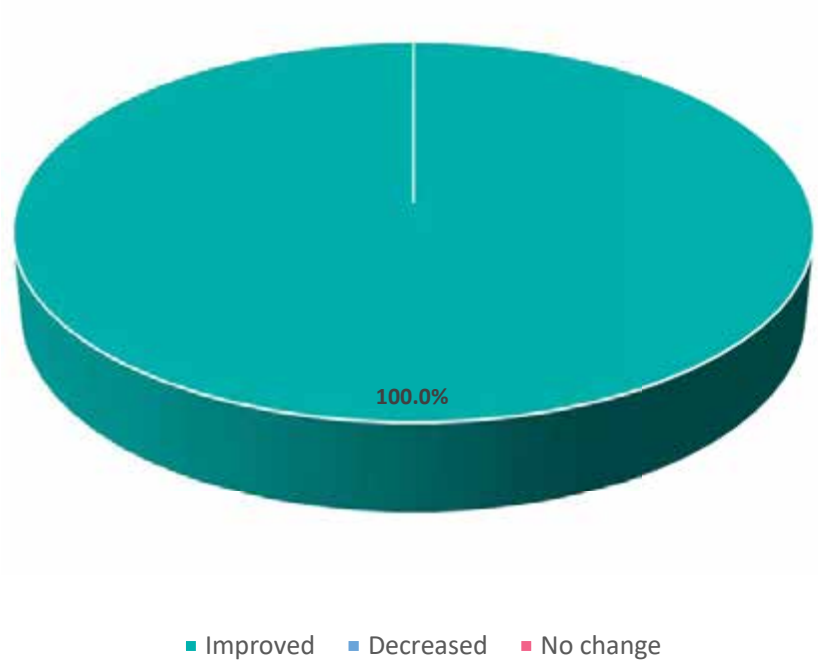
Assessment Results & Comparison

Figure 25: 2020 Whitethorn Creek Assessment Results



Overall, the portions of the Whitethorn Creek drainage assessed are in fair condition. Future restoration practices on this stream should focus on streambank stabilization to prevent additional sediment loading into Loyalhanna Creek.

Figure 26: Whitethorn Creek Overall Comparison 2005 vs 2020



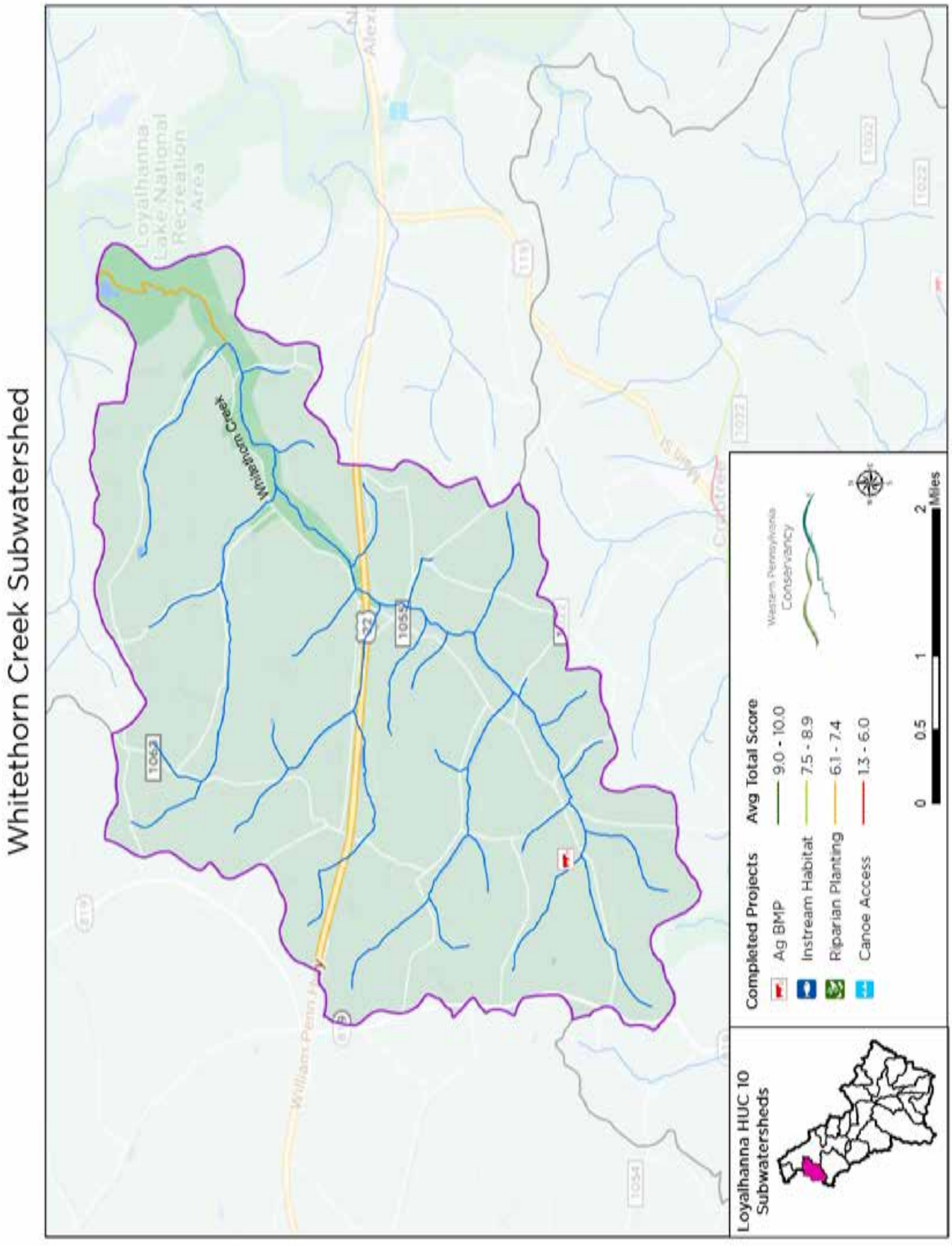
Restoration Priorities

From the updated assessment, the section of mainstem Whitethorn Creek has improved in overall water quality and was noted to be in fair condition; albeit only one section near the mouth was re-assessed. Future restoration efforts should focus on this impacted lower scoring area and implement streambank stabilization, and riparian enhancement projects where accessible. Refer to the following details listed on Table 13 and depicted on Map 13 for impact description, assessed segment locations and recommended restoration strategies.

Table 13: Restoration Strategies for Whitethorn Creek

Stream Segment Name	Description of Impact	Restoration Strategy
WTA 5382 *Whitethorn Creek just above confluence with Loyalhanna Creek*	In-stream Habitat & Erosion	Educate landowners and implement streambank restoration techniques

Map 13: Assessed Stream Segments and Restoration Strategies for the Whitethorn Creek Subwatershed



Getty Run

General Description


Severe erosion with exposed utility lines along Getty Run

The 6.46 square mile Getty Run subwatershed is located in the northern portion of Westmoreland County. It is the last subwatershed to enter the Loyalhanna Creek before it meets the Conemaugh River in Saltsburg. Getty Run follows the old Turtle Creek Railroad as it flows west through the small community of Slickville in Salem and Loyalhanna Townships. Once the site of extensive coal mining, the subwatershed is heavily impacted by AMD.

Getty Run originates on the west side of Slickville north of the intersection of S.R. 819 and Main Street. The headwaters are located in a small wooded lot surrounded by homes. From the headwaters, Getty Run flows south through a residential area located parallel to S.R. 819. At the intersection of Depot Road and S.R. 819, Getty Run turns east and flows underneath S.R. 819.

Flowing east through Slickville, Getty Run is surrounded by a mix of residences and some forest. To the north of the stream, homes and small business dot the hillside. The south side of the stream is comprised mostly of forest and some coal refuse.

Following Main Street and the railroad grade, Getty Run flows out of the town of Slickville. Outside of Slickville, the landscape becomes more forested. At the intersection of Main Street and Butz Road, a large tributary enters Getty Run from the southwest. The tributary originates on a large farm at the intersection of Cells Road and S.R. 819.

Downstream of Butz Road, Getty Run flows through a small farm and past several large coal refuse piles. At the mouth of the stream, the surrounding landscape is forested. In addition, Japanese knotweed occupies most of the streamside riparian area.

The Getty Run subwatershed is surrounded and underlain by the Pittsburgh Coal Seam. As a result, much of the area underneath and around the subwatershed area was heavily mined throughout the early 1900s. Bethlehem Mines Corporation, Irwin Gas Coal Company, Howard Gas Coal Company and Seehart Coal Company all operated in the Slickville Area. Unlike other subwatershed mines, very little historic information was located regarding the deep mines in and around Slickville.

The coal bearing geologic structure in the Getty Run subwatershed area is referred to as the Elders Ridge Syncline. Unlike other synclines, its slope and dip allowed mines to be self-draining. During mining, this was advantageous because it was not necessary to pump water out of the mined areas. Today, this feature is what makes the Getty Run subwatershed one of the most polluted in the entire Loyalhanna Creek Watershed. Getty Run Valley is at the low point of the coal seam so that the natural drainage of the coal seam is towards the crop line. The sealing of any or all of the discharges within the subwatershed would only serve to divert discharge flow to other points. The fragmented nature of the coal seam prevents the utilization of any single discharge point as a drainway for the area to conduct flows to a single treatment facility. As a result, Getty Run is listed on the CWA 303(d) list as an impaired waterway for pH, metals and acidity. Getty Run is classified as a WWF.

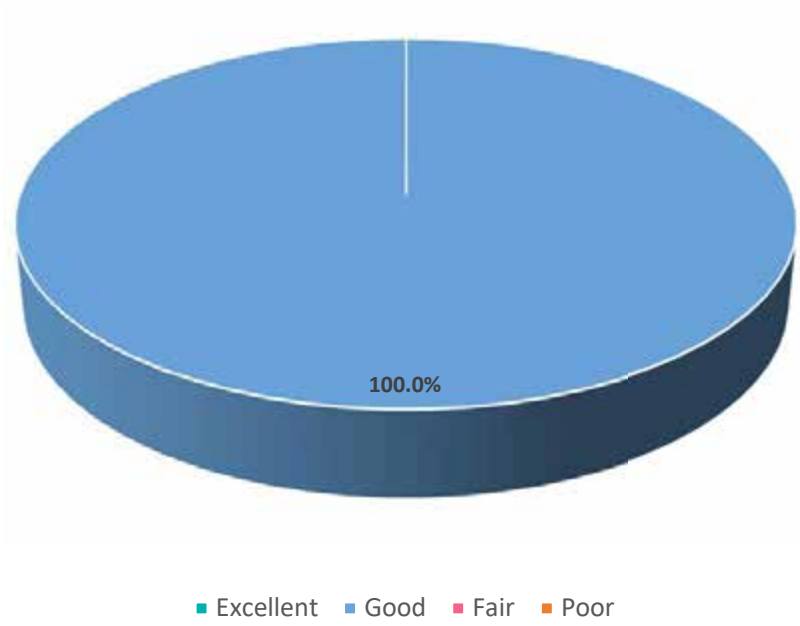
Overview of Historic Data/Projects

According to the Scarlift Report, Getty Run subwatershed is the most "acid mine drainage polluted tributary stream in the watershed." It was also stated that the ability to achieve water quality improvement would be difficult due to its geologic and topographic structure, as well as over 12 known seeps/discharges throughout the subwatershed.

- The Getty Run subwatershed was assessed by the PA Department of Environmental Protection in 2002 and completed the TMDL for Getty Run in 2004. According to the TMDL report, the subwatershed is exceeding designated TMDLs.
- Since 2002, water samples from the three main discharges (Getty 1, 2, 3) have been collected at least annually by LWA and Conemaugh Valley Conservancy.
- No known watershed improvement projects have been implemented in Getty Run since the original assessment completed in 2005.

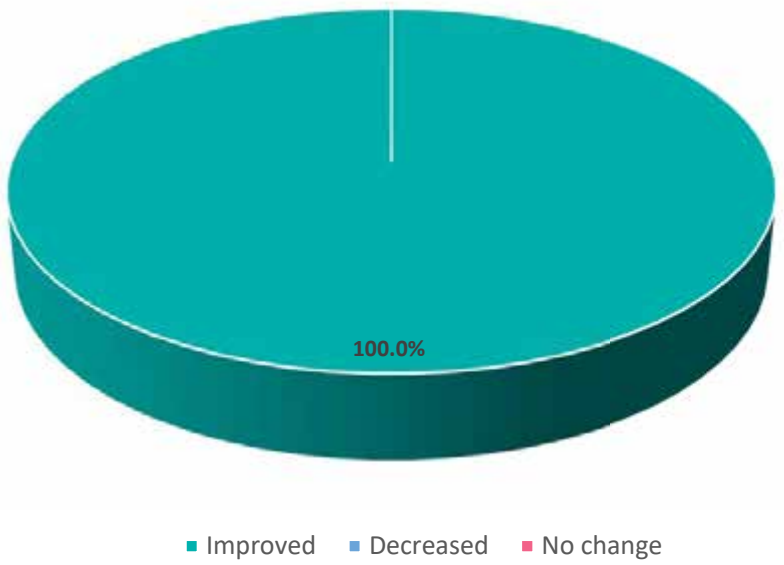
Assessment Results & Comparison

Figure 27: 2020 Getty Run Assessment Results



Overall, the portions of the Getty Run drainage assessed are in good condition. Large amounts of AMD significantly impact this stream, and is the primary source of water quality impairment. These sources should be further investigated for possible treatment options. Refer to the following details listed on Table 14 and depicted on Map 14 for impact description, assessed segment locations and recommended restoration strategies.

Figure 28: Getty Run Overall Comparison 2005 vs 2020



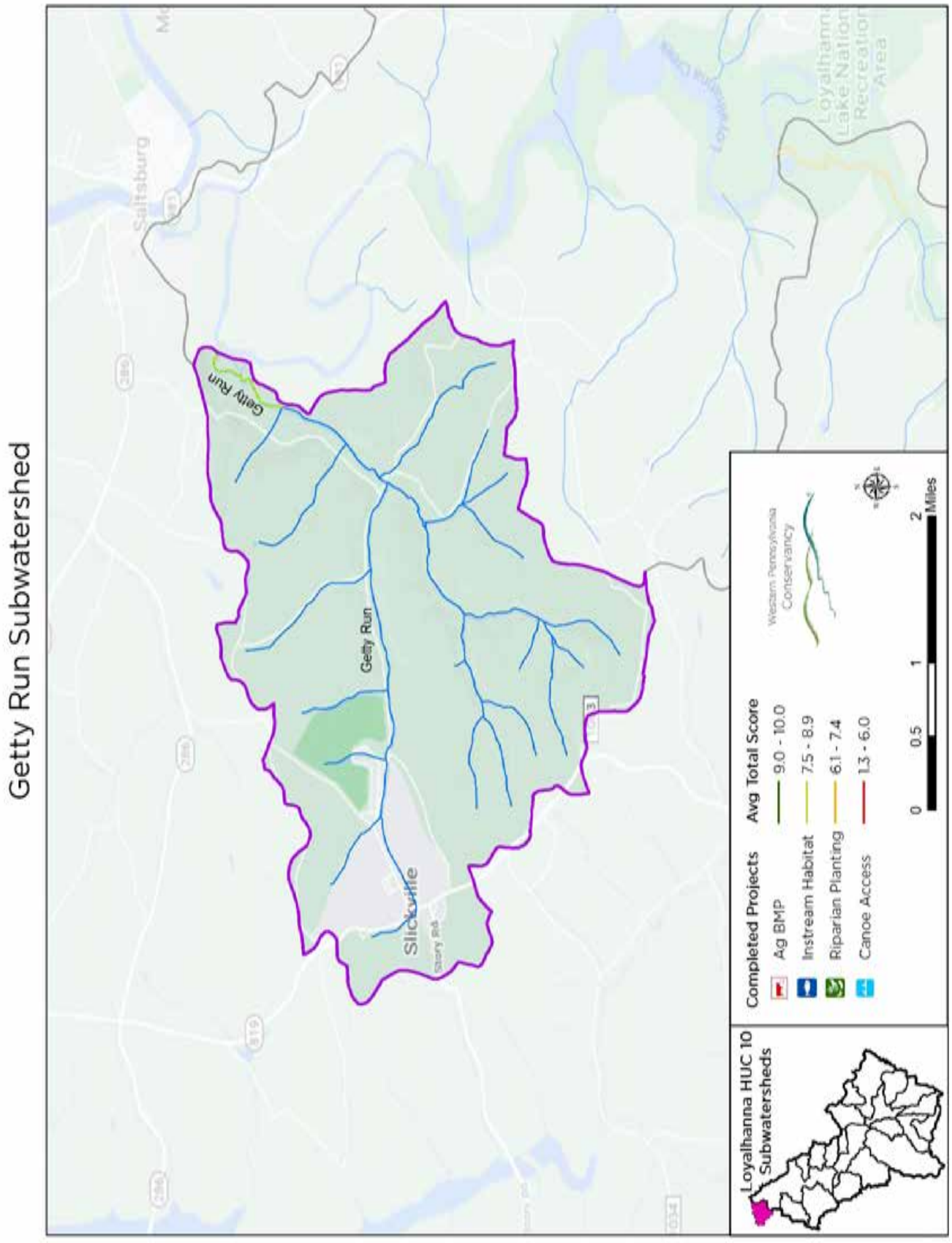
Restoration Priorities

From the updated assessment, much of mainstem Getty Run has generally, shown improvement. However, only one section near the confluence with Loyalhanna Creek was assessed during this project. Future restoration efforts should focus on these impacted lower scoring areas and implement AMD projects where feasible.

Table 14: Restoration Strategies for Getty Run

Stream Segment Name	Description of Impact	Restoration Strategy
GRA 5240 *Lower portion of Getty mainstem, just above confluence with Loyalhanna Creek*	AMD	Investigate sources of AMD near Loyalhanna Confluence

Map 14: Assessed Stream Segments and Restoration Strategies for the Getty Run Subwatershed



Loyalhanna Creek Watershed Aquatic Species of Interest

Eastern Hellbender Salamander, Eastern Brook Trout and Freshwater Mussel Surveys

The Loyalhanna Watershed Association and partners, including the Western PA Conservancy, PA Game Commission and Roanoke College, formulated a study design, protocol and overall timeline for the completion of surveys on aquatic species of interest as part of *the Loyalhanna Creek Watershed Priority Assessment & Restoration Plan.* Current surveys were supplemented with an investigation into historically known streams within the watershed known to support the species investigated as part of this Plan, including the Eastern Hellbender Salamander, Eastern Brook Trout and Freshwater Mussel species.

Eastern Hellbender Salamander

In an effort to determine whether the eastern hellbender (*Cryptobranchus alleganiensis*) is present at known historic locations within the Loyalhanna Watershed, we used environmental DNA (eDNA) sampling. The benefit of eDNA surveys is that there is minimal disturbance to the habitat and to individual hellbenders, as opposed to the disturbance created by cover searches and electroshocking. We first determined historic sites within the watershed, based on our own observances (e.g., previous electroshocking surveys and cover searches) as well as by searching the website www.idigbio.org for museum specimens of this species collected in the Loyalhanna. The Carnegie Museum of Natural History had several specimens, and the Chicago Natural History Museum had one. Unfortunately, these were collected before the widespread use of Global Positioning Systems, so exact locations could not be obtained, but we were able to determine tributaries and stream stretches from which the samples were taken. From these historic records and observances, we chose eight survey locations located throughout the upper and middle watershed reaches. These included sampling sites in the upper and middle Loyalhanna Creek mainstem, Powdermill Run, Mill Creek, Fourmile Run and Ninemile Run.

In September, 2019, water samples (1,000 ml) were collected from each of these locations and then filtered to collect eDNA. Samples were collected and filtered following the US Geological Survey protocol for aquatic eDNA sampling under the supervision of Tammy Colt, Wildlife Diversity Biologist with the PA Game Commission Southwest Region. We collected samples in September, when water levels are generally low (thereby concentrating the DNA as well as having it more likely remain in the vicinity of the hellbender.) Eastern hellbenders generally breed in September in Pennsylvania, so they are moving around and releasing more DNA into the water than in other months, increasing the chance of detection using eDNA sampling. Samples were collected immediately downstream of good potential substrate (e.g., large rocks) at each location. Filtering was completed on the collection day, and filters were subsequently shipped to the laboratory of Dr. Brooks Crozier at Roanoke College for analysis.

In addition to the eight sampling sites, a positive control sample was taken from a currently known hellbender site in the adjacent Conemaugh River Watershed. A sample from a spring-fed source within the Loyalhanna Watershed served as a negative control.

The laboratory at Roanoke used qPCR technique to amplify and detect eDNA within the samples. In addition to testing for hellbender DNA, they included tests for human fecal coliforms and cattle

coliforms. Additional laboratory positive and negative controls, as well as a test for amplifiable DNA within the sample, were included.

Results indicated that there were hellbenders present in the immediate area at two of our historic sites—the middle Loyalhanna Creek mainstem and Fourmile Run. Detection levels for these two sites were equivalent (or equally strong) as that for the positive control from the field. Hellbender eDNA was not detected at any other sites in the September, 2019 sampling event.

For comparison water quality purposes, human fecal coliform was detected at almost every collection site and was highest in the Loyalhanna mainstem near Idlewild Park and SoakZone; Powdermill Run also had a strong detection signal compared to most of the other samples. Cow coliform bacterial DNA was not detected in any of our samples.

Eastern Brook Trout

Electrofishing surveys were completed on Linn Run and the north and south forks of Mill Creek in the summers of 2020 and 2021 by staff from the Western PA Conservancy and LWA. Naturally reproducing Eastern Brook Trout were found during the Linn Run survey. The forks of Mill Creek contained both naturally reproducing Eastern Brook as well as Brown Trout.

Historically, portions of Hannas Run contain both native Rainbow and Brown Trout populations. Laughlintown Run contains primarily Rainbow Trout, but occasionally can hold both Eastern Brook and Brown Trout seasonally. Overall, previous electrofishing surveys have shown that primarily all of the Upper Loyalhanna Creek tributaries indicate the capabilities to provide the natural reproduction of native trout species.

Freshwater Mussels

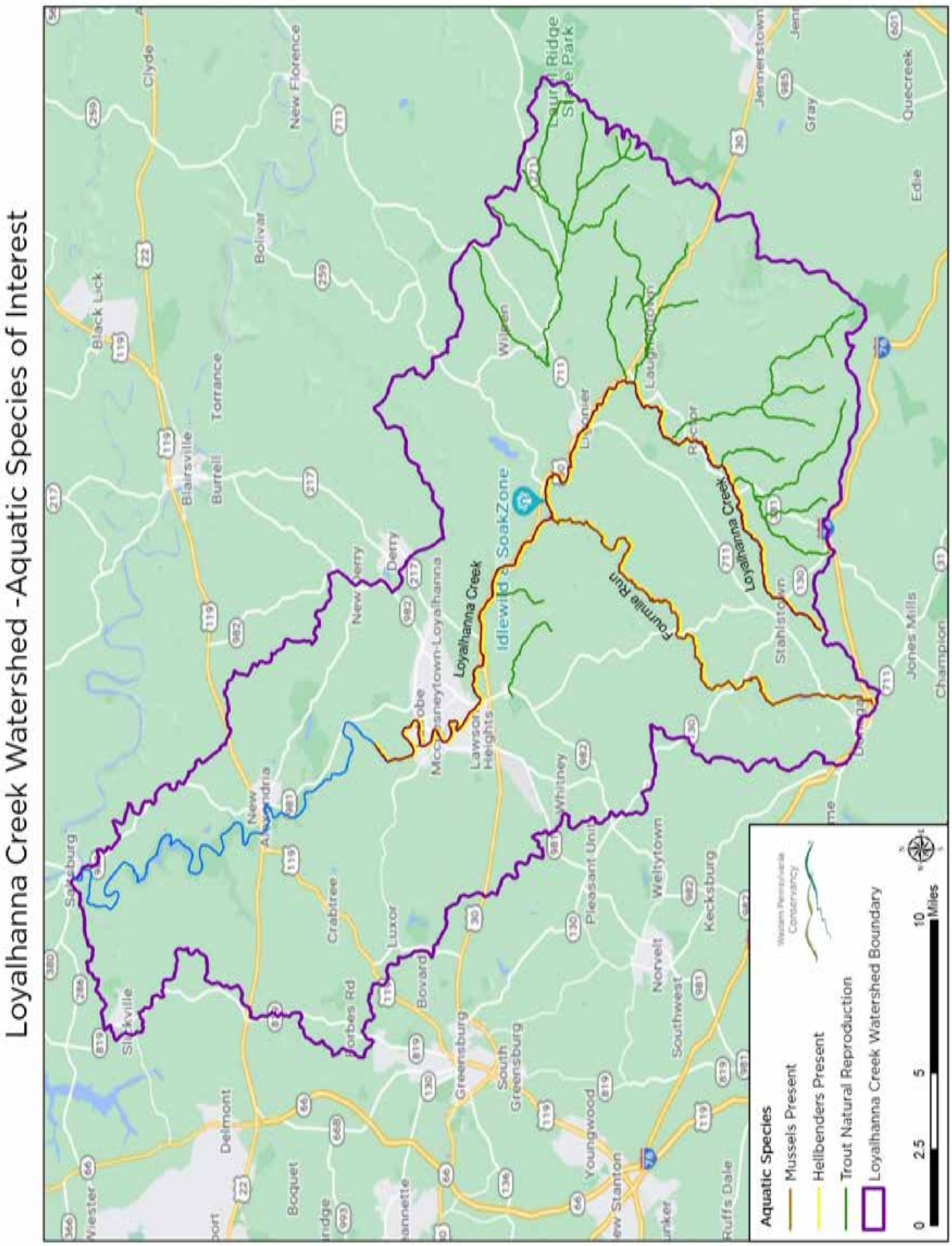
Freshwater Mussel survey protocol is a timed search based on stream width and the number of surveyors. The minimum survey time is typically 10 minutes per surveyor, so the survey period is normally 40 minutes per site, using 4 staff. Surveyors work in an upstream direction visually and tactilely searching for mussels. Water quality readings are taken and qualitative substrate information is also collected including percentage values of each major substrate type in the reach.

All mussels are identified to species, measured to the nearest mm and then released. Quadrate sampling is also conducted, where 1.0 m^2 of the stream is excavated into mess bags for locating juvenile mussels. A 0.25 m^2 grid is used and the grid is excavated four times to get the 1.0 m^2. This work was completed in Fourmile Run, as well as portions of the upper and middle Loyalhanna Creek mainstem in summer 2020.

Species Found: Loyalhanna Creek Mainstem – Wavyrayed Lampmussell, Flutedshell

Fourmile Run – Wavyrayed Lampmussel, Flutedshell, Kidneyshell, Creeper, Spike, Clubshell (endangered)

Map 15: Assessed Stream Segments containing Aquatic Species of Interest



Important Next Steps – Action Plan for Future Restoration

The Loyalhanna Creek Watershed Priority Assessment and Restoration Plan focused on conducting an updated overview of 100 stream miles within the Upper, Middle and Lower Loyalhanna Creek Watershed. These stream segments were identified from a list of priority restoration areas determined in the first Loyalhanna Creek Watershed Assessment and Restoration Plan completed in 2005. Over this 15-year time period, numerous water quality improvement projects have been completed. Most of these projects were aimed at solving impacts from abandoned mine drainage (AMD), as well as working to restore riparian buffer and in-stream habitat and erosion issues within the watershed. To date, streams within the Upper Loyalhanna Creek Watershed contained the majority of in-stream and riparian restoration projects, while streams located within the middle watershed saw some relief from heavily polluted AMD discharges with the construction of two passive treatment systems. The lower watershed, however, still requires significant work to remediate several impairment types, most notably AMD.

One common impact observed on practically every stream segment from this assessment was riparian habitat degradation and invasive species. Outside of the areas where adequate forested buffer is present, landowners should be urged to take action to help eradicate this concern through simple measures such as simply by not mowing their grass up to the stream edge and leaving other vegetation in place. However, noxious invasive plant species also need to be managed for control, which often requires additional work and treatment methods to be effective. A watershed-wide education effort for landowners if oftentimes more difficult than conducting a full-scale constructed restoration project, however individual landowners can drastically help to reduce the widespread erosion and sedimentation issue one parcel at a time. Embarking on projects such as this, is just one new goal on the horizon as a result of this Plan.

Action has been taken over the years to implement projects to drastically improve areas that are negatively impacted by former industry practices as well as naturally occurring events. Thanks to the 2005 and the 2020 assessments, a clear roadmap for future work by LWA and partners is in place. Our action plan will be formulated based on the results of this plan and specific restoration strategies identified within the six impact categories developed as part of this updated assessment.

Acknowledgments

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Western Pennsylvania Conservancy Team

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Abbreviations

These common abbreviations/acronyms can be found throughout the ***Loyalhanna Creek Watershed Priority Assessment & Restoration Plan***.

AMD	Abandoned Mine Drainage
BMP	Best Management Practice
CREP	Conservation Reserve Enhancement Program (USDA)
CWA	Clean Water Act
CWF	Cold Water Fishery
DEP	PA Department of Environmental Protection
EQIP	Environmental Quality Incentives Program (USDA)
EV	Exceptional Value
HQ-CWF	High Quality Cold Water Fishery
LWA	Loyalhanna Watershed Association
PFBC	PA Fish & Boat Commission
PGC	PA Game Commission
SVC	Saint Vincent College
TSF	Trout Stocked Fishery
UNT	Un-named Tributary
USACE	U.S. Army Corps of Engineers
WCD	Westmoreland Conservation District
WPC	Western Pennsylvania Conservancy
WPCAMR	Western PA Coalition for Abandoned Mine Reclamation
WWF	Warm Water Fishery

LOYALHANNA CREEK WATERSHED

Priority Assessment & Restoration

Plan