



# Mill Creek and Rattlesnake Creek Watershed

C O L D W A T E R   C O N S E R V A T I O N   P L A N







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**BWA is grateful for the assistance and support** of the Monroe County Planning Commission, Monroe County Conservation District and the Brodhead Chapter of Trout Unlimited. BWA also appreciates the work of Don Baylor and Chris Hartzler of Aquatic Resources Consulting, and Carol Hillestad, writer.

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#### **ON THE COVER**

**Top:** Mill Creek along Mill Creek Road

**Bottom:** Mill Creek along Monomonock Road

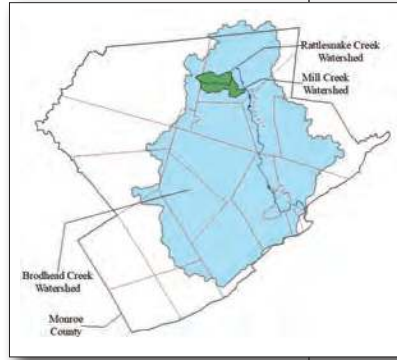
*Photo credits: John Styk and Carol Hillestad*

# Mill and Rattlesnake Creek Watershed: Coldwater Conservation Plan

## INTRODUCTION AND BACKGROUND

Mill Creek and its tributary, Rattlesnake Creek, rise on the Pocono Plateau and flow about six miles to join Brodhead Creek nine miles north of the village of Analomink, Monroe County, Pa.

The 312-square-mile Brodhead watershed is located in the Delaware River basin, in the Pocono Mountains of northeastern Pennsylvania. Mill Creek runs generally easterly through the center of Barrett Township in northern Monroe County.



About mid-way through its journey to the Brodhead, Mill Creek flows through the developed area of Mountainhome, the village center of Barrett Township.

The purpose of this study was to determine whether runoff from development surrounding the creek in Mountainhome has impacted water quality and stream health, or whether Mill Creek remains healthy and is eligible for protection as an Exceptional Value stream for its entire length.

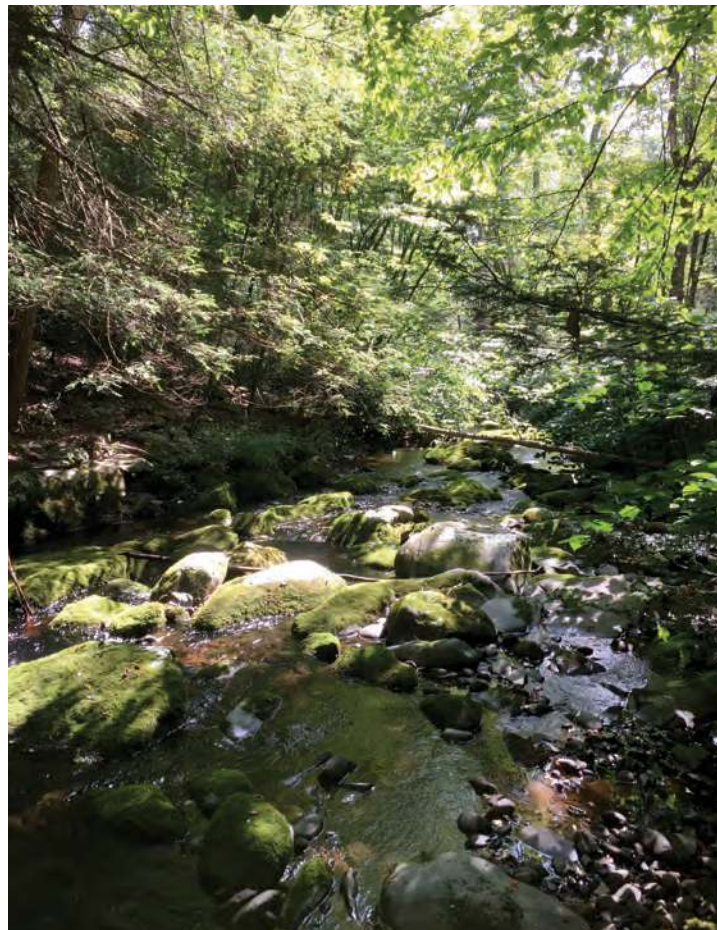
The studies completed to date show the latter to be the case.

## DESCRIPTION AND HISTORY OF THE WATERSHED

### The creek and its watershed

Mill Creek rises at 1,900 feet of elevation on the Pocono Plateau, in a small impoundment of wetlands on the property of a private hunt club, adjacent to Pennsylvania State Game Lands 221. It flows about a mile through game lands, then through private lands, crossing Monomonock Road and State Route 191, where it is joined by Rattlesnake Creek, before flowing under Route 390.

Mill Creek is classified Exceptional Value from its source to Township Road 577 (Monomonock Road)



and High Quality from that point to its confluence with the Brodhead Creek (*Source: PA Code Title 25, Chapter 93*). Pennsylvania Fish and Boat Commission (PFBC) classifies Mill Creek as Class A Wild Trout Waters from its headwaters to the State Game Lands 221 border.

Rattlesnake Creek also starts high on the Pocono Plateau, at about 1,800 feet in a large wetland on private hunt club land, north of Game Lands 221. As it enters game lands, it drops off the edge of the Plateau as a dramatic 75-foot waterfall into a hemlock and rhododendron ravine.



## RATTLESNAKE CREEK FALLS IN GAME LANDS 221

After the Flood of 1955 stripped these banks bare, it was possible to walk from here to Mountainhome along the creek. Today, dense stands of rhododendrons make that impossible. Downstream where it exits game lands, the Rattlesnake frequently goes dry in summer before rising again and joining Mill Creek after it passes under Route 191. Rattlesnake Creek flows for 3.4 miles before joining Mill Creek.

A parking area with access to the stream and trails on Game Lands 221 is at the upper end of Pleasant Ridge Road.

Rattlesnake Creek is classified Exceptional Value from its source to Township Road 594 (Pleasant Ridge Road) and High Quality from that point to its confluence with Mill Creek below Route 191 (*Source: PA Code Title 25, Chapter 93*). PFBC classification is Wilderness Trout Waters.

In the first mile of the upper reaches of both Rattlesnake and Mill creeks, the watershed is within the boundaries of the game lands. The land is steep and vegetation is mixed hardwood forest, hemlock, pine and native rhododendrons. Protected land in the Mill and Rattlesnake Creek watershed is about 38% of total area.

As Mill Creek exits Game Lands 221, the ravine remains steeply sided and there are a few private homes, with no public access to the creek or game lands. Mill Creek flows through the lands of Pennsylvania American Water Company, water supplier for the village of Mountainhome and surrounding area. A large private holding just south of the game lands is the site of the former Monomonock



*Rattlesnake Falls*

Inn, one of the many inns, boarding houses and resorts that dotted Barrett Township from the mid-19th century through the 1960s.

Entering the village of Mountainhome, above the intersection of State Routes 191 and 390, a local garbage hauler and more single-family homes are along the creek as Mill Creek joins Rattlesnake Creek, from the north.



# HUMAN HISTORY ALONG THE CREEK

At this confluence, Mill Creek's watershed terrain levels out. This area along Routes 191 and 390 is today heavily developed with single- and two-story homes and businesses. These include a CVS, municipal building, bank, grocery store, strip mall, apartments, church, volunteer fire company, municipal court, community center and others. Two-lane bridges carry Route 191 and then Route 390 over the creek.

The concentration of impervious cover draining to Mill Creek here is therefore extremely high, estimated to be 50 percent or more.

Historically, this was a thriving mill town, the industrial heart of Barrett Township. Tanneries, a wintergreen distillery, a button and butter-box factory, and sawmill lined the creek.

Tourism started even before the railroad came through in the 1850s, as farmers and homesteaders supplemented income by taking in travelers from New York, Philadelphia and elsewhere who came to fish the famous Brodhead Creek. The railroad created a boom. Dozens of inns, resorts and boarding houses entertained guests who came for clean air, clean water, and of course excellent fishing.

Impoundments were created by mill owners for power and by innkeepers and boarding houses for domestic water, fishing, ice skating and boating — as early "water parks," including a tall water slide. At least six dams on Mill and Rattlesnake creeks were washed out in the 1955 flood, which devastated the Brodhead watershed.

Downstream from Mountainhome center today, private homes along Spruce Cabin Road line Mill

Creek for about half a mile. After the creek flows under Spruce Cabin Road, near the intersection of Spruce Cabin and Henry Price roads, it meanders through large wooded tracts in private ownership to Mill Creek Road where it enters a 97-acre "neighborhood wildlife refuge" owned by Natural Lands (formerly Natural Lands Trust).



*Knotweed flourishes on both banks of Mill Creek east and west of the Route 390 bridge.*

The remaining length of the creek runs closely along Mill Creek Road. Mill Creek forms the boundary between the Natural Lands tract and a private landowner, with a steep bank on the Natural Lands side. On the private land, a narrow buffer between the road and the creek is vegetated with mixed hardwoods and evergreens and large stands of knotweed. This vegetation continues to the confluence with the Brodhead Creek at Route 447 in Barrett Township.

Knotweed is also particularly dense along the creek on either side of the Route 390 bridge and downstream to Preacher Hill Road. A new bridge was constructed across Mill Creek on Preacher Hill Road recently and wooded areas along the creek were cleared. The result is a large stand of knotweed along Mill Creek. The creek's uppermost reaches are free of knotweed.



# PREVIOUS AND CURRENT STUDIES/ANALYSIS OF WATERSHED

Mill Creek, through Mountainhome, is currently classified a High Quality Coldwater Fishery by the PA Department of Environmental Protection. However, the stream may qualify for the Exceptional Value designation based on its water quality, as measured by the aquatic macroinvertebrate and fish communities.

Monroe County's annual water quality study, led by the Monroe County Planning Commission, has recorded water quality and macroinvertebrate data on Mill Creek annually since 2016.

See Map 1 and Table 1 below.

**Map 1 – Monroe County Water Quality study sites, 2016-2019**

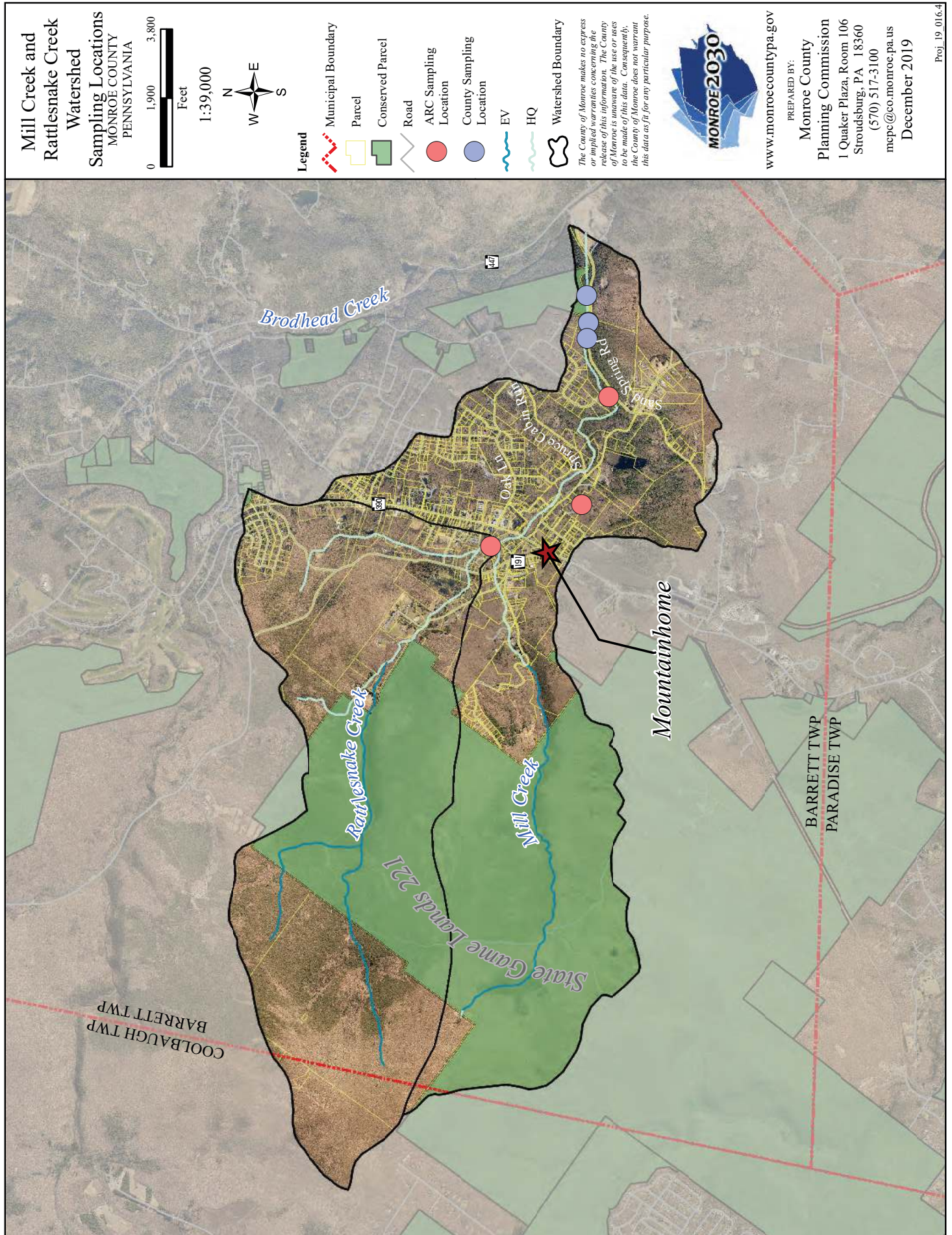


**Table 1 – Monroe County Water Quality Reports 2016-2019**

	TOTAL TAXA	SHANNON DIVERSITY INDEX	EPT TAXA RICHNESS	HILSENHOFF BIOTIC INDEX	INTOLERANT INDIVIDUALS (%)	MODIFIED BECKS INDEX	INDEX OF BIOTIC INTEGRITY
4/18/2019	26	2.57	15	2	76.42	38	89.5
4/18/2018	24	2.62	14	2.8	60.1	32	80.4
4/24/2017	34	2.87	21	2.12	74	41	97
5/5/2016	26	2.41	16	3.03	56%	38	83.2



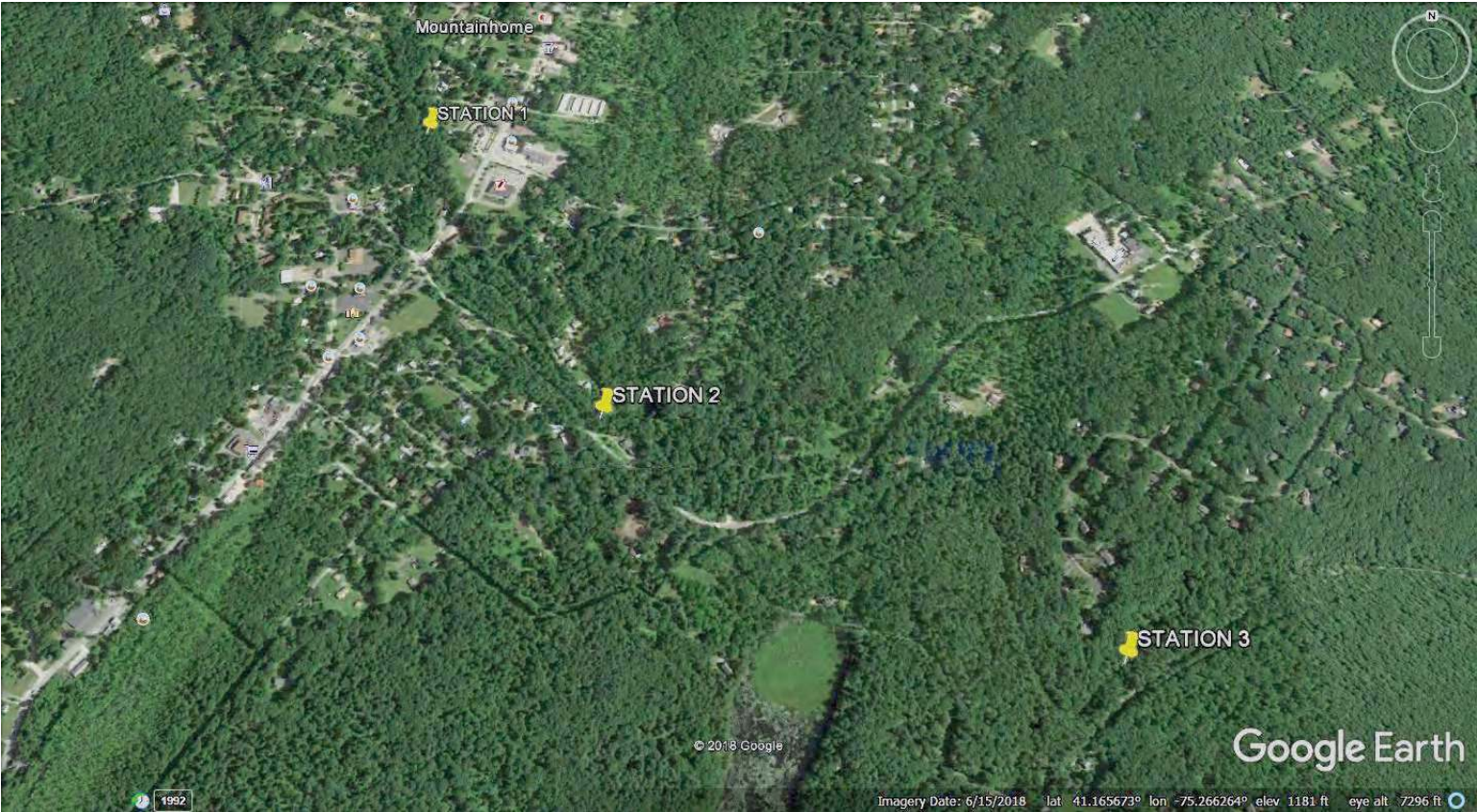
# Locator map





The high Index of Biotic Integrity (IBI) over the past four years (average 87.52) shows excellent water quality in Mill Creek. The county data are confirmed by a study done this year by Don Baylor, biologist, of Aquatic Resource Consulting. Baylor and his team conducted a macroinvertebrate study at three

locations (see Map 2) on Mill Creek on April 18, 2019, and an electrofishing survey at one station on August 29, 2019. The IBI results are summarized here in Table 2 and Map 2 shows the study sites. The full reports can be found at [brodheadwatershed.org/mill-creekproject/](http://brodheadwatershed.org/mill-creekproject/)



**Map 2 – Aquatic Resource Consulting sampling sites, April 2019**

<i>Index of Biotic Integrity (IBI) scores for benthic macroinvertebrate samples Mill Creek, April 18, 2019.</i>			
	Station 1 below confluence of Mill and Rattlesnake creeks	Station 2 near Preacher Hill Road	Station 3 upstream from mouth
Index of Biotic Integrity (IBI) Score	89.5	98.2	90.7

**Table 2 – Aquatic Resource Consulting, Inc. Aquatic Macroinvertebrate study, April 2019**

Volunteers with the Brodhead Watershed Association have monitored water quality of Mill and Rattlesnake creeks for the past 30 years. The BWA volunteer Streamwatch program records temperature, pH, water level, nitrate-N and Ortho-phosphate monthly. No “red flags” or reports of unusual results have been noted on Mill and Rattlesnake creek in the history of the program.



## MACROINVERTEBRATE STUDY SUMMARY

The purpose of this study was to evaluate the water quality of Mill Creek as measured by the aquatic macroinvertebrate community. The survey was to determine whether the benthic macroinvertebrate population would meet Pennsylvania Department of Environmental Protection (DEP) qualifications for Exceptional Value classification. Aquatic macroinvertebrates are preferred indicators of stream water quality because of their limited mobility, one- to three-year life cycles, and specific sensitivities to pollutants.

Clean streams usually support numerous species

of invertebrates, theoretically evenly represented numerically. Impairment may be indicated by low taxa richness, shifts in community balance toward dominance of pollution-tolerant forms, or overall scarcity of invertebrates.

On April 18, 2019, three stations on Mill Creek had excellent Index of Biotic Integrity scores. Scores were 89.5, 98.2, and 90.7 for the upper, middle, and lower stations, respectively. The scores average 92.8, which is within the range qualifying macroinvertebrate populations for Exceptional Value status. IBI scores are calculated on a scale of 0-100 with 100 being the best.



## ELECTROFISHING SURVEY SUMMARY

The purpose of this study was to evaluate the water quality of Mill Creek as measured by the fish community. The survey was to determine the relative abundance of fish species in Mill Creek, in particular the status of the wild trout population.

In a 293-foot stretch of the creek, researchers from Aquatic Resource Consulting found sculpins and brown trout, fish which can only survive in water that stays cold year-round. Of the 112 wild trout collected, roughly half were young-of-the-year, this year's hatch.





*Trout caught during electrofishing.*

Some 12-inch trout and one 14-inch trout were also found.

The total estimated biomass in the stream area samples was 92.1 kilograms per hectare. This value is more than double the Pennsylvania Fish & Boat Commission's standard for Class A Wild Trout Streams (44 kilograms/hectare).

The water was very low, but the preponderance of young fish and high biomass value shows that Mill Creek is a healthy cold-water fishery, with naturally reproducing trout.



*Fish are measured before being released back into Mill Creek.*

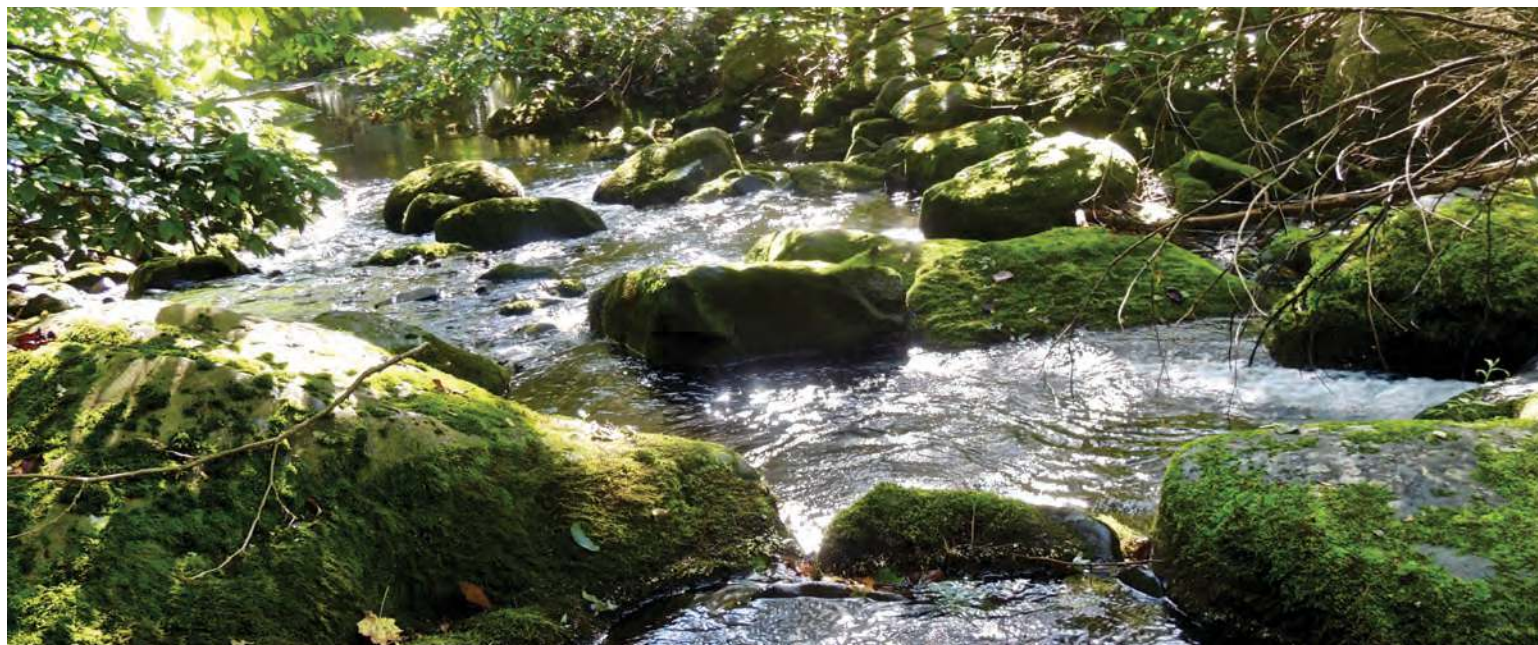


## UNIQUE AND OUTSTANDING VALUES IN THE WATERSHED/STREAM

### Water quality, trout habitat, local cooperation

1. Research and scientific testing on the Mill Creek demonstrate high water quality and excellent trout habitat.
2. Very high biomass of 92.1 kilograms of trout per hectare.
3. Local perception that the creek is an important asset to the community. Barrett Township Historical Society has extensive records about the creek and environs.
4. Excellent headwaters and wetland protection suggests high values will be sustained over time.

5. Conservation-minded owner of downstream lands on south side of Mill Creek above confluence with the Brodhead is considering formal protection for land through which the creek flows.
6. Natural Lands parcel offers downstream protection from the north side of the creek.
7. BWA has received funding to design and install green stormwater practices at key locations along Route 390 and 191, and is receiving willing cooperation from community members, church, and municipal officials. Several citizens in Mountainhome are interested in installing green infrastructure to protect the creek. Workshops are planned to provide information on how to design and install green practices at home or business.



## AREAS OF CONCERN AND POTENTIAL CONFLICT

### Knotweed, development, erosion

1. Bridges carrying Routes 191 and 390 over the creek pose pollution-event risks.
2. Knotweed is prevalent from middle reaches to confluence with the Brodhead. Shredder organisms do not typically process knotweed debris (leaves, stems, flowers) from the riparian corridor, reducing the nutrients available to other creatures.

3. Dense existing development and impervious cover along Routes 191 and 390 threaten water temperature and quality from run-off in storm events.
4. Multiple building sites are for sale in the area, with potential for expansion, thus increasing stormwater run-off.
5. Streambank failures along Wieboldt Road and other locations, with erosion potential.



# RECOMMENDATIONS

1. Identify knotweed stands at their highest point in the watershed. Remove knotweed and replace with natives.
2. Gather necessary information and prepare a petition to the state DEP for changing the designation from High Quality to Exceptional Value.
3. Retrofit storm basin along Route 390, at the former daycare center south of ESSA Bank.
4. Stabilize the streambank at Wieboldt Road and other locations TBD.
5. Implement green infrastructure at Barrett Township Municipal Building, the Friendly Community Center and Mountainhome United Methodist Church.
6. Create contact list of near-creek landowners for targeted communications program of creek-friendly

- homeowner practices.
7. Publicize existing locations where green infrastructure has been implemented: Barrett Paradise Friendly Library and CVS.
  8. Explore the possibility of linkages of preserved lands, wildlife corridors and trail connections between the headwaters of Mill and Rattlesnake creeks on State Game Lands 221 and land conserved by Buck Hill Conservation Foundation and others along the Pocono escarpment.
  9. Explore the possibility of a riparian buffer restoration project along Mill Creek from Route 390 downstream to Preacher Hill.
  10. Investigate potential for trailhead and connection on private property from Monomonock Road to game lands.

# NEXT STEPS

1. Seek funding to implement these recommendations.
2. Continue public relations campaign in the local monthly newspaper, *The Village View*, and dialogue with Barrett Township residents and officials.
3. Meet with CVS manager to discuss their existing

- pollution mitigation procedures and additional green infrastructure options.
4. Continue to implement green infrastructure practices in Mountainhome business areas.
  5. Prepare a petition to the state DEP for redesignation of watershed to Exceptional Value.

# SUMMARY/CONCLUSIONS

Mill and Rattlesnake creeks remain healthy. Their water is clear, pure and cold and supports high populations of macro invertebrates and naturally reproducing wild trout.

- Excellent water quality has been shown in IBI values over four years which are within the range qualifying macroinvertebrate populations for Exceptional Value status.
- The electrofishing survey found a preponderance of sculpins and brown trout which can only survive in year-round, reliably cold waters. Total estimated biomass was 92.1 kilograms per hectare, more than double the state Fish & Boat Commission’s standard

for Class A Wild Trout Streams. The preponderance of young fish and high biomass value shows that Mill Creek is a healthy coldwater fishery, with naturally reproducing trout.

- Continuous monitoring by BWA volunteers has shown no major impacts to the streams. Further, the close-knit community of Mountainhome values the creek and supports keeping it clean, cold and pure.

**The science supports the community’s position: Both macroinvertebrate and electrofishing studies demonstrate that Mill Creek is eligible for protection as an Exceptional Value stream for its entire length.**