Watershed project highlights

In this section we highlight three completed watershed projects and one success story. The watershed projects include AMD remediation, agricultural implementation, and on-site wastewater rehabilitation. The 2024 success story tells of an improving stream devasted by many years of AMD damage.

Pipestem Creek

Pipestem Creek in Summers County of West Virginia is a tributary of the Bluestone River. This stream is impacted by cattle and other livestock feeding near the stream and other surface waterways. Agriculture in this area consists primarily of beef cattle and some horse production.

Problem

Pipestem Creek was put on the 303(d) list in 2006 due to high concentration of fecal coliform bacteria. Source tracking indicated several beef cattle farms throughout the watershed and failing septic systems, which drained directly into tributaries of Pipestem Creek.

The main goal of this project is reduction of fecal coliform loads through the implementation of nutrient management plans and grazing plans, as well as 15 septic pumping's and 10 septic repairs.

Figure 5. Pipestem Creek watershed

Project highlights

Project results included the development of one nutrient management plan and two grazing plans, along with fencing to facilitate rotational grazing and exclude woodlands and tributaries. A total of 1,454 feet (ft) of woodland exclusion fence and 5,278 ft of pasture division fence were constructed. Two alternative water systems were established, which included two pumping plants for water control, six water troughs, and heavy use areas, along with 3,199 ft of pipeline. An additional water trough will be placed with a feed pad which is to be constructed in the fall of 2025 utilizing alternative funding.

Two farms with various cattle operations received assistance, impacting approximately 39.5 animal units on the first farm and about 8.9 animal units on the second farm. The total acres was 75.2. In the near future the nutrient reductions from these practices will be determined.

***Table 3**. Pipestem Creek BMPs implemented and load reductions achieved*

BMPs	Unit planned	Units achieved	LR goal	LR achieved	% Achieved
Nutrient management and other Ag BMPs	1 farm	1 ½ farms	6.06E+11	9.76E+11	161%
Septic pumpout	10	7	4.15E+10	2.90E+11	70%
Septic repair/replace	15	5	2.49E+11	8.30E+11	33%

Fencing is established as part of the nutrient management plans.

Woodland exclusion fence

Pasture division fence

Partners and funding

The project was managed by the WVCA through a sub-grant provided by WVDEP's NPS Program. The Southern CD was the local contact and housed WVCA's conservation specialist that managed the project. Other partners included local landowners, the Natural Resource Conservation Service (NRCS), the Summer Conty Health Dept. (SCHD) and Concord College. NRCS provided technical support and recommendations to WVCA regarding the types of BMPs, The SCHD provided oversight regarding the septic portion of the program, and certified installations. Concord College leads the monitoring efforts, which are on-going.

***Table 4**. Final Pipestem Creek project budget*

§319 funds	Match	Total	Amont spent
$117,663	$91,950	$209,613	$84,503
	Remaining Balance		$33,160

Anthony Creek

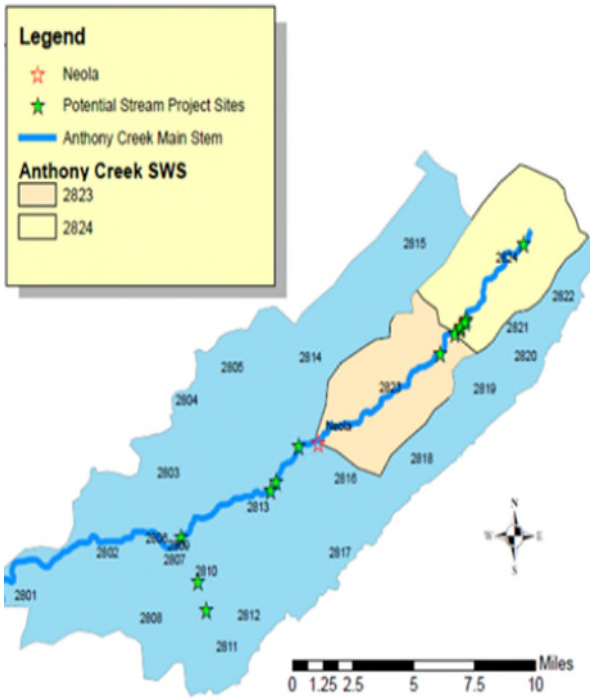


***Figure 6**. Anthong Creek watershed and project areas.*

This project is located within the Anthony Creek watershed, spanning Greenbrier and Pocahontas Counties in West Virginia. Anthony Creek served as a significant tributary to the Greenbrier River, with its confluence situated just upstream of the source water protection area for Lewisburg. Most of the watershed is composed of National Forest, private forest land, and uninhabited areas. Human impact in the Anthony Creek watershed is primarily concentrated in the more populated regions.

Problem

Anthony Creek was listed on the 303(d) list in 1996 due to fecal coliform bacteria contamination from unknown sources. In 2008, a Total Maximum Daily Load (TMDL) study was conducted for Anthony Creek, which assigned fecal coliform load limits to agricultural land and failing onsite sewage treatment systems. Source tracking revealed several beef cattle farms within the watershed that exhibited streambank erosion.

Additionally, the soil in these riparian areas showed elevated levels of fecal coliform bacteria, resulting from years of manure deposition by livestock. The objectives of this project were to decrease fecal coliform and sediment loading in Anthony Creek

Project highlights

During the grant period, two septic systems were replaced, and one septic system was pumped, which accounted for 17% of the septic load reduction goal. Outreach efforts in the Anthony Creek area were challenging due to absentee landowners and unwilling participation. Luckily the septic portion of the project was the initial focus and because of the limited number of septic projects, the proposal was amended to reallocate funds from septic initiatives to stream restoration efforts within the grant period.

The stream restoration portion was a success. Approximately 1,200 ft of stream was restored using log vanes, toe wood, and boulders to redirect water away from easily erodible banks, effectively stabilizing the eroded areas. This amount nearly doubled the original expectation of saving 100 tons, thus achieving an impressive load reduction goal.

***Table 5**. Anthony Creek BMPs implemented, and load reductions achieved*

BMPs	Unit planned	Units achieved	LR goal	LR achieved	% Achieved
Stream restoration	1,412 ft	1,200 ft	1.02E+10	4.06E+10	398%
Septic pumpout	20	1	8.30E+10	4.15E+9	5%
Septic repair/replace	8	2	1.33E+11	3.29E+10	25%

Restoration photos.

Before

After

Partners and funding

***Table 6**. Final Anthony Creek project budget*

§319 funds	Match	Total	Amont spent
$150,000	$76,840	$226,840	$114,329
	Remaining Balance		$35,671

The project was managed by the WVCA through a sub-grant provided by WVDEP's NPS Program. The Greenbrier Conservation District was the local contact and housed WVCA's conservation specialist that managed the project. Other partners included local landowners, the NRCS, Trout Unlimited (TU) and the Greenbrier County Health Dept. (GCHD). TU and NRCS provided technical support in addition on the stream restoration project, and the GCHD certified the septic installations. TU also provided monitoring support.

Muddy Creek Dream Mountain Phase II

Friends of the Cheat (FOC) has worked collaboratively with federal, state, and local agencies to restore Muddy Creek from the damaging effects of AMD since 1994. The *WVDEP Office of Special Reclamation* (OSR) has taken a new approach to restore the lower 3.4 miles of Muddy Creek by constructing the T&T active treatment facility in 2017 to improve pH between upper Muddy Creek and the Cheat River. However, the upper reaches still contributed significant metal, and acidity loads to the stream. The goal of this project was to improve the system performance by adding additional treatment and expanding the capacity of the current treatment systems. Thus far, monitoring has shown a reduction in overall metals of 85% and a 100% acidity reduction.

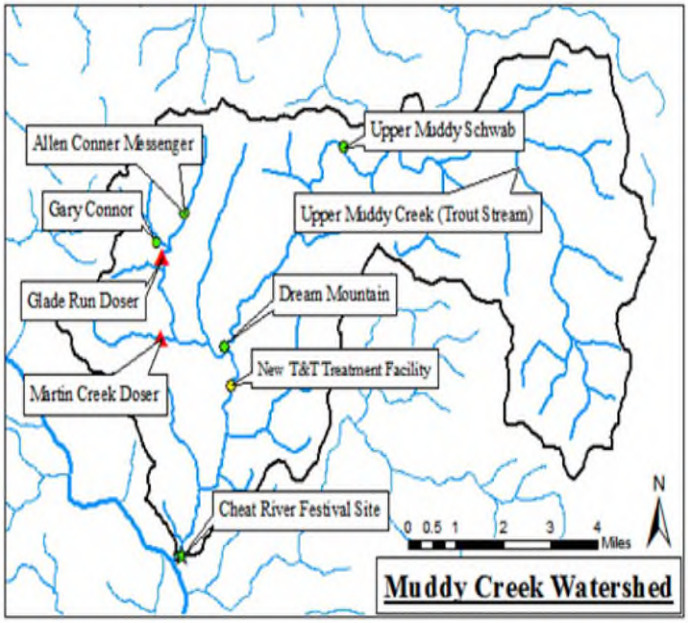


***Figure 7**. Muddy Creek watershed with key AMD treatment sites identified.*

Problem

Settling Pond during Phase II construction.

As identified under the Muddy Creek WBP, the seeps associated with the Dream Mountain site contribute the highest acidity, aluminum, and iron loadings to Muddy Creek upstream of Martin Creek. Additionally, the Dream Mountain site has the worst water chemistry combined with the largest, most variable flows that FOC has ever attempted to treat in its history as an organization. Upgrades to the Dream Mountain system are a key priority for restoration work and an absolute must for improving the lower reaches of Muddy Creek.

Project highlights

FOC procured BioMost, Inc. to design the Dream Mountain passive treatment system improvements. The design consisted of converting the existing steel slag bed into multiple auto flushing vertical flow pond filled with high quality limestone, converting the mixing basin to settling pond, and improving the existing connections between treatment components. After some preliminary design work and data collection, it became clear that the current construction budget would not suffice to complete all tasks as needed to improve the site, a trend FOC has seen routinely in recent years as costs to complete work have increased. FOC

secured matching construction funds through the *Watershed Cooperative Agreement Program* (WCAP) and *WVDEP's Office of Abandoned Minelands* (AML) Program.

Modifications of the original design were necessary. The available funds would be used to continue to rehab existing non-functioning or low-functioning treatment system components into alkalinity-generating components such as additional limestone leach beds, and/or a Jennings-Style vertical flow pond. Construction could not be completed before the end of the §319 performance period; however, all §319 funds were spent before the September deadline, and construction continued using matching WCAP and AML funding. Construction was completed in January of 2023 and since then the site has been monitored monthly.

***Table 7**. Muddy Creek BMPs implemented and load reductions*

Best management practices (Sqft)		Load reductions (lbs/yr)		% Achieved
Two Autoflushing vertical flow ponds	30,940	Acidity	79,774	98
Jenning's vertical flow pond	23,107	Dissolved Aluminum	8,232.4	100
Two setting ponds	34,927	Dissolved Iron	5,126.2	97
One polishing pond	16,819	Dissolved Manganese	252.8	59

While the system out effluent met water quality goals of 90% or greater load reductions for acidity, and dissolved metals, it has been clear after over two years of sampling this is seasonally variable, with loading reduction goals are sometimes falling below 90%. Ultimately from the efforts of the Dream Mountain Project Phase II, FOC anticipates the system out effluent will meet water quality standards for pH, iron, and aluminum and reduce loads by with consistency across all seasons and flow patterns.

Partners and funding

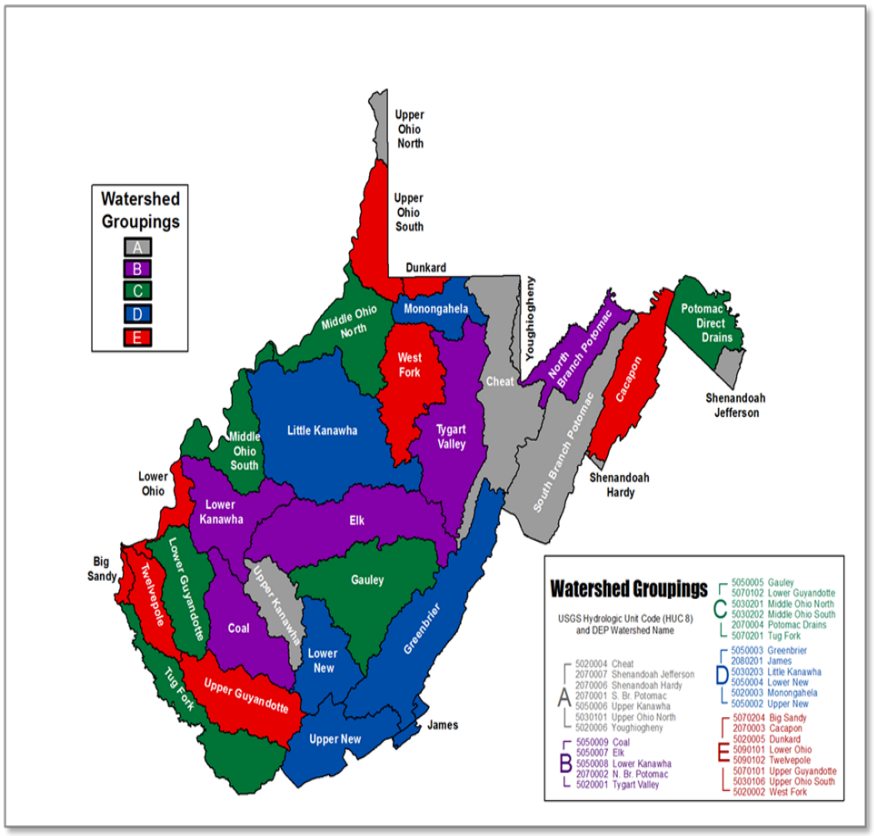
Funding was secured through the EPA's §319 funds administered by WVDEP's NPS Program, the Department of Interior – Office of Surface Mining WCAP grant and WVDEP-AML. Additional match was also provided by WVDEP-AML and FOC. The landowner of Dream Mountain provided access for construction, maintenance, post-construction monitoring and future monitoring.

***Table 8**. Muddy Creek final budget*

Line items	§319 Funds	OSM WCAP	AML (in-kind)	WVDEP AML	FOC	**Total**
Personnel/benefits	$7,493	$5,000		$5,000	$49	**$17,541**
Equipment/supplies	$232				$47	**$278**
Engineering	$105,775					**$105,775**
Construction oversight				$30,000		**$30,000**
Construction	$1,429	$95,000	$1,850	$717,300		**$815,579**
As builds						**$0**
Travel	$242				$108	**$350**
Lab fees	$3,230					**$3,230**
Operating cost	$5,321				$625	**$5,946**
Monitoring/Planning	$3,970					**$3,970**
Total	**$127,691**	**$100,000**	**$1,850**	**$752,300**	**$828**	**$982,669**

Water Quality Improvements from NPS implementation

Water quality improvements are documented and applied through a variety of programmatic methods as implemented by the WVDEP. The targeting of NPS projects for results is being tracked by the Water Quality Standards & Assessment Section (WQSAS) by active communication of project locations in a data share dashboard. This dashboard is utilized when annual monitoring efforts are developed to determine stations where pre-319 project data exists and comparable post-319 project data can be collected to show improvements. Improvements can be parameter specific to show how streams now meet numeric water quality standards, as well as benthic macroinvertebrate data to show Aquatic Life Use attainment. Other physical habitat improvements are documented such as Bank Stability or Instream Sediment levels which are resulting from 319 projects.



One example of water quality improvement from joint efforts is the proposed delisting of a 12-mile portion of Three Fork Creek in the Tygart Valley Watershed. Its **Dissolved Aluminum** as well as **Total Iron** criteria for the **Warm Water Fishery Designated Use** had been Not Meeting Attainment previously; but new data as collected by various contributors show improvement and attainment of the Designated Use and Water Quality Standards.

Selection of monitoring locations is primarily based around the rotating HUC8 basin framework as adopted by the agency where potential basins may be targeted every five years. For example, 319 project streams were considered for monitoring efforts when the New and Greenbrier River basins were planned in 2024 to 2025 sampling. Related monitoring efforts from the WVCA will supplement the monitoring efforts in these watersheds; and such 3rd party data will be submitted and used for assessment decisions in the appropriate *Integrated Reports*.

In the same mindset as many 319 projects, the WQSAS is working to implement an Advanced Restoration Plan (ARP) in select subwatersheds of the Cacapon River basin. To potentially support/develop a WBP, this and potential future ARP's will include post implementation monitoring. Current and future WIB projects will be considered in ARP development and associated monitoring as applicable. Post-TMDL monitoring also follows the rotating basin framework, where improvements from load and wasteload allocations can be documented for assessment and reporting.

Has past NPS implementation impacted water quality? Supporting evidence can be found in the supplemental categories of the *Integrated Report*. Table 9 provides a summary of selected waterbodies that were most likely influenced by NPS implementation.

***Table 9**. Waterbodies likely influenced by NPS implementation*

Stream code	Waterbody Name	Waterbody Extent Description	Parameter
WVJ-1	Potts Creek	WV/VA border at RM 47.41 to Forks	CNA-Biology
WVKN-26	Piney Creek	RM 21.3 to RM 27.7	Fecal Coliform
WVKN-26-K.5	UNT/Piney Creek RM 23.62	Entire length	CNA-Biology
WVKNG-23	Second Creek	RM 4.2 to RM 10.7	CNA-Biology
WVKNG-23	Second Creek	Mouth to RM 4.2	CNA-Biology
WVM-8	Deckers Creek	RM 18.1 to RM 20.4	Manganese
WVM-8	Deckers Creek	RM 6.2 to RM 16.2	pH
WVM-8	Deckers Creek	RM 6.2 to RM 16.2	DO
WVM-8	Deckers Creek	Mouth to RM 6.2	DO
WVM-8	Deckers Creek	Mouth to RM 6.2	pH
WVM-8-0.5A	Hartman Run	Entire length	pH
WVMC	Cheat River	RM 51.0 to Forks	Iron
WVMC	Cheat River	RM 51.0 to Forks	pH
WVMC	Cheat River	Above Cheat Lake at RM 12.6 to RM 28.6	pH
WVMC-17	Muddy Creek	RM 3.3 to RM 9.8	CNA-Biology
WVMC-17	Muddy Creek	Mouth to RM 3.3	DO
WVMC-18	Roaring Creek	RM 10.5 to HW	Aluminum-D
WVMC-18	Roaring Creek	RM 9.2 to RM 10.5	Aluminum-D
WVMC-27-A	UNT/Pringle Run RM 1.75	Entire length	Iron
WVMC-27-A	UNT/Pringle Run RM 1.75	Entire length	pH
WVMC-27-A	UNT/Pringle Run RM 1.75	Entire length	Manganese
WVMC-60-D-3	North Fork/Blackwater River	RM 2.4 to Pond at RM 3.6	pH
WVMT-12	Three Fork Creek	Mouth to RM 12.8	pH
WVMT-12	Three Fork Creek	Mouth to RM 12.8	DO
WVMTB-5	Pecks Run	Mouth to RM 2.2	pH
WVMW-16	Lambert Run	Entire length	pH
WVP-9	Sleepy Creek	RM 31.5 to WV/VA border to RM 36.2	Fecal Coliform
WVP-9	Sleepy Creek	Mouth to RM 7.7	Fecal Coliform
WVP-9-0.5A	UNT/Sleepy Creek RM 3.49	Entire length	CNA-Biology
WVP-9-E	Middle Fork/Sleepy Creek	Mouth to RM 1.2	CNA-Biology
WVP-9-G	Indian Run	Mouth to HW Lake at RM 2.0	Fecal Coliform
WVPC-24	Lost River	Mouth to RM 11.5	CNA-Biology
WVPC-24	Lost River	Mouth to RM 11.5	Fecal Coliform

NONPOINT SOURCE SUCCESS STORY WEST VIRGINIA

Lime Dosing is Improving Tributaries of Little Sandy Creek

Abstract | Water Quality | Highlights | Results | Partners & Funding

Water Body Improved

Little Sandy Creek receives polluted water from abandoned and bond-forfeiture coal mines along its tributaries, Maple Run and the Left Fork of Little Sandy Creek (LFLSC). The West Virginia Department of Environmental Protection (WVDEP) added Little Sandy Creek to the Clean Water Act Section 303(d) List of Impaired Waters in 1996 for pH and iron impairments associated with its public water supply and warm water fishery designated uses. WVDEP operates a lime-dosing station on each of the polluted tributaries (through a water-quality variance). This practice has reduced the tributary loads, and Little Sandy now meets standards for dissolved aluminum and pH. The WVDEP Nonpoint Source Program supported construction of a treatment plant that will further reduce the iron load in LFLSC.

Contact
Kelley Flaherty, Executive Director
Save the Tygart Watershed Association

Click-Here to read the full story.

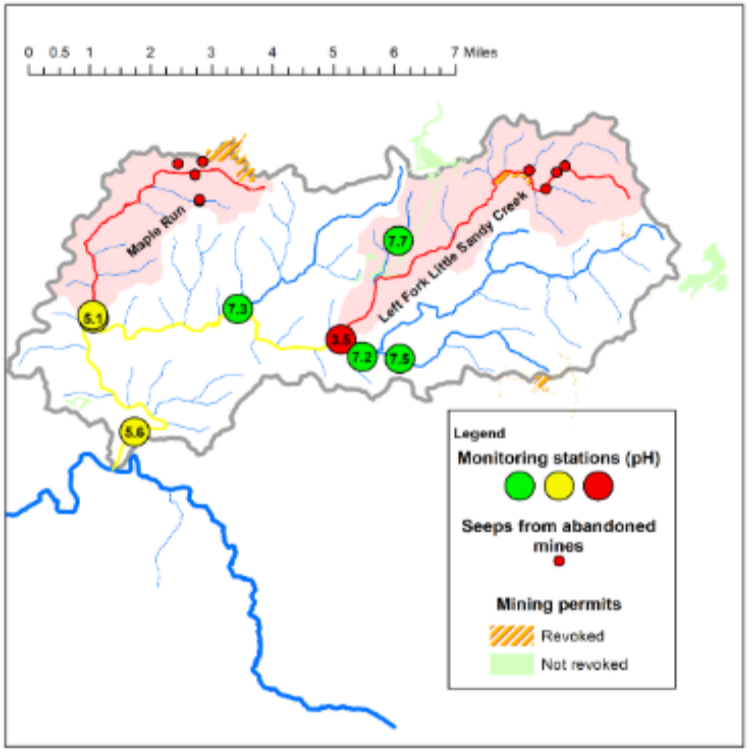


Figure 8. AMD from abandoned mines and from mines with revoked permits (bond forfeitures) pollute Maple Run and the Left Fork of Little Sandy Creek. These tributaries drain to Little Sandy Creek, which fail to attain pH 6, which is the minimum level required by state standards, even though York Run, which drains to Little Sandy Creek between Maple Run and the Left Fork, adds water that does meet the standard.