WV-VA WATER QUALITY MONITORING PROJECT SUMMARY OF 10 YEARS OF MONITORING

Trout Unlimited's Jake Lemon spearheaded and coordinated the WV-VA Water Quality Monitoring Project for the past 10 years.

REFLECTIONS FROM JAKE LEMON, TROUT UNLIMITED

In early 2014, I moved from Colorado to Central Pennsylvania to coordinate Trout Unlimited's Shale Gas Monitoring Program, including the newly formed WV/VA Water Quality Monitoring Project. This work would take me from Elkins to Monterey to Monroe County and many places in between, working with WV Rivers and other partners to support communities in protecting their streams and rivers from degradation associated with shale gas and pipeline development.

My summers were a series of weekend trips to beautiful corners of West Virginia and Virginia, and I quickly developed a deep appreciation of the landscape and people. I was recently asked what single accomplishment I'm most proud of in my professional career. My work with volunteer monitoring in West Virginia and Virginia immediately came to mind. TU, WV Rivers, and many other organizations and individuals came together to form a network of trained citizen scientists who had the tools and know-how to keep an eye on the industry when agencies had insufficient capacity to do so.

This work greatly mitigated the impacts of shale gas and pipeline development on West Virginia's water resources and continues to do so. I'm so inspired and impressed by the volunteers who committed so much energy to this program, and I feel so privileged to have been involved.

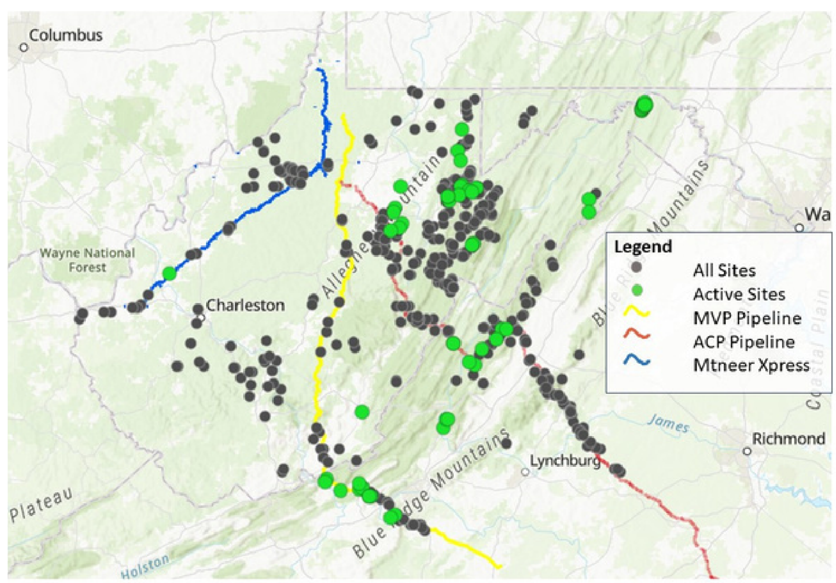
INTRODUCTION

The mission of the WV-VA Water Quality Monitoring Project is to train and equip volunteers from across the two Virginias to monitor streams that have the potential to experience impacts from industrial development and infrastructure buildouts.

The monitoring program was developed by Trout Unlimited to monitor impacts of shale gas development on high quality trout streams. Over the years the program expanded to include warmwater streams and monitoring impacts from pipeline and highway construction. Additionally, we included sites for an annual snapshot day to monitor remote streams in the Monongahela National Forest.

This summary covers approximately 10 years of monitoring from late 2013 through May 2023. During this period, there were 7,913 monitoring events covering 525 sites shown in the map to the right.

The green circles on the map show the sites that have been monitored at least once during the past year.



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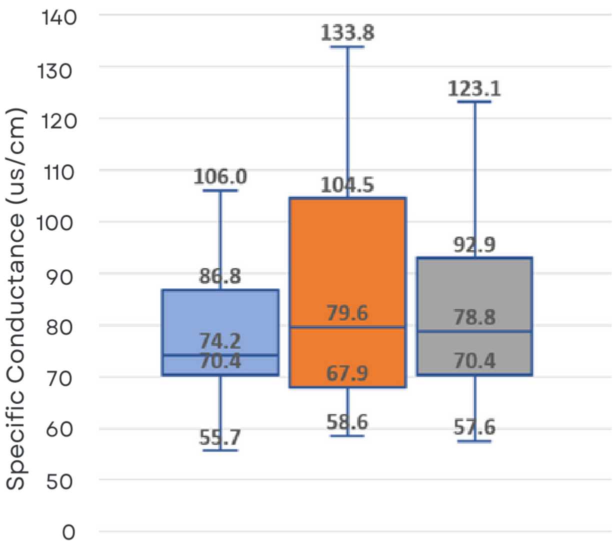
SITE SPECIFIC ANALYSES

Many long-term sites have produced very good data sets. For example, the 3 Cheat River tributary sites shown below have been sampled at least 70 times - and consistently show that conductivity in Elsey Run (blue) is slightly lower than Wolf Creek (gray), and both are lower than Saltlick Creek (orange). Having this kind of quality data allows one to recognize when something is outside of the normal range, which can then lead to identifying a problem that needs to be addressed. The chart below shows the distribution of all conductivity data collected at these three sites; identifying the minimum, maximum, median, 25th, and 75th percentiles of the results. This data's quality is further supported by the fact they are consistent with DEP's WAB data collected on these same streams.

CONDUCTIVITY IN SELECT CHEAT RIVER TRIBUTARIES



Data show evidence of acid mine drainage issues. Jane Birdsong, who is celebrating 10 years of volunteer monitoring with us, has the honor of measuring the lowest pH in the monitoring results. Long Run of North Fork of the Blackwater River had a pH measured at 2.5 on two occasions and had an average pH of 2.95 across 6 samples.

Several sites demonstrate the impacts of acid rain or, more appropriately, acid precipitation since it can also include snow, fog, and hail.

Acid rain results when sulfur dioxide and nitrogen oxides are emitted into the atmosphere and transported by wind and air currents. These atmospheric pollutants react with water, oxygen, and other chemicals to form sulfuric and nitric acids. which then mix with water and other materials before falling to the ground.

WVDEP'S WATERSHED ASSESSMENT BRANCH DATA FOR COMPARISON			
Stream Name	Avg. Conductivity	Min Conductivity	Max Conductivity
Elsey Run	71.69	61	89
Saltlick Creek	98.21	62	174
Wolf Creek	90.46	65	112

This acidic deposition results in acidic streams when their watersheds have limited ability to buffer the acidity – these low-buffered streams are those with low conductivity.

The following sites had pH less than 5.0 and conductivity less than 30 uS/cm for at least 3 monitoring events. Acidic streams impacted by mining are differentiated by having much higher conductivity.

ACID PRECIPITATION IMPACTED SITES		
Stream Name	Avg. pH	Avg. Conductivity
Dry River	5.0	20.7
Gullysville Creek	4.9	20.0
Hone Quarry Run	5.0	27.1
Kennedy Creek	4.5	11.9
Little River	5.0	23.2
Little Thorny Creek	5.0	24.1
Mill Creek	4.7	11.1

ACID PRECIPITATION IMPACTED SITES		
Stream Name	Avg. pH	Avg. Conductivity
North Fork of Potts Creek	5.0	10.0
Orebank Creek	4.8	11.3
Ramsey Draft	5.0	24.5
Ramsey Draft	4.6	26.4
Red Creek	4.6	13.4
Rocky Run	5.0	17.0
South Form of Red Creek	5.0	23.7

THE VALUE OF MONITORING COMMENTS

Many parameters, like conductivity, are highly dependent on stream flow. At low flow, dissolved chemicals are more concentrated – thus resulting in a higher measure or conductivity. Conductivity can vary considerably over time, and results that are outside the norm may, at times, seem questionable.

Notes taken by volunteers during monitoring can help in properly interpreting the results. A good example is the spread of conductivity results measured at Craig Creek (CRAICR004), which varies from 28.5 to 156 μs/cm, with an average of 67 μs/cm.

(CONTINUED)

Notes recorded along with these values included, “This assessment was taken a day after several days of heavy, continuous rain. This location was still high but had clearly been flooding over the banks, probably a foot higher,” “Water was clear,” and “Weeks of no rain mean the stream at this location (upstream from CRAICR002) is mostly dry riverbed; some pools and puddles noted, mostly with brown, scum-covered water, and crammed with small fish,” respectively. These notes from Clare Law perfectly explain the reasons for the variation in conductivity readings.

THE VALUE OF VOLUNTEER MONITORS

Monitoring regularly – especially during and after rain events - is incredibly valuable. When developers and contractors know that there are people watching, they are more likely to do things right like proper installation of silt fences and other Best Management Practices to control erosion and prevent sediment from entering nearby streams.

113 VOLUNTEERS COMPLETED ≥ 10 MONITORING EVENTS

51 VOLUNTEERS COMPLETED ≥ 50 MONITORING EVENTS

20 VOLUNTEERS COMPLETED ≥ 100 MONITORING EVENTS

A lot of volunteers monitoring over the past 10 years!
163 volunteers conducted 7,913 monitoring events!

On average, there have been two and a half samples collected every day since the beginning of 2014 – or once every 10.42 hours. Through rain, snow, and sleet, our volunteer monitors carried on. 91 samples were collected during rain events, and 14 events were described as cold.

The number of volunteers and active monitoring sites has fluctuated over the past 10 years. The peak in monitoring activity occurred at the height of the pipeline construction boom when 3 pipelines were being constructed simultaneously. Monitoring dropped off following the completion of MXP, the cancellation of ACP, and the stay in construction on MVP. The COVID-19 pandemic also caused a drop in volunteer monitoring that we are still bouncing back from. The increase in highway construction and resumed construction of MVP has increased the need for monitoring.

HERE’S WHAT WE ACCOMPLISHED TOGETHER

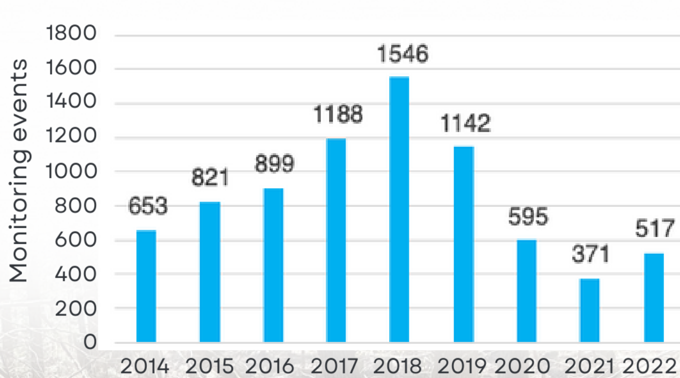
7,608 PH MEASUREMENTS

7,620 WATER TEMPERATURE MEASUREMENTS

7,629 MEASUREMENTS OF CONDUCTIVITY

19,005 SUBSTRATE SIZE ASSESSMENTS DURING PEBBLE COUNTS

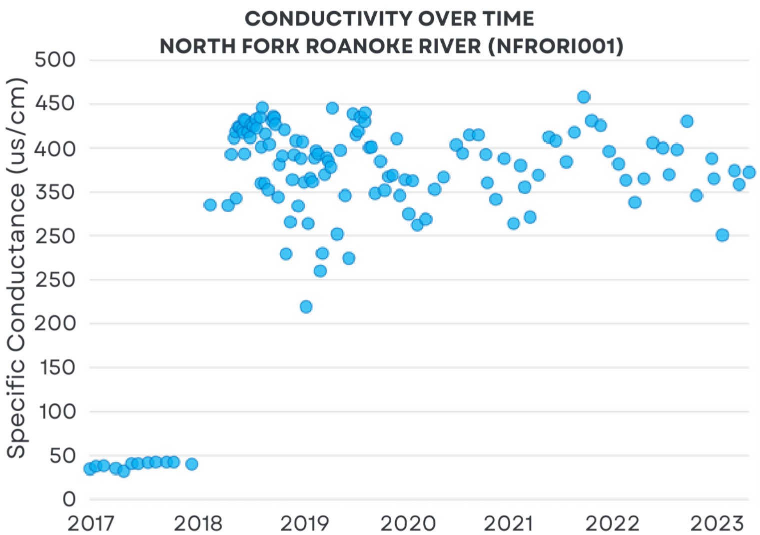
NUMBER OF MONITORING EVENTS BY YEAR



LESSONS LEARNED

The data analyses revealed several lessons learned:

1. There are many dedicated volunteers collecting valuable data across West Virginia and Virginia.
2. The data collected could be even more valuable with refresher training on the methods and upgrading the equipment used.
3. While there are limitations in the precision of the data that some of the more affordable monitoring equipment can provide, proper and consistent use of the equipment will make the most of volunteer monitoring efforts.
4. The use of the Secchi tube to determine turbidity was an example of where data were often compromised, and volunteers themselves said that more time working with equipment during training sessions would be helpful (Volunteer Survey Results, 2016).



Looking at a set of data graphically provides quality assurance because you can identify outliers, such as equipment malfunctions, user error, or a possible significant change in the watershed.

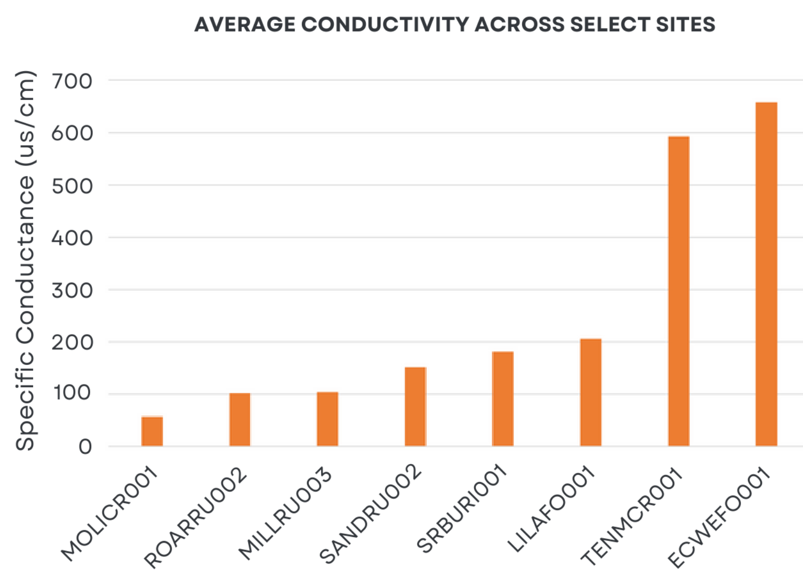
You can also see how conductivity varies over the seasons – higher during the low flows of summer and fall and lower during the higher flows of late winter and spring.

In the left-hand figure, it appears that a change occurred in the waterbody at the end of 2018. This change in baseline conductivity coincides with the start of contruction of the Mountain Valley Pipeline.

Another benefit of graphing data is to see how results can differ from one stream to another. The figure to the right shows the variation in conductivity for streams monitored by volunteer Chris Byrd, another volunteer monitor celebrating 10 years with us!

When comparing data from different streams, considering different land uses in the various watersheds can explain differences in water quality.

In this case, Mountain Lick Run (MOLICR001) is an undisturbed stream in the Monongahela National Forest, while Elk Creek of West Fork (ECWEFO001) is impacted by surface and underground coal mining.



ACKNOWLEDGEMENTS

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To become a volunteer water quality monitor or to learn more about WV River's work, visit: wvrivers.org/our-programs/water-monitoring.