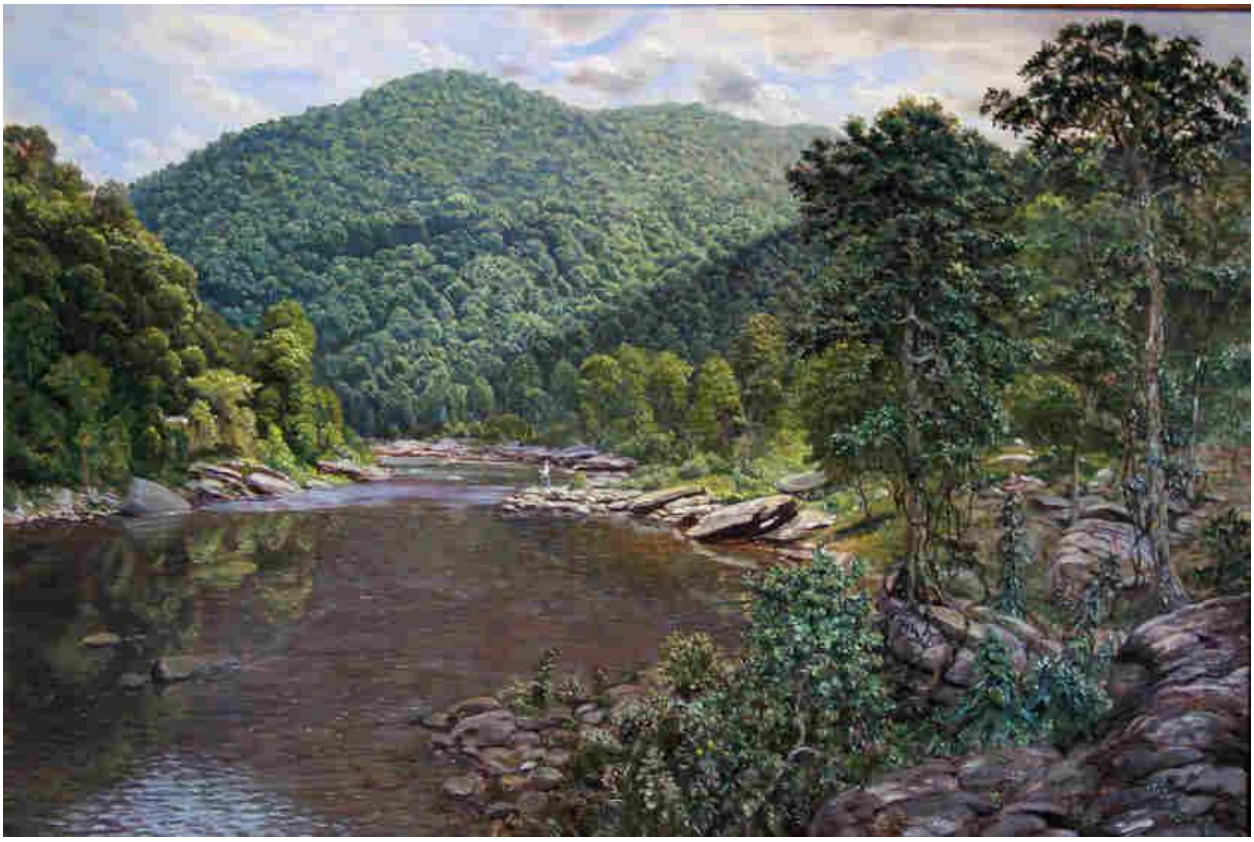


CREATES: Cheat River Ephemeral Access Treatment and Enhancement Strategy

Mission Statement:

The CREATES team plans to revitalize and recover the streams entering the southern 20 miles of the Cheat River Watershed by 2030.

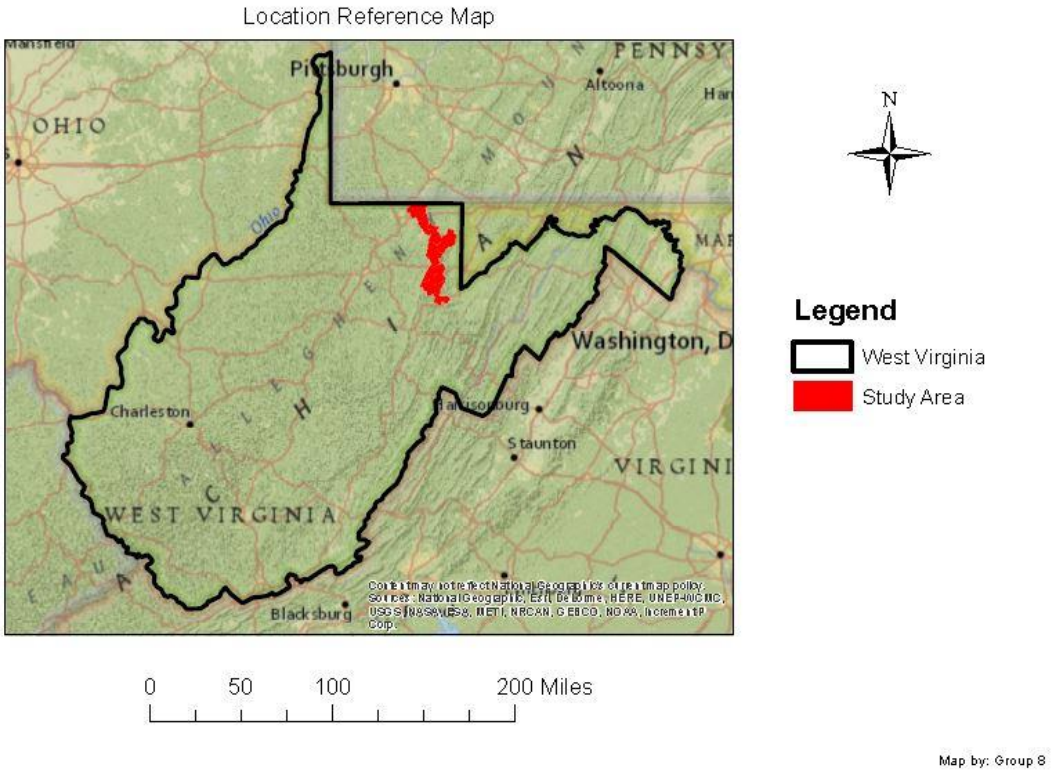
Team:

Hannah Diehl, Brandon Mace, Daniel Taylor, Andrew Stauble, Charlton Becker, and Tyler Dolgos

Background

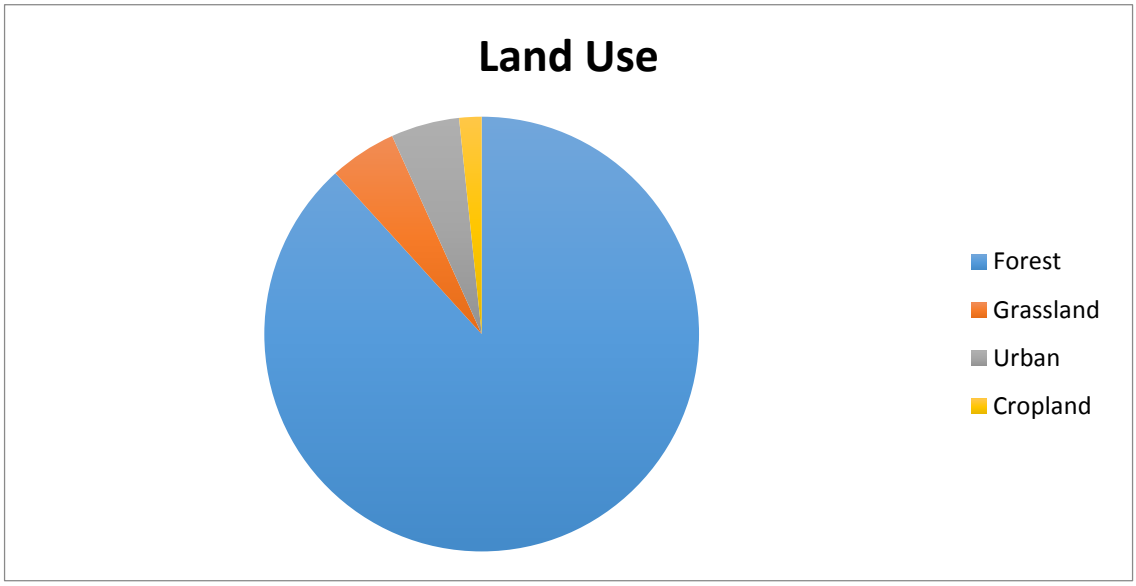
Overview

The Cheat River watershed covers an area consisting of Northern West Virginia, Southwestern Pennsylvania, and a small section of Western Maryland. This area is highly industrialized and includes the coal fields of West Virginia and Western Pennsylvania. Pittsburgh and Morgantown, West Virginia are large population clusters within the watershed. The Cheat River is a major tributary of the Monongahela River. In 1995, American Rivers, a national river conservation organization, declared that Cheat River was the eighth most endangered river in North America due to the severe acid mine drainage (AMD) problems in the lower part of the basin. Problems still persist to this day, which were detailed in a Watershed Assessment conducted by the US Army Corps of Engineers in 2011. Acid mine drainage, tradition gas drilling, industrial and municipal pollution, land use, and deep well gas development are currently some of the principal water quality concerns in the watershed. The quantity of water withdrawn from streams is largely unregulated and is beginning to show negative consequences. Additionally, flood risk management as well as the inability of local communities to implement flood risk management projects was a concern.



Land Use

The watershed includes forest, grassland, urban/residential, and cropland. It is mostly dominated by forest. Drinking water is drawn from the Cheat River in four towns: Parsons, Rowlesburg, Kingwood, and Albright. Several endangered and protected species find home in the Cheat River including the Cheat Mountain salamander, three-toothed flat spired land snail, Indiana bat, and the West Virginian flying squirrel.



Existing regulations/ organizations

Friends of the Cheat was formed in 1994 after a large volume of discharge was released from a recently closed mine, FOTC realized that the issue was more severe than just the impact from the single mine, and formed the River of Promise (ROP) task force. The main goal of the ROP is to reduce the impact of Acid Mine Drainage on the Cheat River by reclaiming mines. “North Fork of Green Roads Railroad Refuse Passive AMD Treatment Project” is a remediation project that was funded in August 2012 to begin the remediation of one of the larger contributors of the Acid Mine Drainage. If successful it will lower the acidity, iron, aluminum and manganese.

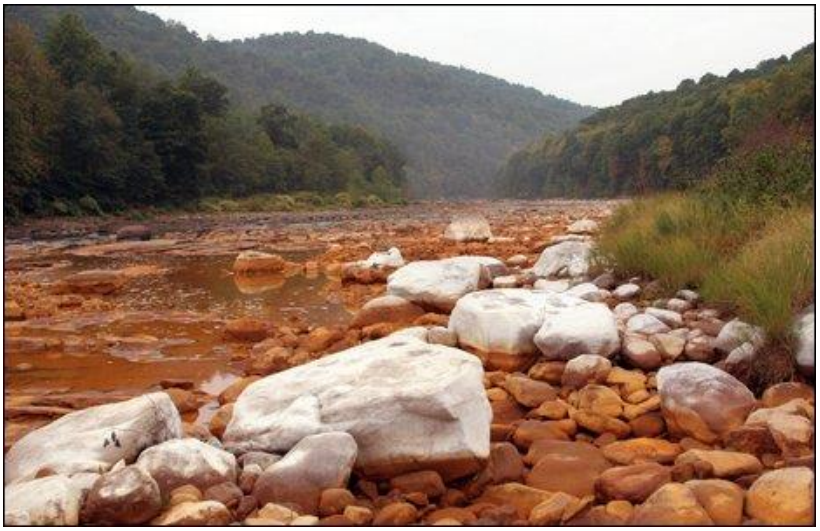
Other partners include the West Virginia Department of Interior’s Office of Surface Mining and Stream Initiative, West Virginia Rivers Coalition, West Virginia Department of Environmental Protection and more. 7 projects in the Cheat River have been funded with the Nation Mine Lands Reclamation Center for $1.1 million. A few of the projects have been completed and are reducing the acid loads.

The Surface Mining and Reclamation Control Act of 1977 was established to regulated mining and the reclamation of cola mines. It made minimum requirements for underground mining to reduce the disturbances on wildlife and the environment. The reclamation planning is focused mostly on the restoration of land and water.

Problems/Areas of concern

Acid Mine Drainage

Many of the abandoned land mines in West Virginia have impacted the watershed with their discharges, leading to high levels of many heavy metals in these streams. There are 239 abandoned land mines in the lower Cheat River, and 66 of these are thought to be discharging acid into the Cheat. The highly acidic discharge from land mines drastically lowers the pH of streams. Lowering the pH significantly harms the aquatic habitat, diminishing the health of the stream. Acid mine drainage is a significant problem, because even after mines have been shut down for a significant amount of time, they still produce high volumes acidic runoff. “In its lower 20 miles, many of the streams in the Watershed have been so severely degraded by acid mine drainage (AMD) that they are effectively dead.”



Biological Disturbances

High Levels of Fecal coliform have been found in some lower Cheat River tributaries. Sources of fecal coliform are runoff from agricultural and urban areas. Unregulated and broken sewage systems contribute fecal matter into the runoff. In the Cheat River, there have been differing ideas about the presence of fecal coliform depending on the sampling. A study in 1996 indicated that many areas in the lower Cheat watershed were impaired. However, a different study in 2001 indicated the opposite, that there were no violations. For example, in 1996 one spot had levels of 1,000 fecal coliform units per 100 mL, while the same site had 28 fecal coliform units per 100 mL. It is important to note that in the 1996

experiment there were much higher levels of rainfall than when the 2001 samples were taken.

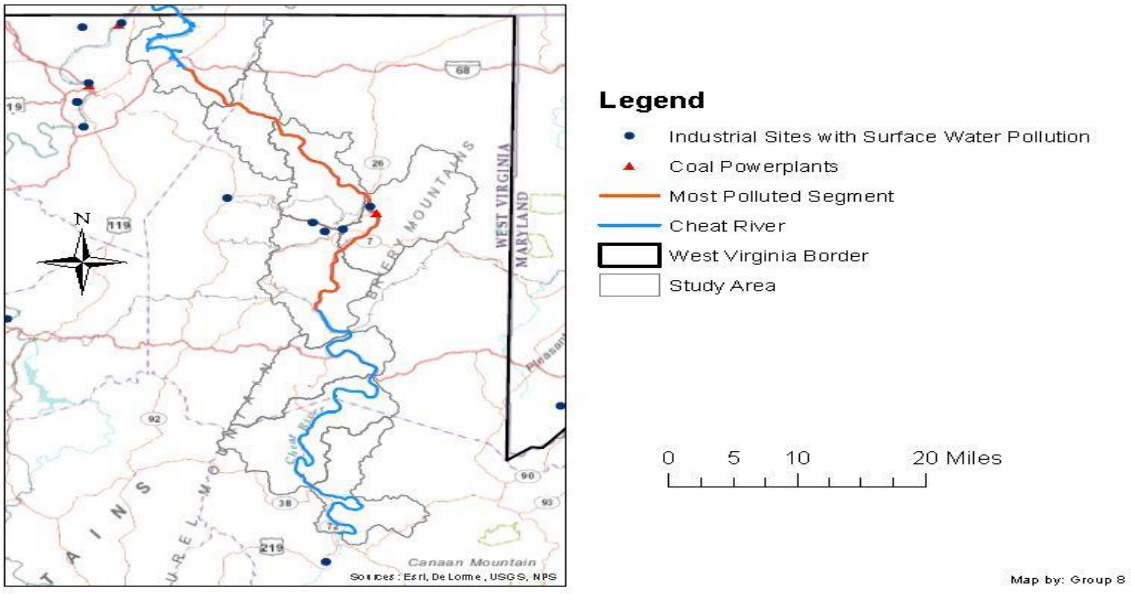
- Human health hazards: Fecal Coliform in large doses is not directly harmful to humans. However, high levels of fecal coliform suggest that there are higher levels of pathogens in the water, which can cause harm to humans. Some waterborne pathogenic diseases that may coincide with fecal coliform contamination include ear infections, dysentery, typhoid fever, viral and bacterial gastroenteritis, and hepatitis A.
- Effects on the environment: Fecal coliform can be harmful to the environment. Decomposition can lower dissolved oxygen levels to the point where aquatic life can no longer survive. Chlorine is often used to treat high levels of fecal coliform but can also be detrimental to the river. Therefore, it is important to locate the sources and take preventative measures before the fecal coliform affects the stream.

Sedimentation Build-up

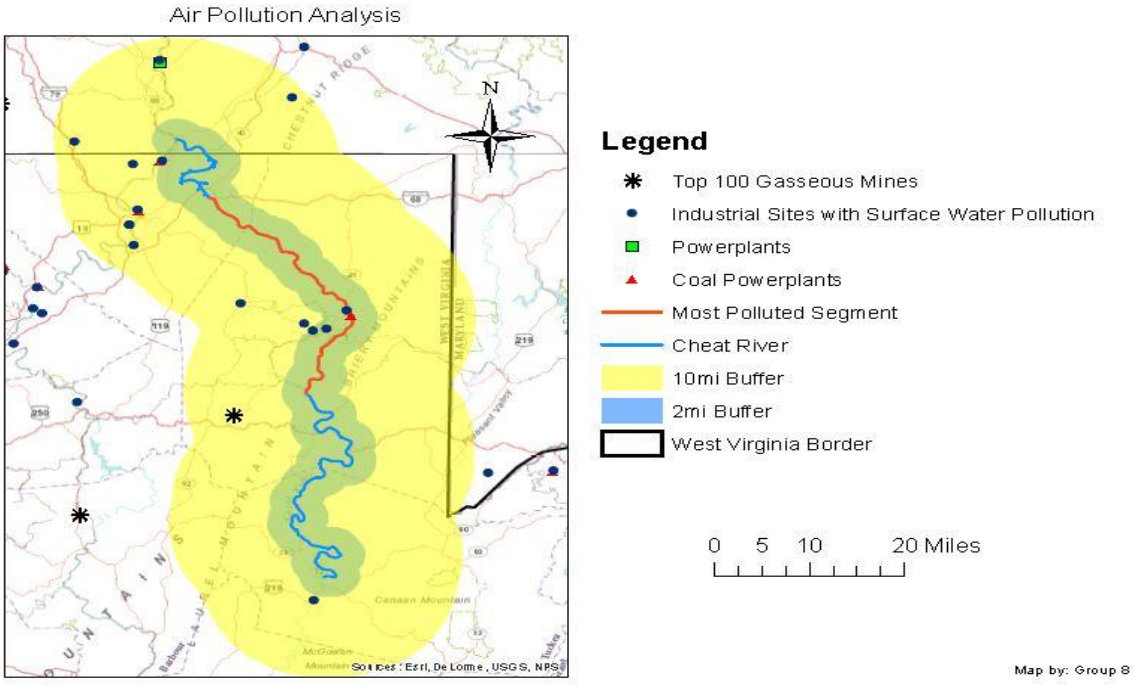
Many of the tributaries have been affected by large amounts of sediment accumulation. Sediment buildup can disturb the floor of the stream and smother the macroinvertebrates in their habitat. High levels of sedimentation can impair the respiration of organisms by clogging their gills.

GIS Maps of Polluted Reach

Cheat River's Most Polluted Reach



Air Pollution Analysis



Solutions/Goals/Recommendations

Acid Mine Drainage

Restoration projects using limestone will help neutralize acidity before the water enters the river allowing for a resurgence of the bass population. There are two types of limestone restoration methods: active and passive. Active restoration includes the direct aeration of lime substance into the water, while passive is the construction of limestone drains and other limestone surfaces for the water to flow through. Advantages of limestone restoration include the cost, availability, easy distribution, non-toxicity, nature of limestone, and the ease in which it dissolves in water. Other strategies for reducing the effects of AMD include installing a "sealing layer" which is typically clay over the spoil, or blending the mineral wastes with acid consuming materials.

Passive limestone restoration is recommended for this site. It is an effective method for reducing the acidity, with low costs and a small environmental footprint. After installation of the limestone drains the acidity of the water will decrease.

It is important to note that targeting the abandoned mines can minimize AMD. This is currently being done by many of the public organizations in West Virginia mentioned earlier.

Biological Disturbances

As noted earlier, the two different studies in fecal coliform had very different results. In 1996 many sites violated the standards for fecal coliform, while in 2001 none of the sites did. The 1996 rainfall discharge levels were much higher than those in 2001. This indicates the source of the fecal coliform is nonpoint. The most effective way to control this nonpoint pollution is to identify the sources and remediate them. This can include fencing livestock out of the stream area. Additionally, septic systems need to be implemented and maintained, or people need to be connected to centralized water wastewater treatment systems.

We recommend research to identify the sources of the pollution. After the sources have been identified, appropriate actions can be taken to minimize the fecal coliform in the runoff.

Sediment buildup

Prevent erosion by protecting the habitat around the stream by installing/maintaining proper vegetative cover. Re-vegetation of highly eroded areas on the stream corridor will reduce the amount of sedimentation occurring in the stream. If there are farms or pastures, buffer strips of vegetation can be planted to reduce the erosion from the area.

We recommend planting native plants in the highly eroded areas around the stream, and introducing a buffer region between agricultural areas and the entrance of the stream.

Partners

Friends of the Cheat

West Virginia University – Department of Environmental Protection

West Virginia: Division of Natural Resources

Conclusion

The current state of the Cheat River watershed is not ideal but can be improved using the methods outlined above. Acid mine drainage, biological disturbances, and sediment build up have all contributed to a poor environmental rating within the watershed. However, installing limestone drains, properly fencing off livestock, improving septic systems, and revegetation of eroded areas can help reverse these effects. Additionally, it is important to keep the surrounding community aware of the existing problems and updated on the progress throughout the project. With these strategies CREATES is confident in the revitalization of the streams entering the southern 20 miles of the Cheat River Watershed by 2030.

Appendix

"Monongahela River Watershed Initial Watershed Assessment." US Army Corps of Engineers. N.p., Sep. 2011. 17 Mar. 2015.

"Stream Water Quality in Coal Mined Areas of the Lower Cheat River Basin." USGS. N.p., Jul. 1997. Web. 20 Mar. 2015.

"Friends of the Cheat." Friends of the Cheat, N.p., n.d. Web. 07 Apr. 2015.

"An Ecological Assessment of the Cheat River Watershed." West Virginia Division of Environmental Protection, N.p., 1996. Web. 15 Mar. 2015.

"Lower Cheat, West Virginia – Nonpoint Source Success Story." Mid-Atlantic Water, N.p, Jun. 2011. Web. 23 Mar. 2015.

"West Virginia: Cheat River" United States Environmental Protection Agency, N.p, n.d. Web. 06 Apr. 2015.