Remedial **E**nhancement of the **NE**w

River **W**atershed

(RENEW)

Group 2

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Mission Statement

The goal of RENEW is to analyze the impacts of human activities on water quality parameters of the West Virginia reach of the New River and provide recommendations to reduce pollutant levels by 50% by the year 2040.

Background and History

The New River flows south to north from its headwaters in North Carolina into the West Virginian Gorge until it meets the Gauley River. Its drainage area in West Virginia alone encompasses ~1,600 mi^2 and it is thought to be one of the oldest rivers on Earth, estimated to be 65 million years old. The river has long been the core of the surrounding substantial mid-latitude forest and supports the diverse plants and animals that call the gorge home.

The river has been designated as a nationally significant and unique wildlife ecosystem by the U.S. Fish and Wildlife Service, and is classified by West Virginia as a high quality stream because of the quality and quantity of fishable marine life. In West Virginia part of the river is protected as a National Park and Preserve, the New River Gorge. According to the National Park Service, the gorge serves a critical role as a migration corridor and homes both endemic and endangered species.

The gorge itself was almost entirely inaccessible until 1873 when railroads connected the more wilderness parts of West Virginia to the bustling east coast and opened it up to mining. From there urbanization progressed and farming also became a major industry in the area. Today, the river is utilized by hundreds of thousands of visitors annually to boat, whitewater raft, kayak, canoe, swim, and fish, making its quality important to public health.

Policies and Mandates

The New River, despite its name, is known to be one of the oldest rivers in North America. In the West Virginia stretch, the New River Gorge National Park encompasses a large portion, which is where RENEW will focus some of its policy efforts.

There are specific policies and mandates for the New River watershed that focus on maintaining its health and ecological integrity. The National Park Service plays a vital role, implementing measures to control pollution and invasive species. The Foundation Plan is put in place to identify park resources and values that are fundamental to achieving the park’s purpose and policy requirements.

In particular to controlling the acid mine drainage there is the Mixing Zones policy that mandates and controls the concentration of pollutants in waterways. There is also the Conditions Not Allowable In State Waters which involve anything from suspicious odors, toxins, distinct colors, and deposits in the water. Since the New River is known to have high quality water there is the Antidegradation Policy that keeps it from degrading any less than it is today.

The West Virginia Water Pollution Control Act mandates the discharge of pollutants into waterways. Permits are required by wastewater treatment facilities and industrial discharges and they need to meet specific standards before releasing the water. There is also a Water Use Permit which states that if someone wants to withdraw water from a public source they need a permit and the amount of water is based on a case by case scenario.

With the concerns of acid mining, coliform contamination, and erosion entering in the waters, the imperative for stringent policies becomes all the more apparent. By enacting and enforcing these policies, we can ensure its continued vitality for generations to come.

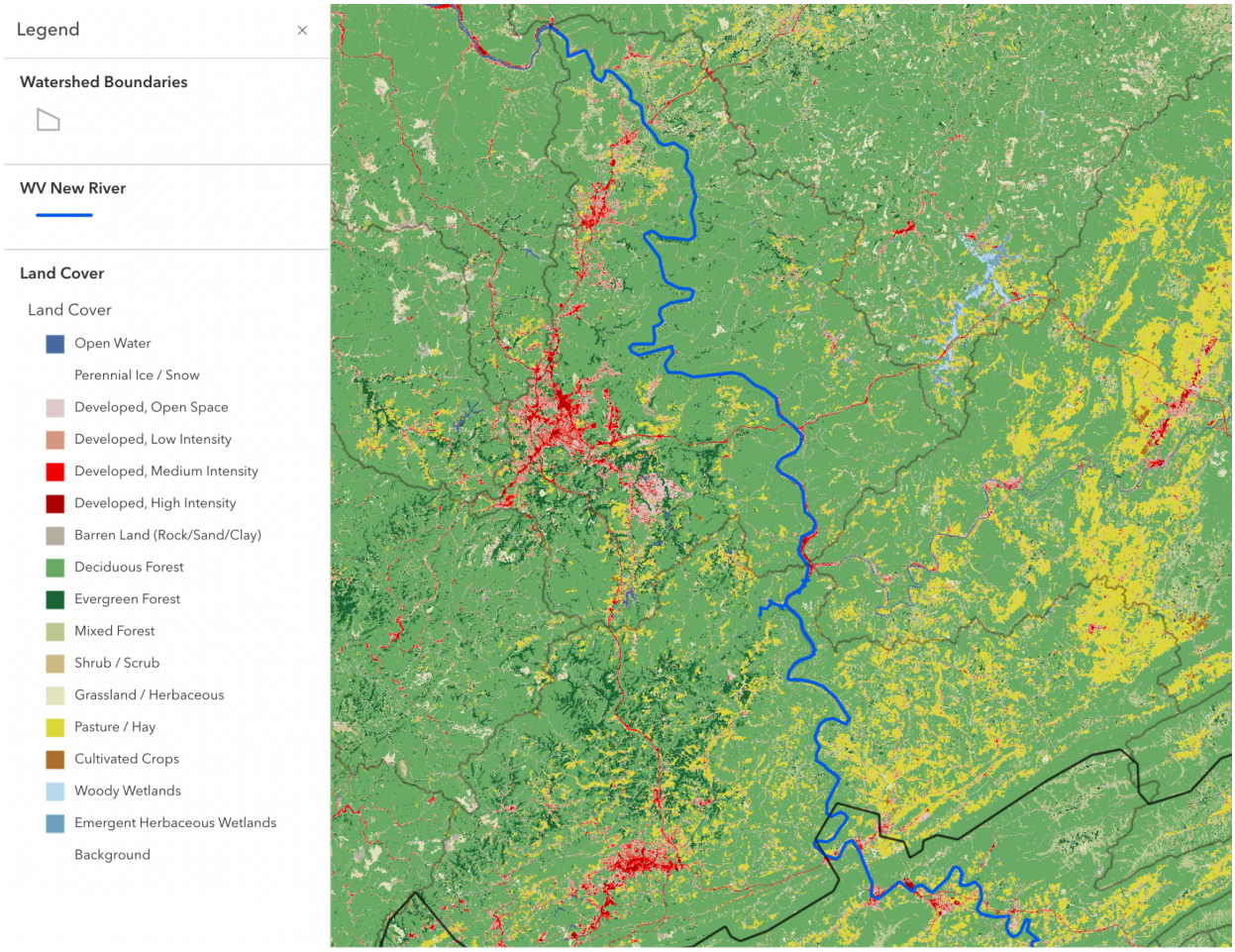
Governance Structure

The New River Clean Water Alliance (NRCWA) is a coalition of government agencies, organizations, and watershed groups that works with communities to identify and address problems to improve and protect water quality in the Lower New River watershed. Some of its partners include the West Virginia Department of Environmental Protection, National Park Service, National Parks Conservation Association, Southern Conservation District, Piney Creek Watershed Association, Region 1 and Region 4 Planning and Development Councils, Beckley Sanitary Board, West Virginia American Water, Plateau Action Network, and the WV Rivers Coalition.

The NRCWA is facilitated by the New River Conservancy, a nonprofit organization based in North Carolina. The New River Conservancy’s main roles within the Lower New River watershed are engaging with local communities, working with local and state agencies to improve infrastructure and secure funding, and conducting and publishing research for the public.

Figure 1

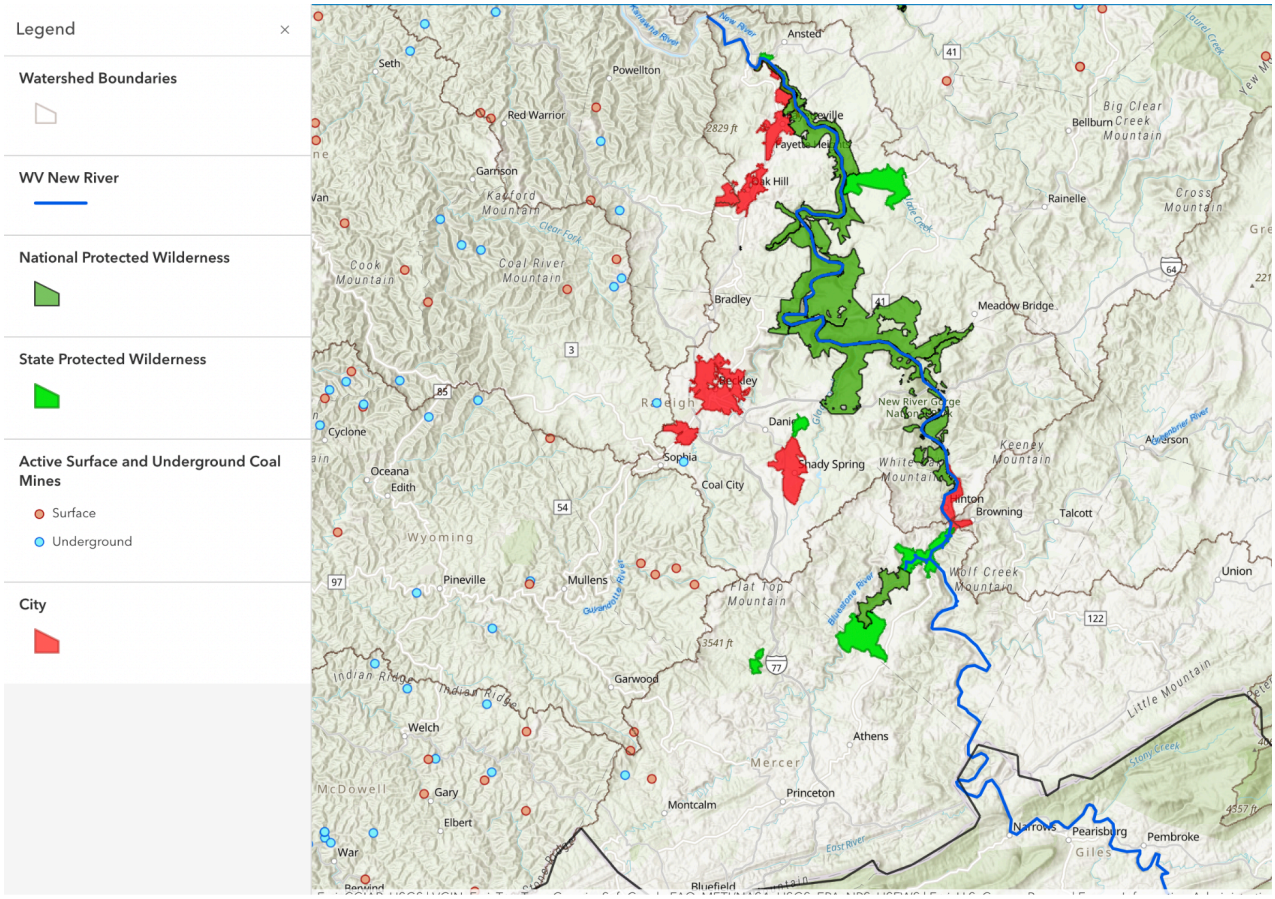
Land Cover Map of the New River Watershed in West Virginia



Note. This map illustrates various types of land cover around the Lower New River in West Virginia. Watershed boundaries are shown in brown while state boundaries are in black.

Figure 2

Protected Areas and Active Mines Near the New River Gorge in West Virginia



Note. This map shows the protected national forest that makes up the New River Gorge as well as state protected wilderness, urban areas, and nearby active surface and underground coal mines located near the New River. Watershed boundaries are shown in brown while state boundaries are in black.

Problems

Problem	Description	Causes
Fecal Coliform	Fecal coliform are present in the gut and feces of warm-blooded animals. Their presence in water samples indicates that there are likely disease-causing pathogens in the water that are dangerous to human health.	Wastewater treatment systems Municipal and residential septic systems and sewage Agricultural and residential runoff
Acid Mine Drainage	High concentrations of metals, primarily iron, aluminum, and manganese are present in most tributaries. Metal contamination creates conditions that are toxic to life.	Mining operations Urbanization
Erosion	Erosion is the geological process by which materials are worn away and transported due to natural forces such as wind or water. The deposition of sediment transportation such as roads and railroads may reduce habitat availability for aquatic species.	Development/urbanization Increase in impervious surfaces

Problem 1: Fecal Coliform

Fecal coliform is currently the most widespread problem and greatest risk to public health in the Lower New River in West Virginia. High concentrations of fecal coliform bacteria that violate water quality standards have been routinely found in many tributaries that flow into the river. Its waterways have been monitored for fecal coliform concentrations since 1985, with some samples containing as much as 100,000 colonies per 100 mL of water. This is 500 times higher than the state standard for primary contact recreation which is not to exceed 200 colonies per 100 mL. Most of the tributaries frequently have concentrations between 10 and 100 times higher than

water quality standards, which has led the New River to be placed on the list of impaired waters by the State of West Virginia.

The presence of fecal coliform in water samples signifies the presence of pathogens that can spread diseases through direct contact with the water. Fecal coliform pollution in the tributaries of the New River mostly originates from nonpoint sources, which makes the problem difficult to identify, track, and regulate. The point sources of contamination in the Lower New River watershed are public and private sewage treatment facilities, home aeration units (HAUs), discharge from MS4s, and combined sewer overflows (CSOs).

Analyses have identified the major cause of fecal coliform bacteria in the river to be human waste from nonpoint sources, either from the overflow of wastewater treatment plants due to surface runoff, leaking sewer lines and faulty septic systems, partially treated sewage from communities with inadequate sewage treatment, or straight pipes of raw sewage from communities that lack sewage treatment facilities. Septic system failure rates across the watershed range from 3%–28%. Animal waste in agricultural runoff also adds to the problem, but its contribution is much smaller than residential sources.

Goal 1: Reduce Fecal Coliform Concentrations

In addressing fecal coliform contamination in the West Virginia reach of the New River, RENEW's goal is to reduce fecal coliform concentrations to the state standard for primary contact recreation, which is less than or equal to 200 colonies per mL of water. This would greatly improve water quality in the New River and its tributaries, thereby safeguarding the environment and public health. Since most of the fecal coliform pollution comes from residential runoff, this problem provides the opportunity to engage homeowners and local communities in watershed management through education, monitoring, and adopting best management practices. The problems associated with combined sewer systems are very difficult and expensive to fix, and because it is not feasible to secure funding and reconstruct entire underground sewer systems by 2040, slowing stormwater runoff and keeping it out of sewer lines is an important way for RENEW to achieve its goals for improving water quality.

Problem 2: Acid Mine Drainage

Runoff from mining operations can be highly acidic and can carry heavy metals, especially iron and aluminum. This creates a toxic environment in the waterways, impairing the biotic community.

The New River Coal field is a region along the New River in West Virginia that has been mined for coal as early as 1873. Industrialization brought an influx of coal mining, but many have since been retired in the second half of the 20th century. Assessments of biologically impaired tributaries of the New River have found that heavy metals and acidity, along with fecal coliform, are stressors to the ecology of the river. Areas of the New River with lowered pH and metal pollution are correlated with violations of metals and pH water quality criteria. Portions of the watershed with higher levels of coal mining also have a decline in the benthic-invertebrate community, indicating poor biological conditions.

The Surface Mining Control and Reclamation Act of 1977 was created to protect the land and water, as well as human health, from the adverse effects of mining. The West Virginia Department of Environmental Protection's Office of Abandoned Mine Lands & Reclamation was created in 1981 to further this effort to protect land and health by managing mines that were established before the 1977 act. This is funded by charging mining operations a fee per ton of coal mined. The goal of these acts is to prevent negative effects of mining on the land and water, but persistent pollution of the New River has shown that more action is needed.

Goal 2: Stop Acid Mine Drainage

Our second goal is to reduce the effects of acid mine drainage on the river in order to promote a healthier biotic community. This starts with managing active and retired mines to prevent polluted water from entering waterways. This can be done by filling closed mines, or by using green solutions such as riparian buffers and engineered wetlands to stabilize the soil and filter the water. These solutions require time for the plants to establish, so direct treatment of the pH of the water may be necessary. To fund these projects, the fees on mined coal could be raised slightly to create a new fund for the management and restoration of the New River.

Problem 3: Erosion

With urbanization and the building of developments increasing over the years, the Lower New River watershed has been experiencing an increased amount of erosion. Erosion is a geological process by which materials are worn away and transported due to natural forces such as wind and water. The intensity of a storm can impact the severity of a rock slide, rock falls, landslides, and flooding events which all worsen during storms, especially along steeper slopes. There has also been an increase in impervious surfaces throughout the Lower New River watershed, which increases the volume at which storm water reaches streams.

Goal 3: Reduce Erosion

To limit the amount of erosion along the New River, RENEW's goal is to help strengthen the root systems of the surrounding plants and direct water in different ways to slow the flow of water and help decrease erosion. The main way to achieve this is by replanting vegetation. This includes replanting native plants and trees, which would help to colonize and establish a root system, thereby stabilizing the soil. It also includes establishing wetlands, which can help with erosion caused by waves. Mulching around the river is another way to implement the strengthening of root systems. This can include spreading a layer of wood chips, such as bark or gravel, over the soil to slow down water flow and retain moisture in the soil. Lastly, erosion can be reduced through retaining walls or terraces. For steeper areas, retaining walls or terraces can help hold back soil and stop it from entering the river.

Recommendations

To reduce fecal coliform concentrations, RENEW recommends:

- Securing funding to provide wastewater services to unsewered areas.
- Replacing aged and faulty wastewater infrastructure.
- Supporting funding proposals for leak detection and repairs on public and private property.
- Adding green infrastructure, such as wetlands, rain gardens, and permeable pavements, to reduce impervious cover and keep stormwater runoff from entering sewer lines.
- Establishing a database to document and track septic system information and maintenance in Fayette County.
- Implement local watershed programs that support community education and engage community members in water quality monitoring.

To stop acid mine drainage, RENEW recommends:

- Establishing riparian buffers to stabilize the soil and reduce runoff from mines.
- Putting in engineered wetlands to filter water and contain pollution.
- Directly treating water to neutralize the pH.
- Filling abandoned mines.
- Increasing the charge per ton of coal for mines on the New River through the West Virginia Abandoned Mine Lands Reclamation Plan.

To reduce erosion, RENEW recommends:

- Replanting vegetation, including native plants, to colonize and establish a root system and stabilize the soil.

- Spreading a layer of mulch (woodchips, bark, or gravel) over the soil around the river to slow down water flow and help retain soil moisture.
- Building retaining walls or terraces to help hold back the soil and stop it from entering the river.

Conclusion

By implementing the recommended methods, fecal coliform, metal contamination, and erosion can be significantly reduced by 2040. This comprehensive approach, RENEW, will lead to a cleaner, healthier watershed, fostering a thriving habitat for the surrounding wildlife and boosting state and local economies through increased ecosystem services and recreational opportunities.

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