KEY-LOG ECONOMICS

Research and strategy for the land community

Valuing Clean Water: The Return on Environment in the Loyalhanna-Conemaugh and Youghiogheny Watersheds of the Laurel Highlands Region

Draft Executive Summary[1]

Watersheds in the Youghiogheny, Loyalhanna, and Conemaugh river systems are recovering from a legacy of coal mining that has left hundreds of miles of streams impaired by abandoned mine drainage (AMD). Meanwhile, a resurgence in coal mining and destructive quarrying practices, extreme weather events, pollution from agricultural and urban runoff, natural gas drilling, and inadequate sewage management are degrading water quality and threatening the resilience of regional watersheds.

This study underscores the economic value of clean water in the Laurel Highlands region and illustrates the "return on the environment" (ROE) that comes from restoration and conservation projects. Restoring damaged streams, conserving natural habitats, and preserving drinkable and recreationally useful water all provide economic benefit to the region. Incorporating these benefits into policy and funding decisions will help create an environment in which both the economy and the watersheds can thrive.

Youghiogheny River at Ohiopyle State Park
Credit: Carla Ruddock

Ecosystem Service Values in the Region: Baseline Assessment

Ecosystem services are benefits that people receive from nature, such as clean air and water, scenic views, experiences in nature, and fertile soil to grow food. We often receive these benefits for free; ecosystems filter our air and water, absorb harmful toxins, and provide a natural buffer to extreme weather events, all at no cost to us.

Stressors in ecosystems, or in watersheds, such as development and pollution, can reduce or disrupt the flow of these services. This disruption results in an economic cost to society. These costs can take the form of spending

[1] Prepared by Anna Perry, Sonia Wang, and Spencer Phillips, PhD. The full report will be available at keylogeconomics.com/laurel-highlands

REGIONAL WATERSHEDS PRODUCE $3.7 BILLION PER YEAR IN BENEFIT FROM ECOSYSTEM SERVICES

on man-made means of providing the same services (for example, by installing more expensive water treatment systems), or in the form of spending on health care to treat illnesses resulting from pollution.

If we can put these effects in monetary, or dollar-valued terms, it can help us understand the benefit of clean water and intact ecosystems. In the case of the Laurel Highlands, we estimate the existing value of ecosystem services including nutrient and water regulation, water supply, recreation, and aesthetic value, at **$3.7 billion** annually. With sufficient funding and other resources devoted to maintaining and improving watershed health in the region, we can prevent the loss of this value and perhaps even see it grow.

Our approach in this study was to define several scenarios (AMD remediation, unconventional natural gas development, promoting higher water quality for recreation, improving sewage management, and reducing stormwater runoff through enhanced natural riparian buffers), in which future ecosystem service flows could increase or decrease. And in each scenario, summarized below and explored fully in the technical report, we have developed models to estimate, using the best available data, the magnitude of those changes in monetary terms.

Abandoned Mine Drainage Remediation: Investing in Restoring Impaired Streams

There are 878 miles of streams in the Loyalhanna, Conemaugh, and Youghiogheny watersheds of the Laurel Highlands that are damaged by heavy metals and/or acidity from abandoned coal mine discharges (PA DEP, 2018). AMD-impaired streams affect local communities and watersheds through poor water quality, forgone recreation or recreational opportunity, and lost natural beauty. These environmental changes have economic costs attached to them including higher water treatment costs, lower recreational economic activity, and lost property values.

Kalp Discharge Remediation at Indian Creek

Passive and active treatment systems throughout the region are beginning to restore streams, improving water quality and allowing fisheries to thrive in waters once too toxic to support aquatic life. An average passive treatment system in these watersheds costs $415,000 to construct and requires $16,600 of annual maintenance to ensure water quality improvements are sustained[2,3].

Continued AMD remediation helps capture economic benefits lost; restoring streams damaged by AMD in the

[2] Stream Restoration Inc., & 241 Computer Services. (2018). Retrieved from https://datashed.org/.

[3] Pennsylvania Department of Environmental Protection. (2016). *Acid Mine Drainage Set-Aside Program: Program Implementation Guidelines*.

Laurel Highlands watersheds can bring an additional benefit of $16.8 million in recreational fishing, $36-$765 million in increased property values, and $489,000-$10.8 million in additional property tax revenue to local counties. This amounts to a one-time economic benefit of at least $41,133 per average stream mile restored, with an annual recreational benefit of $19,131 per average stream mile restored.

In addition, surveys of households in the region reveal residents are willing to pay, or in other words, they value AMD remediation of damaged streams at $20 to $32 per household[4].The 257,000 households in the region could experience $3 -$8 million in benefit from restoration efforts.

Future Natural Gas Development in Regional Watersheds

Almost 9,000 natural gas wells are currently active in the Laurel Highlands' region. By 2030, an additional 8,796 unconventional wells may be constructed in the Loyalhanna, Conemaugh, and Youghiogheny watersheds, resulting in the loss of over 30,000 acres of forest and agricultural land[5]. Over 15,000 of these acres lost would be in important recreation and habitat areas including state parks and lands, native trout watersheds, and within a half-mile of exceptional value (EV) or high-quality (HQ) waters.

Unconventional natural gas drilling requires more intensive resource use than conventional wells; the average unconventional natural gas well in the region uses 7.4 million gallons of water per year and discharges up to 600,000 gallons of wastewater[6]. This level of water use and wastewater discharges will put additional stress on watersheds already facing water supply and water quality issues.

Each well *pad* (which contains 6 wells on average) also converts an average of 30 acres of forest habitat to industrial land uses (well pads, buildings, storage facilities, roads).The loss of forest acreage and the fragmentation of overall forest coverage means less land and lower-quality habitat for native species and for recreation. The average natural gas well pad constructed in forested areas could cost $63,200 per year in lost ecosystem service value, or over $62 million annually across our study region. Losses in agricultural productivity from natural gas infrastructure could cost an additional $58 million per year by 2030.

[4] Hansen, E. (2008). An Economic Benefits Analysis for Acid Mine Drainage Remediation in the West Branch Susquehanna River Watershed, Pennsylvania.
[5] Johnson, N. (2010). *Pennsylvania Energy Impacts Assessment*. The Nature Conservancy - Pennsylvania Chapter.
[6] Kuwayama, Y., Olmstead, S., & Krupnick, A. (2013). *Water Resources and Unconventional Fossil Fuel Development: Linking Physical Impacts to Social Costs*.

Recreation in the Laurel Highlands: Economic Benefits from Water Quality Improvements

Native Brook Trout Caught in Laurel Hill Creek
Credit: Forbes Trail TU

Watersheds in the Laurel Highlands offer a wealth of recreational opportunities that support local economies but require clean water in order to be sustained. Water-based recreational activities in the region include fishing, kayaking, white-water rafting, paddling, boating, and swimming. Anglers participate in over 844,000 recreational fishing days a year in regional watersheds, which produces $31.7 million in regional spending, and an additional $41.9 million in net economic value[7] to recreational anglers.

Unsafe water, or the perception of unsafe water, negatively affects the demand for recreation and the value of recreation. That is, poorer water quality will mean that fewer people will spend less time — and less money — pursuing recreational experiences in the region and it will mean that each recreational experience returns less value to the recreational users, whether visitors or residents. By the same token, improvements in water quality can lead to an increase in visitation and spending in the region, supporting more local jobs and businesses and even attracting new residents, as well as greater satisfaction with each recreational experience.

Researchers have found that people, those that participate in outdoor recreation activities as well as those that do not, are willing to pay more for improvements in water quality. Farber and Griner (2000) studied the value of water quality improvements in western Pennsylvania to persons living within 90 miles of the Loyalhanna Creek and Conemaugh River, both considered polluted. They found that residents would be willing to pay between $57 and $82 per year (adjusted for inflation to 2018 dollars) per household per year over a five-year period to have stream quality improved from moderately polluted to unpolluted[8]. To improve water quality from a severely polluted to unpolluted state, households would be willing to pay between $140 and $180 per year (2018 dollars) for five years. Applying these survey results to the Laurel Highlands region, we estimate a potential benefit of at least $1.1 million for improving the water quality of streams currently classified as impaired for people who participate in water-related recreation activities.

Sewage Management: Problems with On-Lot Septic Systems and Public Treatment Facilities

Water quality degradation from failing septic systems and antiquated public water treatment plants is also a prominent concern within the Laurel Highlands region. There are over 124,000 homes in the region that use on

[7] Net economic value represents the amount recreational fishing participants value the experience above and beyond what they paid for it.
[8] Farber, S., & Griner, B. (2000). Using Conjoint Analysis To Value Ecosystem Change †. *Environmental Science & Technology*, *34*(8), 1407–1412.

on-lot septic systems to treat their sewage and over 27,000 homes that rely on "wildcat" sewers which discharge human waste directly into streets, gullies, or streams[9]. Roughly 20% of on-lot sewage systems in Pennsylvania are failing, and with estimated failure rates even higher for rural communities.

Many on-lot systems are improperly maintained and over half a century year old. Failing septic tanks contribute to nutrient enrichments in streams which causes excessive algal growth, are a source of suspended particles, and contribute to increases in water temperature and levels of fecal coliform bacteria in water. The Pennsylvania Department of Environmental Protection and most local municipalities do not currently have data on the number of failing septic tanks, their spatial distribution, reasons for failures, or associated costs. Compounding these problems is the fact that the dominant soil types in the Laurel Highlands region are not suitable for the disposal of septic tank effluent or on-lot systems[10]. Thus, the region is rife with poorly maintained and/or failing on-lot sewage systems that perhaps should not be there in the first place.

For households attached to municipal sewerage systems, the problems are different. Throughout Pennsylvania, and especially in rural communities, antiquated public sewage treatment facilities are failing and older systems are frequently overwhelmed during heavy rainfall events[11] . Many municipalities have multiple water and sanitary authorities, with each authority differing in what they handle and how many people are served, making regional collaboration difficult.

In the body of this report, we provide recommendations for future study, highlighting what data and literature is currently available, what data gaps are missing, plans for resolving data gaps, and a recommended outline for future analysis.

Best Management Practices: Value from Controlling Runoff

Increasing natural land cover along waterways can be a cost-effective best management practice for controlling nonpoint pollution runoff in both agricultural and developed areas. An average vegetated buffer strip can reduce sedimentation by 58%, leading to improved water clarity, which can have a positive benefit on aesthetics, recreation, and drinking water quality[12]. An estimated 654 miles of streams in the region are impaired by excessive siltation — that is, the streams have high concentrations of suspended particles in the water — largely due to stormwater runoff from agricultural sources, residential areas, roads, and other developed land uses.

We consider a scenario in which a quarter of those 654 impaired stream miles gain acreage in vegetated buffer strips. This action would produce economic benefits in the region, including a $4.65 million increase in the value

[9] Regional Water Management Task Force. (2008, May 9). Regional Water Management Task Force Phase II Presentation.

[10] Western Pennsylvania Conservancy. (2003). Sewickley Creek Watershed Conservation Plan.

[11] Western Pennsylvania Conservancy. (2003).

[12] Evans, B. M., & Corradini, K. J. (n.d.). *BMP Pollution Reduction Guidance Document*. 514.

of property values near treated streams, and water treatment cost-savings of 4% to public water suppliers, and increased recreation visitation and expenditure from fishers and boaters.

These benefits could vary significantly depending on the choice of which stream miles to treat. There are seven public access points with shoreline fishing opportunities along streams impaired by excessive siltation that could stand to benefit the most from upstream or nearby vegetated buffer strips. Similarly, residential properties within the floodplain may benefit more than other properties near streams but outside the floodplain.

Recommendations

While the results summarized above and described fully in the technical report are preliminary, they do suggest that there is much fruitful work that communities, agencies, and individuals could begin now. This includes funding for and implementation of continued, more extensive, and more effective watershed protection measures, like AMD remediation, expanded riparian buffers, and measures to mitigate damage from gas, coal, and gravel mining. Along with the on-the-ground improvements, organizations, local governments, and state agencies can continue research to develop new information and tools to inform the next round of strategies and actions to protect habitat and improve water quality in the Laurel Highlands.

Stream Restoration Preserving Property Value of 1798 Compass Inn in Laughlintown
Credit: Monty Murty

Specifically, we believe the following are likely to be cost-effective — that is, they will produce positive returns on the environment — actions supported by the information now at hand regarding the economic value of clean water and other ecosystem services in the region:

1. Continue and expand AMD remediation, including passive treatment, and using the idea of ecosystem services (and perhaps dollar-value estimates) to prioritize sites where the economic benefit (ROE) will be greatest.

2. Extending and expanding vegetated buffer strips, targeting reaches with the greatest impairment and/or the highest potential public benefit, such as through improved recreational value.

3. Require an ecosystem services impact assessment for each new natural gas well and any surface disturbance associated with coal and gravel mining. These assessments could be used to evaluate the net benefits of mining and/or to set impact fees for such industrial uses.

4. Commission research to fill data gaps on the number, location, and degree of failure of on-lot septic systems in the region, and use the resulting information to target accelerated connection to municipal systems and/or incentives for upgraded or alternative on-lot systems appropriate to soil types and other conditions in the region.

5. Disseminate information from this report and other related research to regional watershed conservation organizations who can then utilize economic information about the effects of their efforts to secure further support and, ultimately, greater watershed protection.