

CONSERVE

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Restoring Watersheds and Improving Water Quality for Future Generations

Western Pennsylvania
Conservancy



water, land, life.

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Cover Photo: An autumn-painted forested tributary to Laurel Hill Creek in Laurel Hill State Park, Somerset County.

Back Cover Photo: Courtesy of Johnny Beavers, 7 Line Media

Western Pennsylvania Conservancy



Message from the President



Pennsylvania's landscapes are defined by dramatic rivers and many tens of thousands of miles of streams. One of the primary focuses of the Western Pennsylvania Conservancy's mission is to protect, and restore when needed, these rivers and streams across the region. Our rivers and streams provide beauty in our state's fabulous landscape, they provide places for recreation, and they serve many important ecological functions.

Historically, forest clearcuts had an impact on Pennsylvania's rivers and streams and their watersheds. Clearcuts from mining – with the resulting abandoned mine discharge impacts we see so widely now – and from industry with

its resulting pollutants had detrimental effects on the health of watersheds and their ecosystems, as did alterations to rivers and streams from culverts, dams and changes to natural flow that were made in order to accommodate commerce and transportation. These impacts continue to varying degrees today, along with other issues such as streambank erosion and nutrient runoff from agriculture.

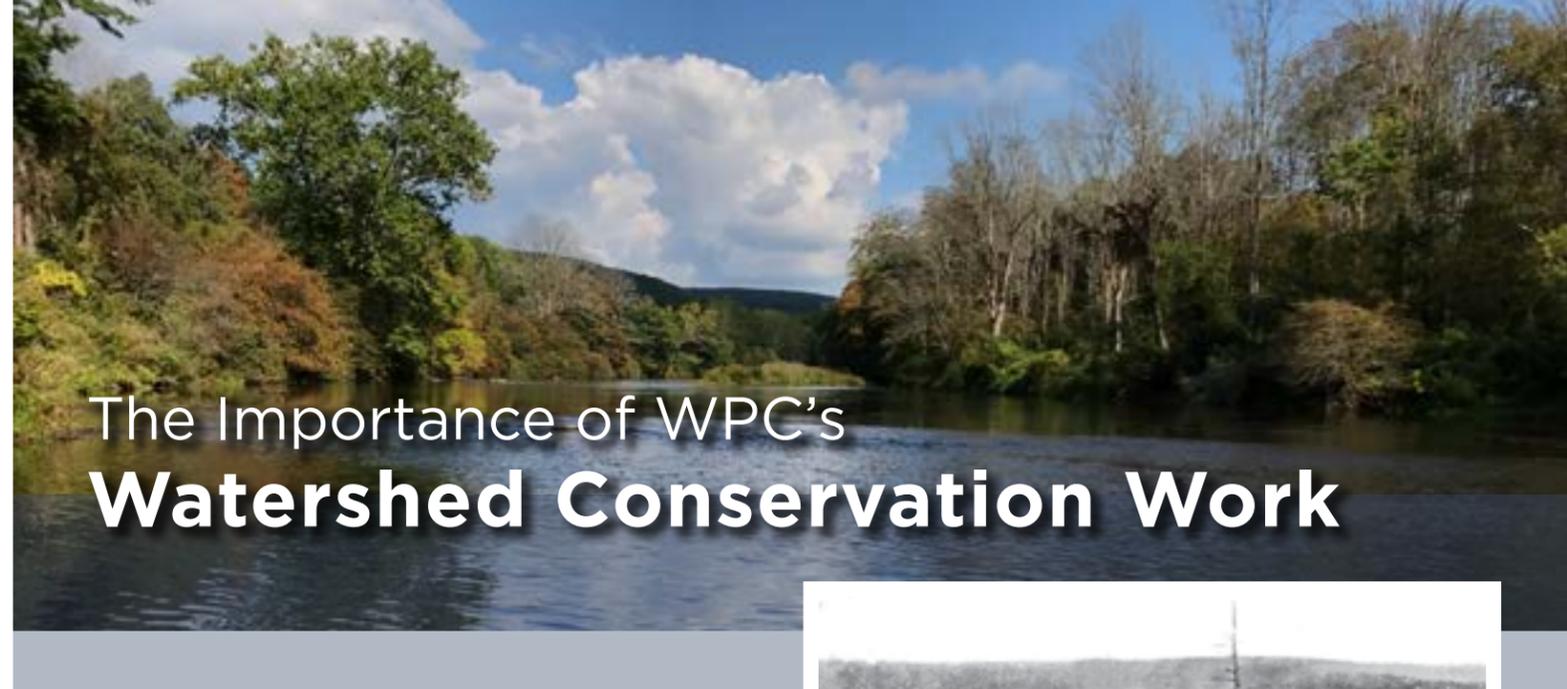
The Conservancy has programs addressing other aspects of our landscape – our land protection work, our natural heritage work to protect threatened species and their habitats, and our gardens, greenspace and urban forestry work. In 2001, the Conservancy added a specific program to protect our rivers, streams and watersheds. Initially called the watershed assistance center, it first primarily provided assistance to local watershed groups.

But protecting and restoring our watersheds is so crucial to our landscape that we expanded the breadth and depth of the program over the last two decades. Now called the watershed conservation program, our watershed staff tackles all aspects of watershed protection and restoration. Our staff works on abandoned mine drainage remediation, stream bank stabilization, in-stream habitat protection and enhancement, culvert and dam removals, tree plantings along our river and stream edges, and the full range of projects needed, whatever the issues are in different rivers and streams. Our watershed staff is expert, knowledgeable, creative and hard-working, and I appreciate how much they are doing every day to protect and restore our streams.

And we couldn't do this work without you – our members, donor and volunteers. During the current pandemic and economy, we need and appreciate your support, at any level, more than ever in our recent history. Thank you for all that you are doing to support our watershed work, and to help preserve the future of Western Pennsylvania's rivers and streams.

Thomas D. Saunders
PRESIDENT AND CEO

The Western Pennsylvania Conservancy protects and restores exceptional places to provide our region with clean waters and healthy forests, wildlife and natural areas for the benefit of present and future generations. The Conservancy creates green spaces and gardens, contributing to the vitality of our cities and towns, and preserves Fallingwater, a symbol of people living in harmony with nature.



The Importance of WPC's Watershed Conservation Work

WESTERN PENNSYLVANIA'S RIVERS AND STREAMS, AND THEIR ASSOCIATED WATERSHEDS, ARE STILL FACING A VARIETY OF THREATS AND STRESSORS DATING BACK TO THE 1700S, SAYS JENIFER CHRISTMAN, VICE PRESIDENT OF WATERSHED CONSERVATION FOR THE CONSERVANCY.

Some of the leading threats facing our region's waterways include the following: in-stream habitat fragmentation from dams and other barriers; streambank erosion; water leaving farms containing animal waste, fertilizers and pesticides (agricultural runoff); lack of forests and native vegetation along waterways; and environmental pollution from water discharging from abandoned coal mines (abandoned mine drainage).

"These continuing and persistent threats are why the work we do, with the help of our members, partners and volunteers, is vital to protect and restore our greatest ecological and recreational assets," she explains. "These issues are not going away overnight and abandoned mine drainage will forever threaten Western Pennsylvania's fish and aquatic life. We still have a lot of work to do to restore our region's waterways."

For example, the Clarion River, a major tributary to the Allegheny River, suffered habitat loss and degraded water quality due to years of neglect and pollution. Today, the Clarion is known as a paddler's and angler's paradise, thanks to decades-long land and water conservation efforts by WPC and many partnering organizations, and state and federal agencies, to protect, restore and improve habitat within the watershed. Its recovery is a water-conservation feat, so much so that it was voted Pennsylvania's 2019 River of the Year.

Jenifer says the Clarion is a great example that highlights the importance of both watershed restoration and conservation efforts. The Conservancy's watershed conservation program scientists and technicians focus on actively restoring and improving the region's watersheds through a variety of initiatives and projects.

These remediation efforts are done with support from



The banks of the Clarion River in the early 1900s were void of forests and high levels of industrial pollution degraded the river's water quality. Photo courtesy of John Imhof.

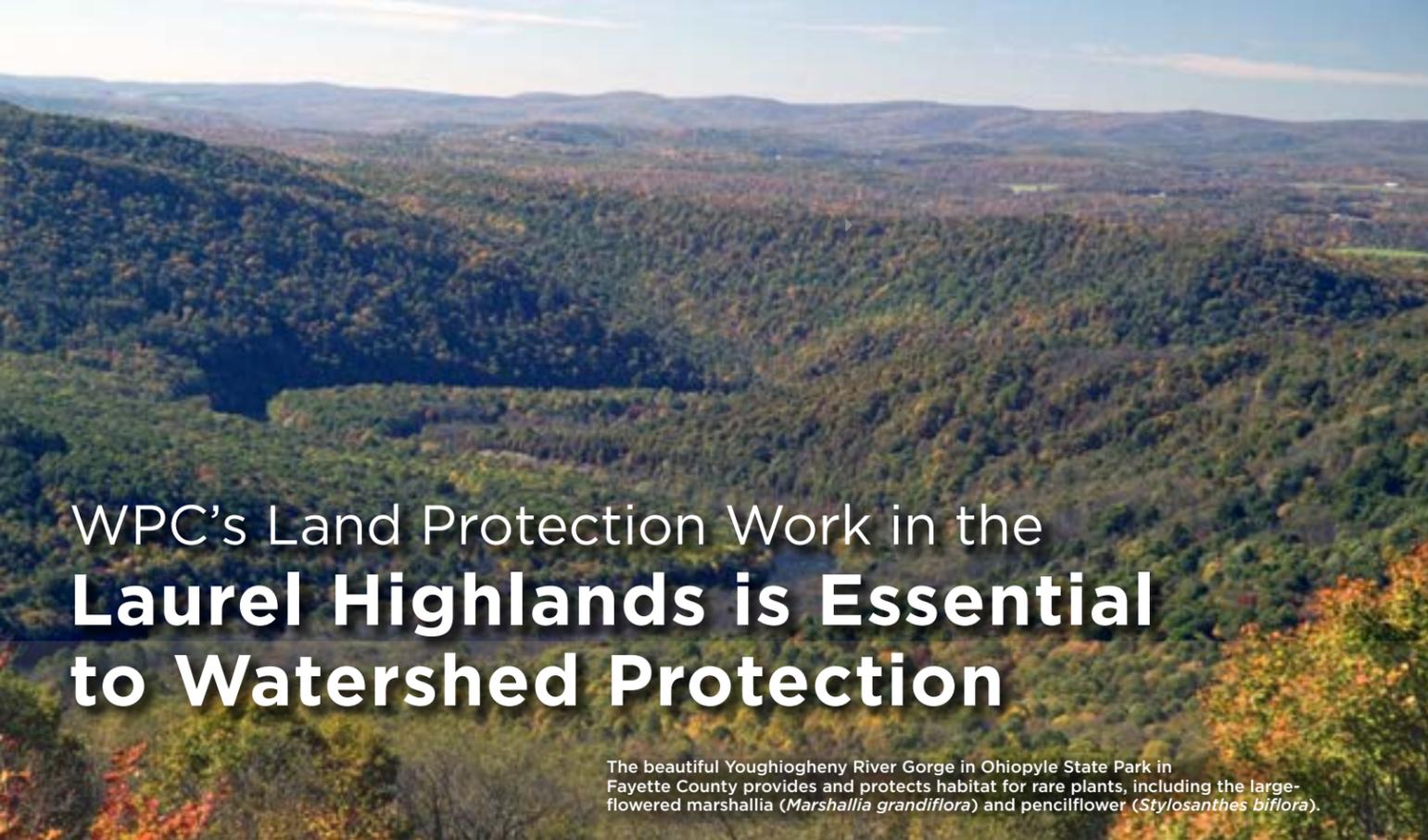
landowners and partners to reduce sediment and pollution in streams, and reconnect and improve aquatic habitats. To date, the Conservancy's team of watershed scientists and technicians has worked to restore more than 3,000 stream miles.

"As we work to address current threats to our local watersheds, we're also challenged with making sure our rivers and streams can be resilient in the face of rising temperatures resulting from climate change," she notes.

Western Pennsylvania's rivers and streams are in the headwaters of two large, vulnerable river systems: the Ohio River and Chesapeake Bay. Science and research point to the importance of restoring the waters in the headwaters. As those waters gradually run cleaner, notes Jenifer, there's a "domino effect" downstream so improving water quality takes time and concerted efforts.

"That's why we work with so many landowners and partners, such as PA Fish and Boat Commission, U.S. Forest Service and PA Department of Environmental Protection, and are relentless in our pursuit to restore local waterways and watersheds," she says, while explaining that we all have a role in improving our region's water quality.

"Becoming a WPC member and/or volunteer, and learning more about your local watershed issues will go a long way in improving local rivers and streams near and dear to you." ■



WPC's Land Protection Work in the Laurel Highlands is Essential to Watershed Protection

The beautiful Youghiogheny River Gorge in Ohio State Park in Fayette County provides and protects habitat for rare plants, including the large-flowered marshallia (*Marshallia grandiflora*) and pencilflower (*Stylosanthes biflora*).



WPC Land Protection Manager for the Laurel Highlands Jane Menchyk, photographed here at the bank of a local river, says water quality decisions are at the core of almost every land conservation conversation. "When a landowner decides to make a conservation commitment through a conservation easement, they help to ensure that water has an opportunity to be restored when it passes through the land for generations to come."

THE RIDGES AND VALLEYS OF THE ALLEGHENY MOUNTAINS' LAUREL HILL AND CHESTNUT RIDGE PROVIDE BREATHTAKING, PICTURESQUE VIEWS. PART OF THIS VAST MOUNTAINOUS LANDSCAPE IN FAYETTE, SOMERSET AND WESTMORELAND COUNTIES IS CALLED THE LAUREL HIGHLANDS, AN ECOLOGICALLY SPECIAL PLACE IN OUR REGION WHERE THE WESTERN PENNSYLVANIA CONSERVANCY HAS BEEN WORKING FOR DECADES TO PROTECT LAND AS WELL AS RIVERS AND STREAMS. WITH EXTENSIVE UNDEVELOPED PUBLIC LANDS, THE REGION REMAINS MOSTLY FORESTED AND PROVIDES HABITAT FOR PLANTS AND ANIMALS, AND IS A POPULAR SPOT FOR OUTDOOR RECREATION.

Since 1951, the Conservancy has protected more than 85,000 acres of the Laurel Highlands' open spaces, forestlands, wild areas and scenic ridges, most of which have been conveyed to the PA Department of Conservation and Natural Resources for state parks and forests. WPC helped establish some of those public lands, including Ohio State and Laurel Hill state parks and helped expand several state forests, including Forbes State Forest.

The Laurel Highlands is a priority conservation area for the Conservancy not only for the forests and farmlands, but for watershed protection and restoration, too. Many of the small rivers and mountain streams that flow down the forested slopes and into the valleys are in the headwaters of two major watersheds in the region: the Youghiogheny River and Loyalhanna Creek. These watersheds are essential drinking water sources and provide natural, scenic, historic, aesthetic, recreational and economic benefits to Western Pennsylvania.

In southern Somerset and Fayette counties, Laurel Hill Creek, the Casselman River and Bear Run are three major tributaries to the Youghiogheny River, which joins the Monongahela River in McKeesport, Pa., and flows next into the Ohio River.

The good water quality in the upper Youghiogheny is in large part a result of the significant amount of protected

land and the lack of human disturbance, says Charles Bier, the Conservancy's director of conservation science who has worked in the watershed for decades. The Youghiogheny and some of its tributaries host special and rare riverbank- and floodplain-dwelling plants that are found along the banks of these mountain streams with rapidly flowing waters, he says.

WPC has protected more than 45,000 acres of land in the Youghiogheny River watershed, 4,000 of which are public lands that are part of Laurel Ridge State Park. And the Conservancy-owned 5,100-acre Bear Run Nature Reserve protects nearly every stream within the Bear Run watershed.

Charles explains that when land is not protected from development, we lose not only forested riparian buffers, but also intact forestland, natural areas and wetlands that work together to help limit the amount of sediment and pollutants entering our rivers and streams. In addition, the forest canopy helps limit direct sunlight over the streams, to keep them cool, which is important in this era of climate change.

"As our planet warms due to climate change, protecting wetlands and intact forests is more important than ever to help absorb excess carbon and filter rivers and streams," he conveys.

The Loyalhanna Creek watershed drains the heavily forested slopes of the Chestnut and Laurel ridges and contains several

high-quality streams supporting a variety of wildlife habitats. The Conservancy has protected more than 11,000 acres in the Loyalhanna Creek watershed, 8,000 of that through conservation easements. Loyalhanna Creek, a popular 50-mile trout fishery and an ecologically significant stream, is a conservation priority for the Conservancy.

A conservation easement donated this year on a 22-acre property in Cook Township, Westmoreland County is an example of how land protection efforts and conservation-minded landowners benefit Loyalhanna Creek. Nearly 1,000 feet of forested frontage on Fourmile Run, a tributary to the creek, will protect water quality and aquatic life in perpetuity.

Since the 1970s, the Conservancy has permanently protected nearly 27,000 acres in the Ligonier Valley in Westmoreland County, more than 10,000 of which are through conservation easements. Shaun Fenlon, the Conservancy's vice president of land conservation, says the long history of conservation successes is the result of close collaboration and shared vision with many landowners in the Ligonier Valley, the greater Laurel Highlands region and across Western Pennsylvania.

But like much of Western Pennsylvania's landscape, the Laurel Highlands has also been impacted by resource extraction over time. Remnants from the Commonwealth's long history of oil, coal and gas mining still adversely impact streams and tributaries in the Laurel Highlands. And results of



Loyalhanna Creek is an ecologically significant stream in Westmoreland County that is a conservation priority for the Conservancy.

working lands, such as agricultural runoff, continue to threaten water quality in local rivers and streams.

"Much work still remains to protect land and restore riparian buffers, wetlands and agricultural areas in the region to improve waterways," Shaun states. "With the support of our members and partners, the Conservancy's land, watershed and science staff will continue collaborating on projects to help reverse the threats to our watersheds in one of the most naturally beautiful and ecologically important areas of Western Pennsylvania." ■

Removing Manmade Barriers a Key Strategy for Improving Watershed Health



Contractors use excavators equipped with hydraulic hammers to break up stone or concrete structures.



Opposite: In Clearfield County, staff are assessing road-stream intersections for aquatic organism passage, with a planning grant from the Coldwater Heritage Partnership, focusing on streams with known crossings that contain naturally reproducing brook trout populations according to data from the Pennsylvania Fish and Boat Commission.

DURING THE 1800S, PENNSYLVANIA'S RIVERS AND STREAMS TRANSPORTED RESOURCES SUCH AS LUMBER AND COAL TO A GROWING NATION. ACCOMPANYING ROADS, BRIDGES, CULVERTS AND DAMS BROUGHT AN UNFORESEEN DOWNSIDE: FRAGMENTED WATERSHEDS.

Manmade barriers prevent aquatic species such as fish, hellbenders and mussels from migrating; their breeding patterns are disrupted. Barriers also trap sediment and nutrients and alter water flow patterns, negatively affecting floodplains and wetlands.

The Conservancy's watershed conservation staff has been partnering with communities, organizations and government entities to assess connectivity issues in waterways and watersheds, using the North Atlantic Aquatic Connectivity Collaborative protocol since 2016. We assess and work to remove problematic barriers such as dams and culverts, helping to restore healthy populations of aquatic species and enhancing biodiversity. The work also reduces sediment runoff to streams, improving water quality and helps alleviate local flooding, all while maintaining local transportation needs and access.

Greg Schaetzle, a WPC watershed project manager, says this summer's barrier removal projects included culvert replacements and the installation of a timberdeck bridge in Laurel Hill Creek State Park on a tributary to Laurel Hill Creek, a wild trout stream.

Also this summer at Ohiopyle State Park in the B. K. Simon Family Forest, a site purchased by the Conservancy and donated to the PA Department of Conservation and Natural Resources in 2008, the Conservancy removed a culvert and two small dams and reconnected a floodplain. Staff from WPC's watershed conservation and natural heritage programs worked with DCNR to complete the project. "We electrofished and found more than 80 brook trout," Greg says. "We'll monitor

to see how the fish populations fared." Future projects include dam removals in Greenlick Run and Dunbar Creek and a culvert removal on Ramcat Run, all in Fayette County.

Volunteers and other organizations help the Conservancy identify the structures. "Once we educate landowners on why barriers are negative for streams and aquatic organisms," Greg says, "they usually agree to removal and restoration."

Removal takes a week or two, and typically happens during low water flow, mid-June through October. "We make every attempt to avoid stream work during spawning seasons," Greg says.

Dams can be small wooden jack dams, concrete dams or large dams owned by cities or the Army Corps of Engineers. The Conservancy partners on removing larger dams that affect local recreation and economy. For small dam removal, the Conservancy works with contractors to remove the entire footer below streambed level. The broken concrete is removed or used for streambank stabilization or instream habitat enhancement.

A stream with a large dam doesn't overflow its banks into riparian areas, but rather directs its water downstream, creating catastrophic flooding. "Removing the structure allows the stream to disperse silt and sedimentation to the floodplain naturally," improving water quality, Greg explains.

Dams affect mussel populations, too. Mussels need flowing water and the cooperation of a fish for reproduction, but dams change a river's flow pattern to that of a lake, and prevent fish, salamanders and other aquatic organisms from migrating. Removing barriers can significantly improve fish populations and species diversity, which are important to the waterway's health and long-term species survival rates as well as dependent ecosystems.

Greg has seen the instant effects of barrier removals. "Even as we're actively removing the structure, I have witnessed trout traversing the area where the barrier was." ■

Restoring CHERRY RUN from Abandoned Mine Drainage

AT 1,465 ACRES, THE CONSERVANCY'S BENNETT BRANCH FOREST PROPERTY IN CLEARFIELD AND ELK COUNTIES IS AN OUTDOOR LOVER'S PARADISE. THE MIXED HARDWOOD FOREST AND STANDS OF HEMLOCK DESCEND ALONG STEEP SLOPES FROM A BROAD PLATEAU. THE BENNETT BRANCH FOREST IS NAMED AFTER THE SCENIC RIVER, BENNETT BRANCH, WHICH RECEIVES THE FOREST'S MOUNTAIN STREAMS AND CREEKS. BENNETT BRANCH FLOWS NORTHEAST THROUGH ELK AND CAMERON COUNTIES AND IS A MAJOR TRIBUTARY TO SINNEMAHONING CREEK.

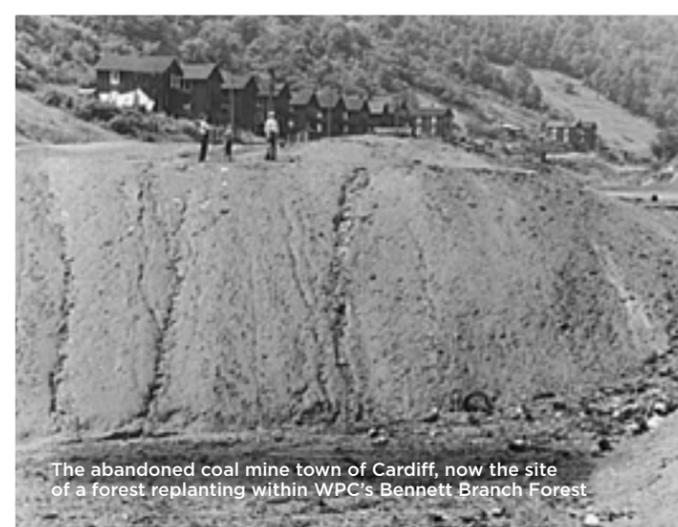
Bennett Branch Forest is nestled between Elk State Forest to the north and Moshannon State Forest to the south. Like much of Western Pennsylvania's landscape, this area has been impacted by resource extraction over its history. Though marked by surface and deep mining and crisscrossed with overgrown logging roads, it has remained a largely contiguous forest, providing habitat for plant species and wildlife, including bear, turkey, neotropical migrant songbirds, and the elk for which the area is known.

Elk County is split by the Eastern Continental Divide; the rivers on the western side of the split eventually flow into the Mississippi River while rivers from the eastern side flow into the Chesapeake Bay. While Bennett Branch passes through beautiful mountain scenery and was once a prime trout stream, the headwaters of Bennett Branch flow from a coal mining area. Land in the region was deep-mined beginning in the late 1800s and strip mined from the 1940s into the 1980s. The company coal town of Cardiff existed within the borders of Bennett Branch Forest and was abandoned by the 1970s due to lack of good drinking water.

As a result of years of mining, Bennett Branch flowed reddish-orange, acidic with abandoned mine drainage (AMD) composed of metals like iron, manganese and aluminum. In all, nearly 33 of Bennett Branch's 44 miles were contaminated and devoid of aquatic life. In the 1990s,



Though marked by surface and deep mining and crisscrossed with overgrown logging roads, WPC's Bennett Branch Forest has remained a largely contiguous forest providing habitat for plant species and wildlife.



The abandoned coal mine town of Cardiff, now the site of a forest replanting within WPC's Bennett Branch Forest



One of two mine discharge sites at Cherry Run

The Cherry Run abandoned mine discharge treatment system



One of three limestone-lined ponds that will treat AMD water from Cherry Run



View of a reclaimed strip mine within the forest

efforts began to clean up the stream, mainly championed by conservationist and WPC board member, the late Dr. Colson Blakeslee. A 41-acre mine drainage treatment plant near Hollywood, Pa., funded by the PA Department of Environmental Protection's Bureau of Abandoned Mine Reclamation (BAMR), began operating in 2013.

Cherry Run, a tributary to Bennett Branch that flows through Bennett Branch Forest, was also contaminated by AMD. WPC staff took water samples from Cherry Run and found

lined with clay and limestone. As the discharge water flows slowly through the ponds, the limestone raises the pH level and solidifies the aluminum, which then falls out of the water as a precipitate and is retained in the settling pond. Each pond removes more aluminum until the treated water flows into Cherry Run.

Construction is on schedule to complete by the end of 2020. While the limestone beds of the ponds will be maintained every three to five years, the entire AMD pond system is designed to remain in place in perpetuity.

two significant AMD discharges entering Cherry Run about a mile before it flows into Bennett Branch. Analysis revealed that aluminum is the primary contaminate in that section of the stream.

Working with Hedin Environmental, the Conservancy conceptualized the pond design in 2011 and worked with various state and federal agencies on implementing a plan. Once sampling was completed and funding obtained from DEP Growing Greener and local foundations, the

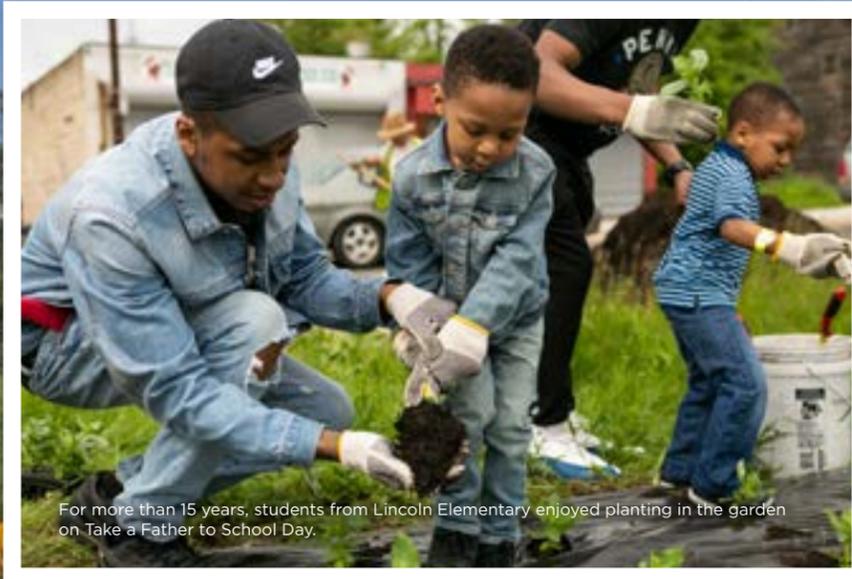
Conservancy broke ground in September 2019 on the \$1 million remediation project that includes retention ponds on the eastern side of the property. BAMR was also developing a remediation project nearby on the Bennett Branch Forest property to clean up a surface mine refuse site and fix a dangerous highwall mine left on the property.

A construction crew excavated basins for the different components of the treatment systems. Three limestone-lined beds will hold 1 to 1.5 feet of water with two additional "polishing" ponds or wetlands. The largest of the basins is about 144 feet by 130 feet. A series of gate valves allows water to flow between the ponds, letting the water rest in each, ideally for 10 to 12 hours, before flowing to the next pond.

Automated by solar power, one system is already online and treating water while the lower, larger system is nearing completion. The work that remains to bring that system online is the construction of a settling pond, the final components in treating the largest discharge.

Construction is on schedule to complete by the end of 2020. While the limestone beds of the ponds will be maintained every three to five years, the entire AMD pond system is designed to remain in place in perpetuity.

"This is a critical project to repair and restore this stream that affects Bennett Branch and ultimately the Chesapeake Bay," says Jenifer Christman, vice president of watershed conservation for the Conservancy. "It's been a massive undertaking and team effort, but we're appreciative of this environmental remediation work that will continue improving water quality in this watershed for decades." ■



For more than 15 years, students from Lincoln Elementary enjoyed planting in the garden on Take a Father to School Day.

School Rain Garden is an Immersive Teaching Tool

The Lincoln and Frankstown rain garden helps to divert stormwater from the sewer system and provides an immersive teaching tool for young urban students.

AFTER HEAVY RAINS, MANY PITTSBURGH RESIDENTS WITNESS STORMWATER RUNOFF THAT LEADS TO PONDING, FLOODING AND SEWER OVERFLOWS. THE RESULTANT POLLUTION AND SEDIMENT WREAK HAVOC ON RIVERS, STREAMS AND CREEKS.

Green infrastructure can help mitigate those problems. It uses plant or soil systems, permeable surfaces, stormwater reuse or landscaping to store or filter stormwater and reduce flows to sewer systems or streams. Bioswales, rain gardens, permeable pavements and green roofs are just some examples.

The Conservancy has been working to increase awareness of the value of green infrastructure for stormwater remediation since 2009, when we held a public green infrastructure symposium that included leading national experts. In addition, we've helped manage stormwater runoff with tree and shrub plantings, riparian tree

plantings and even permeable pavement parking lots. Two bioswales in Millvale help to mitigate flooding in the Girty's Run watershed, and a bioswale and rain garden at Point State Park help manage stormwater runoff.

More recently, we've built on our green infrastructure work by expanding some of our traditional community flower gardens to include green infrastructure features such as bioswales and rain gardens.

The most recent rain garden installation – at the Lincoln and Frankstown garden in the City of Pittsburgh's Larimer community, shared with Lincoln Elementary School – is not only functional and beautiful, but will teach young urban students about pollinators, green infrastructure, the effects of stormwater on our water system and more.

Filled with native plants, rocks and boulders, naturally attractive rain gardens use the living landscape to capture, store, absorb, filter and slow stormwater runoff

before it rushes into sewer systems and eventually local waterways. They can be less expensive alternatives to installing underground storm drains.

In 2014, the Conservancy performed site analyses for three of its community flower gardens to identify opportunities to add stormwater capture using green infrastructure strategies such as bioswales and rain gardens. The Centre and Herron garden in Pittsburgh's Hill District and the Larimer garden had the best potential for rain capture, says Art DeMeo, WPC's director of greenspace services for the community gardens and greenspace program. Partnering with Pittsburgh Water and Sewer Authority and Alcosan, the Conservancy planted the longest bioswale in Pennsylvania, the 585-linear-foot Centre and Herron garden bioswale. It intercepts 882,800 gallons of stormwater per year from entering the combined sewer overflow through natural ground infiltration and absorption from plant material.

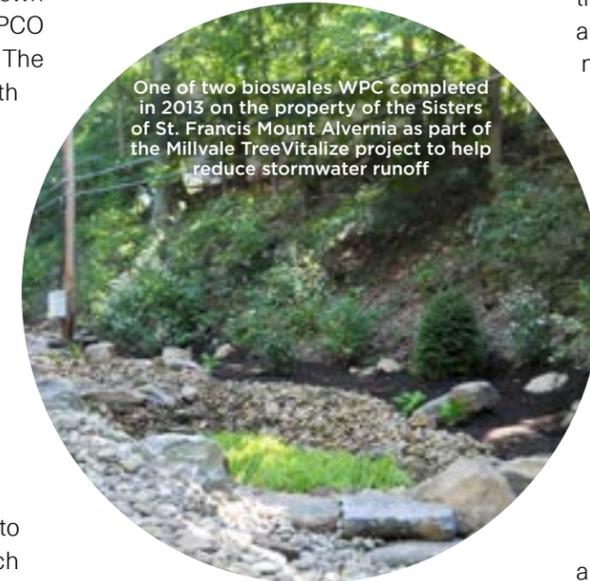
Pittsburgh Community Services (PCO) received an \$80,000 grant from Richard King Mellon Foundation for the Larimer rain garden's installation and upkeep and asked WPC to partner on the project. After consulting with an engineering and design firm, last fall Conservancy staff and contractors installed the rain garden at the Lincoln and Frankstown flower garden, in partnership with PCO and Pittsburgh Public Schools. The installation included moving earth to create steep slopes and a wide basin and building curb cuts. Half of the existing garden is on a vacant city lot and half is on PPS property at Lincoln Elementary School, providing an excellent opportunity for the rain garden to be used as a teaching tool.

"It was a community garden that had some sinkholes due to subsurface issues," Art says. "We were happy for the opportunity to reset the site and add a rain garden to be used as an immersive tool to teach students about green infrastructure, stormwater management and pollinators."

Since the late 1990s, Lincoln Elementary students have planted the garden on Take a Father to School Day. The rain garden's educational component is exciting, Art says,

because in addition to the annual planting, "We'll interface with students and science teachers to get them involved and to explain how rain gardens work, how they help to manage stormwater and why it matters."

Pamela Parks, Lincoln Elementary



principal, says that students' interests informed the selection of the perennials, which will provide food and habitat to pollinating insects. "Students and parents are curious about what's going on. An expected benefit is a growing interest

in science and exposure to agriculture," she says. "Students will get a better understanding of how the water cycle works. They'll learn about the life cycle of plants and how to care for them."

Although COVID-19 prevented students from being involved this spring, Conservancy staff planted nine trees, including redbud, serviceberry and American hophornbeam, and 262 native plants, including black-eyed

Susan, iris, coneflower, sneezeweed, beardtongue and more. A ribbon-cutting is planned for when activities can safely resume.

A fairly rainy spring and some heavy July rains allowed the rain garden to showcase its worth. "It's definitely taking water off the street," Art says. "Now, some of the water is diverted into the rain garden, where it's held and slowly disperses itself throughout the site."

Community members are curious, and Conservancy staff members are pleased to meet with community groups to explain how the site works and how people can get involved. "We always welcome volunteers to care for the community garden," Art says, adding, "It allows community members access to a beautiful, functional, revitalized greenspace." ■



More than 250 volunteers helped to plant 13,000 perennial plants and 25 trees in the Centre and Herron bioswale, designed and installed by Pittsburgh Water and Sewer Authority.



Large Wood Projects Create “A Beautiful Mess” Helping Ecosystems Thrive

Salmon Creek in Forest County one year after a large wood restoration work. The felled tree's branches collected leaves, slowing water flow and creating shelter and shade for aquatic life, and food for macroinvertebrates. The work was enhanced by the efforts of local beavers.

TAKE A WALK ALONG SALMON CREEK IN THE ALLEGHENY NATIONAL FOREST (ANF) AND YOU'LL NOTICE WHAT APPEARS TO BE NATURE'S DETRITUS: TREES IN THE WATER EVERY 200 FEET OR SO, TRUNKS LACED AMONGST STUMPS ALONG THE BANKS, LEAF-PACKED LIMBS CREATING RIFFLES IN THE CLEAR WATER AND AN EARTHY SCENT OF DECAY.

Such scenes might appear to be the haphazard result of windstorms, but in fact, explains the Conservancy's Watershed Scientist Luke Bobnar, they are large woody material (LWM) restoration projects, strategically engineered by WPC's watershed conservation team to help improve streams' water quality and habitat for fish and other aquatic and terrestrial species. They are, he says, “a beautiful mess.”

Since 2013, the Conservancy has used LWM as a holistic method of aquatic habitat restoration in partnership with the U.S. Department of Agriculture Forest Service in the ANF. The projects help mitigate downstream flooding, ensure cool water during summer low flows and improve connections between aquatic and terrestrial ecosystems.

Chuck Keepports, ANF forest hydrologist, says the partnership has increased the ANF's capacity for watershed- and aquatic-related projects and has helped with obtaining grants and recruiting volunteers. “More than 1,000 miles of streams on the ANF could benefit. Through our partnership, we have more than tripled the implementation that the ANF could have done independently.” During the past eight years, Luke confirms, “We've completed almost nine stream miles using this technique, installing more than 1,000 logs in 354 structures. We estimate this has improved at least 27 acres of riparian habitat.”

The technique is holistic because it addresses issues on a watershed scale, not just small segments of a stream. The ultimate goal is to treat a stream as a valley-spanning ecosystem, and restore wood's functional role. Staff members tailor techniques to the stream's size, strategically cutting trees to fall into small streams or using a manually powered winch called a griphoist to maneuver trees in medium-sized streams. On very large streams, heavy equipment is used to put trees in place to make structures stable and secure.

Hardworking volunteers help cut brush, dig around roots and use a griphoist to pull out trees, Luke says. “They weave branches into the structures to retain sediments and woody debris.”



Volunteer and longtime donor Bob Kirker uses a griphoist to move a tree into position on a stream.

Conservancy staff are working with state regulators and land management agencies to apply these practices statewide, and educate the public that wood in streams is essential for healthy ecosystems. Signage near projects discourages people from removing logs for firewood and illustrates wood's benefits to fish and wildlife.

“Public education is critical,” agrees Chuck. When campers cut large wood, he explains, “the length of the log is shortened, reducing its stability and ballast.” He says even volunteers, from high school students to retired professionals, spread the word after learning about the benefits of large wood.

Luke explains that our region once was covered in old-growth forest comprised of many tree species, sizes and ages. They naturally fell, benefiting aquatic and riparian ecosystems. Our native animals evolved to those conditions.

During the nation's rapid growth in the 1800s, streams and rivers were considered highways and were “cleaned” to facilitate the passage of goods on large timber rafts. Many waterways were left shallow, wide and flat. Unsustainable timber management left forests devoid of older trees that would have naturally fallen into streams, and with riparian zones with young, even-aged tree stands that offer little diversity.

“A ‘clean’ stream might look nice to some,” Luke says, “but offers little in the way of fish habitat and likely is an ecosystem out of balance. It has no structure to reduce forceful floodwaters. Fallen trees are often flushed downstream towards bridges, reinforcing the negative perception of wood in streams.”

WPC staff believe LWM restoration projects are essential to holistically restoring historic habitat conditions. However, little scientific research has been conducted in Pennsylvania to quantify those benefits. An upcoming project in Warren County on Little Arnot Run aims to address some data gaps through intensive monitoring of channel shape and size, groundwater levels, stream flow, fish and macroinvertebrate populations, water quality, vegetation and more.

The goal is to establish data on the watershed's existing condition, install large wood structures, remove historic impacts (like sections

of logging railroads), reconnect floodplains and then document changes. Results of the study will be disseminated in scientific circles and to the general public.

By restoring wood's functional role in streams, Luke says, multiple species play vital roles in cycling carbon and nutrients. Bacteria, fungi and aquatic macroinvertebrates eat the trees, which become food for the aquatic and terrestrial ecosystems.

Selective tree harvest near streams leads to the formation of diverse habitats that mimic old-growth forests. Decades or centuries from now, those trees will fall and the cycle will continue. It requires much patience, work and educating people that wood belongs in streams, Luke says, adding, “Shout it from the rooftops...wood is good!” ■

WOOD IS GOOD FOR STREAMS

- Fine and large roots, stems and branches provide diverse habitats for aquatic and terrestrial species.
- Provides cover for fish and macroinvertebrates to hide from predators.
- Retains leaves, which form a base of the aquatic food web.
- Slows water flow, creating backwater pools on the upstream side and scouring pools on the downstream side.
- Deposits gravel at the end of scour pools, providing ideal spawning habitat for native brook trout.
- Helps create or reconnect channels where young trout seek refuge from predators.
- Helps disperse water onto the floodplain, slowing it and protecting downstream communities from more severe flooding. The water soaks into the floodplain soil, making its way to the groundwater table, where it is discharged back into the stream as cool base flow.

New High School STEM Partnership Teaches Students AQUATIC SCIENCE through eDNA Testing



WPC Director of Aquatic Science Eric Chapman is photographed here with local high school students conducting fish surveys.

IN EARLY JULY, THE CONSERVANCY'S WATERSHED SCIENTISTS AND TECHNICIANS GATHERED IN A STREAM FOR MUSSEL SURVEYS. USUALLY THIS TYPE OF WORK STARTS EARLIER IN THE YEAR AND IS SOMETIMES DONE IN CONJUNCTION WITH VOLUNTEERS OR PARTNERS. BUT WITH THE COVID-19 PANDEMIC, NOTHING IN 2020 HAS BEEN USUAL.

"We've had to think about how to do our work safely while adhering to physical distancing and safety protocols," says Eric Chapman, the Conservancy's director of aquatic science. "It's been a matter of considering COVID-19 and how we do our work with a decreased timeline and on a limited budget. It's been a challenge in a number of ways, but everyone's health and safety are our top priorities."

Eric explains the importance of getting out in a variety of streams to do surveys and sampling to help monitor mussel populations. This work helps WPC assess the health of a river or stream. Freshwater mussels filter water as they feed, and healthy mussel populations are indicators of good stream health.

In addition to checking for mussels, our scientists also seek out the elusive eastern hellbender salamander, which was designated as the official state amphibian in 2019. Also indicators of good water quality, hellbenders live in streambeds and usually prefer hiding under large flat rocks. Social distancing guidelines that prohibit close staff contact make it impossible to move these large in-stream rocks to find and assess individual hellbenders.

So, Eric and his team relied more on a different detection method this year. Instead of lifting rocks to find hellbenders, they are taking water samples for environmental DNA (eDNA) testing that detects the presence of hellbender cells or tissues.

"We've been using this well-established method of DNA detection since 2014 with very good results, so it makes sense to rely on this technique as we figure out ways to maximize our work during this pandemic," explains Eric.

One new aspect of the work is a partnership beginning this fall with Seneca Valley High School to help test and analyze several eDNA samples collected from streams this

"We're honored and excited about this amazing opportunity to work with the Western Pennsylvania Conservancy, as this work will support our students doing real-world science and hands-on learning at its best."

Tom Lavelle, SVSD Science Teacher



WPC scientists and technicians take water samples for eDNA and water quality monitoring, using a GPS unit to determine sampling locations in streams.



As seen in this 2019 photo, typically WPC staff members work in teams to conduct aquatic surveys in rivers and streams. However, social distancing safety precautions due to COVID-19 contributed to a delay in some assessments in 2020.

Tom hopes this work will help his students become better analysts and problem-solvers, and would like to one day join the Conservancy's watershed scientists outdoors in a stream to help collect the samples.

summer. The school has one of the few quantitative polymerase chain reaction (qPCR) machines in the region.

This machine detects, measures and traces DNA molecules from water samples. This type of work was previously done by Buffalo State University, but the professor who led the sampling research accepted a new position, leaving Eric to find a new partner.

"We can't thank the university enough for their support and good work over the past several years. They have been a wonderful partner for our eDNA studies," he says.

Under the direction of SVHS science teacher Tom Lavelle, eight students in the school's new Center for Biotechnology Research Lab will be trained to use the qPCR machine to test and analyze the water samples. Each sample will go through a three-step student-led process:

filtration to capture cells, cleaning to ensure the presence of DNA and documentation. It will only take a few days for the students to provide results.

"We're honored and excited about this amazing opportunity to work with the Western Pennsylvania Conservancy, as this work will support our students doing real-world science and hands-on learning at its best," says Tom. "We're still trying to determine what student learning will look like in this COVID-19 era, but regardless of what will happen in the short-term, we're thrilled that we'll be doing these studies for WPC now and in the future."

Tom hopes this work will help his students become better analysts and problem-solvers, and would like to one day join the Conservancy's watershed scientists outdoors in a stream to help collect the samples. "That would just add to this really meaningful and

wonderful experience for my students," Tom adds.

Once the samples are analyzed, the Conservancy will receive data indicating which streams have hellbender eDNA. WPC's science staff will then return to the stream at a later date, likely post-pandemic says Eric, to try to find the hellbender populations.

Eric says it is still ideal and important to physically locate these fleeting salamanders in their habitat in order to tag them for future monitoring. He is encouraged that this unique period in our history is providing additional opportunities for students to learn science.

"I believe this is going to be a really cool partnership with local high school students. This is a natural extension of the STEM work we are already doing with students in the region," Eric adds. "We're appreciative of the Seneca Valley High School administration and for all of Tom's expertise and interest in making this new partnership possible. It's really great knowing we are inspiring the next generation of scientists as they build skills for tomorrow's workforce." ■

Watershed Team Finds Two ENDANGERED MUSSEL SPECIES



A federally and state endangered clubshell mussel.

OF ALL OUR ENDANGERED SPECIES, FRESHWATER MUSSELS RANK LOW FOR MANY PEOPLE IN TERMS OF POPULARITY. DEVOID OF FLUFFY FUR AND PLAYFUL ANTICS, THEY DON'T ATTRACT ATTENTION LIKE POLAR BEAR CUBS DO. BUT TO ERIC CHAPMAN, THE CONSERVANCY'S DIRECTOR

OF AQUATIC SCIENCE, MUSSELS ARE BEAUTIFUL, HARDWORKING CREATURES. THEY'RE ONE OF THE WORLD'S MOST ENDANGERED GROUPS OF ANIMALS DUE TO THEIR RELIANCE ON COOL, FREE-FLOWING WATERS AND ARE EXCELLENT INDICATORS OF STREAM HEALTH.

"The ecosystem services freshwater mussels provide are legendary and priceless," Eric says. "They're the building block for our freshwater ecosystem, filtering silt and pollutants." He says mussels in the Clarion River, for example, filter more than 20 million gallons annually, resulting in cleaner water for fish and people. Eric notes some cities use mussels to augment sewer filtration.

In 2013, Eric and WPC's watershed conservation team found a common mussel shell that led to strategic mussel surveys beginning in 2014. The find came while the team was assisting the United States Department of Agriculture Forest Service – Allegheny National Forest Aquatics and Fisheries program with hellbender salamander surveys on the Clarion River.

USFS Forest Aquatic Ecologist Nate Welker says, "WPC staff are the go-to experts in our region for all things Eastern hellbender and freshwater mussel related. Prior to 2007, USFS only had record of approximately 10 freshwater mussel surveys and 10 Eastern hellbender surveys completed on the ANF, other than the Allegheny Wild & Scenic River. Acting in partnership, WPC and USFS have now completed approximately 54 mussel and 50 Eastern hellbender surveys during the past five to ten years." The USFS has major responsibility for conserving biodiversity through management of habitat and protection of threatened, endangered and sensitive species.

Eric says the number one challenge to a mussel



The WPC watershed conservation team uses various techniques when surveying for mussels, including snorkeling in shallow water, shown here, and SCUBA in water deeper than three feet.

population's survival is dams. "Dams change a river's flow pattern to that of a lake. Mussels need flowing water. Also, fish can't pass a dam, but fish are a necessary participant in freshwater mussel reproduction. They are hosts for mussels to reproduce and move their babies upstream."

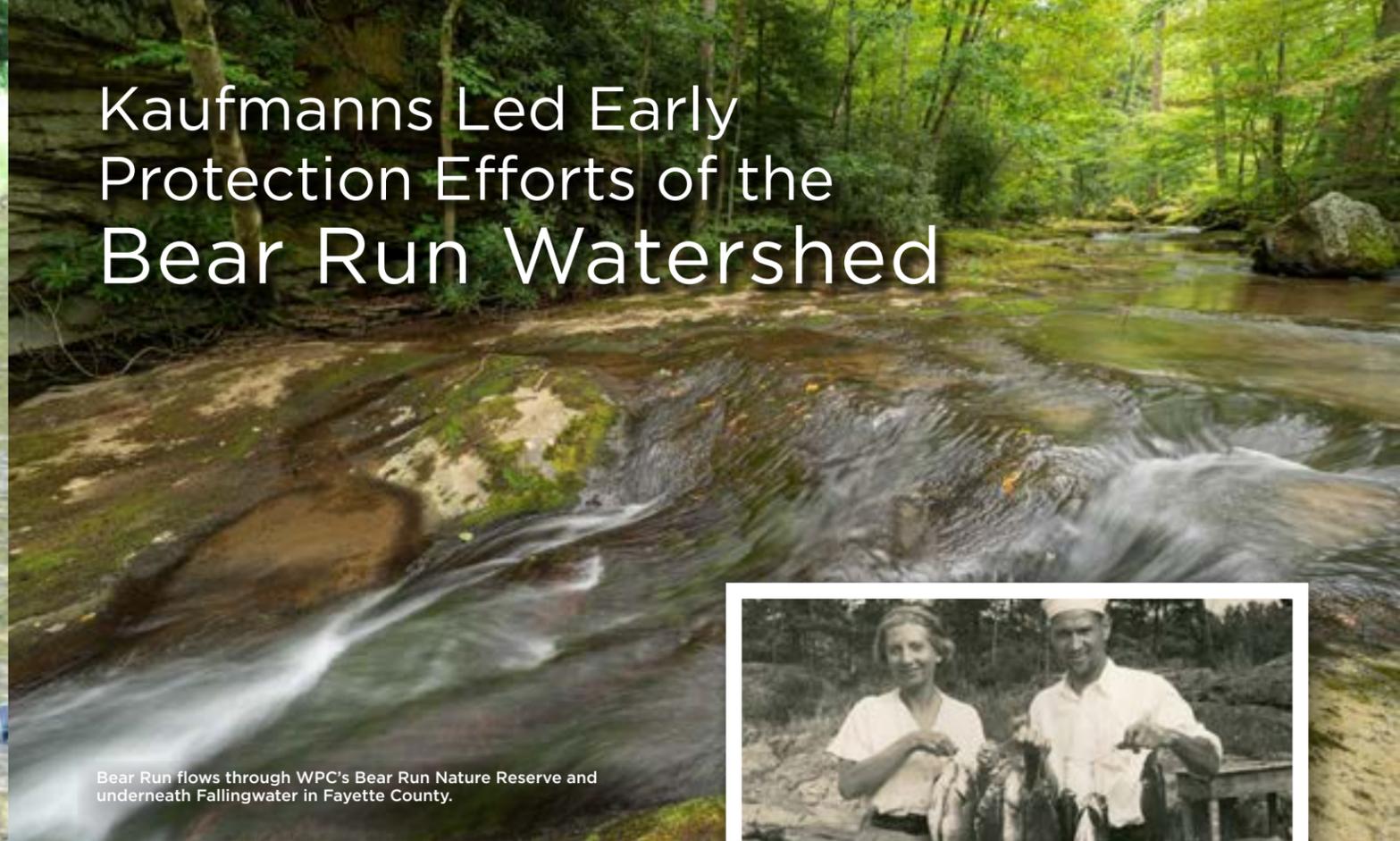
In July 2017, while surveying for mussels downstream of Tionesta Lake, the team found a federally and state endangered northern riffleshell mussel. "Riffleshells have a direct connection to the Allegheny River where there is a population, so it wasn't a shocking find, but also not common," Eric recalls.

Then also in 2017, the teams found a federally and state endangered clubshell mussel. "This was enormously significant because it was found upstream of the dam, in the free-flowing stretch of Tionesta Creek," Eric emphasizes. "The parent population for clubshell mussels is in the Allegheny River, but since the dam was built in 1936 they've persisted for more than 80 years with no direct connection to the Allegheny. This means there's a viable population in the Tionesta."

In 2019, the team found three clubshell mussels at two more sites. This summer, the team was hoping to find more. "Mussels are hard to detect and sometimes the underwater visibility is inches," Eric says, noting that techniques include snorkeling in shallow water and SCUBA in water deeper than three feet.

Tionesta Creek has up to 12 known mussel species, some of which live up to 100 years, indicating long-term good water quality. "Tionesta Creek is gaining ecological significance because hellbenders, mudpuppies, reproducing native brook trout and now the mussels are present," Eric says. "It's an intact watershed." ■

Kaufmanns Led Early Protection Efforts of the Bear Run Watershed



Bear Run flows through WPC's Bear Run Nature Reserve and underneath Fallingwater in Fayette County.

KAUFMANN'S DEPARTMENT STORE OWNER EDGAR J. KAUFMANN, HIS WIFE, LILIANE, AND THEIR SON, EDGAR JR., HAD A STRONG CONNECTION TO THE LAND AND WATER THAT SURROUNDS FALLINGWATER.

Today, this land is part of the Conservancy's 5,100-acre Bear Run Nature Reserve, which hosts more than 500 rare plant species. Approximately 95 percent of the streams and tributaries of the Bear Run watershed are within the reserve. The stream flowing over the iconic waterfall underneath Fallingwater is Bear Run, a PA Department of Environmental Protection Exceptional Value Stream and direct tributary to the Youghiogheny River.

Long before Fallingwater's construction was completed in 1939, the Kaufmanns visited Fayette County often, mostly during the years of the Kaufmann Summer Camp, beginning in 1916. For years, the camp attracted store workers and other visitors from Pittsburgh, West Virginia and Ohio to enjoy the county's smoke-free air, natural resources, hiking trails and fishing opportunities.

The Kaufmann family had a deep appreciation of nature and soon recognized the value of the pristine waters of Bear Run. So much so that a trout hatchery, constructed along the southern shore of the stream, was used to breed, hatch and rear trout before releasing them into Bear Run. Liliane enjoyed the relaxation and jollity of the stream, with fly fishing topping her list of preferred activities.

The Kaufmanns eventually purchased the land surrounding the camp to help protect the value of the watershed from coal mining and lumber camps, and in 1921 built a rustic cliffside cabin they called the Hangover about 1,500 feet southeast of the falls.

Over the years, the Kaufmanns continued efforts to protect the watershed, and in 1951 partnered with the Conservancy to



Fishing was a common pastime for family matriarch Liliane Sarah Kaufmann (1889-1952), photographed here with a friend in the 1920s. Before Fallingwater, the family owned a trout hatchery along the southern shore of Bear Run. (Photograph from the Fallingwater Archives, 1989_92_19.)

purchase Ferncliff Peninsula, which is now a part of Ohiopyle State Park.

When Edgar Kaufmann jr. donated Fallingwater to the Conservancy in 1963, he included nearly 500 acres surrounding the house as well. And he donated an additional 1,400 acres from 1964 to 1991. Those acres pioneered the creation of and helped expand the Conservancy's Bear Run Nature Reserve.

"It's rare to have the majority of a watershed surrounded by protected land, but that's the case for Bear Run" said Charles Bier, the Conservancy's senior director of conservation science. "The Kaufmann family did the initial work to protect Bear Run by purchasing the nearby land. With these forested acres protected from development, it's our job to continue the Kaufmanns' vision to keep the waters of this watershed clean and cool."

Today, ongoing efforts to reduce erosion and runoff into Bear Run continue through active management efforts on the reserve and onsite at Fallingwater. Among the strategies employed are bioswales, planting of native trees, grasses and wildflowers, and a zero-discharge sewage and wastewater treatment system. ■

Federal Clean Water Act Funding Can Pay for Local Watershed Improvement Projects

WPC staff recently met with landowners in Erie County to discuss how to improve degraded streambanks like this one along Trout Run.

LAST FALL, HUNDREDS OF LANDOWNERS LIVING WITHIN THE TROUT RUN WATERSHED RECEIVED POSTCARDS INVITING THEM TO A MEETING TO DISCUSS A NEW STUDY TO IMPROVE WATER QUALITY IN THEIR WATERSHED.

Trout Run is an Erie County tributary to LeBoeuf Creek and part of the French Creek watershed. The run contains wild trout and is classified as a PA Department of Environmental Protection high-quality stream due to its sustaining water quality for wild trout.

Adam Cotchen, a Conservancy watershed scientist, said the outreach effort to Trout Run landowners was a way to begin conversations about why excess nutrients and fertilizers from agricultural operations and sediment from eroding streambanks are the leading causes of reduced water quality in the watershed. Improving the water quality in Trout Run will support aquatic life in French Creek, which is renowned for the number and the diversity of freshwater mussels and fishes.

This landowner outreach began the process to study and improve water quality in the Trout Run watershed. Funding for this work is made possible by the Foundation for Pennsylvania Watersheds. WPC is working with DEP on the development of a Section 319 plan for Trout Run. Under Section 319 of the Federal Clean Water Act, states are eligible to receive funding to support a wide variety of water quality improvement project activities, including landowner outreach, technical assistance, financial assistance, education, training, demonstration projects and monitoring efforts to assess project success.

In Pennsylvania, this federal funding is provided to the PA Department of Environmental Protection. Through a grant application process, once a 319 plan is approved, PA DEP distributes funding to local governments, conservation groups and nonprofit organizations for water quality improvement projects addressing nonpoint source water pollution from excess fertilizers, nutrient runoff and sediment.

"This is the first time in more than 10 years that the state is accepting new watersheds for 319 plan development in Western Pennsylvania," says Jenifer Christman, vice president of watershed conservation for the Conservancy. "This funding will be significant because it's another important and much-

needed funding stream to improve local watersheds."

In order for a project to be eligible for 319 funding, a stream or watershed must first be identified as impaired by PA DEP and listed within its Integrated Water Quality Monitoring and Assessment Report; the updated 2020 version is available on the agency's website.

In 2019, the Conservancy began working on two 319 planning projects. The second project is in partnership with the Chesapeake Bay Foundation on Halfmoon Creek in Centre and Huntingdon counties in the Upper Juniata and Chesapeake Bay watersheds.

Adam says the goal of these projects is to establish a local network of private landowners interested in improving water quality.

"Once the plans are approved by PA DEP and U.S. Environmental Protection Agency, funding and technical assistance will be available free of charge to farmers and landowners to make improvements to their farming and stream management practices," Adam says. "These are free resources to improve our local streams and rivers, so we want to maximize this funding opportunity and partner with landowners to help make a difference."

If you're a landowner in either the Halfmoon Creek or Trout Run watersheds, please contact us at 724-471-7202 and water@paconserve.org for more information. ■

Trout Run, an Erie County tributary within the French Creek watershed, is the subject of a recent study to improve the stream's water quality and soil health.



Western Pennsylvania Conservancy



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The Western Pennsylvania Conservancy protects and restores exceptional places to provide our region with clean waters and healthy forests, wildlife and natural areas for the benefit of present and future generations. The Conservancy creates green spaces and gardens, contributing to the vitality of our cities and towns, and preserves Fallingwater, a symbol of people living in harmony with nature.

field notes
by Charles Bier

A Stream of Reflections

I am standing in a deep valley with eastern hemlocks and yellow birches along the banks of an iconic babbling brook in Butler County. It is locally known as Watson's Run and flows through protected land. Here, as a teenager in the late 1800s, W. E. Clyde Todd made the surprising discovery of nesting magnolia warblers, unknown this far south. He later went on to become curator of birds at Carnegie Museum and donated this land to the Audubon Society. I first visited this valley as a teenager, too, and have known it for some 50 years. As I gaze around the valley bottom, I realize that I probably know this stream better than any other. It is an intimate setting. But it is not the stream from my youth.

The banks of Watson's Run are abrupt and freshly cut; exposing tan clay subsoil where wood turtles used to hibernate. Its floodplain is a jumbled mess of woody debris and newly carved flood channels. Eroded plunge pools are deeper as are deposits of silt. Trees and other vegetation look stressed and some of the wildflowers appear to have washed away. I do not have the scientific studies I usually rely on to verify what is happening. All I have is my memory of observations over time.

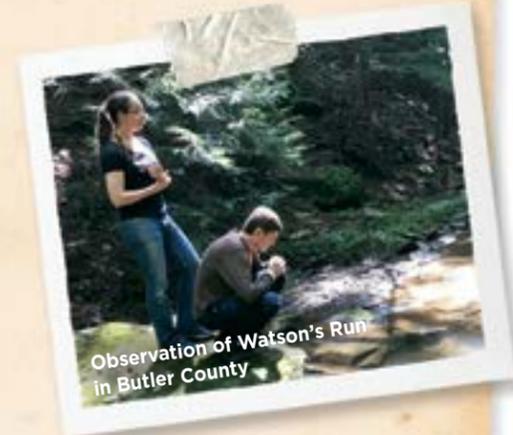
Science is increasingly telling us that landscapes are being altered as global and local climates continue to change. Some of the change involves increasing temperature. The cool habitat loving eastern hemlock and yellow birch are projected to leave this valley and large parts of the state as their ranges retract to the north. The magnolia warbler is unlikely to nest here in the near future. But these outcomes are based on a worst-case scenario. It doesn't have to be that way.

Although describing a future climate is not always predictable, there are emerging trends. As ice melts and oceans warm there is more and more water evaporating to the atmosphere, cycling around the globe and coming to local landscapes as greater annual precipitation, in the form of major storm events and more frequent severe flooding. I believe this is what is happening to Watson's Run.

As conservationists, our work is needed more than ever. We need to double down in our scientific and protection efforts for modern challenges. Progress has been made on classic conservation issues, such as point-source water pollution of the 1900s. Today's issues present new challenges.

The Conservancy is responding. Some of our approaches are the same, but expanded, and some will be new. In order to keep streams cool and shaded for aquatic life, we should assure that forested riparian zones are maintained and enlarged. Old growth forests covering significant areas will not only impede increasing precipitation, but will also store carbon from the atmosphere. Mitigation is now a more frequently used conservation term.

Historically, conservations have been guided with a positive outlook. Sharing that attitude at this time will help make our work together easier and ultimately more successful. ■



Western Pennsylvania Conservancy

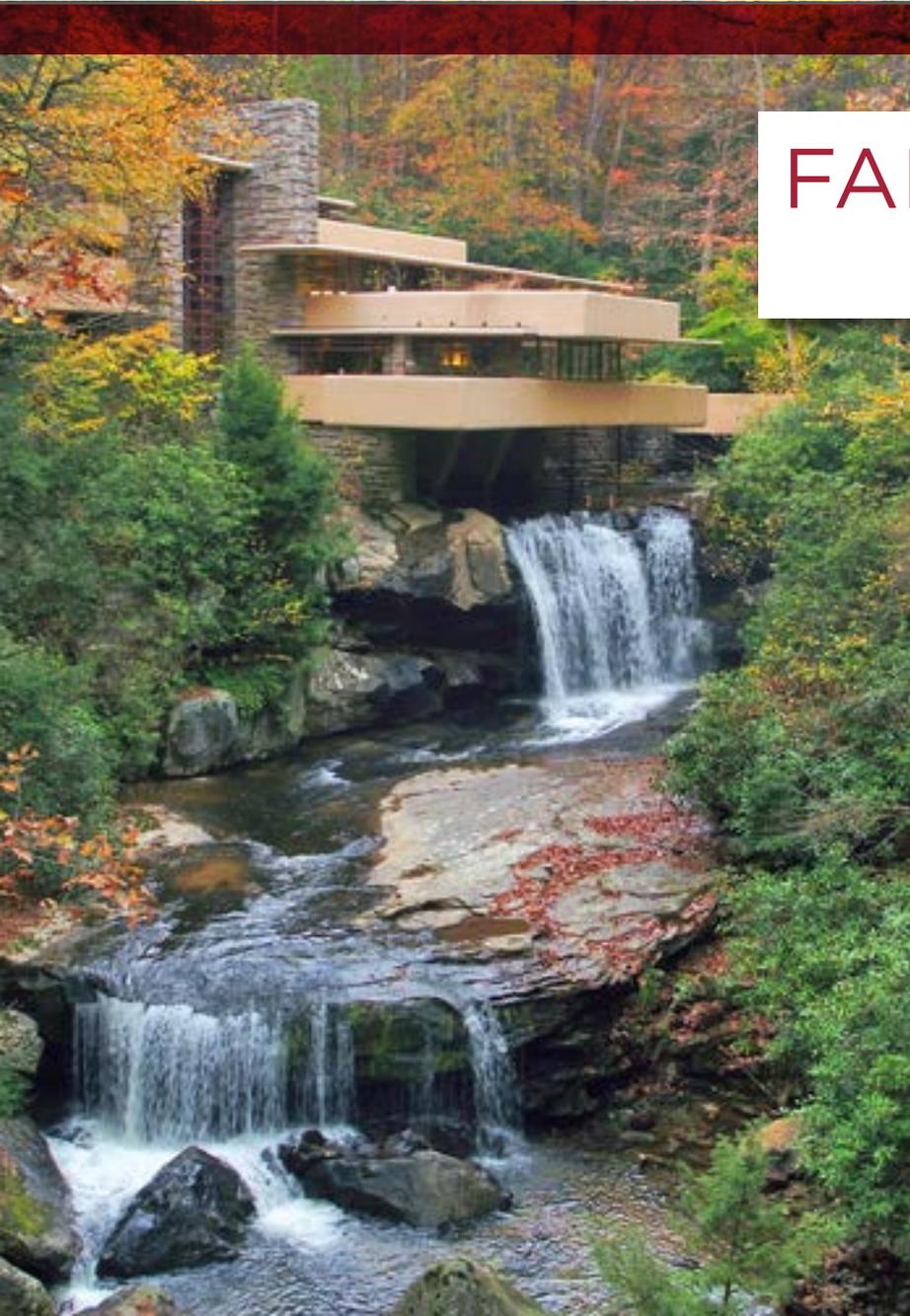


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info@paconserve.org

WaterLandLife.org

**note to printer:
FSC placement**



FALLINGWATER NEEDS YOU

Like most museums and cultural sites around the world, Fallingwater was entirely closed for three months this spring due to COVID-19. Although we reopened for outdoor tours on June 13, Fallingwater is not currently offering interior tours and is operating below 50 percent capacity, as recommended by the PA Department of Health.

This extreme decrease in visitor revenue means there aren't enough funds to cover Fallingwater's needs. So, your support today means you'll be providing the urgent operating funds needed to preserve this architectural treasure.

Frank Lloyd Wright built Fallingwater for a family of three, but the Kaufmanns always understood the significance of this place and knew it should be shared with the world.

It's the passion of people like you that brings Fallingwater alive. And it's your support that helps us care for this place so we can share it with the world. Will you be part of preserving this architectural treasure by making a special gift today? ■

For more information about supporting Fallingwater during this unprecedented time, contact Julie Holmes, director of development, at 412-586-2312 or jholmes@paconserve.org.