

Orientation Guide for New Members Angelica Creek Watershed Association (ACWA)

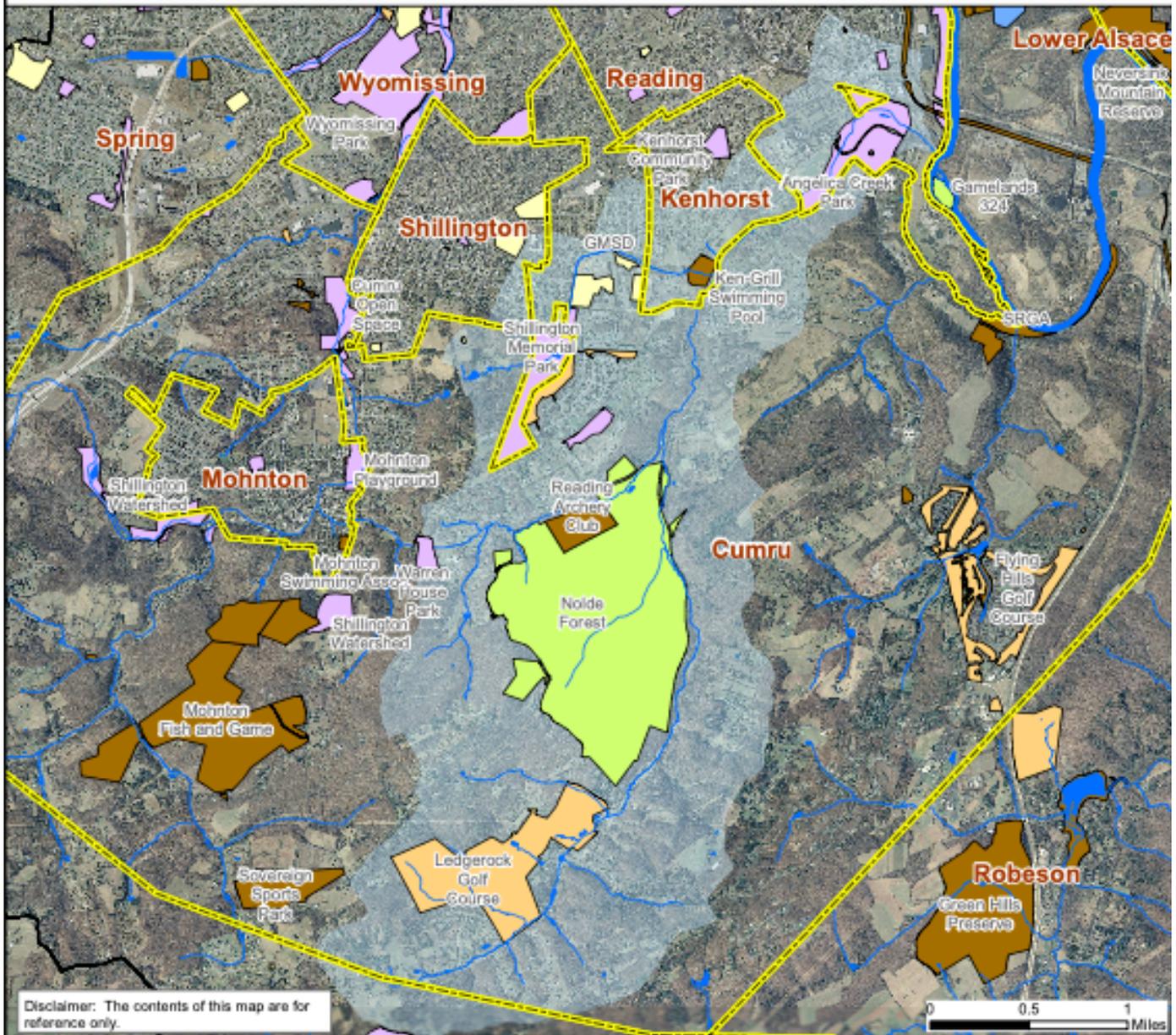
Welcome to ACWA!

Brief Summary

A program of Berks Nature, Angelica Creek Watershed Association is made up of volunteers with a mission to preserve, protect, and restore Angelica Creek Watershed. Our volunteers encourage stewardship through scientific practices and education.

Joining the Schuylkill River just south of the City of Reading, Angelica Creek winds through some of the most beautiful areas of Cumru and Brecknock townships, along with the boroughs of Kenhorst and Shillington. It's one of the most forested watersheds in Berks County, and has numerous opportunities for recreational and educational activities. Berks Nature's "The Nature Place" environmental education center in Angelica Creek Park serves as a hub for environmental education for students of all ages, along with Nolde Forest State Park's Environmental Education Center. Angelica Creek also provides outdoor classroom opportunities for the Governor Mifflin School District, along with Alvernia University and Albright College.

Angelica Creek Watershed Map



Location:
 Cumru and Brecknock Townships, City of Reading,
 Kenhorst and Shillington Boroughs

Angelica Creek Watershed Total Acres: 4,774 acres
 Main Stem of Angelica Creek Mileage: 6.91 miles

Legend

- Angelica Creek Watershed
- Schuylkill Watershed, Berks County
- Municipal
- Water Bodies
- Streams

Recreation Ownership

- State
- County
- Municipal
- Nonprofit
- Private
- School



Source: Berks Nature, Berks County Planning Commission GIS, Berks County GIS, Berks DES, Berks County Mapping, PA DEP

Map Published by: Berks Nature, July, 2019

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ACWA Members - ACWA members share in the Vision and Mission of the Association, as described in the Strategic Plan below. Some ACWA members have had or are still professionally engaged with the environmental movement, allowing them to apply their professional knowledge to our mission. This includes teachers at all levels of education, environmental scientists, landscapers, etc. Others may have experience with community planning and organizational relationships. Some of our members have trained in the Berks Nature Ambassador (https://berksnature.org/wp-content/uploads/2019/11/AMB2020-Application-MG-final_1.pdf), Penn State Extension Watershed Ambassador (<https://extension.psu.edu/programs/watershed-stewards>) or PA Naturalist (<https://pamasternaturalist.org>) programs . We welcome anyone, whether or not they bring any skills, who wishes to offer any amount of time to support the preservation and development of Angelica Creek and its Watershed. The comradery of people from all walks of life around a common goal is one of the great benefits of membership.

ACWA meetings, events and programs

Meetings:

Date and time: 2nd Thursday Monthly, 4:30 - 6:30 PM
Location: Berks Nature (unless otherwise announced)
575 St Bernardine St
Reading, PA 19607

Stream monitoring:

One key component of ACWA's efforts to protect the Angelica Creek Watershed is the monitoring of water quality. ACWA Volunteers perform stream water testing at several standard Angelica Creek sites quarterly on a Saturday, that is selected by the membership on a case-by-case basis. Testing includes water pH, temperature, dissolved oxygen, nitrate, phosphate, as well as macro-invertebrate review. In addition, ACWA has purchased several Stroud Water Research Center produced Mayfly stream sensors, which provide continuous monitoring of water temperature, depth, turbidity and conductivity. Training opportunities exist for members interested in learning to perform water testing, macro-invertebrate identification, and maintenance/interpretation of Mayfly sensors/data. Further details of the water monitoring program may be found later in this document and in the Watershed Monitoring Plan.

Other regular support functions include riparian buffer (vegetated area adjacent to a stream) maintenance and repair, removal of invasive species, environmental education programs, and advocacy for environmental protection. One example of a fun yearly educational event is the Angelica Creek Regatta. Grade school students from Governor Mifflin create boats to race along Angelica Creek, while learning important facts about fresh water streams.

Yearly projects:

Yearly projects are decided upon by consensus of the ACWA members. Decision making is guided by the Strategic Plan which is provided later in this document.

History of the Angelica Creek Watershed and Angelica Creek Park

The Angelica Creek Watershed was initially inhabited by native people of the Lenni-Lenape tribe. European settlers from Britain and Germany arrived in the 1700's. The area was densely wooded at that time. Settlers cleared portions of the area for farming and the Creek was used for small mills, although the hydropower generated by Angelica Creek was not optimal for such development. The watershed fell within Cumru township, which was established in 1732. Shillington, Brecknock, Kenhorst and portions of Reading located within the Angelica Creek Watershed, were subsequently separated from Cumru township.

In 1885, the Angelica Water Company erected an earthen dam and interrupted Angelica Creek's flow. Behind the dam, Angelica's waters settled into a lake which served the surrounding community first as a reservoir and then later as a natural source of ice. Once industrial activities ceased, the City of Reading took ownership of the lake and surrounding property in 1915. Over the ensuing years, Angelica Lake

became a popular spot for fishing, boating, swimming and ice skating. The Angelica Park Boathouse was constructed in 1968. During the 1980's until 2001, the condition of the park and the dam deteriorated.

Then in 2001, Tropical Storm Allison tore through Berks County. Angelica Creek breached the dam and flowed forward unabated. The Angelica Dam was never rebuilt. Instead, the City of Reading chose to repair the natural rhythm of the waterway and its surroundings by establishing a 71-acre environmental park along the creek: Angelica Creek Park.

During this time, Reading City was in negotiations with EPA, DEP and FEMA over chronic water pollution issues from its wastewater treatment facility on Fritz Island, just downstream from Angelica Park. Part of the negotiation with the agencies included the City developing a "Supplemental Environmental Project (SEP)" (<https://www.epa.gov/enforcement/supplemental-environmental-projects-seps>). In 2004 the City agreed to conduct the SEP as part of the consent decree issued by the Department of Justice. The SEP was the environmental development of the former Angelica Lake site.

The project was implemented between 2005 and 2008. The project included creation of two 1-acre wetlands, upland meadow area, fishing pond, approximately 2000 linear feet of stream restoration and relocation, and a trail system. Its objectives were to improve habitat value, sediment retention (floodplain and riparian retention), as well as recreation and education. The adaptive management strategy is briefly described in the following presentation:

https://growthzonesitesprod.azureedge.net/wp-content/uploads/sites/1889/2020/12/SWS_MAC-Presentation_April5_2014_XRiva2.pdf. A more detailed description of the A.M. Marble engineering project can be found at:

<https://drive.google.com/drive/folders/1pQEWUGW2dGDFePZBXRrDcpS8TPoQkjQn>

In 2008 the Angelica Creek Trail was created and connected the City of Reading to Schuylkill River Trail and to Penn Grill Pool, supporting a greenway that connected both people and wildlife. (Note that this trail was one of 9 focus areas for Berks Conservancy's Greater Reading Trails partnership, which had begun in 2004)

In 2010 Reading City Mayor Thomas McMahon announced that the former Boathouse at Angelica Park would become an environmental education center. The Angelica Advisory Committee was formed and included representatives from Berks Conservancy (now Berks Nature), Alvernia University, Albright College and City and community partners. The project was completed but the City did not have the means to provide ongoing care and management of the Angelica Park. Berks Conservancy and Alvernia University agreed to share the management responsibilities. A longterm lease agreement was created for this purpose between Reading City, Berks Nature and Alvernia.

In 2015-2016 Berks Nature built an addition onto the former boathouse, acquired the building, and made this their home site, Berks Nature Place. This allowed Berks Nature staff to take on an even more aggressive approach to continuously improving the area. Berks Nature's efforts to sustain an "Eco-Park" helped the City meet its consent decree and helped Berks Nature, who would use Angelica Park to demonstrate and interpret environmental protection concepts including stormwater management, removal of invasive species, and wildlife habitat preservation in a city park environment.

Angelica Creek had been listed as an impaired stream until 2016. Efforts over the preceding years resulted in dramatic improvements in water quality. In 2016 the PA Fish and Boat Commission moved up the Angelica Creek water quality rating to that of cold water fishery. (see https://3jgs2o4a02n22u73bi2gnd3l-wpengine.netdna-ssl.com/wp-content/uploads/2016/10/Schuylkill_Summary.pdf)

With Berks Nature's move to Angelica Park, further opportunities developed to enhance the value of Angelica Creek for recreation and education. Eco-camp was initiated to engage young people, a pollinator garden was created, and collaboration with a bird watching club began. Berks Nature and ACWA currently are collaborating with other stakeholders including Nolde Forest and Governor Mifflin School District, moving beyond park management to broader watershed planning.

(Regan Moll-Dohm and Larry Lloyd and Alicia Sprow provided contributions to the history above)

Additional resources regarding early history of the Angelica Creek Watershed and surrounding areas may be found in the following links:

<http://www.co.berks.pa.us/Dept/Planning/Documents/MultiMunicipalPlanning/JointComprehensive-Plans/GovernorMifflin/5%20Chapter%204%20Historic%20Preservation.pdf>

<http://www.cumrutownship.com/home/historyofthetownship.html>

Relationships between ACWA and other environmental groups

Berks Nature

Berks Nature is ACWA's host organization. It provides administrative and consultative assistance to ACWA, as well as to other watershed associations in Berks County, including Tulpehocken, Maiden Creek, and Haycreek Watershed Associations. Berks Nature staff members have a wealth of knowledge regarding environmental protection. They regularly attend ACWA meetings. Berks Nature staff foster a sharing of information among Berks County the 4 Berks County watershed associations. ACWA is particularly fortunate since the Berks Nature home site is located within the ACWA watershed and Berks Nature has served a major role in the Angelica Creek restoration project.

There are multiple groups whose mission is to support the environment, including Angelica Creek Watershed. Berks Nature has established an extensive network of relationships with many of these groups, both non-profit organizations and state/federal agencies. Leveraging these relationships increases impact for grant funding requests and allows for coordination of restoration/preservation efforts.

Berks Nature is an active collaborator of the Delaware River Watershed Initiative (DRWI). Generously funded by the William Penn Foundation, the DRWI aligns those conservation organizations who are already working to protect and restore the entire Delaware River system to maximize their impact – from protecting important landscapes, to restoring degraded areas, to adopting green infrastructure and responsible farming practices. The DRWI focuses on eight target areas – known as “Clusters” – in the Delaware River watershed. Berks Nature participates in the DRWI as a member of both the Schuylkill Highlands Cluster (includes the French, Pickering, and Hay Creeks) and the Middle Schuylkill Cluster (includes the Perkiomen, Maiden, Tulpehocken, Manatawny, and Monocacy Creeks). Included among Berks Nature's DRWI partners are the Partnership for the Delaware Estuary, Schuylkill Action Network, Stroud Water Research Center, Nature Conservancy, and others. Berks Nature leadership meets with these partners routinely to ensure that we are achieving all of the grant expectations and planning future projects which include community science projects, public education about watersheds and stream health, and agricultural best management practices.

Berks Nature partners with federal and state agencies mostly to acquire grants. Much of this work is focused on the agricultural best management practices and land protection. These large grants are needed to accomplish their environmental objectives. For example, Larry Lloyd (Berks Nature's Senior Ecologist) meets with the federal agency, Natural Resource Conservation Service (NRCS) often to determine which local farmers are ready for implementation of projects. NRCS pays for some of the work, and Berks Nature pays for some of the work. This partnership leverages over one million dollars annually for Berks County farmers.

Berks Nature provides environmental education to “community scientists” through their Nature Ambassador training program. Berks Nature also hosts the PA Master Naturalist program in Berks County. Further information regarding Berks Nature's Nature Ambassador training program may be found at the following sites:

https://www.facebook.com/bnambassador/?ref=page_internal

https://berksnature.org/wp-content/uploads/2019/11/AMB2020-Application-MG-final_1.pdf

Along with Penn State Extension's Master Watershed Stewardship program, their Nature Ambassador training program and the PA Master Naturalist Program offer training for interested citizens that can be applied through our Berks County watershed associations. *(Information provided by Tami Shimp)*

Nolde Forest Environmental Education Center

Nolde Forest Environmental Education Center (EEC) encompasses 725 acres of deciduous woodlands and coniferous plantations along Angelica Creek. Nolde Forest is home to the entirety of the Punches Run watershed—a pristine reference stream that spills into Angelica Creek. Much of the land that now makes up the Nolde Forest EEC was purchased from the Nolde family by the Commonwealth of Pennsylvania in 1966 to become Pennsylvania's first environmental education center.

With a rich and storied history, the forest was partially hand planted in the early 1900s after hosiery baron Jacob Nolde acquired the land that had been previously used for charcoal making, timber harvesting and marginal farms.

Today, Nolde Forest welcomes tens of thousands of visitors each year. School groups, families from our community, and people from around the world visit to walk more than ten miles of trails and attend educational programs. Nolde Forest serves as an outdoor classroom for organized school groups and university researchers, as well as provides hands-on learning opportunities through scheduled programs and events. The experiences are developed and implemented to increase environmental awareness, knowledge, problem-solving and decision-making skills as well as instilling an environmental ethic. The network of trails makes the park's streams, ponds, and diverse habitats accessible to both students and visitors. Nolde Forest is a place for quiet contemplation and observation of the natural world. The preserved land offers comfort and refuge for visitors seeking healthful outdoor activity within a beautiful forest setting.

By conserving and protecting natural resources within the Angelica Creek watershed, Nolde Forest EEC has long supported the same mission and goals of Angelica Creek Watershed Association, and its commitment to working with partners to preserve, protect and restore the watershed that serves to educate and inspire visitors today and for future generations. *(Created by Jill Kemp)*

Albright College

For the last two decades, faculty and students with the Albright College Biology Department have had the honor of collaborating on several facets of ecological study within the Angelica Creek Watershed. Our work has spanned the entire watershed. In the upper watershed we have a long history of mammal survey study within Nolde Forest, and more recently (since 2013) have worked on an annual analysis of vegetation and small mammal recovery following timber management conducted by PA Department of Conservation and Natural Resources (DCNR). These data are regularly reported back to DCNR as part of an evaluation of their forest management plan. In the lower watershed, we have worked with the City of Reading and Berks Nature at Angelica Creek Park. This latter project started with assessing the impact of dam removal at the Park, which was promptly followed by partnership with our collaborators and the engineering design firm on creation of the environmental park at Angelica Creek Park. The park was planned to simultaneously provide active and passive recreation opportunity for the city and to help ameliorate watershed runoff before it reaches the Schuylkill River. Annually, since 2004, we have assessed the ecological function of the park through stream and wetland hydrology, nutrient chemistry, and analysis of the stream macrobenthic invertebrate community with the ultimate goal of evaluating the success of the project in improving stream and floodplain function. Finally, we have conducted a stormwater survey across the watershed, specifically examining the impacts of increased storm intensity and frequency on loading rates of sediments and nutrients from land runoff. The span of this work has involved ~200 students as part of coursework and a dozen summer student research projects. *(Created by Dave Osgood)*

Alvernia University

Alvernia University has demonstrated commitment to Angelica Creek Park since the inception of the Angelica Park Project. A biology faculty member served on the original task force for environmental park design, including restoring the stream through the park, creation of two wetland areas, a pond, a meadow and multi-use trails. In 2008 the university funded a doctoral-level graduate assistantship position. This individual, with the support of faculty, served a manager role in the Angelica Creek Park project and was

elected by the Angelica Advisory Board to serve as chair of the Angelica Executive Committee. Alvernia and Berks Nature have co-managed Angelica Park since 2010, supporting the City of Reading through a longterm lease arrangement. Alvernia has a strong presence within ACWA.

Governor Mifflin School District (GMSD)

Governor Mifflin School district has also been a valuable partner. The intermediate school is located right in front of an Angelica Creek tributary, called Rabbit Run. In 2016, a contest was held as a collaboration between the ACWA and Gov. Mifflin HS biology teacher, Jennifer Stinson, for Earth Day. The name was inspired by Pulitzer Prize winner and former Berks County resident, John Updike. Since 2018, GMSD has partnered with Berks Nature for an annual regatta where over a hundred people make their own boats and race them down Angelica Creek. This event is an effort to portray how easily substances can travel through our waterways. Also in 2018, the school district assisted with an important stream project that involved the planting of a healthy riparian buffer and invasive species removal. Elementary and middle school students helped plant dozens of trees while high school students removed invasive plants. The collaboration of the GMSD with the AWCA has continued to provide a positive environmental education for Angelica Creek's future generations.

Angelica Creek Watershed Association

3-Year Strategic Plan | 2021-2023

Berks Nature Overview

Berks Nature believes that nature is essential to our quality of life. As an organization we demonstrate that through land protection, watershed restoration, urban gardens, trails and educational programs that aim to connect people with nature.

Berks Nature is home to four of Berks County's watershed associations: the Angelica Creek (ACWA), the Hay Creek (HCWA), the Tulpehocken Creek (TCWA) and the Maiden Creek (MCWA). As programs of Berks Nature, these volunteer driven groups are led by Berks Nature staff to engage people with nature and their watershed, understand what a healthy watershed looks like, and move individuals and organizations toward advocacy or action in protecting their watershed(s).

Berks Nature supports watershed association activities by providing communications and membership recruitment support, administrative and conservation expertise. Watershed associations use GLOBE (Global Learning for the Observation and Benefit of the Environment) monitoring protocols and support our activities around the Delaware River Watershed Initiative.

While each watershed association strategic plan is slightly different and unique to its own community and watershed, all plans support **Berks Nature's watershed conservation program goals:**

GOAL 1: To deepen the community's and Berks Nature's understanding of the watershed's health.

GOAL 2: Create a community of engaged and informed watershed stewards equipped with the resources, knowledge, and relationships necessary to elevate the watershed's priorities to a higher level of action and public discourse.

GOAL 3: Connect the watershed community with stewardship opportunities to actively restore and protect the ecosystem services provided by the watershed.

Angelica Creek Watershed Association

3-Year Strategic Plan | 2021-2023

Program Overview

Mission Statement

A program of Berks Nature, Angelica Creek Watershed Association (ACWA) is made up of volunteers with a mission to preserve, protect and restore Angelica Creek Watershed for its wildlife, local and downstream neighbors, and generations to come. Our volunteers invite stewardship through recreation, scientific practices, and education.

Vision Statement

In three years, the ACWA envisions themselves as an active and reputable organization within the Angelica Creek watershed community acting locally to improve and maintain the health of the watershed while also addressing the global climate crisis.

Core Values

1. **SUSTAINABILITY:** Our actions today will impact future generations.
2. **STEWARDSHIP:** We have a responsibility to cultivate an appreciation for and awareness of the watershed, which includes promoting Leave No Trace recreation practices.
3. **RESPECT FOR NATURE:** Mother Nature is the fundamental guiding force for conservation action.
4. **IMPACT:** Clean water is essential to all life and the core principles of preservation and conservation benefit society by producing higher functioning, sustainable ecosystem services.

Summary

ACWA is a volunteer-driven program of Berks Nature, dedicated to protecting and advancing the health of the Angelica Creek watershed through monitoring, restoration, and education.

Strategic Plan

Angelica Creek Watershed Association

3-Year Strategic Plan | 2021-2023

3-Year Goals and Strategies

GOAL 1: ACWA WILL POSSESS A DEEP UNDERSTANDING OF THE ANGELICA CREEK WATERSHED, ALLOWING ACWA TO REACT AND ADDRESS POTENTIAL THREATS AS THEY ARISE.

1.1 – Document the history and current status of Angelica Creek Watershed in several formats that would be of value to various stakeholders (general public, contributors to the watershed, granters, public officials, etc.) and to inform ACWA’s water quality monitoring plan.

Perform watershed assessment for Angelica Creek reviewing its physical features and current status.

Locate and enlist contributors who have intimate knowledge of the watershed’s history.

Describe impact of stormwater on Angelica Creek’s health using existing data, municipal input, and other historical resources (See Goal 2.1)

Define interests of key stakeholders.

Establish content of value to each audience/stakeholder group.

Establish media (e.g video, online video, power point, detailed document with executive summary...).

1.2 - Create a water quality monitoring plan, driven by existing threats and petition requirements to upgrade the designation of Angelica Creek.

Perform a watershed assessment for Angelica Creek.

Research and review existing monitoring efforts in the watershed (e.g., EPA, Stroud, DEP).

Review monitoring plans from other watershed groups and review requirements for designation upgrade (see goal 3.2)

Create content of monitoring plan.

Establish workforce to address needs.

Establish methods to publish ongoing results that are understandable to the audience.

1.3 - Implement water quality monitoring plan

Specific actions TBD on completion of monitoring plan

1.4 - Establish routine system of logging, reviewing, analyzing, and interpreting monitoring data to more actively build our understanding of Angelica Creek's health trends and identify threats.

Plan and schedule regular visual assessments of the watershed and define how frequently visual assessments should be performed.

Define frequency of data review and then schedule and assign responsibility to regularly review and visualize data (from both the Mayfly datalogger and in-person sampling).

Describe data interpretation methods that are specific to each monitoring project allowing experimental design, appropriate indices/metrics, and data uses to inform each data product and conclusion.

GOAL 2: ACWA WILL CONTRIBUTE LOCALLY TO THE MITIGATION OF AND/OR ADAPTATION OF THE GLOBAL CLIMATE CRISIS.

2.1 – Build relationships and collaborate with local municipalities to better understand and collectively address the threat of stormwater in Angelica Creek

Work with Berks Nature to identify and approach watershed municipalities to discuss stormwater issues and priorities.

Identify opportunities for ACWA to collaborate with municipalities on stormwater mitigation projects

Produce map of the large stormwater inputs or otherwise high-priority “problem” areas for the watershed (if one does not already exist).

2.2 - Identify sites on Angelica Creek to plant (or maintain existing) tree cover, including but not exclusively riparian buffers.

Define sites for riparian repair informed by ACWA's watershed assessment and other available information to maximize impact.

Obtain grant funds as necessary to support tree plantings and maintenance.

Work with partners to identify and then participate in native tree planting efforts in the watershed.

2.3 - Assist Berks Nature with the development of Angelica Creek Park as a "climate friendly" park.

Share resources and maintain open lines of communication with Berks Nature to understand criteria for achieving designation as a "climate friendly" park.

Assist as necessary with the implementation of "climate friendly" criteria.

2.4 - Continue to foster a collaborative approach to addressing the global climate crisis by maintaining and growing our network of conservation partners.

Continue to collaborate with Berks Nature and their partners on climate mitigation/adaptation.

Review/research regional or global initiatives and align ACWA with these models on a local scale (e.g., Reading Climate Action Plan).

GOAL 3: ACWA WILL SUBMIT A PETITION TO UPGRADE THE DESIGNATION OF ANGELICA CREEK.

3.1 - Determine budget and work with Berks Nature commit organizational resources to advance a re-designation petition.

Form a sub-committee within ACWA to coordinate this effort.

Seek funding (further define as more details come together).

3.2 - Develop an action plan or strategy for assembling the re-designation petition.

Research and/or deepen understanding of the petition criteria.

Identify the data requirements for re-designation.

3.3 - Assemble dataset for inclusion in the complete petition application.

Identify and consolidate existing data.

Make arrangements to collect additional data as necessary (further define as more details are needed).

GOAL 4: ACWA WILL ELEVATE OUR PUBLIC PROFILE, BUILD CREDIBILITY, FORGE NEW RELATIONSHIPS, AND ADVOCATE FOR CLEAN WATER AND HEALTHY ECOSYSTEMS AT THE MUNICIPAL LEVEL.

4.1 – Work with Berks Nature education and watershed staff to develop strategy to regularly assist local communities in meeting MS4 goals.

Identify and approach municipalities in Angelica Creek watershed with MS4 requirements and learn about their needs/projects.

Participate in one project that helps a municipal partner in achieving MS4 compliance.

4.2 - Strengthen connections and forge new relationships with watershed stakeholders including, but not limited to, local businesses in Reading and school districts.

Connect with the 18th Wonder and South of Penn Task Force to identify opportunities to strengthen this relationship.

Grow the annual Regatta Event at Angelica Creek Park to include new watershed community members.

Find and describe ways to make explicit connections to ACWA during the educational programming our membership already provides through their professional work.

4.3 - Explore and build relationships with local education institutions to support student-led research in the watershed.

Work with Berks Nature to identify and describe research topics or projects related to Angelica Creek that ACWA has the interest and capacity to pursue with an academic partner.

Poll local professors for interest in forming new student research collaborations.

Leverage membership connections to strengthen existing academic partnerships (e.g., Alvernia).

GOAL 5: ACWA WILL INCREASE THE SIZE AND DIVERSITY OF ITS ACTIVE MEMBERSHIP

5.1 - Develop a volunteer recruitment strategy that intentionally aims to diversify the current ACWA membership.

Identify audiences within the watershed to target.

Determine communication/marketing strategy for each audience.

Reach out to local partners for help engaging target audiences (mailing list, boosting online promotions, access to events, etc.,).

Identify local, environmentally themed meetings and events to attend/network at.

5.2 – Work with Berks Nature communications staff to design and produce volunteer recruitment materials.

Select type of promotional material based upon expected marketing venues (online vs. in-person) and capacity (e.g., funding).

Push membership marketing materials on Facebook (social media).

5.3 – Work with Berks Nature communications staff to create volunteer orientation materials

Decide what orientation materials would be beneficial for a new volunteer.

Review past ACWA content to identify where orientation information already exists.

Schedule semi-regular “orientations” to not only welcome new members but to provide a refresher for existing members.

Collaborate with other Berks Nature watershed associations to streamline effort and share resources/content creation.



Angelica Creek Watershed Physical Characteristics

The headwaters of the Angelica arise near Knauers in Cumru Township. The Angelica Creek Watershed encompasses about 7.5 square miles. The total length of all mapped tributaries in the watershed is approximately 15 miles. Basin elevations range from 200 feet to 1,300 feet, with mean basin elevation at 567.5 feet. Land use within the watershed is currently composed of approximately 57% forest cover (deciduous forest, evergreen forest, mixed forest, and shrub/scrub). Nearly 35% of the watershed is developed, with 7.5% of land in grassland/herbaceous, pasture/hay, and cultivated crops.

A summary of physical characteristics of the watershed may be found on [Model my Watershed](https://modelmywatershed.org/analyze) at the following site:

<https://modelmywatershed.org/analyze>

Access: Go to site above. Click on "Get Started"; then click on "Delineate Watershed" (choose Delaware High Resolution; then click on map to place marker at point where Angelica Creek meets Schuylkill River); See sections labeled Stream, Land, Soil, etc for detailed information in categories listed below.

Contents include:

Delaware High Resolution map - 20 square kilometers

Streams Network Statistics (Stream Order, Length, Mean Channel Slope)

Land - Land cover distribution, protected lands distribution, DRB 2100 land forecast (Centers, Corridors)

Soil - Hydrologic soil group distribution

Terrain - Elevation and Slope (average, min, max)

Climate - Mean Monthly precipitation and climate

Animals - estimated number of farm animals

Water Quality estimates - N, P and SS (total and average)

Water Quality Monitoring

Currently, ACWA relies upon two methods for regular water quality monitoring. This includes (1) continuous monitoring using electronic sensors called "Mayfly sensors", which are placed at several sites along Angelica Creek, and (2) quarterly water testing using GLOBE (Global Learning and Observations to Benefit the Environment) protocols.

Mayfly Sensors

The electronic monitors are called Mayfly sensors and were purchased from Stroud Research Center.

The sensors provide continuous monitoring of stream temperature, depth, conductivity, and turbidity.

Stroud has provided sensors to multiple groups within the Delaware River basin and across the country.

Each site is responsible for maintenance of its equipment including regular cleaning, battery replacement, and quality control, as well as data review. Stroud is available for consultation and education. Sensors

record data every 5 minutes. This data is maintained on a data chip and is also transmitted to a website

that can be readily accessed through the internet. ACWA volunteers may be trained in sensor maintenance and data review.

Further information about the Mayfly sensors can be found at the following sites:

<https://stroudcenter.org/news/digital-mayfly-swarm-is-emerging/>

<https://www.schuylkillwaters.org/sites/default/files/>

[EnviroDIY%20Mayfly%20Sensor%20Stations%20for%20Real-Time%20Stream%20Monitoring%20-%20Dave%20Bressler.%20Stroud.pdf](https://www.schuylkillwaters.org/sites/default/files/EnviroDIY%20Mayfly%20Sensor%20Stations%20for%20Real-Time%20Stream%20Monitoring%20-%20Dave%20Bressler.%20Stroud.pdf)

See the following sites for real time data from Angelica Creek Mayfly Sensors:

Monitor My Watershed Information:

<https://monitormywatershed.org/sites/MSAC2S/>

<https://monitormywatershed.org/sites/MSAC1S/>

<https://monitormywatershed.org/sites/MSPR2S/>

An excellent example of a local monitoring program created by an ACWA Member is shown below:

Stillwater Run (Tributary of Angelica Creek) The site below is a summary analysis of an Angelica Creek tributary created by Robert Sarnoski, PA Master Naturalist and ACWA member.

<https://datastudio.google.com/reporting/b9ee311d-e759-4953-b5b1-47fee86141bc/page/Dx2sB>

(use Google Chrome)

Comparative water temperatures across all ACWA Mayfly sites (created by Robert Sarnoski)

<https://datastudio.google.com/reporting/46f46d6c-0555-449c-b64e-57d634c0dc53/page/kTSCC>

GLOBE

The Global Learning and Observations to Benefit the Environment (GLOBE) Program was founded on Earth Day in 1994. Since then, GLOBE has supported global citizen science in the effort to assist international science and education. GLOBE provides a system in which validated sources can collect and input their data to a public database. Additionally, users can utilize GLOBE's system to analyze and visualize accessed data. ACWA employs the GLOBE's database to input water quality data and visualize trends. Visualizing data trends will allow ACWA to further improve their water sampling plan(s) as well as present the data to relevant audiences.

<https://www.globe.gov>

Macroinvertebrate evaluation

Aquatic macroinvertebrates are adult insects or larvae, crustacea, and worms that are visible to the eye and live at the bottom of streams, rivers, and lakes. They represent an important method of monitoring water quality. The insects vary in their sensitivity to pollution and they have a relatively long life cycle, so they can offer information about water quality over a period of months. Members may receive training if desired to identify macro invertebrate species.

<https://3jgs2o4a02n22u73bi2gnd3l-wpengine.netdna-ssl.com/wp-content/uploads/StroudWebsiteMacro-KeyFNL.pdf>

Angelica Creek Park - Current State

Angelica Creek at Angelica Creek Park now flows through its former lakebed, weaving between two wetlands. Cattails and other wet-loving plants flourish in the soggy soils while native trees and woody shrubs – sycamore, swamp white oak, and osier dogwood – have taken root along Angelica's banks. This varied assemblage of native wetland and riparian plants provides rich wildlife habitat for birds, like the red-winged blackbird, and mammals, like the red fox. This wetland nexus is also designed to collect

and filter stormwater, an emerging challenge for Berks County's streams as extreme weather events increase in frequency and the prevalence of paved surfaces across the watershed increases flooding volumes. Angelica Creek's wetland complex includes a retention pond, upon which a Biohaven wetland island floats. Lush with native plants, the floating wetland recycles excess nutrients carried by stormwater that could otherwise sicken the stream. The once barren lakebed now burgeons with a vibrant community of wetland and riparian plants. This verdant community sequesters carbon and acts as a natural filter for rain and stormwater, allowing water to soak into the soil, increasing groundwater recharge, and reducing the risk of flooding. Before the Angelica Dam breached, the lake and its surrounding area met a singular purpose: recreation. Today, the restored wetland ecosystem of Angelica Creek Park is a living, evolving model of resiliency, reclamation, and transformation serving human and non-human communities alike.

Threats to Watershed Protection

Despite the progress which has been made at the Alvernia Creek Park Site and the protections offered by stream flow through Nolde Forest and adjacent protected properties, there continue to be ongoing threats to watershed development, involving other properties adjacent to Alvernia Creek, as a well as the broader watershed area. These include:

- `Climate change, with rising average temperatures and extremes of weather
- `Urban development
 - Limited existing regulations (ordinances, zoning)
 - Changing policies at multiple government levels
 - Lack of municipal cooperation and capacity, multiple jurisdictions
- `Invasive species of plants and animals
- `Difficulty motivating community members regarding the importance of watershed preservation

Community planning by municipalities within the Angelica Creek Watershed and Berks County:

Collaboration with municipal planners is critical for successful protection of our watershed. Municipalities face competing interests and limited budgets. Contribution of objective, evidence based information regarding environmental issues may lead to development of municipal regulations that will result in watershed protection. Links below describe land and development planning for the Mifflin region (that includes the Angelica Creek Watershed) and Berks County.

<https://www.co.berks.pa.us/Dept/Planning/Pages/GovMifflinAreaJointComprehensivePlan.aspx>

<https://www.co.berks.pa.us/Dept/Planning/Pages/BerksCountyComprehensivePlan.aspx>

Stormwater runoff is an important concern for environmentalists. Municipalities are required to develop plans for their Municipal Separate Storm Sewer Systems (MS4). Watershed Associations may offer support to help municipalities address MS4 issues.

<http://www.stormwaterpa.org/ms4-program.html>

ANGELICA GREENWAY

CONNECTING PEOPLE TO TRAILS AND NATURE

Angelica Creek Trail connects to Kenhorst Borough, Angelica Creek Park and the Schuylkill River Trail. Users can walk, bike, and enjoy the wonderful one mile pathway to the city-owned Angelica Creek Park, educational wetlands and Environmental Exploration Center. Make sure you look for wildlife which resides along this important greenway.

It is a goal of the Greater Reading Trails Partnership to ultimately extend this trail to connect to the popular Nolde Forest Environmental Education Center. The need to create a greenway link between the Schuylkill River Trail, Angelica Park and Nolde Forest was first identified in the 1993/94 Berks County Open Space and Recreation Plan and in the 1998 Cumru Township Open Space and Recreation Plan. The Angelica Creek Corridor was identified as an Open Space Area to be protected. It is a goal of the Angelica Greenway Feasibility Study to create a regional trail connection that allows for links between communities, schools, parks and regional recreational opportunities thus providing more walkable communities.

ANGELICA CREEK TRAIL TRAILHEADS

KenGrill Recreation Center

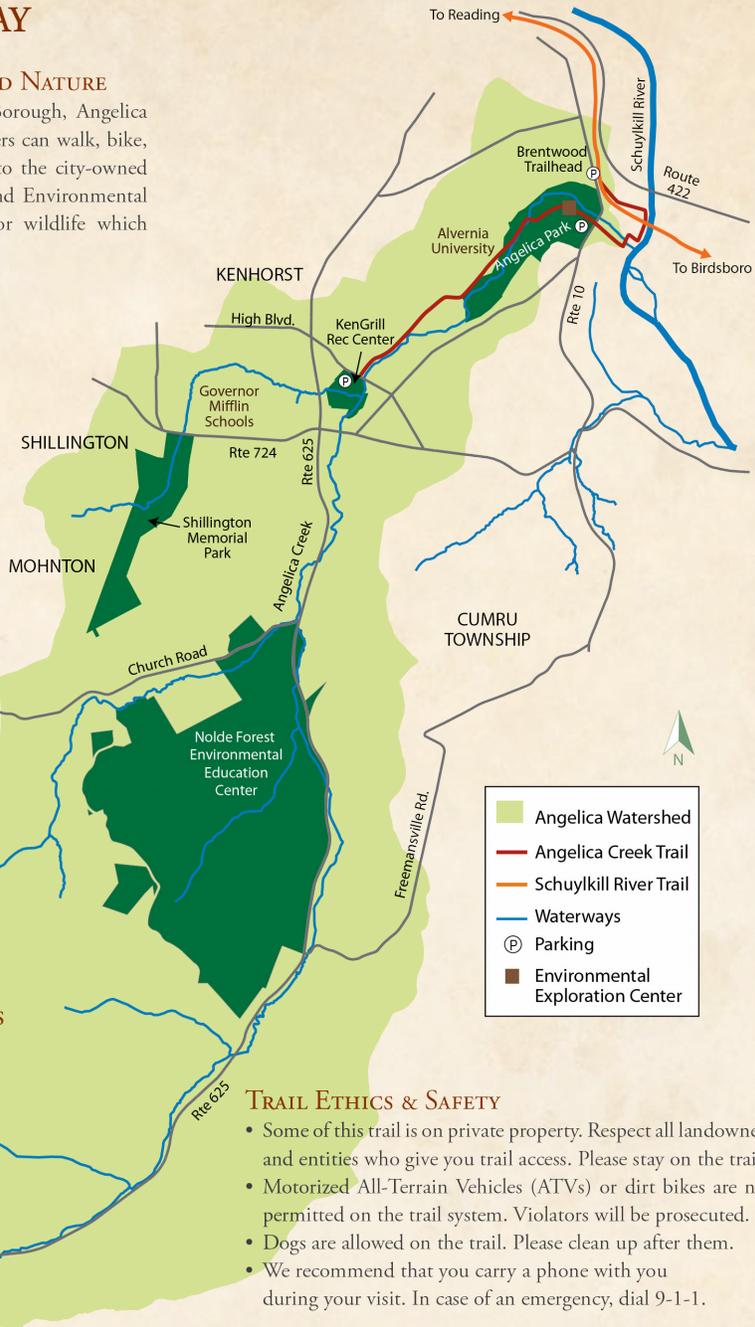
730 High Blvd. Kenhorst, PA
Parking is available at the KenGrill Recreation Center.

Brentwood Trailhead

Located on Rt. 10, Morgantown Road near Reading, PA.

Angelica Creek Park

Located off of Route 10 on Saint Bernardine Street in Reading, PA.



TRAIL ETHICS & SAFETY

- Some of this trail is on private property. Respect all landowners and entities who give you trail access. Please stay on the trail.
- Motorized All-Terrain Vehicles (ATVs) or dirt bikes are not permitted on the trail system. Violators will be prosecuted.
- Dogs are allowed on the trail. Please clean up after them.
- We recommend that you carry a phone with you during your visit. In case of an emergency, dial 9-1-1.