

Shamokin Creek Restoration

ENST411 02: Environmental Community Projects
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Origins

The Shamokin Creek Restoration project came to fruition as a result of a student group from Bucknell University working alongside a variety of community partners. Of those community partners, the most significant are Shamokin Creek Restoration Alliance (SCRA), Faith Alliance of Revitalization (FAR), and the Bucknell's Center for the Environment and Sustainability. Shamokin Creek Restoration Alliance is a non-profit organization based in Shamokin, Pennsylvania. Founded in 1996, SCRA has a strong foundation of community members dedicated to restoring the watershed. Of those community members, the most involved in working with the student group from Bucknell University is Steve Motyka, who has been involved with SCRA since he was a high school student in the area. Similarly, FAR is a "multi-faith, multi-agency, and multi-stakeholder collaborative partnership working to rebuild and revitalize the City of Shamokin and the surrounding communities" (Rome, 2020). Friar Micheal "Mike" Lasky has been incredibly involved in the progression of the revitalization of Shamokin Creek, working closely alongside SCRA and the Bucknell University student group. Lastly, Shaunna Barnhart, representing Bucknell's Center for Sustainability and the Environment, has been an active participant in the project. While SCRA has been active since 1996, it was not until recently that that organization gained significant traction. Within the past year, SCRA has secured \$100,000 in grant funding from a variety of sources.

In February of 2020, the U.S Environmental Protection Agency (EPA) identified Shamokin, Pennsylvania as a community in need of assistance in regards to community rebuilding efforts (Rome, 2020). During February 11-13, 2020, the EPA hosted a community workout in which the Shamokin Community Rebuilding Action Plan was drafted. Among the six goals identified by community members was "Making Shamokin healthy, green, and clean now and tomorrow" (Lasky, 2020). Symbolic of the health and well-being of Shamokin is Shamokin Creek which runs through town. Shamokin is located in Northumberland County, and surrounded by Coal Township. Similarly, Shamokin is located on the Western edge of Pennsylvania's anthracite coal region. While the town is proud of their heritage, the legacy of coal mining has left the surrounding area environmentally degraded in some aspects. Most significant in regards to this project is acid mine drainage (AMD). This waste product originates from coal mines when water, oxygen and iron pyrite combine to create AMD, or water with extremely high levels of acidity and elevated concentrations of metals. While acid mine drainage does occur naturally, large scale disturbances to the natural landscape, such as mining, exacerbate the issue. Similarly, improvements in environmental regulation have decreased AMD in active mines. Hence, much of the drainage issues stems from abandoned mines. Given the history of coal mining, the degree of impairment seen in Shamokin Creek is not surprising. However, the project will assist in revitalizing the overall watershed to improve the water quality as well as provide a healthy aquatic ecosystem.

Project Goals

The main goals of this project are to help SCRA, FAR, and the town of Shamokin to gain more funding, gain new partners and secure land for the AMD remediation site. The project has already secured \$100,000 from Williams Gas Company, which was acquired through the EPA as part of a \$750,000 fine assigned to the gas company. This was to be used as starting funds for the implementation of an Acid Mine Drainage (AMD) remediation site. The designers, Charles Brinkash and Aaron S. Clauser, are requesting \$45,000 of that budget to survey and design the remediation plant. The original \$100,000 can only bring this project so far with over half the project's budget being spent on design, making the accumulation of new partners and more grant funding imperative. The Sierra Club Alleghany chapter has an additional \$15,000 that they are able to give to a local environmental project. One of the main goals of this project was attempting to secure this funding for the remediation project. Similarly, there are other grant opportunities that we worked to either secure or begin the application process, as SCRA wishes to start additional stream remediation efforts. These additional sources of grant funding are as follows: Wildlife for Everyone, NEEF, Cornell Douglas Grant, DNCR Rivers and Conservation Grant, PA Department of Community and Economic Development Abandoned Mine Abatement Grant, and the National Fish and Wildlife Foundation. While the application timeline for some of these grants are not in alignment with Bucknell's Spring semester, if we are able to secure some additional funding now, and open channels for future funding, SCRA will be better able to continue its remediation of watersheds affected by AMD.

Originally the land that the remediation site was going to sit on was going to be donated by the Susquehanna Coal Company. The coal company had given a verbal agreement that they would donate 2-4 acres of land to the remediation effort as long as the project used the coal companies workers to implement the remediation site. However, this has since fallen through and it is unclear if the remediation effort will obtain the land. If the Coal Company does not end up donating the land, SCRA and FAR have arranged with the town of Shamokin to donate land for the remediation site. If the land for the site is going to be obtained through the town of Shamokin, there will need to be new evaluations completed on all possible sites and the designers and surveyors will need to help in the selection of a new remediation site.

A third goal of this project is to help in Shamokin planting trees. FAR, SCRA and the town of Shamokin have been working towards creating a pollination garden in the heart of the town. This will be the first pollination garden of its kind in the anthracite region. The town of Shamokin, FAR and SCRA need the group's help in planting some of the trees/other plants as well as helping recruit more volunteers to take on this task. The trees are typically planted by local school age children during a school field trip to the pollination garden. Due to the COVID-19 Pandemic, the schools cannot have field trips to the pollination gardens. The long term goal of this project is to have Pennsylvania State University biologists certify the garden as a pollination garden for the area. On this day it will also be a priority to educate and raise awareness to the restoration of Shamokin Creek along with the community as a whole. This pollination garden

will be located right next to the affected creek. This garden will act as a riparian barrier. This will help during floods by absorbing excess water and help stop flood water from flooding the local park.

A fourth goal of the project is to arrange a meeting with Bucknell University students and representatives from the Environmental Protection Agency (EPA) and Pennsylvania Department of Environmental Protection (PADEP). This meeting will serve to strengthen relationships between the EPA, PADEP, SCRA, FAR, and Bucknell, as well as being a valuable opportunity for students to learn more about careers in environmental policy and justice and working in a governmental role.

Project Assets

Shamokin Creek Restoration Alliance (SCRA) was successfully able to obtain \$100,000 from Williams Gas Company to be used for the restoration of the creek. Along with obtaining the funding for the project the SCRA was able to gain numerous community partners including FAR, Bucknell University, Shamokin Regional Coal Station, Sierra Club, EPA and DEP of Pennsylvania. This multi organization approach has helped the project become more rounded and incorporate more perspectives into the project. Friar Mike of FAR was able to complete a survey on what the people of Shamokin want the government to do, what the biggest problem facing the community is, and what projects citizens would be willing to volunteer on. The survey displayed that the Shamokin community is a very prideful and caring community that is willing to help out wherever they can help. One of the top responses for changes the citizens would want to see done was the beautification of the towns streams and open spaces. The improvement of the stream is not only top priority with the town officials and local grassroots organizations but has the support of the general community. Another asset of the project is the land is being gifted to them. Either the site will take place on the land that might be gifted to them by the Susquehanna Coal Company or the land owned by the town, no matter what there is not a need for additional investment into land.

Project Needs

Though the project is starting with a budget of \$100,000 from the Williams Gas Company, the project requires a significant amount more in funding. The designer for the remediation site is already requesting more than 50% of the current budget as the design cost. If the remediation site is ever going to be implemented the coalition will need to acquire more funding. Hence, one of our primary goals is to secure additional funding sources so SCRA is able to complete additional projects. Another drawback is that the official place of the end remediation site is not yet known. The surveying and design of the remediation site cannot begin until the final location is known. The coalition is still awaiting the final decision of the

Susquehanna Coal Company to see if they will be granted the land that they were originally promised. Another need identified by the leadership of SCRA is the need to partner with other community organizations. It was the desire to work with other community groups that brought this project to fruition. SCRA is partnered with FAR, and FAR works alongside Bucknell to stimulate student engagement in communities in and around Lewisburg. This project aimed to gain more partnerships and connections in the community. Additional needs were involved with the tree planting day. The original plan to have students within the community come to the planting won't be possible due to the Covid-19 pandemic. Other participants will need to be recruited for the planting day. We also planned to speak with the Sierra Club chapter of Lewisburg to get their endorsement on a grant opportunity that is offered by the Allegheny chapter of the Sierra Club. Additionally, we planned to gain more support through the Sierra Club network by recruiting some of their members to help with different events and initiatives that we have planned, such as the planting day for the planned pollination garden.

Literature Review

History of Shamokin and the Anthracite Coal Region

Anthracite mining began in eastern Pennsylvania in the early 19th century, and peaked between 1910 to 1925 (Rahn 1992). After 1950, anthracite mining in this region of Pennsylvania was “characterized by dwindling output and declining employment”, and between 1950 and 1960 the amount of jobs provided by the coal industry were reduced to less than half of their initial numbers (Deasy & Griess 1965). By 1960, the once booming industry had become an insignificant source of employment in the area, and the area settled into an acute stage of economic depression (Deasy & Griess 1965). This economic decline caused a mass exodus from the area, causing a reduction in the size of the labor force, which subsequently led to lower tax bases and a deterioration in amenities, making the region a less desirable place to live and placing excessive tax loads on the remaining residents (Deasy & Griess 1965).

In Shamokin in particular, there was an above-average decline in the size of the labor force following its time as one of the most prominent coal towns (Deasy & Griess 1965). During the time that Shamokin was being mined, an estimated 1.6 billion tons of coal were mined from a 200 square kilometer area (Rahn 1992). This coal was mostly mined using deep mining methods, which created 700 million cubic meters of void space below the ground (Rahn 1992). These now-abandoned mines flood, and contain water that is highly acidic and has high concentrations of sulfate, irons, and other dissolved solids, which then seep into groundwater and surface streams (Rahn 1992). This has resulted in severe stream pollution, with 98% of the mine drainage sites in the Shamokin-Mt. Carmel area having acidic streams (Rahn 1992). The damage done by the coal industry has resulted in the Shamokin region having “some of the most polluted and visually disgusting streams in America” (Rahn 1992).

Acid Mine Drainage

Acid mine drainage (AMD) is caused by the oxidation of sulphide minerals such as pyrite that are found in the ground bed of mines (Mackay & Stuhl 2013, Simate & Ndlovu 2014, Johnson & Hallberg 2005). The weathering process occurs naturally, but is accelerated by mining activities, particularly in closed and abandoned mines (Simate & Ndlovu 2014). AMD contaminates groundwater, surface water, and sediments sulfates and heavy metals such as iron, aluminium, manganese, and zinc, and also causes decreased pH in water sources (Simate & Ndlovu 2014, Mackay and Stuhl 2013, Rahn 1992). In coal regions, the pH levels of water sources such as streams near mine-drainage sites have decreased dramatically, becoming highly acidic (Rahn 1992). In general, these effects tend to be somewhat neutralized further downstream due to dilution from other contributing tributaries and reactions with river sediment, but water close to the mine sites are highly acidic and have high concentrations of sulfate and other dissolved ferrous metals (Naidu et al 2007). Thus, remediation at the point of drainage remains a high priority. In 2010, more than 600 kilometers of eastern United States streams were polluted due to AMD produced by coal mining sites (Naidu et al 2007). The estimated cost of remediation at abandoned mines across North America is estimated to be approximately \$10 billion (Naidu et al 2007).

Acid mine drainage has severe impacts on the health of an ecosystem and the environment. The heavy metals produced can persist in the ecosystem for a long period of time. These metals can accumulate in successive levels of the food chain through bioaccumulation, and can cause acute and chronic diseases in organisms in that food chain (Simate & Ndlovu 2014). Heavy metals can build up in vital glands and organs and disrupt their function, and inhibit absorption of vital nutritional minerals (Simate & Ndlovu 2014). Fish that acquire heavy metals from the water and from the food chain can experience severe oxidative stress, and chronic exposure can result in death, reduced growth, reduced reproduction, morphological deformities, and lesions (Simate & Ndlovu 2014). Heavy metals contaminating soils can detrimentally affect plant growth, function, and morphology, and altered pH affects what nutrients are available, further inhibiting their growth. (Simate & Ndlovu 2014). Filter feeding macroinvertebrates are hindered by the precipitate that forms as a result of AMD and are thus unable to feed, which results in the decline of their populations (Simate & Ndlovu 2014). Altered pH in water also severely impacts the physiological functions of aquatic animals and can even lead to death (Simate & Ndlovu 2014). The condition of aquatic ecosystems deteriorates as the pH of the water gets further from the normal range of about 6-8 (Simate & Ndlovu 2014). Once pH falls below 4.5, practically no fish remain, and only algae and very acid tolerant species remain (Simate & Ndlovu 2014).

There hasn't been a lot of research done on how acid mine drainage may impact human health, but it is clear that many of the pollutants of AMD are dangerous to humans. Dissolved heavy metals can lead to long term toxicity, and these metals disrupt metabolic functions, organ function, and nutrient absorption (Simate & Ndlovu 2014). There is also the concern that some

of the chemical compounds found in AMD have mutagenic potential, and thus would be of carcinogenic concern to humans (Steyn et al 2019).

Acid Mine Drainage Treatment and Remediation

The remediation of acid mine drainage sites has been growing into a large and profitable business model in recent years (Steyn et al 2019, Simate & Ndlovu 2014, Naidu et al 2007). The cost of remediating all AMD-affected streams in the United States is estimated at approximately \$10 billion dollars (Naidu et al 2007). When treating these sites, there is the opportunity to reclaim resources and industrially useful materials such as metals, saleable products, alkalis, building and construction materials, agricultural products such as fertilizers, adsorbents, and pigments (Simate & Ndlovu 2014). Recovering these materials from AMD sites could partially or fully offset the cost of both initial and ongoing treatment and operating costs (Naidu et al 2007, Simate & Ndlovu 2014, Steyn et al 2019).

There are many different treatment options for acid mine drainage. These are largely divided into two categories: active and passive. Active methods require the use of neutralizing chemicals and agents to ensure that the stream meets the minimum standard (Naidu et al 2007). Active methods of treatment include precipitation, sulfate reduction through microbial mediation, flocculation, filtration, crystallization, or chemical neutralization with caustic soda, lime, magnesium oxide, or hydroxides (Naidu et al 2008). Active methods are normally more expensive than passive methods due to their required oversight and maintenance (Naidu et al 2008, Simate & Ndlovu 2014). Passive methods tend to require at most periodic maintenance, and include methods such as aerobic wetlands, compost reactors, compost wetlands anoxic and open limestone channels, bioreactors, and permeable reactive barriers (Naidu et al 2008, Simate & Ndlovu 2014). Passive methods of remediation tend to be most effective and economically sensible for sites that have low acid loads and experience minimal fluctuations in water flow (Naidu et al 2007). Ecological health is sometimes more difficult to restore in AMD-impacted streams, and returning a site to neutral pH and net-alkaline conditions is not always sufficient in promoting biological recovery (Steyn et al 2019).

Pollination Gardens

The declining populations of bees and other pollinators have been a growing concern as they are essential to many of our crops we rely on for food and survival. Loss of floral resources, associated with agricultural intensification and habitat loss, is one of the major drivers of pollinator decline. Protecting natural areas and restoring agricultural lands are important strategies for pollinator conservation, but urban landscapes, which offer a variety of forage and nesting sites, can also be refuges for bees (Mach, Potter, 2018). Aside from just trees, flowers are also a large contributor to attracting pollinators and can be implemented into the tree planting day. A study was conducted in order to determine which types of plants were the most effective and the results showed *Calamintha nepeta* attracted the most insects, with an average yearly sum

of 112 insects/m², most of them being honey bees. *Helenium autumnale*, *Echium vulgare*, *Geranium rozanne*, *Verbena bonariensis* and *Solidago canadensis* were the most attractive plants for honeybees, bumblebees, solitary bees, Lepidoptera and hoverflies, respectively (Rollings, Goulson 2019). With this being said, the trees that are most likely to survive in Pennsylvania and this specific environment consist of “mesophytic” trees or trees growing in an environment that receives a moderate amount of moisture. The most dominant trees in this type of environment are sugar maple, yellow buckeye, American beech, tulip tree, white oak, northern/red oak, and American basswood (Fergus, 2002).

Proposed Methods

Within our work we composed a set lists of goals for our group to reach throughout the semester with our community partners towards the restoration of Shamokin Creek along with Shamokin as a whole. In order to identify and achieve these goals we first conducted regular meetings with all of our community partners along with going on a tour of the community to identify where our needs were most wanted. Once identifying these needs we continued to work towards making further relationships in efforts to gain more funds/grants, along with organizing specific events to work towards restoration of the Shamokin area and raising awareness

Organizing and hosting a tree planting day in Shamokin:

Normally there is an annual tree planting day hosted by SCRA and FAR with the local Shamokin Area Schools, but with the arrival of the pandemic and new restrictions on in-person gatherings, this is likely not going to be possible. Therefore, a new planting day will be organized by recruiting Shamokin Area community members, local Sierra Club chapter members, and students from Bucknell University. The event will be held on a May 1st. The planting of these trees and other plants will help contribute to a certified pollination garden into the Shamokin Area community, which will emphasize the importance of the community coming together to make Shamokin a greener place. In order to determine which plants are best for the pollination garden we are having Paula and Susanne who are experts on pollination gardens come out to the garden to test multiple factors in order to determine which plants will best suit the pollination garden according to its location and environment. They also will then provide us with a specific design for the rest of the garden. A pamphlet will be handed out to those who come to participate in the planting day which will inform them how the garden will benefit the area, along with providing more information on Shamokin Creek and its restoration to educate local people, raise awareness on the issues that the environment is facing, and gainr more support from community members.

Organizing a tour of Shamokin:

The tour was modeled off of the SCRA's tour with the EPA. The stops were hand picked in order to best educate the Bucknell students on not only the environmental issues affecting the area but also the social and economic issues present in Shamokin. After consulting Steve Motyka of the SCRA the first three sites were selected so we could see three important phases of the effect AMD has on the creek. The first stop was the former site of the coal excavation that has now been turned into a public park. The second site was the raw unfiltered AMD coming out of the ground. The final tour stop was the current passive AMD remediation site. At each of the three sites we planned to have Steve and other SCRA members talk about the site and the importance of it. This followed the general itinerary as the tour the SCRA gave the EPA which granted them the original seed money to install a second remediation site.

At the conclusion of the AMD remediation tour we planned with friar mike to take a driving tour of Shamokin. The route of this tour was completely decided by Friar Mike. Before the tour all group members were required to read a survey of the people of shamokin that was created by FAR and the EPA. This survey discussed what the citizens of Shamokin viewed to be the city's biggest challenges are, what their strengths are and how willing they are to help to improve different aspects of the city. After reading this group members all met with the community partners to discuss this document. The key points we highlighted in the meeting Friar Mike made a point to highlight in his driving tour. At the end of the tour we planned to meet at a local coffee shop to discuss both the AMD tour and the driving tour of Shamokin.

Organizing a meeting with EPA/PADEP:

We are working to arrange a meeting with representatives from the Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (DEP). This meeting will further strengthen relationships between Faith Alliance for Revitalization (FAR), Shamokin Creek Restoration Alliance (SCRA), Bucknell University, the DEP, and the EPA. This interorganizational support and cooperation will be essential to the project going forward. The meeting will also be a good opportunity for participating students to learn more about the fields of environmental protection and environmental justice, as well as a valuable networking event. After much discussion, it was decided that the attendance of this meeting would be limited to community partners and members of the student group in order to create an environment that had ample opportunities for discussion between participants, rather than being a one-sided panel. The meeting was scheduled for April 27, 2021. Prior to the meeting, participants brainstormed a list of questions and topics that they were interested in discussing. Those questions are as follows:

- What initially sparked the representatives' interest in environmental policy and justice?
- What is one issue that the representatives are very passionate about?
- How did the representatives first get involved in working with Shamokin?
- What are some day to day struggles that they face with new policy implementation?
- How does a changing administration affect what these organizations are able to do?

- How do budgets change with administrations?
- What are some differences between working for the government versus working in the private sector? Is one sector more efficient than the other in implementing change?
- What do representatives do that really makes a difference in people's lives?
- How do state and federal government organizations complement each other? Are there any tensions between the different levels?
- How do representatives engage with communities? How does this differ on a federal versus state level?
- How do government shutdowns affect the work that is able to be done by environmental agencies?

Working to get more grants and funding:

We are continuously working on securing additional funding for SCRA. Following our tour with SCRA of Shamokin Creek, we quickly came to understand the importance of additional funding for capital intensive projects such as stream restoration. Hence, we looked to partner with other organizations while simultaneously applying for additional grants. We set a goal of applying for 5 grants in hopes of being successful in being awarded two.

Proposed Timeline

The timeline for the Shamokin Creek Restoration project constantly changed as components were added and reassessed. As elaborated upon in the origins of the project, the student group from Bucknell University joined an active project. Hence, there was an immediate need for the students to be immersed into the thick of the project details. As of March 2, 2021, SCRA was undergoing the approval process for Brinkash and Classer's stream restoration designs. Similarly, Williams Gas Company (WGCo) and the Department of Environmental Protection (DEP) are in favor of moving forward with the design proposal. FAR, SCRA, and the Bucknell student group have been working to create an event timeline regarding upcoming events. The planned events are as follows:

- March 16th: Tour of Shamokin/Shamokin Creek Watershed with FAR & SCRA
- March 17th: Meeting with Sierra Club Otzinschson Chapter (Lewisburg)
- March 23rd: Countywide Action Plan Kickoff Meeting (Northumberland County)
- April 6th: Environmental Justice Symposium through the EPA
- April 12th: Bucknell Student Group meeting with FAR in Shamokin, PA.
- April 14th: Meeting with Sierra Club Otzinschson Chapter (Lewisburg)
- April 27th: Meeting with representatives from Environmental Protection Agency and Pennsylvania Department of Environmental Protection
- May 1st: Tree planting day with FAR, SCRA, and Shamokin community members

- May 3rd: Presentation of Shamokin Creek Restoration project at FAR community meeting
- May 6th: Final presentation of Shamokin Creek Restoration project

The project timeline after May of 2021 offers lots of uncertainty. Currently, there is no definitive end goal for the project. While Brinkash and Classer restoration of Shamokin Creek is the primary focus of this project, there are many more small tributaries in the Shamokin Creek Watershed that will need assessment and potential restoration in the future. This project will not end just with the restoration of Shamokin Creek. Hence, there is a stressed importance on securing a steady stream of grant funding and making connections and partnerships with local environmental organizations.

Results

Organizing and hosting a tree planting day in Shamokin:

We continually worked with multiple members within the community which are all willing to help and be part of the pollination garden. On April 6 two experts on pollination gardens named Paula and Susanne came to the site in order to observe the existing garden, test the soils, and then make a design for us to follow for the rest of the garden. This information was then used and put into place on May 1st which was the official planting date for the garden. On this day there was a great turnout of people being 18 individuals in attendance. To kick off the planting day we first spread mulch all throughout the garden and made pathways with fine stones for visitors to be able to enjoy/observe the garden. Once this was completed, the master gardeners Paula and Susanne laid out where each plant should be planted. In all, there were 12 Rudbeckia, 7 Salvia, and 5 Sedum plants planted. All of these plants are highly attractive and easy to access for a large variety of pollinators. There were also 11 small shrubs planted which were mainly for decorative purposes. A handout explaining the benefits of the pollination garden was also provided to those who attended.

Organizing a tour of Shamokin:

The tour was a great way to put in perspective what is actually happening in the city of Shamokin. The group was joined by Shaunna Barnhart of the Bucknell Coal Region Field Station, Friar Mike and Friar Rich of FAR and Steve Motyka, John Bucanelli, Micheal Handerhan, and Jim Koharski of the SCRA. The first stop was the Veterans memorial park to see the former site of the coal plant. The park comprises a creek, the pollinator garden that also doubles as a riparian buffer, a baseball field and hiking trails. This site was a great example of what can be done when a community reclaims the contaminated land. The second site was the untreated AMD flowing out from the ground. This site was then followed by the AMD treatment

system that the new system will hopefully be modeled on. At each site the SCRA members discussed the importance of each site and the environmental impacts of the site.

During the driving tour of Shamokin, Friar Mike discussed the historic landmarks in the city of Shamokin and the blight that the area now faces. The city of Shamokin was once in consideration to be named the capital of Pennsylvania, with a population of 42,000 people during its peak. The City was once a major tourist attraction, drawing Bucknell students and other residents of central Pennsylvania alike. The city houses many cultural and religious landmarks, such as the first church in the world with electricity. The tour drove through many neighborhoods where half the houses were marked with big red “X’s” to inform firefighters that in the event of a fire let it burn to the ground and don't try to fight the flames. The final stop of the tour was at Shamokin’s newest coffee shop, Bamse Roasters. The coffee shop is in an old church that the owners converted into a coffee shop and museum.

Organizing a meeting with EPA/PADEP:

The meeting took place on April 27, 2021, and was attended by all student members of the group as well as community partners Friar Rich, Friar Mike, and Shaunna Barnhart. It lasted an hour and a half and covered all of the previously brainstormed topics. The representatives that spoke were Danny Gogal and John Brakeall.

Danny Gogal is an Environmental Protection Specialist in the Office of Environmental Justice (OEJ) at the Environmental Protection Agency (EPA), where he has served since June 1992. He has a public policy, environmental policy, and public administration background. He serves on OEJ’s Community Support and Engagement Team. He is also the Tribal and Indigenous Peoples Program Manager, and has been working on tribal and indigenous peoples environmental and public health issues and policy for over 33 years, starting with his internship at the EPA in 1987. He also serves as EPA’s staff lead for international human rights agreements and has worked in various other capacities for the agency’s environmental justice program over the past 29 years.

John Brakeall is the Regional Coordinator for the Pennsylvania Department of Environmental Protection’s (PADEP) Office of Environmental Justice (OEJ). He works with disadvantaged communities with the goal of minimizing environmental impacts, empowering communities, and fostering economic opportunities. Prior to joining PADEP, he worked with the Peace Corps on environmental restoration projects in Mexico, and worked for a private environmental consulting firm carrying out environmental work in the state of Pennsylvania and other neighboring states.

Working to get more grants and funding:

We were successful in partnering with the Oztzinschson chapter of the Sierra Club. In doing so, they agreed to partner on the submission of the Huplits Wildlife Grant which is sponsored by the Allegheny Group of the Sierra Club. However, we were unsuccessful in our submission of the grant. Similarly, we were unsuccessful in the application of a grant sponsored

by the National Environmental Education Foundation focused on outdoor recreation and education. While in the application process, the grant was awarded to a competitor. Similarly, we encountered many issues while in the application process for a Small Watersheds grant within the Chesapeake Bay Watershed sponsored by the National Fish and Wildlife Foundation. Hence, we were not able to submit the grant application prior to the deadline. However, we were successfully awarded \$3,000 from the Pennsylvania Department of Environmental Protection for the 6th year in a row. The funds were awarded for the Environmental Impacts and Solution Field Day. The \$3,000 was allocated to funding the pollinator garden project. We are also looking to receive an additional \$500 from Bucknell's office of the Provost for a solar powered bird baths, water feature, and log structures necessary for the completion of Penn State Universities pollinator garden certification. All other requirements have been met.

Discussion and Analysis

Organizing and hosting a tree planting day in Shamokin:

The organization of the pollination garden and the planting day itself proved to be very simple and successful due to the help from multiple community members and other partners. We were able to have the optimum design and plants needed thanks to the master gardeners willing to work with us. The landscaping of mulch/stone within the garden to construct walkways along with the planting itself proved to run very smoothly and quickly due to the abundance of help and hard work from everyone in attendance. Everyone involved was extremely pleased with the accomplishments of the day and the progress towards having a certified pollination garden within their community. With this being said, there are still a few items left including bird baths, logs, and a water feature in order to finally be certified.

Organizing a tour of Shamokin:

The tour of Shamokin put the whole project in perspective. The tour started at the pollination garden, which has quickly become the main focus of the project. The pollination garden is located next to the contaminated creek. The location of the garden allows for it to double as a riparian buffer. The tour highlighted the sheer amount of work that needs to be done in both Shamokin and the surrounding towns. In Kulpmont at the top of the mountain the AMD comes pouring out of the mountain. This orange river water is so common in the area that one SCRA member stated that it wasn't until he went to college that he learned that orange rivers were not normal. Of the streams in Shamokin there are 63 springs that are contaminated and only four that are being treated. In order to treat all 63 springs, the SCRA would need millions of dollars that it does not have. The sheer scale of the pollution became abundantly clear as the tour progressed. Even the passive treatment plants were in desperate need of refurbishment making the tasks facing the SCRA unfathomable. The driving tour of Shamokin also highlighted some of the major social issues facing the town. All across the city were posters for the "fight the blight" campaign which was a 5k race that was run in order to raise funds for community aid.

Organizing a meeting with EPA/DEP:

The meeting with the EPA and DEP representatives, Danny Gogal and John Brakeall, lasted 90 minutes and was attended by both students and community partners. During this meeting, students were able to ask the questions that had been compiled prior to the meeting, as well as follow up with the representatives on their responses. Keeping the group small allowed for a dynamic conversation between the different parties. In the future, it could be beneficial to continue arranging meetings and panels such as this between Bucknell University students and representatives from organizations working with environmental justice, such as the EPA and DEP. Students are able to learn firsthand about the different experiences and paths that have led representatives to their careers. This experience provides valuable insight on what sorts of careers are available in environmental justice and environmental policy, as well as serving as a networking opportunity. Continuing this paneled discussion would not only be beneficial for students, but also serve to strengthen relationships between the EPA, DEP, FAR, SCRA, and Bucknell University for further partnerships.

Working to get more grants and funding:

As stated above, we had set the goal of applying for 5 grants and being successful in being awarded 2. Unfortunately, we were unsuccessful in accomplishing this goal. No members of our group had any experience in applying for grants. However, as the scope of our project was very fluid, we felt this could be a good opportunity for further the reach SCRA has on the community. Unfortunately, we were unsuccessful in reaching our goals. We predominantly focused on 2 grants through the National Environmental Education Foundation (NEEF) and National Fish and Wildlife Foundation (NFWF), neither of which we received funding from. The grant application process is where we encountered the most difficulty. Applications are much more comprehensive than we believed. Similarly, as student representatives of the group, we are often speaking on behalf of the group in grant language but may not have had the necessary documentation of future plans of the organization. The experience of working to identify organizations to partner with, identifying funding opportunities, and applying for grants was very insightful as to both the importance of funding but also how tedious and competitive some grants can be.

Recommendations and Next Steps

The Shamokin Creek Restoration Alliance (SCRA) and Faith Alliance Restoration (FAR) groups continue to need more funding in order to support the various projects they are conducting in Shamokin. In order to receive this funding, they will need support from grants. Going forwards, a suitable ENST411 project may be to have a group that is entirely focused on grant writing for the organizations. Many organizations, on both the state and national level offer grant funding for projects similar to those SCRA has worked on. However, there is much more than an application that goes into being selected for a grant. Oftentimes, you need to have

partnerships with other organizations which require identification and outreach. Forming partnerships and relationships with other organizations/groups makes the application more favorable. Hence, a future ENST411 group could work to identify other local organizations to work alongside. Regarding many applications themselves, they are incredibly comprehensive including project proposals, compliance measures, budget plans, feasibility summaries and many other sections. Hence, working more closely with SCRA instead of through both FAR and SCRA could be beneficial. If one ENST411 group worked exclusively on the application of grants, I believe they would be more successful. As a benefit to the students, this project would give experience in the realm of grant writing and funding. If students or community partners want more breadth in the project, another component that would be beneficial would be to continue reaching out to other potential partners, especially other groups that have been focusing on stream restoration efforts in Pennsylvania. We have identified Trout Unlimited as a potential partner for SCRA. They offer conservation funding and habitat restoration funds. Similarly, they have funded work in the region before. Hence, they could be a good partner for a future ENST411 project.

Additionally, we recommend continued partnerships in some capacity between SCRA, FAR, and Bucknell University. This project has shown that these partnerships have been beneficial to all parties, and these groups all have more to offer each other in the future. Continuing these partnerships helps to form positive relationships between the community and the university. It may be worthwhile to extend these relationships beyond just ENST411 capstone classes, and have these groups work in collaboration with other classes and departments. Examples of possible courses include additional environmental studies classes, as well as biology classes that focus on stream health and ecology, geology classes that focus on the anthracite coal region of Pennsylvania, chemistry or chemical engineering classes focused on water quality treatment, and other engineering classes that are teaching concepts that are related to the methods of stream restoration.

We also will be working towards gaining the final three components for the pollination garden so it can finally officially be the town's first certified pollination garden. The final three components are two bird baths, logs, and a water feature. We will be calling around to local businesses and posting on local donation sites in order to attain these final components.

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Appendix



Figure 1: One of the locations on our tour with SCRA. This site is one of numerous locations where water has been directed out of the coal mines. This is one of many sources contributing to Shamokin Creek's acid mine drainage issue. No active or passive treatment is currently taking place at this site.



Figure 2: Figure 2 depicts Shamokin Creek in the middle of downtown Shamokin. As depicted, Shamokin Creek is severely affected by acid mine drainage. Similarly, this photo served as a larger representation of Shamokin itself; The wealth that came and left with the coal industry, and the environmental, economic, and social damage it left behind.



Figure 3: Veterans Memorial Park, located in Kulpmont, Pa. This is the location of the pollinator garden and watershed restoration project.



Figure 4: Pollinator garden being constructed.



Figure 5: Penn State master garden demonstrating proper planting techniques.



Figure 6: Students Ben Clark and Geo Barzona plant pollinator plants in the garden at the pollinator planting event.