

Senior Project

Elizabeth Trevathan

During my senior project capstone, some of the work was virtual. This packet includes the articles I wrote, contact sheets of images I took at events, and graphics that I designed. Each piece underwent multiple drafts of edits, where I incorporated feedback from my mentor to create pieces that could be published now in local papers or used in the future by the organization I worked with and their partners.

Afton Planning Committee Groundwater Meeting

Attended on Monday, May 2, 2022

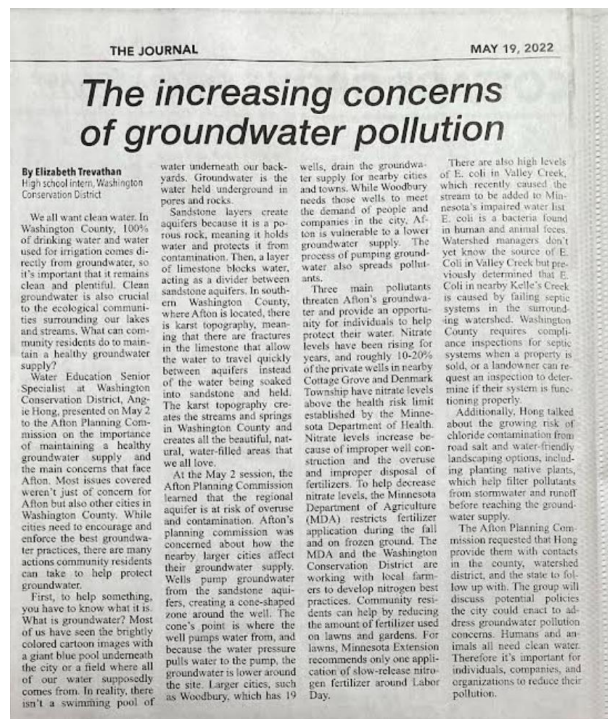
Published in [The Cottage Grove Journal](#)

We all want clean water. In Washington County, 100% of drinking water and water used for irrigation come directly from groundwater, so it's important that it remains clean and plentiful. Clean groundwater is also crucial to the ecological communities surrounding our lakes and streams. What can community residents do to maintain a healthy groundwater supply?

Water Education Senior Specialist at Washington Conservation District, Angie Hong, presented on May 2 to the Afton Planning Commission on the importance of maintaining a healthy groundwater supply and the main concerns that face Afton. Most issues covered weren't just of concern for Afton but also other cities in Washington County. While cities need to encourage and enforce the best groundwater practices, there are many actions community residents can take to help protect groundwater.

First, to help something, you have to know what it is. What is groundwater? Most of us have seen the brightly colored cartoon images with a giant blue pool underneath the city or a field where all of our water supposedly comes from. In reality, there isn't a swimming pool of water underneath our backyards. Groundwater is the water held underground in pores and rocks. Sandstone layers create aquifers because it is a porous rock, meaning it holds water and protects it from contamination. Then, a layer of limestone blocks water, acting as a divider between sandstone aquifers. In southern Washington County, where Afton is located, there is karst topography, meaning that there are fractures in the limestone that allow the water to travel quickly between aquifers instead of the water being soaked into sandstone and held. The karst topography creates the streams and springs in Washington County and creates all the beautiful, natural, water-filled areas that we all love.

At the May 2 session, the Afton Planning Commission learned that the regional aquifer is at risk of overuse and contamination. Afton's planning commission was concerned about how the



nearby larger cities affect their groundwater supply. Wells pump groundwater from the sandstone aquifers, creating a cone-shaped zone around the well. The cone's point is where the well pumps water from, and because the water pressure pulls water to the pump, the groundwater is lower around the site. Larger cities, such as Woodbury, which has 19 wells, drain the groundwater supply for nearby cities and towns. While Woodbury needs those wells to meet the demand of people and companies in the city, Afton is vulnerable to a lower groundwater supply. The process of pumping groundwater also spreads pollutants.

Three main pollutants threaten Afton's groundwater and provide an opportunity for individuals to help protect their water. Nitrate levels have been rising for years, and roughly 10-20% of the private wells in nearby Cottage Grove and Denmark Township have nitrate levels above the health risk limit established by the Minnesota Department of Health. Nitrate levels increase because of improper well construction and the overuse and improper disposal of fertilizers. To help decrease nitrate levels, the Minnesota Department of Agriculture (MDA) restricts fertilizer application during the fall and on frozen ground. The MDA and the Washington Conservation District are working with local farmers to develop nitrogen best practices. Community residents can help by reducing the amount of fertilizer used on lawns and gardens. For lawns, Minnesota Extension recommends only one application of slow-release nitrogen fertilizer around Labor Day.

There are also high levels of E. coli in Valley Creek, which recently caused the stream to be added to Minnesota's impaired water list. E. coli is a bacteria found in human and animal feces. Watershed managers don't yet know the source of E. Coli in Valley Creek but previously determined that E. Coli in nearby Kelle's Creek is caused by failing septic systems in the surrounding watershed. Washington County requires compliance inspections for septic systems when a property is sold, or a landowner can request an inspection to determine if their system is functioning properly.

Additionally, Hong talked about the growing risk of chloride contamination from road salt and water-friendly landscaping options, including planting native plants, which help filter pollutants from stormwater and runoff before reaching the groundwater supply.

The Afton Planning Commission requested that Hong provide them with contacts in the county, watershed district, and the state to follow up with. The group will discuss potential policies the city could enact to address groundwater pollution concerns. Humans and animals all need clean water. Therefore it's important for individuals, companies, and organizations to reduce their pollution.

The Munch Bunch Goat Workshop

Attended on Tuesday, May 3, 2022

Published in [The Country Messenger](#) (Marine on St. Croix, Scandia, May Township)

From two goats to 200 and a welcoming sense of humor, husband and wife Dan and Allyse created The Munch Bunch to tackle invasive species. The Munch Bunch is a goat service company specializing in removing invasive species by allowing the goats to munch on the plants. "We're from, I wish we were from Marine on St. Croix, that would be lovely, anyone selling? No, we're from St. Croix Falls. We actually moved to St. Croix Falls to start the goat farm. Within a 48-hour period, we bought two goats, a trailer, a truck, and a farm. We were going to town. The two goats, we turned into over 200, not by themselves though, we worked on that with them," owner Allyse said.

The Munch Bunch and the Washington Conservation District held a joint workshop on May 3 at Big Marine Park Reserve. Fifty percent of The Munch Bunch's work is on residential property, and fifty percent is on public lands.

Primarily, they work for smaller cities, and projects are predominantly Buckthorn focus, with some Garlic Mustard projects. The workshop was part marketing for The Munch Bunch, education about goats and invasive species, and a chance to gawk at goats.

Buckthorn and Garlic Mustard are two invasive species common in Minnesota that the goats can help with. Buckthorn first brought to North America from Europe as hedging material, can form dense underbrush. It crowds out native plants, specifically native shrubs and trees. Buckthorn can be found in a few different forms, either as narrow and tall trees or more fern-like plants with narrow leaves. Garlic Mustard is originally from Europe and Asia and was initially brought to North America for herbal qualities and erosion control. Its leaves have a garlic smell

The screenshot shows a news article from 'The Country Messenger' with the title 'The Munch Bunch works to combat invasive species'. The article includes a photo of a group of goats in a field. The text of the article is as follows:

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Dan MacSwain, the Natural Resource Coordinator for the Washington County parks, was at the workshop and talked about how goats are used at Cottage Grove Ravine Regional Park and Lake Elmo Park to remove Buckthorn and Garlic Mustard. He said, "Garlic Mustard is one of the species we've had a lot of success with when it comes to Garlic Mustard grazing. We have used it upwards of I think we're in year four. Most cities take over four or five to four weeks, and in that timeframe, when you remove the

The screenshot also shows the website's navigation menu, a search bar, and a 'Submit Your News' section.

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While the goal is to remove the invasive species, the talk of the night was, of course, the goats, which are most successful at removing Buckthorn when the plants are two inches to five feet tall. Sprouts that are smaller than two inches, goats won't touch. Goats can tackle taller trees in the winter, where the goats will eat the bark and slowly kill the trees. Buckthorn dies



through munching by the goats eating its leaves, which pulls the root energy up. While one grazing usually isn't enough to remove a Buckthorn population, twice a year munching for two to three years will cause the plants to die during the winter months since the plants waste so much energy regrowing leaves. Goats, however, do eat everything in sight, and they aren't very selective when it comes to what plants they do and do not eat. Allysse said, "You have to think about the goats as an antibiotic. You have to take the antibiotic to get better, and it might kill some of the good stuff inside of you. But once that bad stuff is gone, that good stuff is going to come again."

One fact about goats surprised the entire audience. Allysse asked the group, "What is the predator that I am most afraid of?" People yelled out their guesses: dogs, coyotes, mountain

lions, teenage boys. The answer? Owls. Allysse said, "I am terrified of owls. They won't pick up a big one but will they will go for babies for sure."

As the group moved toward the goats, everyone was fascinated by the goats themselves. They're cute. The audience began taking pictures of the goats frolicking through the small wooded area in the park. Goats are the selling point of the workshop, but the groundbreaking information came with new technology. Allysse pulled out her phone and showed us a map of where the goats were confined to. Usually, an electric fence is needed for the goats to remain in a specific location. The shock tells the goats where exactly the boundary is. Fencing is the bulk of the required labor before goats can be used in an area. The Munch Bunch recently received a Sustainable Agriculture Research and Education (SARE) grant to study the effectiveness of virtual fencing. The goats wear a collar, similar to a dog collar used for an electric fence. The collar has small solar panels that keep the collar working for two to three months. The collar makes a noise to inform the goats where the boundary is, and they receive a shock if they reach outside of the GPS designated area. The Munch Bunch averages 0.4-2 shocks a day and said it takes about 48 hours for the goats to become accustomed to the system. One of the best parts of virtual fencing, as Allysse explained, is that there is constant GPS tracking of the goats, so if they do escape the virtual area, they can be tracked down. It'll also alert if a goat isn't moving or isn't moving as much as the other goats, allowing The Munch Bunch to determine if a goat is sick quickly.

Goats can be a handy tool for removing invasive species, but they also attract a crowd in a public park. If you are interested in using goats on your property, visit HireGoats.com to determine what company will service your area.



Woodbury City Hall and Public Safety Sustainability Tour



Attended on Wednesday, May 11, 2022

Woodbury City Hall Sustainability Projects

With three previous remodels and two upcoming projects, Woodbury City Hall and the city's other facilities continue to become more sustainable. Green roofs, geothermal heating and cooling, rain gardens, and native plants all serve in Woodbury's sustainability efforts. These efforts are led by the Senior Environmental Resources Coordinator Jen McLaughlin, Environmental Resources Coordinator Kristin Seaman, and Environmental Resources Technician Heidi Quinn.

Woodbury City Hall underwent an extensive remodel in 2007 that included adding a green roof. Usually, when rainwater hits the top of a building, it quickly falls to the ground. The goal of the green roof is to recreate the slow runoff process that the rainwater undergoes on the ground. Large panels lay on the roof with vibrant low-growing plants covering the large area. The panels hold a small amount of dirt, perfect for low-growing plants with small roots. The green roof is low maintenance, and the prescribed plants are drought tolerant, so no excess water is used. When the water hits the green roof, it's forced to slow down and run through the plants and soil, treating the stormwater and removing some pollutants before falling towards the ground. Like many sustainability projects at Woodbury City Hall, the green roof is a pilot project. Completing the project, seeing if it's successful, and living through the maintenance allows the city to provide valuable recommendations to home and business owners in Woodbury.

The Public Safety building also hosts a similarly designed green roof and solar panels that are a part of the city's effort to use community solar power. All Woodbury city buildings are a part of the community solar effort, including park buildings, the city's seven stormwater lift stations, 19 wells, and fire stations. While not all of the buildings have solar gardens, they all subscribe to the use of nearby solar, supporting solar energy. Woodbury City Hall has also incorporated passive solar building design in remodels. Passive solar is when a building is designed to distribute solar heat and light in a way that benefits the building's temperature control and use of electric lighting.

Behind City Hall is around 15 acres of wetland connected to Tamarack Nature Preserve. Currently, the area is full of Ash trees and buckthorn, but there will be a renovation project beginning in the fall that will drastically change the view. A walkway connects City Hall to Public Safety through the wetland. While the path appears to be as narrow as a sidewalk, grass pavers on either side provide the structural support for the ground to hold vehicles when necessary, widening the trail's function.

City Hall's parking lot aims to treat rainwater before it makes its way to the wetland area. During the 2007 remodel, Woodbury added a rain garden and permeable pavers where the fleet vehicles park. Rainwater makes its way onto the pavers or into the rain garden and is filtered through the pavers or plants and soil before reaching the wetland. The filtration process removes possible pollutants before it reaches the natural area.

A stormwater pond is located between City Hall and Public Safety and was built before 2007. While it's not the most modern way of keeping water clean, it's there and therefore used. The purpose of the stormwater pond is to catch water before it reaches the wetland. With new and more modern policies and procedures, the goal should be to treat the water before it reaches the wetland, which the stormwater pond doesn't inherently do. There are plants around the stormwater pond that help remove pollutants, but City Hall has put efforts such as the rain garden in the parking lot to help treat the water before it reaches the stormwater pond. One thing that the pond does is remove sediment from stormwater. As water sits in the pond, sediment sinks to the bottom, separating from the actual water before making its way to the wetland. However, the pond fills with sediment and requires routine cleanouts.

City Hall, Public Safety, and the HealthEast Sports Center all use a geothermal heating and cooling system. A well is located underground at each location, and the earth's temperature, which remains about 55°F year-round, cools or warms water for heating and cooling the building.

City Hall is working with the organization Great River Greening to revamp the wetland. The outcome will be a drastically different landscape, turning the area into a healthier, more native wetland. As a part of the project, all buckthorn trees will be removed. In preparation for the project, a tree survey was conducted, in which they found that there are around 700 Ash trees that need to be removed because of Emerald Ash Borers, which are beetles that remove nutrients from the trees and kill them. The landscape will be left with a few large, healthy oak trees. The trail to Upper Afton Road will be rejuvenized, and a boardwalk will be added.

Currently, the city's fleet includes six plug-in electric vehicles, seven park maintenance vehicles, and four hybrid vehicles. There are no level 2 chargers at city hall, which causes the hybrid cars to switch to gas by the end of the day. Five level two dual chargers will be added so drivers can get more of a charge during lunch and eliminate hybrid vehicles switching to gas. They are adding more electric vehicles each year and have an order in for their first electric truck.

More sustainable aspects will be added to the parking lot at City Hall, including tree trenches. Four to five medians will be converted to tree trenches similar to rain gardens. They hold water allowing the tree to use it and preventing stormwater from entering storm drains. The surrounding plants and trees filter out pollutants before it will be directed to the wetland. Tree trenches also provide extra room for trees to grow and thrive that isn't usually available in parking lots. The tree trenches were first piloted at the nearby Whole Foods. City Hall uses information from that project to improve its installation, including using a slightly larger area for the tree trenches. The permeable pavers in the parking lot will also be replaced since they are at the end of their lifespan.

Stillwater Rain Garden Maintenance Workshop

Attended on Thursday, May 12, 2022

If you own a rain garden, volunteer to maintain one, or simply were interested in learning, all were welcomed, and invited to bring a shovel. At the corner of William Street N and Wilkins Street W, a group gathered on May 12, dressed in visibility vests and holding shovels to learn about maintaining rain gardens. It was a chance for fellow rain garden enthusiasts to share problems they've encountered, and the solutions that they have discovered. Everyone worked on two rain gardens at the intersection under the supervision of Senior Landscape Restoration Technician at Washington Conservation District, Brett Stoplestad, and volunteer and organizer of the event, Ruth Alliband.

As Stoplestad showed each rain garden to the group, he talked about the things that he noticed, with the knowledge that there was a big storm the night before. He pointed out where there were piles of sediment on the road, sidewalk, and in the sediment inlet captures. The location of the sediment shows how the water moves into and around the rain garden. As a storm occurs and rainwater flows into the rain garden, it picks up dirt, leaves, sand, and debris and leaves it in its path as the water soaks into the ground or moves into the garden. It's important to take note of how the water moves to know if the inlet sediment captures are working. Stoplestad also talked about how to dispose of the sediment. The sediment should be scooped up and disposed of at a compost facility. It's impossible to know exactly what the water picked up, so to avoid spreading pollutants, it's important to dispose of the sediment properly.

Professionals learn how to care for rain gardens through a degree. Most cities, counties, and organizations, don't have the efforts to send professionals to care for rain gardens on the monthly basis that is necessary for its continuous success. It becomes the responsibility of neighborhoods and volunteers around them to ensure that they are taken care of. Non-professionals learn how to care for rain gardens through experience, trial and error, and workshops. A lot of people shy away from caring for rain gardens because they haven't cared for one before. Alliband said, "I'm hoping what you take away is some empowerment."

Together, the group cleaned up two rain gardens, pulling invasive species and splitting plants to help evolve the garden.



SMART Irrigation Controllers: Graphics Created for Washington Conservation District & Nearby Cities



SMART Irrigation Controllers

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