



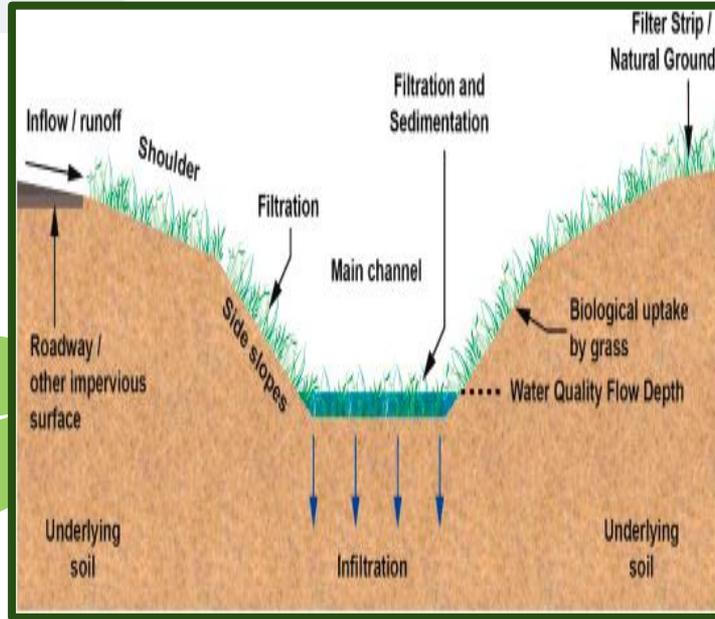
Sleeter Lake
Bioswale
Capstone Project

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What is a Bioswale?

A bioswale is a “ditch” or channel with sloped sides that collects stormwater runoff when it flows off of impervious surfaces. Once collected, polluted water will be filtered and soaked into the ground to re-enter the groundwater system.

These landscape projects are part of a movement called green infrastructure, which focuses on using natural remedies to help solve environmental issues, such as water pollution.



<https://www.sciencedirect.com/science/article/pii/S0301479720316819>

Rainwater flows off of impervious surfaces (pavement, roofs, etc.) and collects pollutants, particularly toxins from cars off of streets or parking lots. Without bioswales, polluted rainwater will enter the local watershed and will have to be filtered out of drinking water or can flow into bodies of water, including the ocean.

Along with filtering out pollutants, bioswales slow down erosion as they collect fast-moving water, preventing the degradation of soil and lake banks.

Sleeter Lake

The lake is a man-made body of water created in 1963 with the purpose of irrigating the 1,000-acre orchard that originally sat on that land. The area has since been developed by Oak Hill properties. The park was founded and preserved by the Town of Round Hill, Loudoun County, and the Round Hill HOA to provide easy access to the lake via open space, picnic tables, benches, grills, and a soft-launch boat ramp.



<https://www.roundhillva.org/sleeter-lake-park>

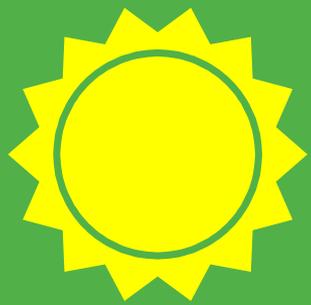
The Bioswale will help keep pollutants from the parking lot pavement out of the water as well as preventing sediment carried by stormwater to enter the lake. By keeping both of these negative components out of the lake, the biodiversity within and around the water can continue to thrive.

Leaders and Associates

We worked with Friends of the Blue Ridge Mountains and Sustainable Solutions to put together the bioswale at Sleeter Lake Park.

- Friends of the Blue Ridge is a dedicated group of locals that are working to preserve the beauty of the Blue Ridge area and maintain the ecotherapy that nature provides. They also worked with the Town of Round Hill to provide funding for our project.
- Sustainable Solutions was founded by James Remuzzi, our project leader, in order to implement environmentally conscious solutions to a growing array of ecological issues while also gaining economic benefit from a healthier environment.

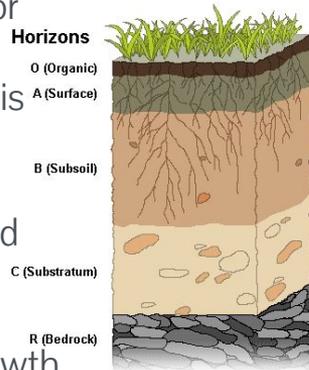




Our Bioswale: The Process to Create it

Experiments

One of the first things we did at the lake was taking samples of the soil that the bioswale sits on. We used a soil auger to identify the content of the dirt (sand, silt, or clay) and what horizon we would reach. We found that the soil is sandy, ideal for water absorption, and it reaches layer B. With this information, we could pick plants best suited for this environment, and we could decide to use biochar, a natural fertilizer, to promote growth.



Another test we ran included rolling a ball down a hill and through the parking lot to imitate the flow of rainwater at the park. This helped us decide where the best spot for water collection is, which is where we put the bioswale.



Results: Soil

Based on our soil observations, where we found that we were dealing with sandy and nutrition deficient soil, we decided to add biochar. Biochar is a soil enricher made by burning biomass in the absence of oxygen; the burning converts the organic materials into stable carbon (used by plants in photosynthesis). We were also able to identify what plants would grow best in sandy soil and would be able to withstand fluctuating water levels with high heats.

Purple Coneflower



<https://en.wikipedia.org/wiki/Echinacea>

Little Bluestem



<https://www.waltersgardens.com/variety.php?ID=SCHB1>

Meadow Blazing Star



https://en.wikipedia.org/wiki/Liatris_tigularis

Results : Site Location

With our rain imitation trials in mind, we found a site that will collect the optimal amount of runoff water from the surrounding area. We also calculated the size of the swale based on the amount of impervious surfaces around the site. We concluded that it will be 12 feet long, 2 ft. wide, and 1 ft. deep, effectively collecting 24 square feet of water.

Before-shot of site



Measuring the site



Outline of bioswale



Action: Excavation



Brought in an excavator because the ground was too rocky to dig by hand.



All of our biochar, topsoil, mulch, and tools.



Process shot: $\frac{2}{3}$ dug out.



Process shot: finished excavating.



All of the removed soil created a wall behind the swale to stop fast moving water from flowing out

Action: Covering Exposed Dirt and Filling Bioswale

We covered the exposed dirt that created a rain barrier with grass seed. The roots will hold the dirt in place and prevent erosion.



We covered the dirt and grass seed with biodegradable netting and stakes to prevent erosion and help the new grass grow.



We filled the swale with alternating layers of biochar and topsoil.



The layers provided nutrition for the plants and added filtration for the runoff water.



Process shot: finished filling the swale

Action: Planting and Mulching



We planned where each plant should be placed. Bluestem was up front to filter sediments. Taller, flowering plants were in the back. The flowers provide beautification and encourage pollinators to interact with the park.



Process shot: planting the plants.



Process shot: finished planting.



We added mulch to the bioswale to protect the new soil, add another layer of filtration, and protect the exposed edges.

Finished Bioswale



Reflection:



What initiated your decision to complete this project?

We all wanted a Capstone that was more hands with on and one that made a positive impact on the environment. When Mrs.Huntington proposed the Bioswale project, we all wanted to learn more about the project.

How did you work with your mentors to complete this project?

We got in contact with Mrs.Huntington so that she could give us the contract information for Mr.Remuzzi. Once in contact with Mr.Remuzzi, we were able to make a schedule on when we would be at the park. He was able to get any necessary equipment, like buying the plants, soil, and any tools we might need. Once on site, Mr.Remuzzi gave step by step instructions of everything we needed to do in order for us to complete the bioswale.

How did you grow/what did you learn from this experience?

We learned what makes a successful bioswale and how to build one. Nearly 9 billion dollars go into finding sustainable solutions that ensure we have clean water



The most important takeaway from this capstone project was the answers to conserving and restoring our environment is already within the nature and community around us. In our bioswale, we used plants and layers of dirt to create an aesthetic and effective water filtering system. Our community, including Town of Round Hill, Friends of the Blue Ridge, Sustainable Solutions, and Loudoun Valley High School came together to fund and implement the change the bioswale will bring to Sleeter Lake park.



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