CFAES SCHOOL OF ENVIRONMENT NATURAL RESOURCES

Slyh Run Soil Restoration

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Background

Why Are Degraded Soils a Problem?

- Urban soils are seeing significant overuse resulting in compaction, contamination with heavy metals, and soils that are depleted of essential nutrients.
- Soils near water sources are more likely to become degraded due to the variability of moisture present in the soil (Luo et al., 2).
- Restoring degraded soils that are compacted or contaminated is essential for biodiversity and ecosystem function (Ampooter et al., 1734).

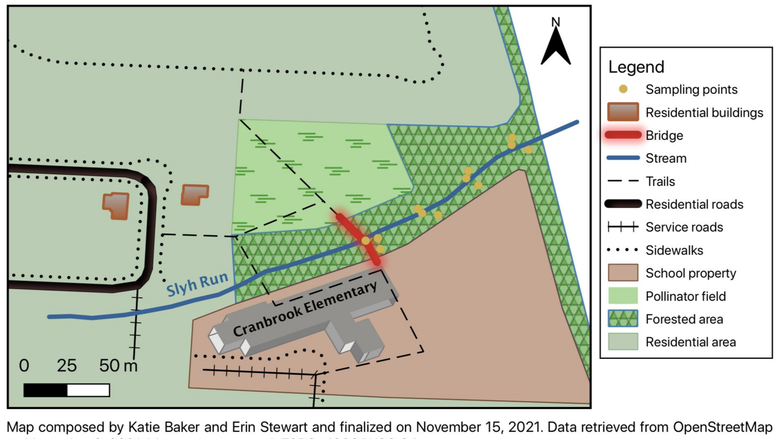
Site Description

- The field site consists of a stream that is accompanied by a trail, bridge, and railroad tracks.
- The stream has vegetation on both corresponding sides, this vegetation consists of woody plants along the stream and larger trees as you move toward the school/residential areas.
- The vegetative structure creates a very shady, low light understory that is a primary location for invasive species (primarily honeysuckle) which has created a lack of vegetation diversity.
- Previous removal of invasive species has left the understory closest to the bridge open but when moving downstream, toward the railroad tracks, the understory is overgrown and crowded.
- There was originally no written plan for the site and no distinct trail near the stream which creates potential for soil degradation.

Objectives

- Determine degree of soil degradation and soil contents.
- Utilize stakeholder, community, and restoration perspectives to restore and maintain this natural area.
- Create a management plan based on these perspectives that allows for soil stability and restoration.

Map of Cranbrook Elementary and Slyh Run with Sampling Points



Map composed by Katie Baker and Erin Stewart and finalized on November 15, 2021. Data retrieved from OpenStreetMap on November 9, 2021. Map projection used: ESPG: 4326/WSG 84.

Figure 1. GIS map of the site to display the physical features of the testing area. The yellow points refer to the sampling points and the blue line refers to the stream, Slyh Run. The area surrounding the stream, indicated by the green triangle pattern, is the forested area. The tan area refers to property owned by Cranbrook Elementary.

Methods

Sampling Methods at Site:

- While collecting soil samples, the equipment that was used included a core hammer, penetrometer, GPS, and a bulk sampling shovel.
- The core hammer was used to collect core samples which were then used to determine bulk density of the soil.
- The penetrometer gave us data to determine how compacted the soil was along the creek.
- The GPS was used at the site to determine exact coordinates of the location of where each soil sample and penetrometer reading was taken at the site.
- The bulk sampling shovel was used to collect bulk soil samples at depths of 0-10 centimeters and 10-20 centimeters at each location.
- Within the 120 meters of land, samples were taken every 40 meters. From the first location on-trail, the off-trail location was 4 meters away and the across the creek location was 10 meters from the location on-trail.

Figure 2. Slyh Run Floodplain area and soil sampling using a core hammer

Lab Testing Methods:

- In order to test for bulk density, the soil cores were dried in an oven. Once dried, soil weight and volume were measured. Using these measurements, soil bulk density was calculated by dividing the weight in grams by the volume in centimeters cubed.
- The samples were also tested for organic carbon content.
- Approximately the same amount of each soil from the different bulk samples were weighed out into separate trays. These trays were then heated in the oven, ultimately igniting the organic material present. The samples were then weighed following the drying process to determine the weight of the organic matter that had been burned off.
- pH testing was done by adding a one to one ratio of dried soil to distilled water to a test tube. A pH probe was then submerged in the solution to determine pH.

Results

- All but one penetrometer reading were under the USDA's standard value for root limiting soil compaction of 300 kg/ cm^2. The 10-20 cm reading at the off trail site was found to be 310 kg/cm^2.
- All of the pH readings were either neutral (9 out of 24 sites) of slightly alkaline (15 out of 24 sites).
- All of the average bulk densities were under the USDA's healthy soil range of 1.4 to 1.65 g/cm^3. Three of the individual readings were found to be within the range of healthy soils.
- Soil organic matter tests indicated that the majority of the soil samples at the site had medium to high organic matter content.

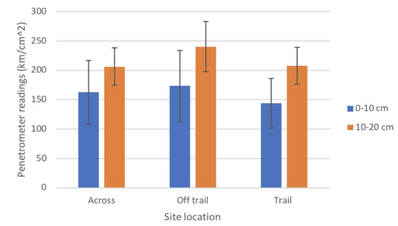


Figure 3: Average penetrometer readings for each sample site.

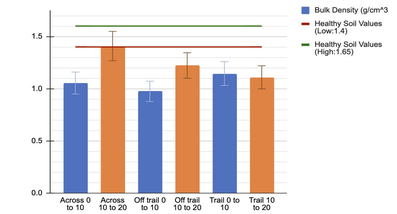


Figure 4: Average bulk densities of soils at each sample sites, along with healthy USDA ranges.

Recommendations

- After analyzing and reviewing the test results from the soil samples that were collected at Slyh Run it was determined that the soil was not compacted.
- As a recommendation, the Slyh Run area would benefit from small to medium size trees or shrubs. Though the ground is not compacted, the roots of the trees and shrubs will help any erosion the area may encounter in the future.
- Tree recommendations are silky dogwood trees. It is recommended to plant every 10 feet at the edge of the creek and continue with staggered rows 3-4 feet behind the initial row (N.C. Forest Service, 2015).
- The soil found at Slyh Run is between neutral and slightly alkaline and silky dogwoods can thrive in soil that is anywhere from acidic to alkaline (Blue Ridge Resource Conservation and Development).
- Adding mulch to Slyh Run would be beneficial to prevent soil compaction in the future. Mulch "alleviates soil compaction by absorbing pressure due to foot traffic" (Foley, 2016).

References

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