Phosphorus Retention Rates in Benchtop Grass Plantings

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Abstract

Vegetated buffer strips can be used to help reduce the amount of nutrient runoff from agriculture fields into a surface water body that receives runoff. The objective of this study was to simulate a vegetated buffer strip by seeing how effective common grass (*Festuca arundinacea*) would be at retaining phosphorus. Experimental groups received a phosphorus solution while the control groups received a dose of tap water. Watering's were done twice a week. We looked at pass through (the inverse of retention) rates by sampling the runoff from each plot at the end of this study and determined a total phosphorus concentration on each sample. A dry mass was also taken of each plant at the end of the study. This research showed that there were high values of phosphorus found in the runoff. This was the opposite of what was to be expected, we were hoping to find lower values of phosphorus.

Background

Excess nutrients running off into water sources has been an ongoing problem in many regions. Many agricultural areas face problems with algal blooms in surface waters. Phosphorus is a limiting nutrient and can lead to algal blooms in surface waters when there are excess nutrients found.

Vegetated buffer strips are a natural way to help reduce the amount of excess nutrients running off into any water sources near agricultural areas. A vegetated buffer strip is an area of land planted with indigenous vegetation situated between a potential pollutant source and a surface water body that receives runoff (Vegetative filter strips).

Objective

The goal of this study was to see how much phosphorus would percolate through the benchtop plantings of common grass (*Festuca arundinacea*).

Methods

- Planted 8 pots with common grass, plots 1-4 were the experimental and 5-8 were the control
- Experimental group was watered with a 1:100 dilution of Miracle-Gro liquid fertilizer (24-8-16 ratio)
- Experimental plots each receive 350 ml of phosphorus solution
- Control plots each receive 350 ml of tap water
- Watered twice weekly on plots until the experimental group began showing signs of dying
- Seven watering events occurred, which consisted of watering two times a week before plants began to die
- Collected runoff water from last watering, to be analyzed in the lab for the total phosphorus test
- Harvested and dried out vegetation from each plant and collected a dry weight
- Total Phosphorus testing was done using an AQ1

Results

- Experimental trays 1 and 4 had inconsistent values
- Experimental trays 2 and 3 had 46 to 47 mg of phosphorus per liter
- This data shows us that the plants did not retain as much phosphorus as expected to
- Control plots have high values of phosphorus, likely to come from traces in the soil
- Harvested dry weights show inconsistent data
- P value was 0.341

Table 1: Total Phosphorus amounts found in plots.

Sample	Phosphorus (mg P/L)
1e	2530
2e	47.1
3e	46.5
4e	3580
5c	38.5
6c	74.8
7c	34.3
8c	55.1

Table 2: Dry weights after harvesting each plot.

Sample	Dry weight (g)
1e	2.5
2e	3.2
3e	1.6
4e	2.0
5c	1.4
6c	1.7
7c	2.3
8c	5.6

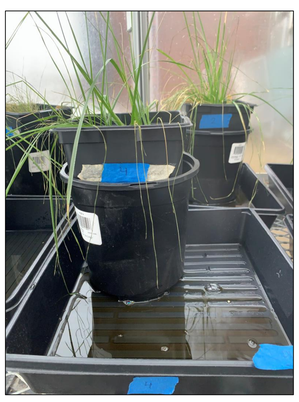

Figure 2: The setup of each sample plot

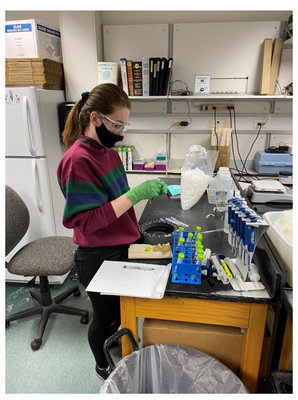

Figure 3: Samples getting prepared for the AQ1

Discussion

Total phosphorus values were high not only in the experimental groups, but also in the control groups. Typical readings of phosphorus from a healthy water source are around 0.03 mg per liter. Our readings excelled past the healthy amount and would be considered concerning values if sampled in a natural water source.

The results from this study were not what was to be expected. The benchtop grass plantings did not retain phosphorus in the way that it was thought they would. Due to time, only one species of grass was grown in this study. For any future studies conducted on this, it would be recommended to have multiple species of vegetation in a plot to see better results.

This project would be a good idea for an educational lab demo in an entry level science course. Where different lab groups set up the bench scale grass plantings, and test different parameters throughout a semester.

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References

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Vegetative Filter Strips (n.d) Natural Conservation Service, United States Department of Agriculture