

Progress Report - MUEI/LEF Grant

Project Title: Impact of Lawn Care Practices on Leaching of Nutrients

Grant Award: \$4,955.20 on March 9, 1999

Funds were awarded to carry out both greenhouse and field experiments designed to examine the impact of mowing (clipping) and fertilization of lawn on the leaching of nutrients, specifically nitrogen and phosphorus. A field site with 80 zero-tension lysimeters was set up in 1998 and an aggressive sampling schedule of the water trapped in these lysimeters was proposed. However, drought conditions in the county and the general dynamics of lysimeter filling made it feasible to sample the lysimeters only in the spring of each year. For this reason, a project extension was approved until the spring of 2002. Fertilization treatments included no fertilizer, organic fertilizer (recommended level), double organic fertilizer (twice the recommended level), inorganic fertilizer (recommended level), and double inorganic fertilizer (twice the recommended level). Mowing treatments were 1 inch, 2 inch, 3 inch, and uncut (grass was not cut in plot). Each of the treatment combinations (mowing X fertilizer) was replicated four times for a total of 80 plots (4 mowing treatments X 5 fertilizer treatment X 4 replicates = 80 plots). Leachate (water collected in the lysimeters) was tested for nitrate and phosphate concentrations and total amount of nutrient leached was calculated.

Samples in the springs of 1999 and 2000 did not show any consistent pattern with regards to the impact of the treatments on the nutrient levels in the leachate.

In 2001, mowing and fertilizer treatments did not have a significant effect on phosphate leaching. Mowing did have a significant effect on nitrate leaching; mowed plots had significantly lower concentrations of nitrate in the collected leachate than uncut plots. Rates of fertilizer application also had a significant effect on the concentration of nitrate in leachate: plots treated with double the recommended level of fertilizer leached significantly more nitrate than unfertilized plots and plots fertilized with the recommended amount. In particular, plot fertilized with double the recommended amount of inorganic fertilizer consistently leached greater amounts of nitrate than the other plots (unfertilized or fertilized with organic fertilizer).

In 2002, mowing did not have any effects on the levels of nutrient leaching from the plots. However, fertilizer type and amount did have significant effects on nitrate leaching; plots treated with double the recommended amount of inorganic fertilizer leached more nitrate than any of the other treatments. Fertilizer treatments also had an effect on phosphate leaching: plots treated with organic fertilizers leached significantly less phosphate than plots treated with inorganic fertilizer.

The results of the fieldwork for 2001 and 2002 were reported and discussed in a senior thesis by Frank Rinkevich, who graduated from in spring 2002. Although we plan to write a research paper on this project, the manuscript remains in the early stages of preparation.

In the summer and fall of 2001, greenhouse experiment dealing was conducted to determine the effects of mowing and fertilization on nutrient leaching from a lawn. Seventy-five soil cores (12 inches long X 4 inches in diameter) were removed from a lawn and set up in a greenhouse. Fertilizer treatments included two types of fertilizer, organic and inorganic, which were applied at one or two times the recommended amount. Some cores received no fertilizer. Mowing treatments included trimming the grass in the cores at one inch, three inches or nine inches. Following a simulated rainfall event, water draining from the bottom of each core was collected and analyzed for total phosphorous, phosphate, total nitrogen and nitrate. Root growth also was quantified. Mowing treatments had a significant effect (using ANOVA) on concentrations and total amounts of leached nitrogen and phosphorus and on root growth. Treatments with shorter grass (one inch) leached significant more phosphate and nitrate. Soil cores with shorter grass has significantly less well developed root systems as determined with a root density scoring procedure. A small, but non-significant, effect of fertilization was observed.

This greenhouse project was primarily the work of Michael Ebner, who did the greenhouse experiment as an independent study in Biology. The results of this greenhouse project were presented as a poster paper at the annual meeting of the Pennsylvania Academy of Science in April 2002 and the abstract of the poster was published in the Journal of the Pennsylvania Academy of Science 75:106 (2002). The title of the poster was "Effects of Mowing and Fertilization on Nutrient Leaching from a Lawn."

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