

CTRF Project Report: June, 2016

Project Title: The impact of golf courses on nutrient loss and overall pollutant export from developed areas

Principal Investigator: Dr. Chris Murray, Lakehead University

Summary:

This project is aimed at quantifying the effect golf course maintenance has on the quality of runoff and groundwater, especially where nutrients, volume of flow and sediment are concerned. Testing during a third growing season is underway, and results from the second season are being analyzed. A subset of these results have been presented at an Environmental Conference.

Personnel:

Ms. Amanda Grant continues her M.Sc. in Biology on this subject, and is beginning her sixth semester in her program. Professor Nanda Kanavillil (Associate Professor of Biology, Lakehead University) is, along with Dr. Murray, advising Amanda and tracking her progress, and serves as co-supervisor for Amanda's M.Sc. project.

Progress since last report:

Following the collection of the second season of outdoor rain and storm data, the research team attempted to collect data throughout the winter in collaboration with Stayner Collegiate Institute (a public secondary school). Ten new plots were established with Kentucky bluegrass in the school greenhouse, and the aim had been to repeat some testing and to investigate possible interference between storm and rain testing. Unfortunately, the winter testing was not successful- a consistent maintenance plan was never finalized with the school, and the plots essentially did not establish fast enough to be useful because of lack of attention. We have moved these plots from the greenhouse back to the outdoor farm used up until now, and new tests are being conducted (with new grass) this season (see below for more details). The school remains enthusiastic about future collaborations in this area, so hopefully other CTRF projects might be able to take place there.

Though the greenhouse-based plots did not succeed, several outdoor events involving snow melt were measured during the late winter/spring. The groundwater collected during those events is being analyzed now.

Second season (2015 spring-summer-fall) data is currently being analyzed, and some has been presented at a scientific conference. A copy of the poster Amanda presented at the 2016 Muskoka Summit on the Environment (Bracebridge, ON) is included with this report. In that poster, only a small subset of the data collected so far is presented. Phosphate concentration in the groundwater measured throughout the growing season is shown, as a function of grass type (Kentucky Bluegrass and Creeping Bentgrass) and fertilizer regime (0, 0.5, 1 and 2 lbs N/1000 sq. ft). Additionally, the effect of different seed density values on phosphate concentration is shown. As the poster indicates, there was no obvious

dependence of phosphate concentration on grass type, seed density or fertility regime. All fertilizer treatment described in the poster is P-free fertilizer, so it is reasonable to expect no spike in PO₄ content following fertilization. All plots show reduced PO₄ concentration over time as grass develops.

Data not included in this poster but being analyzed now includes TSS, NO₃ and runoff volume measurements for all plots as a function of time, fertilizer type (including fertilizer with P added), grass type and seed density. Additionally, the results of snow melt measurements and simulated storm tests (involving influent water purposefully spiked with sediment and nutrients) are now shown in this poster. These results will all be included in the final report, and are being assembled this semester.

Next steps:

New plots have been established for this growing season, and tests now underway involve increased number of replicates (three instead of two). The aim of these tests is to validate the initial results of the previous season. The first measurements from last season were almost universally high in sediment and nutrient concentrations, and while this is understandable given the level of development of the turf, it would be good to confirm that these values are not a function of experimental procedures that were being fine-tuned at the time.

Samples collected during this season and last season will be sent to Thunder Bay this semester for more complete nutrient testing, since so far only nitrate, phosphate and TSS measurements have been performed on them. Last year's samples have been kept frozen since collection for this reason.

Amanda is planning on completing her M.Sc. thesis next semester, and the final report for this project and her defended thesis will be available by the last reporting date of January 15th, 2017.