Use of Compost and Microclover to Reduce Nutrient and Sediment Runoff from Home Lawns

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Introduction

- A recent assessment on the health of Chesapeake Bay revealed that the only source of nitrogen (N), phosphorous (P) and sediment pollution that is growing within the Chesapeake Bay watershed (CBW) is urban/suburban storm water.
- New single family home developments are frequently associated with poor soil chemical and physical conditions that promote runoff and drive new homeowners to apply more lawn fertilizer than homeowners residing in older, more mature, developments .
- Practices under consideration for use as best management practices (BMPs) in new developments include high volume compost amendment of soil to improve soil infiltration and inclusion of microclover in the lawn seed mixtures to reduce fertilizer use.
- Data showing that the two practices reduce N and P and total suspended solid (TSS) stormwater losses compared with current fertilizer use practices is needed to support the adoption of the two practices as BMPs by state and federal regulatory agencies within the CBW.
- Practices that are accepted as stormwater BMP's by regulatory agencies provide builders and developers with additional options that can be used to meet stormwater reduction mandates.

Objective

- To compare the total N, total P and total dissolved solids (TSS) runoff losses from compost amended plots seeded with a mixture of 95% tall fescue (*Lolium arundinacea*) and 5% microclover (*Trifolium repens L. var. Pirouette*) with plots seeded with 100% tall fescue and fertilized as a typical lawn care operator would do in the mid-Atlantic region of the USA
- To evaluate the shoot density to aid in the interpretation of runoff losses from the two plot treatments .

Material and Methods

- 12.2 m by 18.3 m plots (0.022 ha-2) located on 3% hillside slope, having a silt loam surface texture, were seeded in the Fall of 2012 with each lawn treatment being replicated twice.
- Prior to seeding, the soil in tall fescue+microclover plots were amended with 5 cm of yard waste compost (i.e. LeafGro®). No fertilizer or pesticides were applied to these plots for the duration of the study.
- Non-compost admended plots seeded with tall fescue received 5 year applications (Apr., June, Sept, Oct. and Nov.) of urea or sulfur coated urea at a rate 34.2 kg N ha-1(annual load 171kg N ha-1).
- Plots were mowed weekly at 7.5 cm during the growing season with clippings being returned.
- Natural storm event, discrete, flow weighted, runoff samples were obtained at the initiation of runoff and at depth increments of 2.5 mm runoff from 1 April 2013 to 31 Oct 2014.
- Snow melt events were not measured due to equipment limitations.
- Shoot density counts were obtained from five, 6 cm diameter cores removed from each plot.

Results

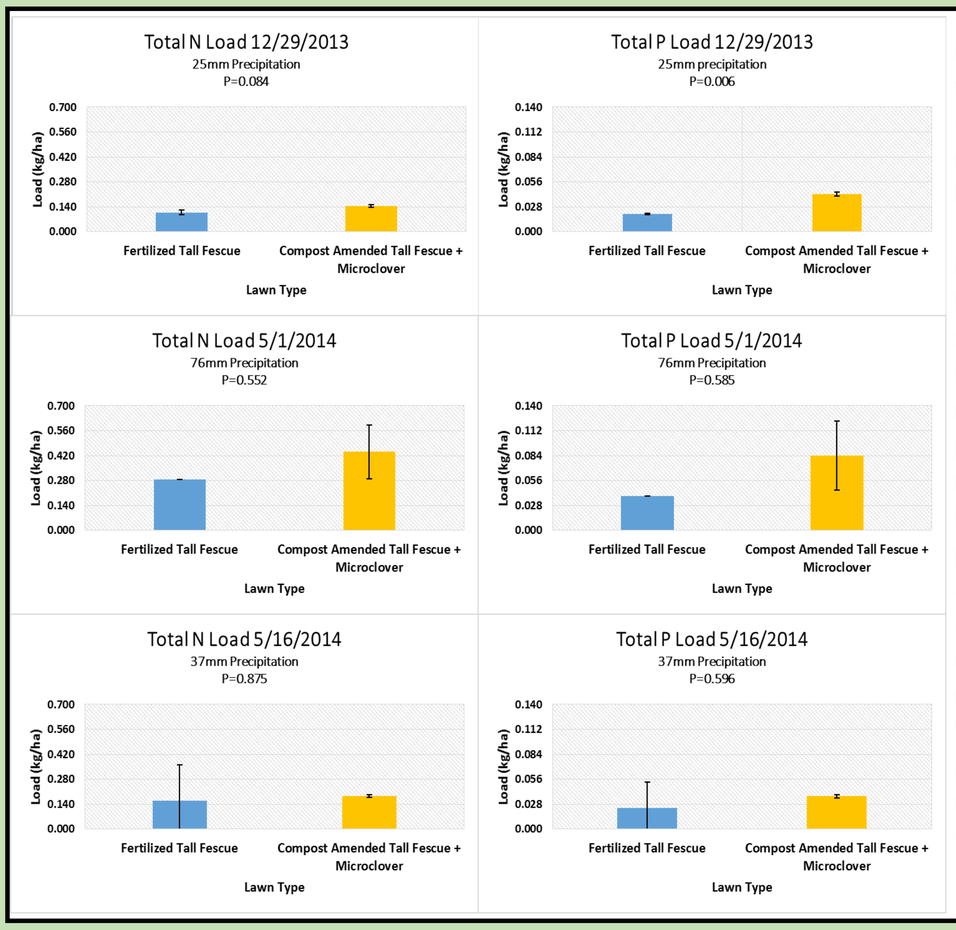

Figure 1. **Total N and total P runoff losses for three natural rainfall events where load could calculated*.** There was no difference in the total N losses between the two lawn care treatments. Total P losses were higher from the composted amended plots for one of three rainfall events. Total N losses from fertilized plots did not exceed 0.8% of the most recent fertilizer N load applied to these plots for any of the three events. (* -May 5 fertilized tall fescue plot loss is based on results obtained from a single plot.)

Table1: **The concentrations of total N, total P and TSS in the first flush sample collection** (once flow first reached 0.02 liters per second). When averaged over the four dates. Total P first flush losses were higher from compost amended + tall fescue plots than from fertilized tall fescue plots. This suggests that initial incremental load loses of total P will be higher from composted amended tall fescue + microplots when little runoff occurs from both lawn treatments.

Treatment	6/ 8/ 2013	12/ 23/ 2013	12/ 29/ 2013	5/ 16/ 2014	Average
	Total N (mg L^{-1})				
Fertilized Tall fescue	6.536	4.054	2.374	5.045	4.503
Compost amended Tall fescue + Microclover	4.758	5.882	3.051	9.138	5.67
Significance Probability	**0.038**	0.134	0.51	0.295	0.333
	Total P (mg L^{-1})				
Fertilized Tall fescue	1.034	0.612	0.407	0.827	0.72
Compost amended Tall fescue + Microclover	0.904	1.016	0.937	1.828	1.171
Significance Probability	0.454	0.063	**0.002**	0.153	**0.039**
	TSS (mg L^{-1})				
Fertilized Tall fescue	58.771	122.165	127.000	121.040	107.244
Compost amended Tall fescue + Microclover	120.524	77.440	85.550	64.785	87.075
Significance Probability	0.606	0.636	0.774	0.380	0.599

Treatment	Year	
	2013	2014
	% Runoff	
Fertilized Tall Fescue	5.9 (0.25)	3.5 (2.6)
Compost Amended Tall fescue + Microclover	3.0 (0.30)	1.6 (0.5)
Significance Probability	0.0178	0.5506
Number of events	6	6

Table 2. **The percent of runoff in two treatments from 2013 to 2014.** Runoff losses from the compost amended tall fescue + microclover plots were 49% lower than from the fertilized fall fescue plots in the first year that runoff was monitored.

Treatment	Year				
	7/ 13/ 2014	11/ 13/ 2014	5/ 14/ 2014	7/ 14/ 2014	9/ 14/ 2014
Fertilized Tall Fescue	12,300	11,200	14,800	12,800	11,800
Compost Amended Tall Fescue + Microclover	19,000	20,600	23,950	36,750	20,400
Significance Probability	0.16	0.14	0.4	0.12	0.11

Table 3. **Summary of shoot density data collected in 2013 and 2014**. In the absence of fertilizer use the compost amended tall fescue lawn treatment had shoot densities that were comparable (if not higher) to fertilized tall fescue lawn treatment. High shoot densities delay the time to runoff

Summary

- The portion of natural storm event precipitation to runoff was small for both lawn treatments.
- Amending the soil with 5 cm compost and establishing a lawn using a 95% tall fescue, 5% microclover seed mixture reduced runoff by 49% when compared to establishing a tall fescue lawn without amending the soil with compost prior to establishment.
- Shoot data collected in 2013 and 2014 suggest that a tall fescue + microclover lawn, when established in a recently compost amended soil, does not need to receive nitrogen fertilizer in the two years following establishment, to maintain a shoot density that is comparable (if not greater) than that present in a well fertilized tall fescue lawn.
- Total P load losses from the compost amended tall fescue + microclover lawns were always greater than from the fertilized tall fescue lawns suggesting further study of nutrient runoff losses of compost amended tall fescue plus microclover lawns is needed before the combined use of these two practices can be recommended as best management practices for lawn establishment in the Chesepeake Bay watershed.

References

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