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Editorial

Privately Owned Residential Lawns…What is their Contribution to Air and Water Quality?

Porché L. Spence*

Department of Environmental, Earth and Geospatial Sciences, North Carolina Central University, USA

***Corresponding author**

Porché L. Spence, Department of Environmental, Earth and Geospatial Sciences, 2202 Mary M. Townes Science Complex, Durham, NC 27707; Current Address: North Carolina Central University, 2217 Snetterton Lane, Upper Marlboro, USA, Tel: 301 952-1760; Email: porchespence@yahoo.com

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The effects of homeowner behavior regarding lawn management and their perceived notion about maintaining a well manicured lawn on the environment at a household scale is poorly quantified. Residential lawn management practices can produce aesthetically appealing landscapes, but are capable of causing nutrient losses via overland flow or gaseous fluxes to the atmosphere (e.g. nitrous oxide - N_2O). There is a need for additional residential landscape studies that include lawn care surveys and ecological data to evaluate the implications of homeowner decision making on the environment at the household scale. It remains unclear whether homeowners conceptualize their lawns as components connected to a greater ecosystem or are aware of the implications their lawn care decisions have on environmental sustainability [1]. Schuler (2000) found that more than 50% of homeowners maintain their own lawns. Residents, who practice "do it yourself" lawn management, do not apply a uniform rate of fertilizer [2]. Since many homeowners are not knowledgeable of appropriate fertilizer application rates, they base their decisions on information provided by the manufacture on the fertilizer bag, recommendations from sales associates working at lawn and garden stores, or their own judgment [3]. Less than 20% of surveyed homeowners test their soil prior to applying fertilizer [3,4], which increases the potential for applying excessive fertilizer and impairing the environment.

Within the last decade, there have been surveys to assess homeowner's behavior towards lawn management and separate studies to characterize nutrient losses via overland flow and N_2O flux from urban and suburban lawns. Nutrient losses via overland flow during natural rainfall events have been investigated on private residential lawns [5,6]. However, N_2O fluxes have been measured only primarily from research turf grass plots [7], campus lawns [8] or a combination of urban land uses including residential landscapes [9,10]. These N_2O studies demonstrated differences in fertilizer application rates and irrigation practices, but were unable to capture the true variability associated with maintenance practices occurring on private residential landscapes because they did not include homeowner lawn care practices.

Law et al. (2004) conducted a residential lawn study in Baltimore County, Maryland that consisted of surveying homeowners about fertilizer application rates and water use patterns in the two urban watersheds. Soil pH, soil nitrogen (N) and soil bulk density were measured from the lawns. This study was intended to evaluate the effects of fertilizer application rates on non-point source pollution in urban areas at a watershed scale; however overland flow samples were not collected to quantify the amount of N generated from the residential lawns. The soil data in conjunction with socio-economic data were used to infer which residential lawns had the greatest potential for N export in runoff.

Dietz et al. (2004) surveyed homeowners in Bradford, Connecticut to determine whether conducting a series of seminars to educate homeowners about best management practices (BMPs) could improve the quality of storm water runoff leaving a suburban neighborhood. The neighborhood was divided in a control watershed (no seminars) and a treatment watershed (seminars). The survey was designed to collect data about clipping management, water use, fertilizer use, and pet waste disposal; however the homeowners were not required to disclose fertilizer type, fertilizer application rate or turf grass type. Soil nutrient data were collected from each lawn. Storm water runoff samples were collected from each watershed but not from each lawn.

A study was conducted comparing nutrient losses via overland flow during natural rainfall events [5] and N_2O losses following natural rainfall events [11] from a high maintenance fescue (*Festuca arundinacea*) lawn (HMFL), a low maintenance fescue lawn (LMFL), and a forested residential landscape (FRL). The homeowners were surveyed and asked to document their management practices. These residential landscapes were not replicated. The N_2O losses should be considered an index for lawn management differences, because a baseline flux was not established and the N_2O losses from were not measured consecutively during the 24-h period following rainfall events or during periods when rainfall had not occurred.

Conducting studies in different neighborhoods and different regions would allow scientists direct contact with homeowners in order to better understand their behavior. Osmond and Platt (2000) revealed that surveyed homeowners in Cary, North Carolina applied the recommended rate of N fertilizer and water use was directly related to summer drought conditions. Socio-economic factors did not correlate with fertilizer application rate. Likewise, there was not a linear association between the socio-economic factors and the amount fertilizer applied to residential lawns located in the Baltimore County, Maryland [2]. The social pressure of maintaining an aesthetically appealing lawn by the rest of the neighborhood influences homeowners to over irrigate and fertilize lawns [12]. Homeowners were willing to implement management practices that improve storm water runoff quality, but they still want their aesthetically appealing landscape [13]. While conducting a lawn management study, some of the neighbors were curious about the study and would ask me questions about the sample collection and the potential implications of lawn management practices on the environment. These same neighbors would share their feelings about their lawn management practices as well as their neighbors' lawns. Through these discussions, there appeared to be an underlying competition between some of the neighbors living along the same street. A few of the neighbors viewed the FRL as the "eye sore" landscape of the street when compared to the other residential lawns thus suggesting that social pressures encouraged "well-manicured lawns" and the concomitant fertilizer application. Although the FRL may not have been as aesthetically appealing as the conventional residential lawns, it generated significantly lower nutrient [5] and N_2O losses [11].

Many homeowners are either unaware or not concerned about the connection between lawn management practices and water quality [13]. Data collected from lawn care surveys in combination with ecological measurements can be used to educate the homeowners participating in the study and their neighbors by informing them of their direct practices on the environment. Once the homeowners are shown the results of their management practices they may be more receptive to changing their behaviors and attitudes about conventional lawns and lawn care. The results from these socio-ecological interaction studies could be used to update greenhouse gas inventories, inform other scientists of the results at conferences, and educate the local community at seminars. Dietz et al. (2004) found that educating homeowners about non-point source pollution resulted in an increase of homeowners adopting BMPs and an improvement in the quality of the storm water runoff leaving neighborhoods. Privately owned residential lawns should be explored further to determine how homeowners make lawn care decisions and how these management practices influence local and perhaps regional air and water quality. Conducting these socio-ecological interaction studies are challenging in that they require integrated science teams that include sociologist, soil scientist, water quality specialist, etc. In addition, there are several logistical difficulties associated with these studies: finding homeowners to volunteer their lawns; implementing non-invasive equipment to collect the data, and; finding more than one residential landscape with similar environmental characteristics for replication. Despite these challenges, additional studies with lawn replicates will better quantify the N_2O flux and nutrient losses via natural rainfall events to depict the effects of homeowner lawn management practices on the environment at the household scale.

REFERENCES

1. Dahmus M, Nelson K. Yard stories: examining residents' conceptions of their yards as part of the urban ecosystem in Minnesota. Urban Ecosyst. 2013; 1-22.
2. Law NL, Band LE, Grove J.M. Nitrogen input from residential lawn care practices in suburban watersheds in Baltimore County, MD. J Environ Plann and Man. 2004; 47: 737-755.
3. Schueler T. Article 126: Understanding watershed behavior. Watershed Protection Techniques. 2000; 3: 671-679.
4. Osmond DL, Platt JL. Characterization of suburban nitrogen fertilizer and water use on residential turf in Cary, North Carolina. Hort Technol. 2000; 10: 320-325.
5. Spence PL, Osmond DL, Childres W, Heitman JL, Robarge WP. Effects of lawn maintenance on nutrient losses via overland flow during natural rainfall events. JAWRA. 2012; 48: 909-924.
6. Garn HS. Effects of lawn fertilizer on nutrient concentration in runoff from lakeshore lawns, Lauderdale Lakes,Wisconsin, US Geological Survey: Middleton, WI. 2002; 6.
7. Bremer DJ. Nitrous oxide fluxes in turfgrass: effects of nitrogen fertilization rates and types. J Environ Qual. 2006; 35: 1678-1685.
8. Raciti SM, Burgin AJ, Man PMG, Lewis DN, Fahey TJ. Denitrification in suburban lawn soils. J Environ Qual. 2011; 40: 1932-1940.
9. Hall SJ, Huber D, and Grimm N B. Soil N2O and NO emissions from an arid, urban ecosystem. J Geophys Res. 2008; 113.
10. Kaye JP, Burke IC, Mosier AR, Guerschman JP. Methane and nitrous oxide fluxes from urban soils to the atmosphere. Ecol Appl. 2004. 14: 975-981.
11. Spence PL, Walker JT, Robarge WP, Preston B, Osmond DL. Comparing nitrous oxide flux from three residential landscapes under different management schemes following natural rainfall events. Submitted to Urban Ecosyst.
12. Nielson L, Smith CL. Influences on residential yard care and water quality: Tualatin Watershed, Oregon. JAWRA 2005; 41: 93-106.
13. Aveni M. Homeowner survey reveals lawn management practices in Virginia. Technical Note 26. Watershed Protection Techniques. 1994; 1: 85-86.

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