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# A LAWN CARE EDUCATION PROGRAM TO ADDRESS WATER CONSERVATION AND WATER POLLUTION PREVENTION IN NEW JERSEY

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## ABSTRACT

Landscapes that have a significant portion of their land cover maintained as turfgrass have the potential to use large quantities of potable water for irrigation. These landscapes also contribute to phosphorus and nitrogen runoff and leaching. An outreach program was developed to address the association of turfgrass management and water resources issues. This included a homeowner survey that found that less than 50% of respondents performed certain good horticultural practices such as testing soils, though 79% of respondents reported performing the majority of lawn care themselves. Students participating in environmentally-friendly lawn care classes reported an increase in knowledge about the importance of soil testing, determining how much fertilizer to apply, and how turfgrass in the landscape relates to larger water resources issues. More than 80% reported that they were likely to use what they had learned, including having their soil tested, following guidelines for fertilizer application, and measuring the amount of irrigation water applied. Other program components included demonstration lawn renovations and a webpage with links to extension resources. Effectively reaching a numerous and diverse group of stakeholders like homeowners would likely prove to be difficult; however, the positive response from municipal officials, Master Gardeners, and non-governmental organizations addressed by this program suggests that outreach materials and education for these groups will prove valuable in disseminating information and resources to a broader group of homeowners.

## Introduction

In recent decades, areas of New Jersey have seen a transition of agricultural and forested lands to residential landscapes. Often these developed areas have a significant portion of their land cover maintained as turfgrass. There are many benefits to having turfgrass cover in a watershed, including preventing soil erosion, percolating rainwater, and filtering stormwater. However, negative impacts of significant turfgrass area in a landscape include the potential for high rates of consumptive water use for lawn irrigation, particularly in summer months, and water quality impairments associated with phosphorus runoff and nitrogen leaching from applied fertilizers. It has been estimated that there are 40 million acres of turfgrass in the U.S. (Milesi et al., 2005), which is on the same order of magnitude of the acreage of any major U.S. crop (USEPA, 2009).

New Jersey receives an average of 38 to 54 inches of precipitation annually, depending on location (NOAA, 2002). Despite this, the state's water supply is under strain due to the aggregate needs of a large population, agriculture, industry, and recreational and ecological requirements. Historically, water withdrawals have caused a lowering of aquifer levels and in some cases problems of saltwater intrusion in the state. Since 1998, some aquifers have recovered while others continue to be further depleted (USGS, 2008). Considering this, consumptive use of potable water supplies for lawn and landscape irrigation is a concern, particularly in areas with significant residential development.

As an example of the potential for water quality impairments, it has been hypothesized that the significant water quality and ecological changes in New Jersey's Barnegat Bay Estuary in recent decades have been related to the conversion of forest and wetland to developed land (Lathrop and Haag, 2007), with fertilizer applications in the watershed being implicated in the nutrient loading to the bay (Kennish et al., 2007).

In response to concerns about nitrogen pollution to the Barnegat Bay and to drinking water supplies, as well as the impacts of phosphorus pollution to freshwater bodies, New Jersey enacted legislation regulating fertilizer application to turfgrass areas for both homeowners and professionals in 2011 (New Jersey Legislature, 2011, Rutgers Cooperative Extension, 2011). This law requires soil tests before phosphorus fertilizer can be applied to established lawns, restricts the amount and timing of nitrogen fertilizers, specifies the labeling of turfgrass fertilizers for sale, and mandates that professional applicators of fertilizer to turf areas obtain certification.

It has been estimated that 11 states have laws regulating the application of fertilizer to non-agricultural lands, such as to turf (USEPA, 2011). Areas of the country with states having laws regulating fertilizer applications to turfgrass include the Great Lakes region (with Illinois, Michigan, Minnesota, and Wisconsin having enacted legislation) and the Chesapeake Bay and mid-Atlantic region (with Maryland, New Jersey, New York, and Virginia having enacted legislation and Delaware and Pennsylvania considering similar legislation). These laws tend to focus on restricting phosphorus applications and certifying professional applicators. Other states with similar legislation are Maine, Vermont, and Washington.

Outreach to homeowners about lawn care may present challenges since there may be many landowners even in a small watershed, and homeowners may lack the horticultural knowledge of professional landscape managers. In response to this concern, an outreach program targeting those who could do

continued and expanded outreach was developed. In particular, municipal Environmental Commissions, municipal Green Teams, Master Gardeners, non-governmental organizations, as well as individual homeowners were addressed. Professional applicators were not specifically addressed since legislation mandated a separate education and certification program for that audience.

## Methods and Results

### *Survey of Homeowner Attitudes, Knowledge, and Practices*

To assess homeowner clientele needs, an online survey of attitudes, knowledge, and practices about lawn care was conducted in five municipalities across the state in early 2010 (Mangiafico et al., in press). The online survey was announced through advertisements in newspapers, municipal websites, university websites, and through municipal Environmental Commissions. One-hundred nineteen respondents completed the 43-question survey. Results indicated that respondents valued environmental stewardship and also valued attractive lawns. However, the rates of respondents performing some good horticultural practices such as testing soils to adjust soil pH were below 50%. The study further found that 79% of respondents reported doing the majority of lawn maintenance themselves, and 50% said they use the internet to search for lawn care information. These results suggested the need to educate homeowners, and that an effort should be made to produce reliable, science-based internet resources where they are lacking.

### *Environmentally-friendly Lawn Care Classes*

In 2010 and 2011, eight classes in seven different counties were conducted with a total of 126 students. The audience included those likely to conduct further outreach activities or participate in decision-making, including municipal Environmental Commission members, Master Gardener, non-governmental organization representatives, as well as some interested homeowners. The scripted slide set was made available to students and distributed to other stakeholders as well (Mangiafico, 2011a). The course consisted of a one-hour lecture plus a discussion period and emphasized water conservation and pollution prevention.

A self-assessment questionnaire was used during most classes both to determine knowledge gain of students from the class and to indicate which behaviors respondents were likely to adopt. The change in responses for knowledge questions was assessed using paired *t*-tests (PROC TTEST, SAS, 2011). Respondents reported an increase in knowledge for all knowledge questions including the knowing the importance of soil testing, determining how much fertilizer to apply, and understanding how turfgrass in the landscape relates to larger water resource issues (Table 1). Greater than 80% of respondents reported that they were likely to use what they had learned, including having their soil tested, following guidelines for fertilizer application, and measuring the amount of irrigation water applied (Table 2, questions 16–20). Furthermore, 77% stated that they would teach others what they had learned, suggesting that these classes would engender broader community outreach (Table 2, question 15). These classes continue, as there is sustained interest in the topic, particularly as provisions of the state's turfgrass fertilizer law are taking effect.

Table 1. Summary of responses for knowledge gain questions for student assessments of environmentally-friendly lawn care classes. Total returned surveys: *n* = 65.

Statement	Number of Responses	Before Average Response (out of 5 = "agree")	After Average Response (out of 5 = "agree")	<i>p</i> -value for change
1. I understand the benefits of using turfgrass as a ground cover.	62	3.42	4.67	<i>p</i> < 0.0001
2. I understand the potential detriments of using turfgrass as a ground cover.	62	3.03	4.29	<i>p</i> < 0.0001
3. I know what is meant by "turfgrass quality" and why the quality of a turf area is relative to what it's being used for.	61	2.92	4.44	<i>p</i> < 0.0001
4. I understand that different species of turf grasses are tolerant of different environmental conditions such as low-pH soils, shade, wet conditions, or drought.	60	3.12	4.56	<i>p</i> < 0.0001
5. I appreciate the importance of soil pH for growing a healthy turf.	61	3.54	4.75	<i>p</i> < 0.0001
6. I understand how to determine how much phosphorus should be applied to my lawn	61	2.59	4.20	<i>p</i> < 0.0001
7. I understand how to determine how much nitrogen should be applied to my lawn.	61	2.52	4.09	<i>p</i> < 0.0001
8. I know how often and how much to water my lawn.	61	3.48	4.63	<i>p</i> < 0.0001

9. I know at what height to mow my lawn, and how mowing height affects the growth of the turf plants.	61	3.64	4.69	$p < 0.0001$
10. I appreciate what it means to follow an integrated pest management (IPM) approach instead of applying herbicides and insecticides on a schedule, like in some 4-step fertilization programs.	60	3.07	4.51	$p < 0.0001$
11. I understand how turfgrass in the landscape relates to environmental issues such as water conservation and surface and groundwater pollution.	60	3.37	4.59	$p < 0.0001$

Table 2. Summary of responses for course value and behavior change for student assessments of environmentally-friendly lawn care classes. Total returned surveys:  $n = 65$ .

Statement	Number of Responses	Average Response (out of 10 = "agree fully")	Percent Answering 7 or Greater (out of 10 = "agree fully")	Percent Answering "Don't know" or "N/A"
12. The information presented was interesting or valuable.	59	8.6	90%	0%
13. The handouts, demonstrations, resources, or online materials were valuable.	54	7.9	74%	9%
14. What I learned increased my understanding of some current issue or some situation in my personal or professional life.	58	8.1	79%	2%
15. I will educate others about what I learned.	56	8.1	77%	5%
16. I will change some behavior with this new information or understanding, either in my personal or business life.	57	8.2	82%	4%
17. I will test my soil or have my soil tested to determine the need to adjust pH and apply phosphorus fertilizer.	54	8.4	81%	6%
18. I will follow guidelines and best management practices for nitrogen fertilization.	57	8.3	84%	4%
19. I will measure the amount of irrigation water I apply, or base	59	8.2	83%	0%

irrigation amount on crop response or soil moisture.				
20. I will choose an appropriate turfgrass species for the site conditions if I need to re-seed or renovate an area.	56	8.7	88%	5%

### Home Lawn and Soil Quality Demonstration Projects

Two demonstration lawn renovations were completed in 2011 to demonstrate the importance of soil quality for lawn quality, as well as for processes related to water resources like rain infiltration and runoff prevention. Measurements on lawns of cooperating homeowners suggested that some new home lawns suffered from soil that was compacted and nutrient-poor. Lawn renovations consisted of cultivating the soil to a depth of 8 inches (20 cm) to relieve compaction, amending with compost and chemical amendments according to soil tests, and reseeded. One renovated lawn included the installation of a SMART irrigation system, and the other was completed without an irrigation system. Outreach included signs, literature boxes with flyers, and press releases. An extension bulletin on the impacts of poor soil quality on water resources was also produced and distributed to stakeholders (Mangiafico, 2011b).

### Turf Management for a Healthier Lawn Webpage

In 2010, a "Turf Management for a Healthier Lawn" webpage was developed to provide a brief, accessible introduction on the topic of good turfgrass management practices for homeowners (Rutgers Cooperative Extension of Salem County, 2011). The page also provides more than 20 links to extension literature on the topic ranging from brochures to more comprehensive management practice guides. Views for the page were 1053 from June 2010 to September 2011.

### Online Guidance Document for Municipalities

At the time of writing, an online guidance document titled "A Municipal Guide to Promote Turf Management for a Healthier Lawn" is being developed to give guidance to municipalities on good turfgrass management practices that minimize the runoff of pollutants and conserve water. The document will give brief introductions to specific topics such as soil testing, soil quality, efficient irrigation, and fertilizer application. The main purpose of the document is to provide municipalities with a set of possible actions to help interested citizens and to list relevant resources for citizens and decision makers.

### Conclusions

A survey of homeowners' knowledge and practices concerning lawn care demonstrated the need for educating this clientele group, particularly in light of recent legislation restricting fertilizer application to turfgrass areas for both homeowners and professionals in New Jersey. Effectively reaching a numerous and diverse group of stakeholders like homeowners would likely prove to be difficult; however, the positive response from municipal officials, Master Gardeners, and non-governmental organizations addressed by this program suggests that outreach materials and education for these groups will prove valuable in disseminating information and resources to a broader group of homeowners.

### Human Subjects Research Statement

All research conducted involving human subjects received federally approved Institutional Review Board approval.

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