Reducing Fertilizer Use & Increasing the Use of Slow-Release Fertilizer

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Southwest Florida Water Management District

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Table of Contents

Background

Caring about the appearance of one's yard seems to come naturally, but adopting natural lawn care practices is another story. The products that people use to care for their grass, namely pesticides and fertilizers, may make lawns look good, but at what cost?

Excess fertilizer washes off lawns with storm water into storm drains, transporting the nitrogen, phosphate and potassium to nearby lakes and streams.[1] Excess nutrients produce blooms of algae and other aquatic plants, which then decompose, depleting the oxygen in the water needed by fish and other aquatic life.[2] Excess levels of phosphate in fresh water and nitrate in salt water are primarily responsible for this process of "eutrophication."[3] The depletion of oxygen will affect the most sensitive aquatic life first, like young salmon.[4] Eutrophication can kill fish and threatens aquatic biodiversity, such as species deemed important for commerce and recreation, aquatic plant beds and coral reefs.[5] Nutrient enrichment also harms water for drinking, industry, recreation and agriculture.[6]

Water shortages and poor water quality are linked because contamination reduces the supply of water and increases the costs of treating water for use.[7] Preventing pollution is among the most cost-effective means of increasing water supplies.[8] Eutrophication due to excessive inputs of phosphorus and nitrogen is the most common cause of water being not fit for drinking, irrigation, industry, recreation or fishing.[9] Eutrophication is responsible for 50% of the impaired lake area and 60% of impaired river area in the United States.[10] Algal blooms have increased in coastal oceans in recent years, causing eutrophication and changes in marine food webs.[11] The severe negative impacts of the algal blooms include damage to aquaculture and shellfisheries,[12] causing shellfish poisoning in humans and killing marine mammals.[13] While phosphorus causes indirect health effects to fresh waters through the process of eutrophication, nitrate pollution poses direct health threats to humans and other animals.[14] For this reason, the U.S. EPA has created a maximum contaminant level of nitrate in drinking water to protect infants younger than 3–6 months.[15] Infants are susceptible to metabolizing nitrate into nitrite in their digestive tracts, which converts hemoglobin into methemoglobin, interfering with the oxygen-carrying ability of blood.[16] [17] This condition is called methemoglobinemia, in which a baby turns blue due to oxygen starvation.[18] Methemoglobinemia can potentially result in death if not properly treated.[19] [20]

Fertilizer, used in both agricultural and urban activities, is a major source of nonpoint phosphorous and nitrate pollution.[21] Urban runoff is the third greatest cause of lake deterioration in the United States, accounting for approximately 28% of the lakes that do not meet water quality standards.[22] Urban runoff of chemicals from lawns is a significant portion of that 28%.

For example, the Lauderdale Lakes in Wisconsin, like many others, are phosphorus limited, which means that phosphorus is the nutrient limiting plant growth and affecting lake productivity.[23] A 1996 study of the lakes revealed that surface water flowing from

the small nearshore contributing drainage area accounted for only 4% of the water inflow, yet represented 51% of the total annual phosphorus input from all sources.[24] A follow-up study conducted in 2002 estimates that the percentage of phosphorus input from lawns accounts for up to 60% of the total annual phosphorus flowing into the lake.[25] The study concluded that fertilizer did not affect nitrogen concentrations in the lawn runoff, but total phosphorus concentration in lawn runoff was directly related to the phosphorus concentration in the lawn soils.[26] Importantly, the dissolved phosphorus concentrations from regular fertilizer sites had a median twice as high as the nonphosphorus fertilized and unfertilized sites.[27]

In Georgia, some researchers simulated heavy rainfall of 2 inches to test how much fertilizer and pesticides would run off slightly sloped plots on clay soil, one to two days after their application.[28] Sixteen percent of nitrate fertilizer washed off of green grass plots, and 64% off of dormant plots, which demonstrates how immediate a concern stormwater runoff can be.[29] These results are particularly concerning, given that an estimated 35% of the U.S. population (38 million people) overfertilize their lawns.[30] A comparison of 11 homeowner surveys on lawn care practices throughout the Chesapeake Bay, Maryland, Virginia, Michigan, Minnesota, Wisconsin, Washington and Florida revealed that 50%–88% fertilize their lawns from 1.7 to 3.2 times a year.[31]

Excessive use of quick-release, water-soluble-nitrogen synthetic fertilizers will end up harming soil and creating more problems than it is worth.[32] Problems include decreased populations of earthworms and other beneficial soil organisms and increased soil acidity, thatch accumulation, soil compaction, certain turf diseases, weed growth[33] and rapid shoot growth.[34] Turf professionals now recommend that fertilization practices aim at complementing and not competing with the structure, organic content and natural nutrient cycling processes, as it is easier to grow grass in biologically active soil.[35]

Possible alternatives to quick-release fertilizers are compost and slow-release fertilizers.[36] Slow-release synthetic chemicals such as IBDU and sulfur or poly-coated urea compounds are preferable because they release more slowly into the soil, preventing runoff.[37] They may, however, still be toxic to earthworms and predisposed to leaching.[38]

Reducing fertilizer use and having people switch to slow-release fertilizers that are less likely to pollute the watershed through stormwater runoff is good for the environment and also for the economy because of all of the related water activities, such as fishing, drinking and swimming. It is also less costly to prevent water pollution than it is to clean up the water after the damage is already done.

Barriers and Benefits

Reducing Fertilizer Use

The barriers to reducing fertilizer use are similar to the barriers to reducing pesticides, which is also a lawn care watershed-related behavior. The most commonly

acknowledged barrier is a lack of knowledge about the connection between lawn care practices and the local watershed. Surveys indicate that the average American citizen is unaware of the watershed concept in general and, therefore, does not understand the connection between their yard, the street, storm drains and the final destination—local streams.[39] In one survey, only 41% of Americans knew what the term "watershed" meant and only 22% knew that stormwater runoff is the most common source of stream, river and ocean pollution.[40] Other surveys indicate similar results. Overall, less than 25% of residents rated lawn fertilizer as a water quality concern;[41] however, about 60% of people who lived adjacent to lakes considered fertilizer use a concern.[42]

Precampaign research conducted by Biodiversity Project for their Great Lakes Forever campaign, identified significant gaps in knowledge about the Great Lakes as barriers to the public's understanding of threats and to the public's role in building solutions.[43]

Maintaining a green, attractive lawn is another barrier to reducing fertilizer use,[44] as is the belief that conventional lawn care practices are more effective, more convenient and less time-consuming.[45]

There is also a major financial barrier associated with educating people effectively about watershed behavior. In a review of eight citizen surveys, messages sent by public television, newspapers and radio were consistently more effective at reaching residents, with up to 30% recall rates by the watershed population for each respective technique.[46] Messages delivered through meetings, brochures, local cable TV and videos tend to be recalled by only a very small portion of the watershed population.[47] However, most watershed education programs do not have the budgets to use more sophisticated wholesale outreach techniques.[48]

The benefits to reducing fertilizer use include not having to mow as often and a healthier lawn without the problems associated with overfertilization. Such problems include thatch buildup, susceptibility to drought damage and rapid leaf growth at the expense of roots.[49]

Switching to Slow-Release Fertilizer

The main barrier to adopting a slow-release fertilizer over a conventional fertilizer is that the former are comparatively more expensive.[50] They can be 10 to 15 times as expensive per pound of nitrogen, compared to soluble, granular forms.[51] The benefit to using a slow-release fertilizer is that the nutrients are released at a slower pace, thus allowing the soil to absorb the nutrients, which prevents excess nutrients from running off into storm drains and seeping down through soil and into the ground water.

Summaries of Successful Programs

Biodiversity Project's Great Lakes Forever program [52]

The Biodiversity Project followed community-based social marketing steps closely in the design of their program. They began by conducting focus groups in four Great Lakes cities in the states of Ohio, Michigan and Wisconsin. The focus groups were followed by confidential interviews conducted with 20 decision-makers throughout the Great Lakes region. Findings from the focus groups and interviews were then used to develop a large-sample (1,500 ppl.) telephone survey. Conducted in July of 2002, the survey included a random sample of adults from Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Erie County (Pennsylvania) and counties in the Lake Ontario watershed in upstate New York. Biodiversity Project's goals were to determine public attitudes, awareness of key issues and values that residents of the eight Great Lakes states associate with the Great Lakes and Great Lakes issues. In combination with this background research, Biodiversity Project also took into account recommendations from Great Lakes policy group leaders from their summer 2003 interviews, and findings from a 2003 electronic survey of organizations, agencies and institutions that carry out Great Lakes public education.

The survey of Great Lakes residents revealed that 94% agree that each of us has a personal responsibility to protect the Great Lakes, and 96% agree that people need to do more to protect Great Lakes' habitats from pollution.[53] People view the lakes as a source of pride and a natural resource to use and protect, with the majority of people listing the lakes as beautiful, vital to the region's economy and a place to go for recreation and relaxation.[54] Residents also recognize that the lakes are not impervious to danger, as 72% disagree with the statement that the lakes are in no danger of damage because of their continuing ability to renew themselves as they have for centuries.[55] While people are concerned about the Great Lakes and feel responsible for protecting them, most people do not understand what they can do to help and whether their own actions have any impact.[56]

After conducting the preliminary background research on Great Lakes residents' attitudes and beliefs regarding the lakes, the Biodiversity Project organized the Great Lakes Forever campaign around four "umbrellas" of issues: water quality, water supply, habitat protection and native biodiversity. The umbrella that is of concern for the purposes of this report is water quality. The group chose to build concern around lower-profile issues by prefacing them with high-profile issues already in the news. For example, when educating about runoff, talk about beach closings, fish kills and people getting sick were considered excellent lead-ins. For this pilot project, two target audiences were chosen: "Great Lakes Lifestylers," people who frequently use the lakes for recreation and cottage-goers, as well as "Engaged frequent voters," people who may not care about the lakes, but about community policy. To target their audiences effectively, Great Lakes Forever placed paid print ads in various Great Lakes lifestyle magazines and radio ads on the major commercial radio stations in the region, buying time on stations most likely to be listened to by the two target populations. Twelve of Wisconsin's most popular coastal state parks received messages on signs because of

partnerships with the Wisconsin State Park System. Partnerships with regional businesses were also utilized, allowing 20,000 drink coasters to be placed in 20 lakeside coastal restaurants, bars and hotels. In addition, a full-page spread of articles and messages central to the Great Lakes Forever campaign was placed in the 2004 summer guide of the Apostle Islands National Lakeshore.

Biodiversity Project also carefully developed their messaging, making sure to phrase the messages positively by beginning with values defining the threat or problem and then offering solutions or action. The message for water quality/water pollution is as follows: "The Great Lakes are one of the natural wonders of the world and it is our responsibility to protect them. They are a place we call home and a resource for us to use and protect—they are the heart of the ecosystems that we rely on for life. They are a gift of nature, whose beauty and bounty enrich our lives and identify our region…Yet polluted runoff is closing our beaches, our fish are contaminated and people have died from outbreaks of bacteria in our drinking water. It doesn't have to be this way. We can all take steps now to help improve the health of the lakes and prevent future public health emergencies." The following solutions are listed: "Get your lawn off drugs: reduce or eliminate the use of pesticides and fertilizers that end up in rivers and contaminate our water; buy produce from local farms that work to reduce erosion and the application of pesticides and fertilizers; conserve water to take the load off aging sewage treatment plants; support more stringent controls on mercury pollution from coal-burning power plants."

In addition to the above-mentioned media techniques, Biodiversity Project had Great Lakes Media Kits and a web site, and used the Great Lakes Forever campaign to host three BioBlitz educational events in Wisconsin. BioBlitzes are full-day educational events that bring scientists and community residents together to determine local species in their natural habitats. The Great Lakes Forever pilot project had more than 50 partner organizations in the Wisconsin area alone, and more than 20 policy advisors around the region to help make Biodiversity Project's work more effective.

The overall costs for the Great Lakes Media Kit and follow-up releases were $4,650 USD. Twenty-eight percent of web site visitors reported a media story placed by Great Lakes Forever as their reason for visiting the site. The magazine print ads cost $17,300 USD in total, including design and placement fees. Eight percent of web site survey respondents reported a magazine print ad as their source for visiting the site. Radio ads cost $3,500 USD for concept, creative and placement consulting, and $12,000 USD for four weeks of placement, of up to three times per day, on six major commercial radio stations, and $4,200 USD for public radio stations for a total of $19,650 USD. Twenty percent of web site survey respondents reported visiting the site after hearing a radio ad. Great Lakes "Vulnerable" Posters (see Appendix A) cost $1,397 USD to prepare and print. Their outcome was not measured, but people responded positively to the posters. The costs for the preparation, printing, graphic illustrations, and production and distribution of 121 signs to 12 parks reached a total of $3,500 USD. No web site survey respondents reported visiting the site after seeing a park sign, and observations indicate that the signs were not placed properly in all of the parks, which may have been why

they were less effective. The Great Lakes drink coasters cost a total of $4,050 USD and were listed by five percent of web survey respondents as the reason for their visit. While viewing the coasters wasn't the most popular reason for visiting the web site, the coasters generated a lot of media interest that helped propel the campaign. The Great Lakes Annex Comment Postcards were mailed to conservation groups, for a total cost of $5,900 USD. Over 5,000 of the 19,000 postcards delivered had their comment cards returned, and attendance at public hearings exceeded the Department of Natural Resources expectations. The permits, facilities, publicity and travel costs for the BioBlitzes cost $7,300 USD. Nearly 300 participants learned about biodiversity in their neighborhood by identifying a total of 1,464 animal and plant species. The events gained significant media coverage, but no other assessment of their effectiveness is mentioned. The Great Lakes Forever web site and email newsletter cost a total of $800 USD. Eight thousand people visited the web site during the campaign's primary months, for a total of 24,000 page views. Since April 2005, more than 30,000 visitor sessions have been recorded on the site, but only 177 people (0.5%) responded to the survey asking about where they had learned about the site, which indicates that there was an extremely small sample size used to provide the above web site-related descriptions.

The total cost of the Great Lakes Forever campaign was approximately $84,250 USD. The web site has recorded 30,000 visits, which indicates that the cost per person for this awareness campaign was $2.80 USD. However, it is likely that many more people than those who visited the web site were made more aware of Great Lakes issues through campaign efforts. The Great Lakes Forever campaign did not measure behavior changes as a result of awareness efforts. Therefore, it is impossible to assess how effective it was at getting people to adopt sustainable gardening practices, such as reducing pesticide or fertilizer use.

The Chesapeake Club Spring Media Campaign[57]

This campaign strongly connects yard care and what many consider the most important component of any saltwater body—its seafood. The campaign's slogan is, "Save the crabs…then eat 'em," a simple but catchy phrase that uses humor to capture people's attention. The campaign uses TV ads, print ads, and billboards (see Appendix B) to promote the message that fertilizer should only be applied once in the fall season. In addition to the awareness portion of the campaign, their web site offers helpful yard care tips. They suggest taking a soil test to find out the best type and amount of fertilizer for your yard, applying it properly using only the amount of fertilizer needed. They also suggest using a slow-release fertilizer that releases nutrients more slowly into the soil, preventing excess nutrients in your grass and thus in the bay. They encourage using compost as a soil conditioner and leaving grass clippings on the lawn, which will act as a natural nitrogen-rich fertilizer. To help people make the right fertilizing choices, the Chesapeake Club has a very informative but easy to understand fact sheet series (see Appendix C). In addition, Chesapeake Club offers bay residents of DC, Maryland and Virginia the "Chesapeake Club Standard" lawn care services by listing a number of lawn care services on their web site who will provide the good-looking lawn that residents want, while practicing lawn care techniques that prevent fertilizer from ending up in the Chesapeake Bay that can kill blue crabs and oysters. Partnerships with lawn care

companies were created by providing them with publicity and free advertising if they practiced watershed-friendly lawn care. In addition, the web site lists Chesapeake Club restaurants, which are restaurants who commit to serving great seafood and saving the seafood in the bay.

No formal assessments of the effectiveness of the program in altering lawn care behavior were conducted. However, the Chesapeake Club operates under the larger umbrella of the Chesapeake Bay Program, which has been attempting to change behavior in the Chesapeake Bay regions for several years, with 2010 as their due date to have the bay "restored."[58] The Chesapeake Bay Program annually receives approximately $20 million USD from the Environmental Protection Agency for its appropriations.[59] There is some indication that the program's efforts are improving water and habitat quality in the bay. Submerged aquatic vegetation beds are thriving in some of Virginia's western shore freshwater areas, and widgeon and eelgrass beds in the middle of the bay have rebounded from last year's late-season loss and are doing well.[60] As well, the volume of oxygen-deprived water in the bay's main stem in early August was twice as low as the amount measured at the end of July and lower than the historical average for early August.[61] However, scientists did not attribute the improved oxygen condition to improved lawn care practices but to the timing of a rain downpour that may have prevented nutrients in the runoff from affecting the bay.[62]

Watershed Pledge Program (WPP), Fish, Wildlife & Recreation Program of the British Columbia Institute of Technology (BCIT)[63]

BCIT's Watershed Pledge Program was instigated in 1999 out of concern for watershed health. It is designed to encourage community support and involvement around water resource sustainability and is structured around four key principles: awareness, education, action and recognition. Home and business residents of the Brunette River watershed (approx. 175,000 people) are asked to "Take the Pledge" by adopting one or more of the related behaviors to the following watershed-related activity groups: runoff, lawn care, in the garden, landscaping, in the home, the car and pets. A person can pledge to improve their fertilizer-related behaviors under both "lawn care" and "in the garden" categories. To pledge, a person reads through the seven pledge categories on the WPP web site. They then fill in their contact information and have the option of checking off all or some of the 31 behaviors related to all seven above-mentioned activity groups, committing to making behavior changes. Commitment is one of many behavior change tools used to motivate people to make behavioral changes. Public commitment is better than private commitment, and written is better than spoken. This program uses written commitment, which may convert into a public commitment. Those who make web-based commitments are subsequently mailed a plaque to display on their lawn (see Appendix D), as well as a fridge magnet (see Appendix E). If utilized, the plaque could help foster community lawn care norms, while the magnet can act as a prompt to remind the person to engage in the sustainable behavior.

Through this program, more than 8,000 booklets have been distributed to homeowners of the Brunette River watershed and an extra 1,800 to interested citizens in other communities, schools and at public events.[64] From the program's inception in 1999 to

2002, approximately 3,700 pledges have been registered, the majority from the greater Vancouver region.[65] There are no formal assessments of this program, but judging by the community-based techniques they used and the number of pledges registered, the program has had some impact at least on making people more aware of the issues and facts about nonpoint-source pollution.[66]

Edmonds Environmental Services TSOM and TSWM, Halifax County, Nova Scotia[67]

Edmonds Environmental Services was established in 1989 as a division of Edmonds Landscape and Construction Services Limited. Recognizing the need for scientific proof as to the effectiveness of nonchemical landscape management, Edmonds launched "Total System Organic Management of Turfs" (TSOM) on the Oaks experimental site at Saint Mary's University campus in Halifax, Nova Scotia. The project involved a series of experiments to demonstrate the environmental and economic benefits of an organic approach to turf management.

Around the same time, Edmonds was approached by Halifax County to explore methods to improve the water quality of First Lake in Lower Sackville that did not rely upon significant expenditures for after-the-fact cleanup of the lake. Edmonds formed partnerships with local researchers, governments and homeowners of First Lake to develop the "Total System Watershed Management" (TSWM) project. The project consisted of two phases. In the Phase 1, TSWM divided 38 households into control and test groups to measure how organic lawn care practices would impact water quality in the lake. In Phase 2, TSWM encouraged the entire watershed population of 2,200 households to adopt a number of proactive techniques. They continued with sampling and analysis of water quality and provided residents with feedback as to the effects of their household practices on water quality in the lake.

Through TSOM, there was a reduction in pesticide and chemical fertilizer use and a reduction in spending on water cleanup. Phase 1 of TSWM showed an 80% reduction in total phosphorous levels and a 50% reduction in fecal coliform bacteria. The two projects overall resulted in a cost reduction of 10%–15%. Because this program encouraged more than a reduction in fertilizer use for the improvement of the watershed, it is difficult to assess how effective the program was at reducing fertilizer use from Phase 2 of the TSWM project.[68]

Florida Yards & Neighborhoods (FYN), Florida

FYN is a program organized through the University of Florida Cooperative Extension Service, with many other supporters including the Institute of Food and Agricultural Sciences and Florida's water management districts.[69] [70] The program is conducted at the local level by county extension offices, and there are approximately 44 counties who sponsor FYN programs. The program is based on the premise that residential yards are the frontline of defense against groundwater pollution; thus Floridians must reduce the runoff of harmful fertilizers and restore more natural habitats.[71] FYN encourages homeowners to landscape to reduce water consumption and minimize or eliminate fertilizer and pesticide use.[72] They encourage nine landscaping principles: right plant,

right place; water efficiently; mulch correctly; recycle; fertilize appropriately; manage yard pests responsibly; attract wildlife; reduce stormwater; and live responsibly on the water.[73] The program educates by answering three important questions: (1) Will it save me money? (2) Will it save me time? and (3) Will I have a better product?[74] Program leaders help homeowners set goals for their yards and consider how much time and money they want to spend mowing and fertilizing grass.[75] After encouraging homeowners to set goals, they educate residents through community outreach and free water-friendly, Florida-friendly workshops.[76] Workshops are held at the community level and are sponsored by a city or county water utility.[77] They also distribute environmentally friendly landscaping instructional booklets and brochures.[78] Crucial to the program's success is overcoming the stereotype that water-friendly yards are rocky and unattractive.[79] Residents are given an extra incentive to plant Florida-friendly yards because they can certify their lawns and receive a sign that can be displayed in their yard (see Appendix F). Such signs may help to foster norms within the neighborhood as well.[80]

The FYN handbook provides everything a person needs to know to create his or her own "Florida Yard."[81] The handbook offers tips on saving costs, environmentally friendly landscaping and advice on how to reduce water, fertilizer and pesticide use. It also provides tips for working with neighbors to share costs and labor.[82] The section on fertilizer suggests compost as the first alternative to consider, but also highly recommends a slow-release, water-insoluble nitrogen and other essential nutrient fertilizer.[83] The handbook presents it as "the most environmentally safe and cost-effective alternative."[84] It does mention that water-insoluble nitrogen fertilizers usually cost more, but that fewer applications will be needed and that in the end, a few dollars can make a big difference in protecting Florida's water.[85]

Since the program's inception in Orange County in 1999, over 12,000 people have attended FYN workshops and presentations.[86] Participants are given surveys to fill out at the workshops, as a pre-workshop assessment of lawn care knowledge and practices, and receive post-surveys in the mail six months later to measure whether the workshops helped to change targeted behavior.[87] Forty-nine percent of the 700 post-surveys mailed to attendees for workshops between 2002–2003 in Orange, Lake and Seminole counties were returned within three weeks of delivery.[88] The survey responses were very positive, indicating that 100% would recommend the FYN program to a friend, family member or neighbor. Many suggested that the program be made mandatory for all new Floridians.[89] More than 50% expressed appreciation to the utilities who sponsor the FYN programs, were impressed with the information they received in the workshop and said they were reducing their watering consumption and using less fertilizers and chemicals, all while remaining satisfied with the appearance of their lawns.[90] More quantitative evaluations of FYN were not available. Because separate counties run the program, there was no overall indication of the program's budget.[91]

Fertilizer Pilot

An effective strategy should simultaneously encourage a reduction in fertilizer use and a switch to slow-release fertilizers. As a consequence, the proposed strategy tackles both of these behaviors simultaneously. Further, the suggested methods can also be utilized to tackle concurrently reducing pesticide use (please review the pesticide reduction strategy, as both can be combined to reduce overall costs and labor).

Reducing fertilizer use will necessitate: (1) informing homeowners of the risks that are associated with overfertilizing lawns; (2) making it convenient for a homeowner to determine what *type* and *amount* of fertilizer to apply and how often; (3) increasing social pressure to reduce fertilizer use; and (4) making it convenient to obtain a slow-release fertilizer.

Communicating Risks: Messages regarding the risks associated with fertilizer overuse are best conveyed by a source that is perceived to be credible. Sources who are credible have both expertise on the topic and are perceived to be trustworthy. Personal conversations are likely to be the most effective in altering perceptions of the safety of fertilizers. More specifically, door-to-door visits by a credible source, such as a horticulturalist, may be sufficient to alter homeowners' perceptions. Face-to-face conversations are suggested due to their advantages over conducting workshops or running advertisements. Workshops are often not well attended and reach primarily those who are most interested in the topic. While advertisements can have a substantial reach, they often produce little or no behavior change.

It is suggested that a horticulturalist would go door-to-door in the late winter or very early spring requesting to speak to the homeowner who either looks after the lawn or who decides what lawn care company to hire. Since men perform most lawn care, it is suggested that the individual who goes door-to-door also be a male. This individual should be wearing photo identification and clothing that indicates that he is a municipal employee. The conversation should underscore that not only can fertilizers be harmful to the environment, but when improperly used, they also hinder having an attractive lawn. Since many homeowners are motivated to have an attractive lawn, this message is likely to capture the attention of the homeowner.

Determining the Type of Fertilizer to Apply and How Often: The door-to-door visits provide a unique opportunity to provide homeowners with a service that can be done quickly and is likely to be seen as valuable by the homeowner. One challenge that is faced by all homeowners who self-apply fertilizer is knowing how much should be applied and how often. To answer this question requires that the owner know the square footage of both their front and back yards. To facilitate this knowledge, the owner can be offered a free service in which the front and back yards are measured and a label is applied to their spreader indicating the appropriate amount of fertilizer that

should be applied to both yards. This sticker should also include a reminder to use only slow-release fertilizer and the frequency with which it should be used.

Increasing Social Pressure to Reduce Fertilizer Use: As with pesticide use, fertilizer applications are tied to homeowners' desire to have an attractive lawn and their perceptions that others in the community expect them to have an attractive lawn. Fortunately, it is easier to have an attractive lawn while reducing fertilizer use than it is to have an attractive lawn and reduce pesticide use. While the latter involves adopting a variety of alternative lawn care practices, reducing fertilizer use and switching to slow-release fertilizers can, as noted earlier in this report, be accomplished quite easily.

After explaining both the importance of reducing fertilizer use and switching to a slow-release fertilizer, the homeowner should be asked if they will make a commitment to reduce their fertilizer use as well as switch to slow-release. Since both actions are "invisible" in the larger community, it is important to ensure that homeowners who elect to change their fertilizer use are recognizable. This can be easily accomplished by asking if a sticker can be applied to their recycling container, which indicates that they are reducing their fertilizer use to protect water resources (the actual message should be market-tested). Affixing a sticker to the side of a recycling container makes the behavior of the homeowner visible to the larger community and increases the likelihood of residents discussing fertilizer use (social diffusion) as well as the development of an expectation that this is a socially expected behavior (social norms). It is suggested that if the homeowner consents to having the sticker attached to their recycling container, that he or she be told that the sticker will be placed on the container on the next recycling day and that the homeowner be asked to remember to put their recycling container out on that day. Asking homeowners to apply the sticker themselves will result in substantially fewer stickers being applied.

If the homeowner has fertilizer applied by a lawn care company, they should be asked to make a commitment to ensure that the company is only applying slow-release fertilizer and with the appropriate frequency. Certifying local lawn care companies with respect to fertilizer application and developing a brand that applies to this certification can facilitate this. Lawn care companies should be asked to include this brand in their advertising so that homeowners can easily determine that they provide this service. To further enhance knowledge of this brand, the recycling container sticker should carry this brand.

Making it Convenient to Purchase a Slow-Release Fertilizer: The home visits also provide the opportunity for the homeowner to purchase a slow-release fertilizer without having to go to a local store. By providing the opportunity to purchase a slow-release fertilizer directly, the likelihood of its use can be increased dramatically over requiring the homeowner to go to a store to purchase it. The purpose of providing the homeowner with the opportunity to purchase the slow-release fertilizer directly is that it greatly enhance the likelihood that the slow-release fertilizer will be used — providing the owner with firsthand experience that an attractive lawn can be had with this product.

In addition to providing the homeowner with the opportunity to directly purchase slow-release fertilizer, they should also be informed that local stores carry slow-release fertilizer and that they can identify the appropriate fertilizer to use by prompts that will be displayed in front of the product. These prompts would, of course, carry the brand noted above. This will, of course, necessitate working with local retailers to showcase slow-release fertilizers and have the brand be associated with them.

Pilot Evaluation

To assess the effectiveness of the proposed strategy, it is suggested that three pilot areas be selected in three different communities. Random assignment of households cannot be used with this pilot, as the development of social norms regarding fertilizer use is a key part of the methodology. As a consequence, the three areas selected in each of these three communities need to be matched closely based upon factors such as property values, size of lots and social-economic data. In addition, the stormwater system for each pilot area has to service just the pilot area. In order to evaluate the effectiveness of this pilot strategy, it is essential to be able to monitor nitrogen, phosphate and potassium in the stormwater system for each of the pilot areas and to be able to do so with the knowledge that levels of nitrogen, phosphate and potassium recorded in the stormwater system are originating in the pilot areas and nowhere else. Due to the importance of this requirement, the size of the pilot area has not been specified, as it will have to be determined instead by the ability to meet this requirement. In other words, each household in the area serviced by the stormwater system will be a member of the pilot area. Every attempt should be made to have these pilot areas be as close as possible in size.

Each of the three community areas would be randomly assigned into one of three pilot conditions: (1) the proposed pilot set out above; (2) receiving information about fertilizer use via a direct mail or drop-off campaign; and (3) the control group, where no information is provided or contact made with households.

The primary form of evaluation will be based upon measurements of nitrogen, phosphate and potassium in the stormwater system after rain events. Ideally, these values should be recorded for the spring, summer and fall before the pilot is put in place to establish a baseline for these three community areas prior to conducting the pilot. These values would then be recorded for the year that the pilot was enacted and for one or more years afterward to ascertain if homeowners are continuing to alter their behavior. In addition, electronic inventory data for the purchase of slow-release fertilizer should be sought from the participating stores, though this data is likely to be inconclusive given the size of the pilot areas relative to the size of the communities from which they are drawn. Finally, the lawn care companies that are certified as providing slow-release services should be asked to provide information on the number of homes in the pilot areas that requested slow-release services relative to the percentage of homes that requested these services in areas outside the pilot areas. This information should be sought for each of the three communities.

Endnotes

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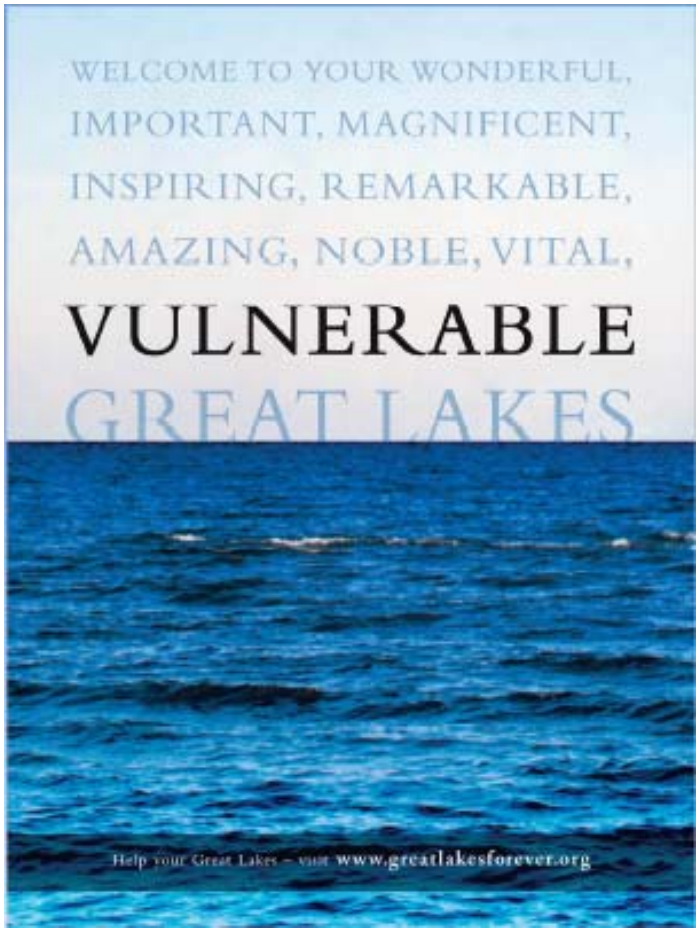
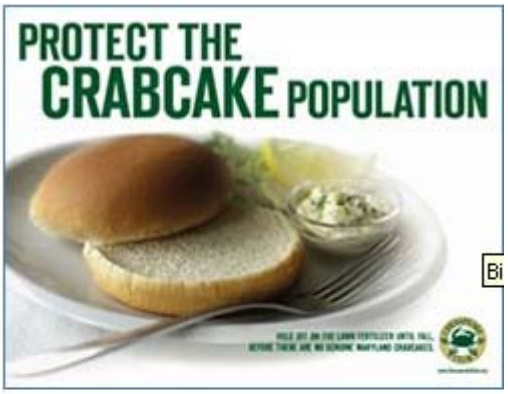
Appendices

Appendix A



Appendix B


NO APPETIZERS WERE INJURED
IN THE MAKING
OF THIS LAWN


PROTECT THE
CRABCAKE POPULATION


THE LUNCH
YOU SAVE
MAY BE
YOUR
OWN


IS THE GRASS REALLY
GREENER IF ALL OF THE
BLUE CRABS ARE GONE?

Appendix C


2
Use Fertilizers Wisely
Protect the Chesapeake Bay
Fertilizers and the Chesapeake Bay
Backyard Actions for a cleaner Chesapeake Bay...
2

Appendix D

Appendix E

Appendix F


The Florida Yard
With a Florida Yard you win and so does Citrus County's environment. A "Florida-Friendly" landscape doesn't waste water, fertilizers or pesticides. It helps protect and restore our natural ecosystems including our water resources.
The Florida Yard incorporates the following 9 principles:
Right Plant/Right Place
Watering Efficiently
Mulching
Recycling Yard Debris
Fertilizing Appropriately
Controlling Yard Pests Responsibly
Controlling Wildlife
Attracting Wildlife
Protecting the Waterfront
Reducing Stormwater Runoff
An alternative to Cypress mulch is recommended. The harvesting of Cypress for the purpose of mulch production contributes to the decline of water recharge areas.
This educational ad provided by the University of Florida Citrus County Extension Office, supported by the Citrus County Board of County Commissioners. For more information, contact your local Extension Office. 726-2141.