

Some Unintended Consequences Associated with Certain Urban Fertilizer Ordinances

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Editor's note: More unintended consequences, a list of related research and extension references, and more details about this topic can be found at <http://edis.ifas.ufl.edu/SS496>.

Plants require nutrients to achieve certain goals such as increased yields, improved fruit quality, improved human health characteristics of food plants, improved vigor for ornamental plants, healthier turfgrass to control runoff, etc. Fertilizer should be thought of as supplementing the native nutrients already in the soil to help plants perform better. Using fertilizer correctly for environmental protection and crop performance involves a careful balance of factors such as the correct amount, appropriate timing and placement of applications, best selection of nutrients needed, best sources and forms of the fertilizers, and optimum water (irrigation) management. Greatest efficiency, and minimized fertilizer nutrient loss occur where the plant nutrient requirements are understood (the amount of fertilizer needed to supplement the nutrients in the soil), and where best management practices (BMPs) are followed so the plant receives the benefit of the fertilizer and negligible amounts are lost.

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Counties and local municipalities in Florida are taking several approaches, including voluntary and non-voluntary means, to comply with the TMDL (need to spell out what TMDL is) limits. Fertilizer ordinances are being used as a regulatory approach in several counties and municipalities. These ordinances include many logical and science-based aspects, such as applying fertilizer at recommended rates, using appropriate fertilizer sources including controlled-release fertilizers, soil testing for P, removing fertilizer, turf clippings and plant materials from impervious surfaces, implementing fertilizer-free zones near water bodies and using appropriate irrigation practices.

Sometimes well-intentioned guidelines, rules and ordinances may lead to unintended consequences that were not foreseen in the rule-making process. In the case of fertilizer ordinances, the unintended consequence could be an inadvertent increase in potential nutrient losses to the environment as a result of aspects of a well-intentioned ordinance.

One regulatory approach that has been popular in the ordinances of some counties and municipalities is a restricted period (also called a “black-out” period) where N and P fertilization of turfgrass is prohibited during the summer “rainy” period, typically June 1 through September 30. The underlying reasoning behind the fertilizer restricted period is concern over fertilizer runoff and leaching during frequent and heavy rainfall events in the summer. The research on this subject, however, points to possible problems associated with severely restricting fertilizers on turf and landscape plants during their most active growing period on sandy and/or compacted soils with low nutrient- and water-holding capacities. These unintended consequences could result in increased nutrient application, increases in nutrient leaching and run-off into water bodies, and increased soil erosion, among other problems. This article discusses the research behind turfgrass growth, biology and ecology, and soil nutrient cycling in the lawn. The unintended consequences of fertilizer ordinance restricted periods are presented to open dialogue among the stakeholders in the ordinance issue and to ensure that all information is presented to completely inform the policymaking process.

The University of Florida Institute of Food and Agricultural Sciences (IFAS) Cooperative Extension Service has fertilization recommendations for turfgrass, and the amounts of fertilizer recommended for the summer months are the minimal amount required to maintain healthy turfgrass and minimize any losses of nutrients to the environment (see <http://edis.ifas.ufl.edu> and search for your topic of interest). The authors understand the need to properly manage nutrients in the environment and the need to apply well-thought-out and science-guided controls on fertilizer use to prevent negative impacts to our environment. We offer science-based alternatives to the strict, calendar-based (summer) fertilizer restricted period approach to encourage new habits for managing nutrients in the residential landscape and to achieve everyone’s improved water quality goals.

Unintended consequence #1: Turfgrass not adequately fertilized will decline in vigor potentially leading to increased leaching of nutrients during the summer, and of fertilizer applied after the restricted period.

- Turfgrass needs adequate and consistent nutrition for optimal health, and healthy, actively growing turf is excellent at absorbing nutrients. The current Extension fertilizer recommendations for turfgrass

emphasize applications of controlled-release N in the summer. Recent research in a Florida Department of Environmental Protection (FDEP) funded project by Trenholm, et al., in Florida shows little N leaching in the summer from a well-maintained lawn that is fertilized (and irrigated) according to research-based recommendations in Florida. In research with well established and maintained St. Augustinegrass turf, inorganic N leaching was low with concentrations of $\text{NH}_4\text{-N}$ and $\text{NO}_3\text{-N}$ in drainage generally less than that reported for precipitation in southern Florida. Figure 1 shows that more fertilizer is potentially lost from applications made during the year when the turfgrass is not growing as actively as it is in the summer.

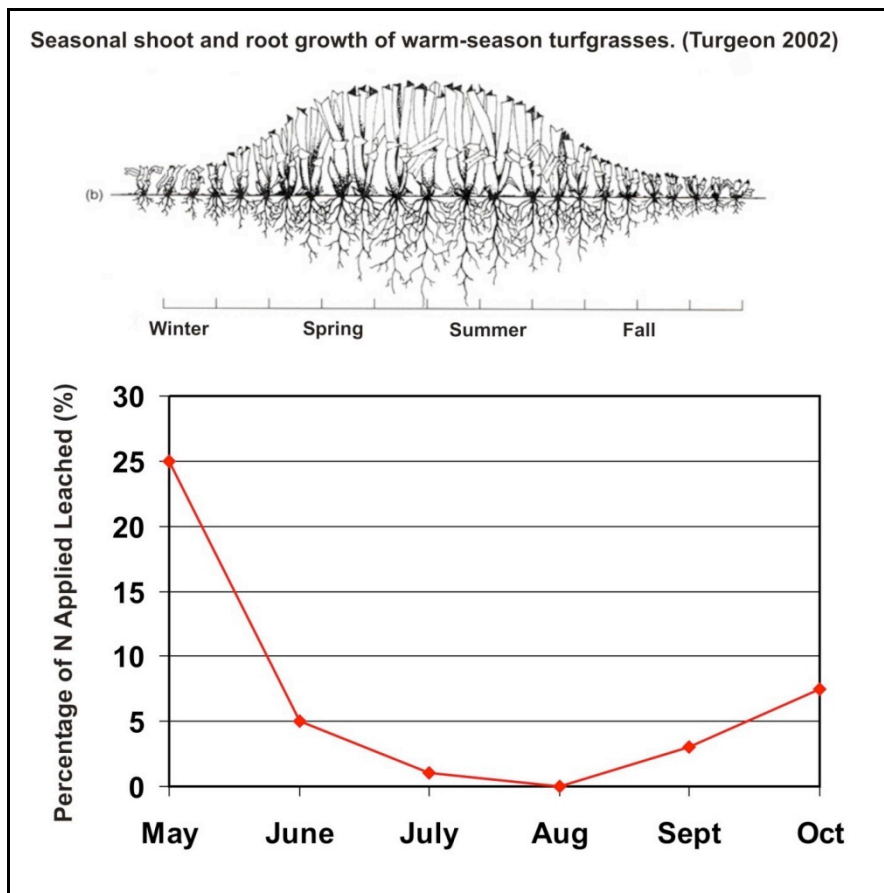


Figure 1. Growth of warm-season turfgrass (top) and N leaching during season (bottom-after Sartain).

- Turfgrass that does not receive adequate N and P will decline with time, leading to weaker turf with less dense root and shoot systems that are less capable of absorbing fertilizer rapidly. Warm-season turfgrass root growth typically declines in fall and winter months due to shorter days, cooler temperatures, and less sunlight (Figure 1). A grass that does not receive adequate nutrition at the proper time

would experience even more decline. This decline might not be immediate upon imposition of a restricted period, due to residual and native nutrients held in the soil, but would become evident in succeeding years as these nutrients are used.

- Treating N-deficient turfgrass during a restricted period with other nutrients, such as iron or potassium, to get “green-up” will not cure the underlying N deficiency and the shoot and root system will continue to decline.

Unintended consequence #2: Unhealthy turfgrass will decline in soil coverage, leading to more leaching, more weeds, and to more soil erosion and nutrient runoff.

- Weak turf will lead to bare-soil areas where weeds will likely invade, which may lead to an increased use of herbicides. Bare-ground patches would lead to more N leaching when fertilizer applications resume following the restricted period. Bare areas also are most prone to erosion and increased nutrient runoff from the lawn. Turfgrass acts to reduce the velocity of the runoff and also filters particulates and contaminants from the water. By reducing the velocity of the water, increased infiltration will occur resulting in groundwater recharge, and increased nutrient uptake by turfgrass will occur. Healthy turf captured the runoff from a 10% slope reducing the N concentration in the runoff to that in the actual rain water.

Unintended consequence #3: A strict, calendar-based restricted period may encourage poorer fertilizer management habits.

- Individuals with particular concerns about the long restricted period may apply extra N fertilizer prior to the restricted period, thinking that the extra N will last throughout the restricted period. This practice could result in considerable loss of soluble N to runoff and leaching before the turfgrass has had time to take up all nutrients. Poor fertilizer habits in other parts of the year (when fertilization is allowed), such as not sweeping fertilizer and grass clippings off of impermeable surfaces, is just as likely as in the summer. Excessive leaching and/or runoff could result with excessive application of either soluble or controlled release N products during these periods. Figure 1 shows that, when leaching is considered, the periods before and after the summer restricted period should be of at least equal concern as the actual summer period (when the turfgrass is growing and absorbing nutrients).

Unintended consequence #4: Focusing solely on the summer rainy period neglects the remainder of the year when leaching and runoff also can occur, especially just before and just after the summer restricted period.

- A problem with the summer restricted period ordinance approach is that it addresses only one-third of the year. Only about 10 to 15% of all rainfall events in Florida are one inch or more, those most likely to result in nutrient leaching. There are other times in the year with these same leaching rainfall events, especially in the fall. An unintended consequence might be the uncontrolled fertilization by homeowners during the rest of the year to “get ready for” or to “recover from” the negative effects of the restricted period. Thus, implementation of a restricted period in fertilization maintenance of a home lawn could lead to greater overall mismanagement of fertilizers in the urban environment.

Unintended consequence #5: Focusing solely on fertilizer and neglecting irrigation management practices could lead to more leaching and runoff of nutrients.

- Any attempt to minimize N pollution from the urban landscape will be for naught if irrigation best management practices are not included in fertilizer guidelines. Automatic operation of irrigation systems during the rainy-season period (when not needed) intensifies the leaching and runoff potential. Irrigation and fertilization practices go hand-in-hand. Properly fertilized and irrigated turf is one of the most environmentally sound plant systems available. Research has shown that over-irrigation can result in losses of significant amounts of fertilizer. Proper irrigation management is critical to preventing nutrient losses.
- Day-of-the-week watering restrictions may encourage over-watering on “your day.” This could compound the problem of soluble fertilizer being leached when applications are being made just before, or after, the restricted period.

The University of Florida summer rainy-season N fertilizer management strategy for inclusion in a fertilizer ordinance

The authors support good nutrient and water management practices for turf and landscape plants. Research shows turf to be very good at accumulating nutrients and mitigating leaching when actively growing in the summer. The unintended consequences described above should be of intense interest to those interested in developing ordinances for preventing nutrient pollution.

We believe there are two science-based approaches to avoid the unintended consequences of a summer restricted period described above.

One strategy would be to use the Green Industries Best Management Practices Guide <http://www.dep.state.fl.us/water/nonpoint/docs/nonpoint/grn-ind-bmp-en-12-2008.pdf> for managing fertilizers year-round. Controlled release fertilizers are recommended for the summer rainy period. These guidelines have been developed to provide research-based information about properly managing fertilizers and irrigation water to prevent losses of nutrients to the environment. Strong and effective education about fertilizer use is the key to any successful best management practice.

Second, if the county or municipality feels they must invoke a **summer** fertilizer "restricted" period, then we hope this document will assist in determining the details of the restricted period. We propose the following reasonable and workable strategy and best management practice during any summer fertilizer restricted period:

Allow application of fertilizer containing no more than 0.5 lb per 1000 sq. ft. soluble N (total N limited to 1.0 lb per 1000 sq. ft) during the summer restricted period to correct a professionally (BMP-trained county agent or BMP-trained turf professional) diagnosed/predicted nitrogen deficiency in the turf. This approach is consistent with the UF/IFAS turf fertilization recommendations, which are based on more than 20 years of research, the Green Industries Best Management Practices Guide, the FDACS Urban Turf Rule and the FDEP Model Turf Ordinance.

Color is highly related to the N status of the turfgrass. A very good quality grass (healthy, actively growing and good visual quality) would be one that is rated 7.0 to 8.0. One that is rated a 9.0 would be very healthy but possibly somewhat excessively fertilized. Considering also environmental and economic factors, it is best to manage turf in the range of 6.0 to 7.0 (with tissue N > 2.0 %), which would be rated a "good" to "very good" quality turfgrass.

In summary, considerable research has been conducted on turfgrass fertilization and water management in urban environments. Much information already is embodied in best management recommendations for environmental protection and should be incorporated into fertilizer ordinances. Part of solving the water quality problems associated with urban fertilizer management is to increase the adoption of known best fertilizer and irrigation practice technologies by homeowners. Another part of solving the problem is making the solutions logical and reasonable so there is a very high likelihood of adoption. There is a strong need for all stakeholders (scientists, environmental groups, lawn, landscape and fertilizer industries, state agencies, boards of county commissioners, local municipalities and others) to work together to develop and implement a lasting solution that everyone adopts and that future generations will continue to benefit from.