

Incorporating Woody Ornamentals into Residential Landscapes to Reduce Nutrient Leaching¹

Drew C. McLean, Andrew K. Koeser, Amy L. Shober, Zhixuan Qin, Gitta Hasing, and Richard C. Beeson²

Introduction

As the population of Florida grows, expanded development has the potential to increase non-point source pollution of surface- and groundwaters. A major concern in the state is the transport of nutrients, mainly nitrogen (N) and phosphorus (P) from residential sources such as fertilizers and grass clippings, to nearby water bodies. Nutrients from fertilizers applied to maintain the health and aesthetics of lawns and landscapes can be transported to nearby water bodies as runoff or leachate (water that drains through the soil profile), especially if applied inappropriately (Figure 1). Excess N and/or P that enters nearby water bodies can trigger excessive algae growth known as “blooms.” When this algae dies, populations of bacteria and other scavenging organisms increase exponentially, eventually depleting the oxygen in water. In severe instances of oxygen depletion, fish and other aquatic organisms can die. This degradation of water quality is a process known as eutrophication.



Figure 1. Residential lawn with a nearby stormwater retention pond
Credits: Gitta Hasing

1. This document is ENH1242, one of a series of the Environmental Horticulture Department, UF/IFAS Extension. Original publication date July 2014. Visit the EDIS website at <http://edis.ifas.ufl.edu>.
2. Drew C. McLean, biological scientist; Andrew K. Koeser, assistant professor; and Gitta Hasing, biological scientist; Environmental Horticulture Department, Gulf Coast Research and Education Center, UF/IFAS Extension, Gainesville, FL 32611. Amy L. Shober, assistant professor and Extension specialist, Nutrient Management and Environmental Quality, Department of Plant and Soil Science, University of Delaware, Newark, DE 19716. Zhixuan Qin, Ph.D. Candidate, Water Science and Policy, University of Delaware, Newark, DE 19716. Richard C. Beeson, associate professor, Environmental Horticulture Department, Mid-Florida Research and Education Center, UF/IFAS Extension, Apopka, FL 32703.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. For more information on obtaining other UF/IFAS Extension publications, contact your county's UF/IFAS Extension office. U.S. Department of Agriculture, UF/IFAS Extension Service, University of Florida, IFAS, Florida A & M University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Nick T. Place, dean for UF/IFAS Extension.

Limiting Water Pollution with Plant Selection

UF/IFAS Florida-Friendly Landscaping program offers a variety of landscape best management practices to reduce the environmental impacts associated with urban landscapes (<http://www.floridayards.org/>). One of the main principles of the Florida Friendly Landscaping program is “right plant, right place,” where landscape plantings are based on the specific use of the area. For example, one would plant shade-tolerant plants in areas with limited sunshine, and drought-tolerant plants in areas with excessively-draining soils. Similarly, the principles of “right plant, right place” may mean that turfgrasses are only installed in sunny areas where the turf will be utilized for outdoor activities.

Florida landscapes are especially prone to nutrient losses in leachate because they are dominated by sandy soils and receive a large amount of rainfall annually. One way to help limit the loss of nutrients from residential landscapes is to consider the type of vegetative cover planted. Incorporating lower-maintenance ornamental plants as a replacement for turfgrass areas may help reduce the overall fertilization demand of your landscape while also reducing potential nutrient loss from the fertilizers that are applied.

Recent research at the University of Florida evaluated the effects of differing proportions of turf and ornamental cover on nutrient leaching losses from established (more than two years after planting), mixed-species landscapes. The work was conducted at the Mid-Florida Research and Education Center in Apopka, FL, and utilized large-scale lysimeters, (145 ft² basins designed to collect water draining through the soil) to assess nitrogen and phosphorus losses associated with three simulated landscape designs. These designs (based on coverage at planting) were:

- 90% turfgrass, 10% woody ornamentals;
- 75% turfgrass, 25% woody ornamentals; and
- 60% turfgrass, 40% woody ornamentals.

All three landscapes used St. Augustinegrass [*Stenotaphrum secundatum* (Walter) Kuntze ‘Floritam’] as the turf cover and included one magnolia (*Magnolia grandiflora* L. ‘D.D. Blanchard’) tree. The 75% and 60% turfgrass treatments also contained sweet viburnum (*Viburnum odoratissimum* Ker Gawl.) shrubs. Turfgrass areas within the plots were fertilized using UF/IFAS recommendations (Trenholm 2005) and were not fertilized June through August. Woody

ornamental areas were fertilized at industry-accepted landscape production rates.

The results suggest that replacing turf with woody ornamentals may help reduce the amount of nutrients lost in leachate from residential landscapes. Irrigation demand was nearly halved, and the volume of leachate (draining water) collected from the lysimeters was significantly reduced when woody ornamentals coverage increased from 10% to 40%. This 30% increase in woody ornamental coverage also resulted in a 70% decreased of N and P loads (concentration in leachate x leachate volume). The researchers conclude that differences in the maintenance requirements (i.e., irrigation and fertilizer inputs) combined with differences in root system morphology between turfgrass and woody plants contributed to these results.



Figure 2. Residential landscape planted with mixed vegetation coverage
Credits: Gitta Hasing



Figure 3. Residential landscape that is dominated by turfgrass monoculture
Credits: Gitta Hasing

Scientists have conflicting views about which landscape designs (i.e. turfgrass monoculture vs. a mixture of turf and woody ornamentals) are least detrimental to the state's water resources. Earlier studies that compared nutrient leaching from recently installed (within one year after planting) landscapes showed that nutrient losses from mixed ornamental plots were actually higher than those seen with newly laid sod. However, woody ornamentals typically take more time than turfgrass to become established. The root system of a newly-planted woody ornamental may not take up water or nutrients fully as it recovers from the stresses of transplanting. The results from this more recent work by Qin et al. (2013) indicate that home landscapes planted with a mix of vegetation (Figure 2) may help to reduce nutrient losses compared to a landscape dominated by a turfgrass monoculture (Figure 3) once woody ornamentals have become established.

When deciding whether to increase the percentage of your landscape covered with trees and shrubs, it is important to make informed selection decisions. How much space (above- and below-ground) does a given species of woody ornamental need to reach its maximum potential? What are its soil, water, and light requirements? Is the tree or shrub suited for your hardiness zone? What is the intended function of the area? Not all woody ornamentals will work in a given landscape design. For example, live oak (*Quercus virginiana*) typically grows too big for most street-side planting spaces, especially if a sidewalk is present. This mismatch can lead to greater long-term maintenance and care demand.

Recommendations

Urban landscapes in Florida are typically dominated by turfgrass monoculture, with ornamental landscape plants comprising only a small portion of the landscape. Incorporating more woody ornamentals into your landscape can reduce fertilization and irrigation demand and help reduce nutrient leaching losses from your yard—a combination that will help protect Florida's water resources. When adding woody plants it is important to adopt “right plant, right place” principles, as poorly sited landscape plantings may not function to their full potential without additional inputs and maintenance. The University of Florida offers many references, including its Florida Friendly Plant Database (<http://www.floridayards.org/fyplants/index.php>) and other EDIS articles (<http://edis.ifas.ufl.edu/ep456>), to facilitate making informed plant selections and designing a planting plan.

References

Qin, Z., A.L. Shober, R.C. Beeson Jr., and C. Wiese. 2013. Nutrient Leaching from Mixed-Species Florida Residential Landscapes. *J. Environ. Qual.* 42:1534-1544.