# Stormwater Best Management Practice

# Municipal Landscaping

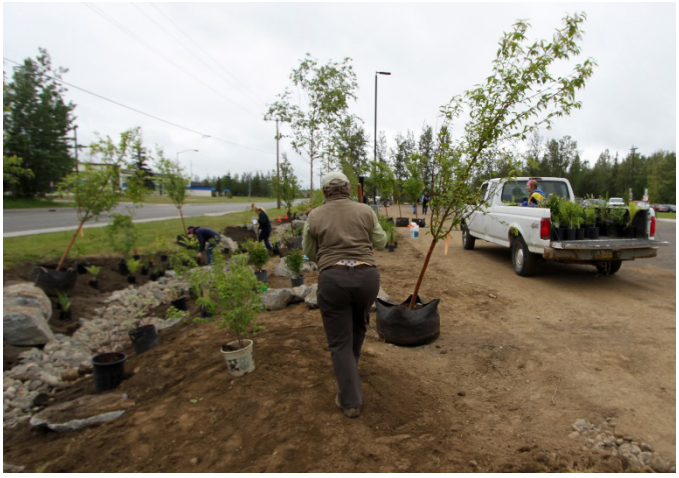
**Minimum Measure:** Pollution Prevention/Good Housekeeping for Municipal Operations
**Subcategory:** Municipal Activities

## Description

Municipal landscaping involves a number of activities that can contribute to water quality impacts. Improper use of fertilizers and pesticides can lead to increased concentrations of nutrients and chemicals in stormwater, while poor grass and vegetation management can lead to export of soil and organic matter. Proper landscaping practices can reduce these impacts and can also provide water quality benefits.

There are many benefits to environmentally friendly landscape design. First, proper site planning can reduce maintenance requirements by using native species that often need less upkeep than non-native species. Soil analysis can prevent overfertilization by eliminating uncertainty regarding existing soil fertility. Minimizing turf area by replacing it with alternative ground cover, shrubs and trees increases infiltration and reduces mowing requirements, which subsequently reduces air, water and noise pollution. Mulches stabilize exposed soils, prevent growth of nuisance vegetation, and improve soil fertility through the slow release of nutrients from decomposition. Ensuring the proper application of pesticides and fertilizers and preventing overuse reduces the potential for contamination of downstream waterways. Finally, a diverse landscape can enhance a property's aesthetics.

Municipal landscaping programs also offer the opportunity to set a good example for residents. To reduce pesticide use and encourage the use of less-toxic alternatives by municipal crews, King County, Washington, and the City of Seattle began to phase out the use of dozens of pesticides in 1999 as part of an overall pesticide reduction strategy. The decision followed criticism that while the municipalities were urging residents to stop using weed killer and pesticides in yards to help endangered Chinook salmon, they were allowing municipal crews to apply herbicides in municipal parks and along roadsides (Johnson, 1999). Pesticide use and conversion of natural habitat to turfgrass also affects pollinators, which are vital to agricultural production. The Bee City USA program seeks to bolster pollinator habitat by increasing the abundance of native plants and reducing the use of harmful pesticides. Currently, over 100 cities are "Bee Cities," which means they commit to incorporating pollinator-friendly landscaping practices into their policies and plans.



Replacing turf with native species, trees and shrubs can reduce maintenance and fertilization requirements.
Photo Credit: Katrina Mueller/U.S. Fish & Wildlife Service

## Applicability

Turf or other vegetation can cover a significant percentage of the land a municipality owns—and it often needs regular maintenance. Municipalities can use environmentally friendly lawn and garden practices on their properties, and they can encourage residents to use the same practices in their yards. Such practices include landscape planning, integrated pest management, planting indigenous species, soil testing, and the reduction or elimination of fertilizers and pesticides. Planting drought-resistant plants and using water conservation practices can be especially useful in areas of low rainfall. Areas of high rainfall experience more erosion, so protecting exposed soils with vegetation and mulches is of particular importance in these areas.



EPA-832-F-21-030F
December 2021

## Siting and Design Considerations

The following guidelines describe ways in which municipalities can promote environmentally friendly landscaping techniques.

***Planning and design.*** It is important to develop a landscape plan that recognizes the property's natural conditions including drainage patterns, soils, existing vegetation and climate. The plan should group plants together according to their water needs. It should also consider the site's intended use. A thoughtful landscape plan will promote natural vegetation growth and minimize water loss and contamination. Alternatively, water-smart landscaping, similar to xeriscaping, uses drought-tolerant vegetation along with non-vegetation components such as gravel, rocks or mulch that can add aesthetic appeal, maintain infiltration rates and reduce irrigation requirements (EPA, 2013). Residents and municipal staff can partner with local nurseries and irrigation and lawn services to determine appropriate landscape designs for a specific site or facility. Planners can also incorporate green infrastructure into landscape designs (see the box to the right) to provide further stormwater benefits.

Several EPA resources are available to help municipalities identify ways to incorporate green infrastructure into existing municipal landscaping, including:

- *Green Infrastructure in Parks* guide
- *Green Infrastructure Operations That Arise During Municipal Operations*
- *Green Infrastructure Operations and Maintenance*

***Soil analysis and improvements.*** Soil testing every 3 to 4 years by residents and municipal staff can help determine the amount of nutrients necessary to maintain healthy vegetation and can prevent overfertilization. Municipalities can encourage home and garden centers to market and sell soil test kits so that property owners can perform such tests on their own. Local extension offices or universities can often perform soil tests and are a good source of information on fertilization and watering rates that are appropriate for local soils and vegetation.

***Vegetation selection.*** Vegetation selection is a critical component of good landscaping practices. It dictates water use, fertilizer and pesticide use, maintenance requirements and site stormwater discharge characteristics. Property owners and municipal crews should use local or regional plants, which are generally more water efficient and disease resistant. Furthermore, exotic plants can potentially invade surrounding natural areas and local waterways. Local nurseries can assist in choosing appropriate regional plant species.

***Turf areas.*** Property owners and municipal crews should plant non-turf areas, where possible, because turf typically needs more water and maintenance than wildflowers, shrubs and trees. If they do use turf, they should choose a type of turf grass that can withstand drought and that becomes dormant in hot, dry seasons. Local nurseries can help property owners and municipal crews choose grass types. In addition, when maintaining lawns, crew should not cut the grass shorter than 3 to 4 inches. They should leave clippings—which carry important nutrients—on the lawn and keep them from ending up in streets and sidewalks. This allows the grass to absorb nutrients as natural fertilizer and prevents those nutrients from reaching downstream waterways, where they can cause eutrophication.

***Efficient irrigation.*** Irrigation requirements vary by climate, soil and vegetation type. Maintenance crews should follow an irrigation schedule that is appropriate for their site and an irrigation rate that is water efficient. Applying water too quickly causes it to run off, along with the top layers of soil. To prevent this, it is important to encourage the use of low-volume watering approaches such as drip-type or low volume sprinkler systems. In addition, overwatering can actually discourage plants from developing deeper roots, which makes them less resistant to drought. Automated irrigation controllers are a good way to provide regular irrigation, and to reduce irrigation rates when it rains to prevent over-irrigation and excessive stormwater discharge.

***Use of mulches.*** Mulches help retain water, reduce weed growth, prevent erosion and improve the soil for plant growth. Mulches usually contain wood bark chips, wood grindings, pine straws, nut shells, small gravel or shredded landscape clippings. Municipalities should consider mulch use and encourage property owners to use mulches and inform them of the benefits of these materials. Additionally, municipalities can start programs

to collect plant materials from municipal maintenance activities as well as yard waste from property owners. They can then convert these materials to mulch and use them at their own properties or redistribute them to property owners.

***Fertilizers.*** Municipalities should discourage property owners and municipal crews from using fertilizers—or, if they do use them, from over-applying them. Municipalities should consider less-toxic alternatives to commercial fertilizers, such as composted organic material.

Municipalities can also recommend practices to reduce the amount of fertilizer entering stormwater. For example, slow-release fertilizers are less likely to enter stormwater. Application techniques, such as tilling fertilizers into moist soil to move the chemicals directly into the root zone, reduce the likelihood that the chemicals will mobilize in stormwater. Timing is also important: property owners should fertilize warm season grasses in the summer (in frequent and small doses) and cool season grasses in the fall. They should not apply fertilizer on a windy day or immediately before a heavy rain. Municipalities can recommend that municipal crews and property owners apply fertilizer at rates at or below those recommended on the packaging—or based on the needs of the soil, as determined by a soil test. Municipalities should also encourage safe disposal of excess fertilizer and containers.

Municipal crews and property owners should change fertilization rates if they use reclaimed water, or "purple pipe" water, for irrigation. Reclaimed water contains important nutrients like nitrogen and phosphorus in concentrations that are often high enough to completely eliminate the need for supplemental fertilizer. Local extension offices or environmental departments can help determine the amount of nutrients in reclaimed water and can help calculate revised fertilization rates.

*Pesticides.* Municipal crews and property owners should use pesticides (like fertilizer) on lawns and gardens only when necessary. They can avoid pesticide use by choosing hearty plants that are native to the area and by keeping them healthy. If they need to use chemical pesticides, they should choose the least toxic pesticide that targets the specific pest in question (boric acid, garlic, insects, etc.). A pesticide labeled "caution" is less toxic than one labeled "warning," which in turn is less toxic than one labeled "danger/poison."

It is important to follow the label directions on the pesticide product. Property owners and municipal crews should read and follow all safety precautions listed on pesticide labels, including wearing of personal protective equipment, using recommended application methods, and washing hands and face before smoking or eating. They should always rinse tools or equipment used for applying or incorporating pesticides in a bucket and handle the rinse water as if it were full-strength pesticide. They can save any unused pesticide and dispose of it at a hazardous waste collection location.

The following websites provide education and information on safe pesticide use:

- University of Nebraska's pesticide education resources
- Pennsylvania State University Extension's information on insects, pests and diseases
- Washington State University's Urban integrated pest management and pesticide safety courses
- Beyond Pesticides
- Cornell University's Pesticide Management Education Program
- National Pesticide Safety Education Center
- Californians for Alternatives to Toxics

*Ordinances.* Pollution due to the improper use or overuse of fertilizers and pesticides is a problem in places around the country. Fertilizer and pesticide ordinances are a way municipalities can reduce or even eliminate fertilizer and pesticide use. The following resources provide information on states or municipalities that have implemented fertilizer or pesticide ordinances, including integrated pest management programs that have become models for other communities:

- The State of Maine's Municipal Pesticide Ordinances Web page provides examples of communities throughout the state that have implemented ordinances specific to their locations and the pesticides of concern.
- The City of Portland, Oregon's Invasive Plant and Integrated Pest Management Program has become a model for communities throughout the Pacific Northwest.

- Fertilizer ordinances in Florida that reduce or completely ban fertilizer applications have become increasingly common to protect local surface water and groundwater quality. Florida state statute encourages every county and municipal government to adopt and enforce a model ordinance or the equivalent, and even requires it in watersheds that have existing nutrient impairments.

## Limitations

There are virtually no limitations for implementing environmentally friendly lawn, garden, and landscaping practices. Some practices are more applicable in certain climates (for example, there is little need for irrigation in areas of very high rainfall), but they are generally low cost and relatively easy to implement. With guidance from a local environmental agency, extension service or nursery, municipality and property owners can make proper decisions about which practices are best.

## Effectiveness

Proper landscaping techniques benefit the environment by reducing water use; decreasing energy use (by decreasing the need for water pumping and treatment); maximizing infiltration of storm and irrigation water; minimizing transport of soils, fertilizers and pesticides; and creating more habitat for plants and wildlife.

Conventional landscaping requires considerable amounts of water. Although municipal water use varies, about 30 percent of the average household's water consumption is for outdoor uses like irrigation (Mayer et al., 1999). In warmer areas, irrigation can exceed 60 percent of total household use (Haley et al., 2007). Xeriscape practices, including reducing turfgrass coverage, can reduce this water consumption (U.S. EPA, 2013, 2017). A study in Colorado Springs compared water use between a traditionally landscaped area and two xeriscaped areas and found xeriscaping to provide water savings of 22 to 63 percent over traditional turfgrass (Colorado WaterWise, 2010).

Good landscaping practices can reduce fertilizer and pesticide export from landscaped areas through better application, ordinances that restrict their use, or conversion to ground covers that do not require their use. A U.S. Geological Survey study of suburban lawns found that stormwater flow from unfertilized lawns had half as much phosphorus as discharge from regularly fertilized lawns (Garn, 2002). Similarly, a comparison of surface water quality data before and after Ann Arbor, Michigan's implementation of a phosphorus fertilizer ordinance found statistically significant reductions in phosphorus concentrations (Lehman et al., 2009). Xeriscape practices can help reduce export of both fertilizers and pesticides by incorporating ground covers that need neither to thrive.

Low-maintenance landscaping can also have positive effects on habitat and biodiversity. Landscaping requiring more maintenance like frequent mowing and pesticide use can lead to reduced vegetation diversity (Bertoncini et al., 2012), which in turn leads to lower biodiversity. In a study of 18 suburban lawns, Lerman et al. (2018) found that less frequent mowing allowed for greater abundance of bees and pollinators owing to greater abundance and diversity of the small weeds and wildflowers they rely on.

## Cost Considerations

Proper landscape activities can be very cost effective. Promoting the growth of healthy plants that need less fertilizer and pesticide minimizes labor and maintenance costs of lawn and garden care. Using water, pesticides, and fertilizers only when necessary and replacing store-bought fertilizers with compost material can increase the savings for a property owner as well as benefit the environment. Reducing turfgrass cover reduces labor and equipment costs associated with regular mowing. Actual cost savings will depend on how much existing labor, maintenance and equipment costs can be reduced.

Costs associated with alternative practices vary widely depending on the features that are incorporated. Features may include vegetation (e.g., wildflowers, grass, shrubs, trees), irrigation systems (drip, sprinkler or none), and "hardscape" features (e.g., rocks, pavers, gravel). The Colorado WaterWise *Guidebook of Best Practices* provides costs for different levels of implementation, which range from $3–$4 per square foot for simple plantings and no hardscape to $20 per square foot for elaborate installations featuring an array of plantings, drip irrigation and hardscape features (Colorado WaterWise, 2010).

**Additional Information**

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

## References

Bertoncini, A. P., Machon, N., Pavoine, S., & Muratet, A. (2012). Local gardening practices shape urban lawn floristic communities. *Landscape and Urban Planning*, *105*(1–2), 53–61.

Colorado WaterWise. (2010). *Guidebook of best practices for municipal water conservation in Colorado.* Prepared by Aquacraft Inc.

Garn, H. S. (2002). Effects of lawn fertilizer on nutrient concentration in runoff from lakeshore lawns, Lauderdale Lakes, Wisconsin (No. 2002-4130). U.S. Geological Survey.

Haley, M. B., Dukes, M. D., & Miller, G. L. (2007). Residential irrigation water use in Central Florida. *Journal of Irrigation and Drainage Engineering*, *133*(5), 427–434.

Johnson, T. (1999). City, county to reduce their pesticide use: Most-hazardous poisons will be largely avoided. *Seattle Post-Intelligencer*.

Lehman, J. T., Bell, D. W., & McDonald, K. E. (2009). Reduced river phosphorus following implementation of a lawn fertilizer ordinance. *Lake and Reservoir Management*, *25*(3), 307–312.

Lerman, S. B., Contosta, A. R., Milam, J., & Bang, C. (2018). To mow or to mow less: Lawn mowing frequency affects bee abundance and diversity in suburban yards. *Biological Conservation*, *221*, 160–174.

Mayer, P. W., DeOreo, W. B., Opitz, E. M., Kiefer, J. C., Davis, W. Y., Dziegielewski, B., & Nelson, J. O. (1999). *Residential end uses of water.*

U.S. Environmental Protection Agency (U.S. EPA). (2013). *Water-smart landscapes start with WaterSense* (EPA 832-K-12-2002).

U.S. Environmental Protection Agency (U.S. EPA). (2017). EPA WaterSense water efficiency management guide—landscaping and irrigation (EPA 832-F-17-016b).

**Disclaimer**

*This fact sheet is intended to be used for informational purposes only. These examples and references are not intended to be comprehensive and do not preclude the use of other technically sound practices. State or local requirements may apply.*