

# Reducing Nonpoint Source Pollution in Residential Landscapes

## *BMPs for Wise Landscape Stewardship*

### How Clean Is Our Water?

We usually think of polluted water as a dark sludge pouring from a factory drainpipe. A more complex type of pollution, however, is known as nonpoint source or NPS pollution. It is more difficult to control since it occurs over a wide area, is difficult to trace to a clearly defined source, and occurs intermittently. Its severity can depend on the amount and intensity of rainfall, land surface area and type, topography, soil type, and human activity. Urban areas are major contributors to NPS pollution due to the large scope of their storm water runoff caused by paved surfaces and rooftops as well as the relatively high concentration of chemicals, waste materials, and other potential pollutants associated with lawn and garden activities.

In 1987 Congress created the Nonpoint Source Management Program to address the critical issue of NPS pollution. Additional amendments have been passed to address this continuing problem. Although tremendous advances have been made to clean up our aquatic environments by controlling point source pollution from industries and sewage treatment plants, NPS pollution remains our greatest source of water quality problems. It is the main reason that approximately 40 percent of rivers, lakes, and estuaries surveyed in the United States are not clean enough to meet basic uses, such as fishing or swimming.

### How Does Nonpoint Source Pollution Get Into Our Water?

During heavy rainfall, flooding, or excessive irrigation, the flow of water sweeps down impermeable surfaces such as concrete and pavement, collecting sediment, fertilizers and pesticides, automobile runoff, plant debris, and various pathogens on its way to storm drains. These storm drains are designed to collect storm water and prevent street flooding. Once the soil is saturated with water or has been replaced by an impermeable surface, this polluted water flows down drains, making its way through a series of pipes that pour directly into our estuaries and waterways. The results can be the presence of

human health risks from pathogens, wildlife habitat destruction, and pollution of aquatic environments. Storm water runoff has the greatest impact on NPS pollution although runoff of irrigation water from home landscapes can have influence as well.

### What Can Homeowners Do?

Table 1 shows that gardens and lawns are responsible for much of the NPS pollution entering our water. Responsible homeowners can take many positive actions to prevent NPS pollution. In each of these four critical areas, the goals should be to prevent or reduce pollution at its source whenever feasible and to reduce the use of water and chemical inputs.

**Table 1.** Nonpoint Source Categories

#### **Nutrients\***

##### *Sources:*

- Fertilizers, mostly phosphorus and nitrogen
- Animal waste

#### **Toxins**

##### *Sources:*

- Pesticides from home landscapes and lawns
- Urban runoff
- Landfills

\* Excessive

#### **Sediment**

##### *Sources:*

- Construction sites and new developments with little landscaping
- Established urban areas

#### **Organic Material**

##### *Sources:*

- Plant debris from home landscapes
- Animal waste-carrying pathogens

## ***Nutrient Management***

Fertilizers contain the macronutrients nitrogen, phosphorus, and potassium (NPK) that support plant growth. Unfortunately, these same nutrients that make lawns and landscape plants grow so well can cause, in contrast, problems when they enter our waterways through runoff or by leaching into the ground. Algae can multiply excessively, choking out native plants and disrupting fish and other wildlife habitats.

### **What You Can Do**

- Soil test annually to determine exactly what nutrients your soil needs. Apply fertilizers accordingly based on soil test results. Contact your county Extension office for more information about how to collect and submit soil samples for analysis.
- Compost yard trimmings instead of bagging them. Compost is a valuable soil conditioner that gradually releases nutrients to your lawn and garden. Using compost will also decrease the amount of fertilizer you need to apply. Your county Extension office has information on developing a compost pile.
- Keep storm gutters and drains clear of leaves and yard trimmings since decomposing vegetative matter leaches nutrients.
- Use controlled-release fertilizers, particularly on areas where the potential for water contamination is high, such as sandy soils, steep slopes, compacted soils, and verges of water bodies.
- Apply fertilizer according to current soil test results and follow instructions at the proper rate and season.

- Avoid applying fertilizer on sidewalks and driveways where it can easily wash into storm drains and eventually into creeks, streams, and rivers.
- Consider using an organic fertilizer such as cottonseed meal, fish emulsion, or bone meal. These add small amounts of nutrients and increase organic content of the soil.
- Check with your local sanitation department for regulations in your area regarding the disposal of pet wastes, which can cause problems since they can contain pathogens.

### ***Toxins***

Healthy plants are generally less susceptible to disease and insects; therefore, they have less need for pesticides. It is unrealistic to expect our gardens and landscapes to be totally disease or pest free. Good cultural practices can handle most of these problems on a daily basis. Integrated pest management (IPM) is an approach to plant care that emphasizes a combination of prevention, monitoring, record keeping, and treatment. Diseases require a host, a pathogen, and a favorable environment to develop and spread. This is known as the disease triangle. Without one element of the triangle, the others cannot exist. Eliminating one component will help eradicate the pest. Use pesticides only after monitoring indicates they are needed, and use treatments only on the target organism. Applications should be made using a method that minimizes risks to human health, beneficial organisms such as lady beetles and praying mantises, and the environment.

### **What You Can Do**

- Design for diverse plant species and a complex landscape ecosystem. This not only provides shelter for beneficial insects, but it ensures that one pest won't wipe out an entire plant species.
- Scout plants regularly to evaluate pest problems. First choose soaps or oils instead of more traditional chemical applications. Treat only the affected area.
- Use pest-resistant plant varieties.
- Remove diseased plants or plant parts from the garden to prevent spread of disease.
- Use pesticides strictly according to label directions and apply only the amount needed. Take appropriate safety precautions and never apply pesticides on a windy or rainy day.
- Create a natural buffer zone to filter runoff and provide a place to put yard waste for composting. Place birdhouses and hummingbird feeders in this area to create a wildlife habitat. Birds are voracious insect eaters and are fun and beautiful to watch as well as protect. Check with your county Extension agent and the Audubon Society or National Wildlife Federation for more information on attracting wildlife to your yard.

### ***Sediment***

Sediment is defined as loose pieces of sand, clay, and silt as well as other small particles. These small particles are major contributors to NPS pollution since wind or water erosion can carry them great distances where they settle at the bottom of a water body and affect fish and other aquatic life. Additionally, soil particles such as silt and clay can accumulate toxins that can eventually end up in our waterways (Figure 1).



**Figure 1.** Eroded soil can wash down drains.

### What You Can Do

- Use landscaping techniques such as grass swales (low areas in the lawn that catch and direct water) or porous walkways, such as brick or stone, to increase infiltration and decrease runoff. Rain gardens can be designed in a swale with water tolerant plants since, during heavy rainfall, water will accumulate and filter contaminated soil particles (Figure 2).
- Where hard surfaces are needed, install wood decking, mortarless pavers, or interlocking stones instead of impervious cement walkways.
- Install gravel trenches along driveways or patios to direct runoff and allow it to filter into the ground.
- Minimize grassy areas that require high maintenance and restore bare patches in your lawn as soon as possible to avoid erosion.
- Preserve existing trees. Plant additional trees and shrubs to help prevent erosion and promote infiltration of water into the soil.
- Use mulches and ground-covers that protect and cool

the soil, reduce weed growth, slow erosion, and reduce evaporation. Organic mulches include shredded bark or chips, wood grindings, or pine straw. Apply 2 to 3 inches of mulch and remember to leave 2 to 3 inches of open space around the trunks of trees and shrubs to avoid excess moisture that can lead to trunk decay or provide a space for pests. Consider low-maintenance ground covers for steep slopes.

### Organic Materials

Plant debris not only adds to the landfill, but the decomposing of the debris in waterways reduces oxygen, which affects aquatic life. Avoid overfertilization and other cultural practices that lead to excessive plant growth.

### What You Can Do

- Mow at the proper height, leaving the grass longer in shade than in sunlight and mow often enough to remove no more than a third of the leaf area at one time.
- Keep mower blades sharp and consider using a reel-to-reel hand-pushed lawnmower for the exercise benefit.
- Recycle grass clippings by leaving them on your yard where they will decompose, returning nutrients slowly back to the lawn.
- Use clippings and leaves as mulch or send them to the compost pile.
- Keep storm gutters and drains free of leaves and yard trim-

mings since decomposing vegetative matter leaches nutrients and can clog storm systems, resulting in flooding (Figure 3).

- Use thinning cuts (selective pruning) rather than headings cuts (topping) since poor pruning generates excessive growth and increases cultural inputs such as increased water use. Never top trees. This pruning practice is detrimental to the tree and can often lead to its death.



**Figure 3.** Avoid clogging storm drains with yard trimmings.

### Water Management

Landscaping accounts for 20 to 50 percent of all residential water use and provides the best opportunity for water conservation at home. Xeriscape landscaping is an innovative, comprehensive approach to landscaping for water conservation adapted in many western states. It can achieve a 35 to 70 percent savings in water. Xeriscape landscaping uses all of the following: planning and design, soil analysis, selection of suitable plants, practical-sized turf areas, efficient irrigation, mulches, and appropriate maintenance management. Benefits of Xeriscape landscaping include reduced water use, decreased energy use because less pumping and treatment are required, reduced heating and cooling costs because trees are carefully placed, decreased storm water and irrigation runoff, fewer yard wastes, increased habitat for plants and animals, and lower labor and maintenance costs.



**Figure 2.** Swales catch and direct water.

## What You Can Do

- Select plants adapted for your area. Enjoy native plants, especially those that need little water and maintenance.
- Group plants with similar water needs and schedule lawn irrigation for specific early morning hours to reduce evaporation during daylight hours (Figure 4).
- Water deeply once a week rather than apply lesser amounts daily.
- Use compost to retain moisture in the soil and help conserve water.
- Use a professionally designed irrigation system for specific landscape situations. For optimum performance, conduct regular maintenance.
- Apply drip-watering systems for herbaceous plants and individual trees and shrubs.
- Water when plants are dry to avoid drought stress. High water use zones generally require 1 to 2 inches of water per week. Clay soils usually require 1 inch per week, and sandy soil needs 2 inches over split applications.
- Consider designing a rain garden to collect water in the swale and avoid runoff.
- Mulch adequately to conserve soil moisture and to reduce crusting and compaction. This will provide better infiltration when water is applied. Mulch also suppresses weeds and reduces herbicide usage.
- Plant grass only where necessary, such as for recreation spots, in light traffic areas, and for maintenance access since,



**Figure 4.** Group plants with similar needs.

in general, grass uses the most water of any component in the landscape. In many situations, you can replace grass with other types of groundcovers, low water use plants, mulches, or permeable hardscapes, including gravel, stone, pavers, or decking. Use native, low-maintenance, and water friendly ornamental grasses.

- Select the appropriate grass type for your area and for its intended use since grasses differ significantly in their water requirements.
- Match turf areas to their intended uses, as well as topographical and soil conditions. Avoid using turf as a fill-in material by placing it in areas that are difficult to irrigate properly, such as steep inclines and isolated strips along sidewalks and driveways. Eliminate long, narrow, or oddly shaped areas that make maintenance difficult.
- Incorporate organic matter to the soil bed when planting shrub and flower bed areas.
- Provide your soil with holding power by planting ground covers in bare spots.
- Water between 4 a.m. and 9 a.m. to reduce evaporation and allow water to move into the root zone. This also reduces disease problems.

## Preparation for the Future\*

As the nation continues to become more urbanized, water, our most valuable resource, becomes more precious and critical to conserve. As populations increase, the demand for water is greater than ever. Individuals, however, can make a difference by ensuring that our landscapes are cared for by following these best management practices. Voluntary conservation can delay the need for more legislative restrictions and regulatory penalties. If each citizen does his or her part, future generations can be assured of having clean water for drinking, wildlife habitats, and recreation as well as an environment that future generations can enjoy.

\*Source: Environmental Protection Agency <http://www.epa.gov/>  
[www.aces.edu](http://www.aces.edu)

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**For more information**, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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