ALABAMA COOPERATIVE Extension SYSTEM

ALABAMA A&M AND AUBURN UNIVERSITIES

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Protecting Water Quality
Controlling Runoff From Your Yard

When rain falls in your yard, where does it land? While this might seem like a ridiculously simple question, its answer can tell you a great deal about controlling runoff in your yard.

If rain falls on paved or impervious surfaces (like roads, driveways, or rooftops), almost all of the water will run off.

If rain falls on grassed areas, more than half of the water may still go directly to surface runoff, depending on soil and rainfall characteristics.

If rain falls on areas planted in dense shrubs and trees, very little water will have a chance to run off, and most will sink into the soil.

Infiltration or allowing water to sink into the soil is the main goal of controlling rainfall runoff. If water can be encouraged to sink into the soil instead of running off, then it cannot transport pollutants to surface waters.

To reduce runoff and increase infiltration, homeowners can try the following:

- Plant a dense cover of trees and shrubs in less intensively used areas.
- Use mulches on planting beds and especially on slopes to slow water movement and allow for infiltration.
- Use permeable paving materials where possible.
- Install contouring and infiltration devices.

Plant A Dense Cover Of Trees And Shrubs

When forests or agricultural areas are developed for residential subdivisions, the dense, natural vegetation is cleared and most of the area is either covered with impermeable surfaces (like houses or pavement) or it is planted with turf (like backyards, school yards, and parks).

When forested areas are converted to grass, the trees and shrubs that slow rainfall are eliminated. Most grassed areas are not as effective as wooded areas in encouraging water to soak into the ground. In fact, surface runoff from properly managed turf may be 33 to 50 percent higher than forest runoff. But grassed areas are much more effective than barren soils which may become so compacted and low in organic matter that they produce almost as much runoff as pavement.

To induce greater infiltration, homeowners can make sure no soil is left bare, reduce the amount of grass, and increase the area allocated to beds or masses of densely planted shrubs, trees, and other woody ground covers. Plants to use in these densely planted areas are usually native plants which are adapted to the growing conditions of a particular area. Take note of the native plants growing under similar conditions in surrounding areas.

By selecting plants that are adapted to the growing conditions where the plant will be located, homeowners can reduce the amount of fertilizers, pesticides, and water that plants need. Homeowners should also try to match a plant's moisture requirements with its location in the yard.

The following tables list plants that can be used on either dry sites or wet sites. All plants require additional care for the first 1 or 2 years. The following plants are drought tolerant but will not perform up to their reputation until they are established.

Table 1. Plants For Droughty Soils.

Botanical Name	Common Name
Trees (Deciduous):	
Acer ginnala	Amur Maple
A. rubrum	Red Maple
Castanea mollissima	Chinese Chestnut
Catalpa bignonioides	Southern Catalpa
Celtis occidentalis	Hackberry
Cercis canadensis	Eastern Redbud
Cotinus coggygria	Smoke Tree
Crataegus spp.	Hawthorn
Diospyros virginiana	Common Persimmon
Elaeagnus angustifolia	Russian Olive
Fraxinus pennsylvanica Marshal	Marshall Seedless Ash
Ginko biloba	Maidenhair Tree (male cutivar)
Gleditsia triacanthos	Honey Locust (thornless)

Koelreuteria paniculata	Golden-Rain Tree
Koelreuteria bipinnata	Flame Tree
Maclura pomifera	Osage-orange
Phellodendron amurense	Amur Cork Tree
Pistacia chinensis	Chinese Pistache
Pyrus calleryana	Callery Pear
Quercus acutissima	Sawtooth Oak
Q. falcata	Bur Oak
Q. macroearpa	Southern Red Oak
Q. rubra (borealis)	Northern Red Oak
Q. shumardii	Shumard Oak
Q. stellata	Post Oak
Sassafras albidum	Sassafras
Sophora japonica	Japanese Pagoda Tree
Ulmus parvifolia	Lacebark Elm
Zelkova serrata	Japanese Zelkova
Trees (Evergreen):	
Cedrus deodara	Deodar Cedar
Ilex opaca	American Holly
Magnolia grandiflora	Southern Magnolia
Pinus taeda	Loblolly Pine
P. thunbergiana	Japanese Black Pine
P. virginiana	Virginia Pine
Thuja occidentalis	Arborvitae
Shrubs (Deciduous):	
Acanthopanax sieboldianus	Fiveleaf Aralia
Berberis thunbergii	Japanese Barberry
Cytisus spp.	Broom
Euonymus alata	Winged Euonymus
Jasminum nudiflorum	Winter Jasmine
Kolkwitzia amabilis	Beauty-bush
Lonicera fragrantissima	Winter Honeysuckle
Potentilla spp.	Cinquefoil
Rhamnus spp.	Buckthorn
Rhus spp.	Smooth Sumac
Robinia hispida	Rose-acacia
Spiraea spp.	Spiraea
Syringa vulgaris	Common Lilac
Tamarix spp.	Tamarix
Viburnum lentago	Nannyberry
Vitex agnus-castus	Chaste Tree
Shrubs (Evergreen):	
Abelia grandiflora	Glossy Abelia
Hypericum calycinum	St. Johnswort
Ilex cornuta	Chinese Holly
I. latifolia	Luster Leaf Holly
I. vomitoria	Yaupon Holly
Juniperus spp.	Juniper (many varieties)
Ligustrum spp.	Privet
Mahonia bealei	Holly Grape
Nandina domestica	Nandina or Heavenly Bamboo
Prunus laurocerasus	Cherry Laurel
Pyracantha coccinea	Pyracantha
Santolina chamaecyparissus	Lavender-cotton
Yucca filamentosa	Adam's Needle Yucca

Source: Pitt et al. 1991.

Table 2. Plants For Wet Soils.

Botanical Name	Common Name
Trees (Deciduous):	
Acer rubrum	Red Maple
Alnus glutinosa	Black Alder
Betula nigra	River Birch
Carpinus caroliniana	American Hornbeam
Celtis laevigata	Sugar Hackberry
C. occidentalis	Hackberry
Liquidambar styraciflua	Sweet Gum
Liriodendron tulipifera	Tulip Tree
Magnolia acuminata	Cucumber Magnolia
M. virginiana	Sweet Bay Magnolia
Nyssa sylvatica	Black Gum
Platanus occidentalis	Sycamore
Quercus bicolor	Swamp White Oak
Querqus lyrata	Overcup oak
Salix babylonica	Weeping Willow
Salix nigra	Black Willow
Taxodium distichum	Bald Cypress
Trees (Evergreen):	
Pinus elliotti	Slash Pine
P. taeda	Loblolly Pine
Thuja occidentalis	Arborvitae
Tsuga canadensis	Canadian Hemlock
Shrubs (Deciduous):	
Aronia arbutifolia	Red Chokeberry
Clethra alnifolia	Summersweet
Comptonia peregrina	Sweet Fern
Cornus alba	Siberian Dogwood
C. sericea	Red Osier Dogwood
Ilex verticillata	Winterberry
I. decidua	Possum Haw
Lindera benzoin	Spicebush
Salix caprea	Goat Willow
Sambucus canadensis	American Elder
Vibumum dentatum	Arrowwood
Shrubs (Evergreen):	
Bambusa spp.	Bamboo
Ilex glabra	Inkberry
I. vomitoria	Yaupon Holly
Myrica cerifera	Southern Wax Myrtle

Source: Pitt et al. 1991.

In areas where children play actively, turf often is the only vegetative cover that will survive. Where turf is used, infiltration can be enhanced through cultural practices such as aeration and periodic thatch removal. In the rest of the yard, lawn areas might well be converted to beds or masses of shrubs, trees, and other ground cover plants that encourage rainfall to soak in.

Use Mulches In Plant Beds And On Slopes

Used in planting beds and on slopes, mulches can help slow water movement and increase infiltration. Mulches decrease runoff during storms, provide more water for plant growth, reduce water loss from evaporation, and promote water penetration by reducing compaction. However, more than 2 to 3 inches of mulch can harm plants

The best mulch for reducing runoff is one that is fine textured and light weight. Examples include pine straw, pine bark mini-nuggets, and pine bark mulch. Organic mulches, such as grass clippings, should be avoided.

Use Permeable Paving Surfaces

The concept of a permeable paving surface seems almost a contradiction of terms. Yet there are many paving surfaces that provide the durability of materials such as concrete while allowing appreciable infiltration of surface runoff. These materials generally fall into two categories: wood decking and pavers.

People seldom consider wood decking to be a paving surface. But low decking can be a functional and attractive ground surface. Whether decking is constructed of redwood or treated Southern pine (the two most commonly used decking materials in Alabama), it possesses much of the durability of more impermeable paving surfaces. Because decking is constructed in plank modules, its infiltration capacity is high. Quite often, a ⅛-inch space is left between planks, providing ample room for rainfall and runoff on the boards to drain directly onto the soil surface. The decking generally shades out weed growth. As long as a minimal air space can be maintained between the soil surface and the decking, problems of rot resulting from the wood coming into direct soil contact can be minimized. One of the problems associated with decking at or near the ground surface is the extensive soil excavation required to provide room for the deck's supporting structure below grade level.

Modular pavers include various kinds of stone (flagstone, bluestone, or granite), brick, lattice paving blocks having a honeycombed configuration, and any of the interlocking pavers currently available. To be effective as infiltration devices, all of these materials must be placed on a permeable base of well-drained soil, or 4 to 6 inches of crushed stone and a 1- to 2-inch bed of sand or stone dust. In addition, all construction must involve use of sand or stone dust in the joints between pavers rather than mortar. As an alternative to chemical or physical control of weed growth between pavers, miniaturized ground covers such as Corsican mint moss or thyme can be grown.

As devices to promote infiltration of surface runoff, however, neither decking nor pavers should be used on poorly drained soils or steep slopes. Water will not soak into tightly bound, shallow, or already saturated soils or steeply sloped sites.

Use Contouring And Infiltration Devices

For many years, normal structural and pavement construction practices have assumed that once water got onto a paved surface, it had to stay on that paved surface and be discharged onto another paved surface or into a pipe or channel. Thus, roof downspouts drained onto driveways and driveway pavements were graded to discharge surface runoff into gutters, drain inlets, and other components of a stormwater management system. The result has been an almost immediate discharge of surface runoff following a rainstorm in urban areas.

Many of these practices are warranted. Surface runoff from extensively paved areas can erode soil when it flows off the pavement. Water left on a paved surface may create safety hazards. Poorly drained soils with low infiltration capacities also need surface drainage. However, pavement and rooftop runoff can be directed onto well-drained soils containing infiltration structures. As long as the erosive force of the water flowing onto the soil can be accommodated, pavement runoff can be deflected onto and spread over well-drained soil where infiltration will occur. Where soil characteristics prohibit retention and infiltration of pavement runoff, detention devices could be used to slow the rate of pavement runoff.

A note of caution is needed, however. Runoff from large areas of paving can be substantial, and it can travel at an erosive velocity. Thus, in collecting pavement runoff, it is important to consider how the water will be channeled to the infiltration or retention device. If runoff is not conveyed safely from the pavement to the device, serious erosion problems may result.

Contouring

In nearly every soil drainage condition, homeowners can create swales, berms, and basins to detain runoff on their property, reduce runoff velocity, and increase the time over which runoff is released from the site. For example, land immediately adjacent to the house needs to have a positive downhill slope away from the house so that water does not seep through the foundation and into the house. Once the water has been carried 10 feet from the house, however, the surface might be regraded so that runoff is temporarily detained on the site and released gradually rather than immediately after the storm.

Surface runoff can be directed, detained, or retained on a site by changing the elevation and slope of the land. Swales (linear depressions in the land surface having a continuous downhill gradient of 2

percent) move water from one area to another. Berms (low ridges) direct water into and through swales. Finally, basins (enclosed depressions in the land surface) gather, slow, and retain runoff.

In some instances, homeowners may be able to correct a wet soil problem by coordinating a system of berms and swales with the location of planned use areas in the yard. To the extent possible, locations receiving intensive use should avoid wet soil. When it is not feasible to avoid a wet area, it may be possible to move the wet area to another less intensively used portion of the yard (such as a shrub and tree mass) by installing a swale to carry the water across the yard. The relocated wet area is then planted with trees and shrubs that tolerate wet soil. In this fashion, a wet area becomes usable. Small ponds can also be created to establish water or wetland gardens.

If this approach to a drainage problem is not feasible, subsurface drainage systems may be warranted.

Infiltration Devices

On sites with well-drained soils, infiltration devices can increase chances of rainfall soaking in and not running off.

If soils are poorly drained, water will stand and not soak in, which could create health and safety problems.

Using berms and swales, homeowners with well-drained soils could enhance on-site infiltration by channeling surface runoff into a gravel-filled seepage pit, a Dutch drain, a gravel-lined recharge basin, or by spreading runoff over the land surface by a series of terraces. However, seepage pits, gravel-lined recharge basins, and terraces lose their effectiveness as infiltration devices when the land surface becomes clogged with clay, silt, or fine sand particles.

The infiltration devices should not be located immediately under an intensively used area. Intensive use usually implies heavy foot traffic, which leads to soil compaction. Unless properly covered with a filter blanket and sandy loam topsoil, heavy foot traffic could lead to premature clogging of the infiltration device.

Conclusion

Controlling stormwater runoff from individual residential lots in urban or suburban environments can have a significant impact on water quality in your community. Not only does this stormwater runoff carry potential pollutants from your property that would normally degrade through soil infiltration, but it joins with runoff from many other yards to increase its force and capacity. Storm sewers may overflow, and erosion and property damage may result. If the storm sewer is not separated from the wastewater sewer system, the flow capacity could exceed the capacity of the wastewater treatment plant. If this occurs, raw sewage could be released into nearby streams.

Homeowners can manage runoff by providing good, permeable ground cover and by landscape alterations. Berms can be created to detain or retain runoff and areas may be planted with shrubs and trees. This dense planting could allow more infiltration than a similar area planted with turf. Porous paving material could be used to promote infiltration. Pavement runoff and all runoff from the residence could be channeled into detention basins and infiltration devices installed in lower-lying areas created in the yard by regrading.

While most homeowners are unable to recontour and replant an entire yard, almost every homeowner is faced with landscape choices. These choices often concern land use (grassed areas versus densely planted areas), plant selection (adaptive versus nonadaptive), or paving materials (porous versus impermeable). By choosing the option that encourages rainfall to soak in, homeowners can control runoff and potential pollution from their yards.

Reference

Pitt, David G., William Gould, Jr., and Leo LaSota. 1991. Landscape Design To Reduce Surface Water Pollution In Residential Areas. Water Resources 32. Maryland Cooperative Extension Service. University of Maryland. College Park, MD.

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