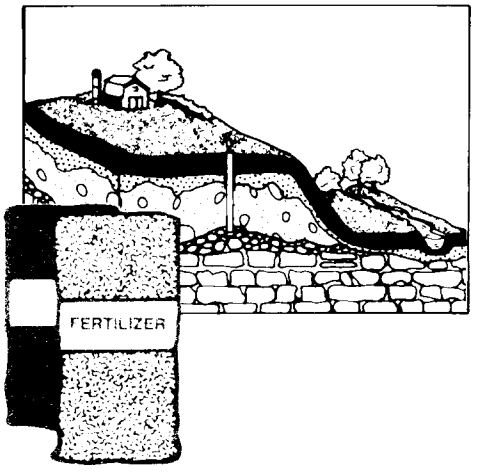


# Soil Facts

## *Managing Lawns and Gardens to Protect Water Quality*

*Water quality is a major environmental issue. Society has been quick to point fingers at industry, agriculture, forestry, and other large land-disturbing activities as the culprits of groundwater and surface water contamination. Soil eroded from lawns and gardens may carry many contaminants to surface water. Water quality, therefore, is everyone's responsibility.*

Normally, the contribution of water pollutants from a homeowner's lawn, the grounds of a business establishment, or recreational turf, such as golf courses or athletic fields, is small. However, when millions of small inputs are added together, the impact on water quality may be significant. The key to minimizing this collective impact is reducing the levels of pollutants that enter the system.

The purposes of this fact sheet are to identify several major pollutants that often originate in our lawns and gardens, to describe the problems they may cause, and to outline some things we can do to minimize their adverse effects on water quality. This information should benefit home gardeners, landscape developers, contract lawn care specialists, athletic field managers, and others who manage soil to grow plants for food, pleasure, or profit.

### Water Quality: A Cause for Concern

One might ask why a single family with only a home lawn or garden should be concerned about the effects of their activities on water quality. The reason for concern is that the effects are not always confined to their land. Soil is a common pathway to groundwater, and soil characteristics determine the rate at which chemicals move through it. Once contaminants reach groundwater, they can travel long distances with the water. Thus, you should be sensitive to the off-site effects caused by the whole neighborhood's activities.

Soil eroded from a homestead may carry many contaminants to surface water. Contaminants may include certain kinds of fertilizers and pesticides, petroleum-based products, the residue of automobile emissions, and atmospheric deposition. Clearly, soil erosion generates a variety of serious water quality problems. Furthermore, sediment (deposits of eroded soil and organic matter) detracts from the appearance of a neighborhood. By being part of a neighborhood, you assume responsibility as a contributor to the cumulative impact of land use on water quality. Perhaps the threat of greatest concern is damage to human health through groundwater contamination. Residents in many rural and suburban areas rely on groundwater for their drinking water supply. In North Carolina, for example, over 50 percent of the population uses groundwater as a source of drinking water. Use of excessive amounts or improper application of fertilizers and pesticides may result in harmful chemical contamination of groundwater. For example, nitrate ($NO_3$) can cause methemoglobinemia ("blue-baby syndrome"), a health threat to infants. Although nitrate has been

detected in our groundwater, the amounts are generally well within safe limits; on the other hand, the fact that it is present in groundwater is reason to use good judgment in applying fertilizers containing nitrogen. Although the quantities of dangerous pesticides that have been detected in North Carolina's groundwater are very small, expressed as parts per billion or even less, the fact that they are present is sufficient cause for concern.

Even in urban settings, where surface runoff is collected from streets and road surfaces and channeled to a water treatment plant, contaminants from lawns and gardens affect water quality. Contaminants increase the degree of treatment required to purify the water before reusing it or discharging it into a public stream. Additional water treatment means an increased cost to a municipality, which passes the cost on to its residents. Thus, water quality affects the pocket books of all taxpayers.

## Sources of Pollution

Clusters of housing, mobile home parks, convenience stores, recreation facilities, and other types of development increase the amount and diversity of pollutants cast into the community's watershed. Three main threats to water quality can be identified.

**Soil Erosion.** Whenever water, as intensive rainfall or irrigation, falls on bare soil surfaces in gardens or lawns, sand, silt, clay, and organic matter may be moved away from the site. The potential for erosion increases with slope, but unless there is runoff, raindrops cannot do much damage. It is the transportation of soil particles and organic matter in runoff that causes concern. This transported sediment can choke lakes and carry chemicals into waterways, making them unsuitable for recreational fishing, boating, or swimming. Everyone, including the urban resident, farmer, gardener, recreational enthusiast, and taxpayer must pay for the damage.

**Nutrient Management**. An attractive lawn, vigorously growing shrubs and flowers that show off the house, and a productive garden are the pride and joy of many homeowners. Fertilizer nutrients, especially nitrogen, phosphorus, and potassium, contribute to the health and beauty of these plants. Nitrogen and phosphorus, however, must be managed carefully to ensure that excessive amounts do not degrade water quality. Too much nitrogen and phosphorus along with carbon in surface water cause eutrophication (death from excessive algae growth) in rivers, lakes, and ponds. High nitrogen levels in groundwater and surface water can lead to the ingestion of nitrogen in its nitrate ($NO_3$) form, which can cause health problems in humans and livestock. Phosphorus accumulates in lakes and ponds primarily from inflow of sediment that has phosphorus attached to it. Preventing erosion greatly reduces the likelihood of phosphorus being a threat to water quality. Nitrogen, whether from compost or fertilizer, may leach past plant roots and accumulate in groundwater or eventually move out to surface impoundments if not used completely by grass, shrubs, or garden crops.

**Pesticide Management**. In addition to fertilizers, many homeowners use numerous conveniently packaged pesticides (herbicides, insecticides, and fungicides) to ward off pests around their house, lawn, and garden. Excessive use of these prod-ucts could lead to their deposition in lakes and streams if they are carried off with sediments. Water-soluble pesticides may leach in sandy soils with subsequent movement to groundwater or surface water.

## Reducing Water Pollution

Strategies for reducing or preventing water contamination by sediment, fertilizers, and pesticides are based on common sense. Homeowners, gardeners, and professional plant managers should determine whether their activities cause sediment, fertilizers, or pesticides to move and concentrate in an environmentally unacceptable manner.

**Erosion Control**. Land-disturbing activities, uncovered soil surfaces, and the absence of water-retention structures may contribute to excessive amounts of sediment in creeks and streams and on streets, playgrounds, and neighbors' property. Try to hold soil in place so that the amount of sediment generated from water erosion is small and does not become a nuisance.

**Nitrogen Management**. Nitrogen is classified as a "mobile nutrient," meaning it is water soluble and moves with surface water. To reduce the risk of water contamination when applying nitrogen to lawns, shrubs, flowers, trees, or vegetables, use modest amounts.

## Application Recommendations:

❑ North Carolina State University turf specialists suggest that for fescue you should apply no more than 3 pounds of nitrogen per thousand square feet per year. This amount should be split into three applications: one-third applied in February, one-third in September, and one-third in November.

❑ For vigorous summer grasses, such as the various kinds of Bermudagrass, use no more than 6 pounds of nitrogen per thousand square feet per year. Apply 1/2 pound in April, 1 1/2 pounds in May and June, 1 pound in July and August, and 1/2 pound in September. Centipedegrass should receive only 1/2 pound of

nitrogen per thousand square feet in July. These suggestions will minimize the amount of unused nitrogen.

❑ For garden vegetables, use no more than 3 to 4 pounds of nitrogen per thousand square feet. In most cases, splitting nitrogen applications for vegetables into at least two or even three applications during the early part of the growing season will ensure that adequate nitrogen is applied throughout the growth period in contrast to applying all of it early in the season before maximum growth and nutrient uptake occur. Unused nitrogen is susceptible to leaching and therefore more likely to accumulate in surface water or groundwater.

Literature form the Cooperative Extension Service, suggestions from reliable garden store operators, or suggestions from soil-testing laboratories will help guide you in the amount to apply.

**Pesticide Management**. When applying pesticides:

❑ Read container labels correctly.

❑ Use the lowest effective rate listed on the label for any one application. The thought that "if a little will do a little good, a lot will do a lot of good" is a fallacy.

❑ Identify pests correctly so that you use the proper pesticide and do not wastefully apply inappropriate materials.

❑ Sweep granules of fertilizer or pesticide that may fall on sidewalks, patios, and driveways off onto the lawn.

❑ Calibrate spreaders and sprayers so that you know how much pesticide you are applying to the area.

❑ Learn about alternative pest control measures, such as beneficial insects, crop rotation, residue destruction, varietal resistance, proper planting dates, and companion cropping systems that may be good alternatives for your pest management problem.

❑ Develop some tolerance of weeds, insects, and disease. A low level of pests will not detract from the overall beauty of lawns and gardens and may help guard against the temptation to use pesticides unnecessarily.

## Irrigation

❑ Irrigate turf, gardens, and ornamentals carefully. In deep, sandy soils, excessive irrigation may leach soluble pesticides and nutrients deep into the soil and may contaminate groundwater.

❑ Guard against irrigation runoff on sloped sites or soils with severely compacted surfaces. The practice of "coring" (punching holes in soil surfaces) may help to reduce the amount of runoff.

## Disposal of Chemicals

One potentially serious source of groundwater and surface water contamination is the disposal of unused pesticides. It is tempting to flush them into sinks and toilets or to pour concentrates in the woods or on the edges of home lots. Serious health or water quality hazards may be caused by these practices. Pesticides and other hazardous chemicals greatly reduce the performance efficiency of home, community, or municipal waste treatment systems. A safe way to dispose of unused or old pesticides is to accumulate them in plastic-lined boxes or in metal or plastic pails and deposit them at a qualified and properly designed hazardous waste storage facility. Many cities and towns throughout North Carolina are now systematically collecting hazardous wastes (including pesticides) at a central point for proper disposal. Call city or county officials to ask about collection schedules. With proper storage, pesticides will keep their effectiveness for several seasons. Use them properly and completely, and you will avoid the problem of disposal.

## Conclusion

Fortunately, you do not have to choose between having an attractive lawn or garden and protecting water quality. The key to achieving both goals is to use chemicals only when needed and then use them judiciously. Reduce soil erosion by keeping soil covered with mulches, matting, and ditch liners. Manage the application of nutrients to keep phosphorus and nitrogen out of the water.

Contact your county Extension office whenever you have questions about lawn and garden products and their possible impact on water quality.

## References and Suggested Readings

*North Carolina Agricultural Chemicals Manual* (published annually)

*Carolina Lawns* (AG-69)

*Tall Fescue and Kentucky Bluegrass Athletic Field*

*Maintenance Calendar* (AG-430)

*Bermuda Athletic Field Maintenance Calendar* (AG-429)

*Tall Fescue Farm Maintenance Calendar* (AG-367)

*Centipedegrass Lawn Maintenance Calendar* (AG-381)

*Zoysiagrass Lawn Calendar* (AG-431)

## Soil Science Fact Sheets

*Soils and Water Quality* (AG-439-1)

*Nitrogen Management and Water Quality* (AG-439-2)

*Pollutants in Groundwater: Risk Assessment* (AG-439-8)

*Good Soil Management Helps Protect Groundwater* (AG-439-9)

*Pollutants in Groundwater: Health Effects* (AG-439-14)

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