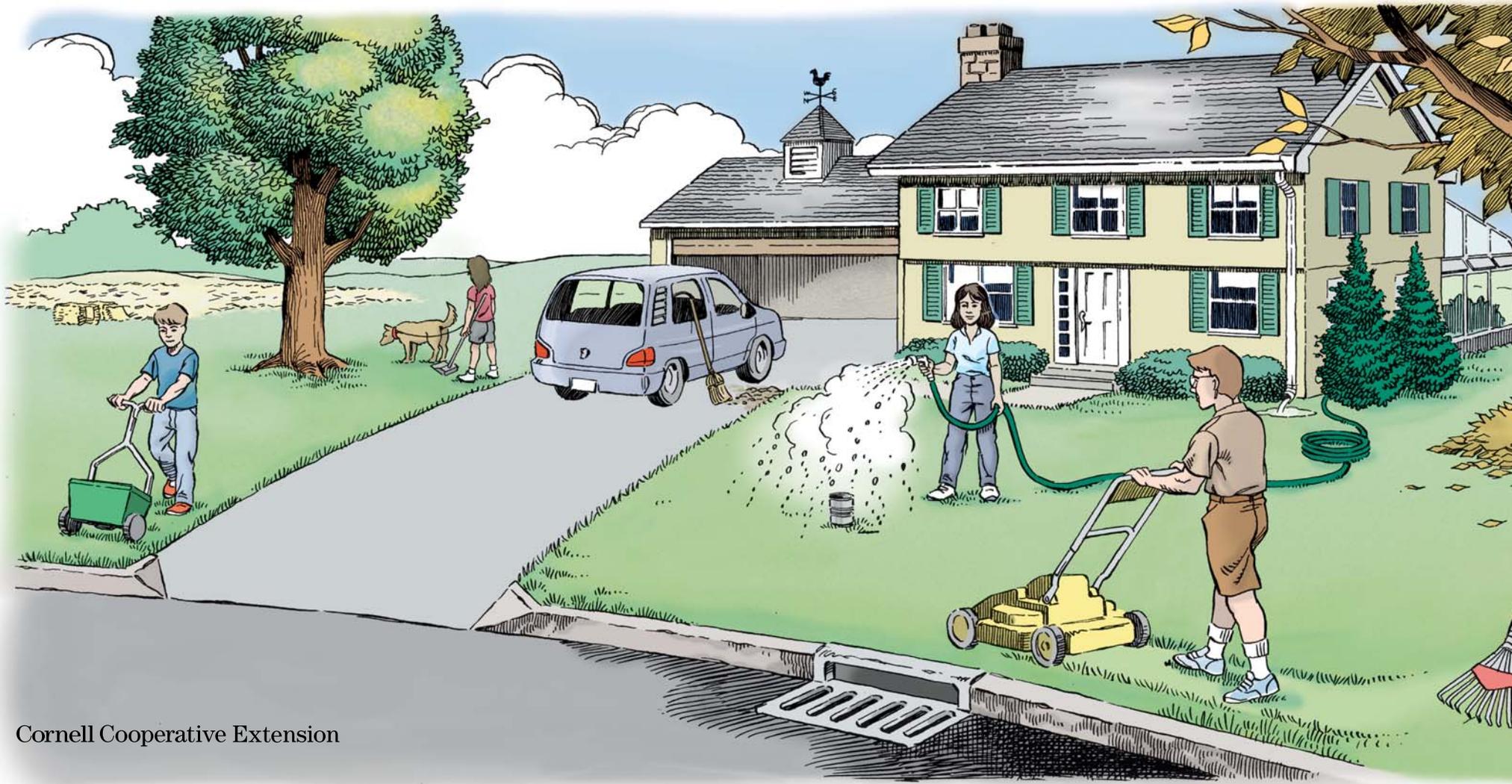


The Homeowner's Lawn Care and Water Quality Almanac

Eva Gussack and Frank S. Rossi, Ph.D.



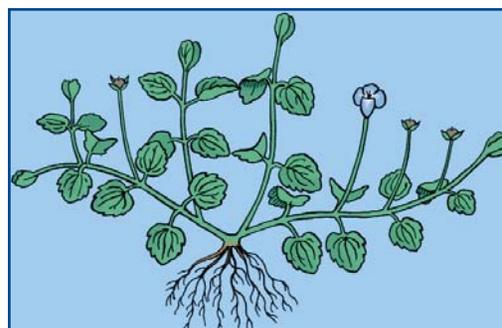
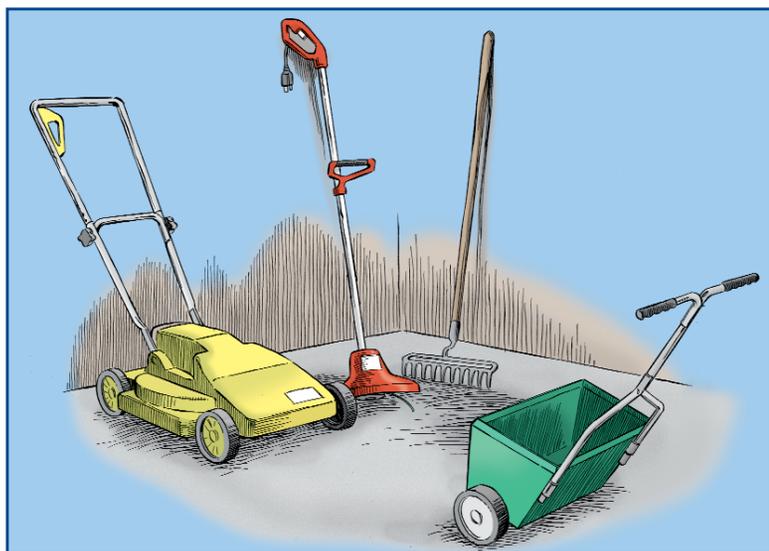
The goal of this almanac is to help you grow and maintain a dense, healthy lawn without polluting watersheds with pesticides, metals, nutrients, and petroleum.

Eva Gussack is an extension associate and Frank S. Rossi, Ph.D., is an assistant professor of turfgrass science, both in the Department of Horticulture, Cornell University.

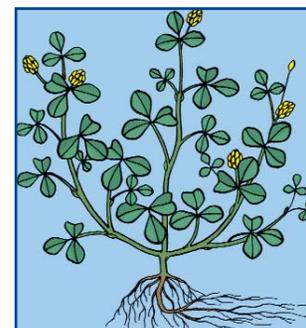
Acknowledgments

Editorial assistance was provided by Todd Schongalla, Anna DeCordova, Tamson Yeh, Jenine Tankoos, and Jim Grefig. Cornell Cooperative Extension of Westchester and Putnam Counties and Cornell University's Turfgrass Program gratefully acknowledge the financial support of the New York Community Trust's Henry Phillip Kraft Family Memorial Fund, through its affiliate, the Westchester Community Foundation. Production and distribution of this almanac was also supported by the New York City Department of Environmental Protection and the New York State Integrated Pest Management Program.

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Veronica



Medic

Useful Contacts

Cornell Cooperative Extension

Check your local phone book or www.cce.cornell.edu/associations.html

Cornell University Plant Disease and Diagnostic Laboratory

Department of Plant Pathology
Cornell University
334 Plant Science Building
Ithaca, NY 14850
607-255-7850

Cornell University Soil Testing Laboratory

Department of Soil, Crop, and Atmospheric Science
Cornell University
804 Bradfield Hall
Ithaca, NY 14850
607-255-4540

Cornell University Insect Diagnostic Laboratory

Department of Entomology
Cornell University
4140 Comstock Hall
Ithaca, NY 14850
607-255-4777

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ISBN 1-57753-272-4 ©2000 by Cornell University • Printed on recycled paper • 141S2 8/00 6 99/11 95 8M FLP MTS90292

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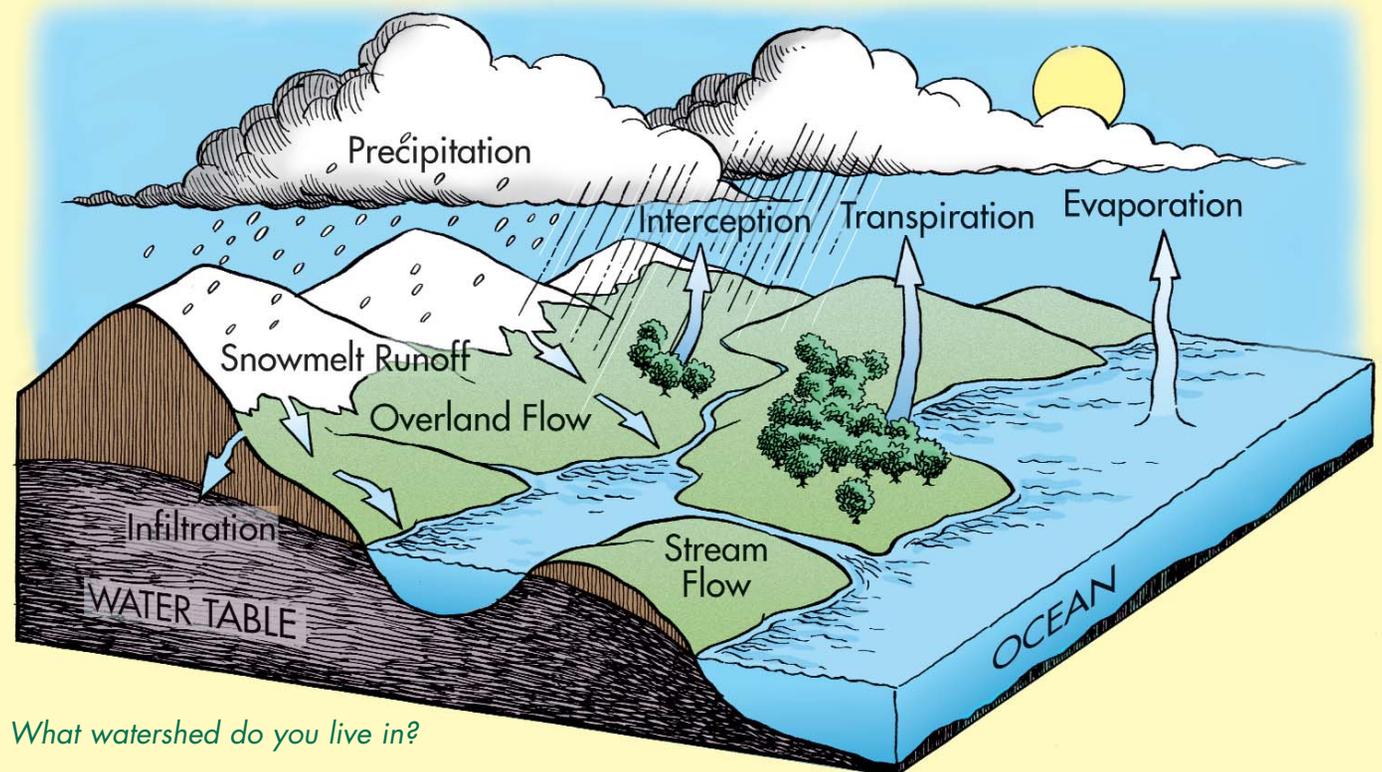
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January

The Big Picture

Learn about the Hydrological Cycle: Movement of Water in the Environment

- Solar energy **evaporates** water from the oceans. The water may then return as rain or snow (**precipitation**). Water can take different routes back to the atmosphere.
- Rain or snow falls. Most is **intercepted** by vegetation before it reaches the earth's surface. Some water never reaches the ground and evaporates back into the atmosphere (interception).
- Some of the water that infiltrates the soil is taken up by plants and released via **transpiration**.
- Remaining water infiltrates down through layers of soil and substrate until it reaches the water table and recharges the groundwater.
- When the soil becomes saturated, overland flow carries water across the land to ponds, lakes, or streams.



What watershed do you live in?

Why is water quality important?

Properly managed water resources provide high-quality drinking water, fishing and swimming, and support habitats for a variety of plants and wildlife.

What is a watershed?

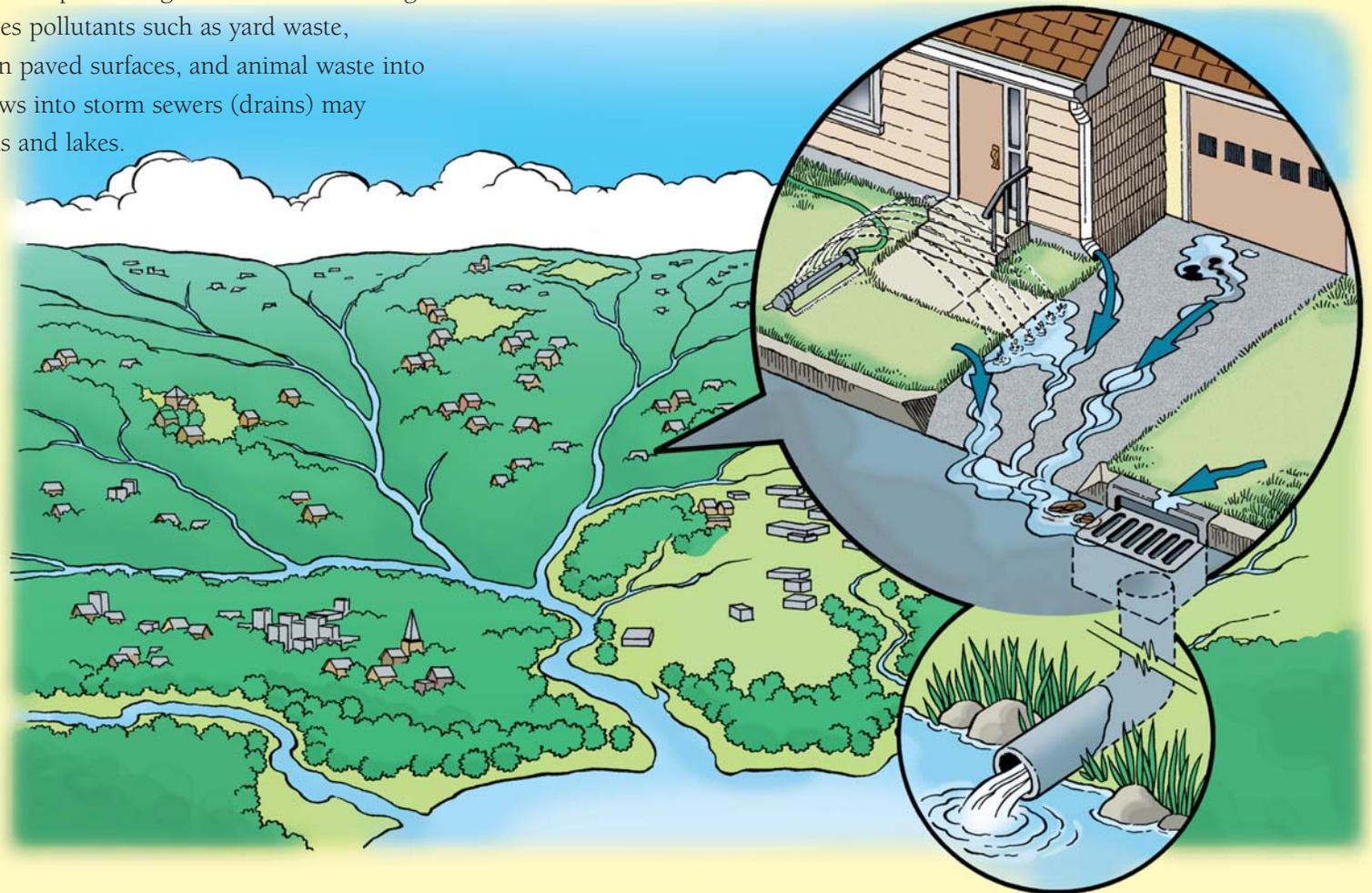
The land area that drains into a particular water body. All land is in a watershed and everybody lives in a watershed.

How do pollutants enter the water supply?

Urban development removes vegetation and replaces it with buildings, streets, walkways, and driveways, thus preventing water from infiltrating the soil. The resulting runoff carries pollutants such as yard waste, fertilizers, pesticides discharged on paved surfaces, and animal waste into water bodies. Even runoff that flows into storm sewers (drains) may be discharged directly into streams and lakes.

January is a good time to

- learn what watershed you live in.
- “surf your watershed” at www.epa.gov.
- investigate community efforts to preserve and protect water quality.
- review your lawn and garden practices.



February

Know Your Pollutants

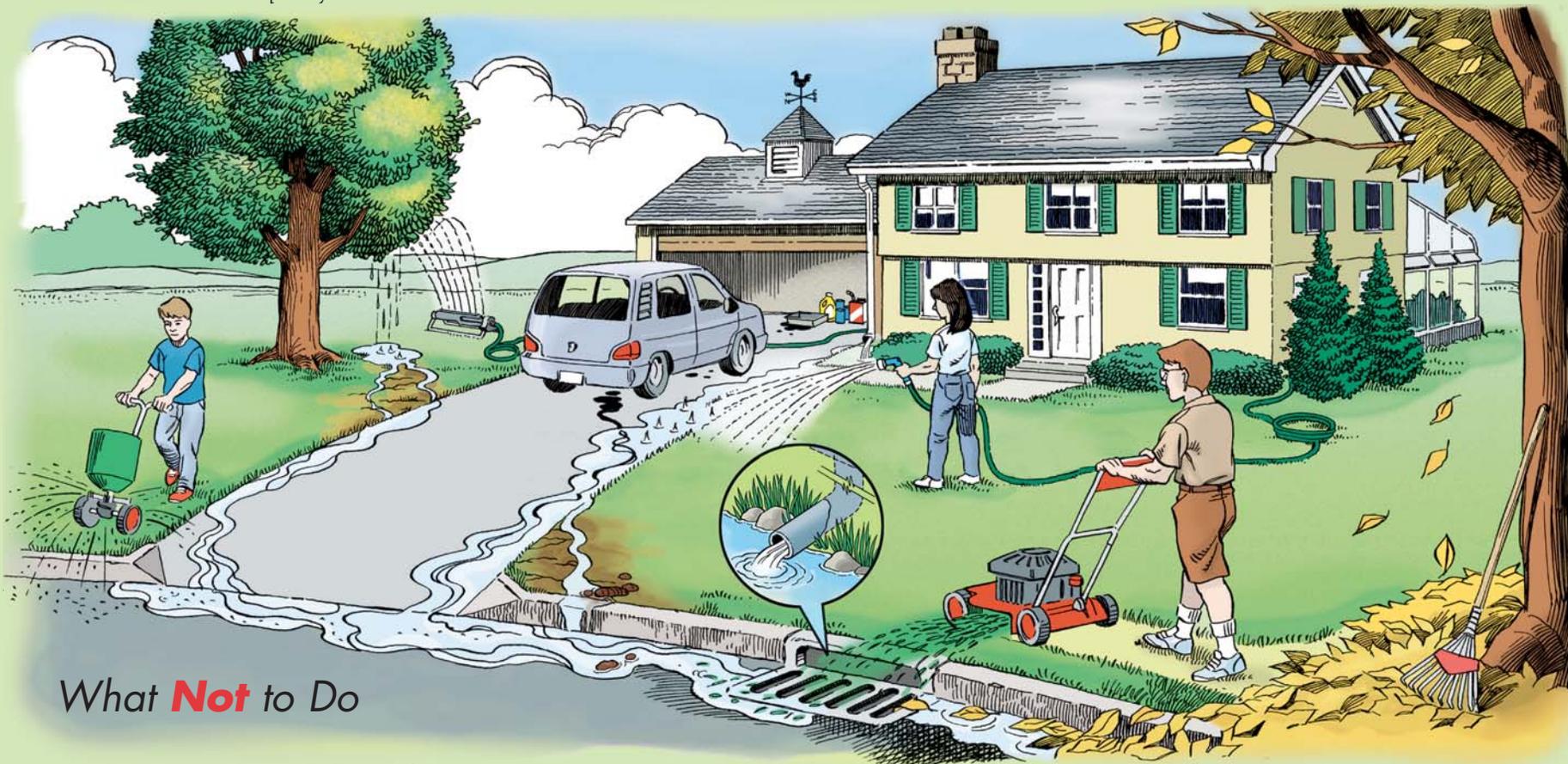
Learn about how lawns can preserve water quality

What pollutants around the home should concern us?

Introducing sediments, metals, pesticides, fertilizers, tree leaves, grass clippings, and household cleansers and automobile fluids into water bodies or groundwater can all threaten water quality.

How does a dense, healthy, lawn protect water quality?

The lawn filters and purifies the water as it enters the soil en route to groundwater. Studies show that lawns reduce surface runoff compared to paved surfaces or bare soil.



What **Not** to Do

Common sources of stormwater pollutants



Nutrients or Pesticides



Hydrocarbons



Silt Sand



Nutrients



To Watershed

Pollutant	Source
silt, sand, and clay particles and other debris	bare soil when establishing lawn; debris removed from vehicles, rooftops
nutrients (N, P, etc.)	fertilizer discharged onto pavement, yard waste (tree leaves, grass clippings), pet waste
hydrocarbons	vehicle exhaust, automobile fluids, burning leaves and garbage
pesticides	pesticides discharged onto pavement, applied immediately before heavy rain

February is a good time to

- recognize and inventory the pollutants around your home.
- assess the risk of these pollutants entering a water body.
- minimize paved surfaces and bare soil areas.
- set target dates for action.

March

Inventory Time

Conduct a landscape water quality assessment

How much do you care about your lawn?

How good does it have to look? *(Perfect or just okay)*

How much time will you invest? *(Just mow or make applications as well.)*

How much money are you willing to invest?

What are your limitations, including equipment? *(Does your mower have height adjustment?)*

Will you use fertilizer? *(Poorly fertilized turf increases runoff.)*

Will you water your lawn? *(Well-designed, in-ground systems are best.)*

Will you use pesticides? *(You will use more if you don't grow healthy plants.)*

How much wear do you expect? *(Will you be running, walking, or working in your yard?)*

Areas to note and take care of

Streams, creeks, rivers, ponds, or lakes

Shady areas

Areas of direct sunlight (southwestern exposure)

Bare surface areas

Locations of weeds

Compacted areas (try to put a knife in the ground)

Exposed tree roots

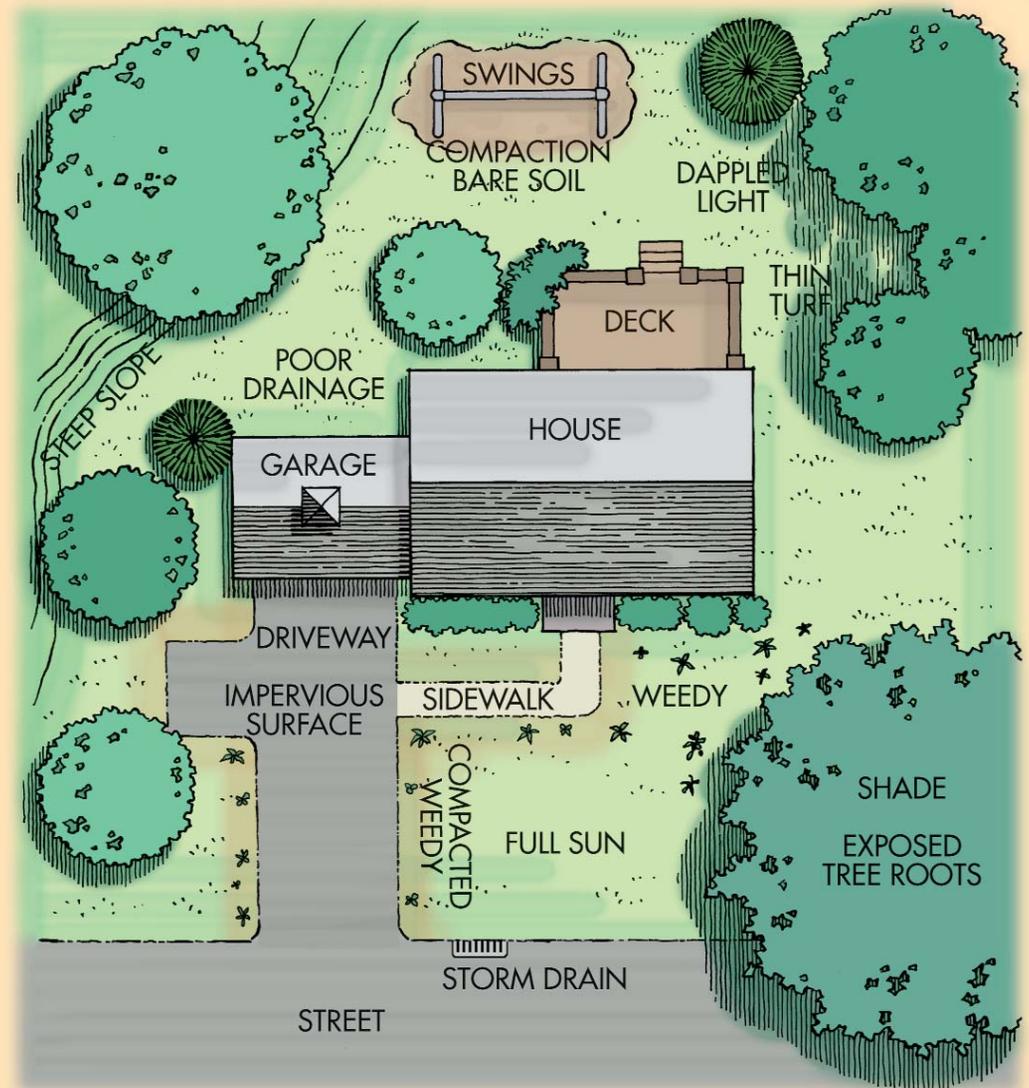
Areas of poor drainage or standing water

Areas of wear

Steep slopes

Impervious surfaces

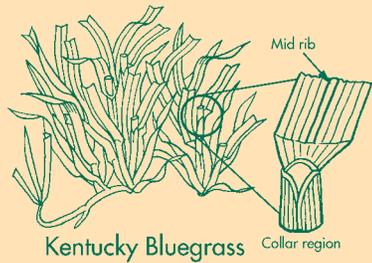
Storm drains



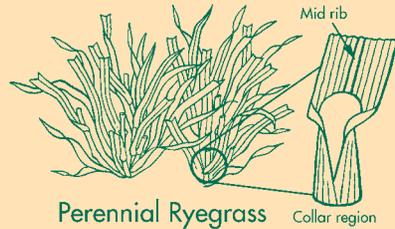
Know how your property and choosing the right grass can protect water quality:

1. Selecting a grass appropriate to your site will lead to rapid establishment, preventing runoff and erosion from bare areas.
2. Appropriate grasses will form a dense stand of turf better able to fight off disease and weed encroachment.
3. A vigorous lawn will require less pesticide input, reducing the potential for polluted runoff, leaching into groundwater, and accidental spills.

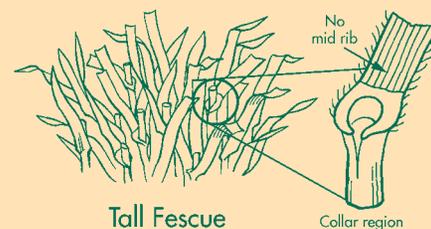
Learn about Lawn Grasses



Kentucky Bluegrass



Perennial Ryegrass



Tall Fescue

	<i>Kentucky Bluegrass</i>	<i>Perennial Ryegrasses</i>	<i>Tall Fescue</i>	<i>Fine Fescue</i>
Growth habit	Rhizotamous	Bunch	Bunch	Bunch
Leaf texture (blade width)	Medium–Fine	Medium	Coarse	Very Fine
Establishment from seed	Slow (approx. 30–90 days)	Fast (approx. 14–21 days)	Fast to Average (21–30 days)	Average (21–50 days)
Seeding rate	1 to 2 lb./1,000 ft. ²	5 to 9 lb./1,000 ft. ²	5 to 9 lb. /1,000 ft. ²	3 to 5 lb./1,000 ft. ²
Annual nitrogen fertilizer	3 to 4 lb./1,000 ft. ²	2 to 6 lb./1,000 ft. ²	2 to 4 lb./1,000 ft. ²	1 to 2 lb./1,000 ft. ²
Drought tolerance	Poor	Poor	Some	Some
Shade tolerance (min. 4 hr. of direct sun)	Poor	Poor	Good	Excellent
Wear tolerance (traffic)	Good	Good	Good	Poor

March is a good time for

- **Spring cleaning:** Rake leaves and winter debris (which are loaded with phosphorus) away from paved surfaces and storm sewers.
- **Soil sampling:** Sample soil every three years to determine the availability of nutrients to the plants. Take approximately 1/2 cup of soil from several locations, mix together, and contact your local Cooperative Extension office for information on where to send the sample. Use this information as a basis for fertilizing.
- **Investigating seed sources:** Be sure to review the seed label for best cultivars. “Variety Not Stated” = buyer beware!



Fine Fescue
(Needlelike leaves)

Collar region

General Seed Recommendations

Use the landscape water quality assessment described above to identify unique conditions on your property. More varied conditions require blends or mixtures to optimize stand diversity.

	Sunny, medium to high maintenance	
	65% Kentucky bluegrass blend 15% perennial ryegrasses 20% fine fescues	3 to 4 lbs. per 1,000 sq. ft.
	Sunny, low maintenance	
	65% fine fescue blend 15% perennial ryegrasses 20% Kentucky bluegrass blend or 100% tall fescue blend	4 to 5 lbs. per 1,000 sq. ft. 7 to 10 lbs. per 1,000 sq. ft.
	Shady	
	100% fine fescue blend	4 to 5 lbs. per 1,000 sq. ft.

Many improved cultivars are available. See Cornell Cooperative Extension turfgrass species and cultivar guidelines.

April

Watch for Weeds

Establish thresholds for action

- A weed is a plant growing in the wrong place.
- Bare spots or thin turf will allow weeds to grow. The best defense against weeds is a vigorous, dense stand of turfgrass.
- Before choosing a weed control option, make sure you know what weeds you have.
- Decide which species you can live with and which species you want to control.
- If you decide you can't live with a particular species, determine how many you need to see before you choose a control measure.
- If populations surpass your thresholds, make sure the control you choose is appropriate for the weed's unique life cycle and biology.
- Annual weeds die off and leave bare soil that is prone to increased runoff.
- Perennial weeds, if dense, can assist in maintaining density and minimizing runoff.

Promoting a dense stand of turf can eliminate weeds and protect water quality by reducing runoff and acting as a filter for substances entering the soil.

Keys to Good Mowing



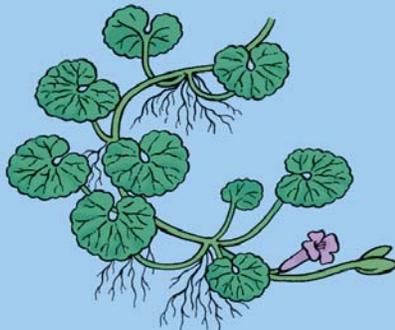
Proper mowing reduces many weed problems

- Set mower height to 3 in. or higher.
- Keep blade sharp; sharpen after every 4 hours of use.
- Follow the 1/3 rule: remove only 1/3 of grass height with each mowing.
- Keep clippings on lawn.

Perennial Weeds



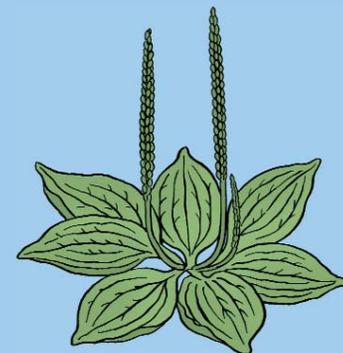
Dandelion



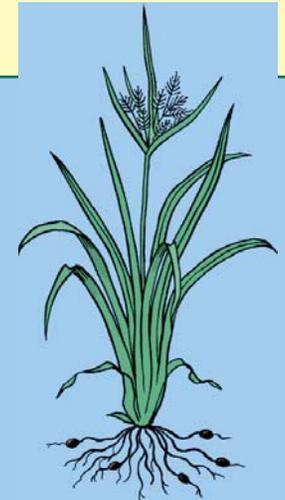
Ground Ivy



Clover

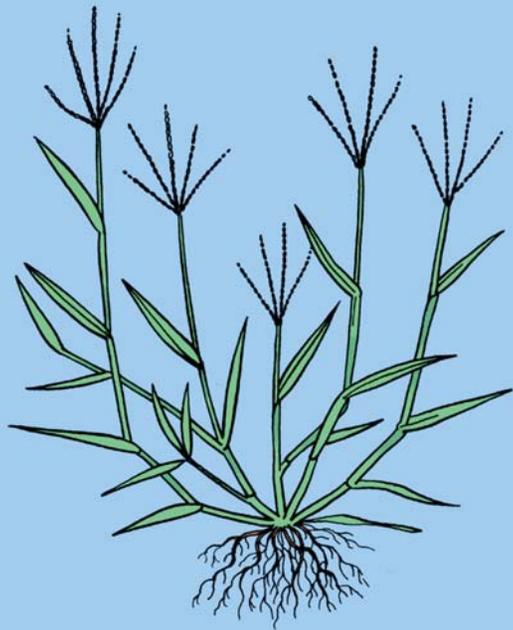


Plantain



Nutsedge

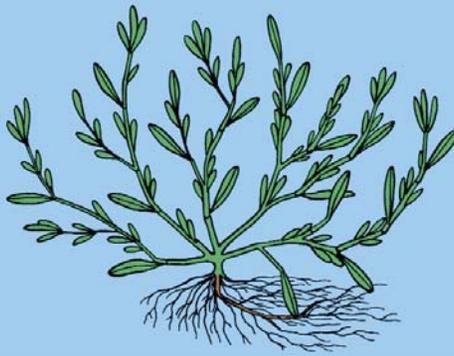
Annual Weeds (return each year from seed)



Crabgrass



Annual Bluegrass



Knotweed (indicates compaction)

April is a good time for

- **Mowing:** Begin when turf is 4 to 4 1/2 inches tall. Set mower height to 3 inches. Remove only one-third of the overall grass height with each mowing.
- **Fertilizing:** Don't fertilize yet if your lawn looked good after winter and/or you fertilized in late fall. Excess fertilizer in early spring promotes top growth at the expense of root growth. Deeper roots are more resistant to pests and drought.
- **Seeding:** Seed only if you have a thin, weak lawn or bare spots. Depending on the species, grass will germinate when soil temperatures reach 45 to 55° F at the 2-inch depth.
- **Irrigating:** Spring rains should be sufficient.
- **Monitoring soil temperatures:** Insert a thermometer to 2 inches and wait 5 minutes.
- **Scouting:** Search for large grubs, but do not apply insecticides because they will not be effective.

Weed Control Options

Cultural: Try these techniques first if you have more weeds than you can tolerate.

- Mow at the proper height for the species of grass. Mowing higher helps desirable turf shade weeds out.
- Reduce soil compaction around areas of heavy wear.
- Weed by hand (best when soil is slightly moist).
- Reduce soil compaction adjacent to paved areas.
- If lawn is thin, fertilize to improve density.

Chemical

Preemergence herbicides (most common for crabgrass, goosegrass)

- are applied to the soil before weeds are expected.
- have low solubility and bind to organic matter, thus they have high runoff potential unless watered in properly.

Postemergence herbicides (most common for perennial broadleaf weeds)

- are applied after weeds have emerged.
- have high solubility and thus high leaching potential, and do not bind to organic matter. Avoid applying before intense irrigation or rainfall.

Nonselective herbicides

- kill or injure all plants they come in contact with.

If you choose a pesticide, be smart:

- Use the right product at the right time. Follow label directions and keep accurate records to create a history.
- Choose products that have the least potential for leaching into groundwater. More highly water soluble materials have the highest potential (e.g., 2,4-D, dicamba, MCPP).
- Use extreme caution when handling materials close to wells and impervious surfaces where runoff may enter storm sewers.
- To avoid volatilization and drift, which release pesticides into the air, do not spray when temperatures are high or it is windy.
- To help prevent polluted runoff, do not apply pesticides when heavy rains are expected or the ground is already saturated or frozen. **Studies have shown that 80 percent of lawn runoff occurs when soil is frozen.**
- Empty containers should be triple rinsed and disposed of properly. Unused materials should be returned in the original container to authorized hazardous materials collection sites.

May

Keep in Balance

Learn about the disease balance

What is disease?

Disease is the disruption of normal growth and appearance of a turfgrass plant owing to the interaction of the plant with a pathogen (usually a fungus). Pathogens are almost always present in the environment.

When does disease occur?

Disease occurs when environmental conditions favor the pathogen. Plants under stress are more susceptible to disease than unstressed plants.

What practices help the environment?

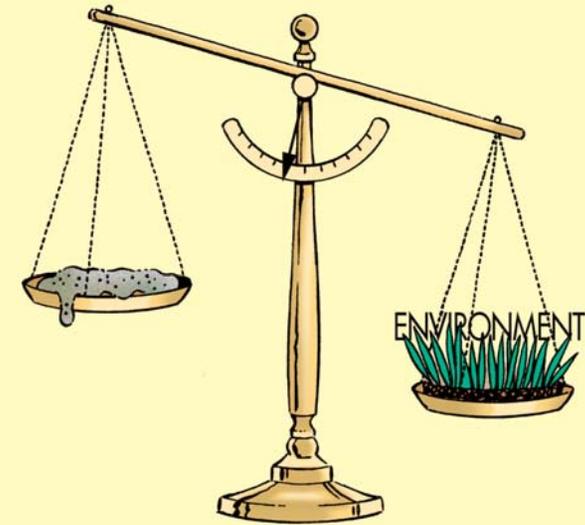
- Provide adequate drainage. (*Minimize low spots.*)
- Plant disease-resistant species or cultivars.
- Avoid overfertilization. (*Follow label directions.*)
- Reduce leaf wetness. (*Water in early morning.*)
- Maintain adequate air movement. (*Remove underbrush.*)
- Avoid watering in the evening.

How does disease affect water quality?

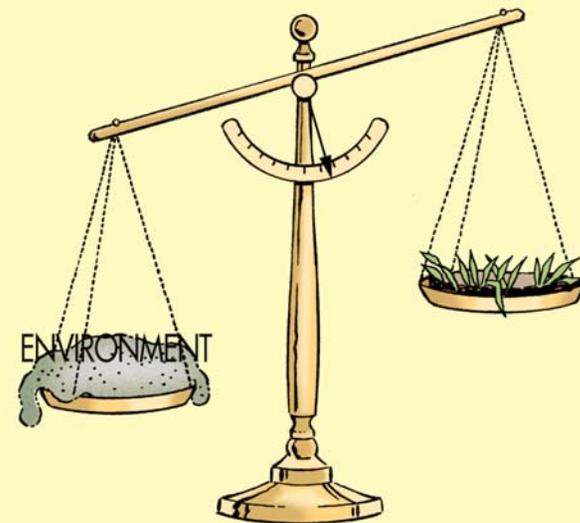
Disease can ultimately kill the grass plants, leaving bare soil that is more prone to runoff and erosion. Chemicals, if misapplied, can pollute runoff or leach into groundwater.

How can I reduce or prevent disease?

The best strategy is to promote a healthy, dense stand of turfgrass that can best cope with stress and thus resist disease pressures. **By the time you see the disease it is likely too late to provide effective control.** However, many disease-resistant cultivars can be planted to minimize future problems.



Healthy Turfgrass: Environment favors turfgrass



Diseased Turfgrass: Environment favors pathogen

The Eight Most Common Home Lawn Diseases

If you see symptoms of these diseases, you can confirm your diagnoses and explore options by contacting your local Cornell Cooperative Extension office, garden center, or lawn care provider. The Cornell Plant Disease Diagnostic Clinic web site, PlantClinic.cornell.edu/Default.htm, is also helpful.



Brown Patch



Dollar Spot



Fairy Rings



Leaf Spot



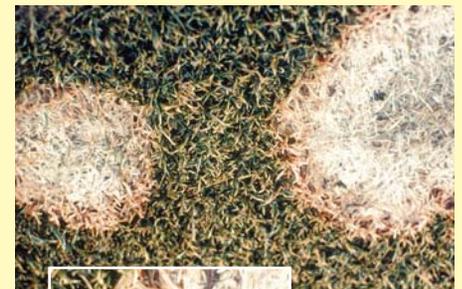
Pythium



Red Thread



Rust



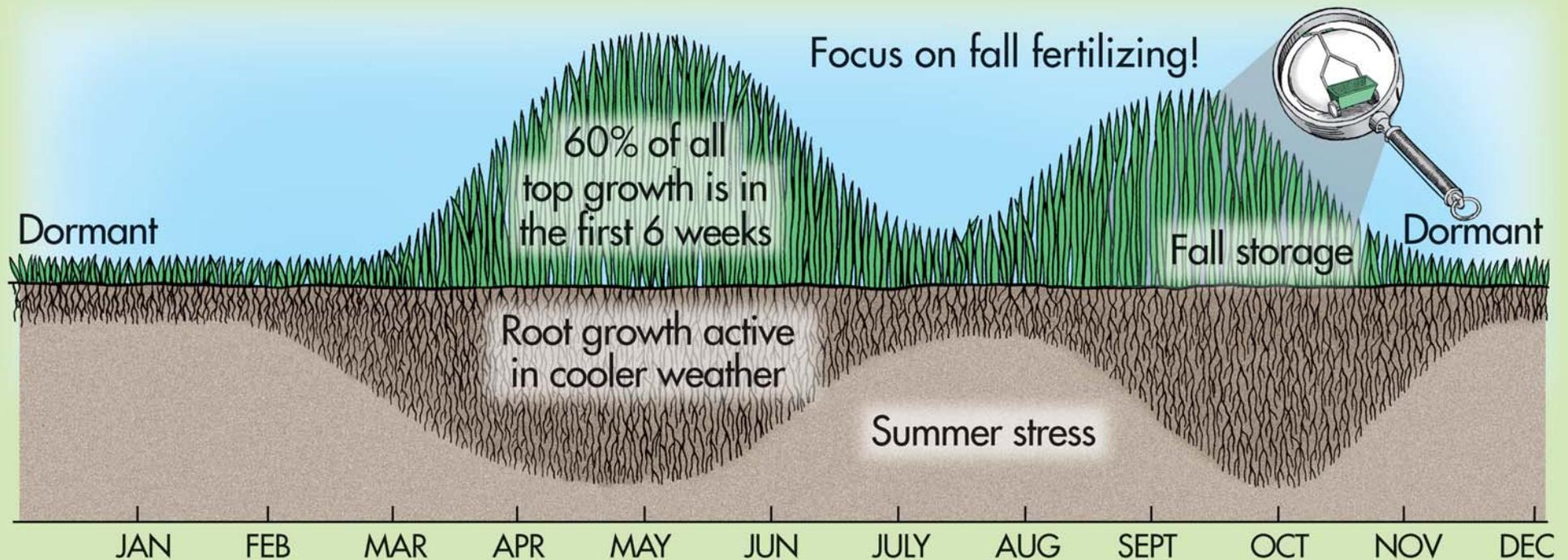
Snow Mold

May is a good time for

- **Mowing:** Keep up with the top growth, but do not remove more than one-third of the overall grass height with each mowing. This may require multiple mowings per week during periods of rapid growth.
- **Irrigating:** Do not irrigate unless conditions are unusually dry.
- **Monitoring soil temperatures:** For optimal preemergence crabgrass control do not apply materials until soil temperatures are between 55 and 59° F. Materials applied earlier can lead to polluted runoff and wasted money because crabgrass does not germinate until soil temperatures, at 2 inches below the surface, are between 60 and 64° F.

June

How Does Your Grass Grow?



Prepare for summer stress

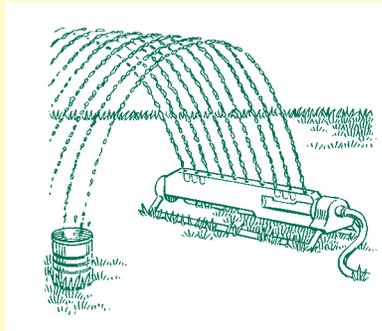
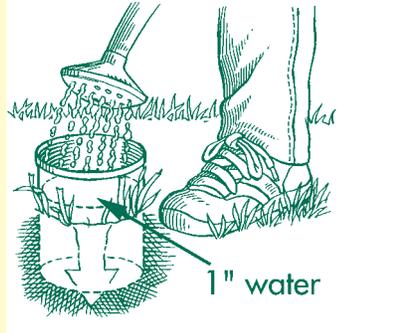
Growth of a Grass Plant

- Cool-season grass plants do most of their growing in the spring and fall. Substantial root and leaf growth occurs in the spring.
- Fertilizers applied in early spring will accelerate shoot growth at the expense of root growth. This lush, succulent growth makes the plant more susceptible to diseases and insects and requires more frequent mowing.
- Early spring seeding and fertilization can benefit lawns that are thin or bare from winter injury.
- Roots grow well in late summer and fall when temperatures cool and the plant can store carbohydrates (energy) from photosynthesis so the plant has an adequate food supply to enable spring recovery.
- The ideal time to fertilize is two weeks after your last mowing. Use a fertilizer that is about 70 percent slow-release nitrogen (IBDU) and 30 percent water-soluble nitrogen. The application should supply 1 lb. N/1,000 ft.²

Protect water quality by

- using proper irrigation and fertilization practices.
- providing the correct amount of water and nutrients. This will help produce a dense mat of turf that will filter pollutants before they enter the groundwater, thus reducing surface water runoff and erosion.

Irrigation



Know the

soil infiltration rate: Insert a coffee can with the ends cut off into the soil and pour in approximately 1 inch of water. Note how long it takes to infiltrate the surface.

irrigation rate: Place a can on an area that is being irrigated and note the amount of water in the can after 15 minutes. This tells you how much water you are applying.

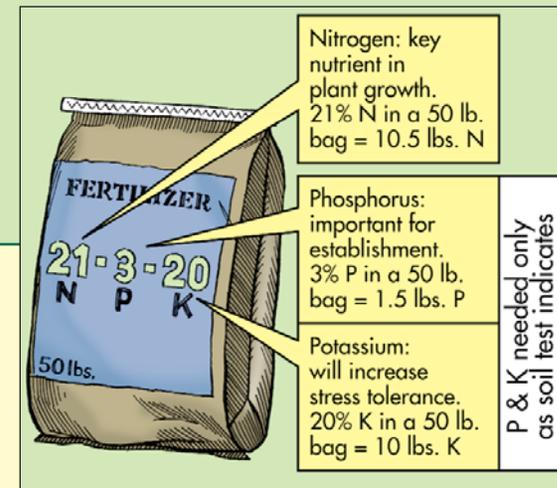
amount of precipitation: Leave a can in your yard to measure weekly amounts of precipitation. To avoid runoff, precipitation or irrigation should not exceed soil infiltration.

lawn's water needs: Healthy, actively growing turfgrass requires about 1 inch of water a week (by rain and/or irrigation).

best time to water: Water in the early morning to reduce evaporation and so plants dry by mid-morning. Prolonged leaf wetness can lead to disease.

June is a good time for

- **Mowing:** Keep your lawn 3 inches tall to reduce stress and pest problems from mowing too short. However, studies have shown that mowing at the low end of the species tolerance on irrigated sites can reduce water use.
- **Fertilizing:** Apply 1 lb. N/1,000 ft.²
- **Irrigating:** Begin to water an area that you want to remain green all summer if your weekly rainfall is less than 1 inch. To prevent runoff, your precipitation or irrigation rate should not exceed your infiltration rate.
- **Scouting:** Walk your property (scout) in the early morning to help detect problems in the early stages when control methods are most effective.



Fertilizers and Water Quality

Fertilizer Type	Advantages	Disadvantages	Potential to Affect Water Quality
<i>Slow release/nitrogen</i>	More constant supply of nitrogen with low burn potential	More expensive	Low
<i>Quick release</i>	Less expensive	Water soluble; has rapid response and higher burn potential	High

Fall is the best time to fertilize your lawn

Apply

1 lb. N/1,000 ft.² on Memorial Day/first week of June

1 lb. N/1,000 ft.² on Labor Day

1 lb. N/1,000 ft.² on Thanksgiving (two weeks after last mowing)

July

Look Before You Treat

Know where the pests are

Insects

Surface Damage

Insects suck juices from plants and cut or snip grass blades and stems above ground.

1. **Cutworms:** Gray-brown-black caterpillars that curl into a "C" when disturbed.
2. **Sod Webworms:** Young caterpillars that have black heads. Full-grown caterpillars are brown to green, have dark spots, and grow up to 3/4 inch long.
3. **Chinch Bug:** Adults up to 1/4 inch long, black with white wings that have a black triangle on them.
4. **Bluegrass Billbug:** Adults have snouts; can be seen on driveways and sidewalks migrating to the lawn in spring.

Subsurface damage

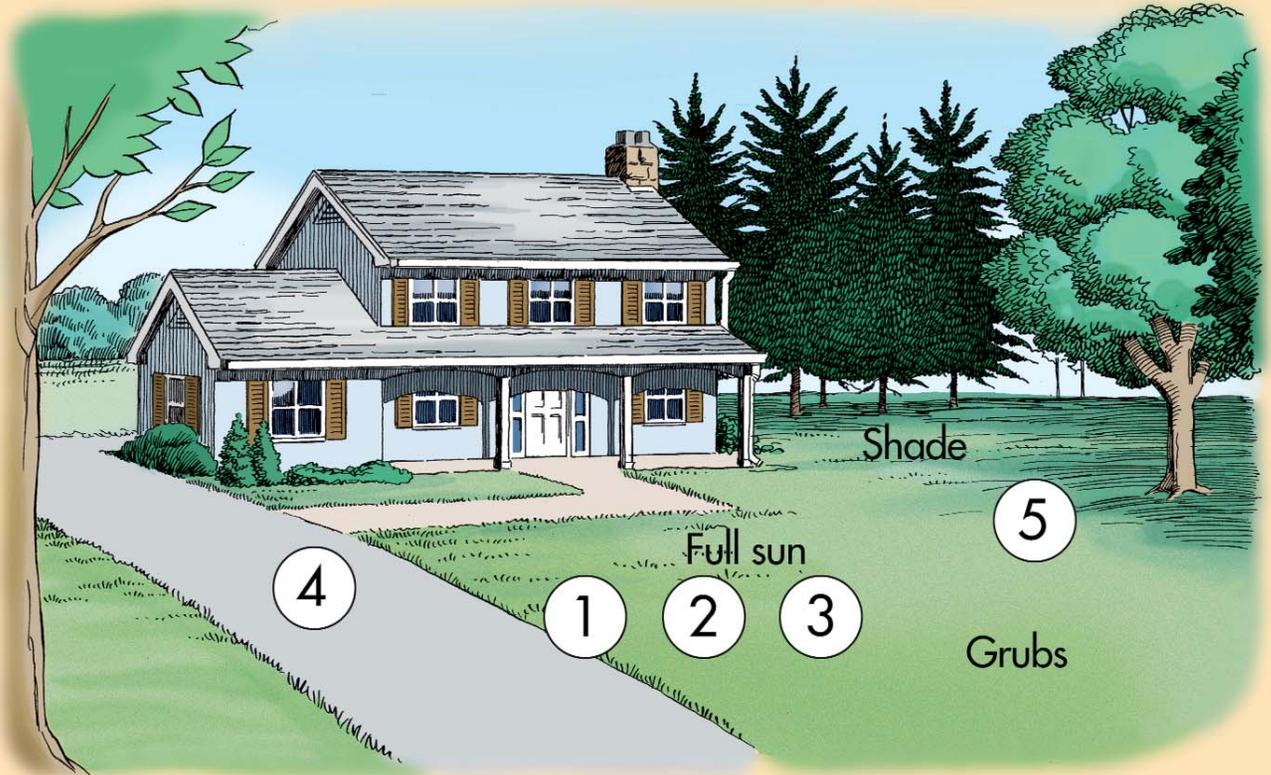
Root system is eaten and plant uptake is disrupted or prevented. Damage appears as wilted turf that does not revive when watered. "C"-shaped cream to white grubs feed on roots of all grasses.

5. Grubs:

European Chafer: Damage threshold 5 to 10 grubs per square foot.

Japanese Beetle: Damage threshold more than 10 grubs per square foot.

Oriental Beetle: Damage threshold 8 grubs per square foot.

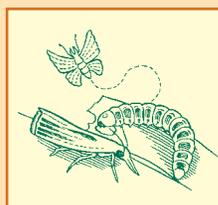


Moles, Skunks, and Crows

These nuisance pests feed on grubs, earthworms, and other insects in the soil. Trapping is the best control method. Sample to determine if grubs are the primary problem.



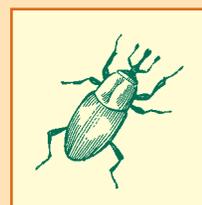
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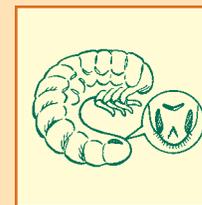
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3



4



5

Protect water quality by regular scouting and sampling. Early detection of a problem can prevent extensive damage leading to dead turf and bare areas that can pose the threat of surface runoff pollution, leaching into groundwater, and erosion. Knowing pest populations from sampling and thresholds for control can reduce chemical inputs.

Other Ways to Reduce Chemical Inputs and Protect Water Quality

- Scout for pests. The earlier a problem is detected, the more control options will be available.
- Plant the right grasses. Look for endophyte-enhanced grasses that resist surface-feeding insects.
- Know the pest's life cycle. Insecticides are *ineffective* when the insects are not active or are too large, such as in the spring.
- For subsurface-feeding insects the pesticide must be watered in immediately after application before it dries on leaves. For foliar feeders allow material to dry on leaf.
- Do not apply materials when ground is frozen or saturated to avoid runoff and surface water pollution. To prevent drift and volatilization (which releases pesticide particles into the air) avoid applying materials when temperatures are high or it is windy.

Look Before You Leap into Control



Sampling Techniques

Turf for Grubs

Cut three sides of a 1-square-foot area of turf. Peel back and count grubs.

Sample a few areas approximately 20 yards apart.

Replace sod and water.

Flotation for Chinch Bugs

Insert coffee can (with both ends removed) at least 1 inch into soil and fill with water.

Insects will float to the surface in approximately 5 minutes.

Irritation for Sod Webworm and Cutworms

Mix 2 to 4 tablespoons of liquid dishwashing detergent with 1 gallon of water and pour over 1 square yard.

Insects will come to the surface in approximately 10 minutes.

Flush surface with water.

July is a good time for

- **Mowing:** If your mower has more than 8 hours of use so far this season, it's time to sharpen the blades or reels.
- **Fertilizing:** Generally, this can be avoided, but July could be a good time to add natural organic materials.
- **Irrigating:** If rainfall has been insufficient, water your lawn deeply (possibly once every five to ten days) to the bottom of the root zone to encourage a deep root system.

August

August

Time to Recover

Recover from summer and gear up for fall

What is thatch, and why can it have a negative effect on water quality?

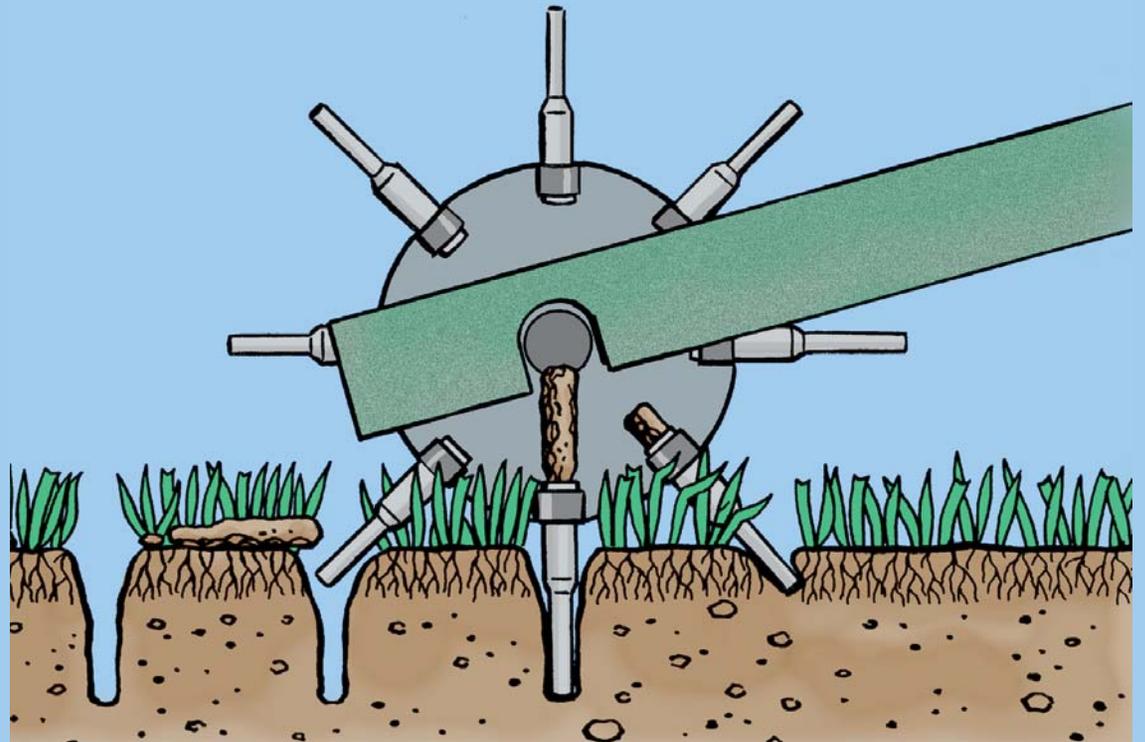
Thatch is the layer of dead and decomposing plant tissue that forms above the soil. A thin layer of thatch is beneficial to lawns. It will protect the crown of the plants and reduce soil compaction. Heavy thatch buildup results when the production of plant tissue exceeds the decomposition rate and can be encouraged by excessive growth in the spring. Fertilizers and nutrients are ineffective when water and materials cannot penetrate the thatch layer. Localized dry spots appear when the thatch becomes water-repellant and runoff increases.

What is compaction, and why can it have a negative effect on water quality?

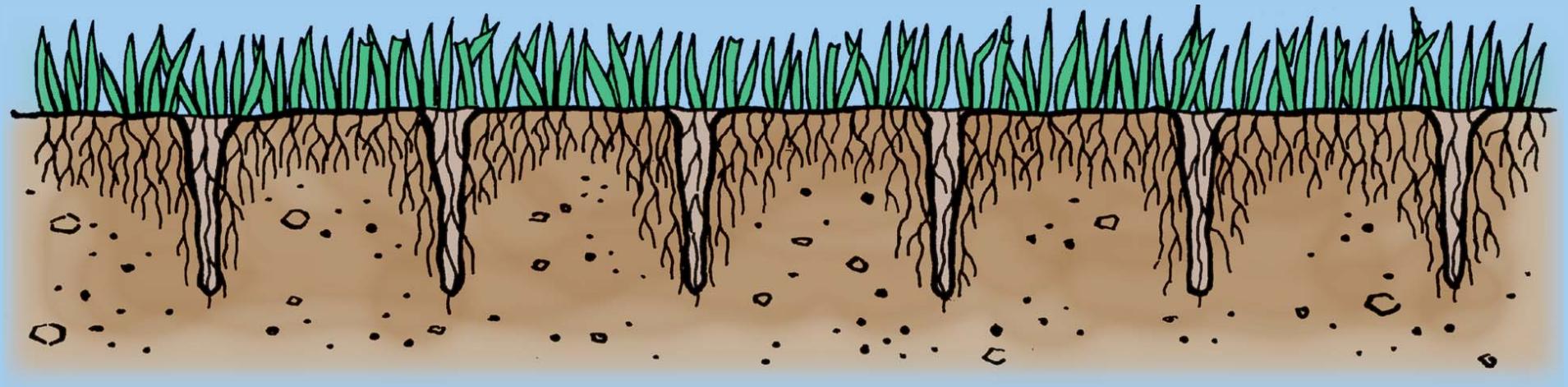
Compaction is a physical condition in which soil particles are crushed together and oxygen levels in the soil are reduced. It usually occurs in areas of high traffic or near impervious surfaces (pavement). Water infiltration and percolation are poor, and soils remain wet longer. The plants respond with reduced root and shoot growth as well as reduced water and nutrient uptake. As the turfgrass thins, the risk of surface runoff from bare areas increases. This is common on heavy clay soils or soils that receive traffic such as athletic fields.

What is core aeration, and how can it have a positive effect on water quality?

Core aeration, which should be done in late August, punches holes in the lawn and pulls out cores. The holes increase infiltration of water, nutrients, and air into the soil. Core aeration should be performed as temperatures cool and soil moisture is adequate. Allow cores to dry on the surface, then break up with a rake and distribute evenly over the lawn as a topdressing. Be careful not to move soil particles off site because they contain phosphorus, which is a leading threat to water quality in many parts of the country.

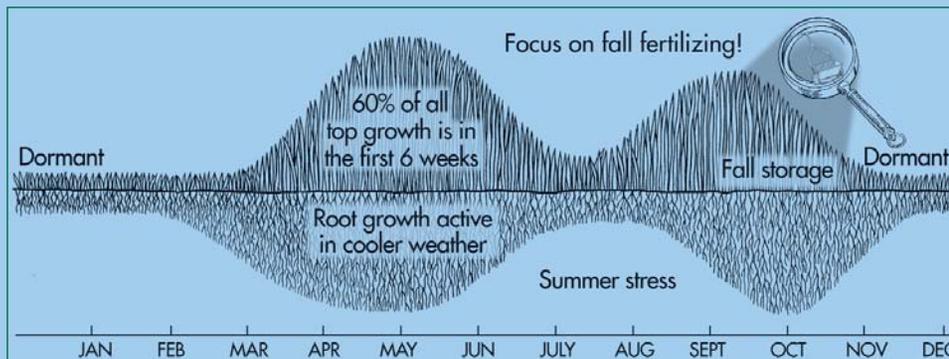


The lawn is perforated during core aeration



Improved infiltration

Turfgrass Growth



An average lawn can allow water to run off at about half a gallon per minute during peak rainfall. By comparison, 7.5 gallons of water may run off from lawns that are thinly seeded. If your lawn has large, bare areas, consider renovating or reseeding. August is the best time to start turf growth from seed.

Practices that promote deep rooting are beneficial at this time of year for food storage to get through winter, supply energy needed for spring greenup, and reduce production of clippings in spring.

August is a good time for

- **Alleviating compaction and thatch problems before the fall surge of growth:** Toward the end of the month temperatures become moderate, soil moisture is adequate, and the turfgrass begins to recuperate from the stress of summer and gear up for fall root growth.
- **Mowing:** Keep up with mowing as the grass recuperates from summer stress and begins active growth.
- **Controlling broadleaf weeds:** Consider a postemergence material in the second half of the month if needed. Hand weed for light invasions.
- **Fertilizing:** Wait until plant recovers from summer stress, usually by Labor Day.
- **Scouting:** The middle of the month is a good time to begin sampling for grubs.

September

Shape Up!

Get your turf in shape for next year

Bare, exposed soil can affect water quality by increasing runoff of water and materials applied, leaching, and erosion. If your lawn survived summer stress, begin with a Labor Day application of fertilizer. If your lawn has deteriorated beyond help from fertilizer and patching, you may choose to renovate by seeding or sodding. The first half of the month is the ideal time because temperatures cool, moisture is adequate, and weeds are less competitive.

Follow these steps:

Renovation/Establishment

1. If renovating, use a nonselective herbicide to kill the existing vegetation or physically dig up and remove it.
2. Remove thatch and dead turfgrass by raking or using a sod cutter.
3. Grade or regrade areas to correct low-lying wet spots.
4. Add soil amendments (lime, fertilizer, compost) based on soil test results and incorporate into the soil.
5. Rake to smooth out the area.
6. Add a light topdressing of a preplant fertilizer.



Lawn Renovation

Minimize the amount of time when soil is bare so as to reduce risk of soil particle movement into water bodies

Seeding



7. Seed area at recommended seeding rates and rake lightly.
8. Roll lightly to ensure good seed to soil contact and mulch lightly if desired with straw, hay, or pelletized mulch.
9. Water regularly, lightly, and gently so that surface does not dry. Water frequently for at least three weeks after planting and fertilize again three weeks after emergence.

Sodding



7. Roll out sod and stagger it like bricks.
8. Roll lightly to ensure good sod to soil contact.
9. Water installed area. Be sure the soil below the sod is moist but not saturated.

September is a good time for

- **Mowing:** Keep blades sharp to avoid dull mower injury. Mow newly established or renovated areas when 60 percent of the seedlings are 2.5 inches tall.
- **Fertilizing:** Fertilize on Labor Day. Apply 1 lb. N per 1,000 ft.²
- **Scouting:** Continue to sample for grubs. The orange on your lawn might be rust, a common turfgrass disease. Despite the color, it is not dangerous to humans and can be managed through proper fertilization.
- **Controlling weeds:** September is still the best time for postemergence broadleaf weed control. Avoid applications when temperatures are below 50° F or before an expected rainfall.

October

An Old Leaf

"Shady characters"/ Yard waste

During the growing season tree shade can reduce energy production in grass plants, making them weak and more susceptible to stresses and pests. The result is a thin stand of turfgrass or completely bare spot that can lead to surface water runoff. Consider the following:

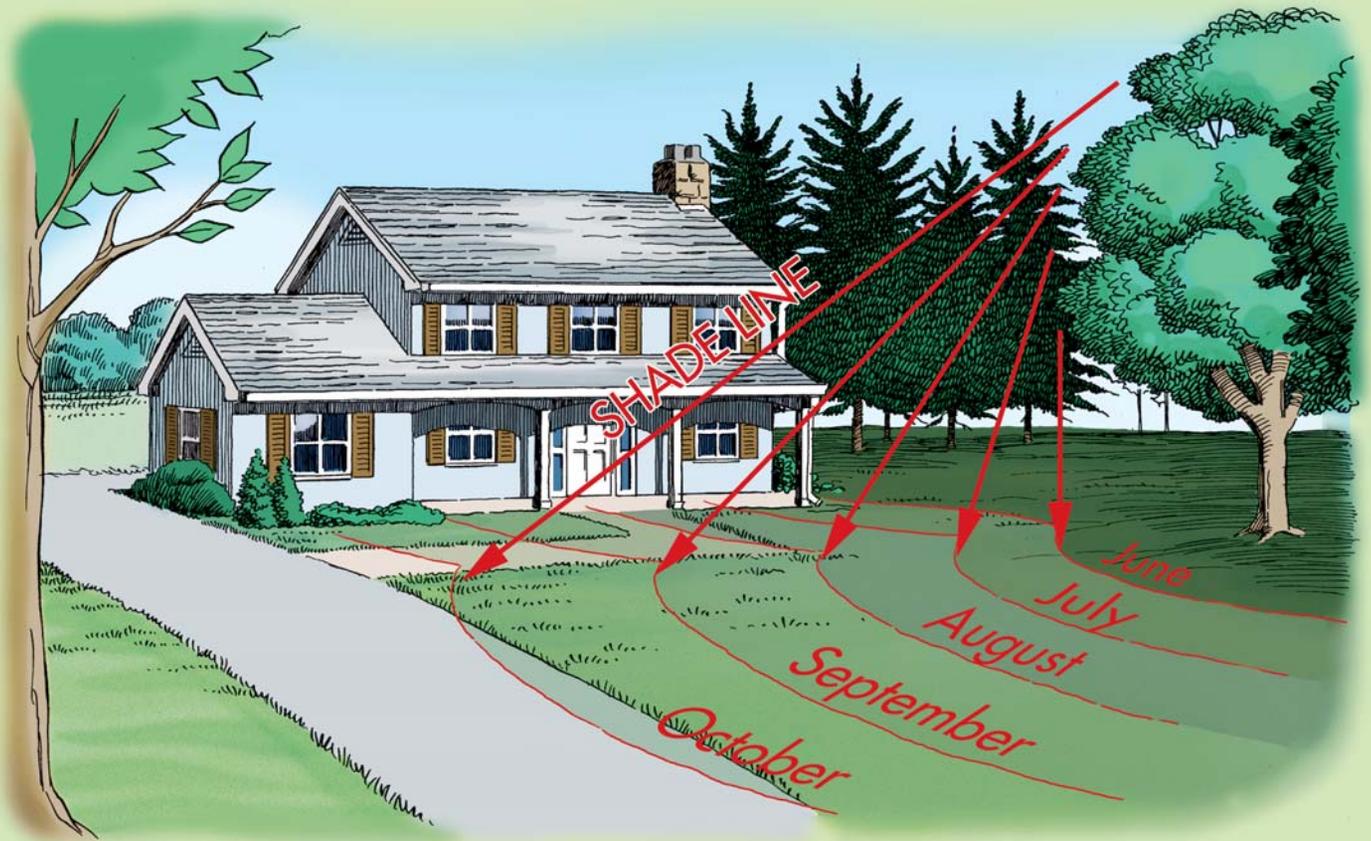
What to do?

Raise the canopy or understory to improve air movement.

Selectively prune entire trees in group plantings. Grass needs a minimum of 4 hours of direct sunlight.

Turfgrass shade management

- Select grass species that show tolerance to shade, for example, fine fescues.
- Fertilize less often because plants in low light grow more slowly.
- Irrigate less often but more deeply to water deeper grass roots.
- Mow at the high end of the recommended mowing height for the species.
- Don't fight Mother Nature! Consider mulching around the bases of trees with wood chips or bark mulch (to a depth of 3 inches) or planting ground covers adapted to the shade. These include pachysandra, lily of the valley, English ivy, periwinkle, creeping myrtle, or creeping mahonia.



*The angle of the sun changes and increases or decreases the area that receives light.
Morning sun is best!*

Tree Leaves Are Loaded with Phosphorus

Autumn is a critical time to protect our water quality.

As deciduous trees begin to shed their leaves in preparation for winter, we run the risk of large amounts of phosphorus being loaded into our surface water runoff and ultimately into lakes and streams.

If leaves are not properly managed, they can lead to high concentrations of phosphorus in lakes, streams, and ponds in the fall. Algal blooms will flourish in these waterways owing to the readily available phosphorus; lower levels of dissolved oxygen from plant dieback can be fatal to fish and other aquatic organisms. This process is called eutrophication.

Consider instead:

- Using a mulching mower to shred the fallen leaves into small enough pieces to be mulched into the turf to decompose.
- Collecting grass clippings and leaves for composting away from the road. Mix in a ratio of one part clippings to three parts leaves. Turn the compost pile every couple of weeks to hasten decomposition and eliminate odors.

October is a good time for

- **Mowing:** Continue as long as grass is growing.
- **Fertilizing:** Apply the last 1 pound of nitrogen per 1,000 ft.² two weeks after last mowing (Halloween to Thanksgiving in the Northeast) when the plant is still actively growing.
- **Raking:** Collect, or finely shred, leaves from the lawn to minimize mold and prevent grass suffocation.
- **Core aerating:** Do this to reduce compaction and improve drainage.

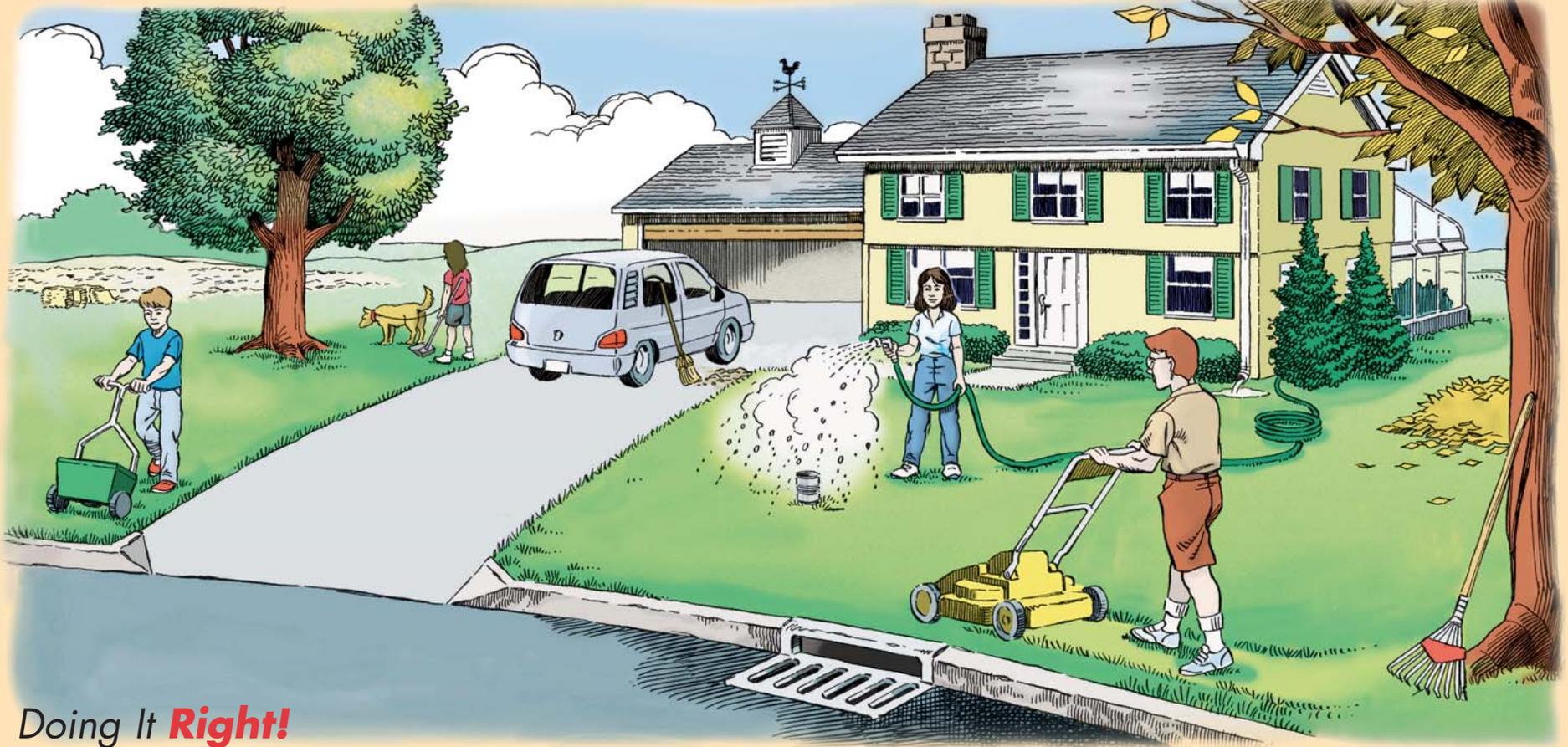
Watch where your leaves go!



November

November

Getting Your Act Together



Doing It **Right!**

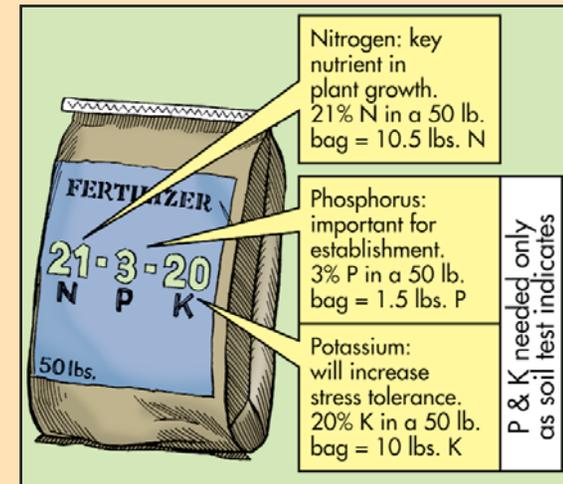
Healthy lawns, Healthy environment

As urbanization continues, land is replaced with impervious surfaces and compacted soils, leading to increased surface runoff and decreased infiltration. In some places, surface runoff loaded with sediments, chemicals, oil, gas, salts, and fertilizers does not flow into sewage treatment plants and may go directly into our water system. Adopting the principles and techniques outlined in this almanac can play a critical role in preserving water quality.

Tips

- Take soil tests to determine what, if any, physical or chemical amendments your soil needs.
- If there is a lake, pond, or stream on your property allow a natural buffer zone to prevent bank erosion and filter substances between the lawn and the water. Allow the lawn to grow long.
- Fall is an ideal time to patch or renovate bare or thin spots to reduce runoff and erosion.
- For top-notch establishment don't take shortcuts during seedbed preparation.
- Use grass species adapted to your site and maintain them according to recommendations. In deep shade consider alternative ground covers or wood chips.
- To avoid runoff, know your infiltration rate and irrigation amount.
- To avoid plant stress, postpone aeration or dethatching in very wet or very dry conditions.
- Do not mix, apply, or dispose of any chemicals within 100 feet of a well. Clean up any spills on driveways, sidewalks, or paths rather than hosing into the street.
- Read the label and follow manufacturer's directions for any materials applied. There is no truth to the thought that "if a little works, more will work better." In fact, using excess fertilizers or pesticides can burn your lawn. Irrigate (0.25 to 0.5 inch) after an application of fertilizer to get the material into the ground where it can be used by the plants.
- To avoid runoff, do not apply pesticides or fertilizers to soil that is already saturated or frozen.
- Leave clippings on the lawn to recycle nutrients and reduce phosphorus loading of water bodies.
- Mulch or collect and compost fallen leaves to protect both the lawn and our water.
- Scout your property regularly to detect and identify problems as early as possible. Pests have a timetable and so do control measures.

Read all labels before applying



November is a good time for

- **Mowing:** Continue until the grass stops growing. Avoid having tall turf bend over and mat on the surface to form the perfect environment for disease.
- **Raking:** Keep tree leaves off paved surfaces.
- **Fertilizing:** Final 1 lb. N per 1,000 ft.² two weeks after your last mowing.
- **Irrigating:** Taper off to none so as to harden plants for winter.

December

Happy Holidays

Maintenance equipment is your ally in protecting water quality—keep it in good condition.

Proper Equipment Use Affects Water Quality

- Use rain gauges to determine irrigation needs so water is not wasted.
- Properly adjust sprinkler heads to eliminate runoff.
- Rake leaves and use for compost or mulch to prevent phosphorous runoff.
- Avoid using rotary spreaders around water bodies and impervious surfaces.
- Use drop spreaders to increase accurate product applications.
- Mow at the proper height to reduce the need for pesticide applications.
- Remove only one-third of the grass blade with sharp cutting edges.
- Leave clippings on the lawn and avoid potential runoff while recycling nutrients.
- Avoid fuel, oil, and grease spills. Never wash into storm drains.

Before Next Season: Equipment Tune-Up Time

- Change spark plugs.
- Sharpen reel or rotary blades.
- Grease moving parts.
- Change oil and empty gas tank. (Gas and oil become stale in the winter and may damage your engine.)
- Check tires.
- Clean and paint equipment if necessary.



Buy your lawn a gift with water quality in mind

- **Journal and camera** are two of the most valuable tools in caring for your lawn and garden. They can create a history of your lawn. In the journal note the date of environmental conditions, problem areas, disease or insect problems, control measures and outcomes. Take photos of problem areas, weeds, disease, and areas that you are considering renovating. This is the time to plan next year's strategies.
- **Magnifying glass and tweezers** can come in handy when trying to identify an insect or disease problem.
- **Mower** with adjustable heights and mulching capability.
- **Sturdy metal rake** for roughing the soil surface when overseeding or patching.
- **Drop spreader** to allow more precise application of material than a rotary spreader.
- **Weed trimmer** to prevent the risk of damaging the base of trees or exposed roots as well as the blades of your mower on the sidewalk or driveway.
- **New sprinkler** with a low flow rate for better infiltration.
- **pH kit** to detect extremes or changes in pH, which signal a problem.
- **Tape measure** because pesticide and fertilizer rates are usually given per 1,000 ft.²



December is a good time to

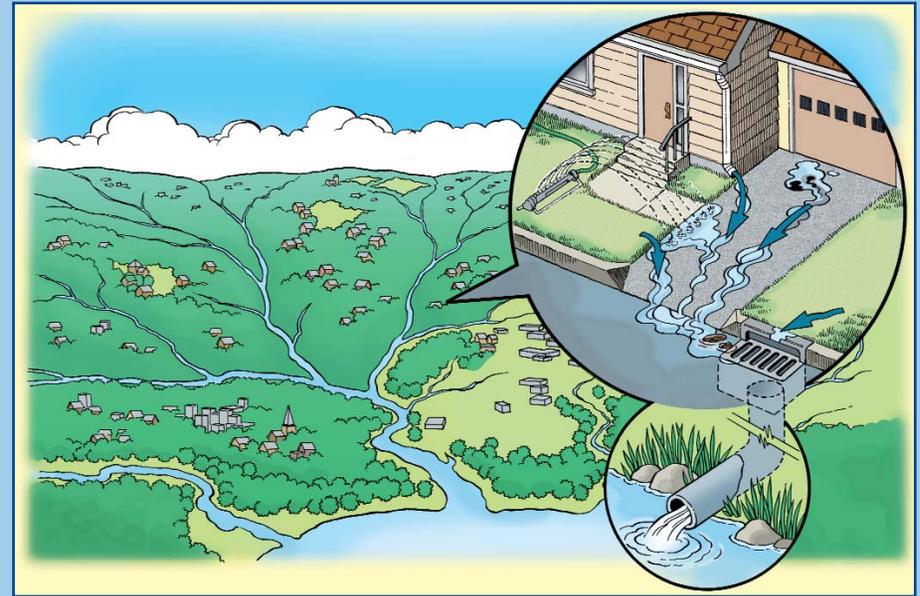
- add to your informational reference library.
- sign up for seminars on lawn care and learn more about your community's efforts to preserve the quality of your watershed.

How does a dense, healthy, lawn protect water quality? Since all land is in a watershed and everybody lives in a watershed you should know how to protect water quality. A healthy lawn, properly maintained, can be a good ally.

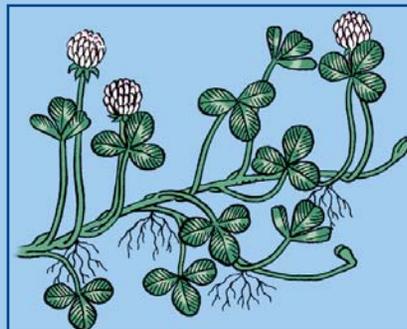
The Homeowner's Lawn Care and Water Quality Almanac provides a month-by-month plan for you to follow, beginning in January. It explains what you can do to protect water quality and what not to do, with your lawn as the intermediary.

The almanac also lists common sources of stormwater pollutants, shows how to conduct a landscape water quality assessment, and provides information and recommendations on grass seed. It discusses pesticides, mowing, equipment maintenance, compaction, fertilizing, irrigating, sampling techniques for pests, and more.

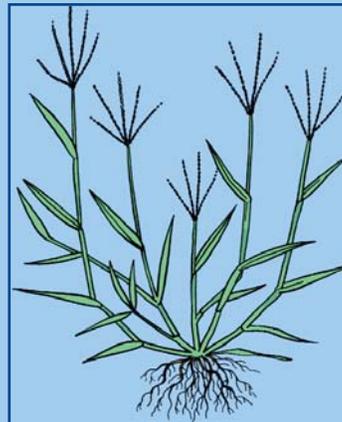
The almanac is easy to use and is filled with unique tips and helpful ideas. The year ends, in December, with a list of creative gift suggestions that you can buy for your lawn.



Dandelion



Clover



Crabgrass



Illustrated by Jim Houghton, The Graphic Touch, Ithaca, N.Y.

Edited by Susan Pohl

Designed by Dennis F. Kulis

Produced by Media and Technology Services at Cornell University
www.mediasrv.cornell.edu

For additional publications on lawn and garden care,
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ISBN 1-57753-272-4