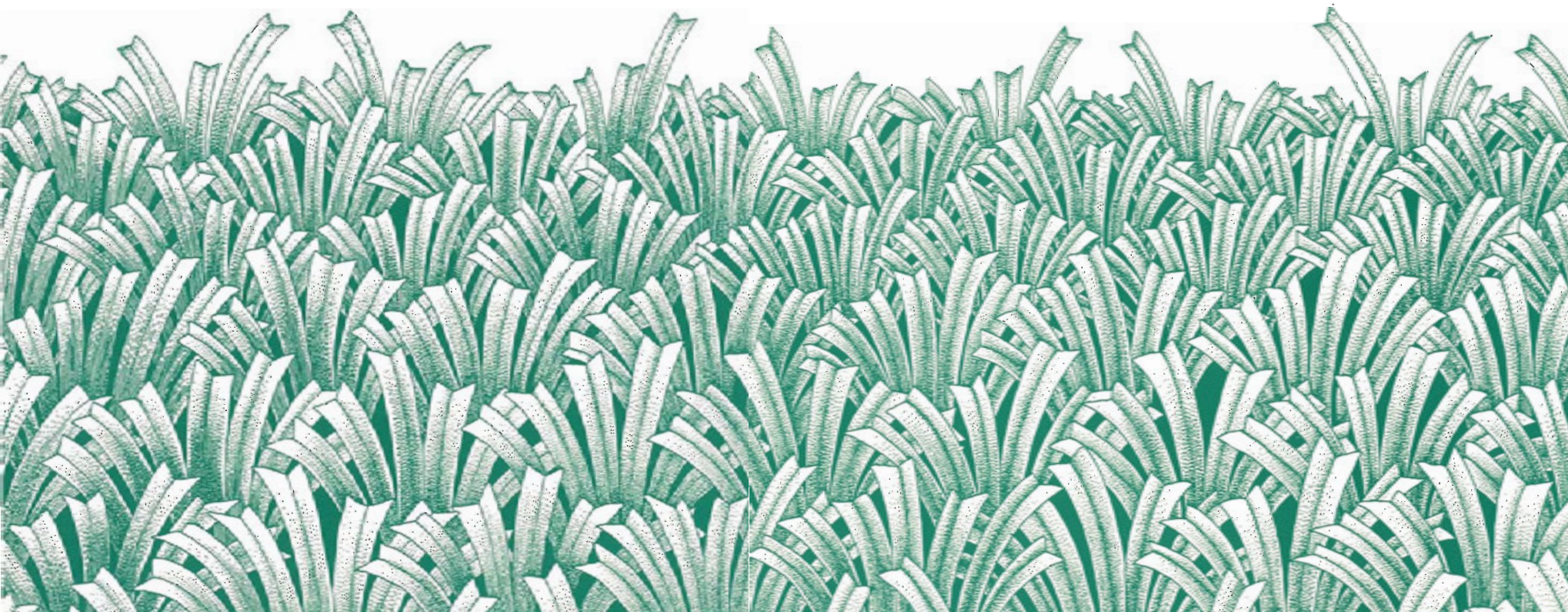


# Home Lawns

## Establishment and Maintenance

MARY C. THURN, NORMAN W. HUMMEL, and A. MARTIN PETROVIC

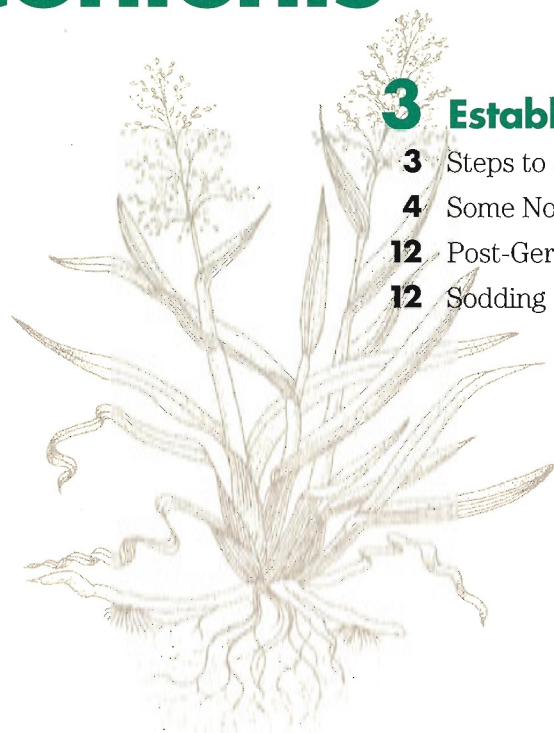




Mary Thurn is an extension assistant, and Norman W. Hummel and A. Martin Petrovic are associate professors, in the Department of Floriculture and Ornamental Horticulture, New York State College of Agriculture and Life Sciences, at Cornell University, Ithaca, New York.

Contributions were also made by Joseph C. Neal, associate professor, Arthur Bing, professor emeritus, and Joann Gruttadaurio, extension associate, Department of Floriculture and Ornamental Horticulture; Richard Smiley, former professor, Eric B. Nelson, associate professor, and Melissa Craven-Fowler, research support aide, Department of Plant Pathology, New York State College of Agriculture and Life Sciences, at Cornell University, Ithaca; Haruo Tashiro, professor emeritus, Department of Entomology, New York State Agricultural Experiment Station, Geneva; and Glen Wood, University of Vermont.

# Contents



## **3** Establishing a New Lawn

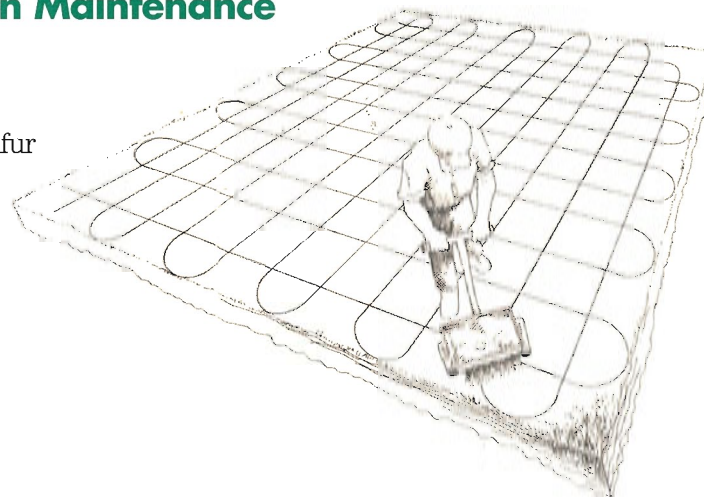
- 3** Steps to Successful Lawn Establishment
- 4** Some Notes about Soil
- 12** Post-Germination Care
- 12** Sodding

## **13** Routine Lawn Maintenance

- 13** Mowing
- 14** Fertilizing
- 16** Adding Lime or Sulfur
- 19** Watering
- 19** Thatch

## **26** Lawn Pests

- 26** Weeds
- 28** Diseases
- 36** Insects

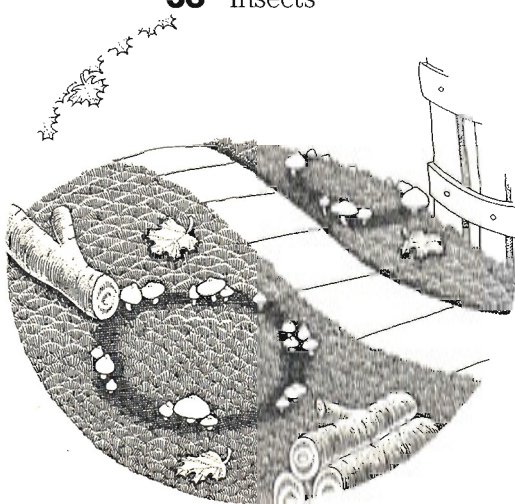


## **40** Special Lawn Problems

- 40** Renovating a Poor Lawn
- 40** Lawns in the Shade
- 40** Steep Slopes
- 41** Turfgrasses and Substitutes to Avoid
- 41** Moss
- 41** Moles, Skunks, and Other Animals

## **42** Appendix

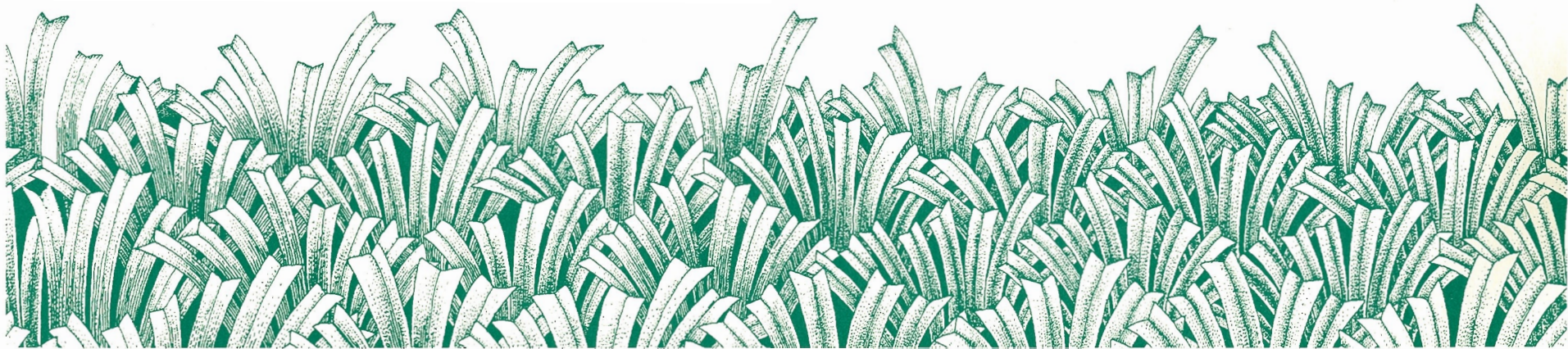
## **46** Helpful References





---

**E**very year Americans spend billions of dollars maintaining their lawns. A turfgrass lawn increases property value, enhances the environment by filtering out atmospheric pollutants, reduces noise, and cools property in the summer. Establishing a lawn is not an easy task, but if you follow the guidelines presented in this booklet, the results will be well worth the effort. Keeping a lawn vigorous, healthy, and thus more tolerant of diseases and insects is more important than ever in view of today's increasing concern about pesticide use.





# Establishing a New Lawn

A new lawn should be seeded between August 15 and September 15 in upstate New York and between August 15 and October 1 in south-eastern New York. Warm soils, cool temperatures, and autumn rains produce an environment favorable for seed germination and seedling growth. Competition from weeds is lower in fall than in early spring. Lawns can be established in spring and summer when irrigation is available but may become infested with annual weeds unless preventive steps are taken. Ensuring a dense, vigorous turf from the beginning will result in an attractive lawn and lower maintenance costs for many years.

## Steps to Successful Lawn Establishment

### 1. Analyze the Site

A few weeks before seeding, set realistic goals based on your aesthetic standards, the amount of maintenance you are willing to provide, degree of shade, and how the lawn will be used. Giving some thought to these issues will help you make the most suitable choices and avoid common pitfalls.

Ask yourself some questions about the site. How well does the soil drain? Will the area need to be provided with surface or subsurface drainage, or will the site be droughty? Is the soil too acidic? too alkaline? How much topsoil is on the site, and does it need to be amended? Will the lawn be estab-

lished by seed or sod? Answers to these questions will help you estimate costs and may change some of your expectations.

Not all residential sites are favorable for growing an acceptable lawn. Heavily shaded or severely sloped areas are difficult and expensive to establish and maintain. Turfgrass may not be the most suitable ground cover for the entire area.

### 2. Have the Soil Tested

Do not neglect this important step. The only opportunity to incorporate lime or fertilizer into the root zone is when a lawn is being established. A competent laboratory can test the soil to determine the lime and fertilizer requirements. Contact your county Cooperative Extension office for information on obtaining a soil test.

### 3. Eliminate Existing Vegetation

Tilling can remove much of the vegetation but will not eliminate persistent weeds such as quackgrass and nutsedge. A herbicide may be necessary at the time of seeding to control perennial grassy weeds. Refer to *Home Lawns: Varieties and Pest Control Guide* for specific recommendations.

### 4. Drain and Grade

Unless excess water drains rapidly through the soil, the turfgrass will have a poor root system and weak growth. If your soil stays wet after a heavy rain, supplemental drainage may be necessary to grow a satisfactory lawn.

The house foundation and the curb or sidewalk level are the fixed grade points for a new home. An existing property has more places that cannot be changed. The goal in grading is to arrange the soil between these fixed points in gradual slopes to direct water away from the house and off the property.

Avoid sudden steep slopes because they are hard to establish and difficult to maintain. If much soil must be changed, move the topsoil into a pile and rearrange the subsoil to the desired grade or slope. Then spread the topsoil evenly over the subsoil. When grading, it is best to prepare the seedbed several weeks before planting to allow the loose soil to settle. A 6-inch layer of loose soil settles to about 5 inches.

#### Steps to Successful Lawn Establishment

- |                                       |                        |
|---------------------------------------|------------------------|
| 1. Analyze the site                   | 6. Select seed         |
| 2. Have the soil tested               | 7. Prepare the seedbed |
| 3. Eliminate existing vegetation      | 8. Plant               |
| 4. Drain and grade                    | 9. Irrigate            |
| 5. Add fertilizer or other amendments | 10. Mow                |



# Some Notes about Soil

## Topsoil

If you are building a house, be sure the topsoil is scraped into a pile and saved for even distribution after construction and rough grading are finished. If this important point is overlooked and only subsoil is left, plan to add at least 4 to 6 inches of good topsoil. Although topsoil is expensive, this is the surest and often most economical way to produce a good lawn in the long run.

Topsoil usually refers to the original surface layer of grassland or cultivated land. It does not generally include soil from peatlands or other special areas such as land disturbed by industrial activity. Acquiring good topsoil is often difficult, and homeowners' choices may be limited by cost and local availability. Before using soil from a potential source, take a representative sample and have it evaluated for pH, nutrient level, and physical condition.

Soil from the top 6 inches of a farm pasture or cropland is often very desirable for lawn use, but find out if any herbicides have been used recently on this land because some of these chemicals are harmful to turfgrass. Do not accept river-bottom silt, pond sediment, soil dug from a

hill with a power shovel, or factory waste regardless of how "rich" any of this material looks. If you live near a large city or in some other area where good topsoil is not available, work with what you have. Even poor soils, if well drained, often can produce a fairly good lawn if the soil is prepared properly, adequately fertilized, and planted with an appropriate turfgrass seed in the right season. If you can maintain the lawn for a few years with adequate water and fertilizer, the turfgrass will produce enough organic matter to improve the soil. Be patient when trying to improve poor soils because it may take several years to produce an acceptable lawn.

## Soil Texture and Structure

Soil should be porous so that air and water are available to turfgrass roots. Soil porosity is defined in terms of texture and structure. Soil *texture* is

determined by the relative amounts of different-sized particles it contains. Particle size ranges from gravel, the largest, through sand and silt, to clay, which is microscopic (**Table 1**). Soil *structure* refers to the aggregation of individual particles into larger particles called granules. The structure of a soil determines its pore space; it is influenced by freezing, thawing, wetting, drying, and penetrating roots. In an ideal soil, half of the volume is pore space. If a soil contains a lot of clay, the pore space may be too small to allow roots, water, or air to penetrate. In sandy soils, pores may be so large that water and nutrients drain away before plants can use them.

Soils are classified into four types based on their texture and structure: gravels, sands, loams, and clays. To determine a soil's textural class, pour 5 inches of dry soil into a quart jar, fill it with water, and cover. Shake

thoroughly and let it settle for at least twenty-four hours. The different soil types will settle out in layers, with sand on the bottom, silt in the middle, and clay on the top. Measure the layers for a rough percentage of soil types. For example, if the jar contains 5 inches of soil, of which 1 inch is clay and 2 inches each are silt and sand, then the soil contains 20 percent clay and 40 percent each of silt and sand. Refer to the textural triangle (**Figure 1**) to find out what type of soil you have. The soil used in this example would classify as a loam. Knowing this will help you determine whether to amend the soil to improve its texture.

A very sandy soil is too "light" or "open" in texture. It is like a mass of tiny stones, containing too few smaller bits of soil between the sand grains to hold water and nutrients. To improve a sandy soil, work about 1 to 2 inches of organic matter into the surface 4 to 6 inches of soil or thoroughly mix 1 inch of heavier soil with the top 4 inches of sand. Using both methods together improves the soil even more.

A clay soil is "heavy" or "dense." It is slippery and sticky when wet and shrinks and cracks as it dries. Heavy traffic from people walking or playing packs a clay soil even more tightly. Work organic matter into a heavy clay soil to improve it. Do not work sand into a clay soil because it will pack harder than before and become much like concrete.

**Table 1. Textural classification of soil particles (USDA)**

Soil Component	Diameter Size in Millimeters
Very coarse sand	2.00–1.00
Coarse sand	1.00–0.50
Medium sand	0.50–0.25
Fine sand	0.25–0.10
Very fine sand	0.10–0.05
Silt	0.05–0.0002
Clay	<0.0002



## 5. Add Fertilizer or Other Amendments

An amendment is any substance added to soil to alter its physical or chemical properties. Depending on soil conditions, select amendments based on one or more of the following:

- Effect on soil texture and related physical properties
- Effect on chemical characteristics of soil
- Local availability
- Long-term availability
- Cost

Organic material is usually added to a lawn to improve soil texture. There are several ways to add organic matter to soil. Avoid using wood chips, shavings, or sawdust because they can “steal” nitrogen, which is vital to the turf, from the soil. For each 1,000 square feet of new lawn, use four large (6-cubic-foot) bales of peat *or* 2 to 3 cubic yards of well-rotted manure or cultivated peat *or* 3 to 4 cubic yards of spent mushroom soil. Smaller amounts of organic matter are of little value. Sewage sludge, sometimes available from sewage treatment plants, may be used successfully if it does not contain excessive amounts of heavy metals from industrial wastes.

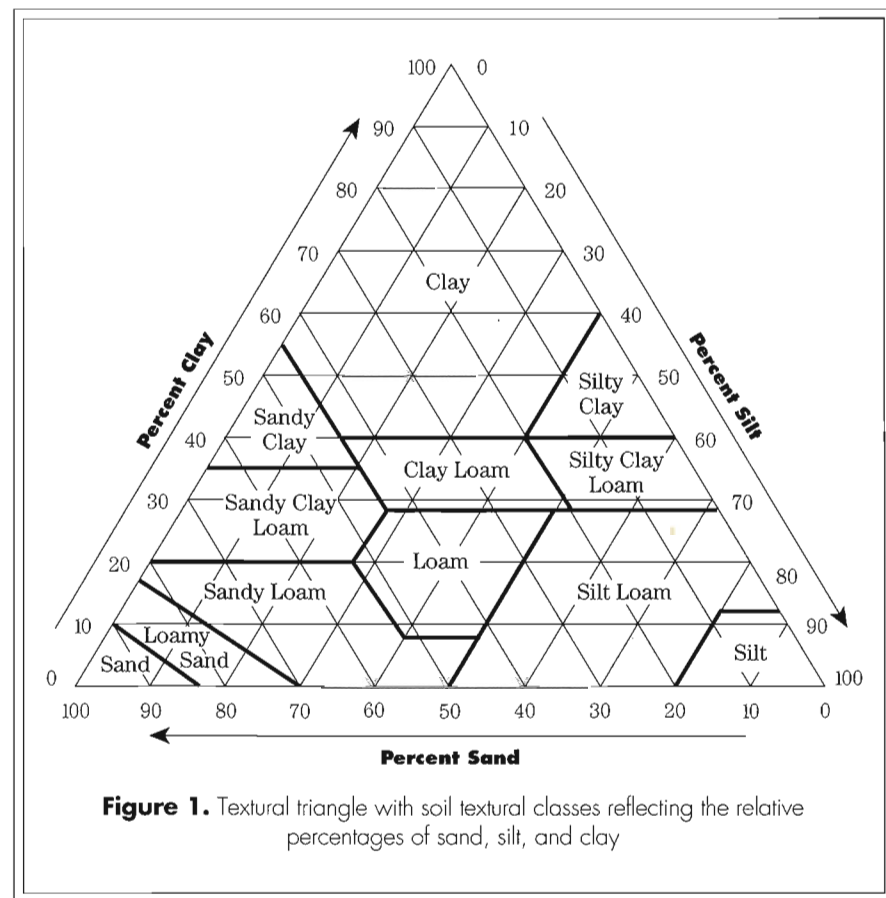
Adding compost can return organic matter to the soil. Its primary benefit is improvement of soil structure, making the soil more

porous, giving roots more room to penetrate, and improving the soil’s ability to hold water and nutrients. Compost is less beneficial as a fertilizer because it is low in the primary nutrients and little is known about the availability of the other nutrients it contains. If you are seeding or sodding a new lawn, mix 1 to 3 inches of compost into the top 4 to 6 inches of soil.

### *Lime or Sulfur*

The pH of soils that are too acidic or alkaline should be corrected before planting. First have the soil tested to determine pH. The test results are reported in pH units.<sup>1</sup> Most New

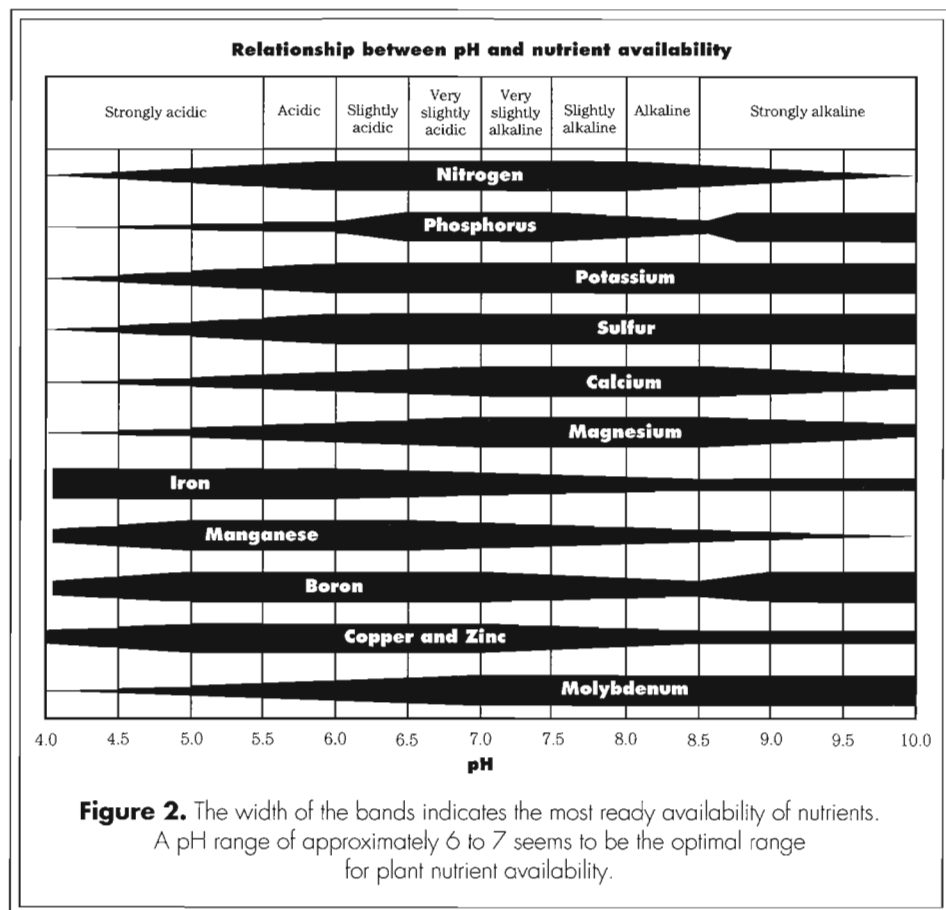
<sup>1</sup> In the pH scale, a value of 7.0 indicates a neutral soil, neither acidic nor alkaline. Values less than 7.0 (as pH 6.5) indicate acidity (the higher the number, the more alkaline the soil).



York soils range from pH 4.5 (acidic) to pH 7.8 (alkaline). Plant nutrients are most available in the pH range of 6.0 to 7.0 (**Figure 2**). **Table 2** lists specific preplant ground limestone recommendations to raise pH when soil pH and texture are known. When pH is above 7.5, elemental sulfur should be used to lower it (**see Table 3**). Purchase a pelleted sulfur product, which can be applied easily with a drop or centrifugal spreader.

### Fertilization

A topdressing of fertilizer on the prepared seedbed will enhance establishment. Nitrogen and phosphorus, the two most important nutrients for establishment, can be provided in a commercial “starter fertilizer.” Starter fertilizers, available at garden centers, contain a high percentage of nitrogen and phosphorus in relation to potassium (e.g., 18-24-6). Apply the fertilizer at a rate that will provide 1 pound of actual nitrogen per 1,000 square feet.





**Table 2.** Pounds of ground limestone/1,000 sq. ft. needed to raise soil pH to 6.5. These amounts indicate preplant amounts to be incorporated into the upper 6" of soil.

pH	Soil Type		
	Sandy loam	Loamy	Clayey
4.5	126	253	348
5.0	106	211	290
5.5	42	84	116
6.0	17	33	45

**Table 3.** Pounds of elemental sulfur/1,000 sq. ft. required to lower soil pH to 6.5. These amounts indicate preplant amounts to be incorporated into the upper 4–6" of soil.

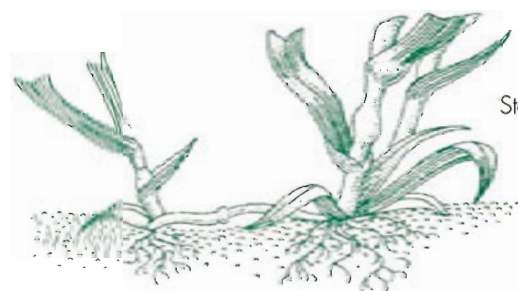
pH	Soil Type		
	Sandy loam	Loamy	Clayey
8.0	5	10	14
7.5	10	20	27
7.0	17	34	47

## 6. Select Seed

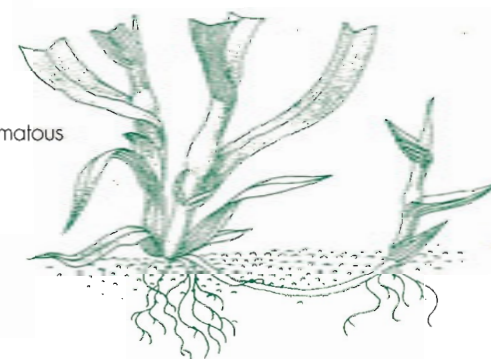
### *Kinds of Turfgrass for Lawns*

A common, serious error in lawn establishment is using the wrong kind of turfgrass seed. Taking time to learn about specific types of grasses and their uses is well worth the effort. Several grass species can

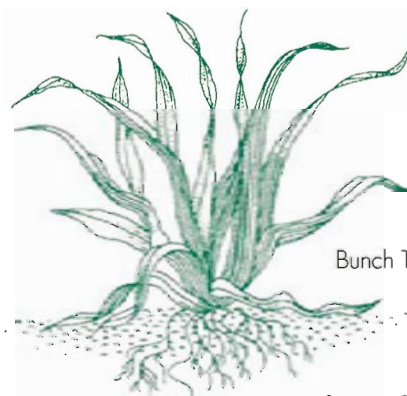
be used for home lawns in New York State. Species and even varieties differ in their appearance, growth habit (**Figure 3**), adaptation, and ability to tolerate diseases and insects. Refer to *Home Lawns: Varieties and Pest Control Guide* for recommendations.



Stoloniferous



Rhizomatous



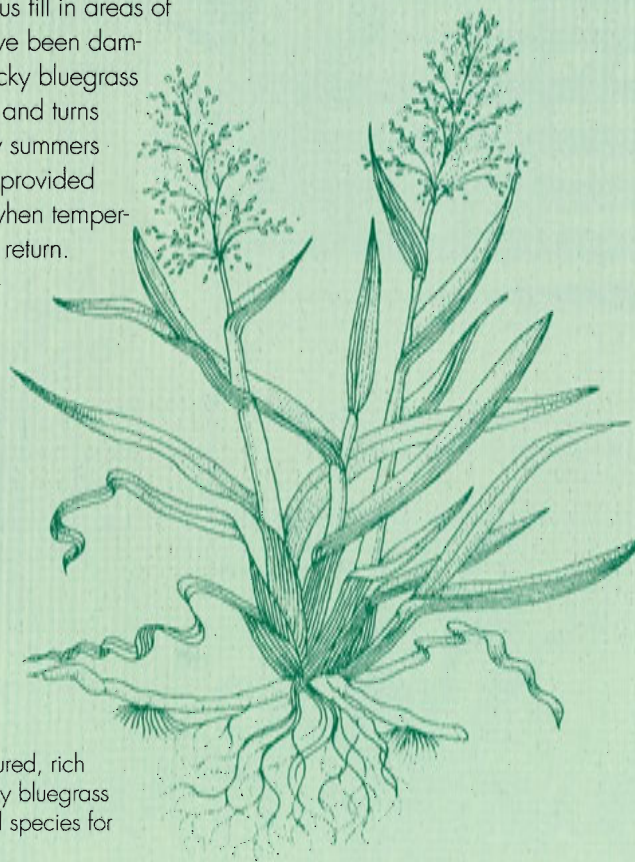
Bunch Type

**Figure 3.** Growth habit



## Common Lawn Grasses

**Kentucky bluegrass** (*Poa pratensis* L.) is the species best adapted to New York State conditions (**Figure 4**). The newer, improved cultivars are very attractive and can survive extremes in temperature and drought. Kentucky bluegrass is a true sod-forming grass because it spreads by underground stems (rhizomes) and can thus fill in areas of the lawn that may have been damaged by pests. Kentucky bluegrass usually goes dormant and turns brown during hot, dry summers when irrigation is not provided but recovers quickly when temperatures drop and rains return.



**Figure 4.** The fine-textured, rich green blades of Kentucky bluegrass make it the most favored species for good looks

Most new bluegrass cultivars have good to excellent resistance to leaf spots, which are common diseases on bluegrass lawns. Cultivars differ in their resistance to diseases such as summer patch. Use a blend of at least three bluegrass varieties to maximize the lawn's resistance to disease.

**Perennial ryegrass** (*Lolium perenne* L.) is a common component of lawn seed mixtures (**Figure 5**). It has a bunch-type growth habit, and its improved cultivars are very attractive and compatible in mixtures with Kentucky bluegrass in upstate New York. Perennial ryegrass has excellent resistance to summer patch and should be included in seed mixtures used where patch diseases

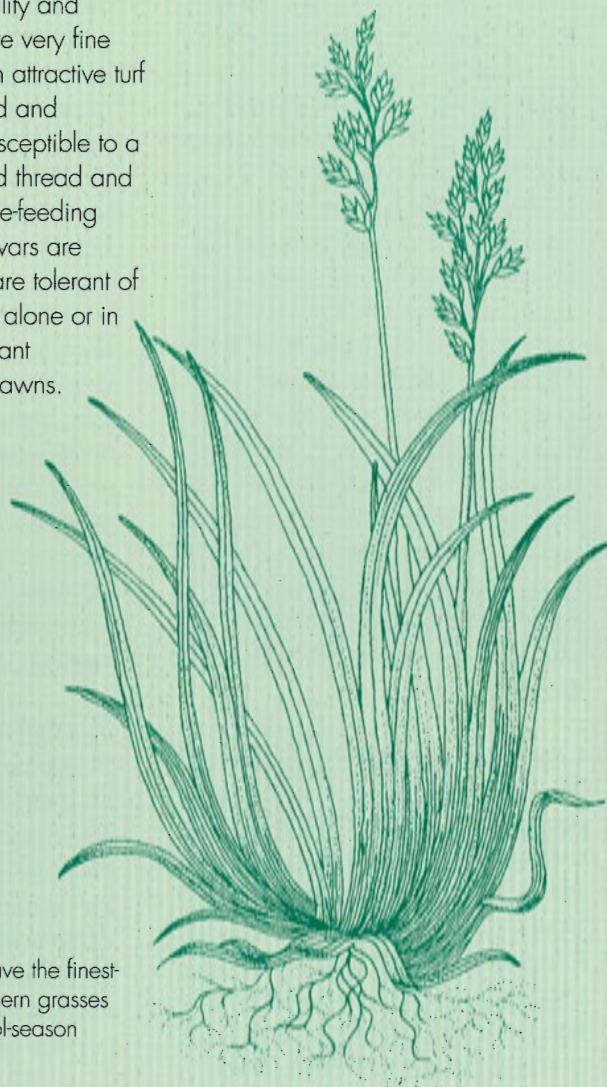
are a problem. Certain cultivars are resistant to surface-feeding insects such as sod webworms and chinch bugs. Because this grass is much more vigorous in the seedling stage than is Kentucky bluegrass, it should not exceed 20 percent, by weight, of the seed mixture.



**Figure 5.** Perennial ryegrass is a medium-textured, spreading grass that germinates quickly



**Fine fescues** (*Festuca* L.), including creeping red (rhizomatous), chewings (bunch-type), and hard fescue (bunch-type) species (**Figure 6**), are excellent low-maintenance grasses that thrive under low fertility and moisture. Fine fescues are very fine textured and produce an attractive turf cover if properly installed and maintained. They are susceptible to a few diseases such as red thread and dollar spot and to surface-feeding insects, but resistant cultivars are available. Fine fescues are tolerant of shade and can be used alone or in mixtures with shade-tolerant bluegrasses on shaded lawns.



**Figure 6.** Fine fescues have the finest-textured blades of the northern grasses and are the best of the cool-season grasses for shaded sites

**Tall fescue** (*Festuca arundinacea* L.) is gaining in popularity. It does well under low fertility and moisture and has few disease problems. Although it is coarser in texture than the other cool-season lawn grass species, the improved "turf-type" tall fescues are finer-textured than old varieties and will produce an attractive lawn if installed properly. Tall fescue grows rapidly, entailing more frequent mowing. It generally does not survive harsh winters but has performed well on Long Island. It is not recommended for lawns north of Westchester and Orange counties, except in areas close to Lakes Erie and Ontario. Tall fescue is not compatible with other grasses and should be seeded only as a monostand.

**Rough bluegrass** (*Poa trivialis* L.) is a special-purpose turfgrass suitable only for moist shade. Seed sown in dry, sunny areas is wasted. Even in moist shade the bright green, soft leaves never make a really tough sod.

### **Creeping bentgrass**

(*Agrostis palustris* L.) and

### **Colonial bentgrass**

(*Agrostis tenuis* L.) are high-maintenance grasses. Creeping bentgrass can be used to create a beautiful lawn, but it requires far more care and expense than most people can give and is generally used only on golf courses. To thrive, this grass requires frequent close mowing, regular watering and fertilization, and constant protection against disease. Colonial bentgrass has similar requirements.



**Table 4*****Relative ratings for maintenance level***

Least	Zoysiagrass
↓	Tall fescue
↓	Fine fescue
↓	Bluegrass
↓	Ryegrass
Most	Creeping bentgrass

***Relative ratings for shade tolerance***

Least	Zoysiagrass
↓	Creeping bentgrass
↓	Bluegrass
↓	Tall fescue
↓	Ryegrass
Most	Fine fescue

***Relative ratings for recuperative ability***

Low	Zoysiagrass
↓	Fine fescue
↓	Ryegrass
↓	Tall fescue
↓	Bluegrass
High	Creeping bentgrass

***Relative ratings for wear resistance***

Low	Creeping bentgrass
↓	Fine fescue
↓	Bluegrass
↓	Ryegrass
↓	Tall fescue
High	Zoysiagrass

***Seeding Blends or Mixtures***

Although a lawn can be established using a single species such as Kentucky bluegrass, a mixture of species is preferable. Different turfgrasses are not equally susceptible to disease, insects, and environmental hazards, and if one species is injured or eliminated by disease or other hazards, the others may be able to fill in the void. Species also vary in speed of establishment, recuperative potential after injury, fertility requirements, and tolerance to close mowing. Refer to **Table 4** for more information on differences in species. The mixture chosen should contain least two basic species such as Kentucky bluegrass and fine fescue or Kentucky bluegrass and perennial ryegrass. If you prefer a single-species lawn for aesthetic or other reasons, always include at least three recommended varieties of that species.

***Choosing a Ready-Made Seed Mixture***

Seed companies are required by law to list on the package label the individual species used in a mixture. Inspect the tag for seed purity information, which includes the minimum percentage of pure seed and the maximum allowable percentages of weed seeds, inert

matter, and "other crop" seed. More than 5 percent of any one "other crop" turf seed must be listed on the label. The percentage of each grass present is given along with germination percentages, weed seeds, and other facts. To judge the quality of a seed mixture, add the percentages of Kentucky bluegrasses, fine fescues, and perennial ryegrasses. If the total is 80 percent or more and the mixture does not contain objectionable grasses such as timothy and orchardgrass, it is suitable to buy. Depending on your lawn, you may need to buy the components separately and make your own seed mixture. For example, if your lawn site is wet and shady, 70 percent rough bluegrass seed and 30 percent shade-tolerant Kentucky bluegrass seed could be combined for a suitable mixture. Some suggested seeding mixes and rates are presented in **Table 5**.

***7. Prepare the Seedbed***

Preparing the seedbed is the most labor-intensive and time-consuming step in seeding a new lawn, but a well-prepared seedbed is essential for rapid, successful establishment. After incorporating any amendments or fertilizer, take the following steps:



- Rake the seedbed to finish grade just before seeding. The soil surface should be smooth, level, and free of debris.
- Roll lightly to indicate any low spots or irregularities in the seedbed.
- Add a topdressing of starter fertilizer on the prepared seedbed to enhance establishment.

## 8. Plant

When you have obtained a high-quality seed mixture, divide the mixture in half. To ensure uniform coverage sow half in one direction and the other half at right angles to the first. A mechanical drop or centrifugal-type spreader does the best job of seeding (or fertilizing or liming), but hand seeding is satisfactory if done carefully. If this is your first attempt to sow seed, mix each half of the seed with some sand or fine topsoil to give you more material with which to work. When there is no wind, scatter one-half evenly and carefully while walking back and forth in parallel lines. Scatter the other half in the same manner walking in lines at right angles to the first half (**Figure 7**).

After sowing, rake the area lightly to cover the seed no more than  $\frac{1}{4}$  inch deep. Seed covered too deeply will be lost. Roll the area lightly to ensure good seed-to-soil contact.

**Table 5. Examples of seeding mixes for lawn uses**

<i>Use</i>	<i>Species/Mix (% by weight)</i>	<i>Mixture (lb. per 1,000 sq. ft.)</i>
<b>Sunny lawns</b>		
Medium to high maintenance	70% (or more) Kentucky bluegrass blend, 10–20% perennial ryegrass*, remainder fine leaf fescues	3–4
Low maintenance, dry sites	65% fine fescue blend, 10–20% perennial ryegrass, remainder Kentucky bluegrass blend	4–5
	<i>or</i>	
	100% tall fescue* blend (southeastern New York)	7–10
<b>Shady lawns</b>		
Dry sites	60–80% fine fescue blend, 10% perennial ryegrass, remainder a blend of shade-tolerant Kentucky bluegrasses	4–5
	<i>or</i>	
	80% shade-tolerant Kentucky bluegrass blend, 20% perennial ryegrass	3–4
Wet sites	70% rough bluegrass, 30% shade-tolerant Kentucky bluegrass blend	2–3

\*Tall fescue and perennial ryegrass may winter kill in the northern parts of New York State, especially away from the Great Lakes

## 9. Irrigate

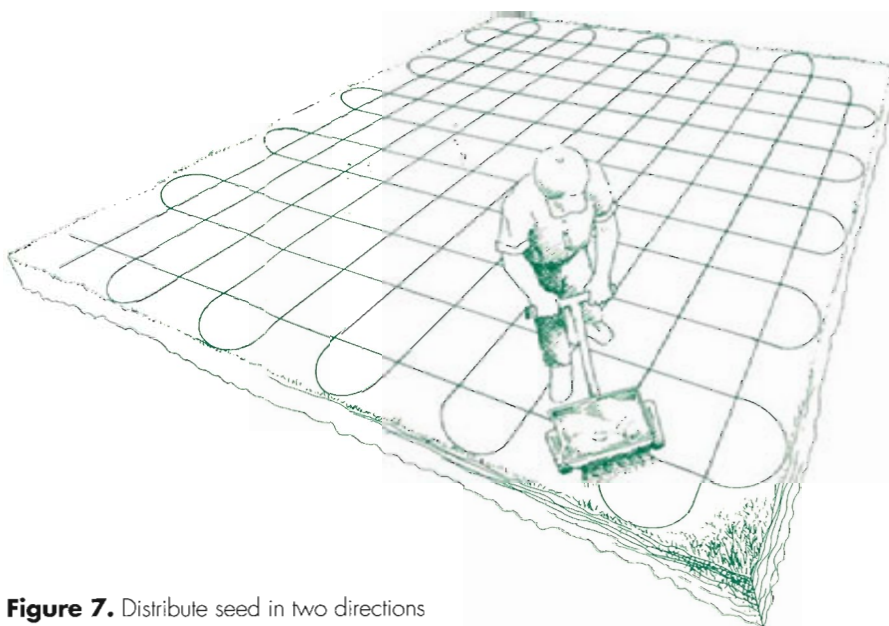
Turfgrass seedlings can die quickly from lack of water. Apply enough water to keep the soil surface moist. As establishment progresses, the frequency of irrigation can be reduced and the amount applied at a single irrigation increased. Continue to irrigate the turf for at least three weeks after germination and preferably until the lawn is completely established. Irrigation is

most important in the spring, especially when seeding a Kentucky bluegrass lawn. Avoid overwatering and runoff.

### *Mulch*

Mulching the lawn with clean (weed-free) straw will conserve moisture and help prevent erosion. Hay is not a satisfactory substitute because it usually contains an abundance of seeds of hay-type

grasses and weeds. Shake out straw thoroughly and spread uniformly; one bale of straw per 1,000 square feet will provide a light mulch covering that will not have to be removed after germination. When you have finished, you should be able to see about half of the soil surface through the straw. The mulch slows surface drying and breaks the force of rains and watering. On steep slopes, anchor



**Figure 7.** Distribute seed in two directions

the straw with wooden stakes and heavy twine. Tack the twine to stakes driven flush into the ground on 3-foot centers. Be sure to remove the twine before mowing to avoid jamming the mower.

## 10. Mow

Proper mowing discourages weeds and makes the lawn more resistant to pests. Most lawn mixes can be mowed when seedlings are about 3 inches tall. Mowing encourages seedlings to tiller, rapidly increasing turfgrass density. Make sure the lawn mower blades are sharp because ragged cuts from dull

blades damage plants and slow the rate of establishment.

## Post-Germination Care

Three to four weeks after germination, fertilize the turf again. Use either a second application of starter fertilizer or another complete fertilizer that has a ratio of 4-1-2 (20-5-10). Apply enough fertilizer to deliver 1 pound of nitrogen (N) per 1,000 square feet.

Almost every new seeding will produce some weeds. Many of the weeds that germinate in new

plantings do not tolerate mowing and are easily controlled after mowing starts. Summer annual weeds that may germinate in fall plantings will not survive the winter.

Do not treat persistent broadleaf weeds with postemergence herbicides until after the third mowing. Most preemergence herbicides should not be applied until the turf is fully established. Exceptions can be used at the time of seeding to control perennial grassy weeds such as quackgrass and yellow nutsedge. Consult *Home Lawns: Varieties and Pest Control Guide* for specific recommendations.

## Sodding

Although sodding is expensive and labor intensive, it provides turf quality that would take at least a full year to develop from seed. A poor, weedy lawn can be removed with a sod cutter and replaced with dense, green, weed-free sod in one day. This can be done anytime during the growing season. Sodding may be the only answer for steep slopes or spots where traffic ruins young seedlings.

Nursery-grown sod is about 1 inch thick, of uniform width, and has little or no soil attached. Nursery-grown sod with blends of Kentucky bluegrass is available in most suburban areas. It makes an

attractive lawn in sunny situations, but a fine fescue mixture is a better choice for dry or shaded areas. Some sod farms produce mixtures designed for shady lawns.

Large areas are best sodded by landscape contractors because the labor and machinery requirements are more than the average person can supply. Small areas and patches can be sodded by an energetic amateur.

To install sod, prepare the soil as though seed were to be planted. Purchase the sod when the soil is ready. Large lots of sod can be obtained for direct delivery to the job. Small lots for patching are available from garden supply firms. Do not accept sod that is dried or wilted. For best results sod should be laid no more than thirty-six hours after it is cut.

Before laying the sod, water the soil lightly to improve the ability of the sod to survive and knit. Lay the sod strips on a prepared soil, tightly together, edge to edge, with staggered joints like bricks in a wall. Fill all cracks with screened soil. Soak the newly laid sod thoroughly. When it is dry enough to walk on, roll or tamp the sod lightly to give good contact with the soil beneath. Water every two or three days in the early morning to keep the soil moist until the sod is securely rooted, usually within two weeks. Avoid overwatering.



## Routine Lawn Maintenance

Every lawn needs to be mowed regularly and fertilized occasionally. Watering is necessary under certain circumstances. A Kentucky bluegrass lawn, for example, will require more water than a fine fescue lawn because fine fescues are a low-water-use species.

### Mowing

Mowing is the most fundamental turfgrass management practice. It provides a uniform and usable surface for aesthetic purposes or recreational activities. Mowing has a profound effect on turfgrass: the removal of photosynthetically active tissue temporarily stops root growth, reduces carbohydrate production and storage, and lessens water absorption by the roots. Proper mowing discourages weeds and makes the lawn more resistant to pests.

Lawns must be mowed to the correct height. Height affects the size of the root system. A shorter lawn has a shallower root system and is thus more susceptible to drought injury, less tolerant of root-feeding insects and root-pruning diseases, and more prone to germination of weed seeds. Keep mower

blades sharp and properly adjusted to avoid injuring turfgrass plants. Mow Kentucky bluegrass and fine fescue lawns to a height of 2 to 3 inches and tall fescue lawns to a height of 3 inches.

Proper mowing also means mowing at regular intervals. The rule of thumb is never to remove more than one-third of the leaf tissue with each mowing. Scalping the lawn can shock it, making it more susceptible to stress.

Always leave the clippings where they fall because they return nutrients to the soil. This can reduce nitrogen and potassium requirements by up to 30 percent. Properly mowed lawns should not have increased thatch or clumps of clippings.

### Composting Clippings

Keep the following points in mind when composting grass clippings:

- Do not use only grass clippings because they mat together and deprive the compost microbes of oxygen, causing an odor.
- Mix grass clippings with leaves in a ratio of three parts leaves to one part clippings. Any woody lawn debris added to the compost pile should be chopped up small.

- Turn the compost pile with a shovel or pitchfork every couple of weeks to facilitate decomposition and eliminate odors.
- Use composted clippings as a mulch in the garden or in flower beds.
- Leave chemically treated lawn clippings on the lawn or compost them for at least two months before using them as mulch. This will allow time for pesticides to break down.
- If you cannot use collected grass clippings in your yard, find a neighbor who might value them as mulch or compost material.
- Because collection and disposal costs are high, keeping your lawn clippings out of the garbage truck saves money.

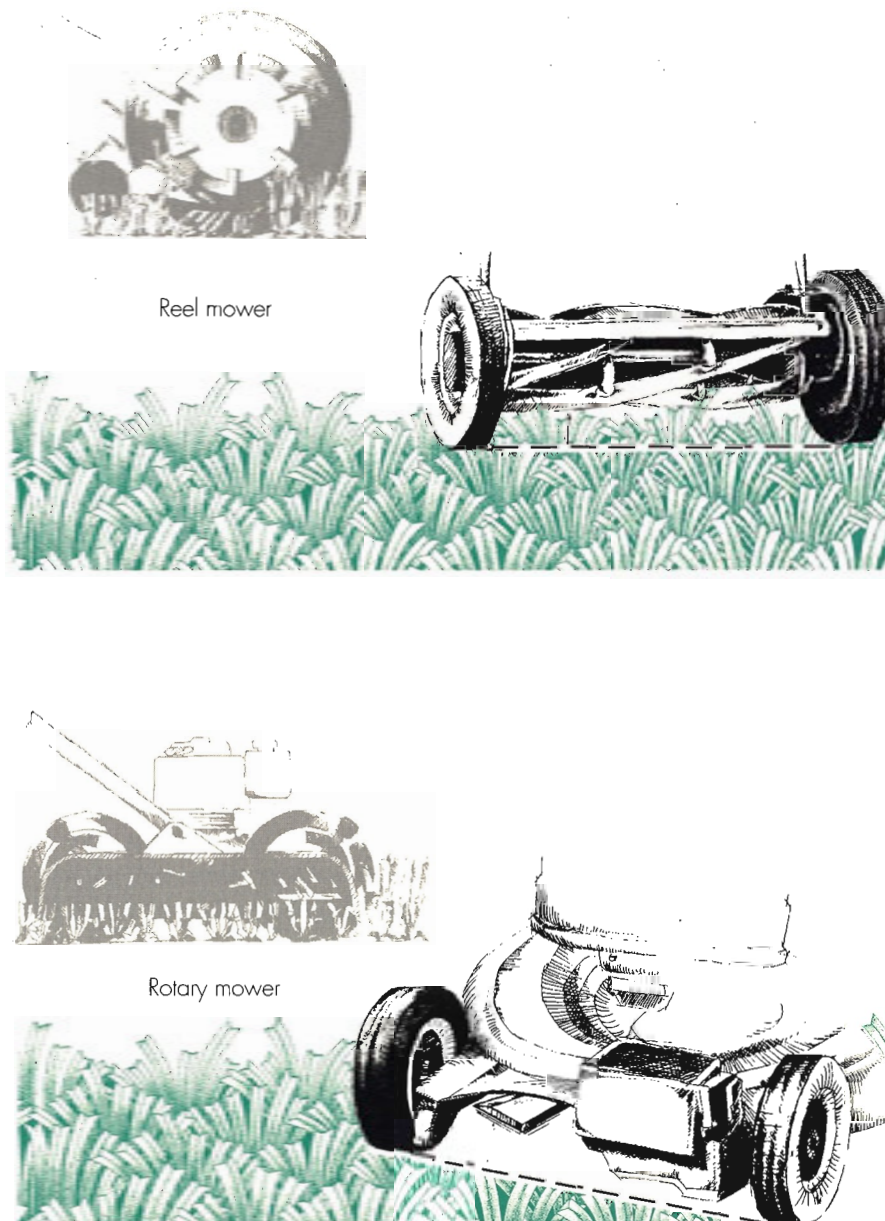
### Choosing a Mower

Three types of mowers are widely available for home lawn use: reel mowers, standard rotary mowers, and mulching rotary mowers (**Figure 8**). The reel mower clips grass by the scissors-like action of the reel on the bedknife. It shears the grass blades cleanly when it is sharp and properly adjusted, but if the blade is dull or makes poor contact with the bedknife it will tear and mutilate the leaves, causing brown and ragged tips. Reel mowers

work best on smooth lawns that are mowed regularly. They require relatively low horsepower to operate, but the initial cost and maintenance may be higher than that of a rotary mower.

The standard rotary mower does not cut as well as a reel mower, but a sharp blade will give a perfectly acceptable cut. A dull blade may cause the grass to have a scorched or singed gray appearance the day after mowing. The mower operates by the high-speed chopping action of a flat rotating blade. Rotary mowers are more versatile than reel mowers because they can mow tall grass and weeds, mulch or bag leaves, and are relatively easy to maintain. They usually have a very tight turning radius for excellent maneuverability. Rotary mowers can be dangerous and should be operated only by adults. Many operators have been injured by the whirling blades, and bystanders have been hurt by thrown stones or debris. Do not remove any of the guards that have been installed for safety reasons.

The mulching mower has become increasingly popular because an average half-acre of turf can produce 5,500 pounds of clippings each season. Many municipalities have banned yard waste from their landfills, and a mulching mower provides an alternative to the time

**Figure 8.** Lawn mowers

and expense of bagging yard waste for disposal. It has four cutting edges rather than two, resulting in finer clippings and quicker decomposition. A mower built for mulching recuts each grass blade several times so it will decay faster and look less unsightly, and it spreads the clippings out over a wider area. Certain bagging mowers can be converted to mulchers using a kit containing a special blade and a plug.

If you decide to use a mulching mower, keep the following points in mind to make the job easier and more effective:

- Don't handle too much grass at once: mow more often and more slowly.
- Keep the blade sharp. It cuts every piece of grass several times.
- To avoid plugging your machine, do not mow wet turf. The finer clippings clump more easily in the housing when wet.

The mulching mower also provides an alternative to the time-consuming job of raking leaves. Leaf collection is usually necessary because uncollected leaves cause turfgrass to deteriorate as a result of limited light. A mulching mower that grinds up fallen leaves as it cuts grass is a convenient, economical,

and environmentally sound way to dispose of leaves.

## Adjusting Mower Cutting Height

Reel and rotary mowers can be adjusted easily for height of cut. The height of cut of most rotary mowers is set by adjusting the height of the wheel. Height adjustment is more complicated for reel mowers. In either case, follow the instructions in the manual for proper adjustment.

## Fertilizing

Turfgrass requires moderate amounts of nitrogen and potassium to produce a healthy, vigorous lawn that requires minimal pesticides. Returning grass clippings after mowing can reduce these requirements by 30 percent. Kentucky bluegrass lawns require 2 to 3 pounds of actual nitrogen (N) and 1 to 3 pounds of potash ( $K_2O$ ) per 1,000 square feet per year, split into two or three applications. Fine fescue and tall fescue lawns require 1 to 2 pounds of nitrogen and 1 to 3 pounds of potash per 1,000 square feet each year.

Lawns should be fertilized two or three times annually, either in the spring and early fall or in late spring, early fall, and late fall. Fertilization



in late fall is not recommended in areas with sandy soils, including Long Island. Nitrogen is released more uniformly in slow-release fertilizers such as sulfur-coated urea or natural organics. The lawn will be greener for a longer period and will have less top growth. Some natural organic products will also suppress diseases.

## What Is in a Bag of Fertilizer?

Fertilizer companies are required by law to list on a fertilizer bag the amounts of elements contained in the fertilizer. This is referred to as a guaranteed analysis. The fertilizer grade is also listed. It designates the percentage of nitrogen, available phosphate, and water-soluble potash in the product. A 10-6-4 grade fertilizer contains 10 percent nitrogen, 6 percent available phosphate, and 4 percent water-soluble potash. Thus a 40-pound bag of 10-6-4 contains 4 pounds of nitrogen (10 percent of 40), 2.4 pounds of available phosphate (6 percent of 40), and 1.6 pounds of water-soluble potash (4 percent of 40).

Fertilizer recommendations are often made using a fertilizer ratio, which refers to the relationship between the percentages of nitrogen, phosphate, and potash. A 16-8-8 grade fertilizer contains twice as much nitrogen as phosphate or

potash. Thus it has a 2-1-1 ratio. Grades of 10-5-5 and 20-10-10 also have 2-1-1 ratios. A grade of 20-5-10 has a 4-1-2 ratio. The easiest way to determine the ratio is to divide each number in the grade by the smallest number in the grade or by the highest whole number divisible into all three numbers of the grade.

A turf-grade fertilizer is a complete fertilizer (containing nitrogen, phosphate, and potash) that has an approximate 2-1-1 or 3-1-2 ratio and has at least 35 percent of its total nitrogen as water-insoluble nitrogen (WIN). Water-insoluble nitrogen is not immediately available to the plant. Instead, the nitrogen is released over relatively long periods of time. Fertilizers with at least 35 percent WIN can be applied at higher rates than can quick-releasing fertilizers (water-soluble nitrogen) with little risk of burning the turf. A fertilizer bag might have the following label:

<b>20-5-10...Guaranteed Analysis...20-5-10</b>
<b>Total Nitrogen: 20% (8%WIN)</b>
<b>Available Phosphate: 5%</b>
<b>Water-Soluble Potash: 10%</b>

If a fertilizer contains slow-release nitrogen, a percent water-insoluble nitrogen (WIN) should be

listed on the label in the guaranteed analysis. This WIN is the slow-release nitrogen present in the bag, and it is expressed as a percentage, by weight, of the bag's contents. It is also important, however, to know what percentage of the total nitrogen is slow release. This can be determined easily by dividing the percent WIN by the percent total N, then multiplying by 100. In this case,  $8\% \div 20\% \times 100 = 40$ , or 40 percent of the total nitrogen is water insoluble. Sixty percent of the nitrogen in this example is quick release and will provide quick greening. The other 40 percent is slow-release nitrogen that will become available over the next several weeks. Some manufacturers and formulators will claim slow-release nitrogen in a product, but if you run through this calculation, you may find that the amount of slow-release nitrogen is insignificant. A fertilizer should have at least 30 percent of the total nitrogen as WIN if it is expected to have some slow-release characteristics.

## Properties of Fertilizers

Turfgrass requires a greater amount of nitrogen than of any other nutrient (**Figure 9**). The many sources of nitrogen are usually classified by availability: quick release (water soluble) or slow release (water insoluble).

- Nitrogen affects shoot growth and density, root growth, and susceptibility to damage from disease, heat, cold, and drought
- Phosphorus is especially important in a new seeding because it promotes root growth
- Potassium promotes rooting, improves heat and cold tolerance, and reduces occurrence of disease
- Returning the clippings after mowing can reduce fertilizer requirements by up to 30 percent

## Quick-Release Fertilizers

### Advantages

- rapid response
- minimal dependency on temperature
- less expensive than slow-release forms

### Disadvantages

- short duration of response
- high salt index, possibility of foliar burn
- possible losses from leaching and volatilization

Quick-release forms of nitrogen should be applied more often and at lower rates than other forms. They can also lower soil pH.

### Slow-Release Fertilizers

#### Advantages

- more constant supply of nitrogen
- less potential for leaching and burning

#### Disadvantages

- more expensive than quick-release forms
- effectiveness can depend on temperature and moisture

Slow-release sources include natural organics, synthetic organics, and coated materials. The release of nitrogen from these sources, especially natural organics, is affected by temperature and moisture.

Several types of fertilizer, their analysis, and properties are outlined in **Table 6**.

### Some Notes on Fertilizing

- Soil testing is the only way to determine how much phosphorus, potassium, and lime or sulfur your lawn may need for optimal growth. This information helps eliminate unnecessary applications. Refer to the appendix for specific instructions on how to take soil samples.
- The amount of nitrogen fertilizer that most lawns require depends on the predominant species of turfgrass, soil type, desired turfgrass quality, type of nitrogen used, and climatic factors. Refer to **Tables 7 and 8** for general guidelines on how much and how often to fertilize.
- Avoid fertilizing in early to mid-spring because a heavy application (especially of nitrogen) can

cause certain disease problems and shallow root growth, which can lead to serious trouble for your lawn during the summer. Do not fertilize in the summer because turfgrass is often under stress from drought and heat and may be damaged by fertilizer.

### How to Apply Fertilizer

Fertilizer must be applied evenly to ensure even growth and color and prevent burning. A mechanical spreader is best for this work. Organic fertilizer can be used in almost any season without danger of burning grass. Inorganic fertilizers can be used during the growing season, but take these precautions against burning: distribute fertilizer evenly, spread fertilizer only when grass is completely dry, and immediately wash the fertilizer off the grass blades to the ground.

Dry fertilizers can be applied with a gravity drop spreader or a centrifugal spreader (**Figure 10**). Use a drop spreader when applying fertilizer-herbicide products to minimize the chance of herbicide injury to trees, shrubs, and vegetable gardens. A drop spreader is also good for applying ground limestone.

Centrifugal spreaders generally cover a larger area with each pass and decrease the time it takes to fertilize your lawn. Uniform application is more difficult, however,

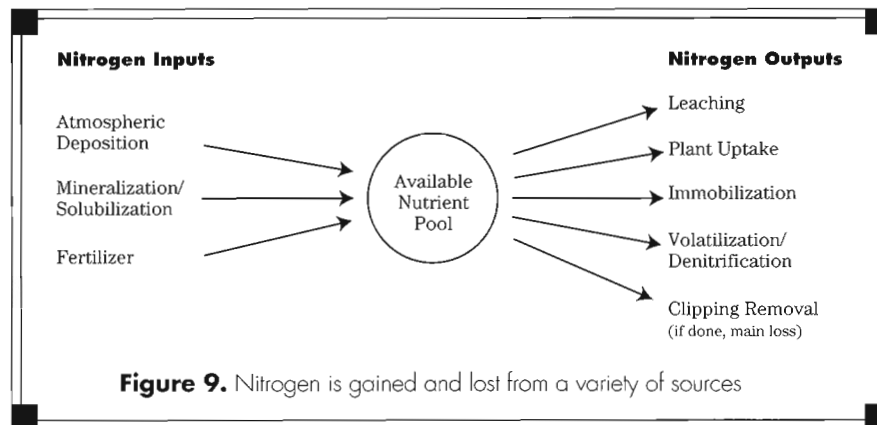
because fertilizer particles are more susceptible to wind. Centrifugal spreaders can also be used to apply granular lime and sulfur materials.

When using either spreader, make at least two passes over your lawn. Apply half of the fertilizer in one direction and the other half at a right angle to the first pass. This will help eliminate the streaks that develop from an uneven application.

## Adding Lime or Sulfur

### Modification of Soil pH

In some regions of New York, soils have an acceptable pH and may never need lime or sulfur. In other regions the pH may be higher than 7.5 (too alkaline) or lower than 6.0 (too acidic). When pH is above 7.0, nutrients such as iron, zinc, manganese, and copper become unavailable. A pH below 6.0 results in reduced availability of phosphorus and depletion of calcium and magnesium. At the higher and lower pH ranges, microorganism activity slows or even stops, reducing the breakdown of organic matter and the consequent release of nitrogen, sulfur, and other nutrients. The only way to be certain of a soil's pH is to have it tested. Your local Cooperative Extension agent can assist you with this test.





**Table 6. Properties of nitrogen fertilizers used on turfgrass**

Nitrogen Carrier	Type	Nutrient Content			Soil Acidifying Effect	Water Solubility	Potential for Burn	Comments	
		N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O					
Quick release									
Urea	Syn. organic	46	0	0	Moderate	High	High	The nitrogen in this group of quick-release sources is readily available to turf, prone to leaching, prone to volatilization (urea), has a high salt content, should not be used during times of stress, and should be applied more often at lower rates.	
Ammonium sulfate	Syn. inorganic	21	0	0	Very high	High	High		
Ammonium nitrate	Syn. inorganic	33	0	0	Moderate	High	Very high		
Potassium nitrate	Inorganic	13	0	44	None	Moderate	Very high		
Monoammonium phosphate	Syn. inorganic	11	48	0	Slight	Moderate	Low		
Diammonium phosphate	Syn. inorganic	20	50	0	Moderate	Moderate	Moderate	Water soluble at pH 9–10, less chance of foliar burn, moderately available to turfgrass plants.	
Methylol ureas	Syn. organic	–	–	–	Undetermined	Moderate	Low		
Slow release									
IBDU (isobutylidene dirurea)	Syn. organic	31	0	0	Undetermined	Very low	Low		IBDU is moisture dependent but has minimal temperature dependency. It has a slow initial response, and N release is slow at high pH. IBDU has a medium residual time.
Urea-formaldehyde	Syn. organic	38	0	0	Undetermined	Very low	Low		
Methylene urea	Syn. organic	39	0	0	Undetermined	Very low	Low		
Milorganite	Nat. organic	6	2	0	Undetermined	Very low	Low	Moisture and temperature dependent. Slow to medium initial response. Medium to long residual. Low N analysis. Some have disease suppressive activity.	
Ringer's	Nat. organic	6	1	3	Undetermined	Very low	Low		
Sustane	Nat. organic	5	2	4	Undetermined	Very low	Low		
Plant Right	Nat. organic	3	4	3	Undetermined	Very low	Low		
Sulfur-coated urea (SCU)	Syn. organic				Undetermined	Very low	Low	Contains from 32 to 37 percent nitrogen. Minimal moisture and temperature dependency. Moderate initial response, medium to long residual. Particle size effect (finer products release more quickly). Mottling of turf can occur, especially with large particle size at low rates.	
Polymer-coated sources	Syn. organic				Undetermined	Very low	Low		
Contain from 39 to 42 percent nitrogen. Uniform release patterns. Temperature dependent. Excellent physical properties.									

**Table 7. Suggested timing of fertilizer application based on the number of yearly applications\***

Number of Yearly Applications	Late Spring	Late Summer/ Early Fall	Late Fall/ Dormant †
1		×	
2	×	×	
3	×	×	×

\* The maximum rate of application of nitrogen is 1 lb. per 1,000 square feet per single application. Therefore, if you plan to apply 3 lb. of nitrogen per 1,000 square feet per year, three applications must be made.

† Avoid late fall/dormant fertilizer applications on Long Island if water-soluble fertilizers are used.

**Notes:**

- Late spring refers to the period just after the "spring flush" but while temperatures are still very mild (60°–70°F day, 40°–60°F night).
- Late summer/early fall is after the summer heat spell, usually in late August or early September when temperatures start to moderate and nights are cool.
- Late fall/dormant refers to the period just after last mowing until winter snow cover.

**Table 8. Approximate pounds of fertilizer (nearest 1/2 pound) required to supply rate of nitrogen recommended**

Pounds of Nitrogen per 1000 sq. ft.	Urea 46-0-0	10-5-5 10-6-4	16-8-8	25-3-3	20-3-7 20-5-10	Natural Organic 6% N
1/2	1	5	3	2	2 1/2	*
1	2	10	6 1/2	4	5	*
1 1/2	3	15	9 1/2	6	7 1/2	17
2	*	*	13	8	10	33 1/2

\*not recommended at these rates

**Precautions**

- Most fertilizers are salts and will burn grass if improperly applied
- Water-soluble fertilizers will burn more severely than fertilizers containing slow-release nitrogen
- Apply fertilizer only when the grass blades are dry, and water thoroughly after application

## To Raise Soil pH

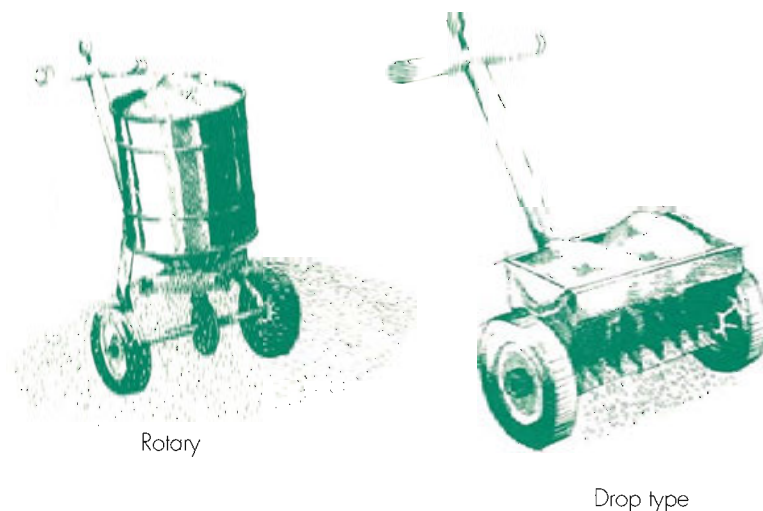
Once you know the soil pH, refer to **Table 2** for preplant liming recommendations or to **Table 9** for established lawn recommendations. Liming can be done in spring or fall but not during summer or within two weeks after applying fertilizer. Avoid using hydrated lime because it is caustic and difficult to handle. See **Table 10** for a description of several liming materials and suggested methods of application.

When a large amount of lime (more than 50 pounds per 1,000 square feet) is to be applied to established turfgrass, a split application is recommended. Apply half in the spring and the other half in the

fall. Add water to remove lime from the shoots and move it into the soil.

## To Lower Soil pH

When the pH is greater than 7.5, acidifying materials should be applied. Elemental sulfur is the preferred material to lower soil pH. For ease of application, use a pelleted form, which can be applied with a centrifugal spreader. Do not apply more than 5 pounds of elemental sulfur per 1,000 square feet per application to established lawns (**Table 9**). Be sure to water in sulfur to avoid burning. Apply sulfur only during spring and fall. Refer to **Table 2** for the rate to use when sulfur will be incorporated into the soil during lawn establishment.

**Figure 10.** Types of fertilizer spreaders

Rotary

Drop type



Do not use ferrous sulfate and aluminum sulfate for soil acidification. Ferrous sulfate can burn grass blades, and aluminum sulfate is not as effective as elemental sulfur.

## Watering

Most cool-season lawn grasses can survive conditions of extreme drought by going into summer dormancy. Unfortunately, dormancy may result in extensive injury from insects and diseases, and it encourages weed invasion. It is preferable to avoid drought conditions through proper maintenance.

When the lawn first begins to wilt in the spring, water it thoroughly with about 1 inch of water. This deep watering encourages deeper rooting, whereas frequent light waterings in the spring promote shallow roots, making the lawn more susceptible to root-pruning insects and diseases. During the summer, it is natural for much of the root system to deteriorate. Summer waterings should be light and frequent; never apply water faster than the soil can absorb it.

The best time to water a lawn is early morning when evaporation losses are low and leaves dry quickly. Evening watering does not allow time for the leaves to dry and creates an environment conducive to disease development.

## Thatch

There are many misconceptions about the causes and problems of thatch. Thatch is a layer of undecomposed and partially decomposed organic residue situated above the soil surface and capable of supporting turfgrass growth (**Figure 11**). As thatch accumulates, it becomes a tightly intermingled mat of dead and living stems, leaves, and roots. A moderate amount of thatch (less than  $\frac{1}{2}$  inch) generally causes no problems and is even desirable because it increases wear tolerance, decreases soil compaction, and insulates the soil from extreme temperature. Excessive thatch, however, leads to scalping, decreased fertilizer activity, water repellence, roots that are limited to the thatch layer, increased disease and insect problems, and decreased tolerance of high and low temperatures.

Thatch accumulates when there is an imbalance between plant growth and decomposition. Heavy nitrogen fertilization and irrigation promote thatch development, which is why the nicest lawns are often the first to have thatch-related problems. To determine if your lawn has excessive thatch, take several wedge-shaped slices, including the surface soil layer, at several locations. Inspect the samples to

determine the thickness of the thatch. A layer of thatch that is  $\frac{1}{2}$  inch thick or thicker may require attention. Control requires an integrated approach that includes prevention, biological control, and mechanical removal.

## Prevention

Water and fertilize often enough to maintain good growth but not enough to encourage succulent,

unnecessary growth. Excessive irrigation inhibits breakdown of thatch by microorganisms. Keep soil pH above 5.5. Mow tall grass at proper intervals. Grass clippings are a valuable source of nitrogen and do not contribute to thatch development if the lawn is mowed regularly. Certain species or cultivars of grasses thatch more quickly than others. Some Kentucky bluegrass cultivars are notorious producers of

**Table 9. pH modification for established turfgrass soil**

<b>To Raise Soil pH</b>			
Pounds of ground limestone/ 1,000 sq. ft. to raise pH to 6.5—surface application*			
	<i>Sandy Loam</i>	<i>Loam</i>	<i>Clay</i>
4.5	42.0	84.3	116.0
5.0	35.3	70.3	96.7
5.5	14.0	28.0	38.7
6.0	5.7	11.0	15.0

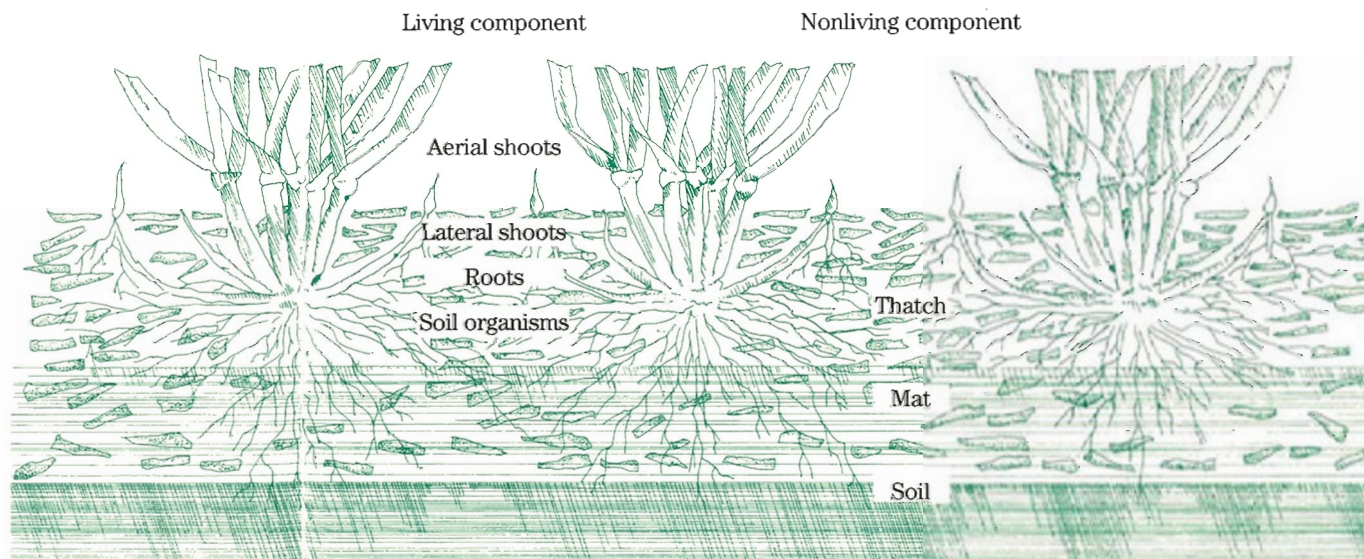
\* Do not apply more than 50 lb. of limestone/1,000 sq. ft. per application.

<b>To Lower Soil pH</b>			
Pounds of elemental sulfur/1,000 sq. ft. to lower pH to 6.5			
	<i>Sandy Loam</i>	<i>Loam</i>	<i>Clay</i>
>8.0	6	11	16
7.5–8.0	4	7	9
7.0–7.4	2	3	5

\* Do not apply more than 5 lb. of sulfur/1,000 sq. ft. per application. Do not apply sulfur during the summer.

**Table 10. Liming materials and their characteristics**

<i>Material</i>	<i>Composition</i>	<i>Rate of Reaction</i>	<i>Method of Application</i>	<i>Comments</i>
<b>Ground limestone</b>	Granular ground limestone	Slow and gradual	Drop spreader	Water in if lawn appearance is a concern; only a slight chance of leaf burn. Its effects can last up to two years.
<b>Pelleted limestone</b>	Pelleted finely ground limestone	Very fast	Centrifugal spreader	Apply 60–70% of the ground limestone rate; effect is not long lasting. Yearly applications are necessary.

**Figure 11.** Thatch, mat, and soil layers

thatch because of their vigorous growth habit. Where these cultivars are used, mow at a shorter height ( $1\frac{1}{2}$ " ) to retard shoot production. Fine fescues grow slowly, but their leaves and other plant parts resist decomposition and are thus prone to development of thatch.

## Biological Control

Altering the soil environment to promote activity of fungi, bacteria, and other microorganisms will enhance decomposition of thatch. Microbial activity is influenced by moisture, temperature, aeration, pH, and supply of inorganic nutrients. Cultivation by core aeration, using a machine that punches a hollow tine into the soil to remove a small soil core, can greatly improve the microenvironment. Mixing the soil cores with thatch increases microbial activity by providing more favorable moisture and temperature conditions. Core aeration is most effective as a preventive measure and should not be used to remove large amounts of thatch. Homeowners who have high-maintenance lawns should consider annual core cultivation.

## Mechanical Removal

Vertical mowing or power raking is the most common method used to remove thatch. Following severe



vertical mowing, a lawn should have at least three to four weeks of good growing weather to recover. Early fall is the best time to power rake a lawn in New York. If it is necessary to power rake a lawn in the spring, consider applying a preemergence herbicide afterward to control annual grasses such as crabgrass, especially in downstate New York. Preemergence herbicides prevent seedling establishment. They do this by creating a chemical barrier in the soil. When weeds germinate in this zone, the herbicide is absorbed and kills the plant. Power raking after applying a preemergence herbicide will break the herbicide barrier and decrease efficacy. A light application of fertilizer following power raking will help the grass recover from injury.

Lawns with a serious thatch problem may require a severe power raking each fall until thatch is less than  $\frac{1}{2}$ " deep. After this, an integrated program of preventive methods may be used. Lawns with more than  $1\frac{1}{2}$ " of thatch will need to be reestablished from seed or sod.

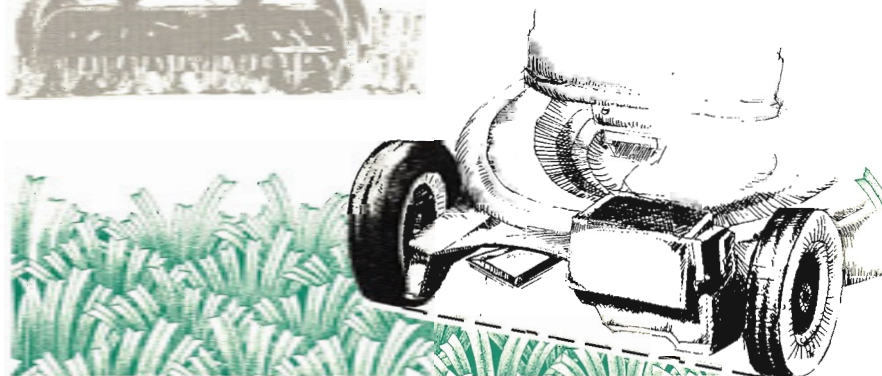
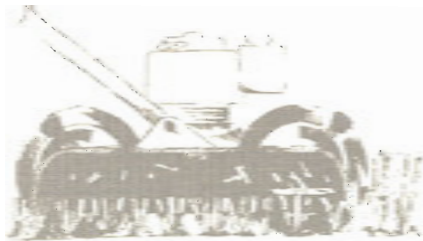


# Lawn Maintenance Calendar

The following charts can be used as a guide to annual lawn maintenance practices. Some operations can be conducted at many different times during the year, but for others there is a preferred time of implementation.

Climatic factors greatly influence the occurrence of lawn diseases, insects, and weeds and the growth of the lawn. Although it is impossible to predict the exact length and kind of growing season in a given year, the maintenance calendar can serve as a useful guide.

The Lawn Maintenance Record Chart is included to help you keep track of your lawn maintenance practices. Post the calendar and chart in a convenient place.





# Lawn Maintenance Record Chart

Operation	January	February	March	April	May	June	July	August	September	October	November	December
Fertilization												
Lime/Sulfur												
Mowing												
Watering												
Weed Control												
Insect Control												
Disease Control												
Dethatching												

## Notes

Fertilizer	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____
Lime/Sulfur	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____
Insect Control	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____
Weed Control	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____
Disease Control	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____	Analysis _____ Rate _____ Amount _____ Date _____

# Turfgrass Management Calendar: Upstate New York

	January	February	March	April	May	June	July	August	September	October	November	December
<b>Establishment</b>												
Seeding											*	
Sodding							if water available					
<b>Maintenance</b>												
Mowing							as needed					
Watering							as needed					
Fertilizing												
Liming/Sulfur												
Dethatching												
Renovating												
<b>Pest Control</b>												
Disease Occurrence				Leaf Spots					Rust	Leaf Spot		
					Melting Out		Pythium Blight		Brown Patch			
							Dollar Spot					
				Stripe Smut			Patch Diseases			Stripe Smut		
		Snow Molds				Red Thread					Snow Molds	
Insect Occurrence				Grubs					Grubs			
							Sod Webworms					
						Chinch Bug						
<b>Weed Control</b>												
Broadleaf			Postemergence					Postemergence				
Crabgrass			Preemergence			Postemergence						

Possible 

Preferred 

\* November is the time for dormant seeding.



# Turfgrass Management Calendar: Southeastern New York

	January	February	March	April	May	June	July	August	September	October	November	December
<b>Establishment</b>												
Seeding											*	
Sodding							if water available					
<b>Maintenance</b>												
Mowing							as needed					
Watering							as needed					
Fertilizing												
Liming/Sulfur												
Dethatching												
Renovating												
<b>Pest Control</b>												
Disease Occurrence				Leaf Spots					Rust	Leaf Spot		
					Melting Out		Pythium Blight		Brown Patch			
							Dollar Spot					
				Stripe Smut			Patch Diseases			Stripe Smut		
		Snow Molds					Red Thread				Snow Molds	
Insect Occurrence				Grubs					Grubs			
						Sod Webworms		Cutworms				
							Chinch Bug					
						Bluegrass Billbug						
<b>Weed Control</b>												
Broadleaf				Postemergence				Postemergence				
Crabgrass				Preemergence			Postemergence					

Possible   
Preferred 

\* Mid-November through December  
is the period for dormant seeding.

# Lawn Pests

## Weeds

Prevention is the best weed control. Damaged or weak lawns are most prone to weed encroachment. A balanced fertilizer program and proper mowing help grasses outcompete weeds. When you start a new lawn, try to prevent weeds from getting a foothold. If you remove weeds from an established lawn, stimulate the grass to better growth or weeds will reappear in the bare spaces.

### To Minimize Weed Problems

- Select the most appropriate turfgrass for your site
- Plant a new lawn in the fall
- Optimize cultural practices (e.g., mowing, fertilization, irrigation)
- Mow your lawn at least 2 inches high to reduce weed competition
- Control insect pests and diseases that damage turf

## Identifying Features of Weeds

Weeds differ greatly in their appearance, growth patterns, and reaction to herbicides. Annual weeds grow from seed, flower, produce new seeds, and die in a single growing season. Perennial weeds grow for two or more seasons, wintering as an entire plant or by roots, underground stems, bulbs, corms, or tubers, which start growth the next season. A perennial can flower and produce seed year after year.

*Grassy* weeds have long, narrow leaves with parallel veins and may complete their life cycle in one season. Annual grassy weeds such as crabgrass, goosegrass, and annual

bluegrass reseed themselves every year. Tall fescue, bentgrass, and quackgrass grow vegetatively for many years. *Nongrassy* weeds, or dicots, have wider net-veined leaves and are also called broad-leaved weeds. Common annual broad-leaved weeds include prostate spurge and common chickweed. Perennial broad-leaved weeds include dandelion, plantain, white clover, hawkweed, and ground ivy.

Yellow nutsedge and wild onion are narrow leaved but are not grasses. Some weeds are a good indication of underlying soil problems. Yellow nutsedge often grows in water-logged soils. Prostrate knotweed is common in dry, compacted soil. Consult your Cooperative Extension agent for help in identifying weeds. Correct identification is the first step in determining what control method to use.

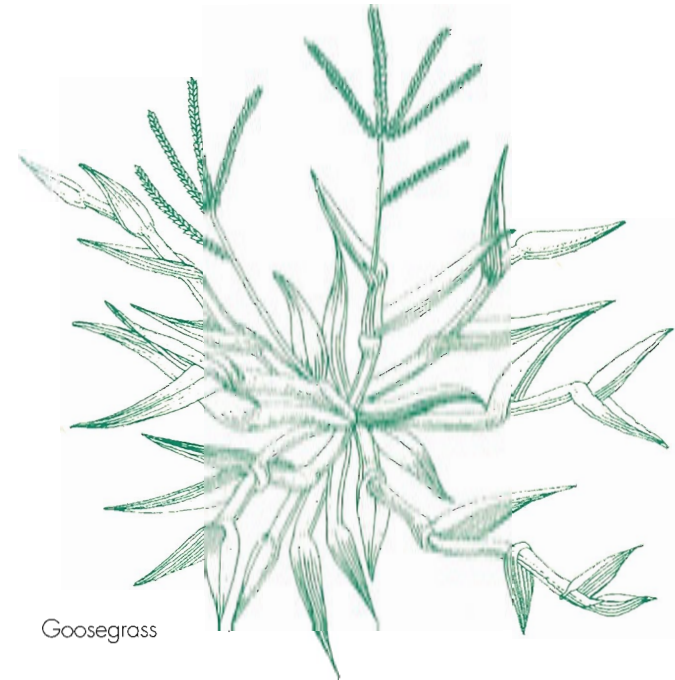
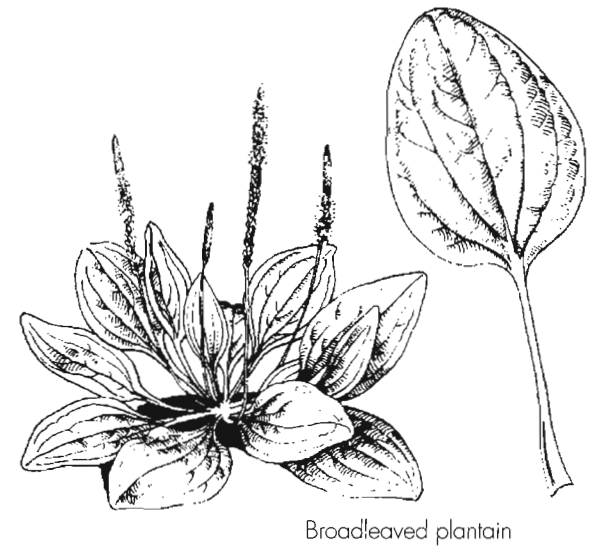


Quackgrass



Smooth crabgrass





## Preventing Weeds in New Lawns

The soil itself is the greatest source of weed seeds in a new lawn. Most soils contain many more weed seeds than are carried in the grass seed.

Planting appropriate grasses at the right season and fertilizing adequately at seeding time are the most important practices in minimizing weed problems. In southeastern New York and on Long Island, planting in the fall is almost the only way to prevent crabgrass from taking over the lawn. (Spring seedings can succeed if the recommended herbicide is used.) If you plant in early fall, the grass plants will spread laterally, and the turf will be dense and mature before most troublesome lawn weeds start to grow the following spring. Proper fertilization of the seedbed will help newly seeded areas quickly gain a competitive advantage over weeds. Apply fertilizer according to soil test recommendations. In lieu of a soil test, use a high phosphorus or starter fertilizer according to label directions. Mowing when grass is 3 inches tall will control many weeds and promote thickening of the lawn.

Do not try to prevent weed establishment by sowing an extra large amount of grass seed. Although growth will be dense, the individual grass plants will be crowded and weak. Diseases may

kill large patches of grass, leaving the lawn susceptible to weed invasion. For better results, sow only the amount of seed recommended, and fertilize it well at seeding time so that each grass plant becomes established quickly.

## Weed Control in Established Lawns

The occurrence of most common weeds can be greatly reduced by improved lawn care. If your lawn drains reasonably well, you can probably reduce the number of weeds drastically by proper fertilization and mowing.

When weeds persist despite good maintenance, you must decide whether to accept them or to control them by hand pulling or with herbicides. A weed-free lawn is neither feasible nor desirable when large areas of turf must be managed. For small lawns or those with only a few weeds, hand pulling as weeds appear can give good temporary results. Weeds are much easier to pull immediately after a heavy rain or watering.

## Chemical Controls

The only alternative to hand pulling weeds is the use of herbicides. Herbicides are most practical for large infested areas where a selective chemical kills the weeds but does not harm the grass. Herbicides

for the home lawn are sold as pre- and postemergents in granular or liquid formulations. Preemergence herbicides are applied to the soil before the target species emerges and are not effective once the weeds appear. Postemergence herbicides are usually applied to foliage after weeds germinate.

Crabgrass is the most common annual weed found in lawns. The best control is a granular preemergence herbicide applied in the spring before crabgrass germinates. Because this herbicide is active in soil it should be applied when the grass is dry so the granules will drop through foliage to the ground.

Most broad-leaved weeds such as plantain and dandelion are best controlled with a postemergence herbicide applied in early fall when the weeds are actively growing but less foliage of desirable plants is exposed. If a granular formulation is used it should be applied in the morning when there is dew on the lawn. This will help the herbicide adhere to leaves and increase absorption into the plant.

Make sure to read and understand the label before applying any pesticide. Check for the safest, most effective time to apply. Do not use at rates higher than those recommended. Do not use the same sprayer used for herbicides such as 2,4-D on any plants other than

grass. Use another sprayer to control insects, diseases, or weeds in the garden.

Many herbicides are available in combinations with fertilizers. These products do two operations at once and facilitate application of pesticides. Because these combination products are pesticides, take proper care in application and storage.

## Diseases

Disease is only one factor that causes unhealthy and dead grass in a home lawn. No amount of disease control effort can overcome poor growing conditions or improper maintenance, and diseases are more likely to occur when lawns have been improperly aerated or fertilized, overwatered, have poor drainage, or have been mowed too low.

Turfgrass injuries from causes such as drought are frequently confused with symptoms of disease. Drought often occurs where thin layers of soil lie over buried debris such as rocks, lumber, plaster, and concrete. The soil dries rapidly in hot summer weather. Dead spots or patches that suddenly appear in a lawn may be caused by fertilizer burn; dog urine; spilled gasoline, oil, or grease; exhaust from power mowers; or improper use of pesticides.



Incorrect mowing can cause a disease-like condition as well as influence the actual development of disease. Cutting grass too closely (“scalping”) or using a mower with dull blades may result in a condition that looks like disease. Infrequent mowing, which produces excessive clippings in a mat, may encourage disease to develop in the hot, humid environment under the mat. Grass weakened by frequent low mowing often appears off-color and is more susceptible to disease.

Lawn diseases are caused primarily by fungi that live in the soil or thatch layer and follow a typical life cycle (see **Figure 12**). Only a few of these fungi are potentially harmful, and even those that cause disease can coexist with grass without damaging it as long as environmental conditions and cultural practices do not create opportunities for attack. Disease-causing pathogens can also become active when applications of fungicides, insecticides, or herbicides inadvertently kill beneficial microorganisms that compete with the pathogens.

A disease must be diagnosed correctly before it can be managed. Diagnosing turfgrass diseases can be difficult because pathogens seldom act alone in causing disease, and symptoms rarely remain constant over a variety of environmental

extremes. In addition, attack by pathogens is often a secondary affliction: something else weakens the grass so that the pathogen is able to attack it.

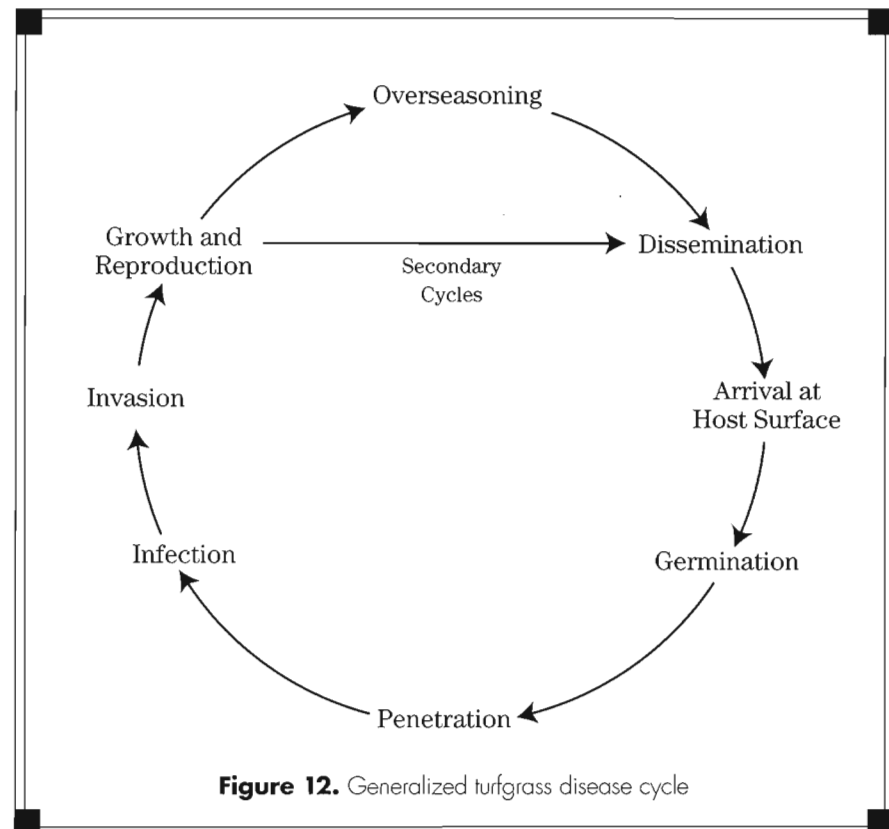
The best form of disease control is prevention. This includes planting resistant or tolerant turfgrass varieties and altering cultural practices to favor the growth of the plant and discourage the activities of pathogens. For more help in diagnosing lawn diseases, contact your county Cooperative Extension agent.

## Disease Control

Although disease spores may be present at any time in your lawn, an epidemic will not occur unless all of the following factors are present:

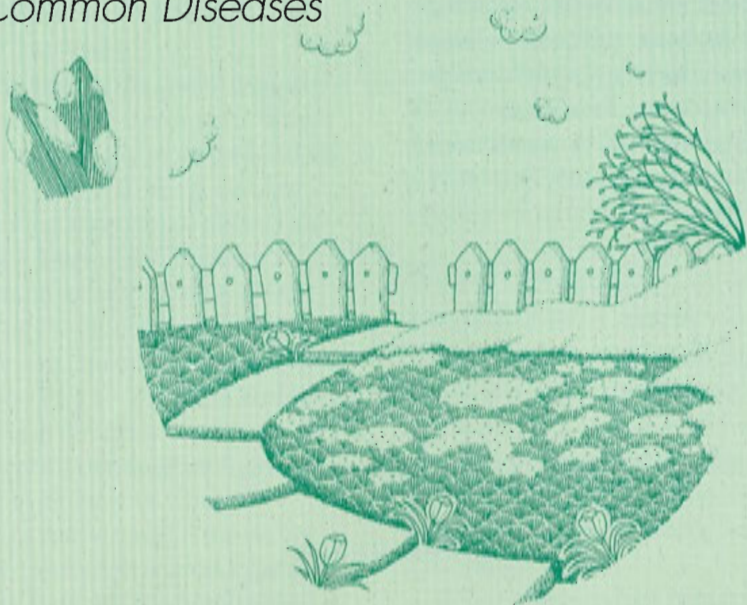
- A host plant (turfgrass species that is susceptible to attack by a specific fungus)
- A pathogen (organism capable of causing disease)
- Favorable environment, including the natural and manmade conditions and practices that encourage development of disease (temperature, moisture, watering, fertilizing, mowing, soil compaction)
- A means by which spores are transported from plant to plant, such as lawn mowers, foot traffic, wind, and water

Cultural practices that encourage a vigorous, hardy turf help minimize both the occurrence of turf diseases and the necessity for control measures. Although fungicides may control one disease, their use often aggravates others.



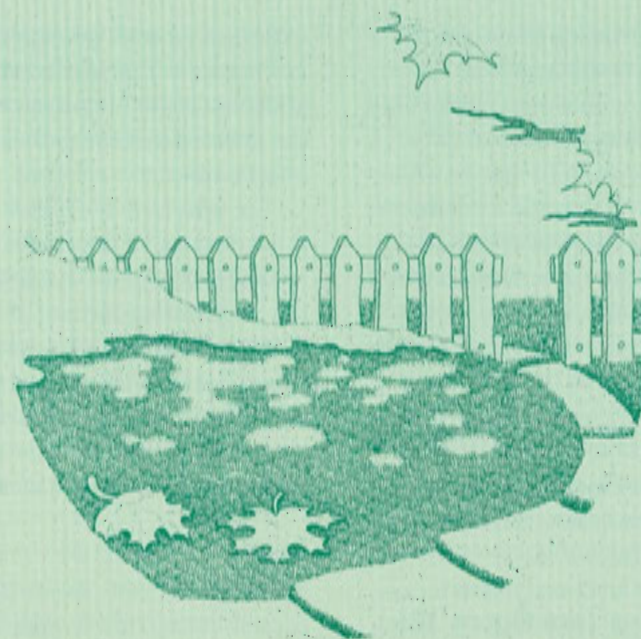
**Figure 12.** Generalized turfgrass disease cycle

## Common Diseases



### **Typhula Blight** (*Typhula*) (also known as Gray Snow Mold)

- Plants Attacked:** ANNUAL BLUEGRASS\*, BENTGRASS, fine fescues, Kentucky bluegrass, perennial ryegrass, and TALL FESCUE
- Time of Year:** December–March
- Symptoms:** Infected turf develops circular, bleached, gray-straw to brown spots 3 inches to 2 feet across as snow melts. Fuzzy, gray-white mycelia may be visible, especially at the margins of the spots immediately after the snow melts.
- Cultural Practices:** Delay fall fertilizer applications until leaf growth has stopped. Mow regularly in the fall. Rake matted grass in spring.
- Comments:** This disease rarely kills plants. It is worsened by cool, wet autumn or spring and by deep compacted snow over unfrozen soil.



### **Pink Snow Mold** (*Microdochium*)

- Plants Attacked:** ANNUAL BLUEGRASS, BENTGRASS, fine fescues, Kentucky bluegrass, perennial ryegrass, and TALL FESCUE
- Time of Year:** March–June and September–November during cool, wet weather
- Symptoms:** In the absence of snow, pink snow mold occurs as reddish-brown, circular spots from 1 inch to 8 inches across. Under snow cover the spots are tan to whitish-gray or reddish-brown. Immediately after the snow has melted, pink mycelia may be visible at the margins of the spots.
- Cultural Practices:** Do not apply nitrogen in late fall. Remove thatch. Rake matted grass in spring.
- Comments:** Disease is worsened by cool, wet autumn or spring and by snow over unfrozen soil. Snow is not necessary for this disease to occur.

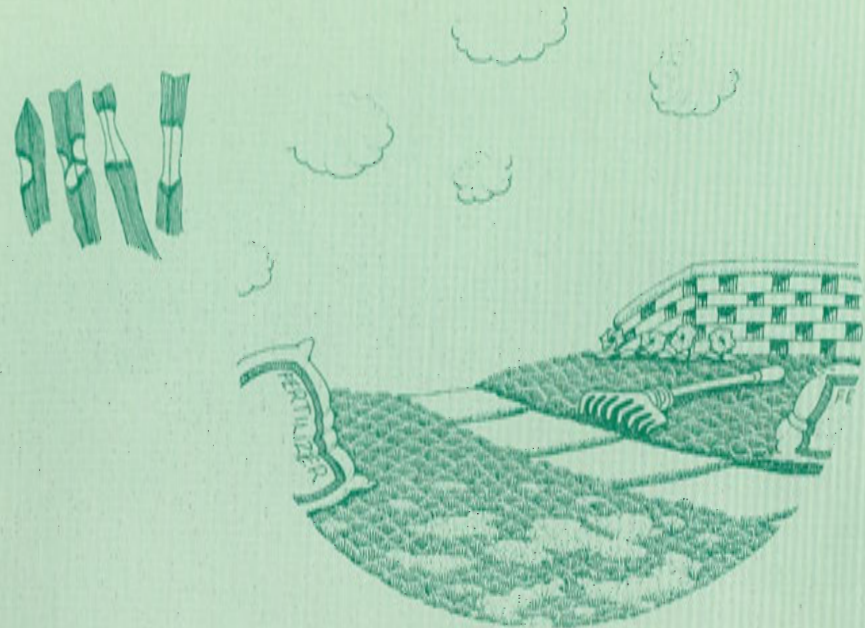
\*Plants whose names are printed in capital letters are more susceptible to the particular disease





### Leaf Spots and Blights

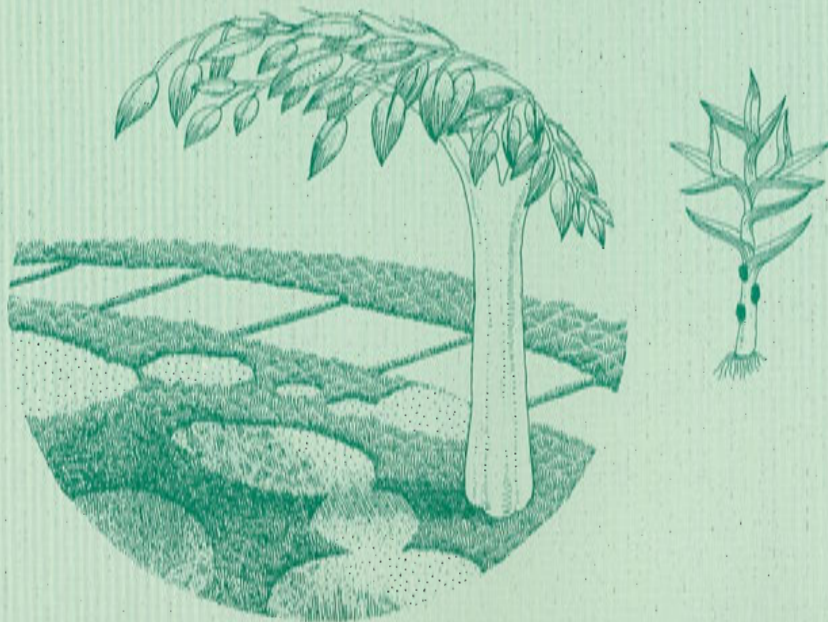
- Plants Attacked:** Annual bluegrass, BENTGRASS, FINE FESCUE, KENTUCKY BLUEGRASS, and ryegrass
- Time of Year:** April–October
- Symptoms:** Oblong brown leaf spots with dark red, brown, or purple borders. Overall yellowish cast to turf; generally does not occur in distinct patches. If severe, leaves shrivel and entire plants discolor and die.
- Cultural Practices:** Use resistant varieties. Avoid excess nitrogen, especially in the spring. Water early in the day and avoid overwatering. Renovate lawn.
- Comments:** Most serious on Kentucky bluegrass lawns when cool weather prevails, usually in the spring. If the disease progresses into the early summer, a more damaging crown rot or "melting out" stage may develop. Leaf spot is greatly intensified by succulent turfgrass growth; thus keep nitrogen fertilization to a minimum in the spring.



### Dollar Spot (*Lanzia* and *Moellerodiscus*)

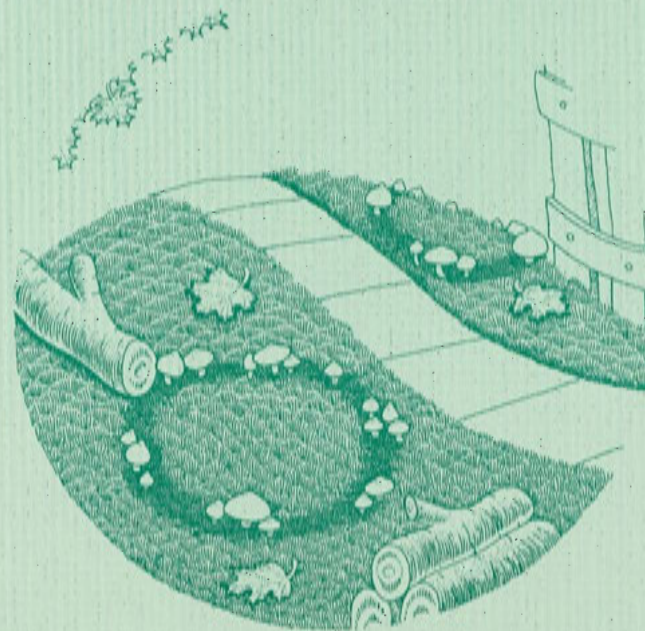
- Plants Attacked:** ANNUAL BLUEGRASS, BENTGRASS, fine fescue, Kentucky bluegrass, and ryegrass
- Time of Year:** June–September
- Symptoms:** Appears as round, bleached to straw-colored spots ranging from the size of a quarter to that of a silver dollar sunken in the turf. Individual spots may coalesce to destroy large areas of the lawn.
- Cultural Practices:** Use resistant varieties. Avoid nitrogen deficiency. Avoid watering frequently or watering in late afternoon or evening.
- Comments:** The use of some organic fertilizers reduces severity of the disease.





### **Brown Patch** (*Rhizoctonia*)

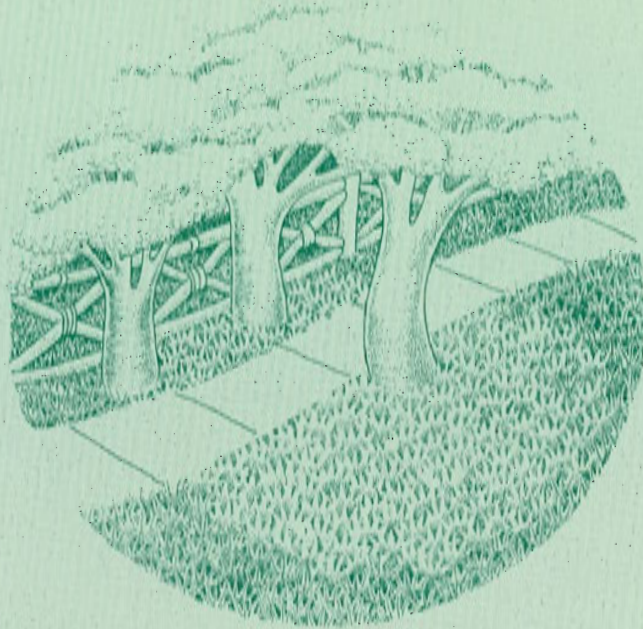
- Plants Attacked: ANNUAL BLUEGRASS, BENTGRASS, fine fescue, Kentucky bluegrass, ryegrass, and TALL FESCUE
- Time of Year: Summer
- Symptoms: Generally appears as roughly circular brown patches from a few inches to several feet across. Bare spots may occur where turf is killed.
- Cultural Practices: Avoid excess nitrogen and excess water. Water early in the day.
- Comments: Most common in summer during periods of hot, humid weather. Use of some organic fertilizers may reduce severity of the disease.



### **Fairy Rings**

- Plants Attacked: All grasses
- Time of Year: April–October
- Symptoms: Fungi growing on dead organic matter release compounds that create a thin, circular, or arc-shaped band of dead grass or rapidly growing dark grass. Rings may vary in size, and the band's diameter increases each year.
- Cultural Practices: Mask symptoms with good fertility, watering, and mowing practices. Rake down or pick and discard the mushrooms.
- Comments: No resistant varieties or effective fungicides are currently available.





### **Powdery Mildew** (*Erysiphe*)

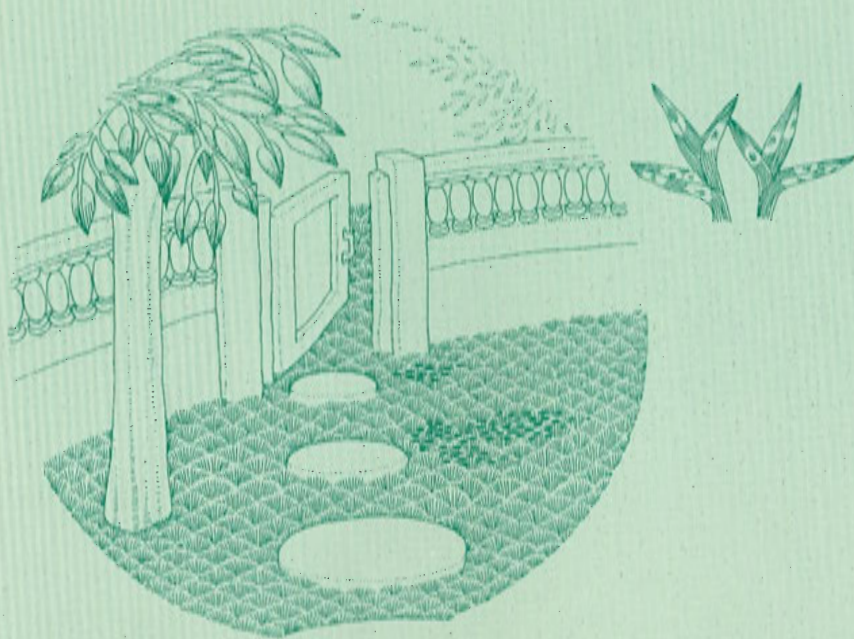
- Plants Attacked: Fine fescue and KENTUCKY BLUEGRASS
- Time of Year: July–October
- Symptoms: White, powdery growth on leaves, which appear frosted. Infected leaves become yellow and then die.
- Cultural Practices: Plant resistant varieties and shade-tolerant varieties. Reduce shading and avoid excess nitrogen.
- Comments: Nearly always found in shady areas.



### **Pythium Blight** (*Pythium*)

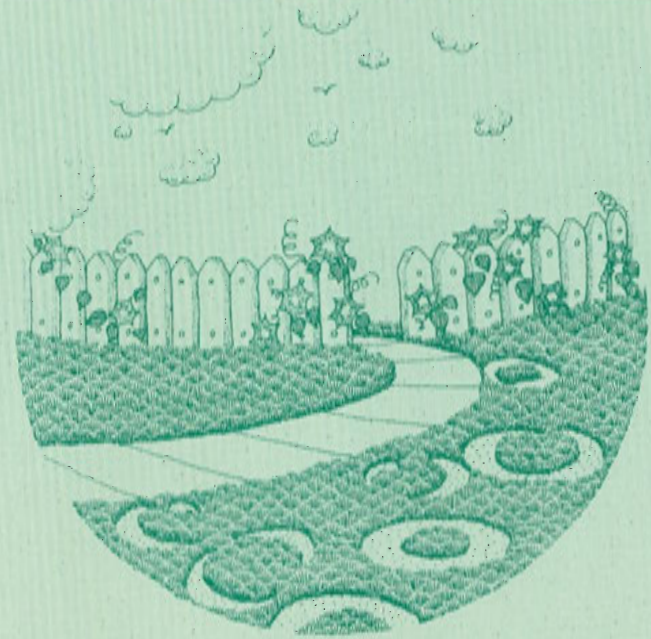
- Plants Attacked: ANNUAL BLUEGRASS, BENTGRASS, fine fescue, Kentucky bluegrass, RYEGRASS, and tall fescue
- Time of Year: July–August
- Symptoms: Small, round to irregularly shaped patches of blighted plants, up to 6 inches across, appear during hot, humid conditions. Diseased patches often follow shapes of wettest areas. Plants that have been killed feel slimy or greasy in the early morning.
- Cultural Practices: Avoid excess nitrogen and excess water. Do not mow wet grass.
- Comments: Most common during hot, humid weather on poorly drained sites. Many patches may coalesce to affect large areas of turf.





### **Rusts** (*Puccinia*)

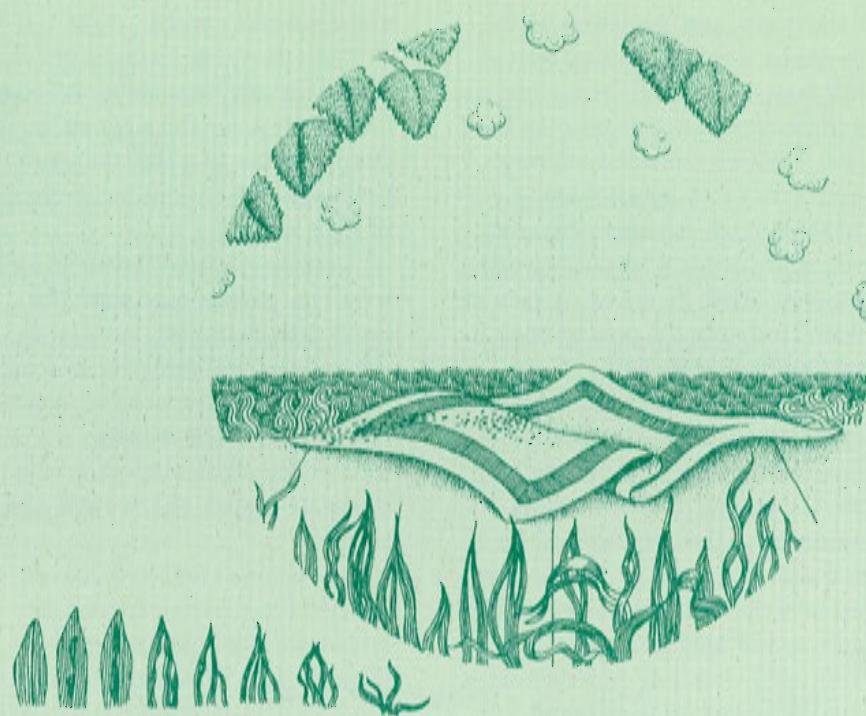
- Plants Attacked: Kentucky bluegrass and perennial ryegrass
- Time of Year: July–October
- Symptoms: Small orange spots occur on leaf blades. Later the grass develops a reddish discoloration and the affected plants shrivel and die.
- Cultural Practices: Use resistant varieties. Avoid nitrogen deficiency and drought.
- Comments: The recommended fall fertilization of lawns should help prevent this problem.



### **Patch Diseases** (Necrotic Ringspot and Summer Patch)

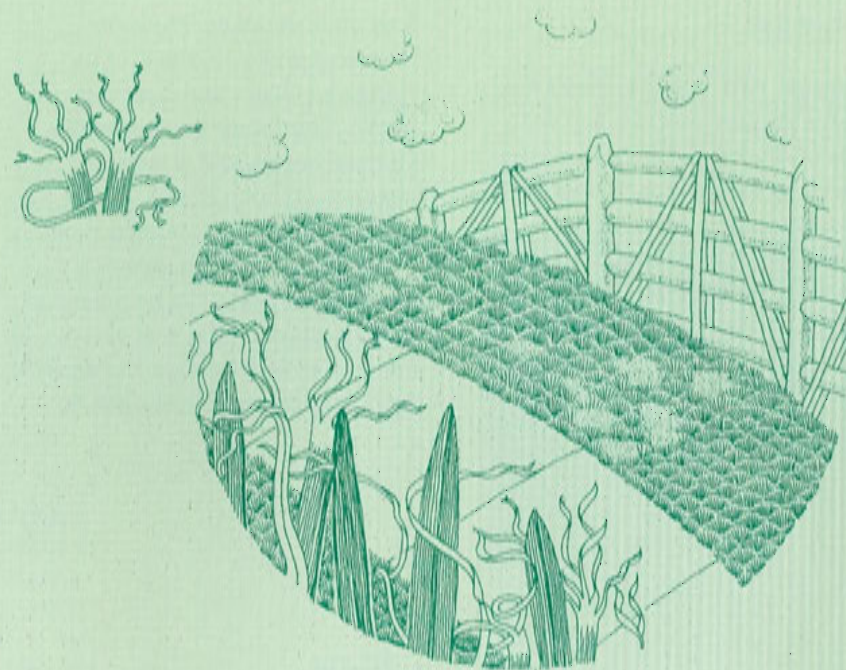
- Plants Attacked: ANNUAL BLUEGRASS, bentgrass, fine fescue, and KENTUCKY BLUEGRASS
- Time of Year: April–November
- Symptoms: Irregularly shaped, bleached leaves or dying leaf ends. Irregular crescents or circles of dying grass with or without a small patch of healthy grass in the center.
- Cultural Practices: Use resistant varieties. Any practice that encourages deeper rooting will help the turf to be more tolerant of these diseases. Remove excess thatch. Avoid high nitrogen nutrition, excessive watering, and drought stress. Keep soil pH above 6.2.
- Comments: Formerly called Fusarium blight syndrome, disease caused by these two root pathogens occurs throughout the year. Summer patch is the more common of the two, its symptoms occurring during hot, dry periods. Perennial ryegrass and several varieties of bluegrass are resistant to this disease and should be included in any new seeding or overseeding mixture.





### Stripe Smut (*Ustilago*)

- Plants Attacked:** Bentgrass and KENTUCKY BLUEGRASS
- Time of Year:** May–October
- Symptoms:** Leaves with smut have gray to black stripes in the spring or fall. The leaf ruptures, shreds lengthwise, withers, and dies.
- Cultural Practices:** Use resistant varieties. Avoid excess nitrogen and drought.
- Comments:** When the leaf ruptures, black, powdery spores are released. A white cloth rubbed over the grass becomes discolored by the black spores.



### Red Thread (*Laetisaria*)

- Plants Attacked:** Annual bluegrass, bentgrass, FINE FESCUE, Kentucky bluegrass, and PERENNIAL RYEGRASS
- Time of Year:** May–October
- Symptoms:** Pink to red threadlike fungus strands grow from the ends of leaves. Entire leaves eventually turn brown and die.
- Cultural Practices:** Use resistant varieties. Maintain adequate fertility and avoid nitrogen deficiency.
- Comments:** Common during cool, wet periods in the spring. Because red thread is usually favored by low nitrogen and potassium fertility, maintaining adequate levels of these two nutrients may help the lawn develop tolerance. The use of some organic fertilizers can also reduce disease severity.



## Insects

In general, two types of insects feed on lawn grasses: root-feeding white grubs of several species and surface feeders, including chinch bugs, sod webworms, and cutworms.

### Root Feeders

Most insect damage to lawns in New York is caused by five species of beetles whose white grub larvae

feed on turfgrasses. The more prevalent grubs are those of the European chafer and Japanese beetle. The Asiatic garden beetle, Oriental beetle, and others are common on Long Island. These scarab larvae chew off grass roots.

Turf that has been seriously damaged by grubs can be pulled up easily because of the lack of roots. In September and October and again in April to early June, grubs can be

found easily and quickly under the loose sod. Grubs are white, worm-like insect larvae with brown heads and three pairs of legs near the head end. They are C-shaped and range from  $\frac{1}{2}$  to 1 inch long but are smallest in late summer when still young. Grub injury is usually worst in sunny areas. Symptoms appear as wilted turf after the ground dries in late spring or early fall.

Check for grubs in your lawn by cutting three sides of a square-foot area with a shovel and peeling back the sod layer. The grubs will be apparent on the underside of the sod mat. Count the grubs in several areas of the lawn. Inspect lawns in mid- to late August in upstate New York and in late July or early August downstate and on Long Island.

Before taking any control measures against scarab grubs, ensure that the damage is caused by grubs. Symptoms vary from weak turf to large, dead patches. A gradual thinning and weakening of the stand may be one of the earliest symptoms as grubs feed on roots near the soil surface. When the grub population is large, grass may wilt suddenly as a result of severe root pruning even if soil moisture is adequate. As damage continues, the surface may become spongy. Root pruning in the soil-thatch interface may be so complete that the sod can be lifted in large sections to reveal

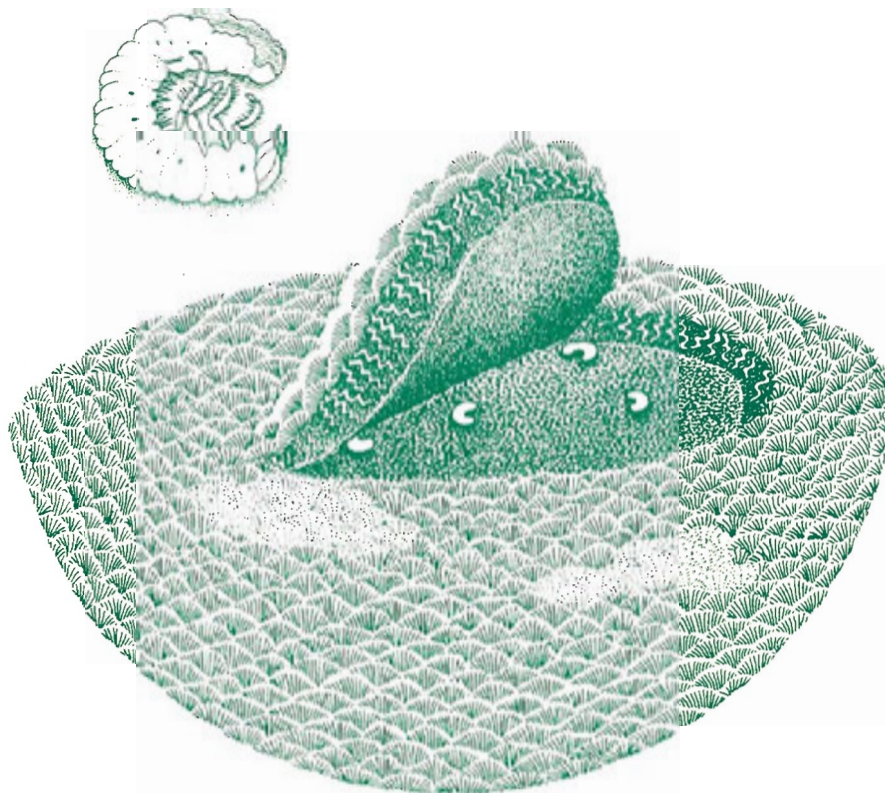
actively feeding grubs.

Remember that no grubs are present during midsummer because the insects are in the adult stage. One indication of a potential grub problem is the obvious heavy flight of adult beetles.

A commonly used threshold for treatment is more than eight live grubs per square foot, but a properly watered and fertilized lawn may tolerate up to ten grubs per square foot with no visible damage, whereas the same infestation could devastate a weak, poorly maintained lawn.

Late summer and early fall are the best times of year to treat for grubs with a one-year life cycle (**Figure 13**). Effective treatment in the fall will make spring treatment unnecessary because these grubs produce only one generation per year. Treat when grubs are young and feeding actively close to the soil surface. This occurs from mid-August to late September upstate and from early August to mid-September in southeastern New York.

Biological control alternatives to synthetic soil insecticides are available. Milky spore disease is a naturally occurring bacterial parasite that infects Japanese beetle grubs. It is not effective on other white grub species and has been, at best, only marginally effective in New York.





Parasitic nematodes (microscopic wormlike organisms) have been introduced as a biocontrol for white grubs. Although results have been inconsistent, nematodes, available through garden specialty catalogs, are a viable choice for insect control of lawns. Homeowners who rely solely on biological controls for white grubs may need to renovate

their lawns following heavy grub infestations. Insecticides are listed in *Home Lawns: Varieties and Pest Control Guide* (see reference list).

## Surface Feeders

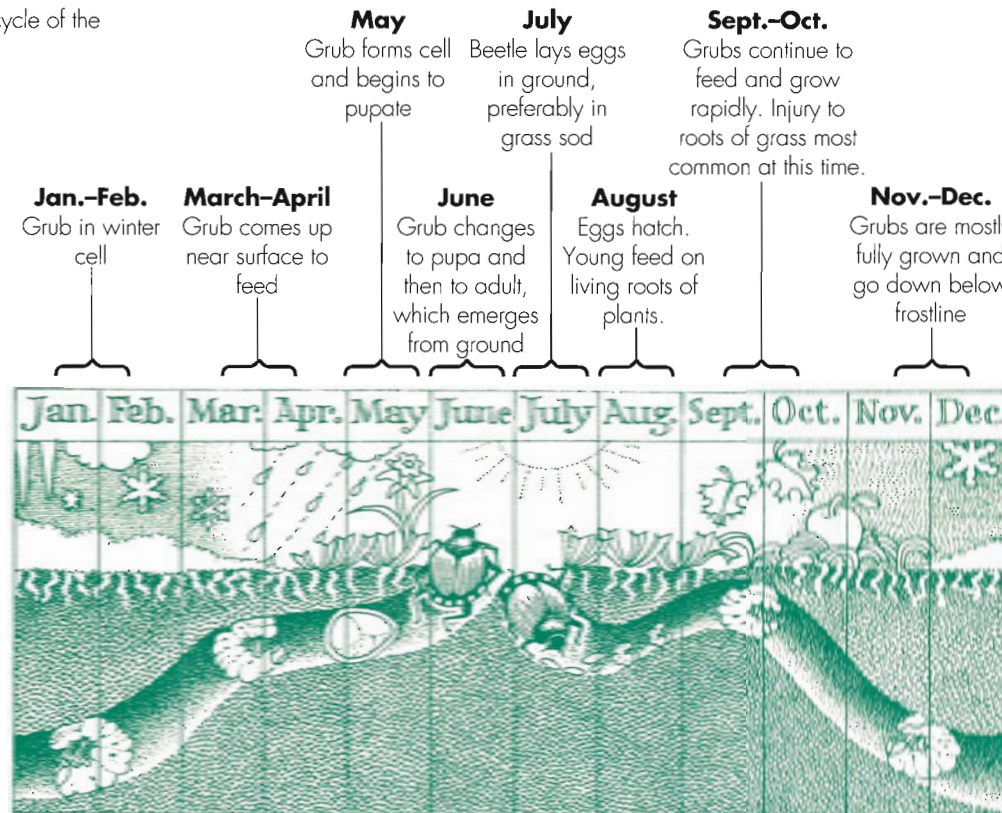
### *Controlling Surface Feeders*

Avoiding drought stress will lessen insect damage. In recent years, plant breeders have developed insect-

resistant grass varieties by introducing a fungus (endophyte) into the grass plant that produces a chemical toxic to insects. Because the toxin does not move to underground plant parts, the grasses are resistant only to surface feeders such as sod webworm, billbug, and chinch bug. Certain varieties of perennial ryegrass, fine fescue, and tall fescue

contain endophytes. For specific cultivars and information on chemical insecticides, consult *Home Lawns: Varieties and Pest Control Guide*.

**Figure 13.** Life cycle of the annual white grub



## Integrated Pest Management

Integrated pest management (IPM) is a pest suppression and avoidance program that may include use of pesticides. Appropriate culture, pest monitoring, sanitation (e.g., thatch control), and proper timing and selection of pesticides are all components of IPM. Ultimately, if a pesticide is employed, it will be used much more efficiently than in a preventive program.

Turfgrass IPM should incorporate all of the cultural factors discussed in this booklet. Following such a program should greatly reduce reliance on pesticides. Pesticide use may be warranted, however, when a weed, disease, or insect infestation reaches an unacceptable or damaging threshold. IPM depends on accurate identification of the pest and selection of a pesticide that will control it effectively with minimal environmental impact.



## Surface Feeders



### Bluegrass Billbug

Bluegrass billbug adults (weevils) are dark gray to black, about  $\frac{1}{3}$  inch long, and have a prominent snout. They leave overwintering sites on warm, sunny days in May and June and can be seen walking over pavement as they seek feeding and egg-laying sites. This is a warning of possible lawn destruction later. Eggs are deposited in the stems just above the crown, and young larvae feed in the stems. As they grow, the white, legless, brown-headed larvae leave the stems to feed externally in the crown of turfgrass plants. The presence of frass, which resembles fine sawdust, around the crowns is characteristic of their activity.



Chinch bugs

### Chinch Bugs, Sod Webworms, and Cutworms

Chinch bugs, sod webworms, and cutworms feed on the leaves and stems of grass, not on the roots as do grubs. They do not occur in soil but on its surface.

Chinch bugs cause yellowing and subsequent browning of grass, usually in gradually enlarging patches. Damage is most likely to be seen during a hot, dry summer (June to August). If spring is cold and wet, chinch bugs are usually not a problem because a fungus disease kills most of the overwintering adults. Adult chinch bugs are very small, about  $\frac{1}{5}$  inch long, and black. Young nymphs are red or brown and black, about  $\frac{1}{8}$  inch long. You can find the tiny bugs using one of two methods:

- Select a sunny spot along the border of the yellow or suspected area of your lawn. Cut out both ends of a large tin can and push one end of the can about 2 inches into the sod. Fill the can with water nearly to the top. If chinch bugs are present, they will float to the surface of the water in about five minutes.
- Place a 1-foot-square piece of white cloth over the suspected area of your lawn and thoroughly flood the sod beneath it. If chinch bugs are present, they will crawl up on the cloth in about five minutes.



Sod webworm  
and moths of sod  
webworms



Moths of sod webworms can be seen on cloudy days and at dusk on hot summer days. As you walk across the lawn, the moths fly ahead of you a short distance in a zigzag pattern before landing. They drop their eggs indiscriminately over the turf during their flights at night. As eggs hatch, young worms feed on grass blades, but as they grow larger they feed on blades, stems, and even the crowns of grasses. Worms feed only at night and rest in silk-lined tunnels during the day. Green frass may be found in or near the tunnels. Small yellow spots of damaged grass coalesce with other spots; large areas of grass may eventually turn brown and die.

Cutworms also feed at night and cause similar yellow spots, which may coalesce to form large patches of dead grass.

## Special Lawn Problems

### Renovating a Poor Lawn

Renovation improves a lawn by seeding into the existing sod. It is a selective tillage process that falls short of completely reestablishing the turf. Lawn renovation becomes necessary when the area has been so damaged that it cannot recover with standard maintenance practices such as irrigation and fertilization. This degree of damage is caused by an environmental or biological factor such as poor drainage, thatch, compaction, excessive shade, unadapted grass species, diseases, and insects. If the cause is not dealt with effectively, renovation may not be successful.

The renovation method used depends on the amount of desirable permanent turfgrass species present

as well as the amount and kinds of undesirable grass, grasslike weeds, or broad-leaved weeds present. If your lawn contains at least 50 percent desirable turfgrass in a fairly uniform stand, a thorough renovation may save it. The thickness of thatch should also be considered. Renovation will probably not be successful on lawns that have accumulated more than 1½ inches of thatch.

Details on renovation are available in the Turf Fact Series *Home Lawn Renovation*, available from your Cornell Cooperative Extension office.

### Lawns in the Shade

Shaded lawns are troublesome because of reduced light and competition with trees for water and nutrients. Even the most shade-tolerant grasses never make as good a sod in the shade as do grasses

growing in the sun.

Sometimes shade alone is the chief difficulty such as on sites near buildings or under deep-rooted, high-branched trees. In many cases good soil preparation plus a shade-tolerant turfgrass mixture makes an acceptable lawn. Fine fescues are the best grasses to use if soil is dry; rough bluegrasses, if soil is moist. Several shade-tolerant Kentucky bluegrasses are also available. Refer to *Home Lawns: Varieties and Pest Control Guide* for specific varieties.

Turfgrass is much harder to grow under dense, shallow-rooted trees because trees cut off the light and rob the soil of water and fertilizer. Of the common trees, Norway maple is the worst offender. In such situations, even your best efforts to establish a lawn may fail. If this is the case, try using perennial ryegrass at the rate of 6 to 8 pounds per 1,000 square feet instead of the other grasses. Mow it high, water

whenever the soil is dry, and fertilize each spring and fall. Whenever dead patches appear, loosen the soil and sow more seed.

If you are unable to grow a lawn, look for a lawn substitute or ground covers suitable for your area. If these also fail, consider flagstone, brick, or gravel.

### Steep Slopes

Avoid steep slopes if possible. They tend to be dry, and lawns are difficult to establish and maintain. If you do decide to use turfgrass on a steep slope, be sure to round off the crest of the slope to avoid scalping.

Whenever possible, sod a steep slope. This prevents a heavy rainfall from washing away all the topsoil and generally ensures that the slope will become established. On very steep slopes, each piece of sod may need to be fastened with a peg and twine. Follow the sodding procedure described previously.





To plant a slope with seed, follow all the important points described for seeding. Pay special attention to seedbed preparation and fertilization, and be sure to plant in early fall. A straw mulch, burlap, or cheesecloth covering is essential during the first few weeks of establishment. Give turf on steep slopes the same care as other lawn areas, and remember to fertilize, mow, and water properly.

Ground covers such as crown vetch may be used as substitutes for turf on steep slopes. Consult your local Cooperative Extension agent for assistance in selecting a suitable substitute.

## Turfgrasses and Substitutes to Avoid

For lawn use in New York State, avoid the following plants: Mondo, Dichondra, pearlwort, St. Augustinegrass, Bahiagrass, and Bermudagrass.

In the spring, zoysiagrass is heavily marketed to homeowners in New York. Zoysias are warm-season grasses that are tolerant of low fertility, drought, close cutting, and summer weed invasion. Accompanying disadvantages are that zoysias go dormant and turn straw brown in autumn and remain so until mid- to late spring. They are not resistant to

traffic or weed invasion when dormant, must be started from plugs or sprigs of sod, and do not tolerate shady conditions. It takes several years of patience to produce a solid sod of zoysia, which has not been consistently winter hardy in New York State. In addition, a severe outbreak of chinch bug can totally destroy a zoysia lawn in one season. For these reasons, zoysiagrass is not recommended for the home lawn in New York.

## Moss

Moss is an indication that growing conditions are not ideal for turfgrass. Favorable conditions for moss include low fertility, poor drainage, unadapted grass species, shade, and humidity. Mosses may also be found in thin turf and full sunlight. Closely mowed turf composed of nonaggressive species is especially prone to moss encroachment.

Depending on your own lawn, controlling moss may entail doing one or more of the following:

- Increase nitrogen fertility
- Raise mowing height
- Adjust irrigation practices to avoid excessive water
- Improve drainage with tiles, dry wells, French drains, or by elevating depressions

- Use a turfgrass species better adapted to the site such as fine fescue or rough bluegrass (*Poa trivialis*) in shaded areas

There is no guaranteed chemical control for moss. The best treatment involves applying iron sulfate or ferrous ammonium sulfate at 1 pound per 1,000 square feet. Water the material after the moss turns black, about one hour after application. It is best to make this application in cool, humid weather. Repeat applications may be necessary. The moss should be raked out after it is dead to avoid formation of an impervious layer over the soil surface. Follow with an application of lawn fertilizer to encourage growth of desirable grasses back into these areas. If sizable bare spots remain after removing the moss, it may be necessary to reestablish the spots by seeding or sodding.

## Moles, Skunks, and Other Animals

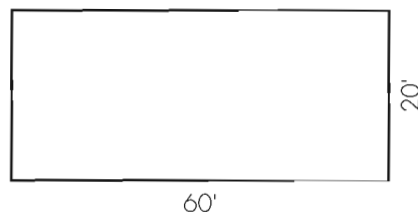
Moles raise ridges in the lawn as they burrow through the soil in search of insects and earthworms to eat. If moles persist, try a trap. Skunks may also damage your lawn by digging holes in search of grubs and earthworms.

## Appendix: Calculations for Home Lawn Practices

You must know the area of your lawn to make proper applications of fertilizer, lime or sulfur, and pesticides. Follow the given formulas to determine the area of your lawn.

### Area of a Square or Rectangle

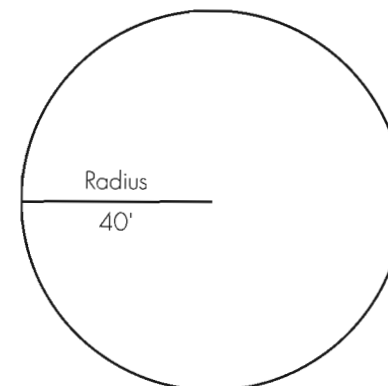
$$\begin{aligned}\text{Area} &= L \times W \\ L &= \text{length} \\ W &= \text{width}\end{aligned}$$



$$\text{Area} = 60' \times 20' = 1,200 \text{ square feet}$$

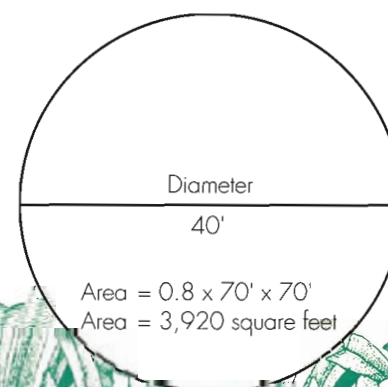
### Area of a Circle

$$\begin{aligned}\text{Area} &= \pi R^2 \\ \pi &= 3.14 \\ R &= \text{Radius}\end{aligned}$$



$$\begin{aligned}\text{Area} &= 3.14 \times 40' \times 40' \\ \text{Area} &= 5,024 \text{ square feet}\end{aligned}$$

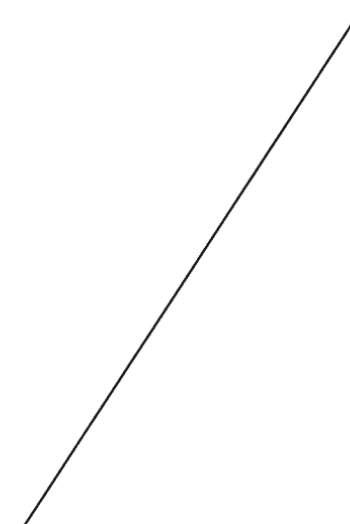
$$\begin{aligned}\text{Area} &= 0.8 D^2 \\ D &= \text{Diameter}\end{aligned}$$



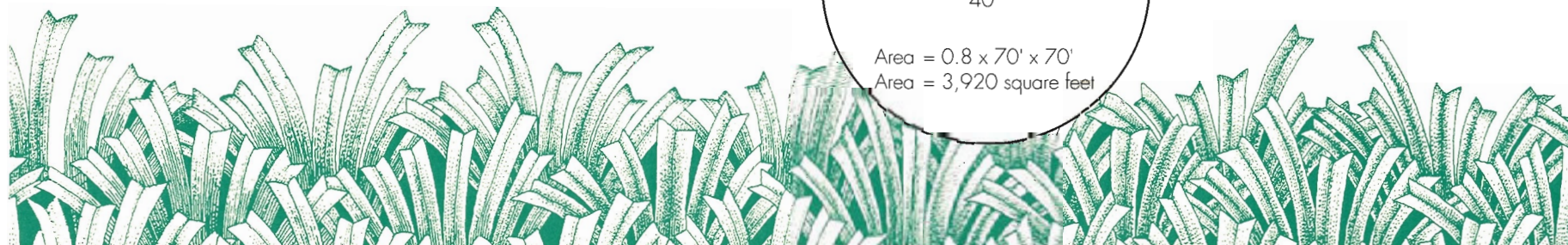
$$\begin{aligned}\text{Area} &= 0.8 \times 70' \times 70' \\ \text{Area} &= 3,920 \text{ square feet}\end{aligned}$$

### Area of a Circle

$$\begin{aligned}\text{Area} &= 0.5 BH \\ B &= \text{Base} \\ H &= \text{Height}\end{aligned}$$



$$\begin{aligned}\text{Area} &= 0.5 \times 50' \times 110' \\ \text{Area} &= 2,750 \text{ square feet}\end{aligned}$$





## Area of Irregular Shape

When the lawn shape is irregular, fit the area to standard geometric shapes, determine the area of all components, and add to obtain the total area.

In this example the upper section can be divided into two right triangles and the lower section into two circles. Find the individual areas of 1, 2, 3, and 4, then add all areas to determine the total.

If you know the dimensions of your property, subtract the area of the house, garage, driveway, and plantings to approximate the lawn area.

The amount of fertilizer needed to cover your lawn is determined by the total lawn area and the fertilizer

rate and analysis. Review the following example:

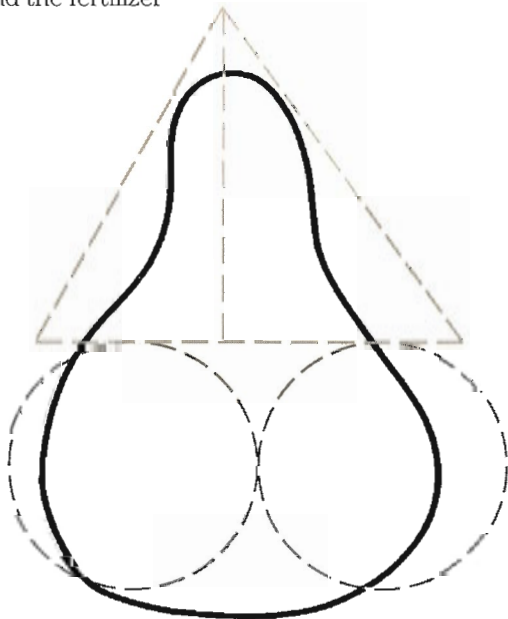
Your established lawn is 5,000 square feet, 1 pound of nitrogen per 1,000 square feet is to be applied, and you have selected a fertilizer with the analysis 25-5-10. Four pounds of 25-5-10 will be needed to provide 1 pound of nitrogen per 1,000 square feet.

$$4 \text{ lb. } (25-5-10) \times .25 = 1 \text{ lb. total nitrogen}$$

$$4 \text{ lb. } (25-5-10) \times .05 = 0.2 \text{ lb. phosphate}$$

$$4 \text{ lb. } (25-5-10) \times .10 = 0.4 \text{ lb. potash}$$

To cover the entire lawn, you will need 20 pounds of this particular fertilizer, i.e., 4 pounds/1,000 square feet  $\times$  5,000 square feet = 20 pounds of 25-5-10 for 5,000 square feet.



## Taking a Soil Sample

Routine soil sampling is the best way to determine soil nutrient levels and pH. Fertilizer and lime recommendations can be made accurately from soil test results.

The best time to sample the soil is before a lawn is established. Proper soil amendments can then be purchased and incorporated into the seedbed before seeding or sodding. It is advisable to have your soil tested every five years or so unless there is a history of soil-related problems. Samples can be taken anytime during the year when the soil is not frozen but should always be done at the same time of year so that comparisons can be made. The two preferred times are early spring, so that results can be received well in advance to plan for the upcoming growing season, and fall, to plan for the next year's growing season. Do not take a soil sample from an area to which lime or fertilizer has been applied recently (within three to four weeks). Before taking samples, obtain a soil test envelope from your county Cooperative Extension agent. Be sure to complete the soil test information card. Provide as much information as possible on previous lawn maintenance practices.

A soil test is of no value unless the sample is representative of the

conditions in the soil. Take ten to twenty random samples (depending on the size of the lawn) and mix them together to give an "average" or composite sample. If you have several seemingly different areas to be tested, it is better to make a composite sample from each area (e.g., front lawn, back lawn). Label the samples so you will be able to identify them when you receive results. Also include the names or types of grasses already growing or to be grown in this area (e.g., Kentucky bluegrass, general lawn mixture, fine fescue).

Soil samples can be taken with a trowel, spade, shovel, or soil tube. A soil tube can be purchased or constructed from a piece of thin-walled conduit or brass tubing. When sampling soil from an existing lawn, take samples from beneath the surface sod layer, from the top 2" of soil (**see A in Figure 14**). Where a bare soil is to be sampled, the top  $\frac{1}{4}$ " of soil should be scraped away before taking the sample from the next 2" depth of soil (**see B in Figure 14**).

When sampling, remember to

1. Take several samples
2. Mix soil together
3. Remove stones, roots, and debris
4. Submit  $\frac{1}{2}$  cup of soil
5. Complete all soil test information

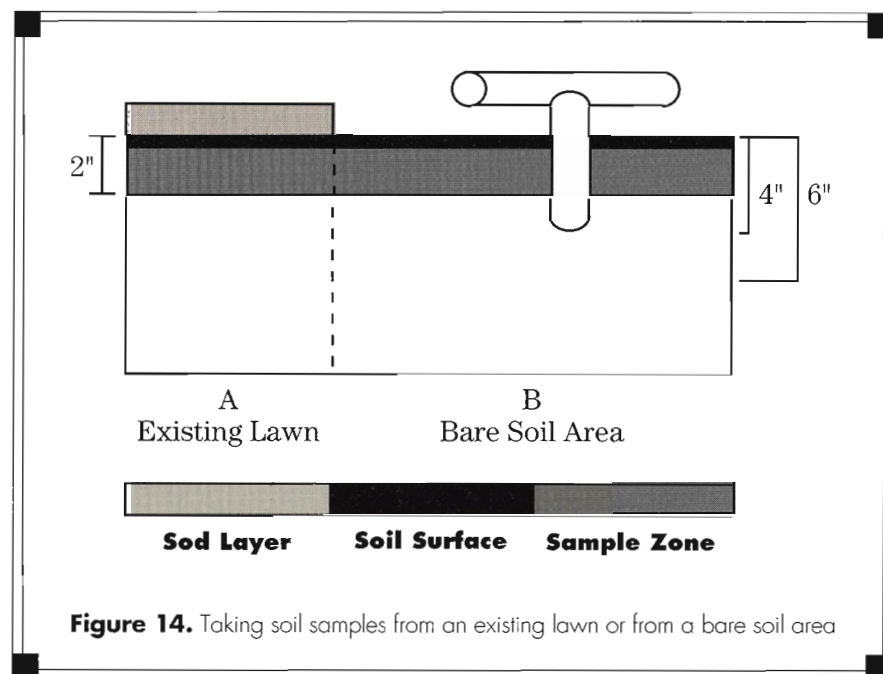
Also remember that a soil test will not diagnose insect and disease problems or the presence of toxic substances.

### If You Need More Help

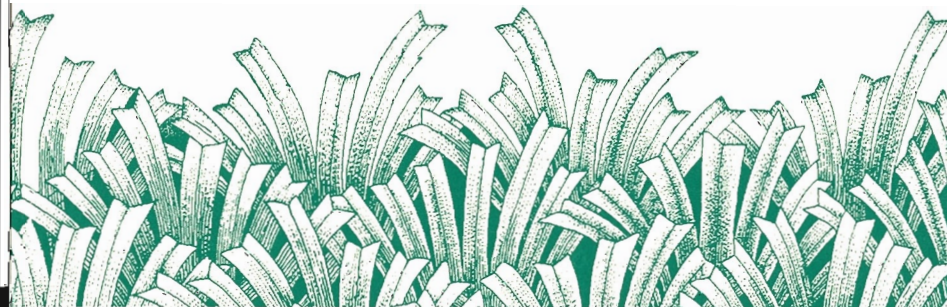
This bulletin answers most of the hundreds of questions asked each year about lawns. If you follow the suggested establishment and maintenance practices, you will have good results in improving and maintaining your lawn. If you have a special lawn problem, contact your county Cooperative Extension

agent. Please be prepared to provide the information indicated on the next page.

Your Cooperative Extension agent will find it extremely helpful to have a turfgrass sample that is 6 inches square and 3 inches deep taken from the area of lawn that is showing symptoms of the problems but is not completely dead. Place the sample in a plastic bag for transportation to the Cooperative Extension office.



**Figure 14.** Taking soil samples from an existing lawn or from a bare soil area





## Know Your Lawn

A thorough understanding of your lawn's features such as size, location, drainage, and turf cover will help you to develop a proper lawn maintenance program or diagnose a lawn problem. The chart below highlights the important features and practices to record. Remember to use the Lawn Maintenance Record Chart for future reference.

### Lawn Description

#### Size:

Total Lawn Area

Problem Area

#### Location:

☐ Sunny

☐ Trees Absent

☐ Shady

☐ Exposed to Wind

☐ Trees Present

☐ Confined

#### Drainage:

☐ Often Wet

☐ Often Dry

☐ Low Spots

#### Kinds of Grasses/Varieties:

Seeded

Sodded

#### Clippings:

Returned

Removed

#### Thatch:

Under 1 Inch

Over 1 inch

### Lawn Maintenance Practices

#### Mowing:

Frequency

Height

#### Watering:

Frequency

Amount

#### Fertilizer:

Analysis (e.g., 5-10-5)

Amount Applied to Area

Frequency of Application

Date of Last Application

#### Lime/Sulfur:

Amount Applied to Area

Frequency of Application

Date of Last Application

#### Pesticides:

Amount Applied to Area

Frequency of Application

Date of Last Application

## Helpful References

- Emmons, R. D. 1984. *Turfgrass Science and Management*. Delmar Publishers, 2 Computer Drive West, Box 15-015, Albany, N.Y. 12212.
- \* Klass, C., and D. M. Karasevicz. 1993-94. *Guide to Pest Management Around the Home*. Cornell Cooperative Extension Miscellaneous Bulletin 74. Ithaca, N.Y.
- \* Nelson, E. B. 1992. *Biological Control of Turfgrass Diseases*. Cornell Cooperative Extension Information Bulletin 220. Ithaca, N.Y.
- \* 1994 *Cornell Turfgrass Species and Variety Recommendations*. Cornell Cooperative Extension Bulletin 141RTG2. Ithaca, N.Y.
- \* Petrovic, A. M., M. T. Cinque, R. W. Smiley, and H. Tashiro. 1982. *Picture Clues to Turfgrass Problems*. Cornell Cooperative Extension Miscellaneous Bulletin 125. Ithaca, N.Y.
- Smiley, R. W., et al. 1992. *Compendium of Turfgrass Diseases*, 2nd Ed. St. Paul, Minn.: American Phytopathological Society.
- Tashiro, H. 1987. *Turfgrass Insects of the United States and Canada*. Ithaca, N.Y.: Cornell University Press.
- \* Thurn, M. C., N. W. Hummel, J. C. Neal, E. B. Nelson, and M. Villani. 1994 (rev.). *Home Lawns: Varieties and Pest Control Guide*. Ithaca, N.Y.: Cornell Cooperative Extension.
- Turgeon, A. J., and F. Giles. 1987. *Turfgrass Management*. Reston Publishing Co., Distributed by Prentice-Hall, Box 500, Englewood Cliffs, N.J. 07632. Telephone 201-592-2000.



Every year Americans spend billions of dollars to make their lawns attractive.

A turfgrass lawn increases property value, enhances the environment by filtering out atmospheric pollutants, reduces noise, and cools the area in the summer.

Establishing a vigorous turfgrass lawn may not be easy, but if you follow the guidelines in the bulletin, the results will be worth the effort.

Keeping a lawn vigorous and healthy and thus more tolerant of diseases and insects is more important than ever. A healthy lawn is more pest resistant, thus reducing the use of pesticides.

The authors show and tell you how to analyze the site, have the soil tested, eliminate existing vegetation, drain and grade the land, add fertilizer or other amendments, select seed, prepare the seedbed, plant, irrigate, and mow.

This second edition of *Home Lawns* explains integrated pest management and emphasizes how to use IPM to reduce reliance on pesticides. Effective use of integrated pest management depends on accurate identification of the pest and selection of a method of control that will have a minimal impact on the environment. Illustrations of grasses, weeds, insects, and diseases are included.



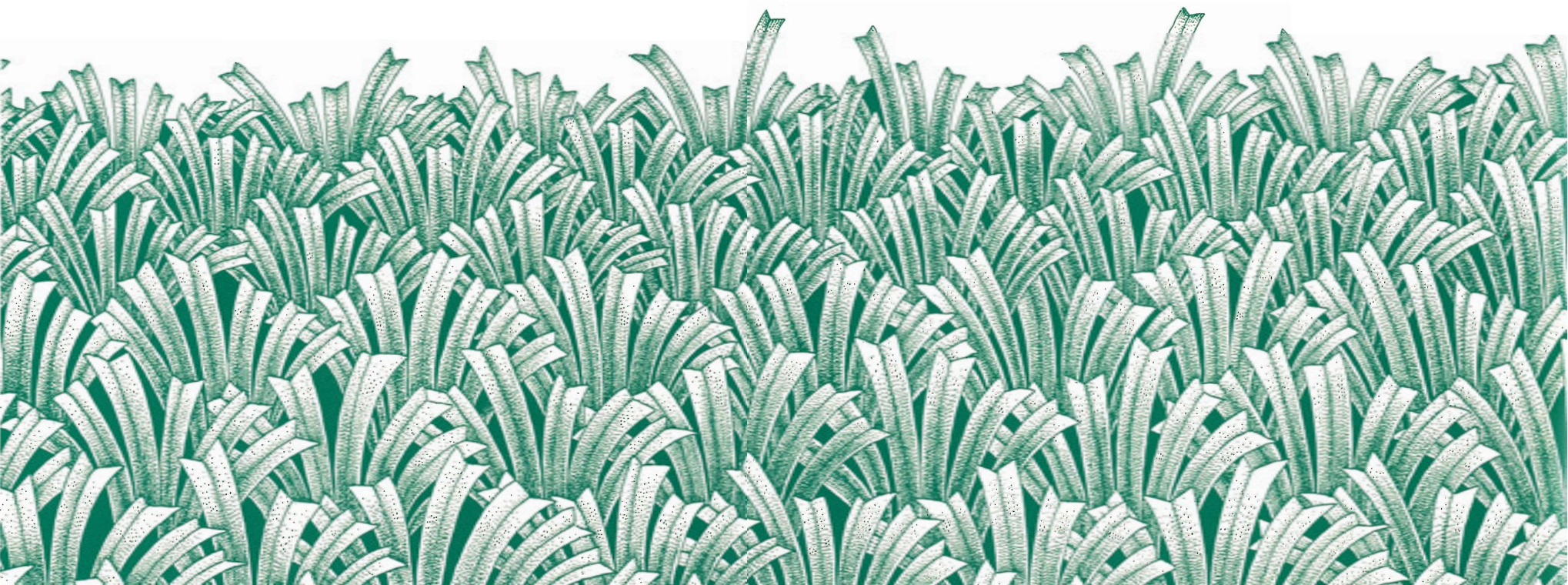
**Cornell  
Cooperative  
Extension**

*Helping You  
Put Knowledge  
to Work*

Editor: Susan E. Pohl  
Designer: Dennis F. Kulis  
Illustrator: Susan Simon

Produced by Media Services, Cornell University  
Cornell Cooperative Extension provides equal  
program and employment opportunities.

Printed on recycled paper  
©1994 Cornell University  
141IB185 521/800 11/94 7M ML PVC30690



# Home Lawns

## Establishment and Maintenance

We apologize for the error in Table 3 on page 7 of revised information bulletin 185, *Home Lawns*.

**Table 3.** *Pounds of elemental sulfur/1,000 sq. ft. required to lower soil pH to 6.5. These amounts indicate preplant amounts to be incorporated into the upper 4–6" of soil.*

pH	Soil Type		
	Sandy loam	Loamy	Clayey
8.0	17	34	47
7.5	10	20	27
7.0	5	10	14