

Information Bulletin 248

Lawn Care without Pesticides

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Part I. Where to Start

It Can Be Done

Chances are, you can grow a pretty good lawn without using insecticides, fungicides, or herbicides. You may even be able to do it using little or no chemical fertilizer, if that's your goal. Will your lawn look like a putting green? No. Will it stand up to wear and tear like a professionally managed soccer field? Not a chance. Will it stay emerald green through the dog days of summer? Probably not. But if you arm yourself with an understanding of what grasses need to thrive—and commit to a long-term plan to meet those needs—you can grow a perfectly acceptable lawn while foregoing lawn chemicals.

Even if you don't want to give up using lawn chemicals completely, this publication will help you get by with fewer pesticides. Either way, our goal is to help your lawn thrive because well-managed lawns are an environmental asset, not a liability (see "Why Lawns Matter," page 7).

Keep in mind, this publication was written with New York State lawns in mind. This approach can be adapted to areas with similar conditions, but the more your conditions differ from ours, the more important it is that you gather sound information. A good place to start is with your state's cooperative extension services. Chances are, there is an office in your county. Find your local office at www.csrees.usda.gov/Extension.



Decide What You Want to Do

The main theme of this publication is that if you do everything possible to reduce the stress on your grass plants—help them thrive—you will have a better lawn. The grass plants will grow stronger, stand up better to weeds, and be more resistant to insects and diseases. Consequently, you will need fewer lawn chemicals. Or, if you don't use lawn chemicals at all, you will have a healthier, better-looking lawn.

But not all lawn chemicals are the same. The insecticides and fungicides used to control insect pests and fungal diseases will probably be easiest to give up. (Most insecticides applied to home lawns are either unneeded or ineffective anyway because they are applied at the wrong time or to the wrong pest.) In recent years, the more dangerous insecticides and fungicides have been taken off the market for homeowners. But some consumers have lingering concerns about the health and environmental effects of certain products that are still available.

In general, chemical fertilizers sold for use on lawns aren't as dangerous. (Caution: Some products are a mix of fertilizers and insecticides or herbicides and may pose more of a hazard than fertilizer alone.) True, many people use way too much fertilizer. And over-application or misapplication can result in fertilizers polluting waterways and wells in addition to weakening your grass. But smaller amounts of chemical fertilizer used judiciously can solve other problems by helping your grass outcompete weeds and resist pests and diseases.

Just as a little fertilizer can help grass thrive, a carefully timed herbicide application or an occasional spot spray in a trouble area may go a long way toward reducing weed problems in the long run. But you can easily do without these chemicals—as long as you don't expect to have a totally weed-free lawn.

So what exactly do you want to do? Turn your neglected lawn into a greener place? Eliminate all lawn chemicals and fertilizers immediately? Cut back on all of them gradually? Eliminate insecticides, herbicides, and fungicides but still use some fertilizers? How far you go is up to you. The principles and practices you learn from this publication will help no matter which chemicals you want to give up and how fast you want to do it.

If you rely on a lawn care service, talk with them after you read this publication and see if they can adapt their lawn program to fit your needs. If not, find one that can. Many larger urban areas have services that specialize in environmentally sound lawn care. Another alternative might be to hire a neighborhood youth who is willing to work under your direction.

The Most Important Step

Read "How Grass Grows" (page 8) and understand these simple concepts. Everything you do (or avoid doing) is based on the fact that cool-season lawn grasses grow best when it's, well, cool. And they need to store energy and nutrients in their roots to get through winter and green up well in spring.

Your First-Year Plan

Once you understand how grass grows, spend the first year adjusting how you take care of your grass so that you better meet its needs.

1. Mow correctly

Mowing takes more time than any other lawn care activity. It also has a tremendous effect on the health of your grass. If you mow high, mow often, and leave the clippings, your grass plants will be healthier and have stronger roots that can better withstand drought, outcompete weeds, and resist pests and diseases. (To find out how high, how often, and why clippings are good, see "Mowing," page 8.)

2. Patch small holes

Nature abhors a vacuum and will rush to fill bare earth with weeds. In early spring, inspect your lawn for small patches where the grass is dead or weak, and reseed them. (See "Repairing Small Spots," page 9.) To prevent weeds without using herbicides, don't let them get a start in these bare spots. Repair any lingering weak spots in late summer or early fall.

3. Wait before you renovate

Is your lawn is more weeds than grass? Take a deep breath and wait a year. Sometimes just changing the way you mow (high, often, leave clippings) will be enough to tip the balance toward the grass. But if after a year or two of mowing correctly the grass is still weak and the lawn is more than 50 percent weeds, your best option might be to start over and totally renovate your lawn. (See "Renovating and establishing a lawn," page 11.)

4. Choose the right grass

Whether you will be renovating or just patching small spots, choose grass species and varieties that help solve problems, not create more. Grasses differ in their susceptibility to insects and diseases, how much light they need, and how much traffic they can take. (See "Choosing Lawn Grasses," page 12.)

5. Do not focus on spring fertilization

Even if you don't plan to use chemical fertilizers over the long haul, applying a little bit can help boost grass growth while you are changing your mowing and management style. The key is not to apply nitrogen fertilizer to healthy turf in early spring. Doing so will encourage lush top growth at the expense of roots, and those roots need to go deep for moisture to outcompete weeds during the hot, dry summer months. One exception: If your turf is thin, a spring N application can help thicken it so that weeds don't gain a foothold in the thin spots. Be sure to do this along with reseeding bare spots. (See "Repairing Small Spots," page 9.)

6. Do focus on fall fertilization

For most low-maintenance lawns, a single application of nitrogen (1 lb. N/1,000 sq. ft.) between Halloween and Thanksgiving (about two weeks after your last mowing) is best. If you applied no nitrogen last fall, apply 1 lb. N/1,000 sq. ft. around Memorial Day. Then begin applying fertilizer in fall when it encourages strong root growth. (See "Fertilizing," page 9.)

7. Stop Watering

In many cases, watering your lawn can do more harm than good. (Sure, if you have a sandy soil that dries out quickly, you will need to water most years.) Improper watering can lead to more disease problems and shallow-rooted plants that are more vulnerable to drought and weed competition. If you do plan to water, make sure you do it right. (See "Watering," page 10.)

Gather More Information

If you had been mowing your lawn too short, watering incorrectly, or applying too much or too little nitrogen fertilizer at the wrong times, you may notice some big differences in how your grass grows and looks after a year or two of doing it right. Hopefully, you now have a thicker sod, healthier grass, and fewer weeds. Your grass probably has deeper roots that help it stay green longer during dry spells without watering. And you've gotten used to your grass being a little higher and a little more uneven between mowings.

But you may still have spots where more weeds are growing than grass or where the grass doesn't grow as well as other places in the yard. Now it's time to focus your attention on these problem areas, do some detective work to find out what's wrong with them, and take action to resolve the problem:

Test the Soil

The soil in these trouble spots may lack the nutrients your grass needs to grow well. Or perhaps the pH (acidity or alkalinity) of the soil is outside the range preferred by most lawn grasses (6.0–7.0). If you haven't done so already, take soil samples both from areas where your grass grows well and from where it grows poorly, have them tested, and compare the two. If there are major differences

between these areas, chances are good that correcting the pH or nutrient deficiency will improve grass growth in the poor areas. Contact your county Cornell Cooperative Extension office (see "For More Information," inside back cover) for soil testing information. Adjust pH and follow fertilizer recommendations supplied with the soil test results.

Observe Soil Conditions

Sometimes the condition of the soil rather than its fertility is the problem. Is your lawn weak in areas where water collects and drains slowly after it rains? Use a shovel to dig into the soil and see if it is compacted or if there is a hardpan (compacted layer) below the soil surface. You will be able to tell because the grass roots won't penetrate into these hard-soil areas.

Layering of soil is another problem to look for. This can occur after construction if only a thin layer of topsoil was added when the grass was replanted or when sandy topsoil was applied over clay topsoil. In either case, the result is often poor drainage and a poor lawn.

Fixing compacted or poorly drained areas might necessitate hiring a professional to regrade and renovate the area. Or you may be able to relieve the compaction by using a core aerator (available at rental stores). (For more information on core aeration, see "Relieving Thatch," page 15.)

If there are spots with little or no topsoil, a possible result of new construction, adding purchased topsoil and reseeding might be the solution. In areas that are chronically wet, grass may not be the best ground cover. Instead, consider planting certain species of shrubs or herbaceous perennials that thrive in saturated soils.

If your lawn has a history of high fertilization, compaction, and poor drainage, thatch (a build-up of dead and decomposing grass stems) might be the problem. (See "Relieving Thatch," page 15.)

Watch the sun

Grass needs a minimum of four hours of direct sun daily. Even six hours a day is marginal. If your grass gets less than that, it probably can't compete with weeds that can get along with less sun. See "Coping with Shade" (page 16) for suggestions.

Deal with high-traffic areas

Even if you use lawn chemicals, it's unlikely you will ever have a nice lawn under the swing set. Even the toughest grass will withstand only so much traffic. To keep weeds from invading and taking over (and then spreading to the rest of your lawn) where grass is weakened by foot traffic, consider establishing stone or gravel paths or other "hardscaping" solutions. Prevent and relieve salt damage adjacent to walks and driveways and damage from dog urine throughout the lawn. (See "Salt Damage," page 16.)

Snuff Out Weeds

Despite your best efforts, some weeds probably remain, especially in high-traffic areas and next to pavement. Weeds are opportunists and will exploit bare spots or places where grass is weak to gain a foothold.

Perennial weeds (those that regrow from their roots every year) can spread and make a lawn unsightly. Examples include dandelions, plantain, ground ivy (creeping Charlie), and nutsedge. These weeds are particularly troublesome because even if you kill the tops, they will regrow from their roots.

Annual weeds (those that die at the end of the season and come back from seed the next year) can leave bare spots that are vulnerable to runoff. Examples include crabgrass, knotweed, and annual bluegrass. To get them under control you need to kill them before they set seed, and then improve the soil conditions to favor lawn grasses.

The first line of defense against all weeds is preventive practices. Before you start attacking weeds individually, make sure that you are following the steps starting on page 2, especially mowing correctly, reducing compaction, repairing bare spots, and fertilizing in fall. Here are some other strategies:

Get to the root of the problem

Let the weeds be your guide. If weeds dominate an area, it's likely that something is wrong with either the growing conditions or your lawn practices. Dense stands of prostrate knotweed (*Polygonum aviculare*) are a good sign of

soil compaction. Don't just pull out the weeds—relieve the compaction. Violets (*Viola* spp.) are a good sign of low light levels. One solution might be to seed shade-tolerant fine fescues. Ground ivy (*Glechoma hederacea*) often thrives where grass is cut too short. Red sorrel (*Rumex acetosella*) thrives in wet, acidic soil.

Weed by hand

This is easiest when the soil is slightly moist. Check your garden center or catalogs for tools that help pull tough perennials, such as dandelions, out by their roots. Research shows that if you remove only the leaves above ground, you will have to repeat the process 8 to 10 times before the roots of some perennial weeds will die.

Use other weeding "tools"

Lately, "natural" products have come onto the market as alternatives to chemical herbicides. Researchers at Cornell have tested one of them, corn gluten meal. When this product was applied in early spring, before crabgrass germinates, lawn grasses grew better than unfertilized plots and crabgrass was reduced somewhat. But the effect was not significantly different from using natural or chemical fertilizers to make the lawn grasses more competitive.

If you want to avoid using "non-selective" synthetic herbicides such as glyphosate (Round-Up), you have several alternatives. But keep in mind these share the same liability as broad-spectrum herbicides: They will kill

good plants right along with the weeds, and they do not solve the problem that helped the weeds gain a foothold.

Nonselective "natural" herbicides.

Like glyphosate, these herbicides will kill plants they come in contact with, but they use different active ingredients, including acetic acid (often derived from vinegar), ethanoic acid, pelargonic acid, fatty acids, and clove oil. These products usually work best on young annual weeds. Tough, established perennial weeds may require several applications. As with any herbicide, follow label directions precisely.

Boiling water. Weeds in cracks in pavement and other spots that are difficult to weed can be killed with boiling water. Use care not to burn yourself or plants you don't want to kill. Remember that this will probably kill only the tops and that perennial weeds will regrow. Commercial-scale machines that use steam to kill weeds are on the market, but few landscapers have them. Smaller versions may be available commercially in the future.

Flame weeders. Specially designed flame weeders—powered by propane or similar fuel—can be an effective non-selective weed killer. But you must use extreme care not to scorch plants or set mulch and other combustibles on fire.

Manage Insects

Many insects live in lawns, but few of them are pests. Many are beneficial insects that help keep pests under control or perform other useful ecological roles. Most pesticides applied to home lawns are either unneeded or ineffective, and they kill beneficial insects along with the insect pests.

Chances are good that if you do everything you can to maintain a healthy turf, your grass will be able to tolerate modest insect pest infestations. But sometimes pests gain the upper hand and cause aesthetic damage to the lawn. If damage is heavy, they can kill enough grass to leave the soil vulnerable to soil erosion and invasion by weeds.

“Scout” for insect pests

In the Northeast, white grubs are the most common lawn insect pests. Chinch bugs, billbugs, and sod webworms cause trouble only occasionally. Before deciding what to do about insect pests, you need to “scout” for them to find out what species are present and if there are enough to warrant treatment. You also need to time treatments for when they will be most effective. For more information about common insect pests—how to identify them, scout for them, and when treatment is justified—visit www.gardening.cornell.edu/lawn.

Plant endophytic grass varieties

Some grass varieties are resistant to insects that feed above the ground, such as cut-

worms, sod webworms, chinch bugs, and bluegrass billbugs. If these insects are a problem, choose endophytic varieties of perennial ryegrass and fine-leaf and tall fescues. (Endophytes are beneficial fungi that live on the grass and discourage surface feeders.)

Try using biocontrols

Several biological control products are on the market to control grubs (the larvae of Japanese beetles and similar insects that live underground and feed on grass roots). Studies in northern regions show that milky spore, a fungal pathogen that infects Japanese beetle grubs, usually does not reduce turf injury from grubs, so we do not recommend it. Soil temperatures are often

lower than optimal for this pathogen, and many times the damage is caused by other grubs that aren't affected by milky spore.

The use of nematodes (microscopic worm-like organisms) to control grubs shows more promise. But effectiveness depends on matching the nematode species with the grub species causing the problem. Results also vary depending on temperature, moisture, and other environmental factors. Contact your county's Cornell Cooperative Extension office for more information on nematodes.

Know where the pests are

Insects

Surface damage

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

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

Subsurface damage

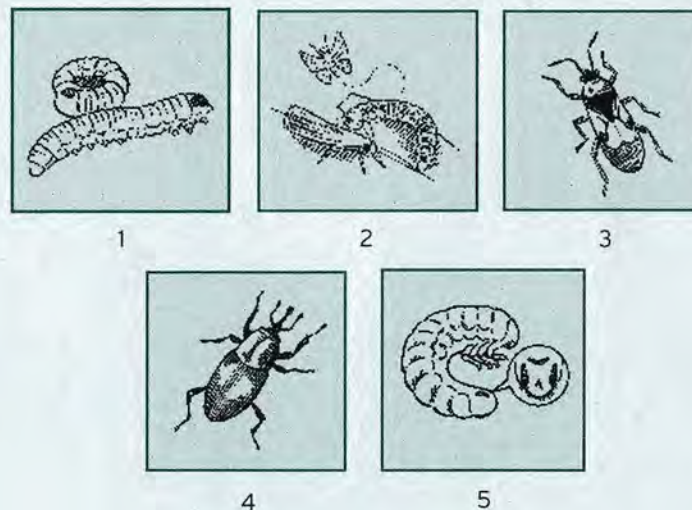
Root system is eaten and plant uptake is disrupted or prevented. Damage appears as wilted turf that does not revive when watered. “C”-shaped, cream to white grubs feed on roots of all grasses.

5. Grubs:

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

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

Oriental Beetle: Damage threshold 8 grubs per square foot.



Prevent Diseases

By the time you see a lawn disease, it is too late to do much about it, at least in the short term. Lawn diseases are caused by plant pathogens, usually fungi. These fungi are almost always present, living off dead and decaying material in the soil but go unnoticed by humans because the grass usually fends them off. (They are not dangerous to humans.) But when environmental conditions are favorable (usually plenty of moisture and the fungi's favorite temperature) and your grass is stressed, the scale tips in favor of the pathogen. Infestations can range from barely noticeable to ugly to devastating. For information on identifying common lawn diseases, visit www.gardening.cornell.edu/lawn. If you haven't guessed by now, prevention is the best remedy. In particular, take the following steps:

- Keep grass leaves dry. If you water, do so early in the morning so that leaves dry quickly. Avoid watering at night.
- Don't overfertilize. Too much fertilizer can stress plants and leave them vulnerable to diseases.
- Plant disease-resistant grasses. Choose the right grass for the site.
- Improve drainage. Poorly drained low spots are particularly prone to disease.
- Increase air flow. Lawn diseases are more likely where stagnant air collects. Clear underbrush to improve air circulation.

Many products such as microbial inoculants, composts, and other biostimulants claim to prevent or control lawn diseases. While some research indicates that composts and inoculants can suppress certain diseases, most of these products have not been tested under controlled conditions. Until more research is done, it might still be worth testing the performance of a small amount of some of these materials on a limited area of your lawn. Overall, however, a healthy lawn, planted with a disease-resistant variety, is the best defense against turfgrass diseases.

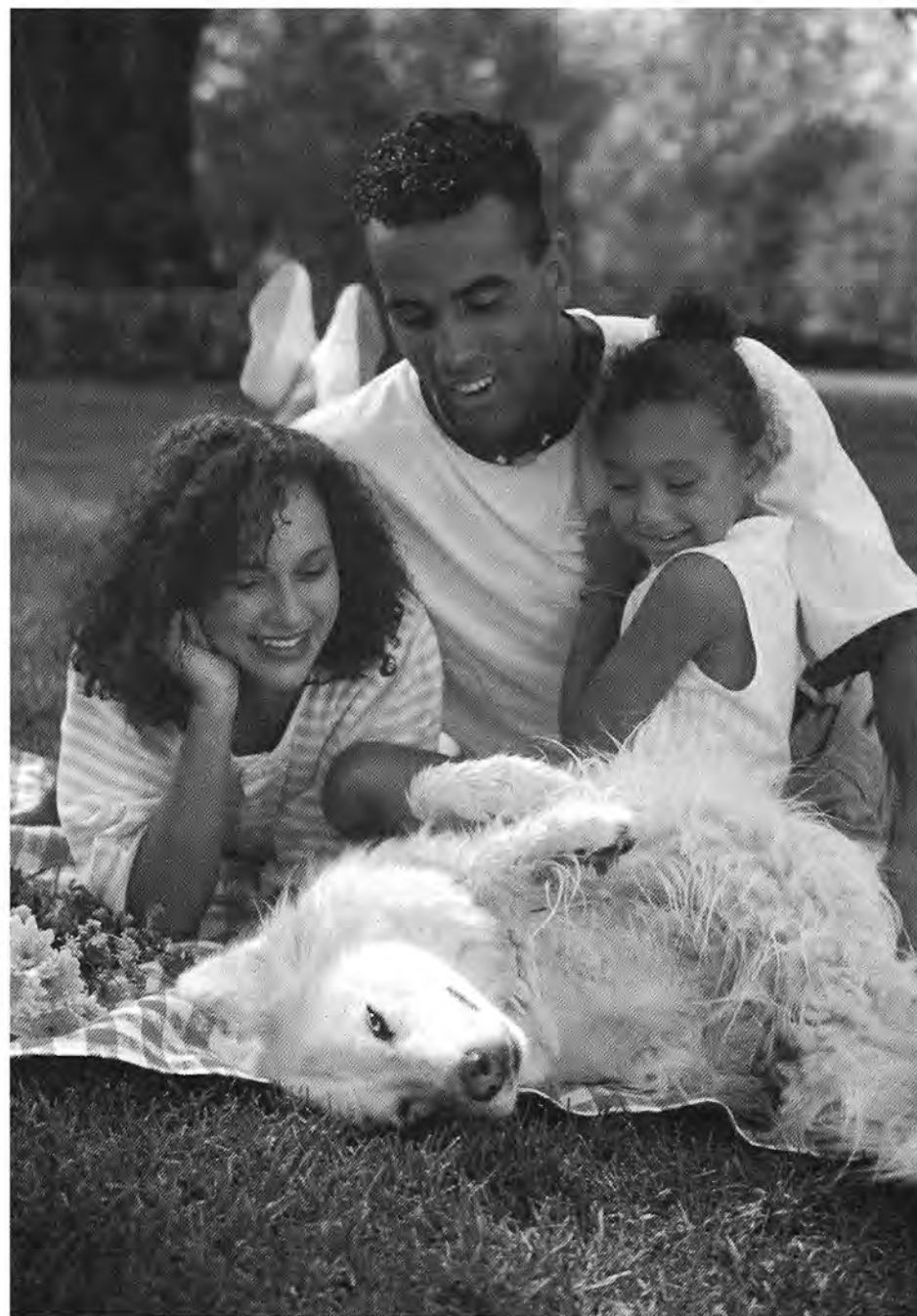
Part II. The Details

Why Lawns Matter

Properly managed lawns offer major benefits to people and the environment.

Lawns have a bad reputation these days. Some people think they are sterile “ecological deserts” or, worse, sources of pollution or human health hazards. But well-managed lawns are an environmental asset. They can help protect or even improve water quality and control erosion. By contrast, lawns that are poorly managed—whether as a result of neglect or through the overuse of fertilizers and pesticides—can be an environmental liability.

What you and your neighbors do with your lawns matters. Collectively, you control about 900,000 acres of lawn in New York alone—75 percent of the managed turf in the state. Ensuring that your lawn helps enhance our environment means being aware that small acts (such as not washing grass clippings into the street or down sewer drains) can have a big impact on our streams and lakes.



Healthy lawns provide many benefits

- Lower air conditioning bills. Moisture evaporating from grass leaves helps keep air temperatures cooler compared to paved surfaces.
- Less pollution. Lawns can help filter pollutants out of the air and reduce noise pollution, especially when used along with physical barriers.
- Higher property values. Attractive lawns contribute to the overall appearance of a community's landscape.
- A place to play. Grasses are the only plants that can withstand repeated recreational use.
- Better water quality. The thick sod formed by grasses helps water soak into the ground. This aids in reducing or eliminating runoff that can carry soil or other contaminants into waterways.

The good news is, you can reap most of these benefits without spending much money or taking more time than you are probably already spending on maintaining your lawn.

Explore this publication and you'll discover the hows and whys of growing a healthy lawn.

How Grass Grows

If you understand cool-season grasses, you can help them thrive

Most lawn grasses grown in New York (and areas that have similar conditions)—

Kentucky bluegrass, perennial ryegrass, and fescues—are cool-season grasses. They grow best in spring and fall.

The major exception is zoysia grass, a warm-season grass occasionally grown in warmer areas downstate. Most ornamental garden grasses are warm-season grasses.

The roots of cool-season grasses grow best between 55° F and 65° F. Shoots grow best between 67° F and 75° F. In early spring, even before the grass starts to green up, the roots break dormancy and begin growing.

The combination of long days, cool temperatures, and adequate moisture produces a flush of growth in the spring. This sometimes makes it challenging to keep up with mowing. In a normal year, 60 percent of grass growth occurs during six weeks in spring.

As temperatures warm during summer, growth slows and lawns require less frequent mowing. Roots can be damaged when temperatures are above 85° F. During this

"summer slump," warm-season weeds such as crabgrass (*Digitaria* spp.) thrive because they are more competitive in warm weather.

The combination of warm temperatures and lack of moisture can cause cool-season grasses to become dormant and turn brown during dry summers. In most cases, the grasses haven't died. They will green up and grow again in fall when cool weather returns and soil moisture is replenished.

Top-growth continues in fall until there are about 10 days with average daily temperatures below 50° F. Roots will continue to grow and take up fertilizer until the ground freezes.

Mowing

Mow high, mow often, and leave the clippings

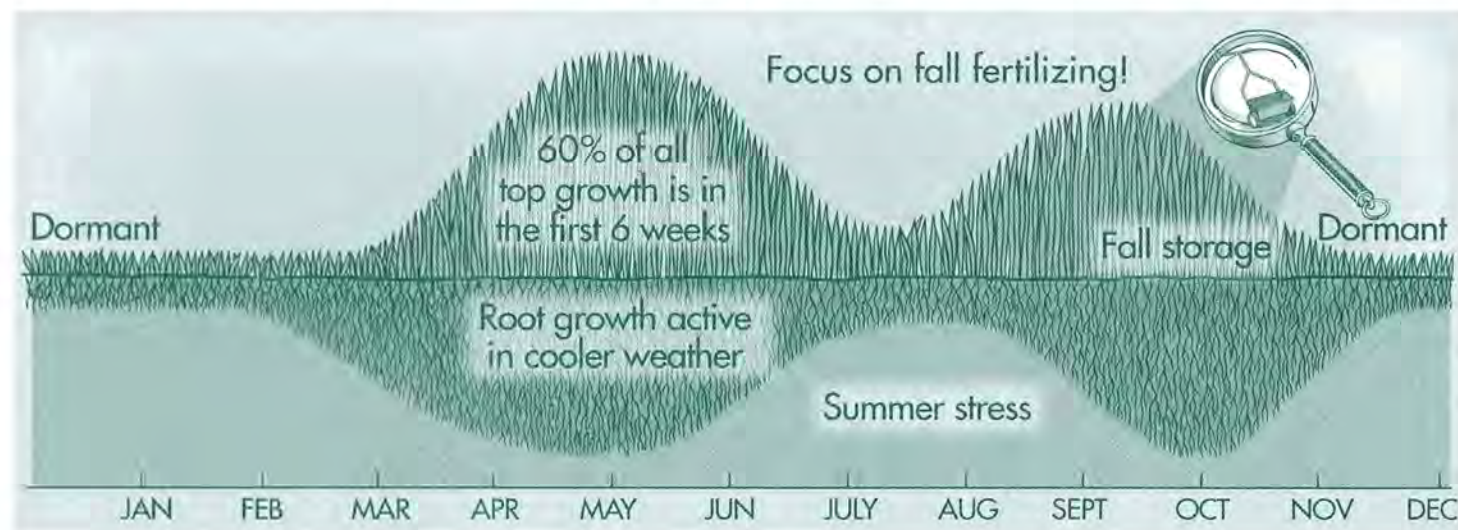
Proper mowing gives grass a competitive advantage over weeds and helps keep your lawn healthy. Over the course of the

season, mowing is the single most time-consuming lawn care chore. You might as well do it right!

How high?

For a healthy, low-maintenance lawn, set your lawn mower to trim grass to 3 inches or higher—likely the highest setting on your rotary lawn mower. (If you're not sure how high your mower leaves the grass, take a ruler and place the end on the soil surface and measure the grass after you mow.)

The reason to mow high is that the roots underground mirror the shoots on top. The shorter you mow, the smaller the root systems will be. Small root systems leave your lawn more vulnerable to drought, insects, and invasive weeds. Short lawns also require more frequent fertilization. Longer grass helps cool the soil surface, reducing water loss from the soil and decreasing competition from warm-season weeds such as crabgrass.



How often?

It depends. Let the grass be your guide, using the one-third rule: never remove more than one-third of the grass blade when you mow. That means if you are cutting your lawn to a 3-inch height, you should mow before the grass is more than 4.5 inches tall. During the spring flush, you may need to mow every three to five days. During the summer slump, the interval may be two weeks or more. If you are cutting the grass shorter, you will need to mow more often to avoid violating the one-third rule.

When to start?

Start mowing in spring when the one-third rule says it's time: when the grass reaches 4.5 inches if you are maintaining a 3-inch cut. Stop mowing in fall as growth slows, usually about the time the daily average temperature falls below 50° F for a week. Don't leave the grass more than about 4 inches long going into winter because it can mat down and encourage snow mold.

What about the clippings?

Leave them. They do not cause thatch, contrary to popular belief. (Thatch usually occurs only when turf is excessively fertilized and soil is compacted, cool, and moist.) If you follow the one-third rule, the clippings won't smother the grass plants. They will dry out quickly and work their way down to the soil surface where earthworms will help incorporate them. Mulching mowers chop clippings finely to speed the process.

If the grass gets too tall and you end up with clumps of clippings, use a lawn rake

to distribute them or rake them up so that they don't kill the grass underneath them.

Clippings return nutrients to the soil, so you can use less fertilizer. They can also cool the soil and help it retain water. Do not blow or leave clippings where they will wash into streets or sewer drains and end up polluting our waterways. Clippings are high in phosphorus, a major non-point source pollutant. If you have a lake, pond, or stream on your property, establish a natural buffer zone between your lawn and the water. Allow the vegetation to grow long in the buffer so that clippings don't get into the stream. The buffer can also filter out other potential pollutants.

Anything else?

Keep your lawnmower blades sharp. Dull blades tear the grass instead of cutting it cleanly. The wounds cause the grass to lose more water, increasing irrigation needs or moisture stress, and also leave the plants more vulnerable to diseases.

Repairing Small Spots

Repairing small bare spots is one of the most important things you can do to keep weeds from invading your lawn

The best times to repair bare spots are in early spring and late summer or early fall, when temperatures start to cool and rains return (mid-August to late September or as late as mid-October in downstate New York and on Long Island).

Bare spots can be caused by foot traffic, compaction or salt damage next to

a sidewalk or driveway, localized winter kill, or dog urine. Whatever the cause, the first step to repair the spot is to loosen the soil with a rake or similar tool.

Choose grass seed that matches your site. If the spot receives less than six hours of direct sun a day, select a shade-tolerant mix that includes tall fescue or fine-leaf fescue. (For more information, see "Choosing Lawn Grasses," page 12.)

To ensure even coverage on a small spot, try mixing 1 part seed with 3 parts topsoil, potting soil, or compost. Sprinkle the seed-soil mix evenly on the bare spot. Ideally, you should end up with about 15 to 20 seeds per square inch. More seed isn't necessarily better because crowding can weaken new seedlings.

Use your foot to firm the seed-soil mix. Close contact between the seed and the soil hastens sprouting. Keep the soil moist, but water only enough to moisten the surface without causing runoff. After seeds emerge, reduce watering to encourage deeper rooting.

You can leave the spot bare or, to help keep soil moist, lightly cover it with weed-free straw, marsh hay, or other mulching material. (Products made from a combination of pelletized newspaper, and water-absorbing gel, such as PennMulch, are also effective.) Make sure at least 30 percent of the soil is visible through the mulch. Start mowing when 60 percent of the grass reaches the recommended mowing height (at least 2 to 3 inches). Make sure your mower is sharp because dull blades can rip out young seedlings.

Fertilizing

Use only what you need, and avoid spring applications

Just like people, lawns need a balanced diet. If you fertilize them too much, too little, or use the wrong kind, they won't be healthy.

Test your soil

A soil test will tell you how much phosphorus (P) and potassium (K) fertilizer your lawn needs, if any. Contact your county Cornell Cooperative Extension office for soil testing information. If tests indicate that no P or K is needed, use nitrogen fertilizers that contain few or none of these elements.

Adjust pH if needed

Lawns should have a slightly acidic pH (6.0–7.0). If your soil tests fall outside this range, follow instructions included with the test results for adding lime or sulfur to bring pH into this range.

Focus on fall

If phosphorus and potassium levels are adequate in the soil, nitrogen (N) is the most important nutrient for grass growth. Understanding how grass grows is important when making decisions about how much nitrogen fertilizer to use and when to apply it (see "How Grass Grows," page 8).

For most low-maintenance lawns, a single application (1 lb. N/1,000 square feet) between Halloween and Thanksgiving (about two weeks after your last mowing) is best. Do not fertilize during Indian summer, a warm period following hard frost. Fertilization at this time

can cause excessive top growth, reduce root storage, and increase winter kill. The best window for fall application is after top growth stops, usually after 10 days with average daily temperatures below 50° F. Roots will continue growing and taking up fertilizer until the ground freezes.

Organic nitrogen sources alone are not a good choice for fall fertilization because they require warm soil and microbial action to release nitrogen. Soluble nitrogen sources are readily available to the plant, but leaching may occur on sandy soils. A 50-50 or 70-30 mix of slow-release to quick-release N is less risky to the environment.

For higher-maintenance lawns, you can also apply 1 lb. N/1,000 sq. ft. around Labor Day and/or Memorial Day. (Neglected lawns or sods thinned by winter kill may benefit from 0.5 lb. N/1,000 sq. ft. after the soil has thawed and drained but before the grass greens up.) At least 50 to 75 percent of the nitrogen applied to any lawn annually should come between August and November.

Lawns that were not fertilized the previous fall or have suffered from winter injury may benefit from spring nitrogen applications. But wait until soil temperatures have warmed to at least 55° F before applying.

Water it in

Give your lawn one-quarter to a one-half inch of water after spreading fertilizer to get the material into the ground where it can be used by plants.

Consider the source

Most synthetic lawn fertilizers contain at least 40 percent slow-release nitrogen.

Slow-release N becomes available to the plant over a period of time depending on soil moisture, temperature, and microbial activity. The balance of the N is water-soluble nitrogen, which is readily available for plant uptake.

Slow-release nitrogen sources have a lower risk of burning plants and a lower potential to pollute water than water-soluble N sources. The tradeoff is that slow-release N is usually more expensive.

Lawns grown on mostly sandy soils should rely more on slow-release nitrogen to reduce the possibility of rain or excessive irrigation leaching N out of the root zone. Research shows that nitrogen rarely leaches from lawns planted on soils containing silt and clay.

Natural organic fertilizers supply nitrogen in complex organic forms that are not immediately available to plants. The fertilizers require warm (higher than 65° F), moist soils for microbial activity to release nitrogen. Natural organic fertilizers are well suited for applications during warm summer months when the potential for burning plants with high-salt synthetic fertilizers is higher.

Topdressing (applying a thin layer on top of the grass) with organic soil amendments, such as composted animal manure, can help improve soil structure and break down thatch, especially if applied in conjunction with core aeration. (See "Relieving Thatch," page 15.) The combination of topdressing and coring can reduce fungal diseases in some situations.

Organic soil amendments should have a carbon-to-nitrogen ratio of less than

30 to 1 to prevent tying up soil nitrogen while they decompose. It is important not to apply too heavy a layer of soil or compost because these layers can prevent water from moving down into the soil. Compost applications should be light and frequent (perhaps every three to four weeks during the growing season, depending on growth and weather), no more than 0.1 to 0.2 inch at a time. Cut your grass slightly shorter than usual before topdressing so that the compost can more easily sift down to the soil and not bury the grass.

Using nitrogen from organic sources is almost always more expensive than using synthetic fertilizers. That's because organic sources contain less nitrogen, much of which is tied up in organic matter and not readily available to the grass. Theoretically, as the lawn matures it needs less nitrogen, and more nitrogen is gradually released from the organic matter you've been topdressing.

Consider different needs

High-traffic areas usually require more fertilizer than low-traffic areas. Different species of grass have different needs, too. Kentucky bluegrass, for example, requires more nitrogen than do fine-leaf fescues. If bluegrass doesn't get enough nitrogen, it is less competitive against weeds and pests. If fine-leaf fescues (which normally grow slowly) get too much N, they produce lush, weak growth that is susceptible to pests.

Apply with care

The idea is to get the right amount of fertilizer on the lawn and none into streams and lakes. Rotary spreaders cover a wide

swath but can also hurl fertilizer into streets and driveways where the next rain carries it into storm drains and then on to waterways. A drop spreader may take a little longer, but it puts the fertilizer exactly where you want it. Use care when loading spreaders. Sweep up spills before they pollute.

Watering

Be careful—you can do more harm than good

Most lawns in New York rarely need watering, except possibly for a few weeks in summer. With careful advance preparation, it is possible to avoid watering even during these weeks and still have healthy turf.

If you choose to water, it's important to do so properly because poor watering practices can do more harm to your lawn than good, and water can carry pollutants out of your yard and into waterways.

Never water at night

The best time to water is early morning, between 4:00 and 8:00 a.m. Evaporation is low at this time, so more of the water makes it into the soil. Leaves dry quickly in the morning sun, reducing the chances of diseases. Avoid watering on cloudy days.

How much?

It depends on soil type, cutting height, lawn use, temperature, wind, and a host of other factors. In general, a healthy lawn loses about 1 inch of water per week during summer. (The process by which water is lost from the soil through the leaves and through the soil surface is

called evapotranspiration, or ET.)

If your lawn receives an inch of rain-fall every week in the summer, it will probably come through with little moisture stress. If you get less rain than that, you can make up the difference with sprinklers or an irrigation system. Your water application rate should supplement what you receive as rain. If you get half an inch of rain one week, apply only another half-inch. (Use a rain gauge, coffee cans, or other containers to measure rainfall and supplemental water.)

It's also important to apply water no faster than your soil can soak it up (infiltration rate). When your irrigation rate (how fast you are putting it on with the sprinkler) exceeds the infiltration rate, puddling occurs on level areas. On slopes, the water will run off and can carry sediments and other pollutants with it. To avoid this, measure your soil's infiltration rate by cutting off both ends of a coffee can and inserting it several inches into the soil. Pour about 1 inch of water into the can and time how long it takes to soak in. Then measure your irrigation rate by placing a coffee can (with the bottom intact) in the area watered by your sprinkler and time how long it takes to fill the can with 1 inch of water. Your irrigation rate should not exceed your infiltration rate.

What about drought?

It is normal for cool-season grasses to experience summer dormancy in response to lack of moisture. Studies show that as little as 1/10 inch of water over a three-week period can keep the sod from dying.

Under all but the most severe conditions, it is best to avoid lawn watering,

especially if your watering system isn't precise. Too much or too little supplemental water can weaken plants, making them more susceptible to pest problems and less likely to recover when cool, moist conditions return. Of course, you should follow all local water restrictions during drought.

What can I do to prevent water stress?

- Plant grass species, such as fescues, that require less water.
- Mow grass higher, encouraging larger root systems.
- Do not apply nitrogen fertilizer in spring.
- Leave grass clippings on the lawn.

Renovating and Establishing a Lawn

Late summer or early fall is the best time to get your turf in shape for next year

Before you decide to renovate your lawn, try using the best mowing, watering, fertilizing, and weed and pest management practices for a year or two. Pay special attention to problem areas and rake up and reseed bare or weed-infested spots.

If your lawn is still more than 50 percent weeds after a few years, it might be time to consider a complete renovation. Planning is critical because during renovation your soil is unprotected and can easily be washed away into surface waters.

Late summer or early fall is usually the best time to establish or renovate cool-season grass lawns in most of New York (August 15 to September 25 or as late as mid-October downstate and on Long Island). Temperatures are moderating, weeds are less competitive, and moisture is usually adequate.

Follow these 12 steps carefully:

1. Control perennial vegetation to keep other species from competing with your new grass

The most effective way to eliminate existing weeds and turf is by using nonselective herbicides that contain the active ingredient glyphosate (e.g., Round-Up). Other nonselective herbicides include glufosinate (Finale) or the herbicidal soap formulation Scythe.

Nonselective herbicides are designed to kill any plant on contact but do not kill weed seeds. Once in contact with the soil they are inactivated. This allows the new lawn to be planted just five to seven days after spraying.

To ensure an effective kill, wait until the vegetation appears chlorotic (yellow). Then either till the vegetation into the soil or run a slicer or dethatching tool over the killed sod.

If you don't want to use herbicides, one alternative is to use a rotary tiller to kill the sod. It will probably take three or four tillings at about one-week intervals to kill the existing sod and weeds. Each time you till, new weed seeds will be brought to the surface, which you will kill with the next tilling. Tilling on slopes leaves soil very vulnerable to erosion. In this case using herbicides to kill the

existing sod is probably more environmentally sound.

Another option is solarization. After mowing down the vegetation close to the ground to weaken it, spread clear plastic over the area and anchor it in place. In research on Long Island, this practice killed the existing vegetation in as little as three weeks when the weather was hot and sunny. Solarization can also kill some of the weed seeds in the soil.

2. Protect and test soil

Minimize cultivation and compaction to maintain good soil structure. If the site needs grading, this might mean removing and temporarily storing the topsoil.

Before establishing the final grade with the topsoil, have it tested by a reputable soil testing lab. The information the lab provides will tell you how much fertilizer, organic matter, and other amendments you need to add to establish a healthy new lawn. Allow two to three weeks for test results.

3. Establish a rough grade

Take care of grade problems before you replant. Now is the time to eliminate low spots and resolve other drainage problems. Gently grade steep slopes to make mowing easier. Fracture compacted subsoil layers to help water move down through the soil profile.

4. Amend and grade topsoil

Cover the subgrade with at least 4 inches of topsoil. Ideally, the interface between the subgrade and topsoil should be gradual, not abrupt. Till a few inches of topsoil into the subsoil, then add the remaining topsoil to the surface. If the topsoil is high in clay, add compost materials that are

good soil conditioners and have relatively high amounts of nitrogen and phosphorus. These include biosolid composts (e.g., Milorganite); brewery by-product composts (e.g., Allgro); animal manure and yard-trimming composts (e.g., Erthrite); paper mill by-product composts such as Glatco-lite.

Organic soil amendments should have a carbon-to-nitrogen ratio of less than 30 to 1 to prevent tying up soil nitrogen while they decompose. Although it might sound like a good idea, do not add sand to high-clay soils in an attempt to improve drainage. The amount of sand needed to improve drainage makes this too expensive, and adding just a little sand can worsen drainage problems. Avoid using uncomposted yard waste because it may carry weed seeds.

To improve the water- and nutrient-holding capacity of sandy soils, add the same kind of compost materials used to improve clay soils. Add high-phosphorus starter fertilizer with about 1 lb. N/1,000 square feet and/or pH modifiers such as lime or elemental sulfur based on information from your soil test.

5. Choose the right grass

The species and variety you choose will depend on:

- the quality of sod you expect.
- how much work you want to do to maintain it.
- how you plan to use it.
- the characteristics of the site, including the amount of sun.
- winter hardiness.
- resistance to insects and diseases.

For more information, see "Choosing Lawn Grasses," at right.

Planting seed costs less than sodding, but sod is preferable when rapid turf cover is needed such as on slopes that need to be protected from erosion. Most cool-season sods are improved Kentucky bluegrass varieties because their spreading rhizomes intertwine to form a strong sod. Use high-phosphate starter fertilizer when laying sod, just as you would with reseeded.

Keep sod in shade so it doesn't dry out, and install it as soon as possible. Lay it in a staggered brick-like fashion, matching the edges closely.

6. Seed at the correct rate

The larger the seed, the higher the seeding rate. Studies show that there is no benefit from seeding more than the recommended rate. Excessive seeding rates create too much competition between the seedlings. Seeding at the correct rate or slightly lower encourages tillering—lateral spreading of the grass plants. (Sometimes if conditions are less than ideal, a higher seeding rate may be justified.)

Use a drop spreader or rotary "spin" seeder calibrated to deliver half of the recommended seeding rate. Then apply the seed in two different directions at right angles to each other. This assures more uniform coverage. For more about seeding rates for different grass species, see "Choosing Lawn Grasses," at right.

7. Rake lightly

Mix the seed and soil so that the seed is covered no more than 1/16 to 1/8 inch deep.

8. Firm the soil

Light rolling assures good seed-to-soil contact needed for the seeds to take up water and germinate. (For small patches, just firm them with your feet.) Do not overfill the roller because it may crush seed and cause compaction. A properly rolled seed bed can reduce establishment time by as much as two weeks.

9. Mulch

Use weed-free straw or marsh hay to conserve moisture and help prevent erosion. (Avoid pasture hay because it is often loaded with weed seeds.) Other effective mulching materials include products made from wood fiber, excelsior, newsprint, and other erosion-control blankets. Products made from a combination of pelletized newsprint and water-absorbing gel, such as PennMulch, are also effective.

10. Water

Germinating seeds and young seedlings will die quickly if allowed to dry out. Keep seedbeds moist at all times until seeds emerge. Water only enough to moisten the surface. Do not overwater, which will cause runoff. Gradually reduce water after seedlings emerge to encourage deeper rooting. Once grass covers about 60 percent of the ground, allow the surface to dry.

11. Fertilize

About two to three weeks after seedlings emerge, apply about 1 lb. N/1,000 square feet. This will increase shoot density and the seedlings' ability to withstand diseases such as rust.

12. Mow

Once more than 60 percent of the grass reaches the recommended mowing height

(at least 2 to 3 inches), start mowing. Mowing encourages lateral shoot development, increases stand density, and helps the turf out-compete weeds. Make sure your mower blade is sharp because dull blades will tear young seedlings from the soil.

Choosing Lawn Grasses

They're not all the same!

If you are renovating or reseeding your lawn, it's important to pick the right kind of grass for your situation. Each of the four most popular cool-season lawn grasses (profiled on the following pages) has its strengths and weaknesses.

Consider the following before you choose which grass will work best for different areas of your lawn. (See chart, bottom of page 13 for summary.)

Shade tolerance

Grasses need a minimum of four hours of direct sun a day. Areas that receive a lot of traffic require at least six hours of direct sun. If your light is marginal, plant fescues, which tolerate shade better than bluegrass or ryegrass.

Drought tolerance

If you don't plan to water during summer droughts, or your soil doesn't retain much water, fescues are the best choice.

Wear tolerance

Fine fescue does not stand up well to traffic. Choose another species for lawn areas that take a lot of wear and tear.

Establishment

Perennial ryegrass is quick to germinate and protect the soil, which is an important consideration on slopes that are vulnerable to erosion. Kentucky bluegrass is the slowest to germinate, while the fescues fall between these two.

Growth habit

Kentucky bluegrass spreads by underground stems called rhizomes. It forms a tough sod. When damaged, the rhizomes can creep back in to cover the bare spot. The other grasses are bunch varieties that don't spread as well or form as dense a sod.

Leaf texture

Fine fescue has very thin, fine leaves. The leaves of tall fescue are coarse. Ryegrass and bluegrass fall in between.

Maintenance

The fescues are good choices for low-maintenance lawns that don't require frequent fertilization or close mowing.

At the other end of the spectrum, Kentucky bluegrass makes a fine-looking lawn but requires more careful management to stay healthy. For a Kentucky bluegrass lawn to look its best, you need to fertilize it three or four times a year. Keep in mind that it is more susceptible to drought and pests.

Seed mixes

Grass seed is often a mixture of several species. Read the label to find out what's in the bag before buying it. "Variety not specified" on the label means "buyer beware." Try not to purchase a mix that is more than 20 percent perennial ryegrass. Because it germinates quickly, ryegrass

Typical mixes matched for different situations

Sunny, medium- to high-maintenance lawn:

- 65% Kentucky bluegrass blend (several different varieties)
- 15% perennial ryegrasses
- 20% fine fescues

Seed at 3 to 4 pounds per 1,000 square feet.

Sunny, low-maintenance lawn:

- 65% fine fescue blend
- 15% perennial ryegrasses
- 20% Kentucky bluegrass blend

Seed at 4 to 5 pounds per 1,000 square feet.

or

- 100% tall fescue blend

Seed at 7 to 10 pounds per 1,000 square feet.

Shady areas:

- 100% fine fescue blend

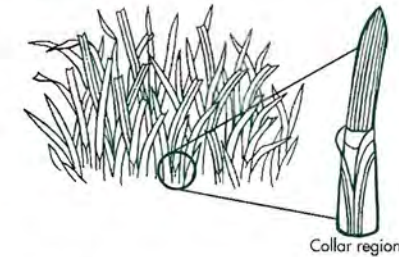
Seed at 4 to 5 pounds per 1,000 square feet.

Summary of cool-season lawn grasses

	<i>Kentucky Bluegrass</i>	<i>Perennial Ryegrass</i>	<i>Tall Fescue</i>	<i>Fine Fescue</i>
Shade tolerance	Poor	Poor	Good	Excellent
Drought tolerance	Poor	Poor	Some	Some
Wear tolerance	Good	Good	Good	Poor
Establishment (days)	Slow 30 to 90	Fast 14 to 21	Average to Fast 21 to 30	Average 21 to 50
Growth habit	Rhizomatous	Bunch	Bunch	Bunch
Seeding rate (lb./1000 sq. ft.)	1 to 2	5 to 9	5 to 9	3 to 5
Nitrogen fertilizer (lb. N/1,000 sq. ft./year)	3 to 4	2 to 6	2 to 4	1 to 2

will overwhelm the other species if there is too much in the mix. (Also avoid annual ryegrass. It will germinate and grow quickly, but usually dies over winter.)

Fine fescues



The fine fescues are comprised of a group of lawn grasses that includes

- creeping red fescue (*Festuca rubra*)
- chewings fescue (*Festuca rubra var. commutata*)
- hard fescue (*Festuca longifolia*)
- sheep fescue (*Festuca ovina*)

The fine-leaf fescues are the most shade tolerant of the lawn grasses. Their leaves are medium to dark green and narrow, almost needle-like. They are primarily bunch-type grasses, except for creeping red fescue, which can produce rhizomes. Fine-leaf fescues are often favored as low-maintenance grasses because they grow very slowly and require little or no fertilizer. Fine fescues should be mowed at least 2 inches or higher.

These grasses are well adapted to infertile, acidic soils and tolerate shade better than other cool-season grasses. They are not good for high-traffic areas because they do not tolerate abrasion,

and like other bunch grasses they are slow to fill in damaged spots.

Thatch can become a significant problem if not managed properly because fescues are the most aggressive thatch producers of the cool-season grasses. (This is primarily because fescue's leaf stems are high in lignin, which is slow to break down.)

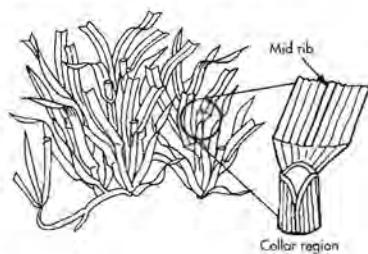
Traditionally, fescues are used in mixtures with Kentucky bluegrass and/or perennial ryegrass. However, growing interest in low-maintenance lawns has made blends of fine-fescue cultivars increasingly popular.

If you use fescue blends as part of a low-maintenance strategy, you need to lower your quality expectations. Fescues do not hold up to traffic as well as other species, and they often take on a "brown haze" appearance under full sun and dry conditions. These are the tradeoffs you need to weigh against the benefit of reduced mowing and fertilizer applications.

Sheep and hard fescues are more adapted to the low-maintenance approach, whereas chewings and red fescue perform better in traditional lawn mixtures that will receive regular fertilizer applications.

Fescues have few major pest problems. Under wet conditions however, red thread and leaf spot can attack them. Similar to the ryegrasses, certain fescue cultivars have endophytes to repel surface-feeding insects but are susceptible to white grub infestations.

Kentucky bluegrass



Kentucky bluegrass is the predominant high-quality lawn grass for northern climates. It is a well-adapted, perennial species that spreads by underground lateral stems called rhizomes. This enhances its ability to form sod and recover from traffic damage.

Kentucky bluegrass is most successful in full sun and well-drained, fertile soil. It should be fertilized regularly and requires irrigation to avoid summer dormancy associated with warm, dry conditions.

The major diseases associated with Kentucky bluegrass include fungal diseases such as leafspot, dollar spot, and necrotic ringspot. Pest problems include surface- and root-feeding insects such as white grubs and billbugs.

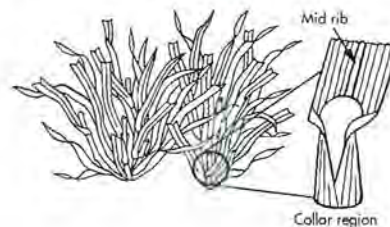
There are many improved cultivars of Kentucky bluegrass bred for close mowing (less than 1 inch), high-traffic areas, disease resistance, and extremely dark green color.

Kentucky bluegrass requires more than two weeks to emerge from seed sown in the soil and can take up to eight weeks to produce a dense sod. This limits its use in overseeding and renovation when a mature lawn is needed in a short time.

This grass also is less competitive with fast-germinating weeds and other lawn grasses such as perennial ryegrass during establishment. Studies show that as little as 30 percent perennial ryegrass mixed with 70 percent bluegrass will result in 80 percent perennial ryegrass three years after establishment. To establish stands of Kentucky bluegrass, you need to use mixes with less than 20 percent fast-germinating species.

The drawback of Kentucky bluegrass's aggressive, sod-forming rhizomes is that they can contribute to excessive thatch development. Under high fertility and cool, moist soil conditions, thatch may have to be removed physically, or core cultivation (aerification) can be used to mix soil particles with the thatch layer.

Perennial ryegrass



Perennial ryegrass has become a popular component of lawn seed mixtures in the United States as a result of improvements in color, texture, and disease resistance. It is used widely because it establishes quickly and competes well. Ryegrass will germinate from seed in just two to four days and will provide a uniform lawn within two weeks.

Perennial ryegrass is a bunch-type grass that does not produce lateral growth in the form of rhizomes or stolons. Rather it spreads from the base by small shoots called tillers. This makes ryegrass plants less competitive in a lawn with regular traffic that injures the plant and leaves open spaces.

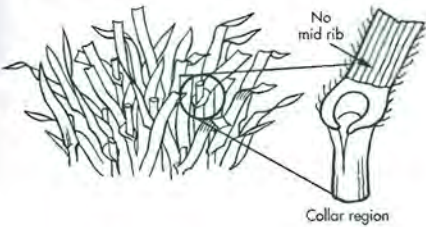
In high-traffic situations, Kentucky bluegrass is more competitive, producing rhizomes that can refill damaged spots. With ryegrass, weeds can often fill in open spaces before the grass can recover. While ryegrass tolerates abrasion better than Kentucky bluegrass, it does not recover adequately. Overseed regularly to maintain a competitive stand.

Perennial ryegrass is most successful in full sun with well-drained, fertile soil. It can tolerate mowing down to three quarters of an inch, but does best at 2.0 to 2.5 inches or more.

Ryegrass is not well adapted to shade and drought, and vigorous growth can cause thatch to accumulate. Major disease problems include fungal diseases such as red thread, rust, brown patch, and Pythium blight. This is most likely a result of reduced growth from low fertility and environmental conditions conducive to fungal growth.

Ryegrass breeders have developed varieties that contain endophytic fungi. These beneficial fungi live in the leaf sheath and produce chemicals that deter surface-feeding insects such as chinch bugs and sod webworm. Unfortunately, they have no effect on white grubs or other subsurface feeders.

Tall fescue



Turf-type tall fescue is a bunch-type grass with substantially wider leaves compared to the fine-leaf fescues. It has very deep roots that help it weather drought conditions better than other cool-season lawn grasses.

The wide blade makes tall fescue inappropriate for lawn mixtures with other cool-season grasses (such as bluegrass and ryegrass) unless it is greater than 90 percent of the mixture. Breeders have developed exceptionally dark green cultivars that are extremely tolerant of heat and drought.

Tall fescue is more shade tolerant than bluegrass or ryegrass but not as tolerant as the fine fescues. It requires regular fertilization and should not be mowed closer than 2 inches.

Tall fescue is tolerant of abrasion, but because it is a bunch-type grass that doesn't spread much it requires regular seeding to stay competitive in a heavily trafficked lawn.

As a result of its "forage grass" heritage (it is commonly grown in pastures), tall fescue has a very rapid leaf extension to replace leaves grazed by animals. This trait has persisted even though the mower has replaced the cow. As a result, tall fescue requires more frequent mowing under ideal growing conditions

compared to other cool-season grasses. Thatch is usually not a problem.

Tall fescue is susceptible to brown patch and Pythium. Similar to the ryegrasses it has suffered recently from rust. Proper nitrogen fertilization is vital to avoid and manage these diseases.

Tall fescue is most successful when established from seed in early August (several weeks before the best date for establishing other cool-season grasses) because it is less winter-hardy in the seedling stage. While generally not recommended, spring establishment can be successful when soils warm and seeding rate is increased slightly to compete with weed growth.

Relieving Thatch

Don't blame clippings

Thatch is a layer of dead and decomposing plant tissue that forms above the soil. A thin layer (1/2- to 3/4-inch) is beneficial because it protects plant crowns and reduces compaction.

But if the layer gets too thick, water, air, and fertilizer can't get through to the soil and grass roots. Runoff increases and dry spots appear. When it's wet, thatch can remain saturated and suffocate roots.

Leaving grass clippings on the lawn when you mow does not cause thatch. Clippings break down quickly in most cases. Thatch is made up mostly of stems and roots that decompose more slowly.

Thatch usually occurs on turf that has been heavily fertilized, and it is most common on poorly drained, compacted, and acidic soils. Of the species of lawn grasses, fine fescues are most prone to thatch problems.

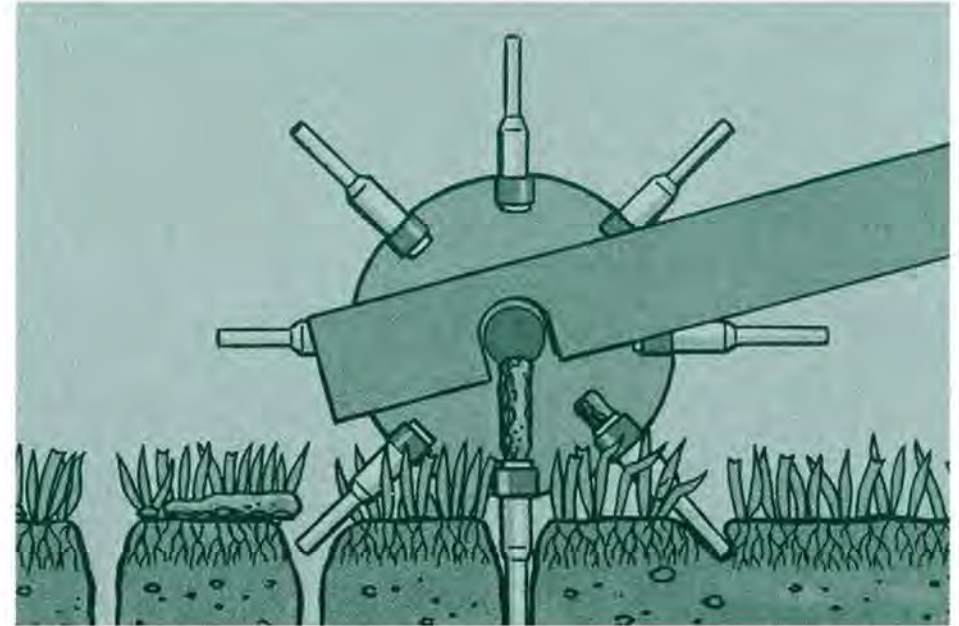
Try core aeration

The best way to relieve thatch problems is by core aeration. Contract with a local landscape company for service or check with your local equipment rental center.

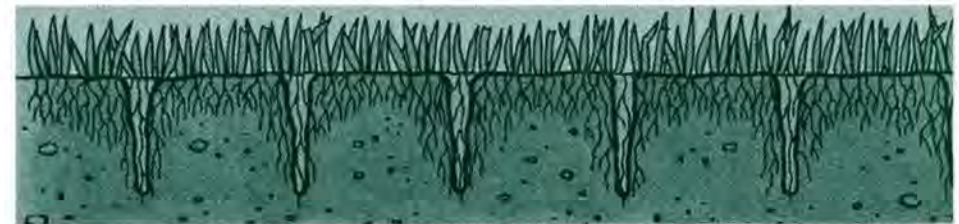
Core aerators punch small holes in the lawn, pull out the cores, and leave them on the surface. Core aeration is most effective in late summer when temperatures are starting to cool and the soil is only slightly moist.

After aeration, air and moisture can penetrate the thatch through the holes. Leave the soil cores on the surface to dry. Then rake them to distribute the soil down through the grass to mix with and dilute the thatch. Don't allow the cores to wash away and pollute surface water.

The mixing action of core aeration is similar to that provided by earthworms. Core aeration can also help increase water infiltration on compacted soils.



The lawn is perforated during core aeration



Core aeration improves infiltration on compacted soils

Coping with Shade



Most grasses are sun-loving plants. For healthy growth, lawn grasses need at least four hours of direct sun a day. Grasses that receive much traffic or wear and tear need a minimum of six hours.

In addition to being weak from lack of sun, grass in shady areas can suffer more diseases because of cool, moist conditions and lack of air circulation. Poor grass stands in shady areas are vulnerable to erosion, which can carry sediments and other pollutants into surface water.

Options for coping with shady areas

Choose the right grass

In spots that receive marginal light, plant fine fescues, which are more shade tolerant than other lawn grasses.

Grow other ground covers

Grass isn't your only choice. Consider attractive and vigorous shade-loving ground covers such as hostas, pachysandra, lily of the valley, English ivy, periwinkle, epimedium, sweet woodruff, and lamium.

Plant a shade or woodland garden

There are hundreds of herbaceous perennial flowers and foliage plants that will thrive in shade as well as annuals such as impatiens.

Mulch around trees

If you don't have the energy to maintain a shade garden, consider using about 3 inches of wood, bark, or stone mulch around the base of trees. (Don't pile mulch against the base of the tree trunk.)

Build paths

If grass grows fine in your shady areas except where people walk, put in a stone, gravel, or other path to concentrate wear and tear in one area.

Mow high

Grass in shady areas should be allowed to grow taller than grass in direct sun. Do not mow closer than 3 inches.

Fertilize and water less

Grass in shady areas grows slowly and needs less fertilizer and water.

Let in more light

Remove lower branches and selectively prune other branches or remove entire trees to let in more light.

Salt Damage

Look for damage along walks, driveways, and roads

Sodium chloride (salt) used for deicing may cause bare spots or give an edge to salt- and compaction-tolerant weeds along sidewalks, driveways, and roadsides. Soil is sometimes covered with white or yellow crust.

Salt damage is often compounded by compaction from foot traffic, auto tires, and piled snow. Even if the damage doesn't kill sod, it increases stress on the grass, making it more prone to diseases and weed competition. Weak turf in these areas is especially vulnerable to runoff into storm sewers and surface waters.

Kentucky bluegrass is very sensitive to salt damage. Perennial ryegrass, fine fescues, and tall fescue are more tolerant.

To prevent salt damage, avoid plowing or shoveling salt-laden snow onto

turf. Apply only enough salt to do the job after you remove the snow. Calcium chloride-based deicing salts don't cause as much damage as sodium chloride.

Even though they are often suggested, do not use urea or other fertilizers as deicing salts. They can run off when snow melts and pollute surface and ground waters.

Spring rains may leach salts from the soil if drainage is adequate. If it's dry, you may need to water by hand to flush them out. If soil is poorly drained, improve it by mixing in organic matter to a depth of 6 inches, or remove soil and replace it with fresh topsoil and reseed. Improve soil before reseeding because salt can prevent germination and damage seedlings.

Dog urine causes similar damage to salt and is often mistaken for disease problems. Salts in dog urine can kill grass. Look for dead spots with greener grass around the edges. Female dogs and dry, infertile soil make problems worse.

To reduce damage, flush with water immediately after dogs urinate or train them to go elsewhere. Rake up feces to prevent them from smothering and killing grass, providing an opening for weeds to get a foothold.

For More Information

Local information

Contact your local Cooperative Extension Office. In New York State:
www.cce.cornell.edu. For all other states: www.csrees.usda.gov/Extension.

Online resources

Lawn care

Department of Horticulture, Cornell University
www.gardening.cornell.edu/lawn

Home gardening

Explore Cornell
www.explore.cornell.edu/homegardening

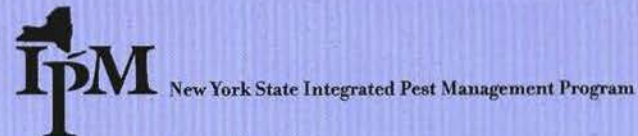
Weeds and your lawn

New York State IPM Program
www.nysipm.cornell.edu/publications/weedslawn

Grubs in your lawn

New York State IPM Program
www.nysipm.cornell.edu/publications/grubs

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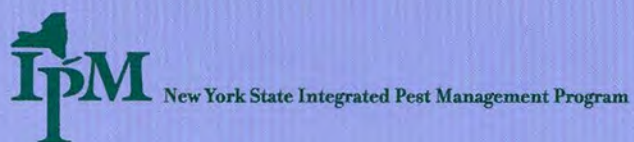
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This essential text focuses on reducing environmental stressors on your grass plants as the key to a lush, beautiful, and thriving lawn. If you understand how grass grows, why lawns matter, and do everything possible to reduce stress, your lawn will grow stronger, stand up better to weeds, and be more resistant to insects and diseases. Consequently, you will spend less time and less money on lawn chemicals, and quite possibly never use pesticides on your lawn again. The key is how far you want to go. The principles and practices you learn in this publication will help no matter which chemicals you want to give up and how fast you want to do it.

Lawn Care without Pesticides begins with a seven-step first-year plan. Patience and careful attention to important indicators of lawn health during the first year may not result in a perfect lawn immediately but will go a long way toward achieving your goals. During the first year make sure you also gather information about your lawn: test your soil, observe soil conditions, watch the sun, and note high-traffic areas. Now it's time to roll up your sleeves and actively snuff out weeds, manage insects, and prevent diseases based on your observations. In addition to learning effective practices for achieving a beautiful lawn, you will learn why lawns matter; how grass grows; best mowing, watering, and fertilizing practices; and how to repair small bare spots, renovate and establish lawns, choose grasses for your lawn, relieve thatch, cope with shade, and deal with salt damage.

Adorned with helpful diagrams and tables throughout the text, as well as a page devoted to additional lawn care information, *Lawn Care without Pesticides* will find a special place reserved among other classic Cornell Cooperative Extension bulletins as a true homeowner's and gardener's reference.



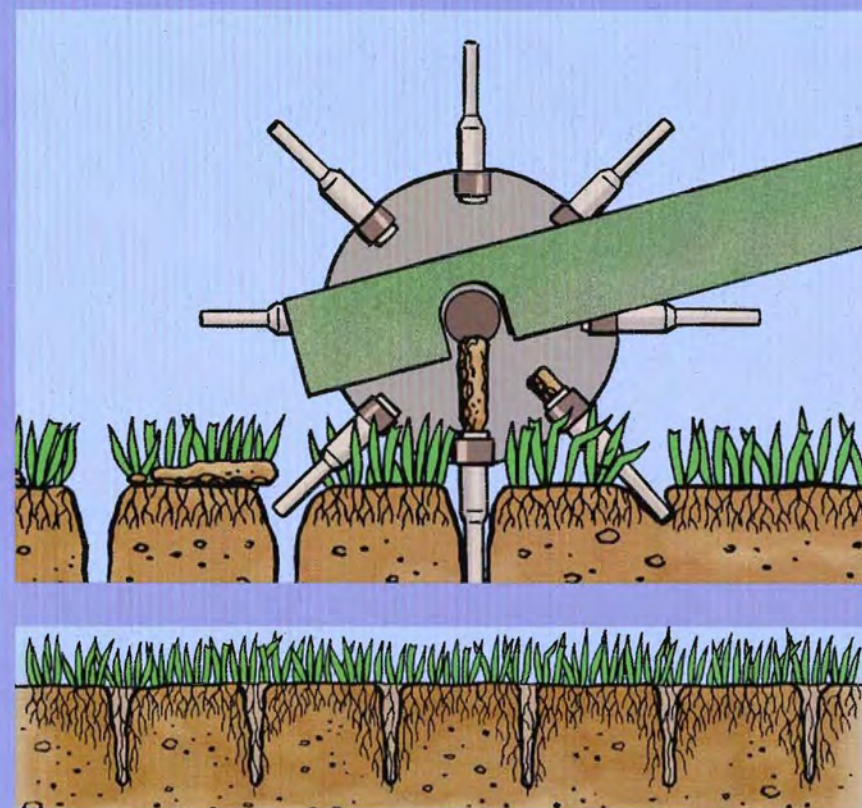
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