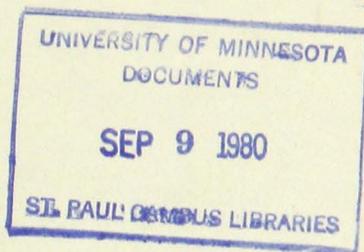


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The
**HOME
LAWN**



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AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF MINNESOTA

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The HOME LAWN

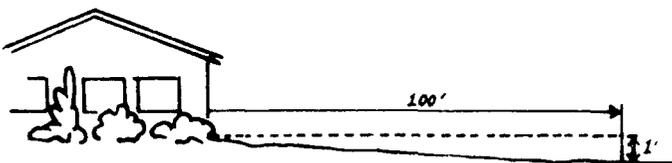
STARTING A NEW LAWN

When starting a new lawn, you should consider two layers of soil: the topsoil, where the grass roots grow, and the subsoil, which is below the root zone.

If possible, start planning with the subsoil. It should offer good drainage; a sandy soil is best. Be sure to loosen and grade the subsoil before applying topsoil. Never roll or pack the subsoil. The subsoil grade should parallel the finished grade.

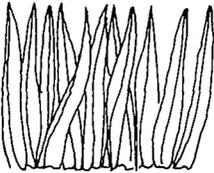
Good topsoil is difficult to find. Sandy loam or loamy sand makes the best topsoil for turfgrass growth. If the existing topsoil is too sandy or too clayey, adding 2 inches of fibrous peat tilled to a depth of 4 to 6 inches will help in establishing the turf. The peat opens a tight clay soil and adds moisture-holding capacity to a sandy open soil. When applying the topsoil, first apply about 2 inches of topsoil and mix it with the subsoil. Then apply topsoil to a minimum depth of 4 inches (preferably to a depth of 6 to 8 inches).

The finish grade should drop at least 1 foot in 100 feet away from the house or in the direction that surface water will flow. Follow grading with a light rolling to eliminate humps and hollows (fill the roller no more than one-third full). Correct surface irregu-



larities by raking or by dragging an 8-foot or 10-foot, 2-inch x 10-inch plank or a piece of chain link fence across the lawn.

Your county agricultural extension agent (check your telephone book under county offices) or the Department of Soil Science, 1529 Gortner Ave., University of Minnesota, St. Paul, MN 55108, will furnish information and forms for testing topsoil. Results of soil tests from the University are mailed 5 to 7 days after the soil sample is received. The soil test includes information about pH, organic matter, phosphorus, and potassium. Recommendations accompany each soil test.



SELECTING GRASSES

Lawn grasses for Minnesota are represented by three species: Kentucky bluegrass, creeping red fescue, and perennial ryegrass. Many varieties of each are available. Select your varieties carefully to be sure they fit your special situation.

Generally mixtures are preferable to pure seedings. If you want only Kentucky bluegrass, it is suggested that you select a mixture of two or three varieties. Otherwise, mixtures of Kentucky bluegrass and creeping red fescue, or Kentucky bluegrass and a named variety of perennial ryegrass, may be appropriate.

The descriptions below should help you select the right grasses for your lawn. The list is not meant to be a complete listing of varieties but rather a beginning reference. If you need more information, call or write your extension agent.

Kentucky Bluegrass--Common Types

Common Kentucky Bluegrass (Poa pratensis) is one of the most widely used lawn grasses. It thrives in the cooler regions of North America and is a medium-textured, green, sod-forming grass. It is found in seed mixtures labeled common Kentucky bluegrass, or just Kentucky bluegrass. It is suitable for average lawn situations and may be less expensive than named varieties.

Park Kentucky Bluegrass, developed at the University of Minnesota, was selected for seedling vigor. It becomes established sooner than most other Kentucky bluegrasses. Park tends to green up a little earlier in the spring than other varieties. It is similar to com-

mon Kentucky bluegrass in texture and color and is well-adapted to the north central region. Park is susceptible to leaf spot and other diseases but normally recovers very well. It makes a good component of a mixture for an average lawn situation.

Newport is darker green and has a little wider leaf than common Kentucky bluegrass. It performs very well in hot summer weather. It is similar to common Kentucky bluegrass in most other characteristics. Newport is resistant to leaf spot and performs very well in a mixture with Park or other common Kentucky bluegrass types. Newport should not be seeded alone.

Aquila produces a dense, medium-green Kentucky bluegrass that performs well in all seasons with medium to low maintenance. Aquila is somewhat resistant to several diseases and recovers well. This is another good component for a mixture.

South Dakota Certified is a true common local ecotype that is best adapted to western Minnesota and areas with soils of high salt content. It should be used in a mixture.

Birka is a new variety that has performed well in evaluations. It is resistant to leaf spot and mildew. It is also shade-tolerant. When seed supplies improve, it will make a fine component to a mixture.

Sydsport is another new variety that looks good in many evaluations and is resistant to leaf spot. Sydsport will make a good component for a mixture as seed supplies increase.

Nugget is a dark-green variety from Alaska. It performs best at a cut height of 1 inch or more. Nugget holds its color well throughout the growing season and is more shade-tolerant than other Kentucky bluegrasses. It is recommended in mixtures.

America is a new variety (formerly named Titleist for a very brief time) reported to be a slow-growing, shade-tolerant bluegrass with leaf spot resistance.

Arboretum is an older variety selected in St. Louis. It tolerates hot weather and low maintenance.

Kentucky Bluegrass—Elite Types

Elite bluegrasses form a dense, dark-green turf when mowed to a height of 3/4 to 1 inch. They are recommended for high quality athletic turf and where exceptional lawns are desired. Don't consider them if you are not willing to water, mow, and fertilize regularly. Elite bluegrasses also must be subjected to an annual power raking to remove and control excessive thatch development. Aerification on an annual basis is also recommended.

Merion bluegrass is a dark-green selection with a slightly coarse texture. It tolerates a little closer mowing and grows more slowly than common Kentucky bluegrass. It is slow to germinate and develop. However, it forms an excellent turf once established.

Rust may be a problem if the fertility level is low. Merion does very well in all seasons. Merion is very susceptible to fusarium blight and is recommended only in mixtures. It is best handled by a professional turf manager.

Glade is a dark-green grass with a slightly coarse texture that performs well in a mixture and is shade-tolerant. Glade is resistant to mildew.

Adelphi, with a dark-green color and medium texture, is one of the finest Kentucky bluegrasses available. It maintains color and density throughout the season. Adelphi is wear-resistant and makes a good component in an athletic field mix, as well as an especially attractive lawn. Adelphi is resistant to most turf diseases, including fusarium blight. It performs well with somewhat less fertilizer than Merion, with 4 pounds of actual N per 1,000 square feet per year being adequate. This variety may suffer from short seed supply.

Parade is a rapid-establishing, medium- to coarse-bladed grass with excellent wear tolerance. It mixes well with other improved varieties and has some resistance to leaf spot, mildew, and fusarium blight. This grass also performs well at 4 pounds of actual N per 1,000 square feet per year.

Baron performs well in Minnesota. It is medium green and resistant to leaf spot. Like Merion, it is susceptible to mildew and shows average resistance to other diseases. Baron is recommended in mixtures and where good air circulation and light prevail. Baron also performs well at 4 pounds of N per 1,000 square feet per year.

Fylking grows more slowly than the common type. Like Merion, it is slow to germinate, but once established it performs well in a mixture. This variety is resistant to leaf spot but is susceptible to fusarium blight.

Bristol is a medium-textured Kentucky bluegrass that performs well in a mixture and results in a high quality turf.

Touchdown is a dark-green, vigorous Kentucky bluegrass. Touchdown tends to predominate in a mixture under high maintenance. It is mildew and leaf spot resistant and is shade-tolerant. Touchdown, because of its vigor, is recommended in athletic field mixtures.

Bonnieblue is another fine new variety, with a dark-green color and leaf spot resistance, that has performed well in Minnesota trials.

Majestic also has performed very well in Minnesota trials. It does well in hot weather and forms a dense, dark-green turf. It is a vigorous-growing bluegrass.

Enmundi, *Ram I*, *Galaxy*, and *Plush* are newer varieties that are showing well in current evaluations. Ram I should tolerate low mowing and some shade, and Plush is reported to be tolerant of low maintenance.

Creeping Red Fescues (*Festuca rubra*)

There are two types of creeping red fescues. One forms clumps under certain situations (Chewings fescue), while the other spreads slowly and forms less of a clump (creeping red fescue).

Common creeping red fescue is fine-leaved, shade-tolerant, and drought-tolerant. It is adapted to poor soils and low fertility levels. It has narrow, tough blades that are not easily crushed and will rarely stain clothes. It is normally seeded in mixtures with Kentucky bluegrass. It is recommended at 30 percent or more of a mixture. It does not mow well in pure seedings.

Several improved varieties are available and recommended: Ensylva, Koket, Highlight, Illahee, Ruby, and Pennlawn. These are vigorous selections that have performed well in Minnesota and deserve consideration when you purchase seed. Creeping red fescues, our best shade-tolerant grasses, mix well with Kentucky bluegrass.

Other Grasses

Bentgrasses. Creeping bentgrass types are adapted for use on golf courses and require a great deal of care. The colonial or non-creeping types are upright in growth and spread slowly. Some colonial types are available as varieties: Astoria, Highland, and Exeter. Exeter, a new variety, has improved disease resistance over the older varieties.

Redtop (white bent) has been used in the past as a temporary grass in lawn seed mixtures. It is not recommended for lawn use.

Bentgrasses generally are not recommended for home lawns. In fact, bentgrass patches in Kentucky bluegrass lawns are a major problem in the northern United States.

Ryegrasses. Annual, perennial, and domestic ryegrasses have been used widely in the past as temporary grasses in lawn mixtures. These grasses are short-lived and are not commonly recommended for lawn use.

Several new truly perennial types have been developed and can be recommended for use in mixtures with Kentucky bluegrass and for athletic field use. The variety NK-200 appears to be the hardiest, followed by Eton, Manhattan, and Pennfine varieties. These varieties mow cleanly and perform well under good fertility and watering programs.

Meadow and broad-leaved fescues. Kentucky 31, Alta, and other broad-leaved fescue varieties are short-life, pasture-type grasses. They are coarse, bunch-type grasses that are weeds in our lawns. They are adapted to warmer climates and states such as Kansas and Missouri. They are not recommended for Minnesota.

Zoysia roots are winter-hardy in Minnesota, but the tops turn straw-colored with the first frost in the fall and do not normally

green up again until very late spring. Many home owners who have tried *Zoysia* inquire as to how to remove it from their lawns.

SEEDING

A mixture of 60 to 75 percent Kentucky bluegrass and 25 to 40 percent creeping red fescue is suitable for most sunny lawns. A mixture of 60 percent creeping red fescue and 40 percent Kentucky bluegrass is best for most shady lawns.

Recommended seeding rates per 1,000 square feet are:

Kentucky bluegrass	2-3 pounds
Creeping red fescue	4-5 pounds
Kentucky bluegrass/creeping fescue mixtures	3-4 pounds

No more than 5 to 10 percent of a mixture should be perennial, Italian, or common ryegrass. High percentages of these grasses commonly are found in cheap mixtures that give unsatisfactory results. They are soft, short-lived grasses that germinate rapidly and are useful only in some locations where temporary or rapid cover is required. The named varieties of perennial ryegrass are exceptions to this rule.

The best time to seed a lawn in Minnesota is between August 15 and September 10. That's when grasses seed in nature. Most annual weeds do not germinate after August 15. Grass seeded in the fall can become established before winter and be growing in the spring before weeds start to germinate.

The second best time is early spring, about the time baseball season opens, or as soon as the ground can be worked.

Seeding is easiest on a calm day. If you seed by hand, mix the seed well and divide it into four equal lots; then spread each lot in a different direction. If you seed mechanically, divide the seed into two equal lots and sow it in two directions. Mechanical seeding can be accomplished with ease by first mixing the seed one part to two with a well-processed natural organic fertilizer to add bulk.

Rake the seed in lightly, leaving about 10 percent of it showing. Then roll the seedbed lightly to firm the seed into the soil, and water it lightly.

It is best to water your newly seeded area two or three times a day for 10 to 20 minutes at a time. Never allow the seedbed to dry out once it has been watered, but try to avoid letting the soil go into the night in a wet condition. As seedlings develop, apply water in greater quantities at longer intervals until the grass is well-developed. Then water it at 1-week intervals, applying about 1 inch of water at a time or as needed.

When grass blades reach a height of 3 to 4 inches, mow the new lawn to a height of 2½ inches. Mow it only with a sharp mower. The second mowing may be to 2 inches and the third to 1½ inches, if you want it that short. An established bluegrass-fescue lawn should be maintained at 1½ inches or higher. Elite blue-grasses can be maintained at ¾ to 1¼ inches.

Seeding costs less than sodding and, if successful, gives the homeowner a great feeling of accomplishment. It ordinarily takes 6 to 12 weeks to establish a healthy lawn from seed, but it usually takes almost a full growing season before the lawn can be considered well-established and ready for children's activities.

SODDING

Sodding costs more than seeding but results in an "instant" lawn. The real advantage is that you needn't face the problems of time and turf establishment—the sod grower must.

In purchasing sod, look for a reputable landscape firm or sod producer. The grass in the sod field should be freshly mowed at lawn height (1½ inches) before it is cut and rolled. Sod should be uniform in thickness (½ inch) and weed free. In most situations, either peat or upland (mineral soil) sod is satisfactory. On athletic fields and areas of heavy traffic, upland sod is recommended.

One often-neglected factor in sodding is soil preparation. A sodded lawn requires the same soil preparation as a seeded lawn. If you use peat sod, be sure to mix peat into the topsoil before laying the sod.

Areas to be sodded should have phosphorus and potash tilled into the soil as in seeding. An application of ½ pound nitrogen fertilizer per 1,000 square feet can be applied immediately to newly sodded turf.

Sodding can be done as soon as growth resumes in the spring but is not recommended after October 1.

Lay sod immediately; don't allow it to remain stacked and rolled for more than a day or two, and then only when absolutely necessary.

Lay the sod on moistened soil. Stagger the joints and fit the pieces as closely together as possible. Always lay sod *across* a slope. You can use short wooden pegs, spaced 1 foot apart, to anchor sod on a slope.

Soak the sodded area immediately after laying and keep it well-watered until it is firmly rooted into the soil (2 to 3 weeks). After establishment, treat the sodded area as any established lawn.

FERTILIZING

Your fertilizer program should be based on complete soil test results. Required amounts of phosphate and/or potash vary greatly with the natural soil fertility, establishment fertilization, and previous maintenance fertilization. Most lawns will require two complete fertilizer applications per year, although some lawns may require only one complete fertilizer application, supplemented with one or more nitrogen applications.

Occasionally lawns having very high phosphate and potash levels will require only nitrogen applications. When a single application of a complete fertilizer is made, cool-season grasses such as Kentucky bluegrass and fescue benefit most from late fall applications. Where soil tests show low levels of phosphate and/or potash, it may be necessary to make additional supplemental applications of superphosphate, potash, or phosphate-potash fertilizers one or more years in the fall until these soil levels are satisfactory.

Rate of application of the complete fertilizer will vary with the species or variety of grass, the soil fertility level, the fertilizer grade, and the type of nitrogen contained in the fertilizer. Red fescue and common Kentucky bluegrass require about 4 pounds of nitrogen, 1 pound of phosphate, and 2 pounds of potash per 1,000 square feet per season. Merion and some other elite type Kentucky bluegrasses require about 5 to 6 pounds of nitrogen per 1,000 square feet, with corresponding increases in phosphate and potash.

The ideal fertilizer program provides uniform growth over the entire growing season. The type of nitrogen-carrying materials in a fertilizer is very important in determining how such a program can be achieved. Basically, nitrogen materials are divided into two broad groups—quickly available and slowly available.

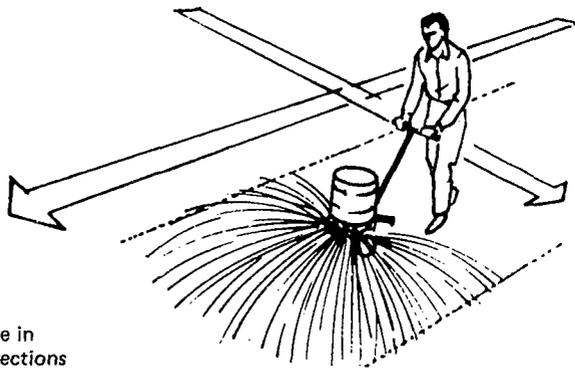
The quickly available materials are water-soluble and the nitrogen is immediately available to the plants. The results are a sudden flush of growth and a rapid depletion (2 to 6 weeks) of the available nitrogen. Thus, it will be necessary to make frequent light applications of these materials to obtain uniform growth over a long period of time and prevent possible burning. Quickly available nitrogen materials include ammonium sulfate, ammonium nitrate, nitrate of soda, ammonium phosphate, calcium nitrate, urea, and many others. A good rule is to avoid applying more than 1 pound of actual N per 1,000 square feet at any one time.

Slowly available nitrogen materials release most of their nitrogen over relatively long periods. These materials depend on soil bacteria or soil moisture to decompose the materials and transform the resultant compounds into nitrogen forms available to the plant. The activity of these bacteria, in turn, depends on moisture and temperature conditions. Under high temperatures and adequate

moisture supply, the breakdown of these materials is accelerated. Under conditions of high temperature and low moisture or cool temperatures, the breakdown will be much slower. Within slowly available materials there are several groups—natural organic materials, synthetic organic compounds such as IBDU, and sulfur coated urea and urea formaldehyde.

Natural organic materials include activated or processed sewage sludge, animal and vegetable tankage, manures, soybean meal, cottonseed meal, etc. Because these natural organic materials vary greatly in their chemical composition, there will be a wide variation in the rate of decomposition, although all of them will release their nitrogen at a slower rate than the quickly available nitrogen sources. It is best to avoid breathing the dust from bean or seed meals, or any fertilizer for that matter.

Ureaform compounds are synthetic materials made by the chemical union of urea and formaldehyde. Within a given ureaform material, there is actually a series of chemical compounds with varying degrees of solubility. As the soil microorganisms decompose these materials, the more soluble materials break down first, followed by each successive compound. Thus, a small amount of nitrogen is being released constantly over a relatively long period of time. This permits the user to apply heavy amounts of these materials at rather infrequent intervals. Care must be taken not to confuse urea (quickly available nitrogen) with ureaform (slowly available nitrogen).



Fertilize in two directions for best coverage.

Lawn fertilizers are sold on the basis of their nitrogen-phosphorus-potassium (N-P-K) content. (In lawn fertilizers, phosphorus and potassium are in the form of phosphate and potash.) Lawn fertilizers have analyses such as 10-6-6, 20-10-10, 20-0-10, 10-5-5, 20-5-10, and 10-4-8. The N is needed for lush green growth, the P for growth energy, and the K for metabolism and stress resistance. The balance among these major elements may be as critical as their availability.

How to calculate fertilizer use at a rate of 1 pound nitrogen per 1,000 square feet:

Weight of bag x percent N = pounds of N in bag x 1,000 = square feet that the bag of fertilizer will cover.

Example:

30-pound bag of 20-5-10 (N-P-K) fertilizer; 30 (weight of bag) x .20 (percent N) = 6 pounds of N; 6 pounds x 1,000 = 6,000 square feet (area covered by bag)



MOWING

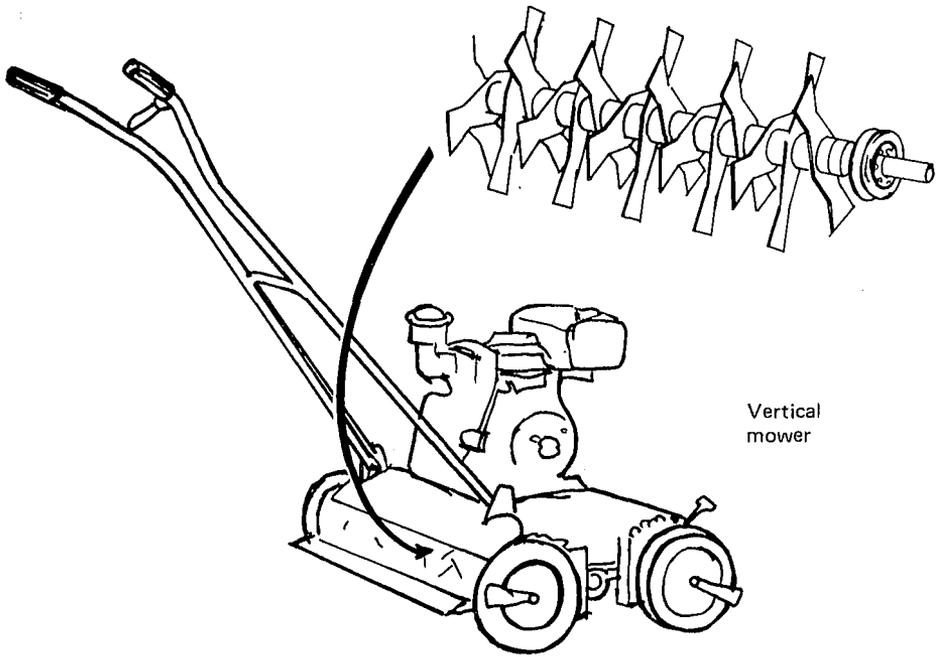
Mow your lawn when it is no higher than 1 inch above regular cutting height: If you maintain your lawn at 1½ inches, cut it whenever the grass reaches 2½ inches. During hot, dry periods, it is wise to raise the cutting height to 2 or 2½ inches, reducing it again in the fall. Mow in the fall until growth stops, sometime in November. It is best for a lawn to go into the winter at or near its regular height. You can leave clippings on the lawn, but remove any long, wet, or packed clippings. Always pick up sticks, stones, wire, or other debris before each mowing.

A sharp rotary mower is satisfactory for most lawn care. When using a rotary mower, never point the discharge toward people. Remember that you assume a great risk whenever you allow children to use such a mower. Collecting clippings with a bag is recommended as a safety precaution; turn the motor off whenever you remove or replace the bag. Disengage the spark plug wire when the mower is not in use or when you're cleaning or working on it. The blades of a rotary mower should be sharpened and balanced whenever needed. A dull mower shreds rather than cuts the grass.

12 A sharp, well-adjusted reel mower results in a clean cut and is less dangerous to handle than a rotary mower. Use it where high

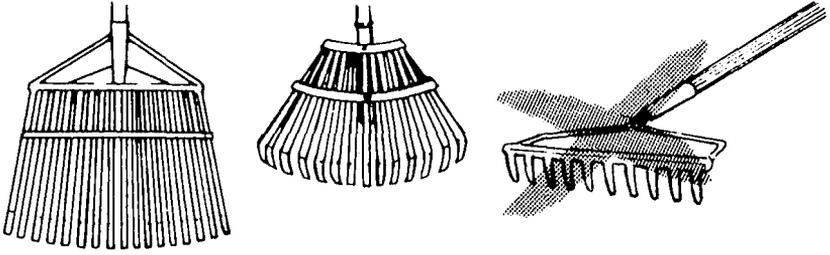
quality mowing is desired or where children will mow the lawn. Reel mowers ordinarily should be sharpened one or more times a year.

Collecting clippings is not necessary unless you are growing a lawn of elite bluegrasses or bentgrass, you have a disease problem, or you have a weed problem such as crabgrass or sand burs.



RENOVATING AN OLD LAWN

If you have a lawn problem that is not serious or widespread, you can renovate with a vertical mower (power rake). Collect the trash and then overseed with the desired grass at the recommended rate. Water as during seeding establishment. You can overseed in the spring or fall, but fall is best. Renovating may require more than 1 year for satisfactory results. If your lawn is 40 percent or more weeds, it may be best to start over. Follow the directions for establishing a new lawn.



RAKING

Ordinarily, one or two rakings a year are sufficient, one before the first mowing in the spring and one to clean up the lawn in the fall. Always use a lawn rake, not an iron garden rake, which can severely damage grass plants. You can use a broom or a wooden, bamboo, or wire lawn rake for cleaning up debris or raking leaves.

WATERING

Lawns generally require 1 inch of water per week during dry periods. Bluegrass will turn brown during dry seasons but will green up again when water is available. The rule is: If you water at all, water regularly, with a 1-inch application every week in which it does not rain. If you don't intend to water regularly, don't water at all.

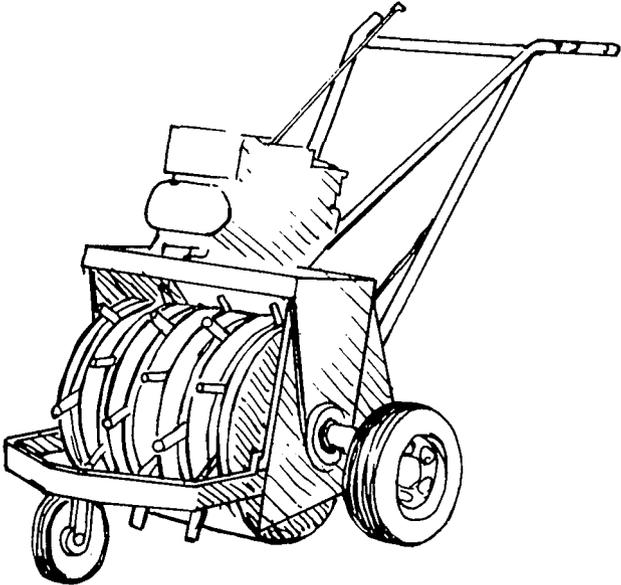
Most lawn sprinklers are capable of applying about $\frac{1}{4}$ inch of water per hour. You can go on that basis, or you can place one or more coffee cans or other containers with straight sides in the area to be sprinkled and measure the amount of water applied.

AERIFYING

Lawn grasses require a well-aerified soil to grow well. Many lawns could benefit from an annual or biennial treatment with an aerifier. If your lawn feels hard under foot, if puddles form or water runs off the lawn when you water, if the grass is thin from wear, and if it is difficult to push a large screwdriver into the soil, you may want to consider aerifying.

Aerification is best done in cool weather when the soil will dry slowly. You can aerify as soon as you can mow the grass in the spring until mid May, and from about August 25 to September 10-15. Be sure to use, or demand that your landscaper use, a

machine that takes plugs of soil out of the ground, leaving a hole about ½ inch in diameter and 3 inches deep. If the machine just punches holes without taking a plug of soil out, it just makes the soil more compact. Good aerifiers are carried by most tool rental agencies and are available from almost all landscape management firms.



Aerifier

CONTROLLING WEEDS

In new lawns, mowing ordinarily controls most weeds the first year. Never use herbicides on a new lawn without first reading the label. The best weed control is a healthy turf, so it follows that the best weed control chemicals are N-P-K fertilizers. Remember that there is a reason why a weed is there instead of grass; correct the reason and the herbicide may not be needed. Always ask yourself what will be there when the weed is gone. If the answer is bare soil, perhaps you should wait to control the weed until you can improve the situation and re-establish the turf.

Herbicides do have a place in maintaining a weed-free turf. When using weed control chemicals, read the label carefully and follow the manufacturer's directions. Apply all but crabgrass control chemicals during the growing season.

When isolated weed patches appear in your lawn, you can treat them individually. Although spot spraying often is recommended, another method is to tie a cellulose sponge to a stick, dip it into the herbicide solution, and brush the weeds with it.

Control of annual grassy weeds such as crabgrass should be accomplished before the weeds appear in the spring (before Memorial Day). Good preemergence crabgrass control chemicals are available.

Sand burs can be controlled to some extent with preemergence crabgrass killers. The best control is to collect clippings and, consequently, the burs, when mowing. Fertilize and water according to the recommendations in this bulletin. Remember that a healthy turf will keep out sand burs. See *Chemical Guide to Insect, Disease, and Weed Control on Turf*, University of Minnesota Extension Folder 551, for detailed recommendations.

CONTROLLING THATCH

An accumulation of tightly meshed dead and living stems and roots that builds up between the zone of green vegetation and the soil surface is called thatch. When a topdressing of soil across the surface results in an intermixture of soil with the organic layer of stems and roots, it is called a mat. This occurs more commonly on golf greens, while thatch is more of a problem on lawns.

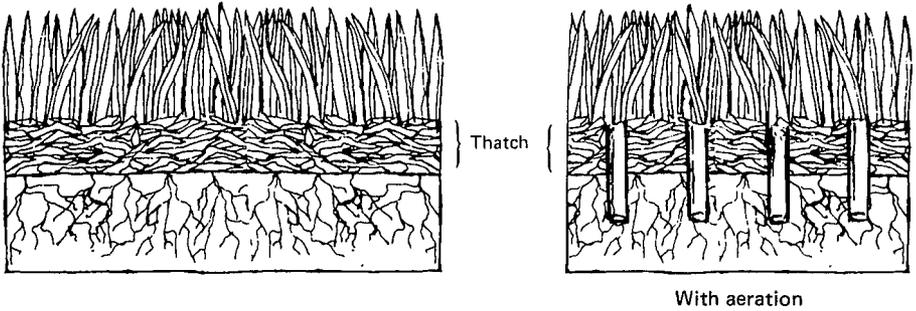
Effects

A thatch accumulation of $\frac{1}{4}$ to $\frac{1}{2}$ inch is beneficial. That is, it increases wear tolerance and resiliency, which has a cushioning effect. On a sports field or play area it helps reduce injury. A moderate thatch also insulates the crowns and lateral stems and protects the plant from extreme temperatures and drought.

If more than $\frac{1}{2}$ inch accumulates, problems may occur. This thick layer could cause a) roots to start to grow in this layer, b) scalping, c) increased disease and insect attack, d) dry spots in the turf, and/or e) decreased heat, cold, and drought tolerance.

Causes

Thatch develops when the rate of accumulation exceeds the organic matter decomposition rate. Cultural or environmental factors that stimulate shoot growth and/or impair thatch decomposition will increase the likelihood of thatch accumulation. Cultural factors that contribute to thatching include a) acidic soils below pH six, which reduce earthworm, insect, and microorganism activity; b) compacted or fine-textured soils with restricted oxygen levels that also impair the activity of decomposing organisms; c) excessive nitrogen or irrigation that stimulates shoot growth; d) infrequent mowing or excessively high cutting heights; and e) use of the more vigorous turfgrass varieties.



Control

Thatch control is not required on all lawns every year. It is advisable only when an excessive accumulation has occurred or will occur in the near future. You can determine the need for thatch control by cutting a pie-shaped cross section in the turf, lifting it, and examining the extent of thatch build-up. If the depth exceeds a half inch, you should take steps to prevent further accumulation.

Prevention

A preventive biological control is an active earthworm population in the lawn. Thus, do not use soil insecticides indiscriminately. Use them only when needed to control specific pest problems, since many of these insecticides also kill earthworms. Since the microorganism, fungi, insect, and earthworm populations are responsible for thatch decomposition, you should encourage them by a) maintaining a soil pH between six and seven; b) maintaining a moist thatch and soil; and c) cultivating by coring or slicing to enhance soil oxygen levels. A light topdressing of soil once or twice a year also helps thatch decomposition. Topdressing is usually practiced only on greens and sport fields due to the cost, time involved, and limited availability of soil. If you do top dress, use a soil of the same texture as the top soil of your lawn.

Removal

If an excessive thatch accumulation has occurred, steps must be taken to remove it. The procedure commonly used is vertical mowing. The operation involves vertical rigid (or flexible) blades (or tines) that produce a perpendicular cutting action into the turf, but above the soil surface.

The amount of thatch removed by vertical mowing depends on the weight of the machine and size of the power unit. You may want to rent a vertical mower since you would probably use it only once a year. These rental units are lightweight and have a

small power unit. They can be transported easily. But because they are light machines, it may be necessary to go over the lawn two, three, or four times in several different directions to remove excessive thatch.

A large quantity of organic material will be brought to the surface during the vertical mowing. You will need to either hand rake or power sweep the material from the area and haul it to a disposal site. For a quick recovery, the lawn should be fertilized and irrigated immediately after vertical mowing.

It is important to time the vertical mowing so that at least 30 days of favorable temperature and moisture follow the operation. Avoid vertical mowing during periods that are particularly favorable for the germination of weeds. An early summer vertical mowing would provide openings for crabgrass and other weedy grasses.

A late summer or early fall vertical mowing is preferred in the cool climatic zone. Early spring, prior to the beginning shoot growth, is the next best time. If you decide to dethatch in early spring, the vertical mowing will serve the dual purpose of spring cleanup and debris removal. It will also stimulate an earlier spring green-up. Avoid dethatching during periods of rapid shoot growth.

A spring and/or early summer vertical mowing is preferred for warm season turfgrasses, to encourage quick recovery and avoid winter weed invasion.

CONTROLLING DISEASES

Lawn grasses may be seriously damaged by diseases. However, with proper fertilization, watering, and mowing, most home lawns will recover and the home owner may not even recognize the disease. Good lawn care, described in this bulletin, is the best preventive measure for lawn diseases.

Disease prevention practices on home lawns include the following: a) grow grasses adapted to your area and level of management; b) apply fertilizer according to local recommendations and based on a soil test; c) water when it's needed but avoid keeping the grass wet for long periods; d) mow frequently at the recommended height for your grass type and use; e) maintain thatch layer at less than ½ inch; f) thin or prune trees and shrubs to allow air movement and light penetration; g) improve drainage and reduce compaction by aerifying.

If a disease is damaging your lawn, the following summary of common Minnesota turf grass diseases may help you recognize and properly treat it.

Snow mold is seen when the snow melts in the spring. Diseased grass is covered with white, pink, or dirty-gray mycelium. The

affected grass is bleached and killed, usually in a circular pattern. This symptom is most common in wet, shaded areas where snow accumulates and is slow to melt. Infection begins in the fall under the wet snow and may continue through winter until spring. Fungal growth stops when the surface freezes or dries. Mow grass until it is dormant, and don't let a heavy mat of grass develop. Rake leaves, keeping the turf surface free to dry quickly. Brushing or sweeping the mycelium off in the spring can reduce damage.

Leaf spot and/or melting out symptoms begin as a dark-brown or purple spot on the leaves in the fall or spring and may result in the sudden dying of whole plants in the summer. The leaf spot stage usually does not cause serious damage. However, in cool, wet periods the leaf tissue is killed and the sheath and crown may be invaded. Then during dry periods, large or small irregularly shaped areas of the lawn die suddenly. Management of leaf spot and melting out is facilitated by removing clippings, raising the cutting height, watering, and fertilizing to meet the needs of the grass plants. Excess water and nutrients can increase leaf disease problems. If leaf spot and melting out is your problem, overseeding with resistant cultivars will reduce the damage. Chemical treatment requires applications in cool, wet growing conditions early in disease development. If melting out symptoms are present, treatment results are poor.

Powdery mildew appears as a white dust on the leaves. It is common in cool, shaded areas of the lawn in the fall and spring. Mildew often thins turf areas in dense shade under trees or on the north side of buildings. Improving light penetration, mowing frequently, and increasing air movement by pruning shrubs reduces mildew. Overseed with shade-tolerant/powdery mildew-resistant cultivars, or plant shade-loving plants.

Dollar spot symptoms are round, bleached, circular areas 4 to 6 inches in diameter. In severe cases, the spots may grow together, forming large irregular areas. Symptoms are more severe when dew formation is common and grass is growing slowly (warm days and cool nights). Water and fertilize to stimulate growth.

Fusarium blight is the most serious problem on well-cared-for lawns. First, a circular wilted spot appears, which quickly fades to a yellow-brown color. The center of the infected area often remains alive or recovers, producing a doughnut symptom. The entire infected area is slightly sunken and the grass plants are completely killed, leaving bare ground and areas that are slow to recover. Thatch reduction programs are often required to improve the lawn area. Fertilize to reduce thatch development and promote root growth. Avoid spring fertilizer applications, and water regularly to prevent wilt. Root systems are usually restricted, so daily watering is needed. Fungicide treatment can reduce symptom development.

Fairy ring appears as a ring of fast-growing, dark green grass, often surrounded by a ring of thin or dead grass. After rains or watering, mushrooms may develop in the dark green ring. Fairy rings are caused by several soil-inhabiting fungi. Growth usually starts at a central point, and the fungus grows outward equally in all directions, developing a circle. Fairy rings are difficult to control. The most satisfactory treatment is to mask the rings by using a root feeder attachment and injecting water deep (12 inches) into the soil within the rings of dead grass. This treatment in conjunction with aerification and adequate fertilization will hide the symptom. You can break up mushrooms with a rake or lawn mower.

Slime mold symptoms appear following heavy rains or waterings. Small colored or white slimy beads develop on the grass, and upon drying they form a powdery mass. Slime molds do not damage grass but are unsightly. They soon disappear, or you can remove the deposits with a rake or a forceful spray from a garden hose.

Rust symptoms are orange to reddish-brown spots on grass blades. This rusty material rubs off on your fingers and shoes. Rust may be a problem in August or September. Heavy infection can cause grass blades to yellow and die. Rust is rarely a problem where proper fertilization, watering, and mowing are practiced.

CONTROLLING INSECTS

Proper insect management on lawns involves more than spraying three times a year. Rather it involves a thoughtful process of detection, identification, and evaluation. It is important to remember that complete elimination of insects is impossible and impractical. Therefore, you should try to manage the insect population at a level that does little damage to the lawn. In truth, damage control and not insect control is the ultimate goal. Lawn damage varies with grass condition, the insect species, and its population level. Vigorous lawns can withstand greater pest numbers than severely weakened ones. Therefore, proper watering and fertilization can help prevent damage. Fortunately, lawn insects do not often present major problems in Minnesota.

The mere presence of an insect may not be a problem, since not every insect is a pest. Even if the insect is a pest, it may not be present in large enough numbers to cause a problem. Therefore, it is essential to know what insect you are dealing with and what population levels cause damage, the stage or stages and time of year when it is most susceptible to control, and the best methods

to regulate the populations. Insects on lawns should be controlled when they cause damage, not simply because they exist.

Detecting the presence of an insect is the first step in good lawn insect control. Be sure to examine an area of grass that contains living as well as damaged grass plants. Our most serious lawn insects feed on living plants and are not found in dead areas. Insects found in completely dead patches generally are not responsible for the damage.

If the lawn looks wilted and water-starved, a root-feeding insect may be involved. Peel the sod back, examine the roots, and look for any root-feeding pests. Some insects hide in the thatch and then feed on the grass blades. Damage from this type of feeding appears as brown patches when the blades are clipped off. One must search in the thatch to find the insect. Others live on the blades and withdraw the plant's sap. Close examination of the grass blade will reveal this type of pest.

Once detected, the insect should be identified. The following information can help in identifying the most common lawn insects. The insects are listed below according to where they are found. Specific pesticide suggestions can be found in *Controlling Lawn and Turf Insects*, University of Minnesota Entomology Fact Sheet 22.

Root Feeders

White grubs are the larvae of the common May beetles or June bugs that fly to lights in the spring. The adults lay eggs in spring and summer. The damaging grubs are whitish with brown heads. They feed on the roots of the grass, and heavy infestations will loosen sod so that it can be rolled back with a minimum of resistance. The grubs are usually found curled in a "C" shape. Population levels of 3 to 10 grubs per square foot can be expected to produce noticeable damage. Therefore, control is justified when a random check of the lawn shows this level.

The most common species in Minnesota feed on the roots for three years before they reach the adult stage. The first year, grubs are up to $\frac{1}{2}$ inch long and produce little damage. The second year, the grubs range from $\frac{1}{2}$ to $\frac{3}{4}$ inch in length, and damage becomes more apparent. This is the best time to control the grubs since damage usually is not extensive and chemicals will effectively control the grubs. The third year, the grubs grow to one inch or more and damage becomes very apparent, particularly in the hot, dry month of August. Unfortunately, control is not effective at this time since damage is generally complete and the big grubs are difficult to kill.

The best method of control is to examine the lawn at least once a year and treat with a suggested insecticide when 3 to 10 one-half-inch grubs are found per square foot. Getting the insecticide into the root zone is important in successful grub control. This is best

done by wetting the lawn the previous evening, applying a granular form of the insecticide, and immediately watering thoroughly. Do not treat in the fall, as the grubs move down into the soil for the winter.

Bluegrass billbugs, as adults, are long-snouted, ¼-inch, gray-to-black beetles with a strongly tapered abdomen. They can be found walking on hard surfaces in early spring prior to depositing eggs in grass stems. The plump, legless white larvae that hatch first feed on stems and then on available roots. Infested lawns have off-colored, irregularly shaped areas that yellow and finally turn brown in late July. Areas of advanced infestation will peel back, but with more resistance than that found for white grubs. However, these areas can contain individual plants that offer little resistance when pulled.

Billbugs are best controlled in May as the females are laying eggs. Application of an insecticide is suggested about 10 days after adults are sighted. Billbugs, like white grubs, also can be controlled when the larvae are feeding on the roots. About 10 larvae per square foot are considered sufficient to cause noticeable damage. Treatment is not suggested in late July or August, as the larvae complete their feeding and move 1 to 2 inches into the soil to pupate.

Blade Feeders

Sod webworm is the most common blade-feeding lawn pest in Minnesota. The adults frequently are called lawn moths. They are light-colored moths or "millers" that make short, erratic, darting flights. They fold their wings back closely against their bodies when resting. This gives them a very narrow appearance.

The moths lay their eggs in the lawn. The worms hatch from these eggs and begin to feed at night on the grass leaves. Some species damage plant crowns or roots as well as leaves. During the day the worms hide in silk-lined tunnels or burrows at or slightly below the soil surface. When fully grown, the worms are a dirty white to light brown with darker spots and are about ¾ inch long.

Close visual examination of the thatch will detect this pest. Flooding the area with water will force the worms to the surface, where they can be counted. A population of 15 worms per square yard may damage turf seriously. Examinations should be made in June and again in early August, since sod webworms have two generations a year. The lawn should be well-watered a day or so before applying the insecticide; then delay further watering for at least 3 days after treatment.

Aphids or *leafhoppers* are small insects that can be found feeding on the exposed blades. They suck the sap from the plant. Established lawns are seldom damaged. However, new lawns can

suffer from feeding by these sap-sucking insects. Control is suggested for new lawns only.

Greenbugs are aphids that can damage established lawns. The insects are small and yellow to green, and they can be found by sweeping your hand over suspected areas. Greenbugs are carried into Minnesota on southerly winds, so they can show up overnight. Damage is almost always to areas of the lawn shaded by trees or shrubs. Only bluegrass is attacked. Control is suggested when greenbug populations are first noted.

Insects That Live in Grass

There are a few very common insects or insect-relatives that live in grass but do not cause direct feeding damage.

False chinch bugs are about $\frac{1}{4}$ inch long, brown, and generally found in dead areas of the lawn. Control is not recommended since they do not cause damage.

Ants are to be expected in lawns. Their preference for nesting in areas of sparse vegetation can lead one to think that the ants are causing the poor lawn development. This is not true. Ants do not feed on plants and so pose no threat to lawns. Ant control is not justified on the basis of protecting the lawn.

Night crawlers are beneficial and should be tolerated whenever possible. However, large populations can cause lumpiness and, in extreme cases, reduce the value of the lawn for recreation. Vertical mowing can help reduce the lumpiness and also the amount of food available for night crawler development. Pesticide application also can be used to reduce the night crawler population.

Other University of Minnesota Extension Publications on Lawns and Landscaping:

- *Chemical Guide to Insect, Disease, and Weed Control on Turf*—Extension Folder 551
- *Control Thatch in the Home Lawn*—Horticulture Fact Sheet 40
- *Controlling Lawn and Turf Insects*—Entomology Fact Sheet 22
- *Fertilizing the Home Lawn and Landscape Materials*—Soils Fact Sheet 7
- *Fungicides for the Home Garden*—Plant Pathology Fact Sheet 16
- *Ground Covers for Rough Sites*—Horticulture Fact Sheet 27
- *Herbaceous Ground Covers*—Arboretum Review 1
- *Landscaping Minnesota Homes*—Extension Bulletin 283
- *Lawn and Garden Fertilizer and Pollution Problems*—Soils Fact Sheet 15
- *Lawn Diseases in the Midwest*—North Central Regional Extension Publication 12
- *Sodding the Home Lawn*—Horticulture Fact Sheet 35