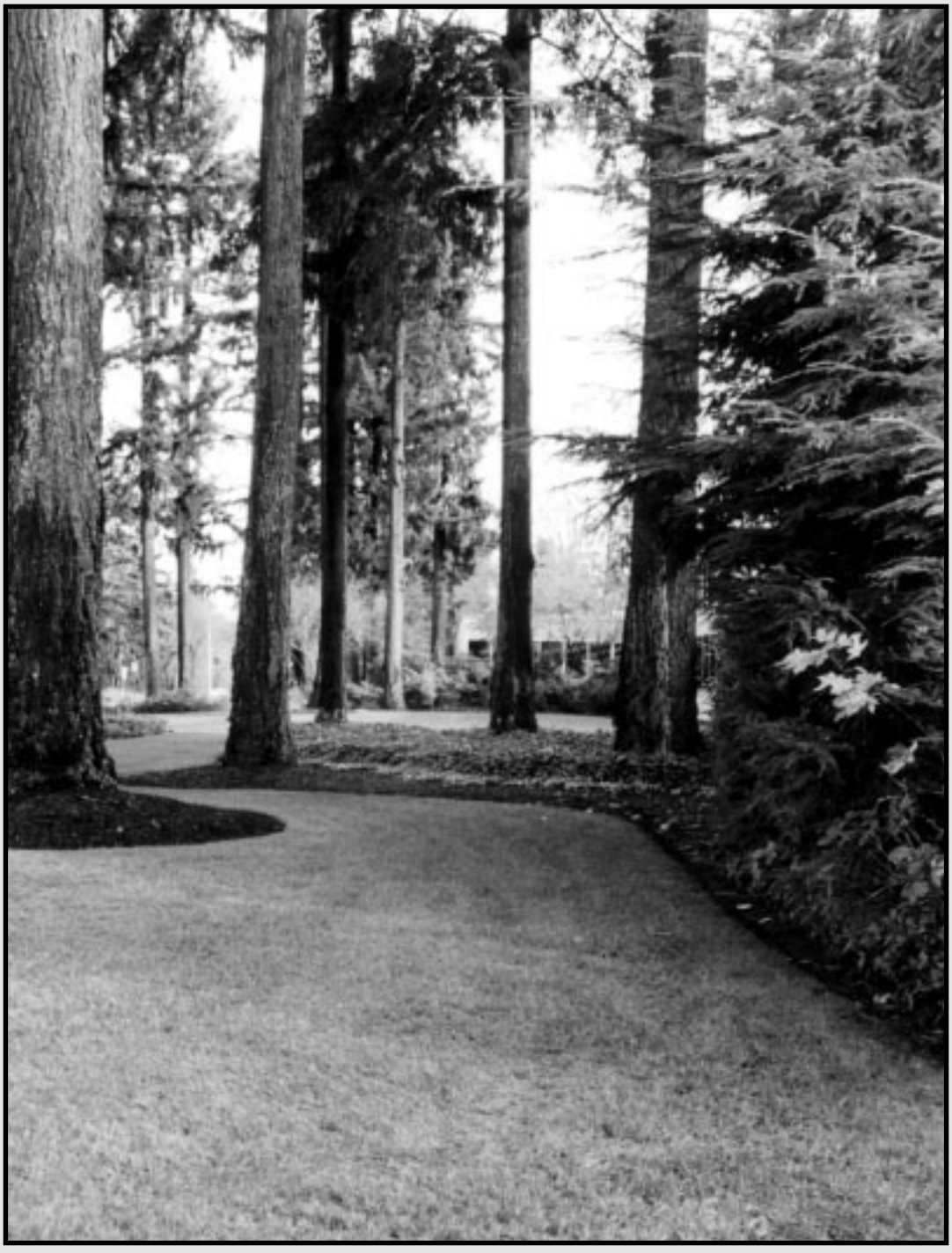

HOME LAWNS

Extension Bulletin 0482

Contents

HOME LAWNS

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Starting a New Lawn

Drainage

A lawn that slopes gently away from the house usually gives the most pleasing effect. On such slopes, surface water drains away from the house. A slope of 6 inches per 100 feet is satisfactory. Lawns may slope much more than this, but on very steep grades they are more difficult to establish and maintain. Irrigation water runoff can be a difficult problem.

You may need to alter your grounds to get a desirable grade. If you need to make major changes, remove about 6 inches of the surface soil and spread it evenly over the area after completing the grading. An uneven subsoil can result in an uneven lawn.

If surface water does not drain away 2 or 3 hours after watering or following rain, subsurface tile drainage may need to be installed to carry away excess or seepage water. Install tiles so there is a uniform fall from 1 to 3 inches per 100 feet in the tile line.

If in grading and leveling you need to raise the ground level around a tree, build a shallow well of brick or stone around it. Be sure to allow for growth of the tree trunk. The roots of the tree need air and should not be covered more than 6 inches deep.

The final grade is set by fixed points such as the curbing, sidewalk or foundation of the house. The finished grade should be approximately one-half inch below these fixed points. After grading has been done and the tile drainage lines set, wet the area thoroughly and allow the ground to settle before the final smoothing operation. Fill the shallow depressions which are certain to develop. Roll the lawn with a standard lawn roller, filled with water to settle soft spots. Continue rolling and raking until the surface is uniform and smooth. This takes a little time, but once the lawn is established, it is difficult and expensive to correct mistakes of hasty preparation. Prior to seeding, rake the lawn to loosen any compaction caused by rolling.

Soils

Many homeowners find that their lawn topsoil is infertile material excavated from the basement or exposed subsoil exposed in the process of grading the site. Should it be hauled away and replaced with good soil? Or, can the soil be improved enough to maintain a lawn? Replacing the soil is usually more expensive than desired. Fortunately, most soil materials can be modified enough to support a lawn.

Soils vary from extremely fine textured, which bake and crack, to coarse sands and gravels, which are low in plant nutrients and dry out rapidly. Soils with high clay contents usually contain more organic matter than sandy soils. This may not be true if the clay is excavated subsoil.

The ideal soil texture for a lawn is a sandy loam. A soil of this type contains 60–70% sand and 30–40% combined silt and clay. If the soil is a natural sandy loam or loamy sand containing as much as 70% sand, no alteration is recommended. If the soil differs much from this texture, it may require special attention. Never add small quantities of sand to a clay soil as concretion may result. Organic matter, such as compost, manure, sawdust, ground bark, peat moss, etc., is more effective in developing better structure in clay soils. Approximately 2 inches of organic matter thoroughly incorporated into 6 to 8 inches of soil may significantly improve the soil structure.

Organic Matter

Addition of organic matter is particularly helpful when lawn soils contain more than 40% or less than 15% silt and clay. While decomposed barnyard manure and compost are very good, they may contain troublesome weed seeds.

If manure is used, water the area thoroughly after the final surface is established and allow any weed seeds to germinate. Use a non-selective herbicide to control the weeds. Plant desired turf seed approximately one week later.

Peat moss, sawdust, straw or other composted materials can be used if thoroughly mixed into the surface 6 inches and do not exceed 20% by volume. The use of fresh sawdust mixed with the soil will require additional nitrogen to prevent nitrogen deficiency.

Rototill any organic material into the surface 4–6 inches of soil. Thorough and careful mixing of this organic matter into the soil is important. Layers or pockets of organic matter will decompose and settle causing an uneven surface. These pockets also serve as habitats for fairy ring and other mushroom-forming fungi and interfere with water movement in the soil causing localized dry spots.

Fertilizers for New Lawns

Before you add fertilizers to new lawn soils, have the soil tested. Ask your county Extension agent about soil testing procedures. If the pH is lower than 5.5 and the calcium content is low, add lime. The most commonly available sources of lime are agricultural limestone, which is principally calcium carbonate, and dolomitic limestone, which is a combination of calcium carbonate and magnesium carbonate. If your soil test reads low in magnesium as well as calcium, then dolomitic limestone would be your best choice. Add phosphorus and potassium if your soil test indicates low for these elements. Ask your county Cooperative Extension agent about the correct amount for the soil or follow recommendations supplied with your soil test report.

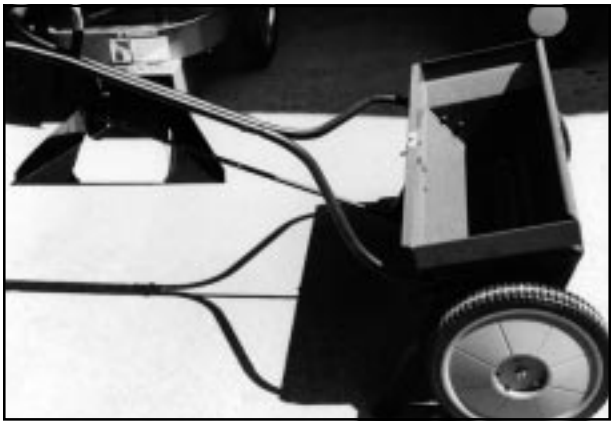
Mix fertilizers into the upper 4–6 inches of soil where soil tests indicate a need. Phosphorus, potassium, and calcium may be lacking in some soils. Nitrogen is necessary for vigorous growth of seedlings and should be added before or immediately after seeding. If both phosphorus and potassium are needed, they may be supplied from 10-20-20 or the proper complete fertilizer to obtain the necessary amount of starter nitrogen. If neither phosphorus nor potassium is needed, apply nitrogen alone at 1 lb per 1000 square feet immediately following seeding. Apply lime only if the soil test indicates a need or if advised by a proper authority.

Seedbed Preparation

After the seedbed is adequately cultivated, graded, leveled, and fertilized, a few important tasks still need to be done: (1) break up or rake away the clods and remove rocks or other trash to make a fine seedbed; (2) roll and rake the seedbed until it is smooth, firm, and settled; (3) thoroughly water the lawn area and wait 1 week for additional settling; (4) re-rake, drag, and roll to create a perfect surface. Loosen the soil surface about $^1/_2$ inch deep before planting.

Seeding

The best time for seeding in eastern Washington is April and May or August and September in this order. April and May are best in western Washington; however, fall seedings as late as October 15 are satisfactory. Midsummer seedings can be made statewide if adequate water is available to induce germination and maintain seedling growth. When seeding during warm,



Typical "drop type" fertilizer spreader suited for nonpelleted fertilizer.

Typical broadcast fertilizer spreader for pelleted fertilizer.

dry, sunny weather, water must be applied in small amounts several times daily to maintain a moist surface. Avoid saturation and mushy surfaces.

Divide the seed in half, spreading one-half in one direction; then spread the other half perpendicular to the first seeding. Use a mechanical seeder or broadcast by hand, rake lightly, and roll. Grass seed should never be covered with more than 1/4 inch of soil. Seeds will not emerge properly if planted deeper.

Organic matter mulches will reduce surface water evaporation and may hasten germination but must be applied uniformly and not more than 1/8 inch thick.

It pays to buy certified seed. Certification insures varietal purity, absence of weeds, and a high germination rate.

Grasses to Plant

Five types of grass (all cool-season grasses)—turftype Kentucky bluegrass, perennial ryegrass, fine-leaved fescues, bentgrasses, and turftype tall fescues thrive in Washington. Some are best for western Washington, others for eastern Washington. (See Tables 1 and 2 for a summary of drought and shade tolerance of cool-season grasses.)

More turfgrass varieties or cultivars have been introduced on the market between 1960 and 1990 than in all other periods of turfgrass management history and more are yet to come. If you are not sure which cultivar to plant for specific purposes, contact your local county Extension agent who will have information on cultivars adapted to your region.

Kentucky Bluegrasses

Kentucky bluegrass is the most commonly used lawn grass in the United States. Kentucky bluegrasses, in general, are not well-adapted to western Washington's soil and climate. They should never be planted in western Washington as monostands (pure Kentucky bluegrass plantings) and when planted should comprise less than 50% of the total seed mixture.

Kentucky bluegrass is well-adapted to eastern Washington's soil and climate and can be planted as monostands or mixtures. In areas of adaptation Kentucky bluegrasses will withstand intensive use on sportsfields and other heavy wear areas, have dark green color, and fill in bare spots quickly once a lawn is established. It is a grass which should be planted in full sun.

Kentucky bluegrasses can be used on sports fields in either western or eastern Washington as mixtures with turftype perennial ryegrasses.

The principal diseases that affect many Kentucky bluegrass cultivars include leaf and stem rusts, powdery mildew, stripe smut, leaf spot, and necrotic ring spot disease.

Turftype Perennial Ryegrasses

Turftype perennial ryegrasses are well-adapted to both western and eastern Washington. In western Washington they may be planted alone or mixed with fine leaved fescues and bentgrasses.

In general, they have greater wear resistance than any other type of grass adapted to this region and can be mixed with Kentucky bluegrass for sportsfields.

Table 1. Shade Tolerance of Cool-Season Turfgrasses

HIGH		
SHADE	TOLERANCE	Fine Fescues (Chewings, creeping, and hard)
		Tall Fescue
		Colonial bentgrass
		Creeping bentgrass
		Kentucky bluegrass
		Perennial ryegrass
LOW		

Table 2. Drought Tolerance of Cool-Season Turfgrasses

HIGH		
DROUGHT	TOLERANCE	Fine Fescues (Chewings, creeping, and hard)
		Tall Fescue
		Kentucky bluegrass
		Colonial bentgrass
		Perennial ryegrass
		Creeping bentgrass
LOW		

Turftype perennial ryegrass is a grass for use in full sun and has a bunch-type growth habit. Overseeding, or seeding over the area at one-half the normal seeding rate, may be necessary to maintain a thick dense stand of grass.

Turftype perennial ryegrasses can be mowed at heights of less than 1/4 inch up to 2 1/2 inches. Some leaf tip shredding may be observed following mowing, but is not a serious disadvantage. Red thread is the most common fungus disease that affects ryegrass lawns. Varietal resistance, proper nutrition, and fungicide applications are used for control.

Fine-Leaved Fescues

Fine-leaved fescues are popular in home lawns because they start growing early and blend well with turftype perennial ryegrasses, bentgrasses, and Kentucky bluegrasses. Most fine fescues are bright green and are well-adapted to shade where light intensity is too low for favorable growth of other cool season grasses. They will not withstand heavy use or traffic.

Red, Chewings, and hard fescues comprise the three major groups used for lawns in the Pacific Northwest. They have lower requirements for nitrogen, water, and mowing than turftype perennial ryegrasses, bentgrasses, and Kentucky bluegrasses. These are truly low maintenance grasses and are the most drought tolerant of the cool season grasses. The fungus disease, red thread, is the most serious disease to affect fescues and can be controlled by varietal resistance, proper nutrition, and fungicides.

Turftype Tall Fescues

Turftype tall fescues have been bred and selected from the coarse bladed tall fescues commonly used for forage grasses. Cultivars adapted for lawns have greater density and finer leaf blades, making them better adapted than the forage types. Although turftype tall fescues do not have the quality as turftype perennial ryegrasses, bentgrasses, and Kentucky bluegrasses, they may be better adapted to poorly drained soils, shady areas, soils with higher contents of soluble salts, and areas that receive minimal irrigation during the summer.

Under irrigated turf management, tall fescues have a high water requirement. Their drought tolerance comes from the deep root system which allows them to pull water from greater depths in the soil. Tall fescue is also a bunch-type grass, like perennial ryegrass, and may require overseeding to maintain a dense stand and crowd out weeds, especially in wet areas west of the Cascade Mountains.

Other Grasses

Do not plant Zoysia, bermuda, dicondra, centipede, carpetgrass, St. Augustine, and mondograss in Washington lawns. These grasses are not adapted to Washington's climate.

Buffalograss, a warm season, low-maintenance grass, is being evaluated for use in central and eastern Washington where soil temperatures are more suitable for its survival. Buffalograss will be dormant for 6–7 months of the year. Several improved seeded types of buffalograss are currently available if the site is suitable for planting buffalograss.

White clover, although not a grass, is sometimes sold in lawn seed mixes. It is susceptible to kill by most common herbicides used for lawn weed control and is usually treated as a lawn weed.

Seeding Recommendations[1]

Western Washington[2]

Any of the following mixtures:

1. Turftype perennial ryegrasses planted as monostands or blends of two or more cultivars seeded at 5–7 lb per 1000 square feet or up to 50% in mixtures with fine-leaved fescues or colonial bentgrasses.
2. Red or Chewings fescue seeded alone at 3 lb per 1000 square feet.
3. Colonial bentgrass seeded alone at 2 lb per 1000 square feet.
4. Colonial bentgrass seeded at 1/2 lb plus 2 1/2 lb of red or Chewings fescue per 1000 square feet.
5. Turftype tall fescues seeded at 6–8 lb per 1000 square feet where recommended.
6. Hard fescues seeded at 3 lb per 1000 square feet.

Eastern Washington

Any of the following mixtures:

1. Kentucky bluegrass seeded alone at 3 lb per 1000 square feet. Two or three blended cultivars are better than any one seeded alone.
2. Kentucky bluegrass seeded at 2 lb plus 1 lb red or Chewings fescue per 1000 square feet.
3. Red, Chewings or hard fescue alone seeded at 3 lb per 1000 square feet, especially in shaded environments.
4. Turftype tall fescues seeded at 6–8 lb per 1000 square feet.
5. Buffalograss seeded at 2 lb per 1000 square feet.

Lawn Maintenance

Buying Fertilizers

Fertilizer recommendations given in this publication are actual amounts of nitrogen, phosphorus, and potash needed. But, fertilizers are never all usable plant food. Fertilizer comes in different forms graded by the amount of available plant food it contains. A fertilizer labeled 10-5-10 contains 10% nitrogen, 5% phosphorus, and

[1]More complete seeding recommendations are available in PNW 0299, *Turfgrass Seeding Recommendations for the Pacific Northwest.*

[2]NOTE: Bentgrasses should not be planted as lawns in western Washington unless the mowing height is maintained below 3/4 inch.

10% potash. Therefore, 100 lb of this will contain 10 lb of available nitrogen, 5 lb of available phosphorus, and 10 lb of available potash.

It works the same way—by percentage—for nitrogen alone. If you want 4 lb of available nitrogen, use 20 lb of ammonium sulfate (21% nitrogen) or 12 lb of ammonium nitrate (33% nitrogen). Slow release nitrogen fertilizers such as urea formaldehyde (UF),38% N, sulfur coated urea (SCU), 31–36% nitrogen, and isobutylidine diurea (IBDU), 31% nitrogen, release their nitrogen over a period of 3 months or slightly longer. They do not readily leach under normal conditions nor burn the grass when applied at recommended rates, although they are more expensive than soluble sources such as ammonium sulfate, ammonium nitrate, or urea.

Using Fertilizers

A healthy turf must be well fed. Adequate nitrogen is essential for a healthy lawn. Phosphorus and potassium are also necessary, particularly when a lawn is established on heavy textured soils such as basement excavations. Turfgrasses are heavy users of potassium. Potassium should be applied in near equal ratios with nitrogen where required and especially if lawn clippings are removed. Ask your county Extension agent about a soil test to aid in proper selection of fertilizers.

Care should be taken to correctly apply the proper fertilizer types according to the soil type, plant needs, and use, as well as precipitation patterns to prevent possible contamination of ground and surface waters.

Fertilizer usage for Washington lawns should be determined by soil tests. In general, eastern Washington lawns need only nitrogen; however, deficiencies of phosphorus and potassium may occur. In western Washington, deficiencies of phosphorus and potassium are common; therefore, fertilizers with a 3-1-2 or 6-1-4 ratio of N-P-K usually give best results. Examples of formulas with a 3-1-2 ratio are: 21-7-14, 15-5-10, 12-4-8, etc. If you wish to apply less phosphorus than that supplied from a 3-1-2 ratio, ask your dealer for formulas containing less phosphate.

Washington lawns should receive 4 lb of nitrogen per 1000 square feet per year whether from a complete analysis fertilizer or from nitrogen alone. Divide this amount of nitrogen into four equal applications to provide the season total.

If the soil is extremely sandy and a quick release fertilizer source is used, it is recommended to divide the 1 lb application rate in half and make two 1/2 lb applications of fertilizer approximately 2 weeks apart to reduce possible leaching of nutrients. This would mean a total of 8 smaller fertilizer applications for the season instead of 4.

For best quality lawns, apply 1 lb nitrogen per 1000 square feet in the fall. For eastern Washington, make this application after the last mowing and before soil freezes. For western Washington, make this application beween mid-November and December 7. When nitrogen is applied in the fall, avoid early spring applications until after April 1 unless nitrogen deficiency is apparent. Better root growth and vigor will be encouraged by this method and will also avoid the flush of growth by annual bluegrass. A suggested schedule is November 15–December 7, April 15, June 15, and September 1 for western Washington; November 1–15, May 1, June 15, and September 1 in eastern Washington.

Sulfur has been found to enhance color and help control certain weeds and diseases in lawns. A moderate rate of 2–3 lb of sulfur per 1000 ft^2 per year is recommended. Try to select a lawn fertilizer that contains sulfur or apply ammonium sulfate twice per year as part of your nitrogen program to receive sufficient sulfur.

A properly fertilized lawn will help to reduce damage from certain diseases (red thread, leaf and stem rusts, and take-all patch disease) and weeds (dandelion, plantain, and clover).

In early spring and late fall inorganic sources of nitrogen such as ammonium sulfate and ammonium nitrate will usually give better results than organic forms. Most sources of phosphate and potash will respond equally well throughout the year. After the soil warms, organic fertilizers such as sewage sludges or plant and animal byproducts work well due to increased microorganism activity in the soil.

Fertilizer Types

Quick release fertilizer types (all nitrogen is released immediately), such as urea, ammonium sulfate and ammonium nitrate, and *slow release* fertilizer types (nitrogen is released over a longer period of time), such as IBDU, sulfur-coated urea, ureaform, and polycoated fertilizers are all available. Slow release products are more expensive to use, but turfgrass growth and color are more uniform over a longer period of time than with quick release types. Quick release fertilizers can result in growth spurts with a lag period between applications. A mixture of the two types of products may yield the best results. These are called "bridge" type fertilizers. Check the label to see what form(s) of nitrogen is used to determine whether fertilizer is quick or slow release or a combination.

A sloped lawn with sandy soil would be a candidate for a slow release type of fertilizer. This would

minimize possible runoff or leaching of nitrates. The turfgrass species, its use and maintenance level will also determine the appropriate fertilizer. In areas that are close to sensitive water sources or on very sandy soils, it would be wise to use a slow release form of nitrogen or small amounts of quick release fertilizers at more frequent intervals.

Lime

Many of the common lawn grasses tolerate a wide range of soil acidity. Strongly acid soils in parts of western Washington may benefit from lime if the soil pH is below 5.5 and the calcium level is below 5 meq/100 g. soil. Under conditions where the lime can be worked into the soil before planting, 100 lb or more per 1000 square feet may be applied if the soil test indicates a need. For established lawns, DO NOT apply more than 35 lb per 1000 square feet per application to prevent lime layers in the thatch.

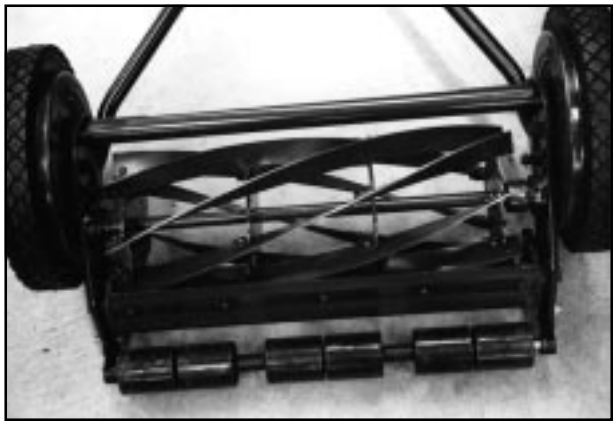
Lime is not a cure-all for lawn moss. Moss is usually caused by neglect of proper fertility and watering practices and lime has little if any effect on controlling this problem. (See EB1096, *The Role of Lime in Turfgrass Management.*)

Mowing

Proper use of a sharp mower can keep a lawn looking neat and well clipped. Dull mowers cause ragged, chewed off grass blades that die back and give the lawn an off-color appearance. For best results with fine-leaved fescues, set the mower at 1.25 to 1.5 inches for western Washington and 1.5 to 2 inches for eastern Washington. Closer mowing will seriously weaken fescue turf. In eastern Washington, Kentucky bluegrass and any seed mixture containing Kentucky bluegrass as a major component are commonly mowed at 2 to 2.5 inches for home lawns. When used for sports turf in eastern Washington, Kentucky bluegrass is mowed at 1.5 inches or lower depending on the athletic use of the turfgrass. Only selected cultivars of Kentucky bluegrass are used as part of the seeding mixture with perennial ryegrass and/or fine fescues in western Washington and are mowed at 1.25 to 1.5 inches.

Colonial bentgrass used for home lawns west of the Cascades should be mowed at less than 0.75 inch in height. If planting colonial bentgrass as a part of a seeding mixture, you may be able to mow as high as 1 inch, but it will tend to build up thatch more quickly. Turftype perennial ryegrasses should be mowed at 1.25 to 1.5 inches west of the Cascades. Perennial ryegrasses are usually used as part of a seeding mixture with Kentucky bluegrass and/or a fineleaf fescue in eastern Washington and should be mowed at 2 to 2.5 inches for the average home lawn. Tall fescues should be mowed at 1.5 to 2 inches west of the Cascades and 2 to 3 inches east of the Cascades.

Do not lower the mowing height of your lawnmower more than 0.5 inch (one notch or setting on your rotary mower) per mowing or you will scalp your lawn causing browning of the grass. Normally this will not kill a lawn, but if your lawn is very thatchy, the scalping or



Reel mowers. (top, bottom photos)

browning will severely stress the lawn making it far more susceptible to damage from both insects and diseases. Do not remove more than 30% of the leaf blade with a single mowing (i.e., if lawn in eastern Washington is 2.5 inches, it should be mowed when it gets to 3.25 inches tall, or if 1.5 inches in western Washington, it should be mowed when 2 inches high). Mowing at regular intervals will promote a healthier turfgrass.

Adjust the mower to the right cutting height, depending on the type of grass. If the lawn is mowed too high, matted thatch will build up at the soil surface. Excess thatch prevents water, air, and plant nutrients from penetrating the soil, can harbor insect populations and may cause the lawn to turn brown.

Table 3. Acceptable Mowing Height Ranges for Home Lawns in the Pacific Northwest.

	Optimum Height Range (Inches)	
Grass	**West of Cascades**	**East of Cascades**
Colonial bentgrass	0.375 to 1	NA
Chewings fescue	1.25 to 1.5	1.5 to 2
Red fescue	1.25 to 1.5	1.5 to 2
Hard fescue	1.25 to 1.5	1.5 to 2
Tall fescue	1.5 to 2	2 to 3*
Perennial ryegrass	1.25 to 1.5	1.5 to 2.5
Kentucky bluegrass	1.25 to 1.5**	1.5 to 2.5

NA not applicable
*assumes improved varieties
**as part of a seed mixture only

Clippings from well-nourished lawns contain moderately high levels of nutrients and when recycled are a good source of fertilizer when left in place. When clippings are not removed, appearance is enhanced by mowing twice weekly or more. Lawn nutrient deficiencies occur more readily when clippings are removed. Excessive clippings should be removed to prevent smothering and disease and for better appearance. Clippings left on the lawn contribute very little to the accumulation of thatch. Newer type mulching mowers hold the clippings under the housing for a longer time and chop the leaf blades into finer pieces for more rapid breakdown.

The type of mower used isn't as important as adjusting the blade to the right height and to achieve proper cutting performance and keeping blades sharp. However, both reel and rotary mowers have advantages and disadvantages.

Reel-type mowers, either hand or power operated, give a positive, smooth, even cut and usually are equipped with a grass catcher. They are difficult to sharpen at home. Rotary-type power mowers are usually less expensive than reel-type power mowers. They are effective in rough areas and in taller grass and weeds. The cutting blade is easy to change and sharpen. However, rotary mowers may not cut as smoothly as reel mowers even when sharp. The cutting action can bruise grass tips and cause them to turn gray or brown. Some rotary mowers are not adapted to grass catchers. Observe the manufacturer's recommendations for safe and proper operation.

Thatch Removal

Proper mowing will cut down on the need for thatch control. However, if thatch accumulates at the soil surface more than 1/2 inch, remove it since it prevents proper penetration of air, water, and plant nutrients.

Many different machines are available for thatch removal. It is usually more practical to rent than purchase a machine unless large areas are involved. More recently, inexpensive thatch attachments have been developed for rotary mower blades that perform satisfactorily where thatch is not excessively thick. Hand rakes are laborious and do not do as good a job as power equipment.

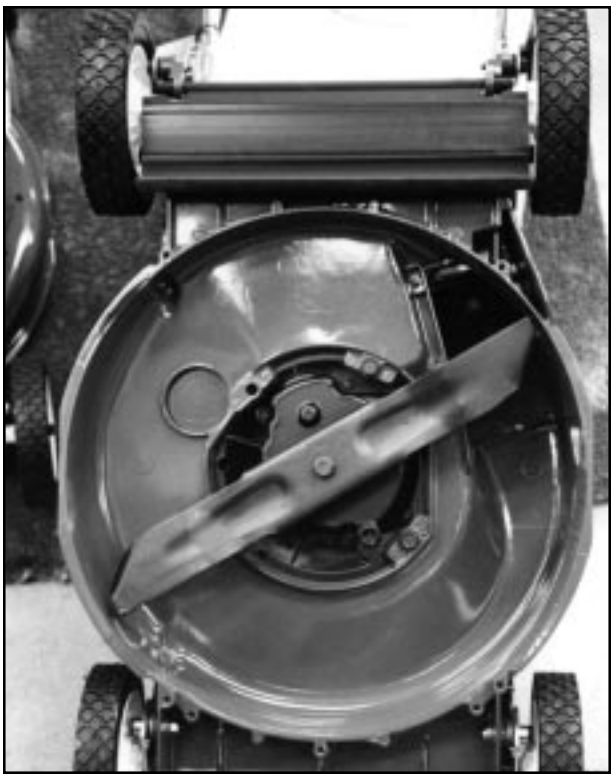
For best results remove thatch from February through April or in late August in western Washington, and as early as the snow is gone and the frost is out of the ground or in late August in eastern Washington. The turf must be able to fill in rapidly in order to prevent weed invasion. If deep thatch layers are to be removed, do not try to do so in a single pass, but make repeated passes in different directions and lower the thatch machine at each new pass. It may be necessary to reseed the lawn after heavy thatching, which may result in thin or bare areas and some tearing. Overseeding is accomplished by using half the seeding rate recommended for establishment of the lawn. Follow the same directions given earlier in this publication for seeding.

Soil Aeration

If your lawn is hard and compacted, aerifying will open the soil and allow better water and air penetration. You can spike the surface with a solid tined fork or you can rent a power aerifier machine. Hollow tine aerifier machines remove cores of soil 1/4 to 1 inch across and about 3 1/2 inches deep. Solid tine aerifiers can go as deep as 12 inches (vertidrain) and the water injection aerifier can penetrate a stream of water approximately 6–8 inches in the soil depending on soil texture. Aerify when the soil is moist, but not saturated. Hollow tine aerifiers will not penetrate dry soil, whereas the deep solid tine aerifiers will penetrate dry soil.

Thatch attachment for rotary mower.

Power rakes. (middle, bottom photos)



Rotary mowers. (top, bottom photos)

Watering

Improper watering is a major cause of unsightly or damaged lawns. Light, frequent sprinklings encourage shallow rooting of turfgrasses. Shallow rooted turf cannot withstand sudden changes in temperature or soil moisture. Overwatering can cause soggy conditions and may (1) leach plant nutrients, especially nitrogen; (2) encourage weeds such as speedwell, buttercup, and annual bluegrass; and (3) cause oxygen starvation of the grass roots. Use a small soil tube, spading fork, or shovel to determine soil moisture conditions before watering. Irrigate when the top 2 inches become dry and crumbly and irrigate to at least 12 inches deep if the soil is that deep. The best time to water for most efficiency and to limit disease is early morning, i.e., 4 a.m. For areas that can't be watered in early morning hours, irrigation should begin as late at night as possible, i.e., 11 p.m., to limit the time leaf surfaces would remain wet and therefore still help limit disease development.

Lawn soil textures of sandy loam or heavier do not ordinarily require irrigation more frequently than once weekly. Light, sandy soils may require irrigation more frequently. Irrigate according to plant type, soil texture and depth.

Wetting Agents

Localized dry spots can develop in lawns. These may be caused by high surface tension that develops in dry thatch, water runoff from high spots, steep grades, or from hydrophobic (water repelling) soils. Wetting agents (surface active agents) are commonly available at garden stores and will significantly improve surface infiltration when properly used. Use only non-ionic organic wetting agents. Do not use household detergents. Wetting agents are of little value on severely compacted or cemented hardpan soils.

Disease Control

Several diseases affect turfgrasses in Washington. Most of these are caused by fungi that attack the roots and shoots. A few, such as leaf rust and powdery mildew, attack only the leaves. Cultural practices can influence development and severity of diseases. Some of the practices that go into making a beautiful lawn, such as high nitrogen fertilization and watering, can also provide conditions favorable to the development of disease. Sulfur fertilizer applications on the other hand are particularly helpful in reducing several disease problems.

Successful disease management begins with planting the appropriate type and variety of grass. Varieties that are resistant to all the potential diseases and have the desirable horticultural characteristics to make an ideal lawn do not exist. However, disease severity can be reduced by selecting mixtures of varieties that are adapted to and have some level of resistance to the most common and/or distinctive diseases for a specific area.

The key to managing diseases on established turf is knowing what disease(s) is(are) present.

Symptoms and control measures for some common lawn diseases in Washington follow. EB0713, *Diseases of Turfgrass*, describes in detail these diseases, and EB0938, *Disease Control in Home Lawns*, presents current fungicide recommendations. Another information source is the Hortsense website at http://pep.wsu.edu/hortsense. Publications specific to some diseases are available at your county Cooperative Extension office.

Fusarium patch is common on bentgrasses and annual bluegrass in both eastern and western Washington, but can also occur on other grasses used for lawns. It appears as small, round, tan to brown patches 2–12 inches across. Under conditions favorable for disease these patches can coalesce into large irregular areas of affected turf. The disease develops most rapidly in cool, moist weather and is usually found during fall and spring. For more details, see EB1108, *Fusarium Patch of Turf*.

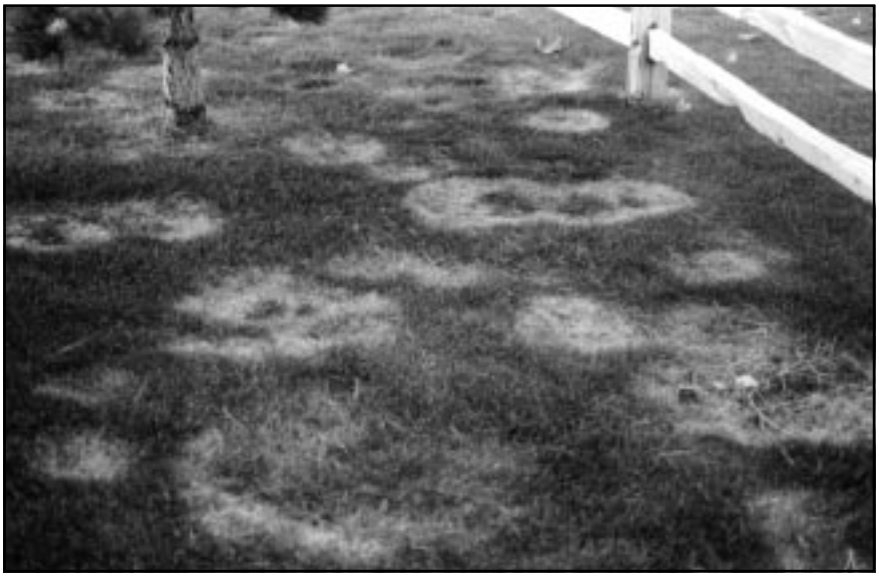
CONTROL

Avoid excessive nitrogen fertilization and use a balanced 3-1-2 or 6-1-4 ratio of N-P-K. Use ammonium sulfate as the nitrogen source, or apply sulfur at 2–3 lb per 1000 square feet per year in two to four equal applications. Promote air and soil drainage to reduce high moisture. Apply fungicides if necessary during "fusarium weather."

Leaf rust or stem rust commonly occurs on many of the Kentucky bluegrasses and appears as yellow, orange, reddish, brown, or black powdery spots. It often forms as a result of heavy dews during warm weather.

CONTROL

Check with local Extension personnel or your area Extension turf specialist for suggested turf species and varieties to grow. Use mixtures with at least one variety being resistant to rust. The rust-infected portion of actively growing leaves moves upward where they can be mowed and removed. Thus, applications of 1 lb of nitrogen per 1000 square feet when conditions are suitable for growth combined with mowing will help the



Typhula snow mold.

turf recover more quickly from rust. Maintaining a balanced fertility program and watering infrequently, but thoroughly, to a depth of 8–12 inches during dry periods will also help to reduce the development of rust.

Red thread occurs most often on fescues, ryegrasses, and bentgrasses during the cool, wet periods from fall until spring in western Washington and in late summer and early fall in eastern Washington. For more details, see EB1016, *Red Thread Disease of Turfgrass*.

Diseased areas of lawns may vary in size and shape and appear scorched. As the grass tips die they change from green to pink to brown and finally bleach to a light tan. During moist weather the fungus produces characteristic red threads or strands on the dead blades of grass. The strands are about 1/4 inch long and pink to light red.

CONTROL

Maintain a balanced fertility program using a 3-1-2 or 6-1-4 ratio of N-P-K. Follow the fertilizer recommendations described in a previous section. The fall and winter applications are most important for minimizing red thread problems. Maintain adequate levels of calcium. Mow frequently and do not allow the turf to become excessively dry. Apply fungicides if necessary.

Damping off is a disease of young seedlings in newly seeded lawns and is caused by several different fungal organisms. In one situation, the disease is favored by prolonged periods of cold, wet weather after the grass seed is planted. Seedlings collapse at the soil line and wither. Very warm, humid weather, not common in Washington can also favor damping off disease.

CONTROL

To prevent serious damping off problems, prepare a good seedbed, avoid overwetting, use fungicide treated seed, and do not plant in cold or very warm weather. If damping off develops, spray or drench with appropriate fungicides.

Powdery mildew may become severe on bluegrasses in eastern Washington under mild, humid conditions, particularly on areas where shade is a problem. Mildew appears as gray, white, powdery masses on leaves and stems. Severely affected leaves may turn yellow and die.

CONTROL

Reduce shading and improve air circulation. Use a moderate rate of a balanced fertilizer. Water in the morning and mow frequently at the higher recommended height. Red or Chewings fescues are recommended for shady areas.

Take-all patch occurs on bentgrass turf and is often more prevalent in western than eastern Washington. It produces brown to gray circular dead spots 4–36 inches across. The spots are quickly invaded by weeds. It is most noticeable in late spring and summer. See EB0939, *Ophiobolus Patch Disease of Turf*, for more details.

CONTROL

Avoid over-liming and water-logging the soil. Use ammonium sulfate or other sulfurbearing materials in a balanced fertilizer program. Two pounds of sulfur per 1000 square feet per year from all sources is satisfactory. Usually sufficient sulfur is obtained when two or more applications of ammonium sulfate per season are made at 1 lb of nitrogen per 1000 square feet per application.

Necrotic ring spot disease is found on Kentucky bluegrass turf growing in both eastern and western Washington. It is most commonly seen on 2- to 5-year-old turf established from sod, but also can occur on seeded turf. See EB1734, *Managing Necrotic Ring Spot on Turfgrass in the PNW.*

Dead rings and arcs up to several feet in diameter appear during the spring and fall in eastern Washington, and most of the year on the western side of the state. Weeds and sometimes unaffected bluegrass often invade the central dead area of these rings.

CONTROL

Avoid overwatering and overfertilization. Keep thatch under control. Although not commonly available to home owners, professional lawn care companies can apply a fungicide which is effective in controlling this disease. See EB1734.

Fairy rings are caused by several mushroom fungi. Rings or circles of dark green grass appear in a lawn and gradually grow larger. Inside this ring there is often a second ring of dying or dead grass—although the grass in the center may be normal. Sometimes mushrooms grow in the edge of the ring.

CONTROL

Keep the turf well fertilized. Daily soaking of the affected area with water for 1 month will help to reduce fairy ring. To be effective, the water must penetrate the ground. It may help to punch holes in the soil in the affected area and use wetting agents. Fungicides labeled for control of fairy ring generally only provide approximately 60 days of control.

Typhula snow mold commonly affects lawns in eastern Washington subjected to prolonged snowcover. It occasionally can also develop during the cool, wet periods from late fall until early spring. It attacks bentgrass, fescue, and perennial ryegrass lawns. Kentucky bluegrass resists this disease. Heavy use of nitrogen fertilizer favors development of the disease. Diseased turf appears as irregular bleached areas soon after the snow melts. The fungus forms small, tan to black, seed-like bodies in the dead leaf sheaths.

CONTROL

Follow fertilizer recommendations previously discussed for fall application. Ammonium sulfate is a good source of nitrogen for fall application. Using the manufacturer's recommendations, apply recommended fungicides in fall after the grass stops growing.

Weed Control

Chemical control is a selective tool which can be used to eliminate weeds. Weed killers can kill many plants, although when used properly, they do not harm grass. See EB0607, *Weed Control in Lawns*, for more details. Identify the weed before applying any herbicide. Read the label on the weed control product carefully.

Use the amine form of herbicide if there is a choice. Apply with care. Spray on a calm day and direct the spray away from flowers and shrubs. Do not soak the weeds but cover them uniformly. Water the lawn as recommended on the label after application of the herbicide. Do not apply herbicides to lawns if the temperature is over 80°F.

Insect Control

Various insect pests attack lawns. Insecticides will control most species commonly encountered.

Keep children and pets off the lawn for 1 day, or as label instructs, after applying insecticides.

Because insecticides must penetrate the turf to control root-feeding insects, it may be several days or longer before insects are killed and the grass begins to recover from the injury. In a heavily thatched lawn, a prior treatment with an aerator may help penetration.

Due to the continual change of home insecticide products, specific product names are not listed in this publication. Current pesticide recommendations can be obtained from your local county Extension office's copy of the *PNW Insect Management Handbook,* which is revised annually.

Ants are more of an annoyance when they take up residence in a lawn than they are a lawn pest. Controlling them is difficult. Broadcast treatments with the more commonly available short residual materials are usually ineffective or, at best, only temporary in effect. If the nest can be located, however, then such materials can be effective if the nest is thoroughly and totally saturated.

Lawn billbugs cause damage to lawns both as grubs and adults. The grubs cut off the roots just below the ground and the adults rip and shred grass stems. Kentucky bluegrass lawns are severely damaged while bentgrass has not been damaged. It is an eastern Washington lawn problem exclusively since it has not yet been detected in western Washington. You can obtain some control by applying insecticide when the damage is first noted and when grubs are present, but for best results, make the application in late May or early June to kill the overwintering adults before they have laid their eggs.

Chinch bugs suck juices from the grass plants and inject a toxin into them. The turf turns yellow and dies in large areas. Damage is associated with summer drought and may be confused with drought damage, including that brought about by excessive thatch accumulation. Shaded turf areas are less damaged. Areas damaged by chinch bugs will not become green again after rains or irrigation.

To find out if chinch bugs are responsible for the damage, dig a section of turf at the edge of the damaged area where the grass is becoming discolored. Place the turf in a plastic bag, seal the bag, and place in a warm area. Any bugs present will soon leave the turf and be seen on the plastic. Or, place the turf section in a container of water. The bugs will shortly float to the surface.

Proper watering reduces turf stress and also encourages development of a fungus which parasitizes chinch bugs. EB1090, *Watering Home Gardens and Landscape Plants*, available from your county Extension office, gives advice on proper watering.

Cutworms are not usually a lawn problem, but you may experience difficulty with them in the lawn as an overflow from either resident or surrounding weeds. Weeds are the preferred host as a rule of many cutworms; therefore, good weed management will prevent most cutworm problems. Insecticide control is usually only effective when cutworms are tiny to half-grown. As mature cutworms, they are virtually impossible to kill with insecticides and you are reduced to killing them mechanically when and if you can find them.

European crane fly larvae, or leatherjackets as they are sometimes called, feed occasionally in home lawns. They have been documented in western Washington, British Columbia, and down into parts of California, west of the mountains. They have been found in several places in eastern Washington as well. Damage is usually temporary and lawns regrow easily. Weed invasion is a threat, however, so chemical treatment may be advisable after monitoring larval populations. If you suspect that you have a crane fly problem, it is important to determine the level of infestation. Monitor the lawn in February or March, and consider treatment if larval numbers exceed 25–30 per square foot. If you have had serious previous infestations or missed the spring application, monitor larval populations in mid-November to December, when larvae are about $^3/_8$-inch long. If populations exceed 25–30 per square foot at that time, then apply treatment. NOTE: Do not treat in the fall if an effective treatment was made in the spring. Two applications per year are unnecessary.

To monitor crane fly populations, survey the turf area in early spring (February or March) or when temperatures are consistently warmer. Select three or four random spots 6 inches by 6 inches (0.25 foot^2) in the lawn. Dig up the top layer (1 to 2 inches) and tear apart samples to count the larvae. Larvae will usually be located at the base of the vegetative layer (thatch) or in very shallow spots in the soil. Multiply the number of crane fly larvae you find in each sample by 4. If this number exceeds 25 per square foot and the turf is thin, consider a chemical control. If the lawn is generally unthrifty, treatment at lower levels (10–15 larvae per square foot) may be necessary. Healthy lawns that have had best management practices applied have been known to have 40 larvae per square foot and still not show any damage.

If sampling is done by a professional turfgrass manager, use a 4 inch-diameter cup cutter in three or four random spots. Pull cores 1 to 2 inches deep and tear them apart to count larvae. Multiply the number of crane fly larvae found in each core by 11.5 to give you the number of larvae per square foot.

When unusually warm weather persists early in the year, be watchful for early crane fly feeding (see http://pep.wsu.edu/hortsense/ and click on Lawn and Turf). Biological control with insect-eating nematodes will suppress populations, but will not eliminate them. If well established lawns are properly cared for, chemical treatment is rarely needed.

Sod webworm or lawn moths are a problem in many grasses of eastern Washington. It is not normally a problem west of the Cascades unless it becomes very dry and watering programs diminish. It can also become a

problem where bentgrass is prevalent. This is related to the stress of thatch associated with bentgrass.

White grubs are the larvae of small scarab beetles related to the June beetles. They feed on the roots of grass to the extent that large pieces of lawn can be lifted freely from the ground. They can be very destructive to golf courses and lawns. Fortunately, they are not very common at pest levels.

Yellow Jackets

CONTROL

There are materials containing aerosol formulations of insecticides which can be propelled for distances of 20 feet. Use according to label instructions. These rapidly kill subterranean colonies. After treating, *do not* plug the entrance hole. Returning foragers will then enter the nest and be killed by the insecticidal residue.

NOTE: For more indepth information on many of the pests mentioned, you can obtain the following publications—relevant to your needs—from your county Extension office.

EB0643, *Yellow Jackets and Paper Wasps*
EB0929, *Thatching Ants*
EB1224, *Lawn Billbugs*

Bee Warning

Many insecticides are highly toxic to honey bees, bumble bees, and other wild bees. Diazinon and Sevin are particularly hazardous to bees. They should not be used where bees are obviously foraging on blooming weeds or flowers.

Simple steps like removing (mowing) blooming clover should always be taken before applying materials hazardous to bees. Avoid using dusts if possible. Sprays are preferred for bee safety.

▲**Warning**. Use pesticides with care. Apply them only to plants, animals, or sites listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

College of Agricultural, Human, and Natural Resource Sciences

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EB0482