

*Cool-Season Grasses***Lawn Establishment and Renovation**

Establishment of turfgrass brings beauty to any landscape. While preparing an area for turf, do not hurry the process. Mistakes made at that time will be evident later and ultimately will cost extra in time and labor. The success of a beautiful turf is dependent on many factors, including initial soil preparation.

Preparation of the site

You may not need to follow all of the above steps to establish your lawn. For example, the soil need not be completely tilled where grading and soil amendments are not required and when soils are not excessively compacted.

Once soil has been tilled, considerable time and effort are required to prepare a firm, granular seedbed. Where surface grade and soil physical conditions are acceptable, lawns can be reestablished with minimal effort by killing the existing undesirable vegetation and incorporating seed into the surface. (See lawn renovation section.)

Regardless of how the site is prepared, the seed must be incorporated into the top quarter-inch of soil. On loose, bare soils, this can be done easily by lightly raking the seed into the surface. On hard, compact soils or soils with existing vegetation and thatch, the seed should be mechanically incorporated into the soil by verticutting, slit-seeding or intense coring. Scattering seed on the surface without incorporation is a waste of time and money.

Soil testing

Have the soil tested to determine the lime and fertilizer requirements to ensure good turfgrass establishment and future growth. The test results provide your soil pH value and indicate if lime will be required. A soil pH between 6.0 and 6.8 is optimum for turfgrass growth. When pH is optimum, other nutrients such as nitrogen, phosphorus and potassium are readily available from the soil for plant uptake. Lime is used to raise

General steps to turfgrass establishment

1. Obtain a soil fertility test and fertilizer recommendations. See MU Extension publication G6954, *Soil Testing for Lawns*. The MU Extension Soil and Plant Testing Laboratory can test your soil; for details, call 573-882-0623 or visit the lab on the Web at <http://soilplantlab.missouri.edu>.
2. Rough grade.
3. Apply lime if needed.
4. Apply fertilizer as recommended by soil test.
5. Apply organic amendments if needed.
6. Till materials listed above into top 4 to 6 inches of soil.
7. Perform finish grading.
8. Apply starter fertilizer, and work it into top inch of soil.
9. Apply seed.
10. Rake or drag to cover seed lightly.
11. Roll lightly.
12. Mulch.
13. Water.
14. Mow.
15. Control weeds.

soil pH, and sulphur is used to lower pH. Phosphorus and potassium needs, if any, will also be indicated on the soil test report. Phosphorus is especially important for root development and seedling establishment. Phosphorus is most effective when incorporated into the top 4 to 6 inches of the soil because it moves downward slowly.

Soil testing and sample boxes may be obtained from your local MU Extension center for a nominal fee. Send soil for analysis two months before your planting date to allow sufficient time to receive fertilizer recommendations and purchase the appropriate materials.

Soil preparation

Proper grading for surface drainage and conserving or developing topsoil will lead to easier care of your lawn in the years to come. Push aside existing

Credits

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topsoil when construction or excessive grade changes are required. Topsoil will be evenly spread over the site once the rough grading is completed.

When building a new home where a basement or foundation is dug, insist that the excavated subsoil not be combined with the existing topsoil. Trees, shrubs, groundcovers and lawns never develop to their full potential in poor-quality subsoil. The initial investment in retaining on-site topsoil or amending poor-quality soils will avoid the agonizing replacement of plants that could not tolerate the poor soil environment.

The area should be rough graded with gentle slopes to adequately drain or divert surface water without erosion. Slopes with a 1-foot drop in 50 feet should be adequate, but slopes should not exceed a 1-foot drop in 15 feet. The finished grade should slope away from the foundation. On sites where topsoil is added over subsoil, be sure that the finished grade is at least 3 inches below the top of the foundation of basement homes. Surface runoff can cause basement flooding if water runs over the basement foundation. Remove all debris such as large stones, tree roots and discarded construction materials that will interfere with turfgrass root growth and water movement through the soil.

Liming and fertilizing

Apply the required amount of lime, phosphorus and potassium recommended on the soil test report for establishing a lawn. Where a soil test is not available, and if soils have required liming in the past but have not been limed for at least two years, apply 25 pounds of finely ground limestone per 1,000 square feet. Also apply 5 to 7 pounds of 0-46-0 phosphorus fertilizer per 1,000 square feet. Phosphorus is not very mobile in the soil and should be incorporated in the root zone — the top 4 to 6 inches of soil — during this step. Nitrogen and potassium are highly mobile in the soil and easily can be distributed by surface application.

Thoroughly till the lime and fertilizer materials into the surface 4 to 6 inches of soil. Do not exceed 3 pounds of 0-46-0 fertilizer per 1,000 square feet if nutrients are not to be incorporated into the top 4 to 6 inches of soil. These practices are aimed at building the basic soil fertility to an acceptable level.

Broadcast and work into the top inch of soil 5 pounds of 20-27-5 or 19-25-5 fertilizer or 10 pounds of 10-24-18 fertilizer, or the equivalent, per 1,000 square feet. The fertilizer should be turf grade and contain 30 percent or more of the total nitrogen as water-insoluble or controlled-release nitrogen. Application at the recommended rate should provide adequate nutrition for the first three months of growth.

As an alternative starter fertilizer, apply 10 pounds of 10-10-10 or 12-12-12 farm-grade (soluble nitrogen) fertilizer or equivalent (for example, 5 to 6 pounds of 20-20-20 fertilizer) per 1,000 square feet. Using nitrogen fertilizers that contain only soluble nitrogen will

necessitate additional nitrogen after six to eight weeks of growing weather.

Soil amendments

A soil test will indicate if organic matter is required. Organic matter, such as peat moss or compost, can be added to clay soils to improve drainage and aeration. The same organic matter can be added to sandy soils to help hold water and nutrients in the soil. Fresh organic matter, such as manure, straw or fresh sawdust, is not usually recommended because it can cause a temporary nitrogen imbalance that will lead to slow growth and grass yellowing.

Reed-sedge peat and moss peat are also good sources of organic matter and tend to last longer in the soil than most other organic matter sources. Organic matter should be worked into the top 2 to 4 inches of soil before applying the starter fertilizer.

Final grading

Rake the area to the finish grade just before seeding. Light rolling will indicate any low spots or other irregularities to the area. A proper final surface will be firm enough to prevent ruts made by seeding equipment but will be loose and crumbly so that seed can be raked easily into the top quarter-inch of soil. Once these steps have been properly followed, you are ready to install a turf by seeding or sodding.

Installation of turf

When to establish

Selecting the right time of the year to seed cool-season grasses is the most important factor in successful lawn establishment. The best time to seed cool-season grasses is between Aug. 25 and Oct. 10. Lawns seeded within a week of Labor Day are more likely to fill in completely by winter and produce a thicker appearance the following spring than lawns seeded in October.

Seeding in late summer is preferred because temperatures are still warm enough to promote rapid germination when accompanied by rain or irrigation. The cooler temperatures and shorter days of the approaching fall are ideal for further growth and development of young seedling grasses.

Establishing cool-season grasses from seed in the spring can be extremely difficult. In some cases, complete failure should be expected. The rainfall or watering required to germinate turfgrass seeds during spring establishment also promotes excessive weed growth, especially crabgrass. If you are lucky enough to beat the crabgrass, expect to continue the battle with frequent summer irrigations to prevent moisture stress. Even if moisture is adequate, summer temperatures may severely thin or completely kill seedling turf. The constant summer watering required by seedling turf

will also increase the chance of Pythium damping off and brown patch. Both of these fungal diseases are encouraged by the same conditions that promote seedling growth — wet soils, frequent watering and summer nitrogen.

Sod of Kentucky bluegrass or tall fescue can be installed during most of the year except in mid-winter when the ground is frozen. When extreme heat and drought conditions exist in summer, sod should be cut and laid during a 12- to 24-hour period. If done under drought conditions, the turf must be kept moist and cool. The soil should be watered enough to cool it before installation. It should be thoroughly watered again immediately after the sod is laid.

Seed vs. sod

A quality lawn containing the recommended mixtures of specific grass varieties and species can be established with either seed or sod. Seeding, however, offers many more species and varieties from which to select. Most sod grown in Missouri is straight Kentucky bluegrass or a mixture of mostly tall fescue combined with a small amount of Kentucky bluegrass. Some tall fescue sod is also available on plastic netting.

Initially, seed is less expensive than sod. However, successful establishment is more risky with seed than with sod, and if reseeding of certain areas or even an entire lawn is necessary, the overall expense may be lower with sod. Also, the area is exposed to erosion because of the time required for seed to germinate and become well rooted in the soil. Sodding practically eliminates such problems, a consideration that may be especially important on steep hills or banks. Sod also reduces the chance of pesticide and nutrient contamination from surface runoff.

Sodding provides an immediately pleasing turf that is quickly functional, and it will compete with viable weed seed already present in the soil. Seeding usually requires weed control during the first year of establishment.

Seed should be used to establish lawns only in early fall or early spring, whereas sod may be established in nearly any season. Sodding of cool-season grasses in the spring is preferred to seeding.

Seeding

Before seeding, be sure that the soil has been prepared properly and is smooth and level.

Seed small areas by hand. A fertilizer spreader can be used in larger areas. When seeding by hand, try to apply 5 to 10 seeds per square inch. Heavier seedings will cause weak, spindly seedlings and spotty establishment. Calibrate spreaders to supply half the amount of seed in one pass over the area. Divide the amount of seed to be sown into two groups. Spread the first group of seed. Then spread the second group at a right angle to the first group.

Rake the seed to cover it with $\frac{1}{8}$ to $\frac{1}{4}$ inch of soil. Roll lightly to make good contact between seed and soil. Use a light layer of straw as mulch — one to one and one-half bales per 1,000 square feet. This helps hasten germination, keeps soil moist and protects young seedlings. The soil should remain moist from the surface to just below the active root zone.

At first, this moist zone will be shallow and require light, frequent irrigation. Use a fine spray to sprinkle seeds one to four times per day until young seedlings are established. As the grass develops, irrigate deeper and less frequently. Always avoid puddles and runoff.

Sodding

Sodding is the installation of commercially grown turf. Sod has a carpetlike appearance consisting of green shoots attached to roots and soil. It usually comes in 18-inch wide 3-foot sections with less than $\frac{1}{2}$ inch of soil attached.

Sodding has the advantage of almost immediate establishment, but its disadvantages are initial cost and the high amount of labor involved.

Choose high-quality sod that is actively growing. Sod is perishable and should not remain on the pallet or stack for more than a few hours. The presence of mildew and distinct yellowing of the leaves is usually good evidence of reduced turf vigor from being stacked too long.

To lay the sod, start with a straight edge such as a driveway or sidewalk. Unroll sod pieces tightly against each other, but don't overlap. Lay the pieces in a staggered, bricklike pattern. Using a sharp knife, cut pieces to fit curves or small areas. After the sod has been laid, roll it to ensure good contact with the soil. Be sure to water thoroughly, and water every day during dry, warm weather. However, avoid soggy situations.

Watering

Newly seeded or sodded lawns require special irrigation. A newly seeded lawn requires daily watering and may need as many as four light waterings in a single day if conditions are dry and windy. Keep the seedbed moist, but not saturated, to a depth of 1 to 2 inches until germination occurs (green cast to lawn and seedlings $\frac{1}{4}$ to $\frac{1}{2}$ inch tall). At this stage, it is crucial that seedlings not be stressed to the point of wilt.

Continue to water one to four times a day with light applications, about $\frac{1}{8}$ to $\frac{1}{4}$ inch of water per day. Straw applied at the time of seeding helps to shade the soil and to prevent rapid drying of the soil surface. It will also reduce soil erosion and seedling damage from the force of large sprinkler drops.

Watering with a light mist is best for establishing new lawns. As seedlings reach 2 inches, gradually reduce the frequency of watering and water more deeply. Begin mowing once a week when the seedlings reach a height of 3 inches. After the new lawn has been

mowed two or three times, water deeply and infrequently. See MU Extension publication G6720, *Home Lawn Watering Guide*.

Newly sodded lawns may require watering one or two times a day. Begin irrigation immediately after laying sod. Plan your sodding operation so that a section of laid sod can be watered immediately while other areas are being sodded. Water sod enough to wet the sod strip and the top inch of soil below the sod.

The first irrigation requires about 1 inch of water to achieve complete wetting of the sod. After watering, lift up pieces of sod at several locations to determine if it has been adequately irrigated. Continue watering one to two times a day or as needed with light irrigations to prevent wilting and to ensure a moist soil just below the sod layer. As sod becomes established and roots penetrate and grow in the soil, gradually reduce the frequency of watering but wet the soil deeper. After sod has been mowed two or three times, water deeply and infrequently.

During hot, windy conditions, establishing sod may require several light mistings per day to prevent wilt and potentially lethally high temperatures. In this case, mist the sod lightly just to wet the leaf surface and not to supply water to the soil. Misting cools the grass plant as water is evaporated from the leaves.

Do not overirrigate the soil because that will inhibit sod roots from growing into the soil. In situations where daily watering is not possible, thoroughly water the sod and soil to a depth of 6 inches. This will delay the rooting time of sod but will reduce the chance of rapid drying and severe loss of grass.

Control weeds

Spring seeded cool-season grasses

Even though spring seeding of cool-season grasses is not as successful as fall seeding, spring and early summer seeding may be unavoidable. The following tips may help your attempt to establish cool-season grasses.

Seed as early as possible. In Missouri, wet spring conditions may prevent using equipment, especially on construction sites. Prepare soil and spread seed in February or March if conditions are dry. Seeds will lay dormant until warm April temperatures cause germination.

Consider using a slit seeder or drill that causes minimal surface disturbance. This reduces competition from weed seeds that may be brought to the surface with complete tillage. These types of seeders are available from rental services or lawn-care professionals.

Competition from crabgrass is a major problem with spring seeding, especially when the lawn is seeded with mostly Kentucky bluegrass. Siduron (Tupersan) is the only preemergent crabgrass herbicide that can be used with new spring seedings, and it

Table 1. Cool-season grass seeding rates.

Turf type	Higher — spring seeding rate (pounds per 1,000 square feet)	Normal — fall seeding rate
Kentucky bluegrasses	3	2
Perennial ryegrass	10	7
Tall fescue	10	7

will not harm the planted turfgrasses as they emerge. It should be applied as the final operation after seeding and before crabgrass germination. If lawn grasses are seeded in February or March, wait until early April to apply siduron so that crabgrass control will last longer into the summer. Shaded areas of the lawn do not need crabgrass control.

After three or four mowings, usually at least a month after grass emerges, apply a label-recommended rate of a broadleaf herbicide on actively growing grass if broad-leaved weeds appear to be overpowering the grass. Do not use herbicides if you do not have a serious weed problem — frequent mowing and proper starter fertilizer may be the only management necessary to establish grass. Broad-leaved weeds can be easily controlled during the following year, provided the turf is able to initially establish without being crowded out by weeds.

Use slightly higher seeding rates to ensure rapid cover and improve competition with annual weedy grasses. Perennial ryegrass, because of its rapid germination, stands the greatest chance of filling in during the first year. Tall fescue is the next best choice for showing at least a modest stand of grass by the fall.

Kentucky bluegrass requires two to three weeks to germinate in the spring. It usually develops a modest stand of grass in the spring. Never use more than 20 percent perennial ryegrass in a mixture.

Fall seeded cool-season grasses

Fall seedings are much more successful than spring seedings because crabgrass and summer stress are not a problem. However, winter annual broad-leaved weeds such as henbit, chickweed and speedwell may require control. These weeds germinate September through November, grow during the winter and result in a dense mat of weeds by early spring.

If weeds dominate the new lawn in the fall, use a postemergence herbicide after the lawn has been mowed at least three times, usually about 45 days after grass germination. Apply broadleaf herbicides on a warm sunny day in the fall when no frost is expected. If present, winter annual broad-leaved weeds can also be killed in late March and April. Although these weeds naturally die, without herbicide application, in May, they should be controlled in early spring if they are overly competitive.

If annual broad-leaved weeds are left uncontrolled, turf will appear thin and weakened through the summer in areas where weeds have died naturally.

Lawn renovation

Lawns occasionally thin out and become weedy as the result of poor management, pests or severe summer stress. For proper care of cool-season grasses, see MU Extension publication G6705, *Cool-Season Grasses: Lawn Maintenance Calendar*. A lawn that does not need regrading or soil tilling can be renovated by simply controlling weeds, planting seed and fertilizing. Determine the cause of lawn decline so that you can adjust your lawn-care program.

The establishment practices mentioned above for time of seeding, weed control, fertility and watering also apply to renovation.

General steps to turfgrass renovation

1. Control existing vegetation that you don't want. If you use a selective broadleaf herbicide (2,4-D, dicamba or mecoprop), wait one month before the next step. Proceed after seven days following total vegetation control with Roundup herbicide and five days with Finale.
2. Set your mower as low as possible, scalp off all existing vegetation, and rake clean.
3. Prepare surface with power rake, verticutter or core aerifier. Skip steps 4, 6 and 7 if you use slit-seeding equipment, which places seed directly into the soil.
4. Rake loosened thatch and existing debris.
5. Add fertilizer.
6. Make a final pass to create open channels for seed collection.
7. Apply seed in two directions.
8. Lightly rake seed into soil surface.
9. Water frequently until established.

Renovating tips

Assess situation

Assess your lawn for desirability and appropriateness of the grass, presence of weeds and bare spots. Kill existing vegetation — grasses and weeds — if any of the following apply:

- Less than 50 percent of the area is in the desired turfgrass.
- Only a cool-season lawn grass is desired but Bermuda grass has invaded. If Bermuda grass is in localized patches or is encroaching from a neighbor along your property line, kill all vegetation only in those areas.
- You want to use a turf-type tall fescue but currently have Kentucky bluegrass, or K-31 tall fescue.
- You have several weeds that require nonselective control, such as quackgrass, tall fescue, Bermuda grass and nimblewill.

A lawn that has more than 50 percent desirable grass, but still appears thin and weak with several

broad-leaved weeds, may need only control of broad-leaved weeds with broadleaf herbicides. After weed competition is reduced, the lawn may regain its original density.

Bare patches less than 4 inches in diameter likely will fill in on their own with proper fertility and no additional seeding. Larger areas that remain too thin a month after broadleaf herbicide treatment may be overseeded. Shaded areas with thin turf and exposed soil often appear to need additional seeding. Renovate these areas, but do not kill existing turf that has thus far survived the difficult growing conditions of shade.

Prepare surface for seeding

One of the most important steps in renovation is placing the seed in contact with soil. This sounds simple, but most lawns have thatch — an intermingled layer of both dead and living plants — over the soil surface. This brown, decomposing layer may be up to 1½ inches thick. Lawns with more than ½ inch of thatch should be dethatched.

Seed placed on or in the thatch layer may germinate, but the eventual stand of grass that develops will be poor. To ensure good seed-to-soil contact, use power equipment to prepare the surface for seeding. Power rakes, verticutters, slit seeders and core aerators are effective machines for properly preparing the surface for seeding.

Dethatching equipment is sometimes available from local rental stores. Local lawn-care and landscape companies also provide dethatching and renovation service. Two to four passes over the lawn may be necessary depending on the soil hardness and thatch thickness. Raking of excess debris will be necessary.

Power rake. Power rakes are lawn mower-like machines that have spring tines instead of blades. The power-driven spring tines rotate in a vertical position and pull the thatch to the surface.

Spring tines that attach to the lawn mower blade do not adequately prepare the surface for seeding. A half-inch of thatch can be removed with a severe power raking, but be prepared to handle several bags of loosened thatch. Power rakes that can be adjusted so that the soil surface is slightly scratched will ensure good seed-to-soil contact but may not loosen hard soils.

Vertical mower. Vertical mowers are similar to power rakes except that they have fixed or flail-type blades that cut groves through the thatch and into the soil. Fixed-blade vertical mowers, sometimes called slicers, are better at cutting into the soil.

Heavy-duty, walk-behind vertical mowers are superior to power rakes for preparing a seedbed. They cut deeper into the soil, ½ to ¾ inch, redistribute some soil onto the surface and provide some soil loosening that helps seedling establishment.

Power rakes and vertical mowers can accumulate a large amount of grass debris on the surface that should

be removed so that the seed can contact the soil. After sufficient disruption of the surface, lightly rake the dead debris off the surface, leaving the loosened soil behind. After raking, a final pass with the equipment will produce closely spaced grooves that are excellent channels for catching broadcast seed.

Slit seeder. Slit seeders are smaller versions of agricultural grain drills but with closer spacing between discs. The discs slice open the ground just ahead of a small tube that drops the seed into the open furrow. A packing wheel follows the seed tube and closes the sliced ground.

Some slit seeders also have a vertical mowing attachment in front of the discs that loosens and redistributes soil on the surface. A slit seeder sows grasses in distinct rows 2 to 6 inches apart depending on the space between the drill discs. It is important to repeat the seeding process at different angles. This usually can be accomplished with two to four passes across the lawn making a checkerboard pattern.

Core aerifier. Coring machines have a series of hollow tines that cut several cylindrical holes in the ground 2 to 3 inches deep and ½ inch in diameter. Some machines will not penetrate hard and dry compacted soils.

Coring machines are used primarily to provide a channel through which air, fertilizer and water can enter the soil. This channel cut through the thatch and into the soil helps to reduce soil compaction, increase root growth and redistribute soil on the upper surface of the thatch. The soil should be sufficiently moist so that the coring machine can penetrate. If a screwdriver can be pushed by hand 3 inches into the ground, the soil is about right. Soils that are too wet will clog the hollow tines and prevent core removal.

The soil cores should be left on the surface to create a more favorable environment for breakdown of the thatch layer by naturally occurring soil microbes. When the soil cores have dried, they can be chopped and dispersed over the surface with a mower, verticutter or power rake. If coring is to be the primary means of preparing a seedbed, the area should be cored to produce at least one hole every 2 inches. Seed and fertilizer while the core holes are open.

Core aerifiers are of many different sizes and shapes. As with all equipment, make sure the machine will fit through property gates before renting or contracting a service.

Also from MU Extension Publications

- G6705 *Cool-Season Grasses: Lawn Maintenance Calendar*
- G6772 *Cool-Season Grass Cultivars for Athletic Fields*
- IPM1009 *Turfgrass and Weeds*
- IPM1020 *Turfgrass and Insects*
- IPM1029 *Identification and Management of Turfgrass Diseases*

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