

TURFGRASS ESTABLISHMENT AND MANAGEMENT

Susan Bell

Extension Educator
University of Idaho Extension
Ada County

L. Darwin McKay

Owner
The Turf Company (Idaho) and
High Desert Turf (Nevada)

Contents

INTRODUCTION	1
SOIL AND SITE CONSIDERATIONS	2
Evaluating the Site	
Soil Texture and Structure	
Soil pH and Fertility	
CHOOSING A TURFGRASS	2
Kentucky Bluegrass	
Tall and Fine Fescues	
Perennial Ryegrass	
SITE PREPARATION	5
Preplant Weed Control	
Soil Preparation	
Installing a Sprinkler System	
ESTABLISHING A LAWN BY SEEDING	5
Seed Selection	
Seeding Rate	
When to Sow	
Seeding Methods	
Top-Dressing Seeded Areas	
Watering and Fertilizing	
Mowing	
Weed Control	
Overseeding	
ESTABLISHING A LAWN BY SODDING	8
Benefits of Sod	
Purchasing Sod	
Preparing for Sod Delivery	
Sod Installation	
Rolling and Watering	
Mowing and Fertilizing	
TURF MAINTENANCE	9
Mowing	
Thatch Management	
Irrigation	
Fertilizing	
Core Aeration	
Weed Control	
Turf Renovation	
TURF PROBLEMS	17
Common Problems	
Insects	
Diseases	
FURTHER READING AND RESOURCES	18

15

TURFGRASS

ESTABLISHMENT AND MANAGEMENT

Learning Objectives

- Learn the characteristics of site and soil considerations for turfgrass applications
- Learn about the different types of turfgrass and how to select the right one for your application
- Learn how to prepare a site for turfgrass planting
- Learn how to establish a lawn from seeding
- Learn how to establish a lawn from sodding
- Learn the basic principles of turfgrass maintenance
- Learn how to deal with the common problems associated with turfgrass

Introduction

Turfgrasses enhance the appearance and utility of home landscapes, parks, golf courses, sports fields, and other greenbelt areas. Lawns improve urban environments by reducing erosion, temperature, noise, dust, glare, and carbon dioxide. Grass is so efficient at converting carbon dioxide to oxygen that an area 50 feet × 50 feet generates enough oxygen to meet the needs of a family of four. A lawn also provides the setting and unity for other landscape elements, such as buildings, patios, water features, trees, shrubs, and flowers.

Everyone knows what a healthy lawn should look like — a uniformly green carpet free of insects, weeds, and diseases. Establishing and maintaining such a lawn is a long-term commitment of labor, money, and other resources. The homeowner faces many decisions. What type of lawn is needed? Will it be a showplace, a recreational area, a backdrop for other landscape plants, or a combination of the above? What level of maintenance will be provided? Will the family perform the maintenance or hire it out? High maintenance usually means greater expenditures of time and/or money. Are both available?

Successful establishment and maintenance of a healthy lawn requires knowledge of climate, soils, and availability of water and other resources. Climate, soils, and topography vary greatly across Idaho. Climate depends on location, ranging from the warm, arid south to the cooler, semiarid north. Idaho's natural vegetation ranges from sagebrush and bunchgrasses in the south to evergreen forests in the north and at higher elevations.

Soil and Site Considerations

EVALUATING THE SITE

Assess your site's limitations. Lack of light or water, poor drainage, or shallow or compacted soils can limit a site's ability to produce quality turfgrass. Turf needs at least 4 hours of direct sunlight a day to thrive. In general, it is best to have at least 1 foot of soil over any hardpan (caliche), dense clay, or gravelly subsoil. If less than a foot of soil exists over hardpan or dense clay, drainage problems and restricted root growth will result in turf failure. However, the limited water- and nutrient-holding capacity of gravelly subsoil will also cause turf to fail. In very low-light areas, on steep banks, and where soil and/or water are inadequate, ground covers, meadow grasses, low-growing shrubs, and mulch are more realistic alternatives to mowed turf.

SOIL TEXTURE AND STRUCTURE

Sand, silt, and clay describe the three basic sizes of soil particles. A soil's percentage of sand, silt, and clay determine its texture. Soil structure refers to the arrangement of soil particles into aggregates. For more information, see chapter 5.

Lawns can grow on essentially any soil texture, from sand to clay, but a fine sandy silt loam is ideal. Sandy or gravelly soils make it difficult to maintain nutrition and moisture levels, while compacted clayey soils can have water infiltration and drainage problems.

Both sandy and clayey soils can be improved by regular additions of organic matter. Humus (finished compost) modifies soil structure to improve aeration and drainage. In addition, humus can improve a soil's ability to hold nutrients and water and it is a food source for beneficial soil microorganisms.

SOIL pH AND FERTILITY

A soil analysis performed prior to lawn establishment will provide valuable information about existing

QUICK TURFGRASS IDENTIFICATION

Bluegrass

- Fine blades, canoe-shaped blade tip
- Rhizomatous growth habit

Ryegrass

- Fine blades, upper side heavily veined, shiny lower leaf surface, pointed tip
- Bunch-type growth

Tall fescue

- Fine- to medium-sized blades
- Upper side heavily veined, lower leaf surface smooth with prominent midvein, pointed tip
- Most have a bunch-type growth habit

Fine fescue

- Very fine needle-like blades, pointed tip
- Bunch-type or rhizomatous growth, depending on species

nutrients, pH, and organic matter. Lawn grasses flourish at a soil pH between 6.0 and 7.5. A pH outside of this range can lead to chronic micronutrient deficiencies and poor growth. Soil pH can be adjusted slightly. If adjustment is needed, it's best to do so during soil preparation, before seeding or sodding. See chapter 5 for more information.

Phosphorus is essential for root development. Unlike most nutrients, surface-applied phosphorus does not move readily down into the soil profile, so it's best to incorporate it into the soil before seeding or sodding (see "Soil Preparation").

Choosing a Turfgrass

Cool-season grasses can withstand Idaho's cold winters and perform well under most conditions found in the state. Most turf species have been hybridized to produce **cultivars** (cultivated varieties) with specific characteristics, such as fine texture, high density, and dark green color; early spring green-up; tolerance to cold, drought, or traffic; or resistance to insects and diseases.

During the intense heat of summer, cool-season grasses often turn tan and go semidormant. This condition is a natural survival mechanism. Once the heat of summer ends and more water is available, the grass will resume growth and become green again.

Selecting a turfgrass depends on site characteristics and on how the lawn will be used (e.g., as playing field or perfect lawn). Grass varieties are available for almost any situation. For lawns that receive a large amount of heavy play or foot traffic, turf-type tall fescue or perennial ryegrass is often used. If many trees are present, select grasses that can withstand shade, such as fine fescue. Some recently introduced turfgrasses are more xeric, using 50% less water than older varieties. In some situations, a mixture of species may be the best option. Table 1 lists cool-season grass species and many cultivars. See the sidebar above for quick turfgrass identification. See Table 2 to compare characteristics of different turf species.

Note: Consult your local University of Idaho Extension office for recommended grass species or cultivars for your area.

KENTUCKY BLUEGRASS

Kentucky bluegrass is probably the most common cool-season grass for lawns and it is part of most grass mixtures. A **monoculture** (pure stand) of Kentucky bluegrass is not recommended because of insect and disease problems.

Kentucky bluegrass has a high fertility requirement and a high water requirement. It does not tolerate shade. It is slow to germinate and establish, but it is good at repairing damaged turf areas because of its ability to spread via rhizomes. However, it can spread into flower beds that border lawn areas and is a strong thatch former.

ENDOPHYTES

Perennial ryegrass and most turf-type tall fescue cultivars live in a **symbiotic** (mutually beneficial) relationship with endophytes. These naturally occurring fungi produce a wide range of chemicals with insecticidal properties, the most important being alkaloids. These chemicals move within the grass plant, giving it built-in defense against billbugs, sod webworms, armyworms, and chinch bugs. Some resistance to nematodes has also been documented.

Different species of endophytes infect different grasses. *Acremonium foliar* infects perennial ryegrass, while *A. coenophialum* infects tall fescue. Endophyte levels vary, depending on the grass cultivar.

TALL AND FINE FESCUES

Turf-Type Tall Fescue

Tall fescue is usually planted as a monoculture or mixed with fine fescues. Newer turf-type tall fescue cultivars, especially dwarf cultivars, are thinner bladed than older varieties and, once established, look very similar to Kentucky bluegrass. These turf-type fescues are not the same as coarse pasture fescues.

Tall fescue is resilient and well adapted to a wide range of soil conditions. It tolerates heat and drought better than most cool-season turfgrasses due to its deep root system (4–6 feet). Its fertility

Table 1. Cool-season turfgrass cultivars for Idaho.

Type of turfgrass	Cultivars
Kentucky bluegrass	Award, NuGlade, Bluechip Plus, Everglade, NuDestiny, Nublue Plus, Liberator, Rugby II, Adelphi, Fylking, Parade, Galaxy, Park, Pennstar, Baron, Liberty, Majestic, Touchdown, Freedom, Newport, Victa, Nugget, Challenger, Kenblue, Plush, Chateau, New Blue, New Star, Washington, Classic
Perennial ryegrass	Accent, Caddieshack, Goalkeeper, Top Gun, All Star, Diplomat, Derby, Evening Shade, Fiesta II, Manhattan II, Omega II, Ovation, Pennant, Regal, Saturn, SR 4000, Troubadour, Palmer, Prelude, Patriot II, Yorktown II
Turf-type tall fescue	Inferno, NoNet, Quest, Summer, Watersaver (RTF), Arid 3, Crossfire, Falcon, Jaguar II, Monarch, Mustang, Rebel II, Titan, Bonsai, Twilight
Fine fescues:	
Chewings fescue	J-5 chewings fescue, Banner, Barialia, Cascade, Jamestown
Creeping red fescue	Audubon, Pennlawn, Rainer, Ruby, Wintergreen
Hard fescue	Ecostar Plus, Rescue 911, Biljart, Durar, Reliant, SR 3000, Scaldi
Sheep fescue	Marco Polo

requirement is medium and its water requirement is medium. Many tall fescue cultivars contain fungal **endophytes**, which ward off insect attacks — a major benefit where turf insects proliferate (see sidebar above).

Tall fescue tends to withstand traffic and heavy use and is often used on football and other playing fields. It does not tolerate low mowing. Most tall fescue cultivars are bunchgrasses; they do not spread by rhizomes and thus do not form thatch or invade flower beds. In recent years, a few spreading turf-type cultivars have been developed.

Fine Fescues

Fine fescues include creeping red fescue, chewings fescue, hard fescue, and sheep fescue. These species are often added to mixtures with other cool-season grasses to provide drought tolerance and disease resistance. These grasses have the narrowest leaves of any lawn grass. Sheep fescue is an Idaho native grass with a blue-green appearance.

Fine fescues perform best in shady conditions. Seed mixes for moderate shade should contain 20%–30% fine fescue. These grasses are adapted

to well-drained, infertile soils. Their fertilization requirements are low to medium and their water requirement is low to medium.

Fine fescues are excellent for overseeding lawns to improve turf quality. On slopes, they often are left unmowed to create a meadow effect.

Creeping red fescue has a spreading rhizomatous root system that will easily cover open soil areas to create a lawn. Chewings fescue is a bunchgrass that does not spread. It must be planted thickly to ensure dense, even turf. Sheep fescue and hard fescue are also bunch types; they make excellent turf, have extensive root systems, and are very drought tolerant.

PERENNIAL RYEGRASS

Turf-type perennial ryegrass germinates and establishes rapidly, often within 6 days. This bunchgrass is extremely wear tolerant, producing beautiful lawns that do not form thatch.

Ryegrass blends well with other grasses and adds insect resistance due to its symbiotic relationship with endophytes. Mixtures of perennial ryegrass and Kentucky bluegrass create a turf far superior to either species grown alone.

Table 2. Turf characteristics.

Characteristic	Turf-type tall fescue	Kentucky bluegrass	Bluegrass/Ryegrass mix	Fine fescue
Leaf texture	Fine to medium	Fine	Fine with high luster	Very fine
Growth rate	Slow to medium	Medium	Medium	Slow
Rooting depth	Very deep (4–6 ft)	Shallow (6–12 inches)	Medium (18 inches)	Deep (2–3 feet)
Thatch production	None to low	High	Varies ^a	Low to medium ^b
Water requirements	Medium	High	High	Low to medium
Fertilizer requirements	Medium	High	High	Low to medium
Insect resistance	High	Medium	High	High
Disease resistance	High	Low to medium	High	High
Drought tolerance	High	Low to medium	Low to medium	High
Heat tolerance	High	Low to medium	Low to medium	Low
Shade tolerance	Medium	Low	Low to medium	High
Cold tolerance	Medium to high	High	Medium to high	Medium to high
Traffic tolerance	High	Medium	High	Medium

^aThatch production depends on the percentage of bluegrass in the mix. Bluegrass is a strong thatch producer, while perennial ryegrass produces

^bFine fescue thatch production depends on the grass variety and increases with higher fertility levels.

Like Kentucky bluegrass, perennial ryegrass requires medium to high fertility levels. It has a medium water requirement. Ryegrass leaves are fibrous and require a sharp mower blade to avoid shredding or tearing the grass.

Site Preparation

PREPLANT WEED CONTROL

If perennial weeds or undesirable grasses are present, preplant weed control is critical. A nonselective herbicide, such as one containing glyphosate, can be used. More than one application may be necessary for some perennial weeds. Follow herbicide label directions carefully.

SOIL PREPARATION

Regardless of whether a lawn is established by seeding or sodding, the key to success is proper soil preparation. Following new home construction, debris is often left in the lawn area. Materials such as cement, wood, bricks, nails, sand, and gravel create unfavorable conditions for lawn grasses and usually result in dry spots. They also block root development and can cause mowing hazards. Remove these materials prior to grading and lawn installation.

If possible, remove rocks from the upper 2 inches of soil to provide a uniform medium for grass roots. If tree stumps or other organic debris are present, remove them rather than covering them with soil.

Buried stumps and logs create soil depressions as they decay, often accompanied by fairy ring fungus and other fungi (see “Diseases”).

The only chance to modify soil structure and drainage is before lawn establishment. Apply 1–2 inches of humus before rototilling. Humus can be purchased by the bag or in bulk at nurseries. For more information on composting and producing humus at home, see chapter 8. If a soil test indicates that fertilizer is needed, apply it now, especially if you are using an organic or slow-release fertilizer, as these products need time to break down. This is also the time to adjust pH, if needed. See chapter 5 for more information. Rototill all amendments into the top 8–10 inches of soil.

Contour and slope are determined by the existing landscape and by structures such as buildings, walks, and driveways. Slope the lawn away from the house. Minor surface irregularities will become permanent after grass roots have locked soil particles together.

After establishing the rough grade, rake and smooth the area to fill holes or depressions and reduce high spots. The smoother the area, the better its appearance. Allow 2–4 weeks for settling before planting the lawn. Two or three soaking and drying periods during this time will facilitate settling.

INSTALLING A SPRINKLER SYSTEM

If an in-ground system is desired, install it after final grading and smoothing, but before seeding or sodding.

Establishing a Lawn by Seeding

SEED SELECTION

Always purchase high-quality seed. Although seeding is an inexpensive way to produce a lawn, the cost of seed is a small portion of the total cost of establishment. Quality seed costs a little more, but it is worth it. Saving a few dollars by compromising on seed quality will only jeopardize your overall investment in your lawn. Purchase seed that is labeled as containing “0% weed seed.” Why plant weeds if you don’t have to?

Certified Seed

Buying certified seed is a good practice. Certification ensures that a seed package contains quality seed of the cultivar named on the label. When certified seed is sold in bulk, a blue certification label is attached to the seed bag.

Seed Package Labels

Seed package labels contain valuable information to help you choose wisely (Figure 1). The seed analysis enables you to determine how well the seed should perform and its cost effectiveness compared to other brands. The following terms are used on grass-seed labels:

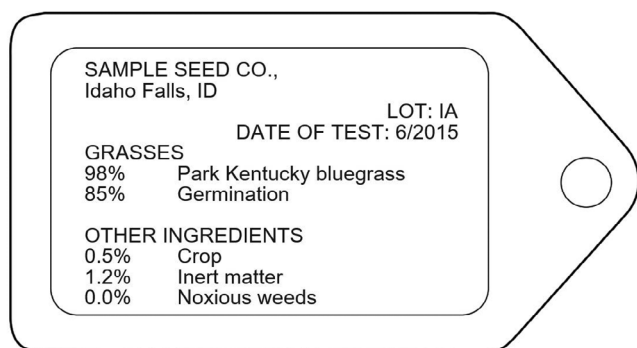


Figure 1. Sample seed label.

pure seed. Percentage (by weight) that is seed of the specified crop.

germination. Percentage of viable (live) seed

inert matter. Percentage (by weight) of chaff, dirt, trash, and anything else that is not seed.

date of test. Date of the seed analysis; it should be within the past 15 months.

weed seeds. Percentage (by weight) of weed seeds in the sample and the number of noxious weed seeds present (Note: It is against Idaho law to sell seed containing noxious weed seeds. If the label lists noxious weeds, do not purchase the seed and report it to the Idaho State Department of Agriculture.)

other crop seeds. Percentage (by weight) of crop seed other than the crop specified. For example, tall fescue seed might include some orchard grass and annual ryegrass seed. Kentucky bluegrass might include bentgrass, annual ryegrass, tall fescue, or perennial ryegrass seed.

Comparing Cost

When comparing seed lots of similar quality, calculate the cost of Pure Live Seed (PLS). PLS indicates the percentage of seed that will germinate and produce the expected lawn quality. To determine PLS, multiply the germination percentage by the percentage of pure seed and then multiply by 100. For example:

Germination = 85%

Purity = 98%

Calculation: $0.85 \times 0.98 = 0.833$

$0.833 \times 100 = 83.3\%$ PLS

Now, to obtain the cost per pound of PLS, divide the price per pound of the seed by the PLS. For example:

Price per pound = \$4.00

PLS = 83.3%

Calculation: $\$4.00 \div 0.833 = \$4.80/\text{lb}$

Table 3. Seeding rates for cool-season turfgrasses.

Species	Seeding Rate	
	(lb/1,000 sq ft)	(lb/acre)
Kentucky bluegrass	1–2	40–80
Perennial ryegrass	4–6	160–240
Fine fescue	3–5	120–200
Tall fescue	4–6	160–240

SEEDING RATE

Seeds vary in size, weight, and growth rate, depending on the grass species. For this reason, seeding rates vary. Follow directions on the seed package or the general guidelines in Table 3. Calibrate the spreader to deliver the appropriate seeding rate. See the sidebar, “How Much Do You Need?,” to calculate how much seed to purchase.

WHEN TO SOW

It can take 4–6 months to thoroughly establish a lawn from seed. The optimum time for seeding turf is in the fall, from mid-August through mid-September (earlier at higher elevations). Completing seeding during this time frame allows the grass to become well established before winter.

HOW MUCH DO YOU NEED?

Seeding and fertilizer rates often are given as amounts per 1,000 square feet. Follow the steps below to calculate how much to purchase.

- 1. Estimate lawn size.** Use one of the following methods.
 - Use a measuring wheel to measure the lawn area.
 - If the lawn is a small square or rectangle, multiply length by width to get the square footage.
For example, $10 \text{ ft} \times 20 \text{ ft} = 200 \text{ sq ft}$.
 - If you know the lot size in acres, multiply by 44,000 to get an approximate square footage. For example, $0.5 \text{ acres} \times 44,000 = 22,000 \text{ sq ft}$.
 - Don't include space occupied by nonlawn areas, such as the house or flower beds. In this example, if only one-quarter of the area is lawn, then the lawn is $5,500 \text{ sq ft}$ ($22,000 \text{ sq ft} \times 0.25 = 5,500 \text{ sq ft}$).
- 2. Calculate the amount of product needed.** Multiply the seeding or fertilizer rate (per 1,000 square feet) by the lawn size found in step 1. Then divide by 1,000. For example, $5 \text{ lb} \times 5,500 \text{ sq ft} \div 1,000 = 27.5 \text{ lb}$. This is the amount to purchase.

Fall seeding is much more successful than spring seeding for several reasons. Warm days and cool nights in the fall provide ideal conditions for seedling growth. Also, there is less weed competition. The first heavy frost will kill tender broadleaf weeds and summer annual grasses that germinate with the grass seed. By spring, lawns seeded the previous fall will be well rooted and have good top growth, making them drought- and heat-tolerant by summer.

In some dry or short-season growing areas of Idaho, grass seed is sown on top of the soil just before winter snows to take advantage of the insulating capacity of snow and moisture from snowmelt. The grass will germinate in spring once the snow recedes.

Spring seeding (April through May) is used where rain or early frost prevents soil preparation and seeding in the fall or if the fall seeding time is missed. Seed as soon as the ground is dry enough to be worked without damaging soil structure.

Germination periods depend on soil temperature. For example, an April sowing will take longer to germinate than a May sowing. If seed is sown too early, when the soil is cold and damp, germination will be slow and irregular.

Spring-seeded turf may face strong competition from germinating weeds in some areas. If practical, wait until annual weed seeds germinate, cultivate the soil to kill them, and then sow the grass seed. This option is feasible if seeding can still be done in May to allow the lawn to establish before the heat of summer.

Establishing turfgrass by seeding in midsummer (July and August) is difficult due to high temperatures, evaporation, and drought conditions. Summer seeding can be successful only if supplemental irrigation is available. The seeded area must be kept moist during the entire germination period. If the surface dries before seedlings emerge, the percentage and rate of germination will be severely reduced.

SEEDING METHODS

Only very small spots can be effectively seeded by hand, as it is difficult to distribute seed evenly using this method. Lawns usually are seeded with a drop spreader or rotary (cyclone) spreader. Drop spreaders are more accurate than rotary spreaders. They also work better along driveways, sidewalks, and flower beds because they do not drop seed where it is unwanted.

To ensure uniform distribution of seed, divide the recommended amount of seed into two equal parts. Sow half of the seed in one direction and the second half perpendicular to the first. Lightly rake the seed into the soil surface (about ¼ inch). Do not rake heavily, as doing so will cover the seed too deeply.

You can enhance germination by using a roller to improve seed-to-soil contact.

TOP-DRESSING SEEDED AREAS

Grass seed can take 1–3 weeks to germinate, depending on species. Top-dressing means applying a thin layer (⅛–¼ inch) of some material to the surface of a newly planted seedbed to encourage germination. A layer of top-dressing reduces seed displacement by wind, rain, and irrigation. It also prevents birds from eating seeds, raises humidity at the soil surface, and reduces soil crusting. While top-dressing is not essential, it is helpful, especially on sloped sites. Humus, peat moss, chopped straw, dried grass clippings, and clean topsoil are commonly used for top-dressing. Choice of material depends on the site, availability, cost, and ease of handling.

WATERING AND FERTILIZING

Failure to provide sufficient moisture is a major cause of unsuccessful turf establishment. After seeding, the top 1 inch of soil must be kept consistently moist. If rainfall is inadequate, irrigate a short amount of time twice each day for the first 3 weeks. Summer-seeded turf may require three or more irrigations per day. After seedlings have grown enough to mow, reduce irrigation frequency (see “Irrigation”).

If a fertilizer was applied before planting, there usually is no need to fertilize a lawn before it is 4–6 weeks old. If no fertilizer was applied prior to seeding, use a cyclone spreader to apply a half-rate application of starter fertilizer (e.g., 5-10-10 or 15-15-15) after the lawn is mowable.

MOWING

Start mowing as soon as the grass is tall enough to cut (more than 2 inches). Frequent mowing helps control annual weeds and limits clipping accumulation, which might smother the new turf.

Set the mower at the proper cutting height for your grass species, and keep the mower blade sharp. See Table 4 for recommended mowing heights. Follow the one-third rule; remove no more than one-third of

the leaf growth at each mowing. Avoid mowing when it is muddy, as mud on mower wheels may adhere to seedlings and pull them out of the ground.

WEED CONTROL

To avoid turf damage, do not spray weeds until the new lawn is at least 6 weeks old. Following fall seeding, the first heavy frost may eliminate most weeds, thus reducing the need for herbicides.

OVERSEEDING

The potential for a lawn to provide a quality surface depends on the species and cultivars of grasses present. The best maintenance program is not likely to produce a quality lawn if inferior grasses dominate the stand. Over time, most lawns eventually become invaded with less desirable grass species, such as bent grass and pasture fescues. Periodic infusion of new, improved cultivars into an existing turf will increase the chances of maintaining a high-quality lawn. Reseeding bare spots or thickening up sparse turf are additional reasons to overseed.

Overseeding is usually done in late summer or early fall. However, small areas can be overseeded at any time, as long as they are kept moist during germination.

Spot Seeding

If seeding a small area, work the area with a hard-tined rake or shovel. If the area is compacted, add some humus and incorporate thoroughly. Mix fertilizer into the soil, if needed (see “Soil Preparation”) and sow the grass seed. Rake the area lightly following seeding to incorporate the seed into the soil. This will increase soil-to-seed contact and enhance germination.

Changing Grass Species

Changing to a more desirable grass species without removing the old grass is a type of overseeding. First, use a nonselective herbicide such as glyphosate to kill the old lawn. More than one application may be necessary.

After the lawn dies, mow as closely as possible. Then dethatch the area with a vertical mower or dethatching machine (see “Thatch Management”). Rake up the accumulated debris and dethatch again in a perpendicular direction. Rake up the remaining debris.

Keep in mind that if a soil problem existed before the original lawn was seeded (e.g., dry, compacted soil), the problem will remain after the new turf is seeded. Where underlying soil problems exist, complete renovation may be needed (see “Turf Renovation”).

Finally, seed the area with the new grass species. Rake lightly to incorporate the seed into the soil. Apply a thin layer ($\frac{1}{8}$ – $\frac{1}{4}$ inch) of topsoil or humus and begin watering as you would a newly seeded lawn.

Establishing a Lawn by Sodding

BENEFITS OF SOD

Sod offers the instant beauty of a lush, weed-free lawn that can be used in as few as three weeks after installation. Sod may be the solution for a family in a new home where children need a safe, clean place to play or where a steep slope increases the risk of erosion. Other advantages of sodding include the following: (1) an instant increase in property value, (2) elimination of the need for top-dressing, (3) reduced need for weed control and water during establishment, and (4) reduced effort to nurture a new lawn to full establishment.

However, sod costs about six times more than grass seed and installation may involve additional expenses, such as labor to remove the old turf and install the sod.

PURCHASING SOD

Several types of sod are available for residential landscapes, with each type suited to a particular environment or use. The most common types are Kentucky bluegrass blends, bluegrass-perennial rye-grass mixtures, tall fescue-fine fescue mixtures, and turf-type tall fescue monocultures. If possible, examine the sod before ordering. Sod should be of uniform color and thickness, with minimal weeds.

PREPARING FOR SOD DELIVERY

Prepare the site before scheduling delivery of the sod. Soil preparation for seeding and sodding are essentially the same (see “Site Preparation”). Do not skimp on soil preparation or site grading.

Do not lay sod on dry soil. Even if sod is watered immediately after installation, root growth will be hindered. Water to a depth of 6–8 inches 24–48 hours before installation. It is important to allow

enough time between watering and sod installation so that the site is not muddy when installation begins.

Sod is heavy; it weighs about 50 pounds per 10 square feet. Piece size varies, depending on the cutting machine used. Pieces typically are 18 inches wide by 80 inches long or 24 inches wide by 60 inches long. Each piece makes up 10 square feet. Sod is shipped on wooden pallets, each stacked with 500–700 square feet of grass.

Be on-site when the sod arrives so that the pallets can be positioned to minimize the distance that sod rolls must be carried. Examine several rolls before accepting the sod.

Plan to lay the sod immediately. If you must wait a day, keep the rolls moist (not soggy) and in a shaded location. For a delay of up to a week, it is best to unroll the sod on a plastic tarp or cement to avoid having it root into itself or into the soil where it's stacked. Make sure to keep the sod moist.

SOD INSTALLATION

Sodding can be successful during every season except winter. Sodding in the spring or fall, when cool-season grasses grow rapidly, allows quick rooting. In dry areas or during hot weather, frequent irrigation is necessary.

The easiest way to install sod is to hire a landscape contractor, but you can save money by doing the job yourself. Be prepared to squat or kneel on the soil surface as you work. Wearing a pair of rubber kneepads is a good idea.

Handle sod with care to avoid tearing or excessive stretching. Lay the first strip along a straight edge, such as a driveway or sidewalk. If no straight edge is available, lay sod at a right angle to a curve or use a string to establish a straight line. On the second and succeeding rows, stagger the joints similar to the way bricks are laid. Fasten the butt joints tightly together to prevent the roots from drying out, but do not overlap the pieces.

Water within 30–60 minutes of laying the first piece. If you wait until the whole lawn has been sodded, the first-laid strips may dry out. Continue to lay sod and water previously sodded sections until installation is complete.

Use a sharp knife to cut sod to fit curves, edges, and sprinkler heads. Try to avoid using short or narrow left-

over pieces, as they tend to dry out rapidly. If an edge does not abut a curb, sidewalk, or another strip of sod, mound soil against it to protect the roots from drying.

When sodding a sloped site, start at the bottom and work upward. If the slope is steep, tack sod strips down with wooden pegs (available at construction supply stores). Leave the pegs in place until sufficient rooting has occurred to stabilize the soil and turf.

ROLLING AND WATERING

After all of the sod is laid, the lawn can be rolled. Rolling eliminates irregularities and establishes good contact between the sod and soil. Rollers are available at equipment rental centers.

Finally, water the sodded lawn thoroughly. Moisten the soil to a depth of 6–8 inches. Irrigate daily until the sod becomes rooted, about 10 days. Keep people off the lawn until the grass is well anchored, usually in 3 weeks.

After the sod is established, decrease irrigation frequency, but increase the amount of water per application. Deep but infrequent irrigations (10–12 inches deep once or twice a week) are best for developing a healthy, deep-rooted turf (see “Irrigation”).

MOWING AND FERTILIZING

Begin mowing after the sod is well rooted and growing. Make sure your mower blade is sharp. Use the one-third mowing rule; remove no more than one-third of the shoot growth at each mowing.

Ten days to two weeks after installation, apply a fertilizer with a high proportion of phosphorus and potassium (e.g., 5-10-10, 10-20-20, or 15-15-15) to encourage root growth. Organic and slow-release fertilizers should be applied during soil preparation to allow time for breakdown and nutrient release to occur. The fertilizer package will indicate the amount to apply (see “Fertilizing” and the sidebar “How Much Do You Need?”).

Turf Maintenance

A healthy lawn should last many years if properly maintained by watering, fertilizing, mowing, and weed control. Dethatching, core aeration, top-dressing, and disease or insect control may be needed in some years.

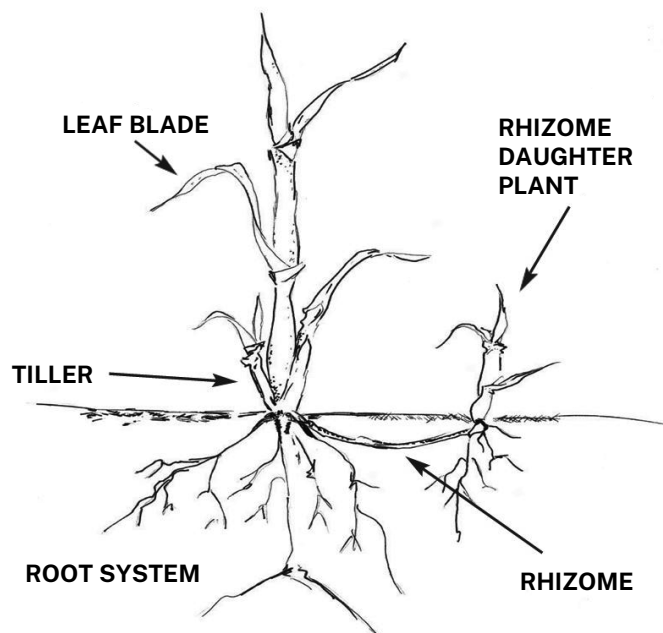


Figure 2. Anatomy of a grass plant. Drawing by Aubrey Stribling, University of Idaho.

It is difficult to dictate a one-size-fits-all lawn maintenance program, given Idaho's wide variety of microclimates and soil types. Basic practices are discussed in this chapter, but recommendations may need to be modified for your location. Talk with your local University of Idaho Extension educator for more information.

MOWING

Mowing is the most basic part of turfgrass maintenance since it influences a lawn's appearance and life span, as well as the need for other cultural operations. Mowing encourages lateral bud growth and **tillering**—the formation of aerial shoots from axillary buds located along the crown (Figure 2). As tillering increases, the grass becomes finer, the sod gets thicker, and the turf's overall appearance is optimized.

However, mowing reduces photosynthesis and hence carbohydrate production. In the short-term, it causes root growth to cease and increases water loss from cut leaf ends. Cut blades also create the potential for pathogen infection.

Some grasses are easier to cut cleanly than others. Perennial ryegrass and turf-type tall fescue, due to fibrous vascular bundles, are difficult to cut cleanly if the mower blade is not sharp. In contrast, Kentucky bluegrass has soft, succulent leaf blades that are easy to mow.

Table 4. Recommended mowing heights.

Species	Height (inches) ^a
Kentucky bluegrass	1.5–3
Perennial ryegrass	1–2
Fine fescue	2–3
Tall fescue	2–4

^aIn spring and fall, use the lower end of the range. Use the higher end of the range in summer.

Always leave an unmowed strip next to ponds, streams, and lakes to reduce surface-water pollution.

Mowing Frequency and Height

Frequent mowing (every 3–4 days during active growth) is recommended to avoid removing more than one-third of the grass blades at any one time. Limiting foliage removal reduces the loss of photosynthesizing tissue. When growth slows due to heat or drought, mowing may be needed only once a week or every 10 days. In shaded areas, photosynthesis is less active than in the sun. In these areas, grasses grow more slowly and can be mowed less frequently as well.

Proper mowing heights for cool-season grasses are listed in Table 4. During the heat of summer, raise the height of the mower blade by an inch. Longer grass blades trap moisture, shade the crowns, and promote a healthy, deep root system. Once temperatures cool, return to the lower recommended mowing height.

Scalping or mowing lower than the recommended height stresses grass and is not advisable at any time. A brown, scorched appearance often follows scalping, due to the removal of grass blades that otherwise would shade and protect the delicate crowns. Scalping ultimately results in decreased drought and heat tolerance, weed invasion, reduced photosynthesis, and shallow rooting.

Clipping Removal

Clipping removal is optional. Clippings quickly decompose and, contrary to popular belief, do not cause thatch.

Mowing frequently and allowing the clippings to filter into the grass benefit the turf. Clippings supply organic matter and recycled nutrients, especially nitrogen. Decomposition of the succulent leaf tissues by soil microorganisms results in a constant, even

supply of nutrients. Research indicates that as much as 20%–30% of a lawn’s fertilizer requirement can be supplied by grass clippings, thus eliminating one fertilizer application per year.

A mulching mower makes it easy to recycle clippings in place. However, any mower will work if the one-third rule is followed. If you mow infrequently and generate a thick layer of clippings, remove them, as they may suffocate the turf.

THATCH MANAGEMENT

Thatch is the brown, fibrous, spongy layer located between the soil and green grass blades. Thatch is not caused by grass clippings. It is composed primarily of high-lignin materials such as roots and stems. As stems and roots grow, old tissues die and slough off, adding to the thatch layer. Soil microbes, earthworms, and other soil organisms decompose thatch.

Thatch accumulation is a natural process for rhizomatous grasses. Kentucky bluegrass is a prolific thatch former, while creeping red fescue is a medium thatch former. Bunchgrasses, such as perennial ryegrass, most turf-type tall fescue cultivars, and other fine fescues (chewings, sheep, and hard), do not develop thatch.

A thin layer of thatch (½ inch) is beneficial, as it reduces soil moisture evaporation and insulates the soil, thus moderating soil temperature. It also retains nutrients and protects roots from compaction by foot and equipment traffic.

Thatch that is more than ¾-inch thick is detrimental because it can restrict water, air, fertilizer, and pesticide movement into the grass and soil. During hot, dry weather, thatch can become dry and resistant to wetting (hydrophobic). Grass roots may grow into thick thatch instead of the soil, making the turf less heat-, drought-, and cold-tolerant. Many turf-eating insects and diseases find thick thatch a good place to call home. Finally, mowers tend to ride on top of deep thatch and do not cut the grass to the desired height.

Causes of Thatch Buildup

Thatch accumulates when conditions are good for organic matter accumulation and poor for its decomposition. Soil compaction contributes to thatch buildup because it affects soil oxygen levels and water movement.

Nitrogen fertilizer stimulates bacterial decomposition of thatch; consequently, insufficient fertilizing can cause thatch buildup. Conversely, overfertilization encourages thatch accumulation since it causes turf to grow (and die) faster than soil microorganisms can decompose the thatch. With excessive fertilization, soils also can become saline, which reduces populations of earthworms and soil microbes.

Overuse of some pesticides, excessively wet or dry conditions, and cool weather also contribute to thatch buildup because they affect the population and activity of decomposers.

Controlling Thatch Buildup

The best way to prevent thatch buildup is to follow proper turf management practices. Use the right amounts of fertilizer and water to create conditions needed for moderate growth.

Clippings left on the lawn add nutrients as they decompose, invigorating microbial activity and accelerating thatch decomposition. Routine core aeration can also help, especially when cores are left to break down on the lawn (see “Core Aeration”).

Top-dressing is another way to reduce thatch buildup. Periodic top-dressing with a thin layer (¼–½ inch) of soil or humus encourages beneficial microbial populations. Top-dressing often follows core aeration if the cores are not left in place. A drop spreader is usually used to top-dress. After top-dressing, rake the material into the turf.

Dethatching

Measure thatch depth by removing a wedge of turf, leaving the underlying soil intact. When thatch is more than ½ inch deep, dethatching may be needed. It may be necessary to dethatch every year until thatch is reduced to ½ inch. If thatch buildup is extreme (1½–2 inches deep), it may be wiser to remove the lawn and reseed or resod the area (see “Turf Renovation”).

Dethatchers (vertical mowers) use cutting blades or tines that spin vertically to slice into the turf and soil surface, ripping the thatch. Dethatchers are available at equipment rental centers. After dethatching in one direction, remove the debris. Then dethatch in a perpendicular direction and remove the remaining debris.

Dethatching makes a lawn look rough and ragged in the short-term. Top-dress after dethatching to level

depressions. Follow with fertilization and irrigation to stimulate regrowth. Damage caused by dethatching may require overseeding, so fall is the preferred time for dethatching.

IRRIGATION

The goal of irrigation is to keep a lawn healthy when rainfall is not dependable. The key is to moisten the top 12 inches of the root zone if possible. Kentucky bluegrass can develop a root system 6–12 inches deep and perennial ryegrass can root 18 inches deep. Fine fescues develop roots 2–3 feet deep and tall fescue roots can be 4–6 feet deep!

To irrigate properly, you must know your soil. Loamy soils are porous, yet retain moisture and are easy to irrigate. Clayey soils hold the most water, but can take a long time to absorb and release it.

When watered deeply, clayey soils can hold water for a week or more. If irrigation is too frequent, they can become waterlogged. Sandy soils, however, are porous; they wet and drain quickly. Thus, they may need to be irrigated twice weekly to maintain comparable turf health.

Benefits of Deep, Infrequent Irrigation

Watering deeply (10–12 inches) but infrequently (no more than once a week, twice on sandy soils) produces healthy turf. Light daily irrigations wet only the soil surface. Because roots grow where the soil is moist, shallow watering equals shallow-rooted turf. Shallow-rooted turf will not be able to withstand temperature extremes, pathogens, or insects, nor can it take advantage of nutrients deep in the soil. Deep watering also benefits landscape trees and shrubs, which suffer under a shallow watering regime.

Another advantage to deep watering is that it forces an exchange of soil atmosphere (in soil pores) with each irrigation. As water moves down the soil profile, oxygen is pulled into the soil. Improved soil aeration produces good root growth.

Watering infrequently also means more efficient water use because less moisture is lost to evaporation. Deep, infrequent irrigation can result in a water savings of approximately 45%–55% per year compared to daily irrigation.

Finally, infrequent watering reduces weed populations because the area is not constantly moist. Many shallow-rooted weeds die when drought stressed.

To determine how deep your irrigation water goes, use a soil probe or shovel to check soil moisture after irrigation. At 10–12 inches deep, the soil should feel like a slightly damp, well-wrung-out sponge — neither sopping wet nor bone dry. If the soil feels dry at the 10–12-inch depth, you are not watering long enough (see “Irrigation Challenges”). Monitor irrigation each month until you learn how long it takes your soil, under your watering regime, to wet to this depth. Soil moisture sensors can more accurately determine moisture at the desired depth and control when irrigation begins and ends. They can greatly improve irrigation efficiency and lawn health.

When to Irrigate

Learning to “read” your turf is an important skill. Watch for dry spots; they can indicate that the entire lawn needs water (see “Irrigation Challenges”). Failure of grass blades to spring back when walked on, a grayish turf color, or lack of overnight dew formation indicate a need for irrigation. However, it is best to irrigate before these signs appear.

How Long to Irrigate

Rules of thumb for lawn watering are often given in gardening books. Example: “Turf uses an average of 1–2 inches of water per week.” Reading this, homeowners often set sprinkler clocks accordingly. Unfortunately, water use varies day to day, due to differences in temperature, wind, humidity, and solar radiation (whether it is sunny or cloudy), so averages do not necessarily reflect the amount of water needed at any given time.

The best approach is to determine when irrigation is needed and then water long enough for moisture to reach a soil depth of 10–12 inches. As weather conditions change, adjust the frequency and amount of irrigation.

If you plan to water weekly using the “1–2 inches” rule of thumb, the amount applied should vary with the weather. While 2 inches of water per week may be needed during hot, dry weather in midsummer, less than ¼ inch may be consumed during cooler weather and rainy periods.

You can check how much water you apply using the “can method.” Use four or five flat-bottomed cans of the same diameter (such as soup cans). The reason for using several cans is that nozzles often do not apply equal amounts of water over the entire spray pattern.

Start within a foot or two of the sprinkler head and place cans in a line to the end of the spray pattern. Leave an equal distance between the cans. To determine the average amount of water applied over a specific period of time, add together the amount of water collected in all the cans. Then divide by the number of cans. For example:

Number of cans: 4

Watering time: 30 minutes

Total water collected in four cans: 2 inches

$2 \text{ inches} \div 4 \text{ cans} = 0.5 \text{ inch of water applied over 30 minutes}$

How to Irrigate

Early morning (before sunrise) is the best time to water, since the turf will dry before evening. Night irrigation also uses water efficiently by reducing evaporation loss. However, it may increase disease problems if humidity and moisture remain high overnight. Daytime watering is not recommended, especially on hot or windy days, because of high evaporation rates and/or sprinkler drift. On hot summer days, as much as half of sprinkler output can be lost to evaporation.

Regardless of soil type, apply water slowly to achieve good infiltration and prevent runoff. On clayey soils, it may take hours to apply the desired amount of water. Slow application of water is especially important on slopes, thatchy turf, and sites with clay or compacted soils.

Overwatering Problems

If turf is squishy 12 hours after irrigating or if you observe standing water, either you are overwatering or there is a drainage problem (or both). Yellowish-green grass or a thinning lawn may also indicate excessive irrigation.

Overwatering can leach nutrients beyond the turf root zone. Also, oxygen levels are low in saturated soils. Because roots develop best where oxygen is adequate, saturated soils induce shallow rooting. Low oxygen levels also slow the activity of beneficial soil organisms and encourage root-rot pathogens that thrive under anaerobic conditions.

Water Stress

Turf can wilt during drought or when underwatered. Just before wilting, the turf will no longer spring back after being walked on. As turf wilts, the blades turn

grayish. Turf can survive a little water stress, but it is best to irrigate before these symptoms develop. If you notice these symptoms, water immediately. During severe drought conditions, cool-season grasses protect themselves from dying by becoming dormant and drying to a tan color. Once moisture returns, the grass greens up again.

Irrigation Challenges

Sloped land and compacted soils present special challenges. On these areas, irrigation must be adjusted to reduce puddling and runoff. One solution is “cycle” watering. This method entails applying a portion of the water needed, just to the point before runoff. Irrigation is then switched to another area while water infiltrates the soil in the first area. Later the same day, the first area is watered a second or third time to reach the appropriate soil depth. To improve water infiltration on compacted soils, consider core aerating once or twice a year (see “Core Aeration”) or amending the area.

Dry spots may indicate that it is time to water the entire lawn or they can indicate a problem with either the watering system or the soil. Check sprinkler spray patterns to make sure they overlap. Watch to see whether water is being blown off track. Look for bent or tilted sprinkler heads and foliage that might be blocking the spray. If necessary, move sprinklers or prune plants. In some cases, an additional sprinkler head may be needed to provide sufficient moisture.

Also check the soil in the dry spot with a shovel or probe to look for compaction and construction debris. If the problem is construction debris, remove it and relevel the area for seeding or sodding.

FERTILIZING

An adequate fertility program can produce dense, well-colored, manageable turf, while reducing weeds, moss, and some turf diseases. Underfertilized bluegrass or perennial ryegrass can exhibit poor color and turf thinning, which encourages weed invasion. However, fertilizer will not thicken up turf where compaction or other soil problems are present.

Conversely, overfertilizing increases the need for mowing and encourages thatch development. An overfertilized lawn also requires more water and pesticides, since fast-growing, succulent turf is more susceptible to diseases and insects.

CALCULATING FERTILIZER APPLICATION RATES

Table 5 gives fertilizer recommendations as pounds of nitrogen (N) per 1,000 square feet. Fertilizer package directions list rates to use as pounds of fertilizer per 1,000 square feet. Follow package directions or use the steps below to calculate how many applications are needed and how much to apply each time.

- 1. Convert nitrogen rate to fertilizer rate.** Divide the amount of N needed (Table 5) by the percentage of N in the fertilizer, as indicated by the fertilizer analysis. For example, a 15-5-10 fertilizer contains 15% N. To apply 2 pounds of N using this fertilizer, you will need to apply 13 pounds of fertilizer ($2 \text{ lb} \div 0.15 = 13.3 \text{ lb}$). Leaving mowed clippings on the lawn may replace 20%–30% of the required N (see “Mowing”).
- 2. Split the total.** Excessive fertilization at one time can burn turf and contaminate surface and groundwater. The amount of fertilizer that can be safely applied at one time depends on the product’s N percentage; higher N content reduces the maximum application rate. Package labels indicate how much fertilizer can be applied at one application. Split the total required fertilizer from step 1 into two to four applications in order to avoid exceeding the maximum. For example, if 13 pounds are needed, and the maximum application rate is 3 pounds, split the total into four applications ($13 \text{ lb} \div 3 \text{ lb} = 4.3$). If the amount needed is less than the maximum application rate, all of the fertilizer can be applied at one time.

Sandy and gravelly soils have limited ability to hold water and plant nutrients, making them prone to nitrate leaching and root burn. To avoid these problems, cut the rate in half and fertilize more frequently or use only organic or slow-release fertilizers.

See the sidebar, “How Much Do You Need?,” to calculate how much fertilizer to purchase.

Nitrogen (N) is the most important nutrient for promoting good turf color and growth and N fertilizer usually is needed every year. Other nutrients may be needed, but determining which ones requires a soil test. Phosphorus (P) and potassium (K) are not always needed. A soil test every 3–5 years is very helpful.

Either organic or synthetic fertilizers can be used on turf. Organic fertilizers must be broken down into an inorganic form (cations and anions) by soil microbes before being utilized by plants. This breakdown, which releases nutrients slowly over the course of weeks or months, depends on the type of fertilizer, time of year, soil type, soil temperature, soil moisture, and microbial populations present in the soil. Thus, organic fertilizers can extend the supply of nutrients over time and reduce N loss to leaching. Using organic fertilizers takes advance planning to ensure that enough time is allowed for breakdown of materials so that nutrients are available when the grass needs them.

The most commonly deficient nutrient in lawns grown on alkaline soils is iron. Iron deficiency is treated using a chelated iron product or by altering soil pH prior to planting. A soil analysis can indicate whether a pH problem exists. See chapter 5 for more information.

Understanding Ratios and Analyses

The fertilizer analysis (the numbers on a fertilizer package) always reads in the order of N-P-K (nitrogen, phosphorus, potassium). The numbers indicate the percentage of each of the three nutrients in the package. For example, a 15-5-10 fertilizer contains 15% N, 5% P (expressed as P_2O_5), and 10% K (expressed as K_2O). See chapter 5 for more information.

On established turf, a fertilizer ratio of 3:1:2 or 3:1:1 is often recommended. A 3:1:2 ratio means the fertilizer contains three times as much N as P and twice as much K as P. An example of such a ratio is a fertilizer with an analysis of 15-5-10. A fertilizer analysis of 15-5-5 is an example of a 3:1:1 ratio.

How Much Fertilizer to Apply

Grass species differ in the amount of N they require (see Table 5). The sidebar “Calculating Fertilizer Application Rates” explains how to calculate the number of applications needed and how much to apply each time.

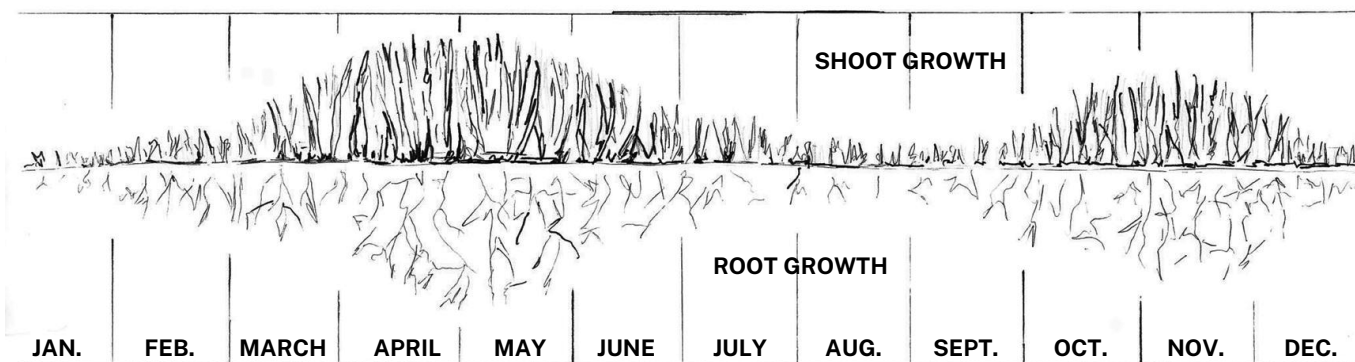


Figure 3. Cool-season grass growth cycle. Drawing by Aubrey Stribling, University of Idaho.

Timing Fertilizer Applications

The natural growth cycle of cool-season grasses influences the timing of fertilizer application (Figure 3). Two applications are recommended during the fall: in early September and mid-November. Fall fertilization coincides with the normal, vegetative growth phase of cool-season grasses and promotes turf vigor.

Benefits include the following: (1) increased storage of carbohydrate energy reserves, (2) stronger root systems, (3) increased shoot density, (4) greater stress tolerance, (5) better fall and winter color, and (6) earlier spring greenup. If a third or fourth application of fertilizer is needed, a late April or early May application time will suffice to prepare the turf for summer heat stress.

Avoid fertilizing cool-season grasses in the heat of summer – July and August – as this is when they tend to go semidormant. Fertilizing at this time stimulates growth when the turf needs to slow down or “rest.” Over time, summer fertilization will

Table 5. Recommended annual N application for cool-season turfgrass.

Species	Actual N
	(lb/1,000 sq ft/year) ^a
Fine fescue	1–2
Tall fescue	2–4
Kentucky bluegrass	2–6
Perennial ryegrass	2–6

^aWithin the recommended range, the need for N is determined by cultural practices such as irrigation and clipping removal. If irrigation is limited, less fertilizer is needed. Leaving clippings on the lawn also reduces the need for fertilizer.

cause turf thinning, invasion by weeds, and higher susceptibility to diseases and insects.

How to Fertilize

For even coverage, apply granular or pelleted fertilizer with a cyclone or drop spreader. Drop spreaders are more efficient and easier to use along driveways and walks, but remember to overlap the wheel areas to avoid leaving stripes. Set your spreader to apply the desired rate. Hand application is not recommended, except in small areas, because it leads to uneven coverage.

CORE AERATION

Coring (core aeration) involves removing finger-sized cores of turf and soil. It is accomplished using a core aeration machine with hollow tubes or tines (available from equipment rental centers).

Core aeration has several benefits. It increases oxygen and water infiltration in compacted soils, promotes fertilizer movement into the soil, and encourages root growth. Aeration can also reduce thatch development if done regularly. On tight, clayey soils or those exposed to heavy traffic, aeration might be needed once or twice a year.

Core aeration is usually done in the spring or fall, when exposed roots are less likely to dry out. Make sure soil is well moistened before aerating, as tines cannot penetrate to the needed depth in dry soil. Travel in one direction first; then switch to a perpendicular direction. Cores are usually left to disintegrate in place. Irrigation helps wash the soil from the cores. As this soil mixes with thatch, it hastens thatch decomposition. Depending on soil type, core disintegration may take a few days to several weeks.

If cores are removed from the lawn, top-dressing may follow aeration. Top-dressing with ¼–½ inch of humus or a 50:50 mixture of humus and sand places looser material into the holes, thus improving future air and water infiltration. Use only construction sand, not river-washed sand.

WEED CONTROL

Discouraging Weed Growth

Limiting the germination and growth of weeds can reduce the need for herbicides. Because competition reduces seed germination and survival, one of the best weed deterrents is a dense stand of turf. Thick turf can choke out most weeds, while a thin lawn exposes the soil to weed invasion. Follow good irrigation and maintenance practices to promote a healthy lawn.

Raising the mower blade slightly can allow grass to shade out germinating annual broadleaf weeds. In order to reduce future weed populations, mow the tops off weeds before they form seed.

Controlling Weeds

The first step to controlling weeds is to identify them. Weed life cycles and control measures vary. Annual weeds, for instance, are easier to control than perennial weeds, and small, immature weeds are more affected by herbicides than mature weeds.

Perennial weeds can be especially challenging. They are difficult to control without herbicides, due to their invasive and often extensive root systems. For instance, a single field bindweed plant can grow a 4-foot-deep × 20-foot-wide root system! Trying to dig out a perennial weed with a rhizomatous root system, such as bindweed, can be impossible, since cutting the rhizomes stimulates more shoot growth. Tough perennial weeds such as Canada thistle, field bindweed, and whitetop may require several herbicide treatments. Weekly hoeing to remove top growth reduces root vigor over time, but it can take years to eliminate established perennial weeds using this method.

Where possible, selective methods of control are recommended (e.g., hand pulling or herbicide application to individual weeds). Weed-and-feed formulations are not recommended for continued use near trees, shrubs, or other landscape ornamentals.

Make sure turf is well established and growing vigorously before herbicide treatment. To protect yourself, as well as your lawn and the environment, read and follow the herbicide label carefully. For more information on pesticides and pesticide safety, see chapter 9.

Herbicides will provide only temporary control if soil conditions and management factors that encourage weeds are not addressed. For example, soil compaction favors weeds and discourages turf growth. Common lawn weeds such as annual bluegrass, black medic, chickweed, clover, crabgrass, knotweed, prostrate spurge, and plantain thrive in compacted soils.

Timing Weed Control Measures

Annual grasses such as crabgrass are usually treated with a preemergent herbicide in mid-March (or when the forsythias bloom). Preemergent herbicides kill seeds before they have a chance to germinate. Early April is a good time to treat summer annual weeds with a postemergent herbicide, while winter annuals are often treated in late summer or fall.

Fall is the best time to treat perennial weeds. It is difficult to kill established perennial plants in the spring; these plants move nutrients from the roots to aboveground parts in spring, so herbicides may not move down to the roots. In the fall, however, perennial plants translocate carbohydrates from their aerial portions to their roots, so a fall-applied herbicide will be carried to the root system, where it will work all winter to kill plant tissues.

For more information on weeds and their control, see chapter 14.

TURF RENOVATION

Renovation is needed if a lawn becomes thin or too poor to save. Renovation is also useful for extremely weedy lawns or those with extreme thatch accumulation. On lawns with underlying problems, such as poor drainage or extreme compaction, renovation eliminates the frustration and cost of trying to keep sickly turf alive and provides an opportunity to correct the problem and start afresh.

To renovate turf, kill the grass with a nonselective herbicide and remove it with a sod cutter. Add soil amendments, if needed, and then plow or rototill. Grading, smoothing, and seeding or sodding (as described earlier in this chapter) are the final steps.

Turf Problems

Turf problems often go unrecognized until considerable damage has occurred. To effectively solve problems, you first must identify the cause. Some have their beginnings in improper maintenance practices.

COMMON PROBLEMS

- **Improper watering** (too much or too little) is the single most important cause of poor turf. Follow irrigation recommendations.
- **Poor soil drainage** is seen on clayey or compacted soils. It may show up as standing water or as muddy or damp areas with sparse turf and moss. Cycled irrigation may help. If you choose to renovate the lawn, correct underlying problems at that time.
- **Summer dry spots** are common, especially in southern Idaho. Check for compaction, buried debris, and bent or blocked sprinkler heads. On steep slopes with recurring dry spots, consider terracing or replacing turf with a ground cover or meadow grass.
- **Mowing too low** (scalping) can stress turf and cause it to scorch and turn brown. Mow at the correct height for your grass species.
- **A dull, brown cast** on the surface of the grass blades could indicate a dull mower blade. If cut ends look shredded, it's time to sharpen the blade.
- **Yellowing turf** may indicate excess water, lack of N, or iron deficiency caused by high soil pH. Follow irrigation recommendations and obtain a soil test to check pH and soil nutrient levels.
- **Turf that grows too fast** between mowings usually indicates overfertilization. Follow fertilizer recommendations and fertilize during the proper times for cool-season grasses. Avoid fertilizing in July and August.
- **Thin turf** may result from shading or improper fertilizing and watering. Fertilizing cool-season grasses during the heat of summer can cause turf to thin over time. If shade is the culprit, reseed with a shade-tolerant mix or plant a ground cover.
- **Thatch buildup** is indicated by turf that feels spongy when walked on. Thatch should not be

thicker than ½ inch. Dethatch if needed. Follow maintenance recommendations to minimize thatch buildup.

- **Crabgrass and other weeds**, when found persistently next to a driveway or sidewalk, usually indicate that the turf is stressed by heat radiated from the paved area. An accepted xeriscape solution is to replace turf in these areas with a 2–3-foot-wide bed of shrubs and herbaceous perennials.

INSECTS

Insects can occur on even the best-kept lawns. Many lawn insects are not harmful. Where there is a history of insect pest problems, however, control may become necessary. Begin by identifying the insect. If needed, use an insecticide registered for the specific pest. Always read and follow pesticide labels.

Three common turf insects in Idaho are sod webworms, white grubs, and billbugs.

Sod Webworms

This insect is the most common aboveground insect in Idaho lawns. Sod webworm larvae are ¼–¾-inch-long smooth caterpillars. They are green, gray, or light brown, with rows of regularly spaced darker spots.

Adults are white, tan, or brownish nocturnal moths that fly up from the turf when disturbed (as by mowing). They have a snout-like projection on the head and a very narrow body profile. (They fold their wings around their bodies instead of fanning them outward.) Eggs are laid in June and August and larvae overwinter.

Sod webworm larvae feed at night on grass leaves and stems above the crown. Initially, damage appears as small, brown patches of grass that look scalped. As damage progresses, patches can merge into larger, irregular shapes. During the day, the caterpillars hide in silk-lined tunnels located in the soil near grass roots — hence the name “web” worm. Because sod webworms are surface feeders, they are easy to kill with insecticides.

White Grubs

White grubs are larvae of several species of June beetles (June bugs) and chafers. The C-shaped, plump grubs are large (up to 1½ inches long and ½ inch wide), with six legs close to the head end. They are creamy white with brown heads.

Larvae feed on grass roots and the resulting damage causes grass to succumb to drought stress. Grub-damaged grass dries out and is easily pulled out or rolled back like a carpet. A deep thatch layer can protect grubs. Digging by birds, skunks, and raccoons often indicates that grubs are present. If white grub damage is suspected, check for grubs in the top 2–3 inches of soil. Adult beetles do not feed on grass.

One application of insecticide often gives season-long control.

Billbugs

Adult billbugs are slow-moving, black weevils (¼–½ inch long) with a long, curved snout — hence the name “bill” bug. The C-shaped larvae are tiny (⅛–¼ inch long) and creamy white with brown heads. They look similar to white grubs, but are much smaller and lack legs.

Adults feed on grass blades and stems, while larvae feed on roots. Billbug damage often occurs in turf that is stressed by heat and drought (e.g., turf that abuts cement or is growing on a slope). Damage appears as spotty patches of yellow or dead grass. Damaged grass breaks away at the crown as you pull on it or can be rolled back like a carpet. A sawdust-like material (frass) may be evident.

Begin checking for adult weevils in late April to mid-May. Adults are slow moving and nocturnal, so check at night with a flashlight. They often can be found crawling on pavement near lawns. Digging may reveal billbug larvae; after mid-July, larvae move deep into the soil and are harder to detect.

The key to billbug control is to kill the adults before egg laying begins in May by using an appropriate insecticide.

DISEASES

Turf disease problems are uncommon in Idaho’s arid and semiarid climates. Fairy ring fungus is one frequently seen disease. At high elevations or where snow accumulates for long periods, snow mold may be a problem. See Table 6 for a list of lawn diseases, descriptions, and solutions.

For long-term disease control, you may need to adjust cultural practices to discourage pathogens. Sometimes, a single change (such as irrigating less frequently, reducing fertilizer rates, or mowing at the correct height) is sufficient to keep turf disease free.

In recent years, major advances have been made in the development of effective fungicides and bactericides for turfgrass disease control. When necessary, carefully select and use these products and always read and follow the pesticide label.

Further Reading and Resources

BOOKS

Christians, N., A. Ritchie, and D. Mellor. 2007. *Lawns: Your Guide to a Beautiful Yard*. Des Moines, IA: Meredith.

Turgeon, A. J. 2011. *Turfgrass Management*. 9th ed. New York: Prentice-Hall.

WEBSITES

University of Idaho Extension

<https://www.uidaho.edu/extension>.

Colorado State University, CSU Turfgrass Program

<http://csuturf.colostate.edu>.

Oregon State University, Department of Horticulture

<https://horticulture.oregonstate.edu/>.

Utah State University Extension, Lawn Care

<http://extension.usu.edu/yardandgarden/htm/lawns>.

Washington State University, Turf Management

<http://turf.wsu.edu>.

Table 6. Lawn diseases.

Disease/Symptom	Conditions Favoring Development	Management
Brown patch (<i>Rhizoctonia solani</i>) Brown, irregularly shaped or circular patches.	Moist, warm (above 80°F)	Avoid excessive, frequent irrigation and high N fertility.
Fairy ring (<i>Marasmius oreades</i>) Rings of dark green grass or arches of dead grass, with or without small, tan mushrooms (mushrooms appear mostly in spring and fall).	Mild, moist. Fungus grows on decomposing organic matter in the soil.	Core aerate or, for small areas, use a potato fork to poke holes in rings. Soak rings with water daily for 1 month to reduce hydrophobic patches. Keep turf well fertilized.
Fusarium patch (<i>Microdochium nivale</i>) Browning and thinning of turf in large, irregular spots (1–8 inches).	Cool, wet. Worse in spring and fall.	Promote soil aeration and drainage by amending the soil and following irrigation recommendations. Avoid excessive N.
Helminthosporium diseases (<i>Helminthosporium bipolaris</i> , <i>H. drechslera</i> , and <i>H. exserohilum</i>) Root and crown rot; yellowing and thinning of turf; tan to purple spots on leaves.	Moist. Common on bluegrass and perennial ryegrass.	Water in morning. Pick up clippings. Do not let grass get matted. Avoid excess N.
Necrotic ring spot (<i>Leptosphaeria korrae</i>) Dead circles, arches, and eventually patches; starts small but can spread to cover large areas.	Found on seeded and sodded bluegrass. Most common on 2–5-year-old sodded bluegrass.	Choose a resistant cultivar. Promote deep-rooted turf with proper fertilization, irrigation, and mowing.
Rust (<i>Puccinia</i> spp.) Leaves turn yellow; yellow, orange, or reddish-brown powdery growth on leaves.	Variable. Most common on certain cultivars of bluegrass and perennial ryegrass.	Increase N. Water during dry periods. Mow frequently.
Snow mold, gray (<i>Typhula</i> spp.) Irregular dead, bleached areas (2–24 inches) with gray mold, usually under or near melting snow.	Cold, wet. Worse under prolonged snow cover.	Avoid heavy late N fertilization.
Snow mold, pink (<i>Microdochium nivale</i> , <i>Fusarium nivale</i>) Circular, light-brown patches (2–12 inches); grass blades are faded and covered with pink fungus.	Cold, wet. Worse under prolonged snow cover.	Avoid heavy late N fertilization.
Yellow patch (<i>Rhizoctonia cerealis</i>) Light brown to yellow patches or rings.	Prolonged moisture at 40°F–60°F	Ensure deep rooting. Avoid excessive irrigation and fertilization.

Adapted from Sustainable Gardening: *The Oregon-Washington Master Gardener Handbook*, Oregon State University Extension publication EM 8742.