

TURFGRASS MANAGEMENT

- ✓ For Professionals
- ✓ For Homeowners

Purdue Turfgrass Science
www.agry.purdue.edu/turf

Establishing a Lawn from Sod

Aaron Patton

Assistant Professor — Turfgrass Extension Specialist



In Indiana, most new lawns are established by seed, but sod is a common alternative. Sod is often faster and more reliable than seed, which requires more time and care to establish. Sod is especially popular when there is an immediate need to reduce erosion or reduce the amount of soil that gets tracked indoors. What's more, sod allows you to establish a lawn even when seeding conditions are not optimal.

This publication explains:

- What to consider when selecting sod.
- How to prepare a site for sod installation.
- When and how to install sod.
- How to maintain the sod after installation.

It may not be practical to do everything described in this publication, but successfully installing sod always includes paying detailed attention to soil preparation, site grading, and watering — all are integral steps in the installation process.

Select Sod Carefully

Table 1 lists sod species that are available in Indiana and their approximate costs.

Table 1. Turfgrass species, available cultivars suitable for Indiana, and approximate costs.

Species	Available Sod Cultivars Suitable for Indiana	Approximate Cost (per square yard) ^{*†}
Bermudagrass [‡] (<i>Cynodon dactylon</i>)	'Quickstand,' Common, others	\$1.50-\$2.50
Kentucky bluegrass (<i>Poa pratensis</i>)	many	\$1.50-\$3.00
Tall fescue ^{**} (<i>Festuca arundinacea</i>)	many	\$1.50-\$3.00
Zoysiagrass [‡] (<i>Zoysia japonica</i>)	'Meyer'	\$2.00-\$3.00

* Costs vary by cultivar, sod producer, quantity ordered, and wholesale vs. retail. These approximate costs do not include installation.

† When buying more than 5,000 ft² of sod (and when possible), it is a good idea to inspect the area from where the sod will be harvested for weeds and quality.

** Tall fescue sod often contains 10% Kentucky bluegrass or netting to help the sod hold together.

‡ Best used in southern Indiana. Bermudagrass is best used in the southern quarter of Indiana, while zoysiagrass can be used in the southern half of Indiana.

Prepare the Site Before Installation

Before installing sod, there are nine steps you should take to prepare the site to ensure success.

1. Test the Soil

A soil test provides key information including soil pH, potassium, and phosphorous levels. Collect soil samples in a plastic bucket from the upper 4-6 inches of soil from ten or more locations around the site. Remove any vegetative material such as stems and leaves from the sample. Air-dry and mix the samples thoroughly.

Make sure to test your soil at least one month prior to establishing your lawn. This will allow ample time to receive the test results and incorporate any recommended nutrients prior to laying sod. If you need to add topsoil from off-site, you must test this soil as well.

More information about soil testing is available in Purdue Extension publication AY-18, *Soil Testing For Lawns*, available from the Purdue

Extension Education Store (www.the-education-store.com).

2. Determine the Lawn Area

A key step in establishing a lawn by sod is to determine the size of the area to be sodded. This will help you calculate how much sod and nutrients you will need.

The best way to do determine the area is to divide your lawn into several squares, rectangles, or circles (Figure 1). Calculate the area of these smaller shapes and then add them together to determine the total size of the lawn.

Vendors typically sell sod by the square yard. Therefore, divide the total square feet of your lawn by 9 in order to determine how many square yards of sod you need to order. Typically, one pallet of sod contains about 50 square yards (450 square feet) of sod. Order about 10 percent more sod than you anticipate needing to account for calculation errors and waste that occurs when cutting sod around corners and edges.

Figure 2 shows an example of a lawn. The easiest method for calculating the area of the lawn in this example is to calculate the total area of the property, and then subtract the hard surfaces from that to get the total area of the lawn.

The total turfgrass area of the lawn is 3,779 square feet. When you purchase sod, divide that total by 9 to determine how many square yards you need, then add 10 percent to account for miscalculations and waste.

$3,779 \text{ square feet} \div 9 = 420 \text{ square yards}$

Add 10 percent: $420 \text{ square yards} \times 0.1 = 42 \text{ square yards}$

$420 \text{ square yards} + 42 \text{ square yards} = 462 \text{ square yards}$

You should order 462 square yards of sod for this lawn.

3. Control Perennial Weeds

If an installation site has perennial weeds or undesirable grasses, it is important to control these weeds before you install sod (Figure 3A). A typical example is when creeping bentgrass (*Agrostis stolonifera*) or quackgrass (*Elymus repens*) are present in lawns.

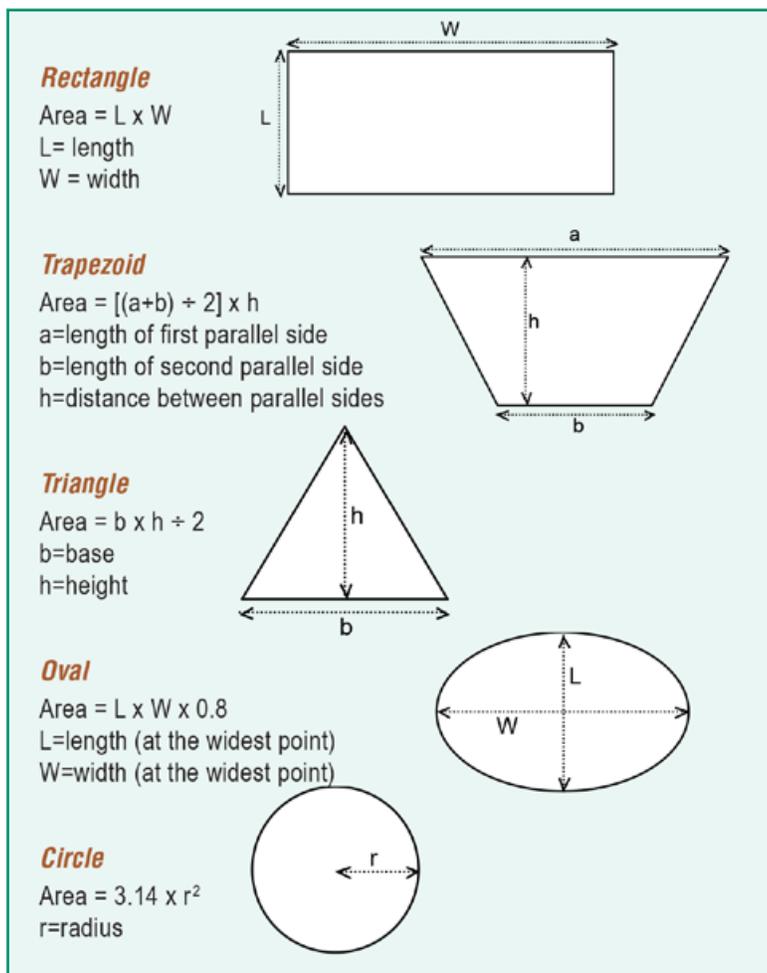


Figure 1. Common shapes and how to calculate their area.

Section of Property	Calculation (feet)	Area (square feet)
Total land	$((90 + 60) \div 2) \times 80$	6,000
House	50 x 25	1,250
Driveway	15 x 40	600
Porch	8 x 12	96
Mulch 1	10 x 5	50
Mulch 2	25 x 5	125
Mulch 3	3.14 x 82 x 0.25 (mulch bed is a quarter circle)	50
Mulch 4	3.14 x 82 x 0.25 (mulch bed is a quarter circle)	50
Total area of objects		2,221
Total turf area	(6,000 square feet – 2,221 square feet)	3,779

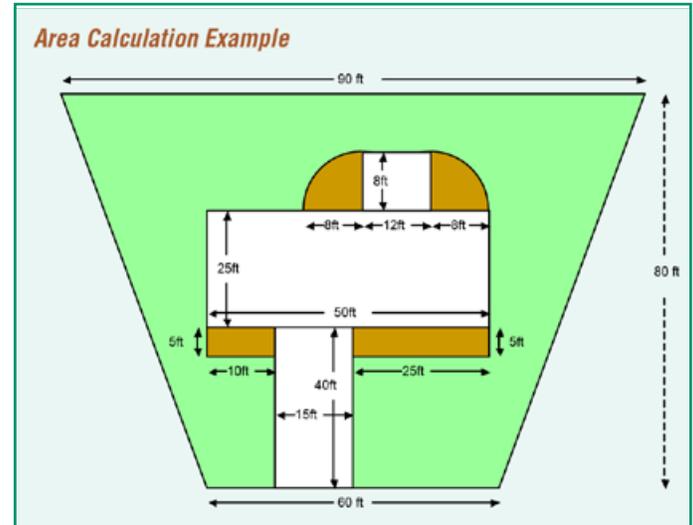


Figure 2. An example property with dimensions for its lawn, hardscape, landscape, and house.

Glyphosate (Roundup® and many other trade names) is the most commonly used herbicide for preplant weed control. Make the spray solution by adding the appropriate amount of glyphosate per gallon of water. Consult the label for the amount to use (dilute) per gallon. Of course, different glyphosate products contain varying amounts of the active ingredient (never 100 percent). Some formulations may come “Ready-to-Use” and may not require any dilution. Always read label directions and dilute the product to get the recommended concentration. Do not expect complete control of these perennial weeds after one glyphosate application. Multiple applications of glyphosate spaced two to four weeks apart may be needed to achieve greater than 95 percent control of certain perennial weeds.

4. Remove Trash

Remove all wood, concrete, pipe, rock, and construction scrap from an area before installing sod. You do not want these objects to interfere with turfgrass root growth and water movement.

If this is a newly constructed home, insist that the builder not use the site as a dumping ground for paint, concrete, and other debris. If you do not remove tree stumps, they will eventually decay and leave depressions in the lawn.

5. Grade the Soil

Before installing sod, make sure the site’s surface is smooth and firm so that there are no areas where standing water collect. If your site requires

extensive grading, stockpile the existing topsoil and replace it after the rough grade is set.

The rough grade should slope gradually away from the house at least 15 feet in all directions. A 1-foot drop in 50 feet will usually supply adequate surface drainage. Mowing and erosion problems may arise when the slopes are steeper than a 1-foot drop every 4 feet. On some sites, it may be hard to avoid such dramatic drop-offs. When that is the case, consider using terraces or retaining walls, or planting a ground cover.

Allow one week for the soil to settle before final grading. Irrigation or significant rainfall will aid in settling the soil.

Take care not to destroy or damage existing trees. Tilling around trees will cut a large percentage of a tree’s surface roots which can weaken or kill the tree. Placing large amounts of soil over the roots can also kill trees because this practice deprives the roots of oxygen. If you need to make significant grade changes, it is recommended that an experienced professional construct a root-aerating tree well.

6. Replace Topsoil

Before installing sod, redistribute or add topsoil. This is especially important on sites with poor inherent soil fertility.

Approximately 19 cubic yards of topsoil create a layer that is 6 inches deep over 1,000 square feet. If suitable topsoil is not available, modify the existing soil. For example, if your topsoil lacks organic matter, incorporate peat, decom-

posed manure, or compost at 1 to 3 cubic yards per 1,000 square feet. Mix these materials with the native soil at least 6 to 8 inches deep.

7. Install Drainage and Irrigation Systems

Before you install sod, you should install any drainage or irrigation systems you need. However, you should complete the rough grading before you dig irrigation trenches and install irrigation heads because it will be difficult to use large grading equipment without damaging any installed irrigation components. Install subsurface drainage and irrigation after rough grading but before final grading and smoothing.

Drainage lines are usually placed 6 to 18 inches deep. Place irrigation pipe below the frost line and normal tillage depth (12 to 18 inches).

8. Apply and Incorporate Amendments

Uniformly apply nitrogen, phosphorous, potassium, and lime according to soil test recommendations (Tables 2-4).

A starter fertilizer (which is high in phosphorus but low in nitrogen and potassium) is a good choice when establishing a new lawn. This ap-

plication should contain about 0.5 to 1.0 pound of nitrogen per 1,000 square feet of lawn and at least 1.0 pound of phosphorus (usually listed as P_2O_5 or phosphate on the fertilizer analysis) per 1,000 square feet of lawn. Although soil phosphorus is measured as P, our recommendations are given as P_2O_5 as this is the common form in fertilizers and the standard form by which it is listed on the fertilizer bag.

Phosphorus is important in newly seeded areas as it is critical for the initial development of roots in the soil. Potassium improves stress tolerance in high traffic situations and during drought but is not needed in higher quantities at establishment. Nitrogen is best applied after establishment — more information about N fertilization is covered in Maintaining Sod After Installation, below. Thoroughly mix lime and organic amendments into the upper 4 to 6 inches of soil after application. Avoid tilling when the soil is too wet to avoid damaging the soil structure.

9. Make the Final Grade

Final grading should leave the soil surface ready for sodding. Use a hand rake for small areas

Table 2. Phosphorus (P) recommendations for newly planted turf and for annual fertilization of established turf in Indiana.*

Soil Test Values			New Sod or Seed (lbs. P_2O_5 /1,000 ft ²)	Annual Applications on Established Turf (lbs. P_2O_5 /1,000 ft ² /year)
Range	ppm P	lbs. P/acre		
low	0-13	0-25	1.5	1.5
medium	13-25	26-50	1.0	1.0
high	>25	>51	1.0	0

* Although soil phosphorus is measured as P, our recommendations are given as P_2O_5 as this is the common form in fertilizers and the standard form by which it is listed on the fertilizer analysis (label). These application amounts should be used only as a general guideline. Actual rates are affected by soil type, use of turf, species, soil pH, and other factors.

Table 3. Potassium (K) recommendations for newly planted or established lawns, golf, and sports fields in Indiana based on soil test results.*

Soil Test Values			Lawns	Sports/Golf
Range	ppm K	lbs. K/acre	lbs. K_2O /1,000 ft ² /year	
very low	0-25	0-50	4-5 [†]	4-5 [†]
low	25-50	51-100	2-3 [†]	3-4 [†]
normal	50-75	101-150	12	2 [†]
high	75-100	151-200	0	1 [†]
very high	>100	>200	0	0

* These application amounts should be used only as a general guideline. Actual rates are affected by soil type, use of turf, species, soil pH, and other factors.

[†] Apply 0-0-60 — muriate of potash or potassium sulfate (K_2SO_4 — or 0-0-52 — potassium chloride (KCl) — in the early spring and/or late fall. Use a rate of 1 lb. of K_2O per 1,000 ft² per application in addition to planned nitrogen applications. Applying 1 lb. of K_2O per 1,000ft² is equivalent to 1.67 lbs. of 0-0-60 and 1.92 lbs. of 0-0-52. Lightly irrigate after applications to avoid foliar burn from these potassium-containing fertilizers. Alternatively, use a fertilizer containing nitrogen and potassium. Apply potassium-containing fertilizers until soil tests indicate they are no longer needed.

Table 4. Recommendations for modifying soil pH in lawns.

Soil pH	Recommendation
<6.0	Apply lime to increase soil pH and increase the availability of plant nutrients. See your soil test recommendations for exact application amounts. If you apply before planting, be sure to incorporate lime into the soil through tillage. After planting, do not apply more than 50 pounds of lime per 1,000 square feet per application. Lime is slow acting, so soil pH will not change quickly. Retest your soil pH in two years to check for a change in the pH.
6.0-7.5	This is the optimum soil pH range for turfgrass growth. No adjustment is needed.
> 7.5	It is difficult to lower the pH of a soil. Applying elemental sulfur can lower soil pH over a long period of time, but is often not feasible. It may be necessary to increase your annual application rates of nitrogen, phosphorus, and potassium by 25 percent to compensate for reduced nutrient availability in high-pH soils.

(Figure 3B). Larger areas require a heavy steel drag mat, soil blade, or plank drag.

A properly prepared sod planting bed should be firm enough to walk on with the top 0.5 inch of soil loosened. The soil will require further watering or rolling if footprints are deeper than 0.5 inch. During final soil preparation, examine the height and slope of the soil in relation to walks and driveways. Driveways and walks should be about 0.5 inch above the soil surface to allow for the soil that comes on the sod. Fill any low spots that collect and hold water after irrigation or rainfall.

Moisten the Soil

Prior to installation, water to lightly moisten the soil. This watering should be scheduled far enough in advance to avoid a muddy site when sod installation begins. *Do not install sod on excessively dry or hot soil.* Even if you water sod immediately after laying it on dry soil, root growth will be retarded, so watering before installation is essential.

Optimum Window for Sod Installation

Once the site is prepared for installing sod, you should try to time the installation so that it has a good chance to get established. Although it is true that you can install sod even when conditions aren't optimal for seeding a lawn, there are still optimal times for installing sod.

Fall is the optimum time of year to establish cool-season species such as tall fescue and Kentucky bluegrass. A fall planting date will allow adequate time for the roots to develop prior to the next summer.

Lawns sodded in the spring and summer will not survive droughty conditions well the first year. Additionally, lawns sodded in the heat of sum-

mer (when temperatures exceed 90°F) may not grow any new roots until air and soil temperatures cool. For these reasons, it is essential to provide proper irrigation for summer-established sod until the turf can establish a new root system.

Due to construction deadlines, it is sometimes necessary to install sod during the winter. Dormant sodding can be successful but is more risky than fall sodding due to the increased risks of winter desiccation and injury.

However, you can establish warm-season grasses (such as zoysiagrass and bermudagrass) almost any time of the year although early summer is best. If you install zoysiagrass and bermudagrass from early to midsummer, that will provide conditions to grow roots rapidly because the grasses are actively growing. Summer plantings give warm-season grasses time to develop an extensive root system before cold weather arrives.

Sodding bermudagrass in early summer will increase the chances it will not suffer winterkill. Zoysiagrass is somewhat slower to root than bermudagrass and needs ample time to become well-established.

Due to construction deadlines it is sometimes necessary to lay sod during winter when warm-season grasses are dormant. As with cool-season grasses, dormant installations are more risky due to the increased risks of winter desiccation and injury.

Delivery

Prepare the site before scheduling delivery of the sod and make sure that irrigation or water is available and ready after installation is complete.

When you purchase sod, it should be:

1. Guaranteed as to turfgrass species and cultivar(s) you requested and of uniform height, color, and leaf texture.
2. Relatively free of weeds, insects, and diseases.
3. Thin cut (0.5 to 0.75 inch of soil) and of uniform thickness. Ideally, the soil texture of the sod should closely match the soil texture of the area where it will be installed.
4. Delivered and installed within 24 hours of harvest. The sod also should be moist when it is delivered.

It is difficult to determine whether dormant zoysiagrass and bermudagrass sod is healthy at the time of delivery. If the soil on the sod is moist, then it is likely healthy and installation can proceed. To assess its health, you can bring a small piece of sod indoors (where the temperature is greater than 70°F) and kept moist to monitor its growth. It should begin to grow within two weeks.

Sod normally arrives on wooden pallets each stacked with 50 square yards of turf. Sod weighs about 35 to 40 pounds per square yard. Slab pieces are typically 18 inches wide and 24 inches long, but vary depending on the particular cutting machine. Sod rolls are typically 18 inches wide and 6 feet long or 24 inches wide and 5 feet long. The charge for the sod will likely include a deposit on each pallet (typically less than \$10 each).

Try to be on site when the sod arrives so the pallets are positioned strategically to minimize the distance you need to carry pieces for installation. You should receive documentation during delivery that guarantees the species and cultivar of the turfgrass you requested. Inspect the sod before you accept the shipment to make sure it is exactly what you ordered.

Install Sod Promptly

Lay sod soon after it is delivered. The longer the sod sits on the pallet the more it will deteriorate.

When the area being sodded slopes, start at the bottom and work toward the top. Lay the first strip of sod along a straight edge such as a driveway or sidewalk with subsequent strips placed parallel and tightly against the first. If there are only curves, lay the sod at right angles to the curve. In irregular areas, use a string to establish

a straight line (Figure 3C). Butt joints tightly to prevent root drying, but do not overlap (Figure 3D).

On the second row, stagger the joints as when laying bricks (Figure 3D). Use a sharp knife or sod knife to cut sod to fit curves, edges, and sprinkler heads. Try to avoid short or narrow strips because they tend to dry rapidly. As a rule of thumb, don't use pieces less than 9 inches wide or 18 inches long. Always place trimmed pieces on the inside.

Mound soil against exposed edges to protect them from drying if the entire area is not sodded. On steep slopes, peg both ends of the sod strip with wooden pegs or sod staples on the high side of each piece. You can remove any pegs after the turf has rooted and you can leave sod staples in the soil to biodegrade.

When a conveniently large area is sodded, initiate light watering to prevent drying. Continue to lay sod and water until installation is complete.

Roll Sod Into the Soil

Lightly roll the lawn after installation (Figure 3E). Rolling eliminates irregularities, removes air pockets, and establishes good contact between the sod and soil.

You can use a variety of rollers, but the most common are filled with water. The goal is not to compact the soil but instead to gently press the sod to the soil.

Water Thoroughly

As soon as the sod is installed and rolled, begin to thoroughly water it (Figure 3F). Water the sod to keep it sufficiently moist, and then irrigate daily in the morning until the sod becomes well rooted, usually about 10 days after installation.

You can check for rooting by grasping a corner of the sod and trying to pull it up. New roots will be white and older roots will be brown (Figure 4). Sod may take longer to root when temperatures are above (summer) or below (late fall and early spring) optimum. During warm, dry periods it may be necessary to water multiple times each day.

After the sod is established, decrease the frequency and increase the amount of water per application. Most grasses are fairly well rooted



Figure 3. These photos show the steps for preparing a site and installing sod.

within 10 to 14 days if temperatures are optimal and the sod is kept moist. Irrigate dormant sod as needed to keep it moist despite the fact it is not actively growing. Lack of irrigation is the number one reason dormant sodding is unsuccessful. Monitor soil moisture throughout the winter until new roots develop in early spring.

Maintaining Sod After Installation

After installing sod, there are a few practices you can follow to ensure it becomes healthy and well-established.

Mow Higher at First

Once the sod has sufficiently rooted and you can reduce the frequency of irrigation, you can begin mowing.

Despite all efforts to create a smooth surface with good site-preparation and planting, some

undulations will remain. Start off at a slightly higher mowing height than what is ultimately desired. Mow the lawn slightly higher than normal for the first few mowings to prevent scalping the newly sodded lawn. Mow the sod with a sharp mower blade to avoid tearing and pulling the grass.

Apply Adequate Fertilizer

New sod will require additional nitrogen fertilization. Unlike, phosphorus and potassium, nitrogen cannot accurately be assessed using a soil test. Additionally, nitrogen is needed at higher quantities by plants than phosphorus and potassium and nitrogen fertilizers are critical to producing healthy, dense turf. You should make a follow-up application approximately one month after installation and again 30 to 60 days later.



Figure 4. Newly initiated roots, which are white, are typically visible a few days after planting sod.

One pound of nitrogen per 1,000 square feet is a good target rate to use after planting, but you should use less if you planted the sod in summer. Delay nitrogen fertilizer applications until April or May (after full green-up) if you installed the sod in the winter.

More information about fertilizing your lawn is available in Purdue Extension publication AY-22, *Fertilizing Established Lawns*, available from the Purdue Extension Education Store (www.the-education-store.com).

Use Herbicides Carefully

Some preemergence herbicides that you apply before installing the sod in spring or summer can reduce sod rooting. Avoid applying any herbicide except glyphosate within two months prior to sod installation.

If you installed sod in spring, summer, or fall, you can use most selective postemergence broadleaf herbicides 30 days after installation. Wait to apply preemergence herbicides until the turf is well-established. For dormant (winter) sodded turf, it is recommended to wait about 60 days after installation before applying herbicides. In all cases, follow herbicide label recommendations.

Avoid Common Mistakes

Although people make many mistakes when establishing a lawn using sod, the most common mistakes include:

- Lack of irrigation or inadequate irrigation during summer, especially to sod edges (Figures 5A-C).

- Lack of irrigation to dormant sodded areas (Figure 5D).
- Poor spacing of sod seams (Figures 5E-F).
- Waiting to install sod more than 24 hours after it was harvested (Figures 5G-H).
- Allowing foot traffic too soon after installation. It is a good idea to keep people off the lawn for three to four weeks until the grass has become well anchored.

Core Aerate If Necessary

Layering is a serious problem that can negatively affect sod rooting. Layering occurs when the soil on the sod is dramatically different from the soil at the installation site.

The problem typically occurs when the soil on the sod has a texture with a high proportion of clay and the soil at the site has a more coarse texture (larger particle size) such as a sandy loam or sand. In these situations, the two distinct soil layers can impede the downward movement of water and air, which decreases turf rooting.

To help alleviate this layer problem, core aeration (aerification or coring) will help provide channels for the roots to better penetrate the soil. This is a good idea on newly sodded turf areas, especially in newly constructed areas where the topsoil is not replaced or when the color of the soil on the sod is dramatically different than the color of the existing soil. Although soil color is not a direct indication of soil texture, it can help determine whether or not you might have a soil layering problem.

Many professional lawn care companies offer aerification services or you can rent aerifiers. You should not aerify newly laid sod until it is securely rooted into the soil, which typically occurs at least two months after planting. It is best to aerify cool-season turf in the spring or fall, and warm-season turf in summer. When aerifying, use the largest diameter tines available. Try to achieve 20 to 40 holes per square foot — in many cases, this may require multiple passes over the site.



A. This lawn received inadequate irrigation after the sod was installed.



B. This lawn received inadequate irrigation after the sod was installed.



C. The edges of this sod dried after installation.



D. This bermudagrass sod was laid in early winter and suffered winterkill due to insufficient irrigation during winter (left and right). Some areas were resodded in late winter and survived (center).



E. Overlapping these sod seams during installation caused desiccation.



F. There was too much space between these sod seams, which caused drying.



G. Waiting too long to install sod can dry it out. Do not purchase sod more than 24 hours after it has been harvested, and always plant fresh material.



H. Waiting too long to install sod can dry it out. Do not purchase sod more than 24 hours after it has been harvested, and always plant fresh material.

Figure 5. These photos show potential problems that can occur after sod installation.

References

- Ferrell, J.A., T.R. Murphy, and W.K. Vencill. 2003. Tolerance of winter-installed tall fescue (*Festuca arundinacea*) and hybrid bermudagrass (*Cynodon transvaalensis* × *C. dactylon*) sod to herbicides. *Weed Tech.* 17(3):521-525.
- Fishel, F.M., and G.E. Coats. 1994. Bermudagrass (*Cynodon dactylon*) sod rooting as influenced by preemergence herbicides. *Weed Tech.* 8(1):46-49.

Find Out More

Find more publications in the Turfgrass Management series by visiting the Purdue Extension Education Store:

www.the-education-store.com.

Reference to products in this publication is not intended to be an endorsement to the exclusion of others that may be similar. Persons using such products assume responsibility for their use in accordance with current directions of the manufacturer.

May 2013

It is the policy of the Purdue University Cooperative Extension Service that all persons have equal opportunity and access to its educational programs, services, activities, and facilities without regard to race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability or status as a veteran.

Purdue University is an Affirmative Action institution. This material may be available in alternative formats.

