Spreaders must be properly calibrated if they are to deliver granular fertilizers and pesticides to turf at correct rates. If calibration is done incorrectly, the product may be misapplied and either too much or too little of the product will reach the turf. Spreaders can be calibrated in several ways, but the following methods are relatively simple, fast, and accurate.

**Types of Spreaders**

Rotary spreaders (sometimes called centrifugal, spinner, cyclone, or broadcast spreaders) and drop spreaders are used for applying granular fertilizers and pesticides to turf. Rotary spreaders can include walk-behind types, which the operator pushes while walking at a constant pace (Figure 1); ride-on types, on which the operator stands on a platform and steers a motor-propelled vehicle that distributes granular and liquid products to turf (Figure 2); or pull-behind types, which are towed by or mounted on a utility vehicle or tractor. Walk-behind rotary spreaders are typically used for fertilizing residential lawns, golf course putting greens, and other small to medium-sized turf areas where maneuverability in confined spaces is important. Ride-on rotary spreaders are popular with lawn care professionals because they can cover large residential and recreational turf areas relatively quickly and reduce fatigue associated with pushing walk-behind spreaders over large distances for many hours. Pull-behind spreaders typically hold large amounts of fertilizer and are often used for treating large open areas, such as golf course fairways or athletic fields.

All rotary spreaders are equipped with a hopper containing one to three holes in the bottom. The holes can be opened and closed by a lever located near the handle or steering device. When the holes are open, granules flow through and strike a gear-driven rotating plate, which distributes the granules by centrifugal force. The amount of product that falls through the holes is regulated by an adjustable lever, usually located...
on the back of the hopper. The adjustable lever can be set on numbers or letters that correspond to the size of the hopper openings (Figure 3).

Rotary spreaders distribute granules in a band or swath that is greater than the spreader’s width. This feature allows you to cover large areas quickly. However, the product is not uniformly distributed over the entire swath, and fewer granules reach the outer margins of the swath than the area immediately around the spreader. To account for the lack of uniformity, you must overlap swaths. The amount of overlap varies among spreaders; therefore, you should measure the “effective swath width” of your spreader to determine spacing between passes (see “Measuring the Effective Swath Width of Your Rotary Spreader” on page 5).

Drop spreaders have rectangular hoppers that taper to a series of equally spaced holes arranged in a row (Figure 4). Most models have a rotating agitator just above the holes to ensure uniform flow of the product. The holes in the hopper can be opened and closed with a lever near the handle; the size of the openings is regulated with an adjustable lever on the back of the hopper. A deflector or baffle is usually located beneath the discharge holes. Uniformity of application across the width of the spreader is improved when the stream of granules from a hole hit the deflector. The granules fall straight to the ground as they flow through the holes or off a deflector; thus, the swath width is only as wide as the row of holes at the bottom of the spreader hopper. Most drop spreaders range from 1.5 to 3 feet in width.

Drop spreaders are preferable to rotary spreaders for working in small, confined areas and when using lightweight or very fine granules. They are not efficient for treating large areas. Drop spreaders are very accurate, and no overlap of swaths is needed. However, it is very important to make passes exactly adjacent to one another (like laying strips of wallpaper) and avoid overlaps and skips. With drop spreaders, the product falls between the wheels. Therefore, you should overlap wheel paths with each pass to ensure uniform coverage. Splitting the application rate in half and making two passes perpendicular to each other over the treatment area reduces streaking associated with coverage skips.

**Calibration Basics**

Regardless of the spreader type or model you use, each individual spreader is slightly different from all others. Therefore, you should calibrate each spreader separately, even though it may appear identical to another spreader. You should also calibrate your spreader(s) for each granular product that you use because products vary in density, size, active ingredient, and nutrient content.
Fertilizer and pesticide manufacturers often provide recommended spreader settings on the product labels. These correspond to particular spreader models and application rates. Although these spreader settings are a useful starting point in the calibration process, a recommended setting should not be trusted to deliver the desired amount of product, primarily because of differences in ground speed among operators and differences among spreaders. Spreaders should be calibrated separately for each operator.

Even experienced applicators occasionally make skips and overlaps, which result in alternating light and dark green stripes in the turf, inconsistent pest control, or foliar burn. To reduce these problems, make two coverage passes, with the second pass being at right angles to the first. The resulting grid pattern has the effect of masking skips or overlaps made in either coverage pass (Figure 5). If you choose this approach, calibrate the spreader to deliver half the desired rate of fertilizer, then cover the entire area twice.

**Calibrating Rotary Spreaders**

**Step 1.** Along with your fertilizer/pesticide product and spreader, gather the following materials (Figure 6):
- Tape measure
- Scale (there are many types of scales, but you should choose one that will weigh small amounts of product accurately—preferably in ounces and grams. Remember, a small error in calibration will be multiplied in treating large areas of turf.)
- Bucket
- Chalk or flags
- Calculator, pencil, paper

**Step 2.** Measure your spreader’s effective swath width (see “Measuring the Effective Swath Width of Your Rotary Spreader” on page 5).

**Step 3.** Measure a 50- or 100-foot strip in a turf area that is not being used or where no one will object to striping or burning from the product application (Figure 7). If a turf area is not available, you can mark off a strip on a paved area. (Be sure to sweep up the product from the pavement after your test runs to prevent runoff into turfgrass or storm sewers.) Use chalk or flags to indicate the starting and end points of the strip.

**Step 4.** With the hopper-opening lever in the closed position, fill the hopper to about one-third to one-half full of a known weight of product (5 to 10 pounds is usually adequate for most granular turfgrass products). Make sure you write down the weight of the product.
Step 5. Adjust the spreader to the recommended setting on the product label (if available) for the rate you desire. Choose the half-rate setting if you plan to make two coverage passes when treating turf.

Step 6. Position the spreader several feet in front of the starting line and begin walking at a brisk, comfortable pace (the pace you will use to treat the lawn; Figure 8). When you reach the starting line, open the hopper holes and keep walking at the same pace without varying your speed. Close the hopper holes as you pass over the finishing or end point.

Step 7. Pour the remaining product in the hopper into a bucket, then weigh the product (be sure to subtract the weight of the bucket; Figure 9). The difference in weight between the original amount and the product left in the hopper after the calibration test run is the amount that was distributed.

Step 8. Now you must determine if the amount of product distributed in the first calibration test run equals the rate you want to apply to the turf. Use the following example to help you determine how much product you need to collect in the calibration test run.

**Example:** You would like to fertilize a lawn with a 20-0-10 fertilizer at a rate of 1 pound of nitrogen (N) per 1,000 square feet. You will be making two coverage passes, and each pass will deliver half the desired rate (0.5 pound N per 1,000 square feet).

First, use the following formula to determine how much fertilizer is needed to apply 0.5 pound N per 1,000 square feet to the turf:

\[
\text{pounds of N per 1,000 square feet desired for application} \div \text{percent of N in fertilizer (in decimal form)} = \text{pounds of fertilizer per 1,000 square feet.}
\]

Thus, in this example:

\[
0.5 \text{ pound N per 1,000 square feet} \div 0.2 = 2.5 \text{ pounds of fertilizer per 1,000 square feet}
\]

Second, determine the weight of fertilizer that must be applied in the calibration test run to have your spreader deliver 2.5 pounds of fertilizer per 1,000 square feet. Assuming your rotary spreader’s effective swath width is 10 feet and your test strip is 50 feet long, use the following formula to determine the required fertilizer weight:

\[
\text{weight of fertilizer per 1,000 square feet} \times \left[ \text{effective swath width of spreader} \times \text{length of strip} \right] \div 1,000 \text{ square feet} = \text{weight of fertilizer that needs to be applied in this test run}
\]

Thus, in this example:

\[
2.5 \text{ pounds of fertilizer} \times [10 \text{ feet} \times 50 \text{ feet}] \div 1,000 \text{ square feet} = 1.25 \text{ pounds of fertilizer needs to be applied in this test run}
\]

Next, compare the weight of fertilizer applied in your first calibration test run to the amount required (1.25 pounds in this example). If the amount of fertilizer applied is less than 1.25 pounds, then increase the spreader setting to provide larger hopper openings and make another run. Conversely, if you apply more than 1.25 pounds, reduce the setting to make the hopper openings smaller. Repeat steps 4 through 8 until you reach or come as close as possible to the target weight of 1.25 pounds.
Measuring the Effective Swath Width of Your Rotary Spreader

Your rotary spreader’s effective swath width can be determined by placing shallow cake pans or boxes (1 square foot by 1 to 2 inches high) a foot apart in a row that is wider than the anticipated spreader swath (Figure 10). One pan should be placed in the center of the row, and an equal number of pans should be placed to the right and left of the center pan. As you make your passes, the spreader should pass directly over the center pan. Make sure there is enough space between the center pan and the two pans on either side to allow you and your spreader wheels to pass. Fill the spreader about one-half full of the product that you plan to apply, and use the recommended setting on the product label for the desired application rate. Remember that the spreader swath will vary with the spreader model, the product used, and the ground speed of the operator. Therefore, the effective swath width should be determined for each spreader, product, and operator.

When all pans are in place and your spreader is one-half full of product, begin your first pass well in advance of the row of pans. Travel in a direction perpendicular to the row of pans, and walk at a brisk, comfortable pace (your normal fertilizing speed) while passing over the center of the row. Stop after you have passed over the pans. Make at least three more passes over the pans in the same direction. Record the location of each pan relative to its distance from the center pan (for example, pan 1R: 1 foot from the center pan on the right side; pan 3R: 3 feet from the center pan on the right side, and so forth). Weigh the contents and record the weight of product from each pan. Since you will be dealing with small amounts of product, you may have to use a weighing scale that can measure in grams. Alternatively, you can empty the contents of each pan into individual clear plastic tubes and arrange the tubes in a rack using the same order as the placement of pans (Figure 11). The tube method allows a visual representation of the distribution of granules from your rotary spreader.

When examining weights or tubes of fertilizer granules, you may find that the distribution pattern is not perfectly even. Occasionally, more granules collect in some of the outer pans than in the center, and depending on the model, more granules may be distributed to one side of the spreader than the other (Figure 12). Fortunately, most high-quality rotary spreaders have devices that allow you to correct the skewing of granular product distribution (Figure 13). Although you may not end up with a perfect distribution pattern, it’s a good idea to get as close as possible to the pattern shown in Figure 14.

When you are satisfied with the distribution pattern, compare the granule product weight or volume amounts collected from each pan. The amounts are typically highest from pans nearest the center of the row, but will gradually decrease as you begin moving away from the center. When the amount of product from pans on the left and right sides of the swath equals half the amount obtained from the center pan, measure the distance between these pans. This distance is your effective swath width. If you determine that the effective swath width of your rotary spreader for a particular granular product is 16 feet, then you should make your passes 16 feet apart.

Figures 14 and 15 show the effective swath width of a rotary spreader and the appropriate distance between passes.
Calibrating Drop Spreaders

**Step 1.** Along with your fertilizer or pesticide product and spreader, gather the following materials:

- Catch pan (a catch pan is a trough mounted underneath the spreader hopper. It collects granular product as you make a pass with the hopper holes open. If a catch pan is not sold with your spreader model, you can use the calibration method described for rotary spreaders. Spread the product onto the turf or pavement and determine how much was applied in your test run by subtracting what you have in your spreader at the end of the test run from the amount you started with.)
- Tape measure
- Scale (there are many types of scales, but you should choose one that will weigh small amounts of product accurately. Remember, a small error in calibration will be multiplied when large areas of turf are treated.)
- Bucket
- Chalk or flags
- Calculator, pencil, paper

**Step 2.** Measure the swath width of your spreader (distance between the wheels).

**Step 3.** Measure a 50- or 100-foot strip in a turf area that is not being used or where no one will object to striping or burning from the product application. If a turf area is not available, you can mark off a strip on a paved area. (Be sure to sweep up the fertilizer from the pavement after your test runs.) Use chalk or flags to indicate the starting and end points of the strip.

**Step 4.** Attach the catch pan to the spreader. If a catch pan is not available, weigh out 5 to 10 pounds of product (or enough to complete the test run and still have some left over) and record the weight.

**Step 5.** With the hopper-opening lever in the closed position, pour the product into the hopper.

**Step 6.** Adjust the spreader setting to the recommended setting on the product label (if available) for the rate you desire.

**Step 7.** Position the spreader several feet before the starting line and begin walking at a brisk, comfortable pace (Figure 16). When you reach the starting line, open the hopper holes and keep walking at the same pace without varying your speed. Close the hopper holes as you pass over the finishing or end point.
**Step 8.** If you use a catch pan, remove it from the hopper, pour the product into a bucket, and weigh the product. If you did not use a catch pan, pour the product remaining in the spreader into a bucket and weigh it (don’t forget to subtract the weight of the bucket).

**Step 9.** Now you must determine if the amount of product collected in your calibration test run equals the rate you want to apply to the turf. Use the following example to determine how much product you need to collect in your calibration pass.

**Example:** You want to apply a 30-0-10 fertilizer at a rate of 1 pound of nitrogen (N) per 1,000 square feet. You will be making two coverage passes perpendicular to each other, and each pass will deliver half the desired rate (0.5 pound N per 1,000 square feet).

First, use the following formula to determine how much fertilizer will be needed to apply 0.5 pound N per 1,000 square feet to the turf:

\[
\text{pounds of N per 1,000 square feet desired for application} \div \text{percent of N in fertilizer (in decimal form)} = \text{pounds of fertilizer per 1,000 square feet}
\]

Thus, in this example:

\[
0.5 \text{ pound N} \div 0.30 = 1.6 \text{ pounds of fertilizer per 1,000 square feet}
\]

Second, determine the weight of fertilizer that must be applied in the calibration run to have your spreader deliver 1.6 pounds fertilizer per 1,000 square feet. Assuming the swath width of your spreader is 3 feet and your test strip is 100 feet long, use the following formula to determine the required fertilizer weight.

\[
\text{weight of fertilizer per 1,000 square feet} \times \left[ \text{effective swath width of spreader} \times \text{length of strip} \right] \div 1,000 \text{ square feet} = \text{weight of fertilizer that needs to be applied in this test run}
\]

Thus, in this example:

\[
1.6 \text{ pounds fertilizer} \times [3 \text{ feet} \times 100 \text{ feet}] \div 1,000 \text{ square feet} = 0.5 \text{ pound (or 8 ounces) of fertilizer needs to be applied in this test run}
\]
Next, compare the weight of fertilizer collected in your catch pan or applied to the turf in the test run to the amount required (0.5 pound in this example). If the amount of fertilizer collected or applied is less than 0.5 pound, then increase the spreader setting to provide larger hopper openings and make another run. Conversely, if you collect or apply more than 0.5 pound, reduce the setting to make the hopper openings smaller. Repeat steps 4 through 9 until you reach or come as close as possible to the target weight of 0.5 pound.

**Tips for Making Uniform Granular Product Applications**

- Applying products having different-sized granules with a rotary spreader can result in poor coverage. Try to use products containing granules with similar sizes and weights.
- If running low on product in the hopper, don’t bounce or rock the spreader while the product is being applied. If you don’t have enough product to complete the pass, put more product in the hopper.
- Always begin walking before opening the hopper holes. Always close hopper holes at the end of a pass while still walking and before turning to begin another pass.
- Don’t operate spreaders while traveling backward.
- If granules stick together in clumps, either make sure you break them apart or don’t use the product.
- Don’t apply lightweight materials on windy days.
- Be sure to clean your spreader thoroughly after applying granular products to prevent buildup of fertilizer or pesticide particles and corrosion on spreader parts. Also, lubricate gears and other moving spreader parts before storing.

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**Handy Conversions for Granular Products**

**Linear Measure**
- 1 foot = 12 inches
- 1 yard = 3 feet
- 1 meter = 3.28 feet
- 1 meter = 1.09 yards

**Square Measure**
- 1 square foot = 144 square inches
- 1 square yard = 9 square feet
- 1 acre = 43,560 square feet = 4,840 square yards
  = 0.405 hectare

**Rates of Application**
- 1 pound per 1,000 square feet = 43.6 pounds per acre
- 100 pounds per acre = 2.5 pounds per 1,000 square feet

**Weights**
- 1 ounce = 28.4 grams
- 1 pound = 16 ounces = 454 grams
- 1 ton = 2,000 pounds
- 1 kilogram = 2.2 pounds = 1,000 grams

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Prepared by Peter Landschoot, professor of turfgrass science. The author gratefully acknowledges Bradley Jakubowski and Devon Carroll for providing assistance with this publication.

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Penn State College of Agricultural Sciences research and extension programs are funded in part by Pennsylvania counties, the Commonwealth of Pennsylvania, and the U.S. Department of Agriculture.

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Produced by Ag Communications and Marketing
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Code EE0242 12/18pod