Calibrating Spreaders

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Proper calibration of application equipment can be one of the trickiest tasks that homeowners and commercial applicators face. However, it is one of the most important steps in making fertilizer or chemical applications, second only to reading and following the label. An improperly calibrated spreader will apply too much or too little product and may result in uneven fertilization, injury to the lawn or other plants, inadequate control of target pests, environmental harm, and/or a waste of money.

Spreaders should be calibrated for each user. Differences in the height and stride of users create varying walking speeds that can cause differences in the rate of application. As walking speed increases, the rate of application decreases. Inversely, as walking speed decreases, the rate of application increases. When using rotary spreaders, faster walking speeds can cause materials to be broadcast further out from the spreader than at slower speeds. Due to user variability, some landscape companies assign spreaders to specific users to reduce application errors.

Spreaders should also be calibrated for each material applied as each product varies in size, weight, and density. When broadcast at the same walking speed, larger and heavier materials tend to be broadcast further from the spreader than smaller and lighter materials.

Spreader Basics

Spreaders are used to apply dry granular materials, such as fertilizer, pesticides, lime, or seed. There are two types of spreaders: rotary spreaders and drop spreaders. Rotary spreaders distribute material in a swath much wider than the width of the spreader. These are useful when applying materials to large areas. Drop spreaders distribute materials in a swath equal to the width of the spreader. Drop spreaders are useful when applying materials to smaller areas or around edges (i.e., applying fertilizer around a pool or other sensitive areas).

A drop spreader (left) and rotary spreader (right).
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The procedure outlined below serves as a guide to calibrating rotary and drop spreaders.

Step 1: Gather Materials

- Spreader
- Material to be applied
- Tape measure – at least 100 ft.
- Scale – digital or analog as long it's capable of giving measurements in small increments
- Nine 9″ x 11″ shallow cake pans or disposable aluminum trays
- Nine graduated cylinders (if measuring effective swath width visually)
- Bucket
- Flags, cones, or chalk
- Calculator
- Pencil and paper

Materials necessary for calibrating a spreader.
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Step 2: Determine the Effective Swath Width of the Spreader

Rotary spreaders broadcast material by centripetal force in a swath wider than the spreader width; however, the swath is not uniform. Material is broadcast heaviest directly in front of the spreader and gets progressively lighter as the distance from the spreader increases. Determining the effective swath width helps applicators properly space their passes to maintain an appropriate amount of overlap. Use the procedure below to determine the effective swath width.

1. Select a location where the spread product can be cleaned up. A paved surface works well, or a large drop cloth can be used. Otherwise, it is likely that the product will be over-applied during the calibration process.
2. Place shallow pans or trays (approximately 1 ft^2 in size) in a straight line at 1 foot increments. Label the pans, starting with 0 and place them in the following order: 0- -2-3-4-5-6-7-8-9. A pan labeled ″1″ is purposely omitted and a blank spot is left in its place. The reason being that the spreader will pass over the ″0″ pan and the wheel needs room to pass.

Pans labeled 0-9 placed in a straight line. A space is left between the "0" and "2" pans for the spreader wheel to pass through.
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3. Fill the hopper about half full of the desired material.
4. Pushing the spreader, walk towards the pans perpendicular to the line, but start far enough in advance in order to get up to a comfortable walking speed before passing over the pans.
5. While broadcasting the material, walk back and forth across the line of pans with the spreader passing directly over the "0" pan. Do this 6-12 times or until there is a measurable amount of material in the pans.
6. Measure the amount of material in each pan. The material can either be weighed (preferred) or poured into a cylinder and measured visually. The amount of material in the pans will be highest near the "0" pan and will decrease as the distance from the "0" pan increases.

The material caught in each pan was poured into a cylinder for visual measurement.
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7. To determine effective swath width, find the pan which contained ½ the quantity of material of the "0" pan. For example, if the "4" pan has half the material of the "0", then the spreader has an effective swath of 4 feet on either side or 8 feet total.

Pan 4 contained roughly half of the material of pan 0.
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Effective swath width indicates how far to space each spreader pass. Therefore, if the spreader has an effective swath width of 8 feet, each pass should be spaced 8 feet apart. Wire flags can be used to help mark the passes.

Step 3: Mark off a Test Strip
Make a test strip either in an area of turf that is not being used or on pavement where the material can be swept up and collected. Measure a straight line 50 or 100 ft long and mark the ends with flags if on turf or chalk if on pavement. A distance of 100 ft will be easier to calculate later, though if there is not enough space available, make a 50 ft test strip and walk it twice (down and back) to equal 100 ft.

Step 4: Calculate the Desired Application Rate of Product

Determine how much product to apply. The following examples will demonstrate a couple of potential scenarios.

Example 1: A soil test report states that a lawn needs 20 lbs. of lime per 1000 ft^2.

Calculate the amount of lime needed to apply to the test strip to deliver 20 lbs. per 1000 ft^2. Assume the effective swath width of the spreader is 6 feet, and the test strip is 50 feet long.

Lime per 1000 ft^2 x (swath width x length of test strip) ÷ 1000 ft^2 = lime needed in test strip

20 x (6 x 50) ÷ 1000 ft^2 = 6 lbs of lime needed in test strip

Example 2: A soil test report states that a lawn needs 1.0 lb of nitrogen (N) per 1000 ft^2. The purchased fertilizer has an analysis of 10-10-10. Two coverage passes will be made, so 0.5 lb of N per 1000 ft^2 will be applied on each pass.

1. Calculate the amount of fertilizer needed to apply 0.5 lb of N per 1000 ft^2. The fertilizer to be used contains 10% N (in decimal form this would be 0.1).

0.5 lbs N per 1000 ft^2 ÷ 10% N fertilizer = X lbs of fertilizer per 1000 ft^2

0.5 ÷ 0.1 = 5 lbs of fertilizer per 1000 ft^2

2. Calculate the amount of fertilizer needed to apply to the test strip in order to deliver 5 lb of fertilizer per 1000 ft^2. Assume the effective swath width of the spreader is 8 feet, and the test strip is 100 feet long.

Fertilizer per 1000 ft^2 x (swath width x length of test strip) ÷ 1000 ft^2 = fertilizer needed in test strip

5 x (8 x 100) ÷ 1000 ft^2 = 4 lbs of fertilizer needed in test strip

Step 5: Use the Test Strip to Adjust Spreader

Once the rate has been calculated, use the test strip to adjust the spreader.

1. Start by adjusting the spreader opening to the setting recommended on the product label or to a middle setting if no setting is recommended.

The spreader adjustment is set to the middle setting.
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2. Next, weigh out a known amount of material (10 lbs is a good weight to start with). Use a bucket that has been tared for the scale (that is, the weight of the bucket has been accounted for and only the weight of the material will register on the scale).

This scale has been tared for the weight of the bucket and now reads "0".
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3. Pour the known amount into the spreader.
4. Make a pass down the test strip with the hopper open, broadcasting the material. Make sure to start walking in advance of the test strip and get to up a normal walking speed (same pace as when measuring swath width) before passing the first marker (flag, cone, or chalk). Open the hopper when passing the first marker and close it when passing the second

marker. Repeat the process in the opposite direction if planning to walk the strip twice.
5. Weigh the material left in the spreader.

The material left in the spreader after walking the test strip is poured out to be weighed.
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6. Subtract the weight of the material left in the spreader from the original amount. The difference is the amount of product that was applied to the test strip.
7. Make the necessary adjustments to the hopper openings and repeat steps 1 through 6 until the desired rate calculated earlier has been applied (4lbs in Example 2).

Tips for Calibrating Spreaders:

- Always calibrate for each user and each material.
- When calibrating drop spreaders, the effective swath width is equal to the width of the spreader.
- If the label of the product being used offers recommended spreader settings, this is a great place to start, but is not always accurate.
- Start several feet in front of the flags or chalk marks and get up to a comfortable walking speed before opening the hopper.
- It's a good idea to make two perpendicular coverage passes when applying fertilizer. This helps ensure even coverage.
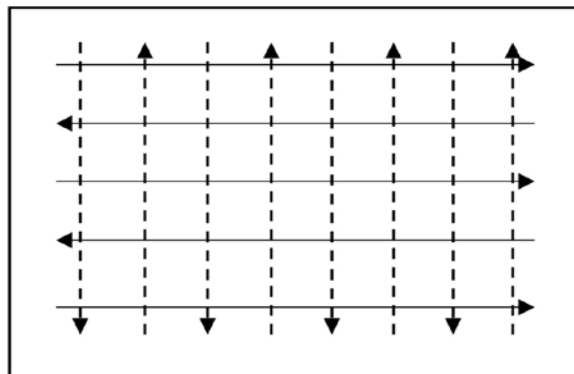
Two coverage passes ensure good coverage. The hashed lines represent a coverage pass in one direction and the solid lines represent the second pass perpendicular to the first.
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- Try to maintain the same walking speed when applying that used to calibrate the spreader.
- Always use the appropriate personal protective equipment as outlined on the product label.

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Worksheet for Calculating Lime, Seed, Granular Pesticides, etc.

Sample Problem:

A soil test report states a lawn needs _____20_____ lbs of lime per 1000 ft^2.

The effective swath width of the spreader is ___6___ feet and the test strip is _____50_____ feet long.

Calculate the amount of lime needed to apply to the test strip using the following formula:

Lime needed per 1000 ft^2 x (swath width x length of test strip) ÷ 1000 ft^2 = Lime needed in test strip

_____20_____ x (___6___ x ____50____) ÷ 1000 ft^2 = _____6_____ lbs
lbs of lime per 1000 ft^2 swath width (ft)   length of test strip (ft)   lime needed in test strip

Applicator's Info:

A soil test report states a lawn needs _____ lbs of lime per 1000 ft^2.

The effective swath width of the spreader is _____ feet and the test strip is _____ feet long.

Calculate the amount of lime needed to apply to the test strip using the following formula:

Lime needed per 1000 ft^2 x (swath width x length of test strip) ÷ 1000 ft^2 = Lime needed in test strip

_____ x (_____ x _____) ÷ 1000 ft^2 = _____ lbs
lbs of lime per 1000 ft^2 swath width (ft)   length of test strip (ft)   lime needed in test strip

Worksheet for Calculating Fertilizer Requirements

Sample Problem:

A soil test report states a lawn needs__0.5___ lbs of nitrogen (N) per 1000 ft^2.

We've purchased a fertilizer to apply which contains __10__% nitrogen.

The effective swath width of the spreader is ___8___ feet and the test strip is ____100___ feet long.

1. Calculate the amount of fertilizer needed to apply the required nitrogen per 1000 ft^2.

   _____0.5_____ ÷ _____10_____ x 100 = _____5_____lbs
   amount of N needed (lbs)   % N of the fertilizer   fertilizer needed per 1000 ft^2

2. Calculate the amount of fertilizer needed to apply to the test strip.

   _____5_____ x (___8___ x _____100_____) ÷ 1000 ft^2 = _____4_____lbs
   fertilizer per 1000 ft^2 (lbs) swath width (ft) length of test strip (ft)   fertilizer needed in test strip

Applicator's Info:

A soil test report states A lawn needs _____ lbs of nitrogen (N) per 1000 ft^2.

We've purchased a fertilizer to apply which contains _____% nitrogen.

The effective swath width of the spreader is _____ feet and the test strip is _____ feet long.

1. Calculate the amount of fertilizer needed in order to apply the required nitrogen per 1000 ft^2.

   _____ ÷ _____ x 100 = _____lbs
   amount of N needed (lbs)   % N of the fertilizer   fertilizer needed per 1000 ft^2

2. Calculate the amount of fertilizer needed to apply to the test strip.

   _____ x (_____ x _____) ÷ 1000 ft^2 = _____lbs
   fertilizer per 1000 ft^2 (lbs) swath width (ft) length of test strip (ft)   fertilizer needed in test strip