

Sprayer Calibration

It is critical to know the output of a sprayer in order to add the proper amount of herbicide to the tank. *Applying too heavy can kill desirable species and wastes money. Applying too light contributes to resistance, reduces effectiveness, and wastes money.*

Handgun or Backpack Sprayer

1. Measure a plot that is exactly 18.5 ft X 18.5 ft (1/28th of an acre).
2. Spray the plot uniformly with water, keeping the sprayer pressure constant. ***Be sure to record the length of time it takes you to spray the entire area using a stopwatch.***
3. Spray into a bucket (or a graduated container such as a Nalgene) for the same number of seconds. **Keep the sprayer pressure constant!**
4. Measure the number of ounces of water collected in the bucket or Nalgene.
5. The number of ounces of water measured from the bucket is equal to the number of gallons per acre (GPA) the sprayer is delivering.
6. Add the proper amount of herbicide to your tank using the chart on the right.

Gallons/acre (from step 5)	Recommended Herbicide Rate/Acre				
	5 fl oz/ac	7 fl oz/ac	1 pint/ac	1 quart/ac	2 quarts/ac
20	7.5 cc/gal	10.5 cc/gal	5 tsp/gal	10 tsp/gal	3.25 fl oz/gal
30	5 cc/gal	7.0 cc/gal	3 tsp/gal	6 tsp/gal	2 fl oz/gal
40	3.8 cc/gal	5.3 cc/gal	2½ tsp/gal	4.75 tsp/gal	1½ fl oz/gal
50	3.0 cc/gal	4.2 cc/gal	2 tsp/gal	3.75 tsp/gal	1.25 fl oz/gal
60	2.5 cc/gal	3.5 cc/gal	1½ tsp/gal	3.25 tsp/gal	6½ tsp/gal
70	2.1 cc/gal	3.0 cc/gal	1½ tsp/gal	2.75 tsp/gal	5.5 tsp/gal
80	1.9 cc/gal	2.6 cc/gal	1.25 tsp/gal	2½ tsp/gal	4.75 tsp/gal
90	1.7 cc/gal	2.3 cc/gal	1 tsp/gal	2 tsp/gal	4.25 tsp/gal
100	1.5 cc/gal	2.1 cc/gal	1 tsp/gal	2 tsp/gal	3.75 tsp/gal

**Liquid conversions: tsp = teaspoons; TBS = tablespoons; fl oz = fluid ounces;
1 cc = 1 ml; 3 teaspoons = 1 tablespoon; 8 fluid ounces = 1 cup;
2 tablespoons = 1 fluid ounce; 1 cup = 16 tablespoons**

Sprayer Calibration

Boom or Boomless Sprayer

Volume Method

1. On level ground, fill sprayer tank to a known level with water.
2. Turn on sprayer until all nozzles have output, shut off and refill tank to desired level.
3. Measure off ¼ of an acre, marking the start and end with a flag.

<u>Width of boom</u> (feet)	<u>Linear feet</u> to cover ¼ acres
2	5445
4	2723
6	1815
8	1362
10	1090
20	545
30	363

4. Drive the measured ¼ acre with the speed that you will be using to spray, turning on the sprayer at the starting mark and off at the ending flag.
5. Return to the level ground that you filled the sprayer at and carefully measure the amount of water it takes to refill to the known level from step 1.
6. Multiply the amount from above step by 4. This is GPA (Gallons Per Acre).

Stationary Method

1. On level ground, fill sprayer tank with water and drift agent (if using).
2. Turn on sprayer and measure spray pattern width in feet.
3. Collect liquid from each nozzle for 1 minute. Measure in ounces.
4. Divide ounces by 128 to determine GPM (Gallons Per Minute).
5. Determine speed (MPH) you will be using during spraying.
6. With the below formula calculate GPA (Gallons Per Acre).

$$\text{GPA} = (\text{GPM} \times 495) / (\text{MPH} \times \text{swath width in feet})$$

Herbicide Sprayer Calibration Guidelines

How do I make the most of my herbicide spot treatments?

Accurate timing, careful measurements of herbicide and uniform spray motions are essential to proper, economical application. Consistent spray motions can help obtain good coverage of troublesome weeds. Soaking scattered weeds rather than using regular spray motions may result in excessive rates that could injure desirable species.

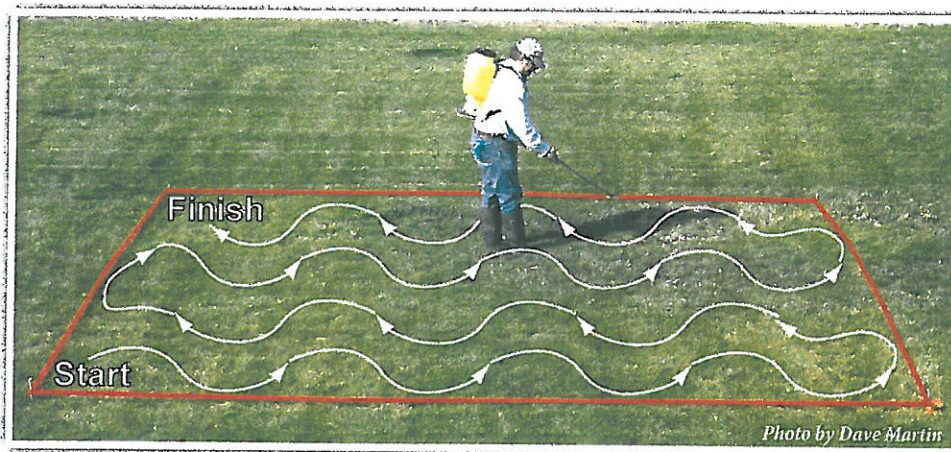
How much herbicide do I put in my tank?

The mix amount is dependent on your spray volume and your application rate. Therefore, this question cannot be answered until we know the volume that is being applied with your particular spraying style in gallons per acre (GPA). The following step-by-step procedure will allow you to calibrate your spray volume (see answer at end).

Sprayer Calibration: Six Simple Steps

The following step-by-step method of calibrating a backpack or hand-gun sprayer involves very little math or formulas. It is based on the following principal:

One gallon = 128 fluid ounces and your calibration area to be sprayed is 1/128 of an acre, thus fluid ounces collected = gallons per acre.



- 1.** Clean sprayer and nozzle thoroughly. Then, fill the spray tank with clean water. Spray with water only to check to see that the nozzle forms a uniform spray pattern. If the pattern is uneven, check to make sure the nozzle is clean and replace it if needed. Adjustable nozzles should be set and marked to permit repeated use of the selected spray pattern. If necessary, add a marker dye to the water to more easily see your spray pattern.

- 2.** Measure an area 18.5 feet by 18.5 feet, which is equal to 1/128th of an acre. If possible, this should be done in the field on which you will be spraying.

- 3.** Time the number of seconds it takes to spray the measured area uniformly with water using gentle side-to-side sweeping motion with the spray wand similar to spray painting a home or automobile. Record the number of

seconds required to spray the area. During application be sure to maintain a constant sprayer pressure and cover the entire area uniformly one time.

You should repeat step 3 at least twice and use the average of the two times.

- 4.** Spray into a container for the average time calculated in step 3. Be sure to maintain constant sprayer pressure while you spray into the container.

Tip Use a syringe to measure herbicide if you are applying a low-rate product like Milestone (e.g., 5 to 7 fl oz/ac).

1 tsp=5cc
1/2 tsp=2.5 cc
1/4 tsp=1.3 cc



- 5.** Measure the number of fluid ounces of water in the bucket. The number of fluid ounces collected from the bucket is equal to the number of gallons of water per acre the sprayer is delivering. Volume sprayed in fluid ounces = gallons of water per acre (GPA).

- 6.** Add the proper amount of herbicide to the tank. For backpack sprayers, use Table 1 to determine how much liquid herbicide to add to each gallon of water. For large sprayer, use Table 2 to determine the amount of liquid herbicide to add to your spray tank.

Find your spray volume in gallons per acre (GPA - calculated above) and read across the tables (next page) to determine the amount of herbicide to add to each gallon of water based on the recommended herbicide application rate.

["CALIBRATION" continued on page 18]

Table 1: Backpack or Other Small-volume Sprayers

The amount of herbicide you need to add to each gallon of water based on the recommended rate for the weed you are treating.

Gallons/Ac (from step 5)	Recommended Herbicide Rate/Acre				
	5 fl oz/ac	7 fl oz/ac	1 pint/ac	1 quart/ac	2 quarts/ac
20	7.5 cc/gal	10.5 cc/gal	5 tsp/gal	10 tsp/gal	3 1/4 fl oz/gal
30	5 cc/gal	7.0 cc/gal	3 tsp/gal	6 tsp/gal	2 fl oz/gal
40	3.8 cc/gal	5.3 cc/gal	2 1/3 tsp/gal	4 3/4 tsp/gal	1 2/3 fl oz/gal
50	3.0 cc/gal	4.2 cc/gal	2 tsp/gal	3 3/4 tsp/gal	1 1/4 fl oz/gal
60	2.5 cc/gal	3.5 cc/gal	1 2/3 tsp/gal	3 1/4 tsp/gal	6 1/3 tsp/gal
70	2.1 cc/gal	3.0 cc/gal	1 1/3 tsp/gal	2 3/4 tsp/gal	5 1/2 tsp/gal
80	1.9 cc/gal	2.6 cc/gal	1 1/4 tsp/gal	2 1/3 tsp/gal	4 3/4 tsp/gal
90	1.7 cc/gal	2.3 cc/gal	1 tsp/gal	2 tsp/gal	4 1/4 tsp/gal
100	1.5 cc/gal	2.1 cc/gal	1 tsp/gal	2 tsp/gal	3 3/4 tsp/gal

Liquid conversions: tsp = teaspoons; TBS = tablespoons; fl oz = fluid ounces; 1 cc = 1 ml; 3 teaspoons = 1 tablespoon; 8 fluid ounces = 1 cup; 2 tablespoons = 1 fluid ounce; 1 cup = 16 tablespoons

Example for Backpack Sprayers: You have completed the calibration procedure and applied 30 fluid ounces in the measured area. Therefore, your spray volume is 30 GPA. Look at Table 1 above for the amount to mix in 1 gallon of water. Assume you want to apply 5 fluid ounces of Milestone® per acre; the amount listed for your volume (GPA) and this application rate is 5 cc in each gallon of water. If you are filling a 3-gallon backpack sprayer take this amount times 3 and you would need to measure 15 cc (with a syringe) or 3 tsp of Milestone® for your 3 gallon mix. It doesn't take much.

Table 2: Larger Hand-gun Sprayers

The amount of herbicide you need to mix in 100 gallons of water based on the recommended rate for the weed you are treating.

Gallons/Ac (from step 5)	Recommended Herbicide Rate/Acre				
	5 fl oz/ac	7 fl oz/ac	1 pint/ac	1 quart/ac	2 quarts/ac
20	25.0 fl oz	35.0 fl oz	5 pt	5 qt	10 qt
30	16.7 fl oz	23.3 fl oz	3.3 pt	3.3 qt	6.6 qt
40	12.5 fl oz	17.5 fl oz	2.5 pt	2.5 qt	5 qt
50	10.0 fl oz	14.0 fl oz	2 pt	2 qt	4 qt
60	8.3 fl oz	11.7 fl oz	1.6 pt	1.6 qt	3.2 qt
70	7.1 fl oz	10.0 fl oz	1.4 pt	1.4 qt	2.8 qt
80	6.3 fl oz	8.8 fl oz	1.25 pt	1.25 qt	2.5 qt
90	5.6 fl oz	7.8 fl oz	1.1 pt	1.1 qt	2.2 qt
100	5.0 fl oz	7.0 fl oz	1 pt	1 qt	2 qt

Conversions: 16 fluid ounces = 1 pint; 32 fluid ounces = 1 quart; 64 fluid ounces = 2 quarts

Example for Larger Sprayers: You calibrate your sprayer and the output is 50 GPA, and your sprayer holds 100 gallons. The area you can treat is 2 acres with your full spray tank. The label requires an herbicide application rate of 5 fl oz/acre for the target weed. You would add 10 fl oz of herbicide to your tank since you are treating 2 acres with each full tank mix.

Calibrating equipment with boomless nozzles (e.g., boom-buster or boom-i-nator) with a refill method

The refill method of calibration is simple and easy to understand. This should always be done in the field on terrain similar to where you plan to make the herbicide application. Field surface conditions can greatly affect sprayer speed, which in turn affects application rate. Basic steps for the refill method are as follows.

1. Park the sprayer on level ground, then fill the spray tank with water to an easily determined point (mark this on the tank).
2. Adjust the pressure to recommended level. Most nozzles work best between 30 and 35 psi (pounds per square inch).
3. Select a speed that can be easily maintained for field conditions. Field conditions will have a large effect on speed, which affects application rate. For example a sprayer calibrated at 4 mph but driven at 3 mph will over-apply by 33% potentially damaging non-target vegetation!
4. Spray a measured area (spray swath width and length). Measure a length to spray--such as 200 feet--and drive that length at a speed that negotiates terrain and minimizes drift. Measure the spray swath width during this step.
5. Return to the filling point. Be sure to park equipment in the same location to refill the tank.
6. Measure the amount of water required to refill the tank. Use a calibrated pail so you can accurately measure water required to fill the sprayer to the original mark.
7. Calculate the spray rate. The final step is to determine the spray rate; in this case it will be in gallons per acre (GPA).

$$GPA = \frac{\text{gallons sprayed [from Step 6]} \times 43,560 \text{ sq ft/acre}}{\text{swath width (ft)} \times \text{swath length (ft)} \text{ [as measured in Step 4]}}$$
8. Add the proper amount of herbicide to the tank. Example: Your spray tank holds 30 gallons total. If you want to apply one pint of herbicide per acre, and your spray rate is 15 gallons per acre (as calculated in Step 7), then you would add two pints of herbicide to the tank. The best way to mix is to add half of the amount of water to the tank, then add the herbicide, then fill the sprayer with water to the 30-gallon mark.