Calibrating Equipment for Aquatic Herbicide Application[1]

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Introduction

Calibration is the process of measuring and adjusting equipment performance (Figure 1). Before applying herbicides in aquatic environments, the primary application equipment that must be calibrated includes granular spreaders, boom sprayers, handheld sprayer guns, and direct metering systems.

The two primary reasons to calibrate application equipment are 1) to ensure that the correct amount of pesticide is applied and 2) to determine the amount of pesticide and water needed to correctly apply the pesticide to the desired area. Applying either too much or too little herbicide can cause problems. Using more herbicide than the label recommends is expensive, potentially toxic to fish, wasteful, and illegal. Applying too little herbicide may result in poor vegetation control. Repeat treatments can be costly and may be prohibited by label restrictions.

Pesticides for aquatic weed control may be recommended at certain rates per surface acre, concentrations in the treated water column, and percentage dilution mixed with water in the spray tank. In order to apply a pesticide correctly, the application rate must be determined.

Figure 1. Checking nozzle output.
Credits: UF/IFAS Pesticide Information Office

Many variables complicate pesticide application for aquatic weed control. For example, it is extremely difficult for the aquatic pesticide applicator to achieve a constant boat speed because of winds, vegetation density (Figure 2), and

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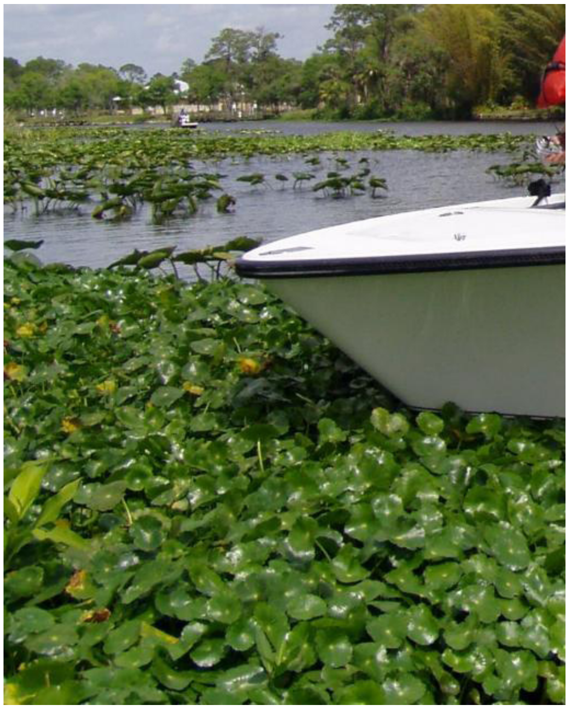

Figure 2. Thick aquatic vegetation is only one variable that affects calibration.
Credits: UF/IFAS Pesticide Information Office

Figure 3. Aquatic weed control accuracy is best achieved working in two-person crews.
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water flows. Pump pressure can vary during the application if vegetation is sucked into the water supply lines. For this reason, it is best to work in two-person crews. One person can drive the boat, monitor and set the boat speed, and monitor the dispersal or application rate of the given pesticide. The other person can be responsible for filling the spray tank or granular pesticide spreader hopper, directing the spray wand or handgun, and ensuring that the spray or spreading equipment is operating properly. It's essential for the spray team to work together closely to adjust boat and pump speed to ensure even application rates (Figure 3).

How precise should calibration be? When measuring output, calculating application rate, or performing other calibration-related calculations, the acceptable variation is plus or minus 10% (± 10%). In other words, the equipment is properly calibrated if the actual measured output is within 10% of the output desired or if the actual application rate is within 10% of the recommended rate.

There are several basic items needed to calibrate:

- Stopwatch or watch with second hand
- Measuring tape
- Calculator
- 100-ft floating rope with a float tied to the end
- Buoys or poles
- Scale that will weigh up to 20 pounds
- Blank herbicide granules
- Enough graduated cylinders or buckets to catch the output from each nozzle of the spray boom
- A quart container calibrated in ounces if calibrating a suction/induction system

Calibration is not difficult, but it does require some math. This publication provides standard formulas and conversion factors (Table 1) incorporated into practical examples to help with calibration.

Liquid Calibration

Determining Speed

To calibrate most types of application accurately, you must know the equipment's actual travel speed; therefore, this section applies to boom sprayers as well as several other application techniques. Actual speed is not always the same as the speed indicated by a speedometer. Relying on a speedometer reading is not a good idea; it's best to measure the speed of an applicator in feet per minute.

To determine actual boat speed, measure a distance of 100 feet in the lake using the 100-foot floating rope and mark the distance with the buoys or poles. Operate the boat with the spray tank half-full and the number of persons and other gear that will be carried in the boat. Approach the front marker at a comfortable speed (usually a fast idle or equivalent to a fast walking pace). Start timing when you pass the first marker. As you pass the end marker, note the time in seconds that it required to cover the distance. Do this in the opposite direction and average the two numbers to compensate for going with and against the wind. Determine mph by the following equation:

mph=[distance traveled (ft) X 3,600] ÷ [5,280 X time to cover distance (sec)]

Here's a practical example that works through the entire process with the variables presented in a step-by-step fashion.

Example: A boat is operated over a 100-foot test strip. The time required to complete the test run is measured in seconds by a wristwatch. The run is made in opposite directions and the times are 55 seconds and 53 seconds. What is the boat's actual travel speed in feet per minute (fpm)? In miles per hour (mph)?

Solution:

mph = [distance traveled (ft) X 3,600] ÷ [5,280 X time to cover distance (sec)]

fpm = 100 ft ÷ (54 sec ÷ 60 sec/min)=111.11 fpm

mph = (100 ft X 3,600) ÷ (5,280 X 54 sec)=1.26 mph

Boom Sprayers: Determining Boom Swath Width

The swath width of the boom may be determined by the following relationship:

swath width = number of nozzles X nozzle spacing (ft)

Example: What is the swath width of a boom equipped with 8 nozzles spaced 18 inches apart?

Solution:

swath width = 8 nozzles X (18 in ÷ 12 in per ft) = 12 ft

Note: Double the effective swath width if making surface applications to open water or using drop hoses for subsurface applications. It can be assumed that the herbicide will diffuse between the actual treated swaths. If that's the case in this example, the effective swath width would be 24 ft.

Boom Sprayers: Determining Acres per Minute (apm)

To calculate the acres per minute treated by the application, use the following relationship:

apm = [swath width (ft) X speed (fpm)] ÷ 43,560 ft^2 per acre

Example: How many acres per minute is the sprayer treating if the swath width is 12 feet and it is traveling at a rate of 111.11 fpm?

Solution:

apm = (12 ft X 111.11 fpm) ÷ 43,560 ft^2 = 0.03 apm

Boom Sprayers: Check Nozzle/Drop Hose Output Uniformity

After the nozzles are fitted to the sprayer, it is important to check for uniform output (Figure 4) regardless of the nozzle type selected or the sprayer type used. Any nozzle that varies by ±10% from the average output should be cleaned or replaced. The same principle applies when using drop hoses for subsurface applications (Figure 5).

Figure 4. A nozzle uniformity check from a backpack sprayer.
Credits: UF/IFAS Pesticide Information Office

Example: A sprayer is operated in a stationary position and water is collected from each of its 8 nozzles for 1 minute. The average nozzle output is determined to be 49.7 ounces. One nozzle was found to have an output of 43.2 ounces. Should it be cleaned or replaced?

Solution:

10% of 49.7 ounces = 0.10 X 49.7=4.97 ounces

Figure 5. Drop hoses for subsurface application.
Credits: UF/IFAS Pesticide Information Office

49.7 ounces - 43.2 ounces = 6.5 ounces

The difference is 6.5 ounces less than the average nozzle output, which is greater than a 10% difference from the average, so the nozzle should be cleaned or replaced, then rechecked.

Boom Sprayers: Calculate Gallons per Minute (gpm) of Spray Applied

For this sprayer, the gpm would be:

(49.7 ounces ÷ 128 oz per gal) X 8 nozzles = 3.1 gpm

Boom Sprayers: Calculate Gallons per Acre (gpa) Applied

The gallons per acre (gpa) of spray mixture that the equipment applies can be found by the following relationship:

gpa = gallons per minute ÷ acres per minute

Example: This sprayer is applying 3.1 gpm at a rate of 0.03 apm. What is its gpa?

Solution:

gpa = 3.1 gpm ÷ 0.03 apm=103.3 gpa

Boom Sprayers: Calculate Acres Treated per Tank

To determine the number of acres one tank load of spray mixture will treat, use the following relationship:

acres per tank = tank volume (gal) ÷ gal per acre

Example: This sprayer is equipped with a 200-gallon tank. The gpa output was determined to be 103.3. How many acres can the sprayer treat with a full tank?

Solution:

acres treated = 200 gal ÷ 103.3 gpa = 1.94 acres

Boom Sprayers: Calculate Acres Treated per Tank

Use the following relationship to determine how much product to add to make a full tank:

herbicide product = acres treated per tank X product label rate

Example: A product label calls for an application rate of 32 ounces of product to be applied per treated surface acre. How much herbicide should be placed in this 200-gallon tank if a full tank treats 1.94 acres?

Solution:

herbicide product = 1.94 acres X 32 oz = 62.1 oz product

Boom Sprayers: Shortcut for Determining gpa

The number of gallons per acre of spray mixture applied can be calculated by the following relationship:

gpa = (gpm X 5,940) ÷ (mph X w)

Where:

gpa = gallons per acre

gpm = average nozzle output in gallons per minute

5,940 = conversion factor that allows expression of these units

mph = miles per hour

w = nozzle spacing in inches

Boom Sprayers: Nozzle Selection and Drift

Sprayer nozzles mounted on spray booms should be selected based on the desired volume rate, operating pressure, droplet size spectrum, and compatibility with the sprayer. In general, 1) high volume applications require large orifice nozzles; 2) increasing the pressure reduces the droplet size;

3) small droplets are more drift-prone; and 4) every nozzle cannot be used on every sprayer. Many manufacturers' labels will specify droplet size criteria set by the American Society of Agricultural and Biological Engineers (ASABE) standards (Figure 6). The standard (S572) rates droplets as extra fine, very fine, fine, medium, coarse, very coarse, extremely coarse, or ultra coarse. Droplet size categories are color-coded as shown in Table 2. The droplet size created by a nozzle becomes very important when the efficacy of a particular herbicide is dependent on coverage (Table 3) or when minimizing material leaving the target area is a priority. A good collection of nozzles can provide flexibility in application.

Spray Drift Requirements For Aerial Application

- Applicators are required to use a coarse or coarser droplet size (ASABE S572) or, if specifically using a spinning atomizer nozzle, applicators are required to use a volume mean diameter (VMD) of 385 microns or greater for release heights below 10 feet. Applicators are required to use a very coarse or coarser droplet size or, if specifically using a spinning atomizer nozzle, applicators are required to use a VMD of 475 microns or greater for release heights above 10 feet. Applicators must consider the effects of nozzle orientation and flight speed when determining droplet size.

Figure 6. Label statement regarding droplet size.
Credits: CDMS

Applications Based on Concentration

Herbicide labels usually have tables that the applicator can use to determine the appropriate amount of herbicide formulation for a desired concentration and given water depth. However, sometimes it is necessary to calculate the amount of herbicide to use without a table provided. It may be useful to calculate the (potential) concentration of herbicide in water for a given depth when the recommendation is given only as a surface acre application.

Herbicide concentration in water is usually referred to in parts per million (ppm) or parts per billion (ppb) on a weight: weight basis. Before determining concentration or amount of herbicide to use for a given concentration, first measure the surface area and water depth in order to calculate water volume. If water depth is not uniform, it is important that average depth is measured. In small ponds, depth should be measured across the pond in at least two directions, taking sufficient measurements to adequately describe the pond's depth (Figure 7). In many Florida lakes, depth will be uniform throughout a treatment area. However, plots should be checked for uniformity of depth, and if the plots are not uniform, average depth should be measured.

Figure 7. Measuring pond depth to calculate water volume.
Credits: UF/IFAS Pesticide Information Office

Example: A manufacturer's label recommends 0.2 ppm elemental copper for control of planktonic algae. How much copper carbonate will be needed if the product contains 9.1% elemental copper and the pond to be treated contains 6.9 acre-feet of water?

1. Solution: Use the following relationship to determine how much active ingredient is necessary:

pounds of active ingredient needed = ppm (desired) X acre-feet X 2.7

pounds of active ingredient needed = 0.2 ppm X 6.9 acre-feet X 2.7 = 3.73 pounds

2. Solution: Now the amount of copper carbonate product may be determined:

pounds copper carbonate = 3.73 pounds active ingredient ÷ 0.091 = 41.0 pounds

Example: A manufacturer's label recommends 1.0 ppm copper for control of hydrilla in a canal with flowing water. The minimum exposure period must be at least 3 hours and the water is flowing at 3 cfs (cfs = cubic feet per second) (1,350 gpm). The concentrated herbicide will be placed in a tank equipped with a brass needle valve to maintain a drip into the canal. What should the drip rate be in ml per minute if the label states to apply 3 quarts per hour? How much total product will be needed for the job?

1. Solution: Use the following relationship:

drip rate (ml per minute) = [label rate (gal) X 3,785] ÷ 60

2. ml per minute = (0.75 gal X 3,785) ÷ 60 = 47.3 ml per min

3. total amount for the job: 3 qt per hr X 3 hr exposure = 9 qt

Handheld Sprayer Guns

A handheld sprayer gun runs off a pump and spray tank that is mounted on a boat, ATV, or truck (Figure 8). The methods for calibrating sprayer guns are similar to those for calibrating a boom sprayer. At times, the width of the spray swath will need to be determined. Swath width can be measured easily after some practice using water on a paved surface (Figure 9).

Figure 8. Measuring output of a handheld sprayer gun.
Credits: UF/IFAS Pesticide Information Office

Figure 9. Checking swath width of a sprayer gun on asphalt.
Credits: UF/IFAS Pesticide Information Office

Example: Use the following scenario to answer the questions:

- A test course of 100 feet was set up to practice with the sprayer gun.
- It took an average of 43 seconds to walk over the test course.
- The swath width is 15 feet.
- 4.2 gallons of water were collected into a bucket from the sprayer gun in a one-minute test.
- The sprayer's tank capacity is 100 gallons.

1. What is the speed in fpm and mph of the applicator?

Solution:

fpm = 100 ft ÷ (43 sec ÷ 60 sec per min) = 139.66 fpm

mph = (100 ft X 3,600) ÷ (5,280 X 43 sec)=1.59 mph

2. How many acres per minute are being treated?

Solution:

apm = (15 ft X 139.66 fpm) ÷ 43,560 ft^2 = 0.05 apm

3. How many gallons per acre are being applied?

Solution:

gpa = 4.2 gpm ÷ 0.05 apm = 84.0 gpa

4. How many acres can a full tank treat?

Solution:

acres treated = 100 gal ÷ 84.0 gpa=1.19 acres

5. How much herbicide should be mixed into a full tank if the product's label calls for an application rate of 70 ounces per surface acre?

Solution:

herbicide product = 1.19 acres X 70 oz = 83.3 ounces product

Direct Metering Systems

When large areas are treated, it is often more efficient to meter the herbicide into the suction side of the pump and eliminate the time spent filling and mixing tanks. Water is drawn into the pump through "water boxes" built into the bottom of the spray boat. Normally, one or more plastic tubes are tapped into the pump suction line. Each tube has a valve for opening and closing the lines. Tubes have an in-line orifice used to meter the correct amount of herbicide into the system. A number of suction hoses can be used, and the application can continue without interruption. When the herbicide in the container being used is depleted, the applicator opens a valve in the hose in a second container and closes the valve of the empty one. Calibration of this type of system is based upon measuring the herbicide withdrawal rate (Figure 10). Direct metering systems offer several advantages:

- The main carrier tank is loaded with clean water, not mixed chemicals.
- The concentrated chemical is accurately injected and mixed just prior to spraying.
- There is reduced operator exposure to chemical concentrates.
- There is no pre-mixing of chemicals in the main carrier tank.
- No mixture is left over upon completion of a job.
- Unused concentrated chemical remains safe and secure in a dedicated holding tank.
- The operator can quickly change from one chemical product to another without cleaning and rinsing the main carrier tank.
- Chemical application rates can be adjusted by varying the concentration of chemical injected into the carrier.

Example: A boat equipped with a handheld sprayer gun and direct metering system will be used to treat water hyacinth. Use the following scenario to answer the questions:

- The label rate of herbicide to apply is 3 quarts per acre.
- The desired spray volume is 100–200 gallons of water.
- It takes an average of 114 seconds to cover a test distance of 200 feet.

Figure 10. Measuring herbicide withdrawal of a direct metering system.
Credits: UF/IFAS Pesticide Information Office

- The swath width of the sprayer gun is 15 feet.
- The sprayer gun's output is 6 gpm.

1. How many feet per minute are being treated?

Solution:

fpm = 200 ft ÷ (114 sec ÷ 60 sec per min) = 105.26 fpm

2. How many acres per minute are being treated?

Solution:

apm = [swath width (ft) X speed (mph)] ÷ 43,560 ft^2

apm = (15 ft X 105.26 fpm) ÷ 43,560 ft^2 = 0.036 apm

3. How many gallons per acre are being applied?

Solution:

gpa = [gallons sprayed (gpm)] ÷ [acres treated (min)]

gpa = 6 gpm ÷ 0.036 apm = 167 gpa

The calculation of 167 gpa meets the desired application volume of 100–200 gallons of water.

4. How many ounces per minute (opm) of herbicide should be withdrawn by the direct metering system to meet the 3 quarts (0.75 gal) per acre herbicide rate?

Solution:

opm = apm X gpa X 128 oz/gal

opm herbicide = 0.036 apm X 0.75 gal X 128 oz per gal = 3.5 opm herbicide

If rate adjustments need to be made with a direct metering system, the orifice in the suction line may be changed.

Mixing Dilutions

Some pesticide labels will give rate directions to prepare a spray solution based on a percentage volume. This happens particularly in situations when small handheld sprayers —such as backpacks— will be used to make treatments. In such situations, for example, the label may state to prepare a 0.5%–5% by volume solution. When determining a percentage solution, the calculation involves using a decimal equivalency. Examples of decimal equivalencies are listed in Table 4. An example of the calculation is provided in Table 5.

Granular Calibration

Aquatic managers may occasionally wish to apply a granular or pelletized product using a spreader (Figure 11). Just as with liquid applications, a calibrated spreader is needed to apply the correct rate. When calibrating a spreader, be sure to use the product (or blanks if available) that will be applied. Delivery rate can vary by product because of particle size and weight.

Figure 11. Granular spreader.
Credits: UF/IFAS Pesticide Information Office

To determine the pounds per acre applied using the following equation and steps:

pounds per acre = pounds product ÷ acres

1. Adjust the spreader gate to a medium setting.
2. Fill the spreader with a known quantity of granules.
3. Operate the spreader over a test course.
4. Measure the width of the applied granule swath (ft) and the number of linear feet traveled.
5. Multiply linear feet by swath width (ft) to convert to acres.
6. Divide the granule weight in pounds by the acres treated.

Here is a method that can be used with spreaders equipped with a handheld gun (Figure 12):

1. Operate the spreader for two passes over a known course distance and record the time needed.
2. Measure the swath width of the granule pattern (Figure 13).
3. Operate the spreader in a stationary position and catch the granules from the gun by directing it into a bucket for the time it took to run the spreader over the course.
4. Record the weight of the granules.
5. Divide the granule weight in pounds by the area treated (after converting to acres).

The exact effective swath of a spreader may be difficult to determine because the rate per unit of area diminishes near the edge of the pattern. A general rule-of-thumb is that the effective swath probably wouldn't exceed 75% of the greatest distance between granules. As an example, if the greatest distance between where granules landed to each side of the spreader was 60 feet, the effective swath should be approximately 45 feet (.75 x 60).

Example: Twenty pounds of the blank product granules are placed in the hopper of a centrifugal spreader. The spreader is run a total distance until empty (160 feet), and the effective swath width is measured to be 45 feet. What is the spreader's application rate per acre?

Solution:

Figure 12. Granular spreader with handheld gun.
Credits: UF/IFAS Pesticide Information Office

Figure 13. Measuring the swath width of a granular spreader.
Credits: UF/IFAS Pesticide Information Office

1. Determine the acres treated.

(45 feet X 160 feet) ÷ 43,560 ft^2 = 0.17 acres

2. Determine the application rate.

20 pounds ÷ 0.17 acres = 117.6 pounds per acre

Example: A granular spreader with a handheld gun is operated over a 150-foot test course. It took an average of 45 seconds to operate the spreader over the course. The effective swath width was measured and found to be 17 feet. The gun was directed into a bucket catching the granules while operated in a stationary position for 45 seconds. The granules were weighed, and it was determined that 4.1 pounds of granules were caught. What is the spreader's application rate per acre?

Solution:

1. Determine the acres treated.

(17 feet X 150 feet) ÷ 43,560 ft^2 = 0.06 acres

2. Determine the application rate.

4.1 pounds ÷ 0.06 acres = 68.3 pounds per acre

Example: A centrifugal spreader must be calibrated to apply 40 pounds of granules per acre. The effective swath width is measured to be 40 feet and speed was calculated at 2.5 mph while tested over a 200-foot distance.

Solution:

1. Calculate how many acres per minute are being treated.

apm = [swath width (ft) X speed (mph)] ÷ 495

apm = (40 ft X 2.5 mph) ÷ 495 = 0.2 apm

2. Calculate the number of pounds of granules delivered per minute.

pounds per minute = acres per minute X pounds per acre

pounds per minute = 0.2 X 40 = 8.0 pounds per minute

3. Therefore, to calibrate the spreader a setting must be found that will deliver 8 pounds per minute. What if a situation exists in which the lowest setting without clogging still delivers more than 8 pounds per minute?

Increasing boat speed will increase acres treated per minute; therefore, a greater pounds per minute rate can be used so that the spreader can be calibrated. The boat is checked again over the 200-foot course with an increased RPM, and is timed at an average of 34 seconds.

4. Calculate how many acres per minute are now being treated.

apm = [swath width (ft) X distance (ft) X 60 sec] ÷ [43,560 ft^2 X time to cover distance (sec)]

apm = (40 ft X 200 ft X 60 sec) ÷ (43,560 ft^2 X 34 sec)=0.32 apm

5. Calculate the pounds per minute that will result in 40 pounds per acre and a 40-foot swath width at the new per-acre rate.

pounds per minute = acres per minute X pounds per acre

pounds per minute = 0.32 apm X 40 pounds per acre = 12.8 pounds per minute

6. Therefore, to calibrate the spreader at the new speed, find a spreader setting that will deliver 12 pounds per minute. It is helpful to determine spreader output in pounds per minute through a range of settings on the spreader to refer to for future applications at various rates and speeds. In this example, the following outputs are determined for the spreader:

Spreader setting	Pounds per minute
1	clogs
2	clogs
3	10
4	15
5	20

It is not necessary to move the spreader setting small increments because variables that will vary during the application — such as boat speed — will have a greater effect on pounds per acre than small changes that can be affected with the spreader setting. In this example, a spreader setting between 3 and 4 will give the desired 12 pounds per minute, which will result in the required application rate of 40 pounds per acre at the measured speed.

Note: Spreader output will be different at given settings for different-sized particles. Therefore, separate calibration tables must be made for different-sized pellets and granules.

Remember that calibration is the first approximation of delivering the correct application rate. The applicator must pay close attention to maintain constant speed and continually be aware of the area covered and amount of herbicide applied.

Table 1. Useful formulas and conversion factors for calibration.

Variable	Formula/conversion factor
Travel speed	Distance traveled ÷ time elapsed
Miles per hour (mph)	[Distance traveled (ft) X 3,600] ÷ [5,280 X time to cover distance (sec)]
1 mile per hour (mph)	88 feet per minute
Miles per hour (mph)	Feet per minute ÷ 88
Square feet per acre (ft^2)	43,560
Linear feet per 1 mile (ft)	5,280
Acre-feet	Average depth (ft) X surface area (acres)
Acre-feet of canal	[Length (ft) X width (ft) X average depth (ft)] ÷ 43,560 ft^2
Acres per minute (apm)	[Swath width (ft) X Distance (ft) X 60 sec] ÷ 43,560 X time to cover distance (sec)
Acres per minute (apm)	[Swath width (ft) X speed (mph)] ÷ 495
Gallons per acre (gpa)	Gallons sprayed (gpm) ÷ acres treated (min)
Gallons per acre (gpa)	[gpm X 5,940] ÷ [mph X nozzle spacing in inches (w)]
Gallons per minute (gpm)	Gallons sprayed ÷ minutes elapsed
Gallons per minute (gpm)	Acres per minute X gpa
Gallons per minute (gpm)	(mph X w X gpa) ÷ 5,940
Acres per tank	Tank volume (gal) ÷ gpa
1 part per million (ppm)	2.7 pounds per acre-foot of water
Pounds of active ingredient needed	ppm (desired) X acre-feet X 2.7
Herbicide per tank	Acres per tank X recommended herbicide rate per acre
Herbicide per tank	Tank capacity X solution needed (% decimal equivalency)
Drip rate (ml per minute)	[Label rate (gal) X 3,785] ÷ 60
1 gallon	3,785 ml

Table 2. ASABE Standard S572 Spray Quality Categories.

Color code	Category (symbol)
Purple	Extra fine (XF)
Red	Very fine (VF)
Orange	Fine (F)
Yellow	Medium (M)
Blue	Coarse (C)
Green	Very coarse (VC)
White	Extremely coarse (EC)
Black	Ultra coarse (UC)

Table 3. Droplet spectra category and recommendation for herbicide types. An X represents a recommendation.

ASABE Standard S572 Droplet Spectrum Categories	Contact foliar herbicide	Systemic foliar herbicide
Extra fine (XF) (purple)		
Very fine (VF) (red)		
Fine (F) (orange)	X	
Medium (M) (yellow)	X	X
Coarse (C) (blue)		X
Very coarse (VC) (green)		X
Extremely coarse (XC) (white)		
Ultra coarse (UC) (black)		
*Based on volume median diameter designation.		

Table 4. Decimal equivalencies.

% Solution	Decimal equivalency
0.25	0.0025
0.5	0.005
1.0	0.01
5.0	0.05
10.0	0.10
50.0	0.50
100.0	1.00

Table 5. Example calculation of preparing a spray mix as a percentage solution.

Step	Example
1. Tank capacity (gal)	3 gal
2. Label rate (% solution)	2.0%
3. Amount needed per gal (#1 x #2)	(3 x 0.02) = .06 gallons product/tank
4. Convert to ounces for ease of measuring (gal product x 128 oz/gal)	(.06 x 128) = 7.7 oz/gal