

RECORDKEEPING MANUAL

**FOR PRIVATE PESTICIDE
APPLICATORS**



Important Phone Numbers for Pesticide Applicators

Emergency Phone Numbers



National Poison Control Center (800) 222-1222

- For aid in human poisoning cases.



State or County Police..... _____

- To report accidents on roadways involving pesticides.



State Emergency Management _____

- To report accidents (spills and leaks) involving pesticides.



CHEMTREC (24 hours) (800) 424-9300
(National Chemical Response and Information Center)

- For help involving spills, leaks, fires, and accidents involving hazardous chemicals.

Other Phone Numbers



State Regulatory Agency _____

- For pesticide labeling, licensing, and compliance information.
- For pesticide disposal assistance.



Local Cooperative Extension Service _____

- For information on safe and proper pesticide use.



NPIC (National Pesticide Information Center) (800) 858-7378

Monday through Friday. 8 a.m. until 6 p.m., CT.

Web address: <http://npic.orst.edu>

- For medical and consumer information on pesticides.

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If You Need More Recordkeeping Manuals

If you want more copies of this manual please contact the United States Department of Agriculture, Pesticide Records Branch at (703) 330-7826.

- Or e-mail us at:
amspesticide.records@usda.gov
- Or you may write to:
USDA, Pesticide Records Branch
8609 Sudley Road, Suite 203
Manassas, VA 20110-4582

Recordkeeping Manual

for Private Pesticide Applicators

Grower/Applicator Information

Owner/Operator _____

Address _____

Company/Farm Name _____

Phone Number _____

Applicator Name

Certification Number

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

G. _____

H. _____

The Federal recordkeeping regulation requires the certified private applicator to record the brand name and the Environmental Protection Agency (EPA) registration number of the federally restricted-use pesticides he/she applies. The Federal recordkeeping regulation does not require the certified private applicator to record active ingredient(s). You will be able to save time by listing the brand/product name, EPA registration number, and active ingredient(s) of the pesticides you apply on this page and then entering the corresponding number(s) to complete your record form. **Use of this page is voluntary.**

<u>Brand Name</u>	<u>EPA Registration Number</u>	<u>Active Ingredients</u>
1) _____	1) _____	1) _____
		1a) _____
		1b) _____
2) _____	2) _____	2) _____
		2a) _____
		2b) _____
3) _____	3) _____	3) _____
		3a) _____
		3b) _____
4) _____	4) _____	4) _____
		4a) _____
		4b) _____
5) _____	5) _____	5) _____
		5a) _____
		5b) _____

Brand Name

EPA Registration Number

Active Ingredients

6) _____

6) _____

6) _____

6a) _____

6b) _____

7) _____

7) _____

7) _____

7a) _____

7b) _____

8) _____

8) _____

8) _____

8a) _____

8b) _____

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10) _____

10a) _____

10b) _____

11) _____

11) _____

11) _____

11a) _____

11b) _____

Brand Name

EPA Registration Number

Active Ingredients

12) _____

12) _____

12) _____

12a) _____

12b) _____

13) _____

13) _____

13) _____

13a) _____

13b) _____

14) _____

14) _____

14) _____

14a) _____

14b) _____

15) _____

15) _____

15) _____

15a) _____

15b) _____

16) _____

16) _____

16) _____

16a) _____

16b) _____

17) _____

17) _____

17) _____

17a) _____

17b) _____

Recordkeeping Manual

for Private Pesticide Applicators

This manual contains forms that will help you keep the records required by Federal regulations for restricted use pesticides and for compliance with the Worker Protection Standard. These forms are intended for use by private pesticide applicators. They are not intended for use by applicators licensed as commercial pesticide applicators.

These forms are designed for your convenience. The information you write here becomes the official record for your compliance with the law. This manual was designed for use in the field or office. If you use a sharp, dark pencil to write on the forms, your marks are less likely to be destroyed by rain, coffee spills, or other accidents. Please write clearly so that those who inspect your records can easily understand them.

You may keep your records in other ways as long as they contain the required information. Either handwritten notes, computer-generated records, or other recordkeeping systems are acceptable. The forms in this manual are also available from the following Internet Web site:

<http://www.ams.usda.gov/science/sdpr.htm>.

Recordkeeping Requirements for Restricted Use Pesticides

The 1990 Farm Bill requires private certified pesticide applicators to keep records of all applications of federally restricted use pesticides. The U.S. Department of Agriculture (USDA) Agricultural Marketing Service carries out the provisions of the Federal recordkeeping requirements. The information required by the Federal legislation is shown on page 9. These records must be kept for 2 years; however, you may want to keep them longer for reference in making future management decisions.

Although applicators have 14 days to record information related to applications, it is a good idea to fill out the recordkeeping form immediately after application to be sure that you have an accurate and detailed record.

If you hire a commercial applicator to apply a restricted use pesticide, you should obtain the necessary recordkeeping information from the applicator. Commercial applicators are required to provide their clients with a copy of the record within 30 days of application. Application information is also required for fields receiving spot treatments.

On the field record form “USDA” will appear under each column heading that is required by the Federal pesticide recordkeeping regulation.

Who Has Access to Your Records?

Your records can be inspected at any time by authorized representatives of the U.S. Department of Agriculture and State pesticide regulatory agencies who present identification. In addition, a licensed health-care professional, or someone working under a licensed health-care professional's supervision, can request the record information at any time following an application when treating individuals who may have been exposed to restricted use pesticides.

Benefits of Keeping Records

The records you keep on pesticide use are not only required by the law, they will also help you improve your farming operation.

- Records help you evaluate how well a chemical worked, particularly if you have used reduced rates or alternative application techniques.

- Records help you figure out how much pesticide you will need in a future year, so that you will not have to store or dispose of extra chemicals.
- Records help to prevent carry-over injury and improve rotation decisions.
- Records may protect you from legal action if you are accused of improper pesticide use.
- Food processors may require pesticide records to evaluate the potential for residues.
- Lenders and land developers often require records to evaluate potential environmental liability before lending money or buying land.
- Records provide data to respond to surveys conducted by Federal agencies and universities that can impact future availability of some pesticides through re-registration. They may also be used to respond to the public's concern regarding pesticide use.
- Records can save money by helping a farmer determine the best pesticide management program. Records are the key to a successful integrated pest management program.

Enforcement and Penalties

USDA's Agricultural Marketing Service (AMS) administers the Federal recordkeeping regulations. The AMS Administrator is responsible for the enforcement actions taken against violators of this standard. Any private applicator who violates the recordkeeping requirements of the USDA shall be liable for a civil penalty of not more than \$550 for the first offense and not less than \$1,100 for any subsequent offense.

What's in the Rest of the Manual?

- Summary table of pesticide recordkeeping requirements.
- 16 field forms to record your pesticide applications.
- Instructions for accurate sprayer calibration.
- Sample sprayer calibration log form.
- 6-year calendar.

Recordkeeping Information for the Worker Protection Standard

The Worker Protection Standard (WPS) is a Federal regulation that is intended to reduce the risk of pesticide poisoning and injury among agricultural workers. Private applicators who hire pesticide handlers and/or workers must display application information in a centrally located area accessible to all employees *before* a pesticide is applied. This display of information applies to *all* pesticides with "Agricultural Use Requirements" printed on the label, not just restricted use pesticides.

The Hand/Head Keep Out symbol appears in the column headings on the field record sheets to mark information required for worker protection. This includes the location and crop/commodity treated; brand name; EPA registration number; active ingredients of pesticide applied; the month, day, year, and time of application; and the Restricted Entry Interval (REI). Most of this information can be found on the pesticide label. Workers, handlers, government officials, health care workers, and employers of commercial handlers hired to work on the farm or business must have access to this information. Commercial applicators must provide this information to the agricultural employer before making pesticide applications. Information must be displayed for 30 days after the end of the REI. If there is no REI on the label, the information should be displayed for 30 days after the application.



If You Need More Recordkeeping Manuals

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QUICK REFERENCE CHART OF PESTICIDE RECORDKEEPING REQUIREMENTS FOR PRIVATE APPLICATORS














REQUIRED ITEMS	<u>Restricted Use Pesticides</u> USDA Requirements for Private Applicators	<u>Agricultural Use Pesticides</u> Worker Protection Standard Requirements for Agricultural Employers
Brand Name/Product Name	✓	✓
EPA Registration Number	✓	✓
Total Amount of Pesticide Used	✓	—
Date of Application	✓	✓ plus time of application
Description/Location of Treated Area	✓	✓
Crop, Commodity, or Stored Product	✓	—
Size of Area Treated	✓	—
Name of Certified Applicator	✓	—
Certification Number	✓	—
Active Ingredients	—	✓
Restricted Entry Interval (REI)	—	✓
Complete Record	Within 14 days of application; keep 2 years.	Before application; keep 30 days after the REI expiration.

How To Complete the Field Record Form









- “USDA” will appear under each column heading that is required by the Federal pesticide recordkeeping regulation.
- The information in columns marked with the Hand/Head Keep Out symbol must be provided to field workers/handlers for *all pesticides with “Agricultural Use Requirements” on the label* to meet the WPS requirement.
- This information must be posted *before application and remain for 30 days after the end of the REI* for the WPS requirement.



FIELD ID/LOCATION “USDA” : # 52-48 Old Creek Field 

Applicator Name and Certification Number “USDA”	Mo/Day/Year Time “USDA” 	EPA Reg. Number “USDA” 	Active Ingredients 	Brand Name “USDA” 	Restricted Entry Interval (REI) 	Crop, Commodity or Site “USDA” 
Bob B. Smith	5/3/02 10 am*	241-337	Pendimethalin	Prowl 3.3EC	24 hrs	cotton
200028265	5/3/02 10 am*	100-642	Fluometuron	Cotoran 4L		
						

*Time is not required by the USDA pesticide recordkeeping regulation, but it is required by the WPS.

-  Write the **location of the field** (not the farm or business). The field may be identified on a farm map, by a USDA map and number, by a common field name (for example, 52-48 Old Creek Field), or by a legal description. If the site treated is a greenhouse or storage facility, give it a unique name or number.
-  If the **name and certification number** are the same as the name and certification number of the person on the applicator information form on page 3, then you may record the letter listed for the applicator. If anyone else is applying the pesticide, record the applicator’s name and certification number.
-  Fill in the **month, day, and year** of application. WPS also requires you to post the **time** of application, so record time here as well.
-  The **EPA Registration Number** is located below the ingredients statement on most labels. It is **not** the same as the EPA establishment number (for example, EPA Reg. No. 241-337). If you completed page 4 through 6 as suggested, you may write the appropriate number in space 4.
-  Copy the **active ingredients** (common name) from the label for all products used in the application. If you completed page 4 through 6 as suggested, you may write the appropriate number in space 5.
-  Write the **brand or product name** of the pesticide. Multiple lines may be used to record tank mixes. Information on all products used in a tank mix is required. If you completed page 4 through 6 as suggested, you may write the appropriate number in space 6.
-  The pesticide label lists the **Restricted Entry Interval**. The application information for workers must remain posted until *30 days after the end of the REI*. When there is no REI, the notice must remain for 30 days after the application date. If you apply pesticides in a tank mix with different REIs, write down the longest REI.
-  Fill in the **crop, commodity, or site**. If the location is a greenhouse, record crop and site location. If you are treating livestock, record the type of animals treated (hogs, cattle, etc.).

- ⑨ The pesticide label will tell you the application **rate** per unit (for example, 1.5 pints per acre or 1 pound active ingredient per acre). Record the rate you actually use.
- ⑩ Record the number of **units treated**. This may be acres, linear feet, bushels, cubic feet, square feet, or number of animals, etc. For special applications (for example, alternate middles, weed wicks, band applications) record the total area covered. A 20-acre field treated using an alternate middle approach would still be recorded as 20 acres. See note on spot treatments below.








Rate	Size of Area Treated “USDA”	Total Amount Applied “USDA”	Field Notes: target pest(s); sprayer nozzles, speed, pressure, gallonage; wind & weather; crop status
1.5 pints per acre X	20 acres =	3.75 gallons	Sunny, wind speed 3-5 mph. Light grass infestation. 2002. Gallonage = 10 gallons per acre. Banded at planting.
2 quarts per acre X	20 acres =	10 gallons	
⑨	⑩	⑪	

- ⑪ The **total amount applied** is figured as the amount of product multiplied by the area treated. If you have filled out columns 9 and 10, multiply them to get the total amount. Record the total quantity of pesticide used—*not the quantity after water or carrier added*.
- ⑫ When you are filling out the application record, you may find it helpful to record information about the sprayer equipment, the pests, the weather (particularly wind speed and direction, but also temperature and humidity), and the crop status. This will help you know whether an application was effective and improve future pest-management decisions. It will also be helpful in problem solving if the pesticide fails to control the target pest or moves off target.

Note: “Spot Treatments” are applications made to less than 1/10th of an acre. Application of a herbicide along a fence row or an insecticide applied to a fire ant mound would be examples of spot treatments. (Note: Greenhouse and nursery treatments do not qualify as spot treatments.) For spot treatments, describe location of area treated (for example, poison ivy along fence row of Baker Farm), indicate “spot treatment,” and record:

- Brand name.
- EPA registration number.
- Month, day, and year.
- Total amount applied.
- Location.

FIELD ID/LOCATION "USDA"  :

Applicator Name and Certification Number "USDA" 	Mo/Day/Year Time "USDA" 	EPA Reg. Number "USDA" 	Active Ingredients 	Brand Name "USDA" 	Restricted Entry Interval (REI) 	Crop, Commodity or Site "USDA" 

Rate	Size of Area Treated "USDA"	Total Amount Applied "USDA"	Field Notes: target pest(s); sprayer nozzles, speed, pressure, gallonage; wind & weather; crop status
X	=		
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Sprayer Calibration (1/128th of an Acre Method)

Wayne Buhler, Ph.D., Pesticide Education Specialist
North Carolina State University

To use pesticides successfully, you must be able to measure and adjust the amount of pesticide applied to the target area. It is well worth the time to calibrate your sprayer so that you know it is actually applying the product at the right rate in a uniform pattern. You need to calibrate your sprayer routinely.

If the sprayer applies too little pesticide, you may have poor pest control and extra costs for additional applications and crop losses. If you apply too much pesticide, you may damage the crop, end up with too much residue in the crop and soil, and be fined for illegal applications. You will also have wasted money for unneeded pesticide.

Choose the right nozzle size, type, and alignment for your application needs. Pesticide labels, equipment catalogs, and dealers have information that will help you select the right nozzles.

There are a number of different calibration methods that work equally well. The procedure described here can be done with a few common tools and basic arithmetic.

Clean the Sprayer Before Calibrating

- 1) Remove nozzles, screens, and in-line strainers and clean them in soapy water with a soft brush. Remove any deposits from the nozzle orifice with a non-metallic object or compressed air. (Never use a knife or wire to clean nozzles. They will be ruined.)
- 2) In a place away from any wells or water supplies, rinse the spray tank thoroughly and partially fill it with clean water.
- 3) Start the sprayer and flush hoses and boom with plenty of water.
- 4) Turn the sprayer off and put nozzles back on the boom. All nozzles should be the same size and type.
- 5) Restart the sprayer, adjust pressure for proper field application, and inspect nozzles for proper spray pattern. Replace any nozzle that produces an irregular spray pattern. Recheck for even pattern.

Check Nozzles for Uniform Output

- 1) Find a container marked in ounces. With the sprayer operating at the desired pressure, catch the output from each nozzle for 20 seconds and write down the number of ounces.
- 2) After catching the spray from every nozzle, add the amounts caught and divide by the number of nozzles to get the average output per nozzle.
- 3) If the output from any nozzle is more than 10 percent above or below the average, clean or replace that nozzle.
- 4) Recheck the output from any cleaned or replaced nozzles. Use the new output to figure a new average. If more than 2 nozzles have output rates 10 percent above or below the average, replace all of them, and repeat steps 1, 2, and 3 to be sure the flow rate is uniform.

Nozzle Output Check – Example

Nozzle	Output Test #1 (Ounces after 20 seconds)	Output Test #2 (Ounces after 20 seconds)
1	16	16
2	13	14
3	15	15
4	15	15
5	16	16
6	15	15
7	17	17
8	19	16
Total	126 ounces	124 ounces
Average	÷ by 8 nozzles = 15.75 ounces	÷ by 8 nozzles = 15.5 ounces

Output Test #1

- Average 15.75 (round to 15.8). Ten percent of 15.8 is 1.58 (round to 1.6).
- Acceptable range: 14.2 to 17.4 ounces (15.8 ± 1.6).
- In this case nozzle 2 and nozzle 8 should be checked. When output is too low, the nozzle may be clogged and cleaning may bring it into the correct output range. When output is too high, the nozzle is probably worn out and should be replaced.

Output Test #2

- Average 15.5. Ten percent of 15.5 is 1.5.
- Acceptable range: 14 to 17 (15.5 ± 1.5). All nozzles now fall within the acceptable range.

Check Boom Height and Nozzle Spacing

Refer to the manufacturer’s guidelines to find out what boom height and nozzle spacing will give the spray pattern overlap and/or band width that you need. You can check the spray pattern by spraying water on a dry pavement or other smooth surface. Streaking may result from damaged nozzle tips or an uneven or improper boom height. Adjust until pattern is even.

How To Calibrate the Sprayer

This method is based on the fact that a gallon is 128 ounces so that the number of ounces of pesticide per nozzle applied to 1/128th of an acre is equivalent to the number of gallons applied to 1 acre. Table 1 shows how many linear feet the sprayer must travel to give the equivalent of 1/128th of an acre at various nozzle spacings and band or row widths. When the sprayer travels this distance, each nozzle will have sprayed 1/128th of an acre.

STEP 1: DISTANCE

Using Table 1, find the distance you need to travel for your nozzle spacings, band or row widths. Mark off this distance in a field, allowing space for the sprayer to reach full operating speed before reaching the first marker of the test course.

STEP 2: TIME

Fill the tank half full with water (no pesticide). Make at least two runs over the marked distance with all the equipment (cultivator, disk, planter, etc.) that will be used during the application engaged. Also, use the gear and throttle settings that will be used during actual spraying. Figure the average time in seconds that the sprayer takes to travel the marked distance. Do not spray during this procedure.

STEP 3: OUTPUT COLLECTION/GPA

Park the tractor and adjust sprayer pressure to the level that will be used for application. Using a container marked in ounces, catch the output from a single nozzle for the length of the average travel time (from Step 2). The number of ounces collected from one nozzle is equal to the output of the entire sprayer in gallons per acre (GPA). (Because you have already determined that output from each nozzle is within 10 percent of the average output, it is not necessary to collect output from every nozzle during this step.)

Note: When more than one nozzle is used per row or band, the spray collected from one nozzle should be multiplied by the number of nozzles directed at the row or band. All nozzles in this group must be the same size and have uniform output. This combined output, in ounces, from all nozzles directed at the row or band is equal to the gallons per acre being applied to that row.

Table 1. Calibration Travel Distance

Nozzle Spacing,* Band or Row Width (inches)	Distance** (feet)
6	681
8	511
10	408
12	340
14	292
16	255
18	227
20	204
22	186
24	170
26	157
28	146
30	136
32	128
34	120
36	113
38	107
40	102
42	97
44	93
46	89
48	85

*Use nozzle spacing to determine driving distance for broadcast sprays. Use band width to determine driving distance for banded sprays (including post-directed herbicide sprays). Use row width for foliar sprays directed to the crop.

**For other spacings, the distance (in feet) can be figured as:

$$\text{Distance (ft)} = \frac{4084}{\text{nozzle spacing, band or row width (in)}}$$

STEP 4: HOW MUCH TO USE

After calibrating the equipment, figure the amount of pesticide and carrier to put in the tank to get the desired application rate based on the application method. See the examples for various application methods.

Adjustments for Non-Water Carriers

If you will be using a carrier other than water, the GPA number you get from following Steps 1, 2, and 3 can be adjusted by using a conversion factor from Table 2. Multiply the GPA value from Step 3 by the conversion factor to get the correct output for the solution being sprayed.

Example: From Step 3, you have found a GPA of 20 gallons per acre. If you will be applying the pesticide with 28 percent nitrogen solution, the conversion factor is .89, and you will multiple 20 x .89 to find an actual application rate of 17.8 GPA.

Table 2. Conversion Factors for Non-Water Carriers	
Weight of Solution in pounds per gallon	Conversion Factor
6.6 (kerosene)	1.26
7.0	1.09
8.0	1.02
8.34 (water)	1.00
9.0	.96
10.0	.91
10.65 (28% nitrogen solution)	.89
10.8 (30% nitrogen solution)	.88
11.0 (7-27-7 fertilizer)	.87
11.06 (32% nitrogen solution)	.87
11.4 (10-34-0 fertilizer)	.86
11.5 (12-0-26)	.85
11.6 (11-37-0 fertilizer)	.85
12.0	.83
14.0	.77

Sprayer Calibration Examples

EXAMPLE 1: BROADCAST APPLICATION

- Field size: 30 acres.
- Planned application: Broadcast herbicide.
- Nozzle spacing: 22 inches.
- Rate per acre: 2 pints.

— *Step 1.* —

Based on a 22-inch nozzle spacing, you need to drive 186 feet (from Table 1).

— *Step 2.* —

You determine that it takes 32 seconds to drive 186 feet.

— *Step 3.* —

Output per nozzle for 32 seconds is 13 ounces. This means your sprayer is applying 13 gallons per acre.

— *Step 4.* —

To figure out how much herbicide is needed to treat the field:

- Multiply the number of acres (30) by the gallons-per-acre output (13) to determine the amount of total spray solution needed to treat the field:

$$\begin{array}{r}
 30 \text{ acres} \\
 \times 13 \text{ gallons per acre} \\
 = 390 \text{ gallons spray solution.}
 \end{array}$$

- The amount of herbicide needed to treat the field is:

$$\begin{array}{r}
 30 \text{ acres} \\
 \times 2 \text{ pints per acre} \\
 = 60 \text{ pints or 7.5 gallons.}
 \end{array}$$

- Add 7.5 gallons of herbicide to 382.5 gallons of water (390-7.5) to treat the 30-acre field.

EXAMPLE 2: BANDED APPLICATION USING ONE NOZZLE PER ROW

- Field size: 30 acres.
- Planned application: Herbicide in 12-inch band over corn rows spaced 36 inches apart.
- Label rate (broadcast): 1.5 quarts per acre.

— *Step 1.* —

Based on a band width of 12 inches, you need to drive 340 feet (Table 1).

— *Step 2.* —

You determine that it takes 58 seconds to drive 340 feet.

— *Step 3.* —

Output per nozzle for 58 seconds is 12.5 ounces. This means your sprayer is applying 12.5 gallons per *treated* acre. **Note:** When you apply pesticides in a band, you are treating only a fraction of the total area of the field. This area is referred to as *treated* acres. To determine how many treated acres there are in a specified field acreage, multiply the field acreage by the ratio of the band width to the row width:

$$\begin{aligned} &\text{Treated acres} \\ &= \text{field acres} \\ &\times (\text{band width divided by row width}). \end{aligned}$$

In this example,

$$\begin{aligned} &30 \text{ acres} \\ &\times (12\text{-inch bands divided by } 36\text{-inch rows}) \\ &= 10 \text{ treated acres.} \end{aligned}$$

— *Step 4.* —

To figure out how much herbicide is needed to treat the field:

- Multiply the number of treated acres by gallons per treated acre to determine the amount of total spray solution needed to treat the entire field:

$$\begin{aligned} &10 \text{ treated acres} \\ &\times 12.5 \text{ gallons per treated acre} \\ &= 125 \text{ gallons spray solution} \end{aligned}$$

- Determine the amount of herbicide needed to treat the 30-acre field by multiplying the number of treated acres by the labeled broadcast rate:

$$\begin{aligned} &10 \text{ treated acres} \\ &\times 1.5 \text{ quarts per acre} \\ &= 15 \text{ quarts or } 3.75 \text{ gallons.} \end{aligned}$$

- Add 3 gallons and 3 quarts of herbicide to 121 gallons and 1 quart of water (125 gallons - 3.75 gallons of herbicide = 121.25 gallons) to treat the 30-acre field.

EXAMPLE 3: DIRECTED FOLIAR SPRAY APPLICATION USING MORE THAN ONE NOZZLE PER ROW

- Field size: 30 acres.
- Planned application: 3-nozzle application of fungicide to crop planted in 40-inch rows.
- Label rate (broadcast): 2.5 quarts per acre.

— *Step 1.* —

Based on a row spacing of 40 inches, you need to drive 102 feet (Table 1).

— *Step 2.* —

You determine that it takes 15 seconds to drive 102 feet.

— *Step 3.* —

Output per nozzle for 15 seconds is 6 ounces. Assuming all nozzles are the same type and have uniform output, the group output from the 3 nozzles per row equals 18 ounces (3 nozzles x 6 ounces per nozzle). This means your sprayer is applying 18 gallons per acre. If all the nozzles are not the same type, measure the output from each nozzle of the group and add them together. This total, in ounces, is equal to gallons per acre.

— *Step 4.* —

To calculate how much fungicide is needed to treat the field:

- Multiply field acres by the gallons-per-acre output to determine the amount of total spray solution needed to treat the field.

$$\begin{aligned} &30 \text{ acres} \\ &\times 18 \text{ gallons per acre} \\ &= 540 \text{ gallons spray solution.} \end{aligned}$$

- The amount of fungicide needed to treat the field is:

$$\begin{aligned} &30 \text{ acres} \\ &\times 2.5 \text{ quarts per acre} \\ &= 75 \text{ quarts or } 18.75 \text{ gallons.} \end{aligned}$$

- Add 18 gallons and 3 quarts of fungicide to 521 gallons and 1 quart of water (540 gallons - 18.75 gallons of fungicide = 521.25 gallons of water) to treat the 30-acre field.

Sprayer Calibration Log

Date calibrated					
Sprayer brand					
Sprayer type					
Sprayer model					
Nozzle type and size					
Boom height					
Pressure					
Speed (mph)					
Throttle (rpm)					
Tractor model					
Tractor gear					
Spray volume (gallons/acre)					

Adapted from *Pesticide Applicator Log* by James Dill, James Dwyer, and Leigh Morrow. University of Maine Cooperative Extension. 1993.

Table of Measurements

STANDARD MEASURE	METRIC CONVERSION
LENGTH: 1 ft = 12 in 1 yd = 3 ft 1 mi = 5,280 ft 1 mph = 88 ft/1 min	LENGTH: 1 in = 25.4 mm = 2.54 cm 1 ft = 304.8 mm = 30.48 cm 1 yd = 914.4 mm = 91.44 cm = 0.914 m 1 mi = 1,609 m = 1.61 km 1 mm = 0.03937 in 1 cm = 0.394 in = 0.0328 ft 1 m = 39.37 in = 3,281 ft 1 km = 3,281 ft = 0.621 mi
AREA: 1 sq in = 0.007 sq ft 1 sq ft = 144 sq in 1 sq yd = 1,296 sq in = 9 sq ft 1 ac = 43,560 sq ft = 4,840 sq yd	AREA: 1 sq in = 6.45 sq cm 1 sq ft = 929 sq cm 1 sq yd = 8,361 sq cm = 0.8361 sq m 1 ac = 4,050 sq m = 0.405 h 1 sq cm = 0.155 sq in 1 sq m = 1,550 sq in = 10.76 sq ft 1 h = 107,600 sq ft = 2.47 ac
VOLUME: 1 tsp = 0.17 fl oz 1 tbs = 3 tsp 1 fl oz = 2 tbs = 6 tsp 1 cup = 8 fl oz = 16 tbs 1 pt = 2 cups = 16 fl oz 1 qt = 2 pt = 32 fl oz 1 gal = 4 qt = 8 pt = 128 fl oz = 231 cu in <i>Note: To convert liquid ounces to gallons, multiply by 0.0078125 (.008)</i>	VOLUME: 1 fl oz = 29.5 ml = 0.0295 L 1 pt = 473 ml = 0.473 L 1 qt = 945 ml = 0.945 L 1 gal = 3,785 ml = 3.785 L 1 ml = 0.033 fl oz 1 L = 33.8 fl oz = 2.112 pt = 1.057 qt = 0.264 gal
WEIGHT: 1 oz = 0.0625 lb 1 lb = 16 oz 1 ton = 2,000 lb 1 gal of water = 8.34 lb	WEIGHT: 1 oz = 28.35 g 1 lb = 454 g = 0.4536 kg 1 ton = 907 kg 1 gal of water = 3.786 kg 1 g = 0.035 oz 1 kg = 35.27 oz = 2.205 lb
CONCENTRATION: 1 part per million (ppm) = 0.00001 percent = 0.013 oz in 100 gal of water 1 percent = 10,000 ppm 0.1 percent = 1,000 ppm 0.01 percent = 100 ppm 0.001 percent = 10 ppm	CONCENTRATION: 1 part per million (ppm) = 1 milligram/liter = 1 milligram/kilogram 1 percent = 10 grams/liter 0.1 percent = 1,000 milligrams/liter 0.01 percent = 100 milligrams/liter 0.001 percent = 10 milligrams/liter
TEMPERATURE: To convert degrees Celsius (C) to degrees Fahrenheit (F): multiply by 1.8 and add 32. Example: 30 degrees C = 86 degrees F. (30 x 1.8 + 32). To convert degrees Fahrenheit (F) to degrees Celsius (C): subtract 32 and multiply by 0.56. Example: 50 degrees F = 10 degrees C (50 - 32 x 0.56).	

ABBREVIATIONS

ac acre	gal gallon	lb pound	ml milliliter
cm centimeter	h hectare	mi mile	mm millimeter
fl oz fluid ounce	(1h=10,000 square meters)	oz ounce	qt quart
ft foot or feet	in inch	pt pint	sq square
g gram	kg kilogram	m meter	tbs tablespoon
	km kilometer	mg milligram	tsp teaspoon
	L liter	min minute	yd yard

Adapted from *The Safe and Effective Use of Pesticides* by Patrick Marer, Mary Louise Flint, and Michael Stimmann. University of California. Publication 3324. 1988.

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21	22	23	24	25	26	27	18	19	20	21	22	23	24	18	19	20	21	22	23	24	22	23	24	25	26	27	28	
28	29	30	31				25	26	27	28				25	26	27	28	29	30	31	29	30						
May 2007							June 2007							July 2007							August 2007							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
		1	2	3	4	5						1	2	1	2	3	4	5	6	7				1	2	3	4	
6	7	8	9	10	11	12	3	4	5	6	7	8	9	8	9	10	11	12	13	14	5	6	7	8	9	10	11	
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27	28	29	30	31			24	25	26	27	28	29	30	29	30	31					26	27	28	29	30	31		
September 2007							October 2007							November 2007							December 2007							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
						1		1	2	3	4	5	6					1	2	3							1	
2	3	4	5	6	7	8	7	8	9	10	11	12	13	4	5	6	7	8	9	10	2	3	4	5	6	7	8	
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23	24	25	26	27	28	29	28	29	30	31				25	26	27	28	29	30		23	24	25	26	27	28	29	
30																					30	31						
January 2008							February 2008							March 2008							April 2008							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
		1	2	3	4	5					1	2						1				1	2	3	4	5		
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27	28	29	30	31			24	25	26	27	28	29		23	24	25	26	27	28	29	27	28	29	30				
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May 2008							June 2008							July 2008							August 2008							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
				1	2	3	1	2	3	4	5	6	7			1	2	3	4	5							1	2
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25	26	27	28	29	30	31	29	30						27	28	29	30	31			24	25	26	27	28	29	30	
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September 2008							October 2008							November 2008							December 2008							
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
	1	2	3	4	5	6				1	2	3	4							1		1	2	3	4	5	6	
7	8	9	10	11	12	13	5	6	7	8	9	10	11	2	3	4	5	6	7	8	7	8	9	10	11	12	13	
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28	29	30					26	27	28	29	30	31		23	24	25	26	27	28	29	28	29	30	31				
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Acknowledgments

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