Application Calibration 101

Back-pack sprayer
Boomless sprayer
Spot treatments
Application Calibration 101
Why should you calibrate?

• Save money
• Improve herbicide performance
• Improve labor productivity
• Good stewardship of resources
• Have confidence in what you are doing
  – Good record keeping and accurate calibration can assist with and potential claims and investigations
• Apply according to label directions
  – It’s the law!
Application Calibration 101
Equipment Preparation

• Clean sprayer, screens and nozzles thoroughly
• Fill spray tank with clean “water”
• Check nozzles to determine uniform spray pattern
  – Replace defective nozzles
  – Adjustable nozzles should be set and marked
  – Use appropriate nozzle type to fit the spray project
• Determine and set effective operating spray pressure (psi)
• Use a dye to assist with determining droplet size and spray coverage
Back-pack Sprayer Calibration
Model 30 Gunjet

Teejet nozzles
4004E
1506
$110
CFValve™ Constant-flow Valve

- Consistent spray output with ±1.5% accuracy regardless of pressure variations.
- Reduces pumping and drift and saves you money by using less spray material.
- Valve automatically closes if the output pressure drops below the preset valve pressure.
Back-pack Sprayer Calibration

- Broadcast or spot treatments
  - Measure 18.5 ft x 18.5 ft (128th acre)
    - Use a representative spray area
    - Terrain, weed species (size and density)
    - Spray method and spray volume (GPA) varies depending on site characteristics
Bareground Treatment

Utility Substation/Industrial Sites
Application volume to assure adequate coverage can vary depending on treatment timing.
Application volume to assure adequate coverage can vary depending on treatment timing.
Terrain of application site
Low Volume Foliar Crew at Work
Height of target weeds at application
Low Volume Foliar Application
Weed density at application site
Good luck
Reassess application method and timing
Back-pack Sprayer Calibration

• Measure 18.5 ft x 18.5 ft (128\textsuperscript{th} acre)
  – Use a representative spray area
  – Terrain, weed species (size and density)
  – Spray method and spray volume (GPA) varies depending on site characteristics

• **Spray the measured test area**
  – Use water only - initially
  – Keep a constant PSI, nozzle setting, speed and spray motion
  – Record the “time” it took to spray the test area
  – Best to repeat spray step 2-3 times for accuracy
Waving Wand Application @ 8 GPA
SS Y19 adjustable conejet nozzle
Back-pack Sprayer Calibration

• Measure 18.5 ft x 18.5 ft (128^{th} acre)
  – Use a representative spray area
    • Terrain, weed species (size and density)

• Spray the measured test area
  – Keep a constant PSI, nozzle setting, speed and spray motion
  – Record the “time” it took to spray the test area
  – Best to repeat spray step 2-3 times for accuracy

• **Collect and measure the spray for the time it took to spray the test area**
  – Volume collected in *ounces equals GPA*
Back-pack Sprayer Calibration

• **Step 1 complete**
  – We have calculated spray volume (GPA)

• **Next Steps**
  – **Chemical selection**
    • Based on current and future site use, product label, customer objectives, target pests, potential non-target impacts...
  – **Chemical rate**
    • “How much chemical” do we add to the tank
    • Label rates for target pests, use site, tank size...
Back Pack Sprayer Calibration

*Calculate amount of chemical needed per tank*

Chemical (oz) = \( \frac{\text{rate/acre}}{\text{tank volume (GL)}} \times \text{GPA} \)
Back-pack Sprayer Calibration

#1 Example (18.5’ x 18.5’ spray area)

- You **collected 100 oz** in the time to spray area
  - oz collected = GPA spray volume = **100 GPA**
- Spray tank (back pack) = 4 gallon
  - 4 gal / 100 GPA = **25 back packs/acre**

Garlon 4 Ultra  $\frac{64 \text{ oz/acre} \times 4 \text{ gal tank}}{100 \text{ gpa}} = 2.56 \text{ fl oz/tank}$

Milestone  $\frac{7 \text{ oz/acre} \times 4 \text{ gal tank}}{100 \text{ gpa}} = 0.28 \text{ fl oz/tank}$

**Remember:** The spray volume (GPA) and herbicide rate per acre determines how much chemical you put in the spray tank!
Back-pack Sprayer Calibration

#2 Example (18.5’ x 18.5’ spray area)

- You **collected 40 oz** in time to spray area
  - oz collected = GPA spray volume (40 GPA)
- Spray tank (Back pack) = 4 gallon
  - 4 gal / 40 GPA = **10 back packs/acre**

\[
\text{Garlon 4 Ultra: } \frac{64 \text{ oz/acre} \times 4 \text{ gal tank}}{40 \text{ gpa}} = 6.4 \text{ fl oz/tank}
\]

\[
\text{Milestone: } \frac{7 \text{ oz/acre} \times 4 \text{ gal tank}}{40 \text{ gpa}} = 0.70 \text{ fl oz/tank}
\]
#3 Example (18.5’ x 18.5’ spray area)

- You **collected 10 oz** in time to spray area
  - oz collected = GPA spray volume (**10 GPA**)  
- Spray tank (Back pack) = 4 gallon
  - 4 gal / 10 GPA = **2.5 back packs/acre**

**Garlon 4 Ultra**  
64 oz/acre x 4 gal tank = 25.6 fl oz/tank  
10 gpa

**Milestone**  
7 oz/acre x 4 gal tank = 2.8 fl oz/tank  
10 gpa
Back-pack Sprayer Calibration

From 2 qt/a Garlon + 7 oz/a Milestone examples

- 100 GPA - 2.56 oz Garlon/4 gal tank  (0.5% mix)
- 40 GPA - 6.40 oz Garlon/4 gal tank  (1.25% mix)
- 10 GPA - 25.60 oz Garlon/4 gal tank  (5.0% mix)
- 100 GPA - 0.28 oz Milestone/4 gal tank (0.055% mix)

% solution is meaningless without knowing your effective spray volume/acre
  - 1% solution = 5.12 oz/4 gal tank
  - 2% solution = 10.24 oz/4 gal tank

Remember:
The spray volume (GPA) AND the herbicide rate per acre determines how much chemical you put in the spray tank!
Back Pack Sprayer Calibration
Test Your Knowledge

• **Using a 4 gallon back pack**

• GPA = 25 gpa

• Chemical rate = Garlon 3A @ 2 qt/acre
  + Milestone @ 7 oz/acre
  + Escort XP @ 1 oz/acre

• Surfactant rate: ¼% by volume (1 qt/100)

• Calculate amount of each product needed per tank

• **Chemical = rate/acre x tank volume (GL) / GPA**
Back Pack Sprayer Calibration

Test Your Knowledge

EXAMPLE

Garlon 3A = \[
\frac{64 \text{ oz/acre} \times 4 \text{ gal tank}}{25 \text{ gpa}} = 10.25 \text{ fl oz/4 gal tank}
\]

Milestone = \[
\frac{7 \text{ oz/acre} \times 4 \text{ gal tank}}{25 \text{ gpa}} = 1.12 \text{ fl oz/4 gal tank}
\]

Escort XP = \[
\frac{1 \text{ oz/acre} \times 4 \text{ gal tank}}{25 \text{ gpa}} = 0.16 \text{ oz/4 gal tank}
\]

Surfactant ¼% = \[
\frac{32 \text{ oz/100} \times 4 \text{ (gal tank)}}{25 \text{ gpa}} = \frac{0.25}{100} = 0.0025
\]
\[
= 0.0025 \times 512 \text{ oz (4 gallons)} = 1.28 \text{ oz/4 gal tank}
\]

Chemical = \[
\frac{\text{rate/acre} \times \text{tank volume (GL)}}{\text{GPA}}
\]
Guidelines for Backpack and Spot Spraying

Chaparral™ herbicide is a low rate herbicide that requires a small amount in your tank. Accurate timing, careful measurements of Chaparral and uniform spraying 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 Chaparral herbicide do I put in my 2 gallon tank? For example, you went through the calibration procedure and applied 40 fluid ounces in the measured area. Therefore, your spray volume is 40 GPA. Look at the chart below for the amount of mix in 2 gallons of water. Assume you want to apply 2 ounces of Chaparral per acre; the amount listed for your volume (GPA), and the application rate is 1 tsp. Add 1 tsp of dry product into 2 gallons of water with 1 TBSP of surfactant. It doesn’t take much!

**NOTE:** Make sure the Chaparral is in solution with agitation. Shake the backpack periodically to maintain solution.

### Chart: Amount of dry herbicide to mix in 2 gallons of water in teaspoons (1 tsp = 0.1 oz of dry product)

<table>
<thead>
<tr>
<th>GPA</th>
<th>2 oz/acre</th>
<th>2.5 oz/acre</th>
<th>3.3 oz/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>2.00 tsp</td>
<td>2.50 tsp</td>
<td>3.30 tsp</td>
</tr>
<tr>
<td>30</td>
<td>1.33 tsp</td>
<td>1.67 tsp</td>
<td>2.20 tsp</td>
</tr>
<tr>
<td>40</td>
<td>1.00 tsp</td>
<td>1.25 tsp</td>
<td>1.65 tsp</td>
</tr>
<tr>
<td>50</td>
<td>0.80 tsp</td>
<td>1.00 tsp</td>
<td>1.32 tsp</td>
</tr>
<tr>
<td>60</td>
<td>0.67 tsp</td>
<td>0.83 tsp</td>
<td>1.10 tsp</td>
</tr>
</tbody>
</table>
Back-pack Sprayer Calibration

Linear Applications

- Linear Applications (Ex: bareground along fence)
  - $\frac{1}{128}$ acre = 340 sq ft
  - $340 / \text{swath width} = \text{swath length}$
  - Use off-center (OC) or even-fan (E) nozzles
    - Example 8002E, 4004E, OC-6...
  - Volume collected in *ounces* equals GPA

<table>
<thead>
<tr>
<th>Sq ft / SW</th>
<th>SL</th>
</tr>
</thead>
<tbody>
<tr>
<td>340 / 1’</td>
<td>340’</td>
</tr>
<tr>
<td>340 / 2’</td>
<td>170’</td>
</tr>
<tr>
<td>340 / 4’</td>
<td>85’</td>
</tr>
<tr>
<td>340 / 10’</td>
<td>34’</td>
</tr>
</tbody>
</table>
Oregon application – 12 feet on land and 3 feet over edge of stream bank (over vegetation in water and/or water)
Back-pack Sprayer Calibration

- Treat weed infested “ZONES” especially when using herbicides that have soil activity - NOT just visible plants
  - Treat weeds that you may not see
  - Residual control of new germinating weeds
  - Use less chemical!
- Use selective herbicides when possible to encourage grasses and other desirable vegetation
- Note the potential for off-target impacts
  - “Turn around and look around”
  - Crops, water, trees, people...
- Always follow label directions and local regulations
  - State and local regulations may differ from label directions
Remember

The spray volume (GPA) and the herbicide rate per acre determines how much chemical you put in the spray tank!
Boomless Sprayer Calibration
Calibration using boomless nozzles
Use for broadcast or spot treatments

Zone Treatments:
- Improve coverage and labor productivity
- Reduce skips and drift potential
- Residual weed control with soil active chemicals

• Note distribution of spray droplets across spray swath
• Boombuster Boomless nozzles BB437R & BB265R (40 GPA)
Waving Wand Application @ 8 GPA
SS Y19 adjustable conejet nozzle
Boomless Sprayer Calibration

• Measure effective swath width in feet
Boomless Sprayer Calibration

- Measure effective swath width in feet
- Determine **length** of calibration course
  - Divide 5,445 (1/8 acre) by effective swath width in feet
    - 5,445 / Width = Length
    - (acre = 43,560 sq ft / 8 = 5,445 sq ft)
  - Example: **calibration length** for 30 foot swath
    5,445 / 30’ = 181’

<table>
<thead>
<tr>
<th>SWATH WIDTH</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>10’</td>
<td>545’</td>
</tr>
<tr>
<td>20’</td>
<td>272’</td>
</tr>
<tr>
<td>30’</td>
<td>181’</td>
</tr>
<tr>
<td>40’</td>
<td>136’</td>
</tr>
<tr>
<td>50’</td>
<td>109’</td>
</tr>
</tbody>
</table>
Boomless Sprayer Calibration

• **Drive the course**
  – Select gear and RPM you will use during spraying
  – Use accurate speedometer if available

• **Record travel time in seconds**
  – Repeat and calculate average time)
Boomless Sprayer Calibration

- Park sprayer and **maintain constant RPM and spray pressure**
- **Collect spray** in container for “**travel time**”
  - Use a trash bag (as a funnel) and a bucket to catch water
- **Pints collected = gallons per acre (GPA)**
Boomless Sprayer Calibration

- Pints collected = gallons per acre (GPA)

Examples:
Collect: 5.0 gal x 8 pt/gal = 40 pt = 40 gpa

Collect: 640 oz / 16 oz/pt = 40 pt = 40 gpa

Collect: 40 pt = 40 gpa
Boomless Sprayer Calibration

• Step 1 complete
  – We have calculated spray volume (GPA)

• Next Steps
  – “Chemical selection”
    • Based on current and future site use, product label, customer objectives, target pests...
  – Chemical rate
    • “How much chemical” do we add to the tank
    • Label rates for target pests, use site, tank size...
Boomless Sprayer Calibration

• **Calculate the amount of chemical needed per tank**

• Chemical = rate/acre x tank volume (GL) GPA

  **EXAMPLE**
  
  Milestone 7 oz/acre x 50 gal tank = 11.7 fl oz
  30 GPA

  Add 11.7 fl oz to 50 gallon tank

  **Remember:**
  
  The spray volume (GPA) and herbicide rate per acre determines how much chemical you put in the spray tank!
Broadcast/Boomless Sprayer Calibration
Test Your Knowledge

• Prepare 200 gallon tank mix

• GPA = 50 GPA

• Chemical rate = Garlon 3A @ 4 qt/acre + Milestone @ 7 oz/acre

• Surfactant rate: ¼% by volume

• Calculate the amount of each product needed per tank
Broadcast/Boomless Sprayer Calibration

Test Your Knowledge

Chemical = rate/acre x tank volume (GL)

GPA

EXAMPLE

Garlon 3A = \( \frac{128 \text{ oz/acre} \times 200 \text{ gal tank}}{50 \text{ gpa}} \) = 512 fl oz (4 gal)

Milestone = \( \frac{7 \text{ oz/acre} \times 200 \text{ gal tank}}{50 \text{ gpa}} \) = 28 fl oz

Surfactant ¼% = 1 qt/100 gallons x 2 = 2 qts/200 gallons

= 32 oz/100 x 200 (gal tank) = 64 oz/200 gallons

or (0.0025 x 128 oz/gal x 200 gal tank = 64 oz/200 gallon tank)

or (0.0025 x 128 oz/gal x 200 gal tank = 64 oz/200 gallon tank)
Application Calibration
Target Rate Vs. Actual Rate

Target treatment area / Actual treatment area = % application rate

1. Target treatment area 20’ vs. Actual treatment area 10’ = 2X rate
2. Target treatment area 10’ vs. Actual treatment area 20’ = 1/2 rate

• Slopes, nozzle height and angle, vegetation interception...impact “Actual treatment area”
Boombuster 265R 40 GPA@ 5 MPH
20 foot spray swath

Note droplet distribution across spray swath
Garlon 3A @ 1 qt/a + Milestone 7 oz/a
ODOT Salem, OR (160 DAT)
Forest Roadside Trials
Efficacy, Conifer Tolerance – Green Diamond Resources

Boombuster 265R nozzle
30 GPA
Roadside Trials - Chemical Pruning Efficacy, Conifer Tolerance

Garlon 4 Ultra + Milestone VM

Non-treated
Garlon 4 Ultra 48 oz +
Opensight 3.3 oz/acre (1YAT)
Boominator 187FL Nozzle
30 foot swath
Boominator 187L and 187R Nozzles
Polaris ATV Tri-Track Sprayer

Boombuster 140R - Side application
Boominator 187FL - Rear application

Honda 4HP with 12 GPM Pump
Boomless Nozzles 187 FL (30 GPA)
Boomless Nozzles 140R (30 gpa)
Handgun With Boomless Nozzle 140R
Good coverage is critical!
Sprayer Calibration

- Treat weed infested “ZONES” especially when using herbicides that have soil activity - NOT just visible plants
  - Treat weeds that you may not see
  - Residual control of new germinating weeds
  - Use less chemical!
- **Use selective herbicides** when possible to encourage grasses and other desirable vegetation
- Note the potential for off-target impacts
  - “Turn around and look around”
  - Crops, water, trees, people...
- **Always follow label directions and local regulations**
  - State and local regulations may differ from label directions
# Boomless Nozzles

### Boominator Spray Nozzles
- **Full Pattern**
  - **1870FL**
    - 30 ft
    - 20 PSI
    - 3.0 GPM
    - 5 MPH
    - 10 GPA
  - **2650FL**
    - 38 ft
    - 20 PSI
    - 6.7 GPM
    - 5 MPH
    - 17.5 GPA
- **Short Pattern**
  - **1406R**
    - 6 ft
    - 20 PSI
    - 1.7 GPM
    - 5 MPH
    - 28 GPA

### Boom Buster Spray Nozzles
- **265R**
  - 21 ft
  - 30 PSI
  - 6.8 GPM
  - 5 MPH
  - 35 GPA
  - 8 MPH
  - 22 GPA
- **375R**
  - 23 ft
  - 30 PSI
  - 14.4 GPM
  - 5 MPH
  - 66 GPA
  - 8 MPH
  - 41 GPA
- **437R**
  - 31 ft
  - 30 PSI
  - 18.5 GPM
  - 8 MPH
  - 39 GPA
• http://www.boominator.com/NozProducts
Sprayer Calibration

Remember
The spray volume (GPA) and the herbicide rate per acre determines how much chemical you put in the spray tank!
Questions?

Spot treatment guides
milestoneherbicide.com
techlinenews.com
Thank You

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www.vegetationmgmt.com
Chemical pruning and under tree applications

- Use special care when applying soil active herbicides
  - Tordon, Milestone, Perspective, Viewpoint, Streamline, Imazapyr, Spike, Krovar, Others...
- Carefully calibrate equipment and application technique when making treatments around desirable trees and sensitive plants
- Avoid treating within the root zone of desirable sensitive trees
- Always calibrate spot treatments to deliver uniform broadcast rates.
- Use Garlon 4 Ultra, Garlon 3A, 2,4-D, Vista, Accord or PastureGard HL... in more sensitive sites where products having soil activity is not the best fit
- Read and follow all label directions - including use precautions and restrictions.
Improving “line-of-sight” in roadsides
Chemical pruning – Opensight + Garlon
Chemical Pruning - Linn County, OR
Opensight 3.3 oz/acre + Garlon 4 Ultra 2 qt/acre
Applied June 2010, Evaluation July 1 2011 - 13 MAT
Auxin herbicide
Conifer injury symptoms
Injury caused to conifers resulting from root uptake of soil active herbicides
Injury to conifers resulting from poorly calibrated spot treatment of soil active herbicide
“Don’t become a target”
Keep Herbicide Spray on Target
Garlon directed spray
Conifer plantations