Equipment Calibration for Rangeland Weed Control

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Introductions

- **My experience: Habitat Restoration Crew Lead at Pinnacles**
  - Managing invasive weeds for about the last 10 years
  - Extensive work with backpack sprayers
  - Some work with smaller UTV mounted sprayers
  - Recent work with a tractor mounted boom sprayer

- **Talk will be focused on rangelands and occasional weed control**

- **It doesn’t have to be complicated**

What I'll Talk About

- What is Calibration
- Why Bother
- Keys to Success
- Adjustments to Make
- Considerations for
  - Boom Sprayers
  - Boomless Sprayers
  - Backpack Sprayers
- Helpful Gadgets
- Wrap Up & Questions

What is Calibration?

The process of adjusting sprayer components and verifying that spray equipment is delivering a desired and repeatable volume over the area treated

Why is Calibration Important?

- **Reason 1: Laws and Labels**
  - Per Acre Maximum Volume
  - Per Acre Rate Spot Treatments

Why is Calibration Important?

- **Reason 2: IPM**
  - Need to know what you're doing to plan treatments and evaluate results

More Practical Reasons to Calibrate

- **Opportunity to test equipment and work out kinks without herbicide**

- **Double checking versus %volume mix applications**

- **Make good use of time and money**
  - Too little: waste of time, risk of resistance
  - Too much: waste of money, risk of damage

How to Calibrate: The Basic Steps

1. Set up your Sprayer
2. Measure your Spray Rate (volume per time)
3. Measure your Application Speed (area per time)
4. Do the math to get to gallons per acre

- Using a spreadsheet makes the math much easier
- Using “nearly no math” method is even easier

The 128 / “Nearly No Math” method

- **Measure the (effective) spray width of a single nozzle**
  - Equal to the spacing between nozzles on a boom
  - The whole width of the setup for boomless
  - ¾ of the fan width for a backpack
- **Determine the distance needed for that nozzle to spray 1/128th acre**
  - 340 divided by that width in feet
- **Time how long it takes to spray that length**
  - Begin with pump primed and a “running start”
- **Spray into a bucket for that length of time and measure the volume**
  - Average for all nozzles in a boom setup

- **That volume in oz is equal to gallons per acre**

Keys to Success

- **Known area (box or distance along a line)**
- **Measurable Volume**
  - charge sprayer before starting
  - Spray into a bucket, or measure the amount needed to refill the tank
- **Controllable Rate (regulated pressure and output)**
- **Consistent Pattern**
  - Fixed nozzles
  - Consistent height
  - Even overlap

Variables to Manipulate

- **Pressure / Flow**
  - 4x pressure to double output
- **Pattern / Nozzles**
- **Speed / Tempo**
  - Within Reason…

	PSI	DROP SIZE		CAPACITY ONE NOZZLE IN GPM
		80°	110°	
XR8001 XR11001 (100)	15	F	F	0.061
	20	F	F	0.071
	30	F	F	0.087
	40	F	F	0.10
	50	F	F	0.11
	60	F	VF	0.12
XR8004 XR11004 (50)	15	C	M	0.24
	20	M	M	0.28
	30	M	M	0.35
	40	M	M	0.40
	50	F	F	0.45
	60	F	F	0.49
XR8015† XR11015†	15	XC	VC	0.92
	20	XC	VC	1.06
	30	VC	VC	1.30
	40	VC	C	1.50
	50	C	C	1.68
	60	C	C	1.84

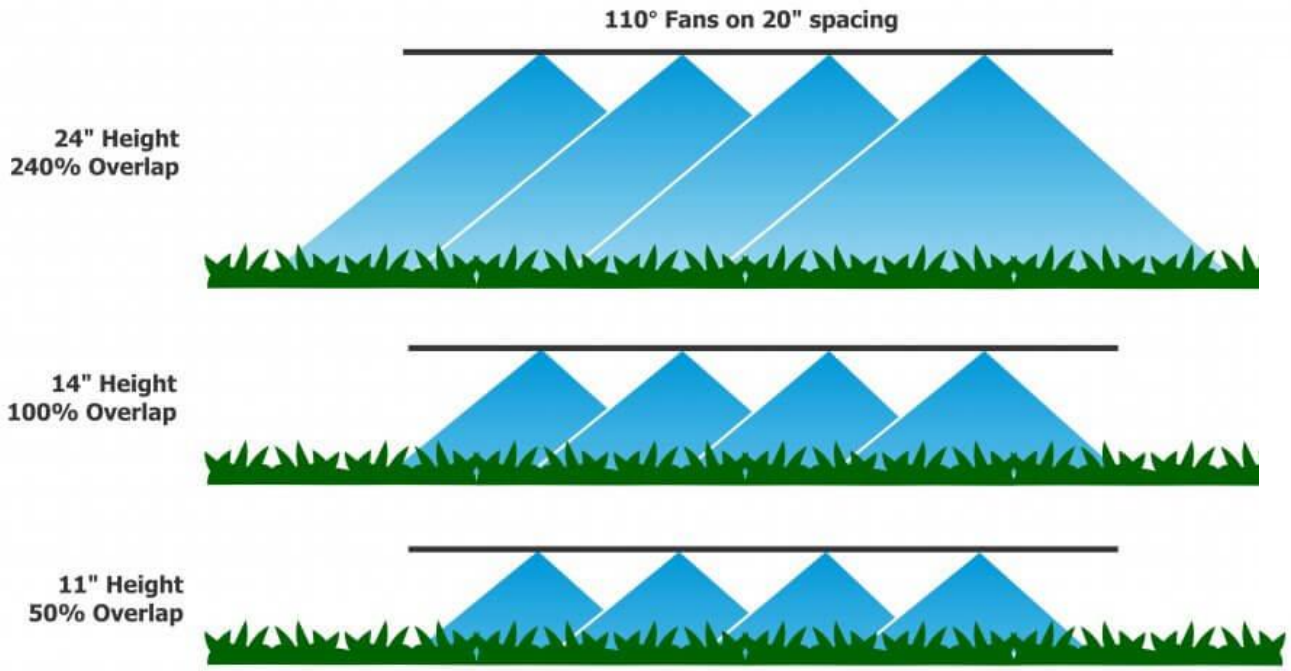
The Goal is Consistency

- **Maximize where possible**
- **Do your best with the rest**

Boom Spraying

- Lots of control over variables
- PTO Pump tied to RPMs
- Spray tip angle, boom height, overlap (usually 100%)
- Nozzle variance (usually less than 10% is OK, clean/replace as needed)

Boom Height, Overlap, and Sprayer Angle



Forward angle	Nozzle fan angle	Nozzle spacing (in)	Boom height (in)	
			50% overlap	100% overlap
0	110	20	11	14
0	80	20	18	24
30	110	20	9	12
30	80	20	15	21
45	110	20	7	10
45	80	20	13	17

Source: Sprayers101.com

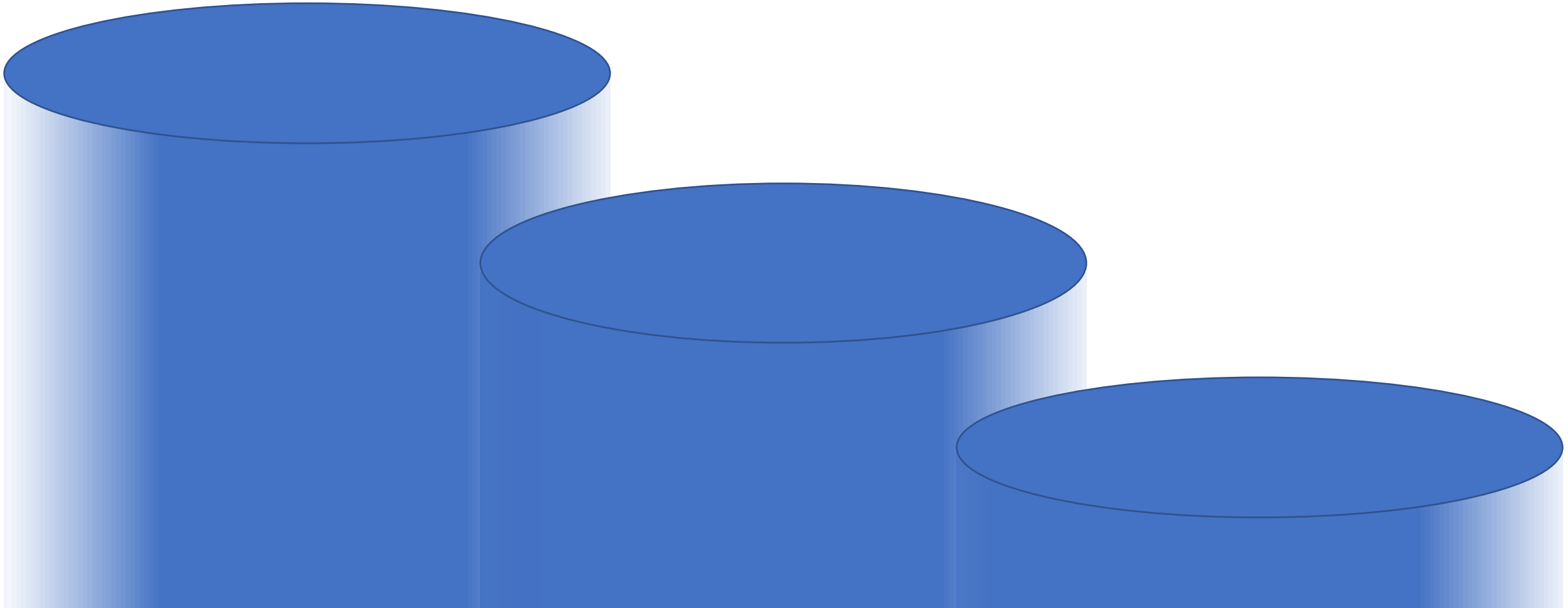
Boomless Sprayers

- **UTV harder to control speed**
- **Separate pump engine or motor**
- **Less consistent pattern**
  - Consider double spraying if evenness is critical
- **More compact and transportable**
- **Better with sites that have obstructions**

Backpacks

- **Not as easy to control variables**
- **Speed=Natural Walking Pace**
  - Use a Metronome?
- **Pattern**
  - Fixed pattern needed
  - How steady is your hand?
- **Output**
  - Need to regulate flow

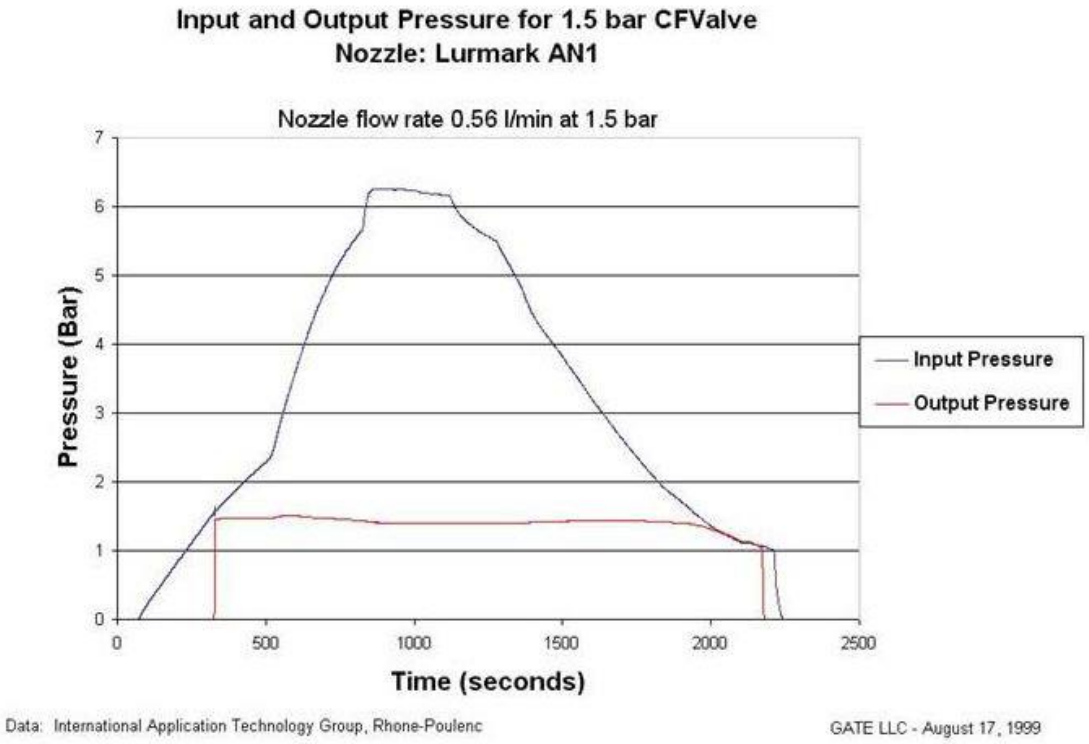
50% Overlap Recommended for Backpacks



Small ATV Sprayers

- More like a backpack sprayer in terms of calibration
- Some pumps produce pulses of pressure so CFVs are needed

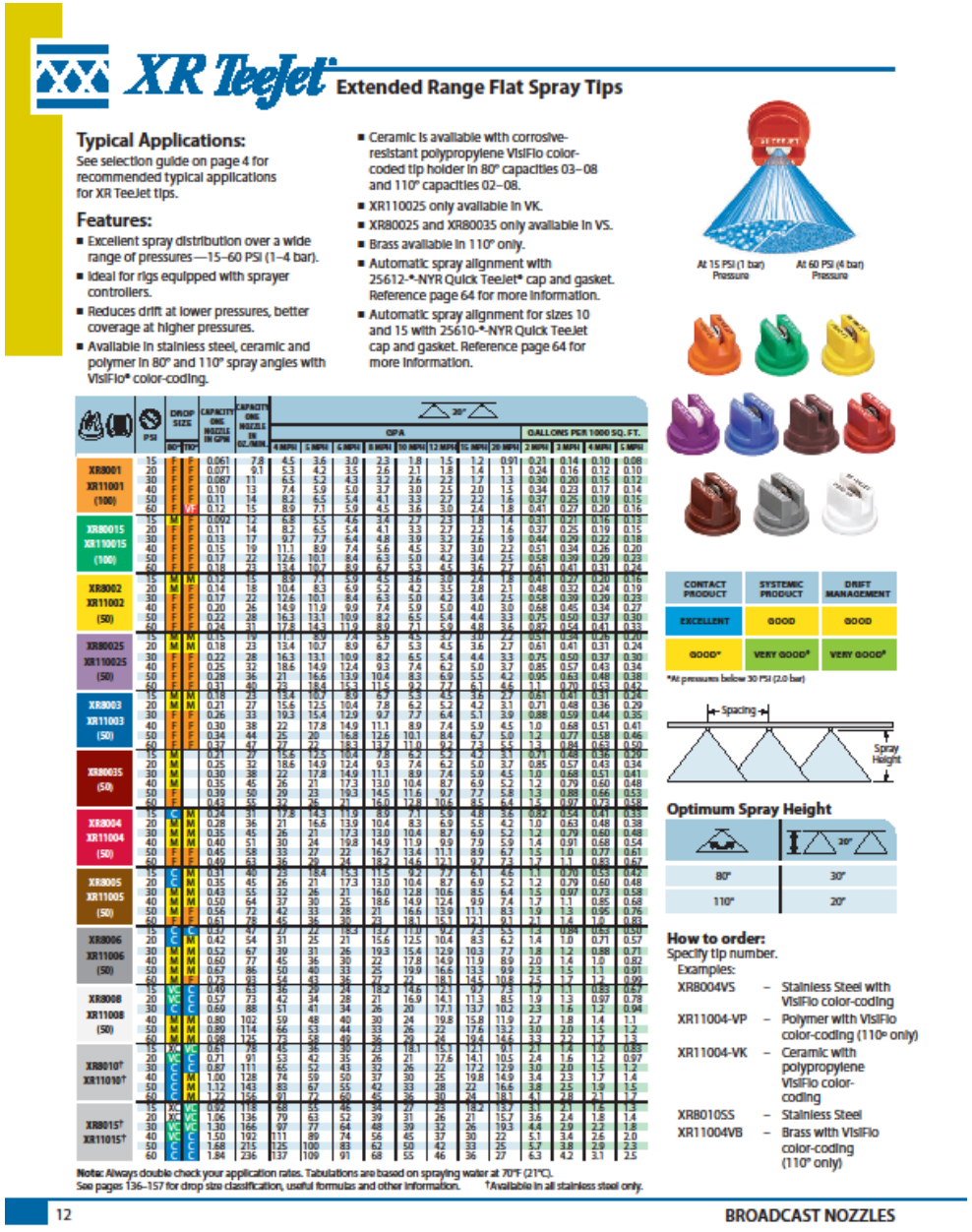
Tools: Constant Flow Valve (CFV)



Tools: Spray Tips

- Consumable Product

- Change Output
- Change Pattern
- Reduce Drift



XR TeeJet® Extended Range Flat Spray Tips

Typical Applications:
See selection guide on page 4 for recommended typical applications for XR TeeJet tips.

Features:
- Excellent spray distribution over a wide range of pressures—15–60 PSI (1–4 bar).
- Ideal for rigs equipped with sprayer controllers.
- Reduces drift at lower pressures, better coverage at higher pressures.
- Available in stainless steel, ceramic and polymer in 80° and 110° spray angles with VisiFlo® color-coding.
- Ceramic is available with corrosive-resistant polypropylene VisiFlo color-coded tip holder in 80° capacities 03–08 and 110° capacities 02–08.
- XR110025 only available in VK.
- XR80025 and XR80035 only available in VS.
- Brass available in 110° only.
- Automatic spray alignment with 25612-*-NYR Quick TeeJet® cap and gasket. Reference page 64 for more information.
- Automatic spray alignment for sizes 10 and 15 with 25610-*-NYR Quick TeeJet cap and gasket. Reference page 64 for more information.

At 15 PSI (1 bar) Pressure — At 60 PSI (4 bar) Pressure

CONTACT PRODUCT	SYSTEMIC PRODUCT	DRIFT MANAGEMENT
EXCELLENT	GOOD	GOOD
GOOD*	VERY GOOD*	VERY GOOD*

*At pressures below 30 PSI (2.0 bar)

Spacing — Spray Height

Optimum Spray Height

	30"
80°	30"
110°	20"

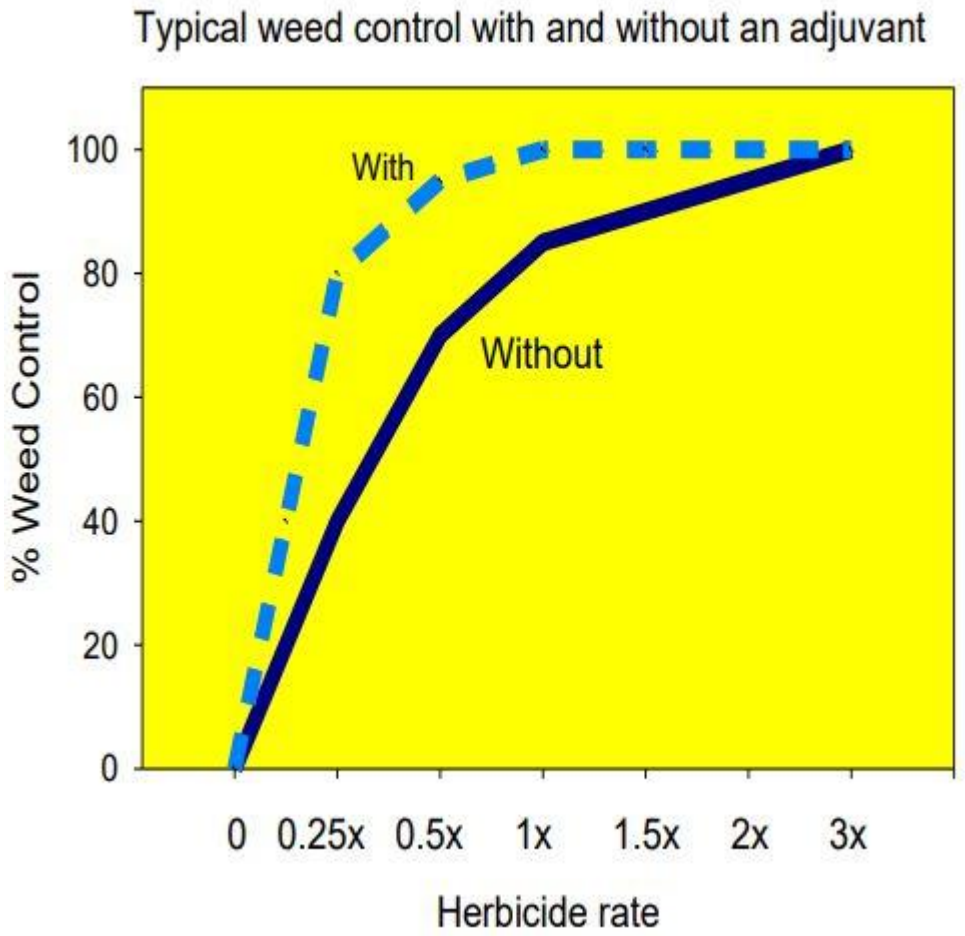
How to order:
Specify tip number.
Examples:
- XR8004VS – Stainless Steel with VisiFlo color-coding
- XR11004-VP – Polymer with VisiFlo color-coding (110° only)
- XR11004-VK – Ceramic with polypropylene VisiFlo color-coding
- XR8010SS – Stainless Steel
- XR11004VB – Brass with VisiFlo color-coding (110° only)

Note: Always double check your application rates. Tabulations are based on spraying water at 70°F (21°C).
See pages 136–157 for drop size classification, useful formulas and other information. †Available in all stainless steel only.

12 BROADCAST NOZZLES

Adjuvants

- **Surfactants**
- **Conditioners/Acidifiers**
- **Dye**



In Summary:

- Control what you can, do your best with everything else
- It doesn’t have to be complicated

- Use the extra information to make adjustments if needed

Questions?