

Fraser Fir Cone Control Update

Jeff Owen, Area Extension Forestry Specialist

NC State University
A&T State University
**COOPERATIVE
EXTENSION**

Empowering People • Providing Solutions

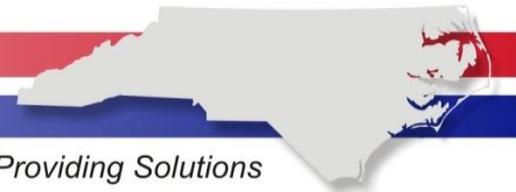
Precocious Cones on Fraser Fir – *An Expensive Problem*

- Pulled off by hand
- Even a 2 meter tree can have several hundred cones
- Some farms spend weeks pulling cones
- More hand labor than pruning in a bad year



Control of Emerging Fraser Cones

- Using herbicides to kill emerging cones before foliage bud break in spring
- Narrow window for treatment
- Target new 1 inch cones



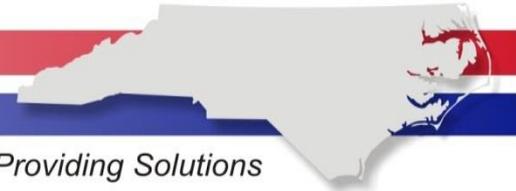
Cone Research 2012 - 2016

- Backpack Sprayer Treatments:
 - 2012: Apple thinning agents (10X rates), herbicides, & homemade herbicidal mixes
 - 2013: Herbicides & insecticidal oils
 - 2014: Conventional & organic herbicides, & tobacco sucker control materials
 - 2015: More organic contact herbicides
 - 2016: Backpack, high pressure, & Jacto mist blower sprayers



Product Tested in 2016

- Axxe ~ Ammonium soap
 - 15% = 156 ml / l (20 oz / gal)
 - 10% = 102 ml / l (13 oz / gal)
 - 6% = 62.5 ml / l (8 oz / gal)
- Scythe ~ Fatty Acid
 - 10% = 102 ml / l (13 oz / gal)
 - 5% = 39 ml / l (6.5 oz / gal)
 - 2.5% = 26 ml / l (3.3 oz / gal)
- Off Shoot O
 - ~ Fatty Alcohol
- Off Shoot T
 - ~ Tobacco Sucker Control
- Avenger
 - ~ Citrus oil product
- WeedZap
 - ~ Clove & cinnamon oils

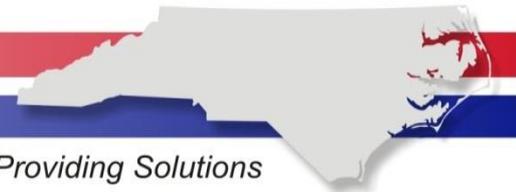
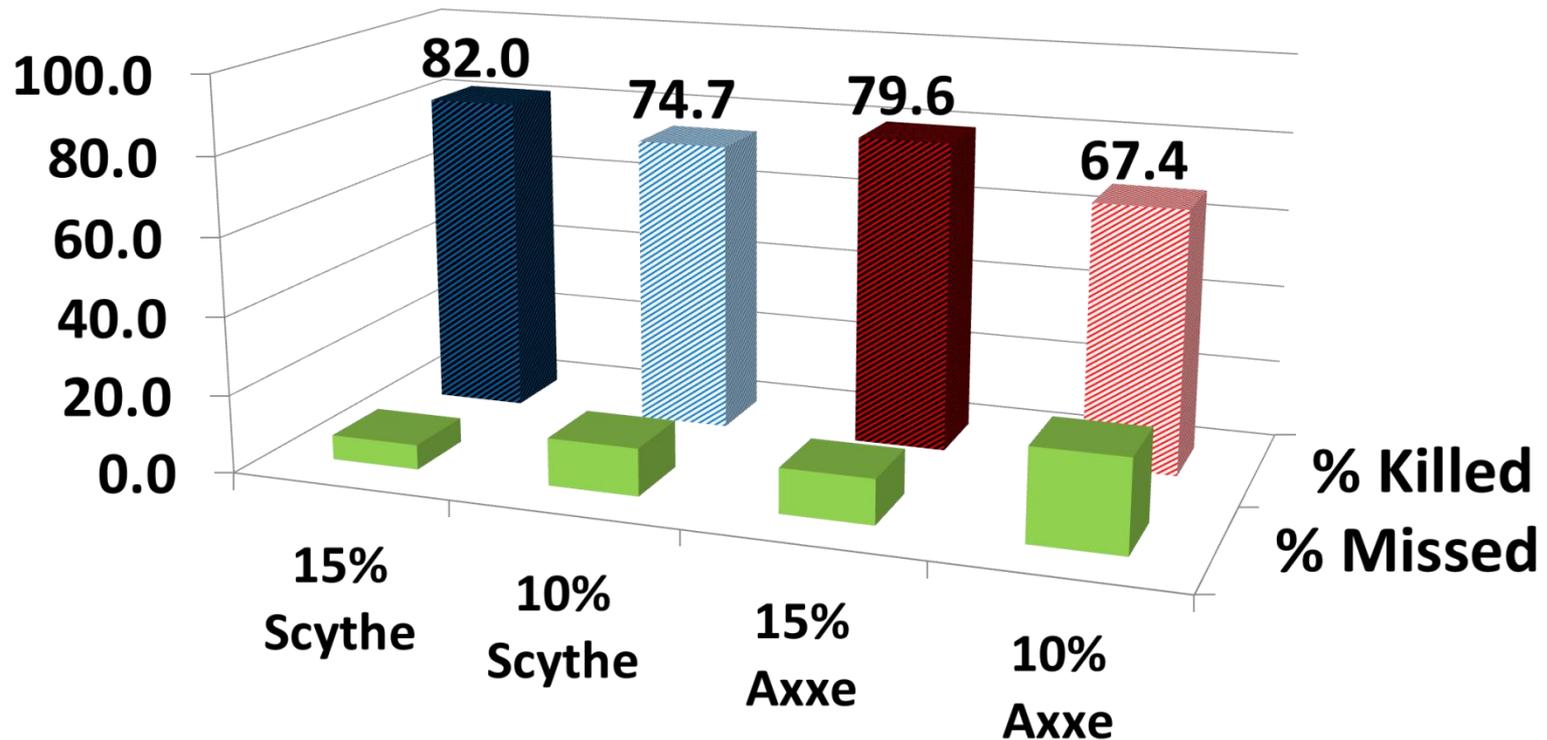


2016 Cone Research

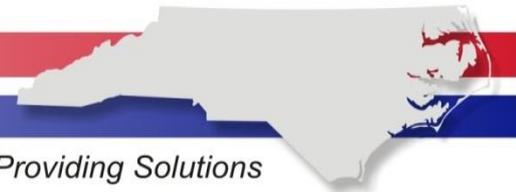
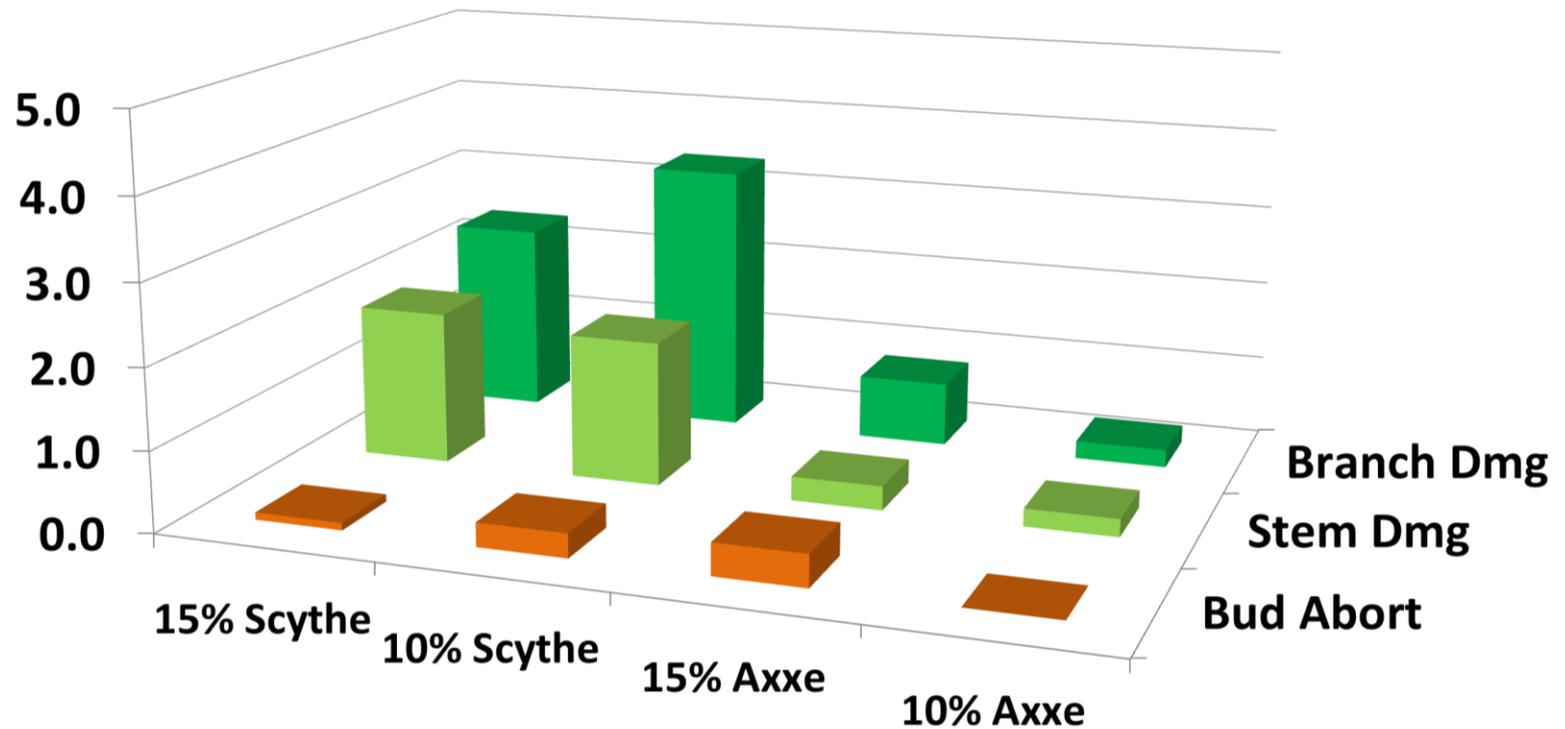
- Building on previous work
- Repeated 2015 backpack sprayer work
- High pressure sprayer study
- Mistblower sprayer study
- Talked to Axxe manufacturer about possibly adding this use to the label



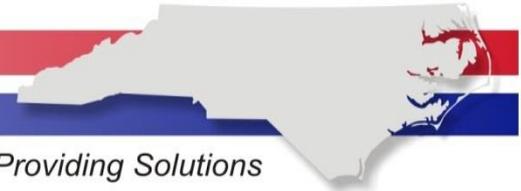
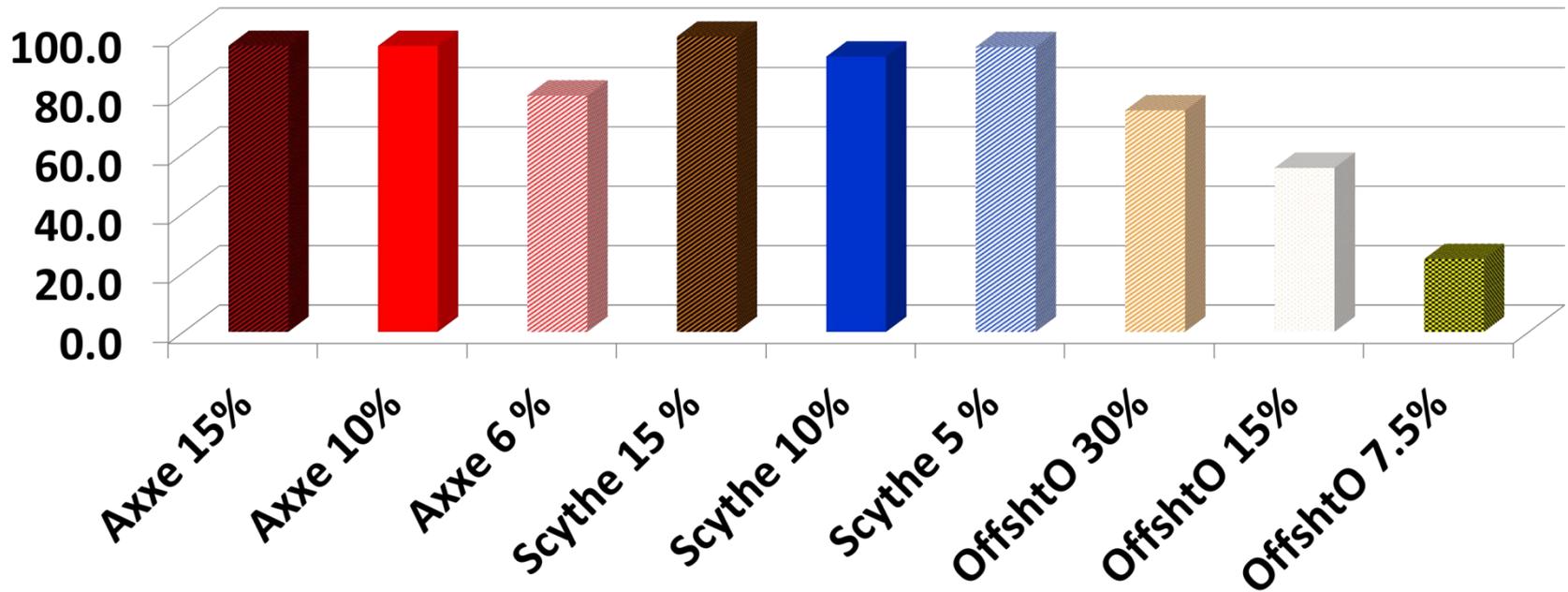
Cornett Farm 2016: % Cones Killed



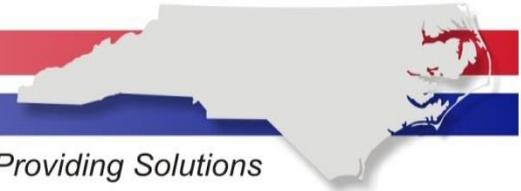
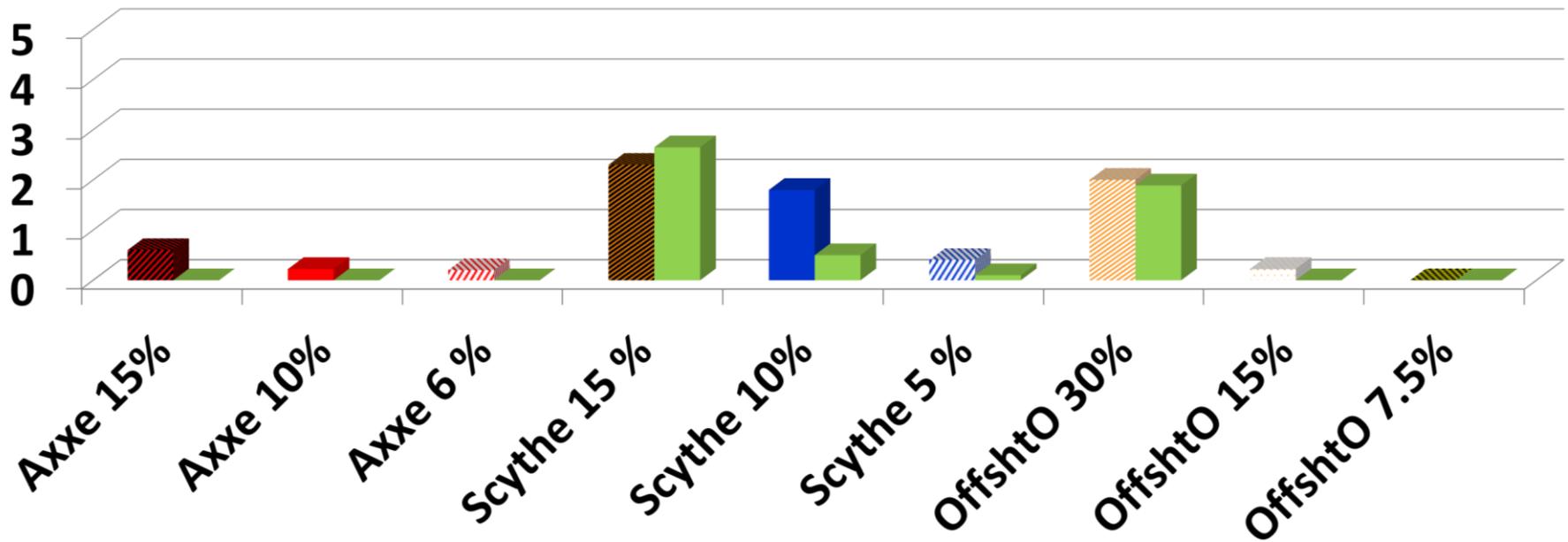
Cornett Farm 2016: Average Tree Damage Rating



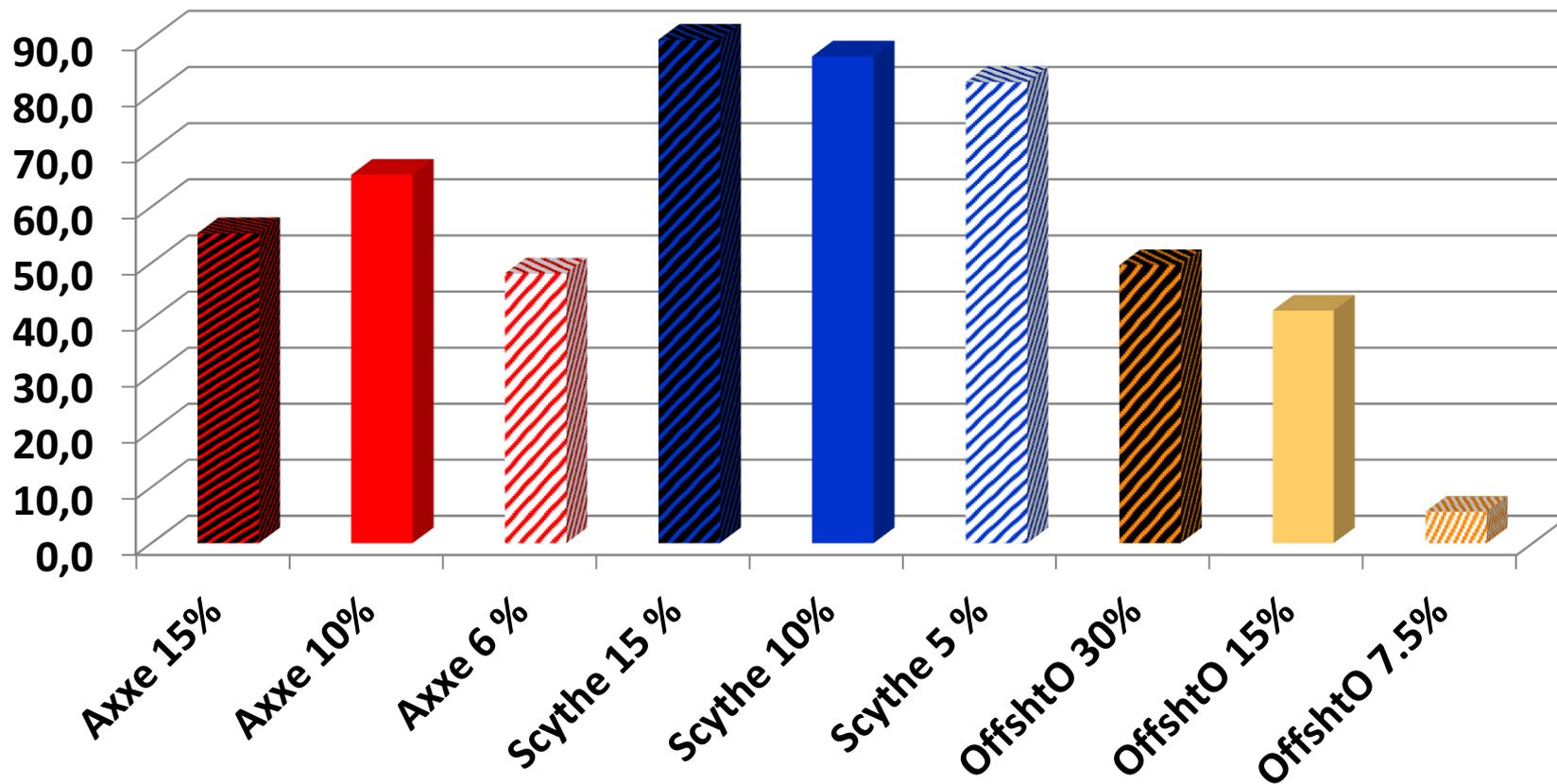
Cartner Farm 2016: % Cones Killed



Cartner Farm 2016: Stem & Branch Damage

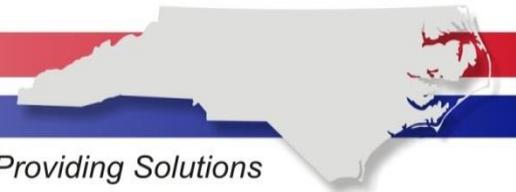


Wishon 2016: % Cones Killed



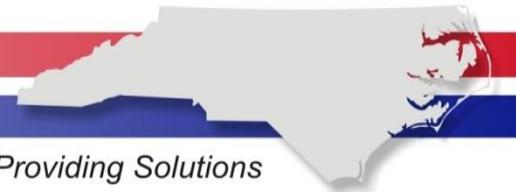
Backpack Sprayer Treatments

- Somewhat variable control
 - Especially on big trees
 - Wind can blow spray away
 - Poor coverage on cone clusters
- Worker protection concerns
 - Proximity to tree being sprayed
 - Toxicity of organic herbicides

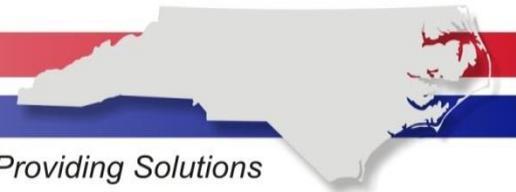
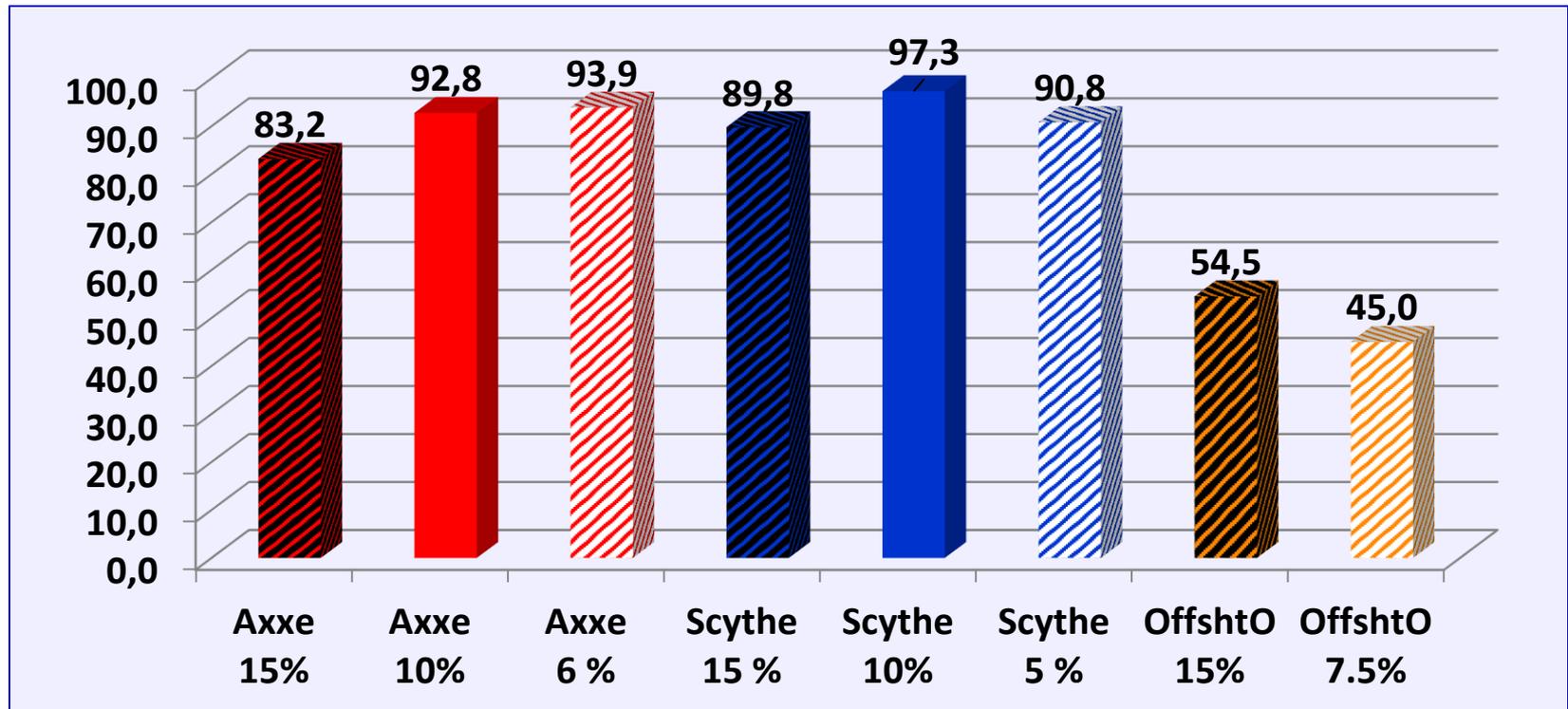


High Pressure Sprayer Treatment

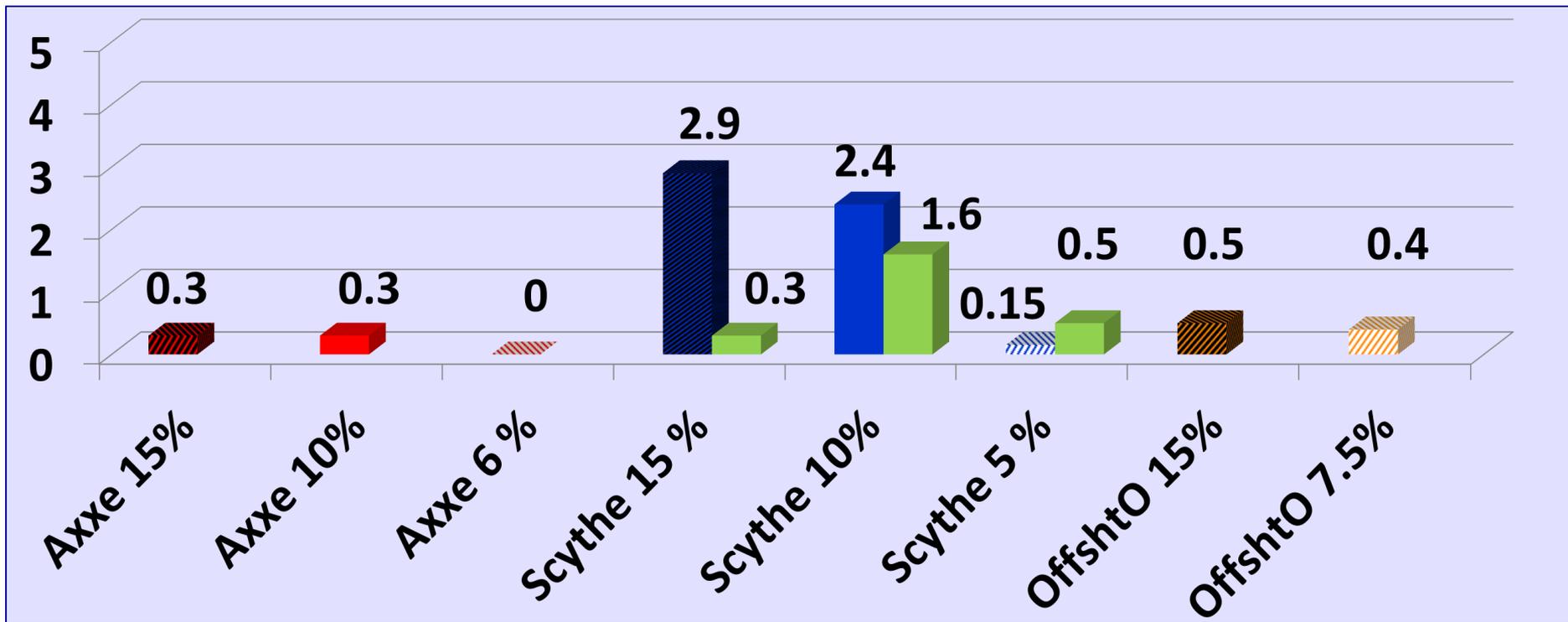
- More distance from tree
- Better coverage of cone clusters
- But...a majority of spray passes through the tree



High Pressure Sprayer 2016: % Cones Killed

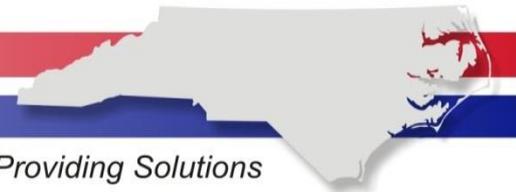


High Pressure Sprayer 2016: Stem & Branch Damage



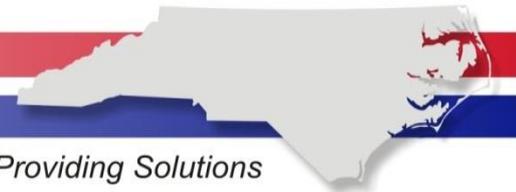
High Pressure Sprayer 2016

- Worked well but very wasteful using a standard spray gun
- Even 6% Axxe from a high pressure sprayer looked great after 2016 treatments



Part 2

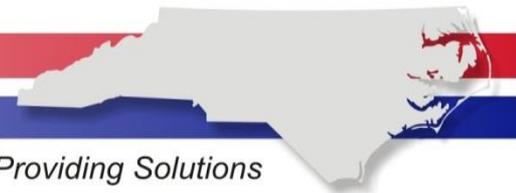
- A cautionary tale
- Or, maybe hindsight is “twenty – twenty”



We Started Looking for Efficiency

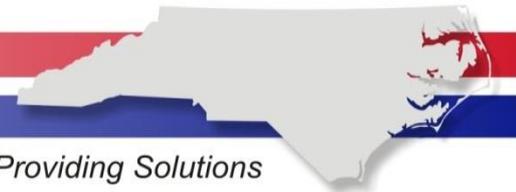


July 2016: Playing with different nozzles, wands, & water



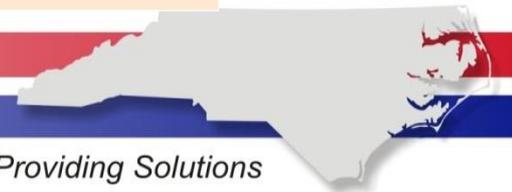
We Calibrated Different High Pressure Sprayer Setups

- We recorded:
 - Sprayer pressure settings (PSI)
 - Nozzle type / orifice size / nozzle setting
- Measure the volume sprayed per minute
- Divide by the # trees sprayed per minute
- Multiply by “trees per acre”
- Calculate price per acre



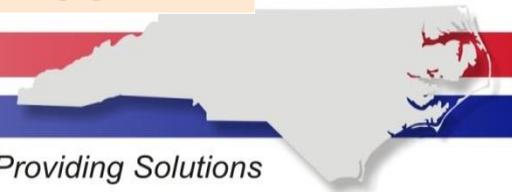
Field Calibration Data

nozzle	psi	gpm	trees / m
full stream 250	250	2.5	19
half stream 250	250	2.3	18
max cone 250	250	1.4	16
"broken" 100	100	1.7	14
"broken" 150	150	2	16
"broken" 260	260	2.6	18
fog 100	100	1.1	13
oscillate 200	200	0.9	19
oscillate 320	320	1.1	18
oscillate 350	350	1.2	19

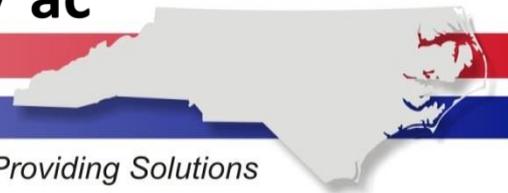
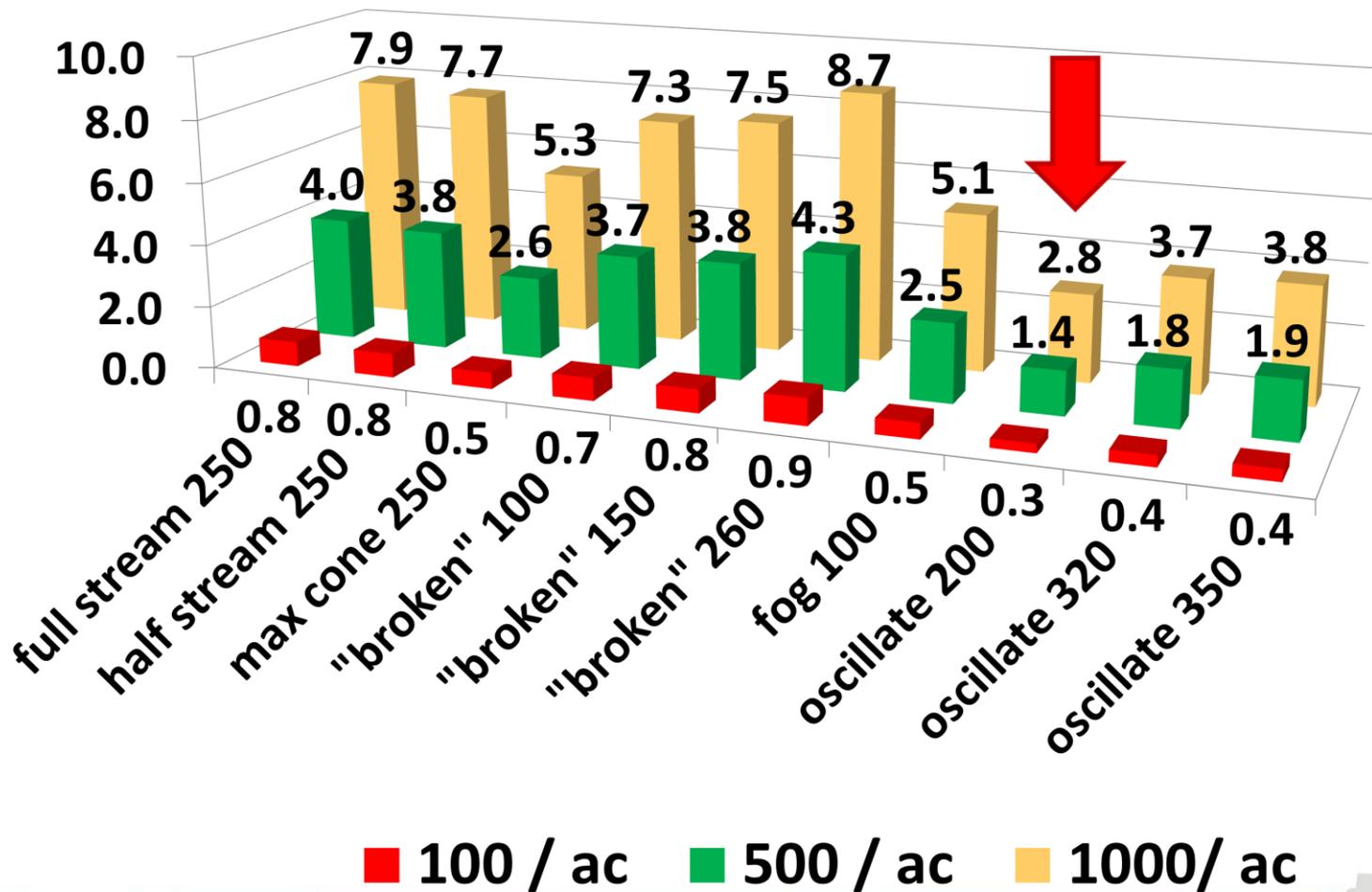


Gallons of Water per "Trees / acre"

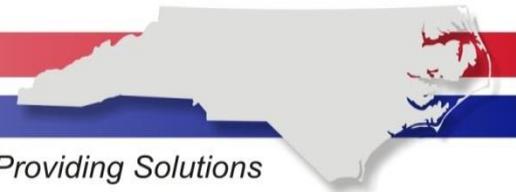
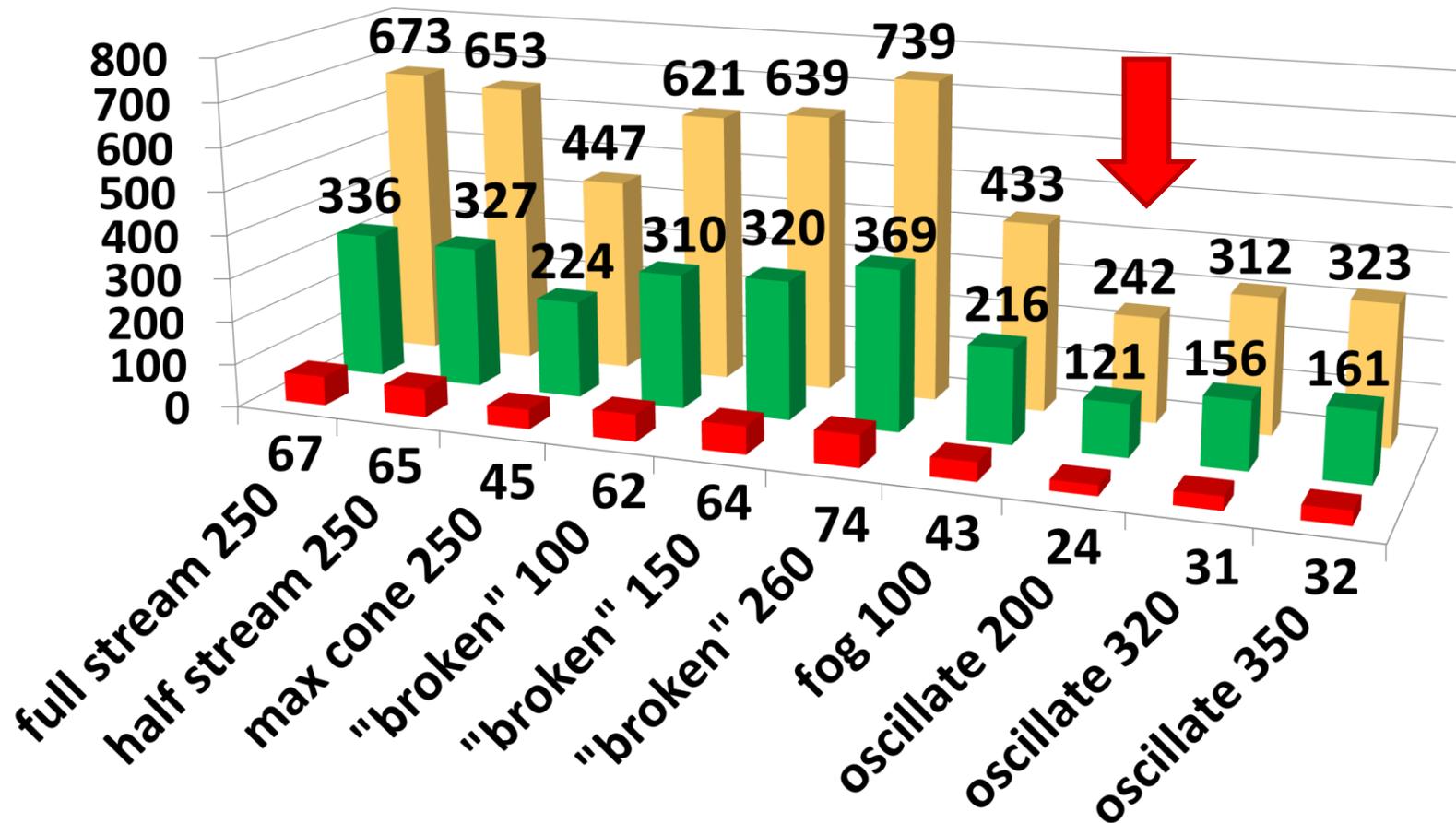
nozzle	100 / a	500 / a	1000/ a
full stream 250	13.2	65.8	131.6
half stream 250	12.8	63.9	127.8
max cone 250	8.8	43.8	87.5
"broken" 100	12.1	60.7	121.4
"broken" 150	12.5	62.5	125.0
"broken" 260	14.4	72.2	144.4
fog 100	8.5	42.3	84.6
oscillate 200	4.7	23.7	47.4
oscillate 320	6.1	30.6	61.1
oscillate 350	6.3	31.6	63.2



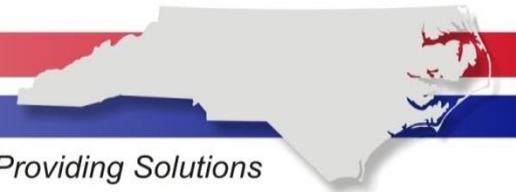
Gallons of Axxe per Acre (at 6%)



Cost of Axxe per Acre (at 6%)



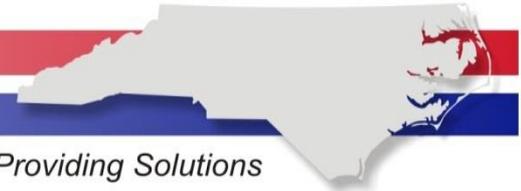
An Interesting Exercise



So... What did we do in 2017?

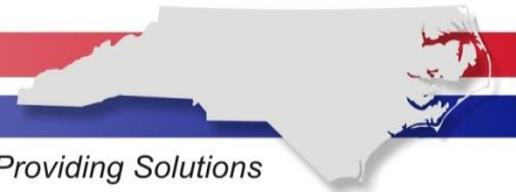
- Axxe ~ Ammonium soap product
 - 10% = 101.5 ml per liter
 - 6% = 62.5 ml per liter
 - 4.5% = 46.9 ml per liter
 - 3% = 31.3 ml per liter
 - 1.5% = 15.6 ml per liter

Put all our eggs in one basket



2017 Cone Studies

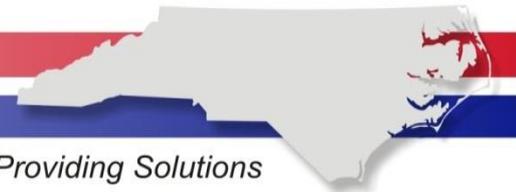
- Five high pressure sprayer studies with Axxe in different NC counties
- A Sprayer comparison study with one rate of Axxe



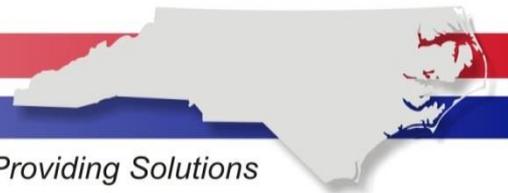
Manual Backpack Sprayer with a Wand Extension



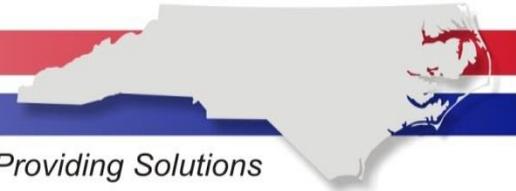
Solo Backpack Mistblower



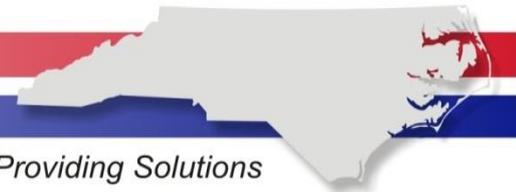
Conventional High Pressure Spray Treatment



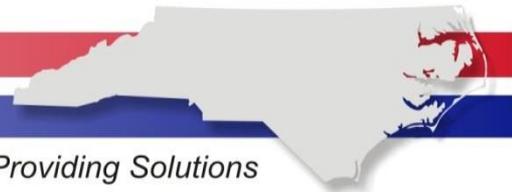
High Pressure Sprayer with a Pressure Washer Wand & Turbo Nozzle



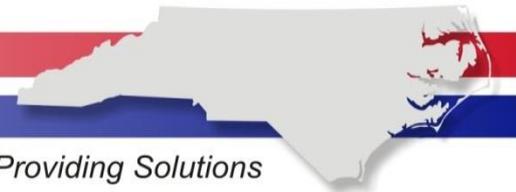
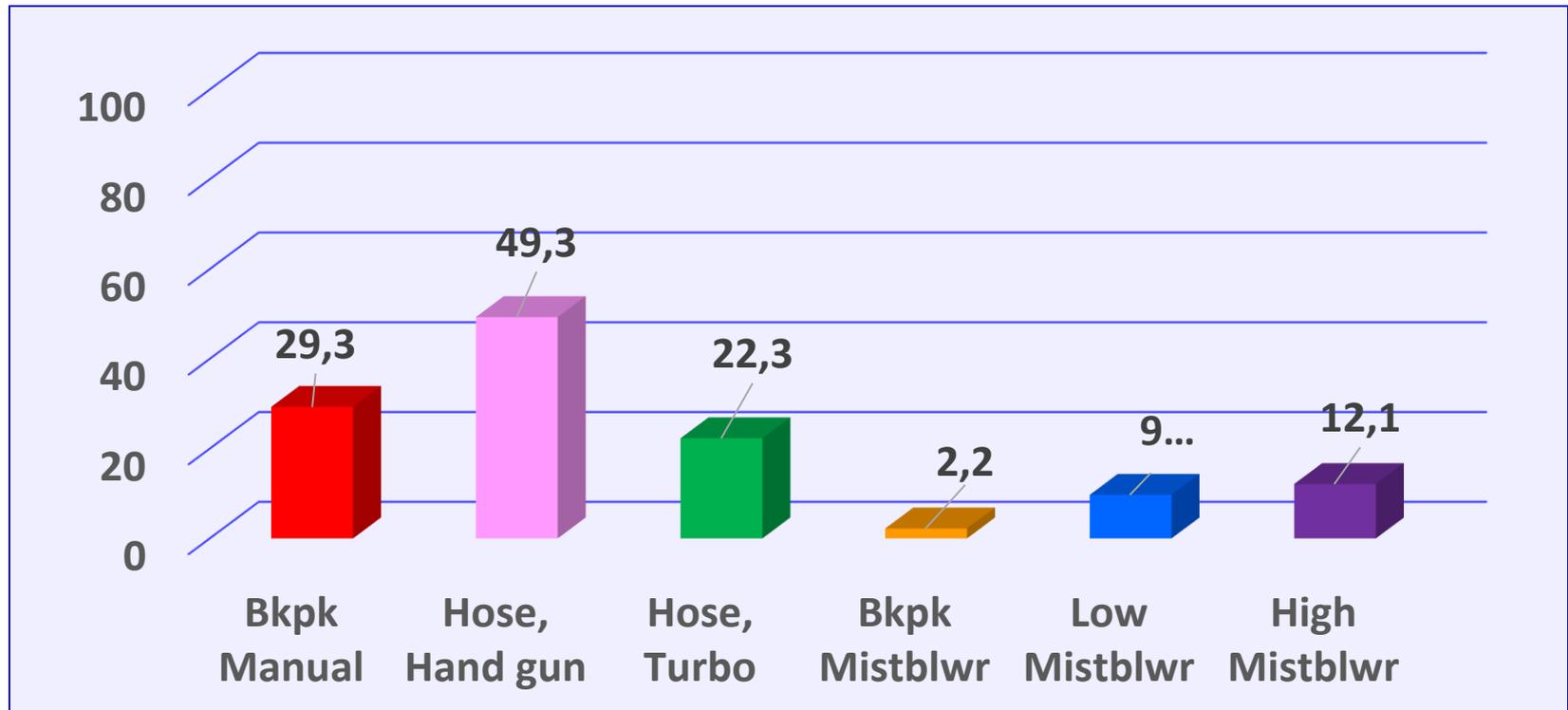
A few added details



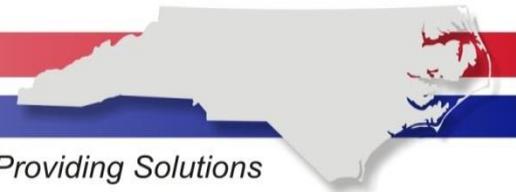
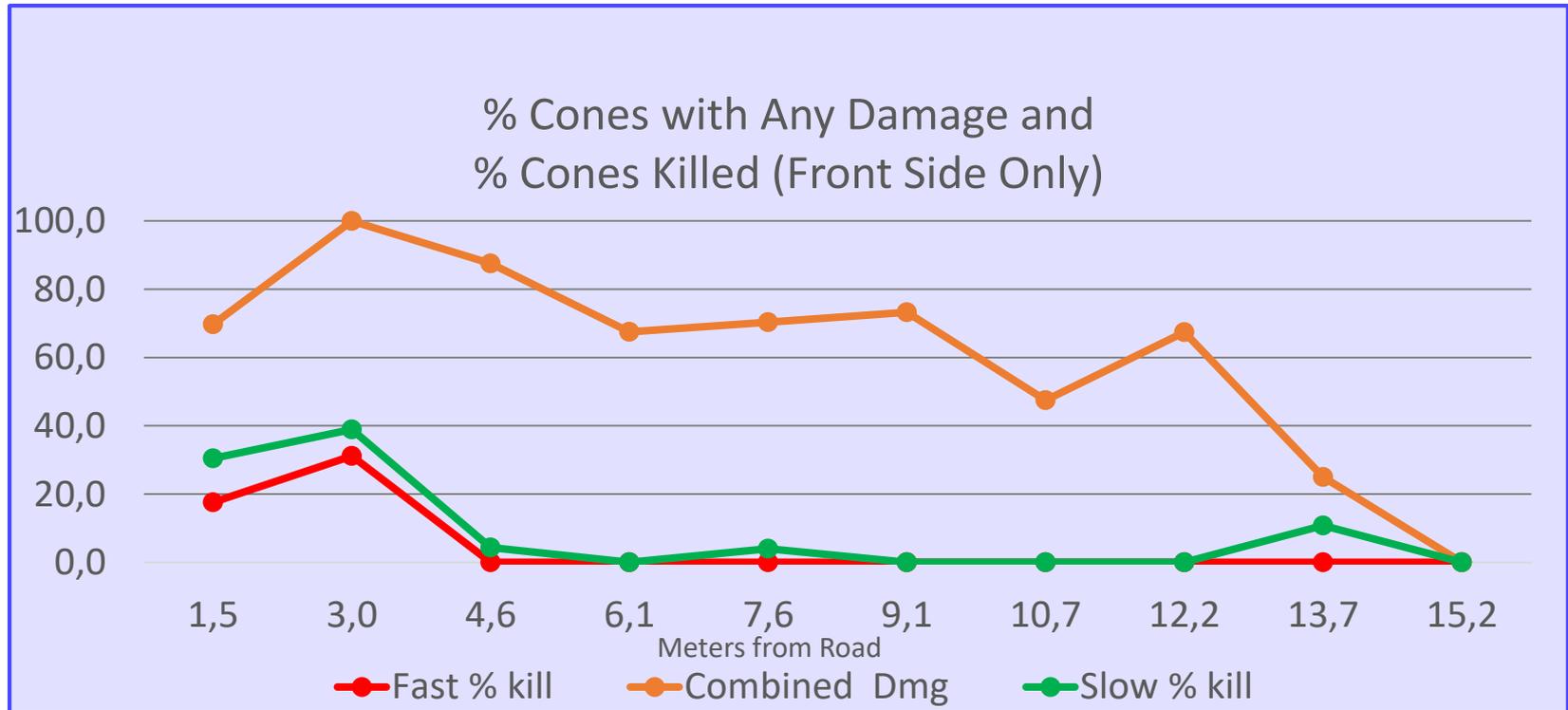
Cannon Mistblower



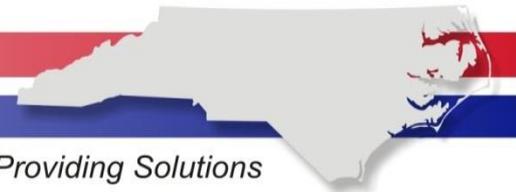
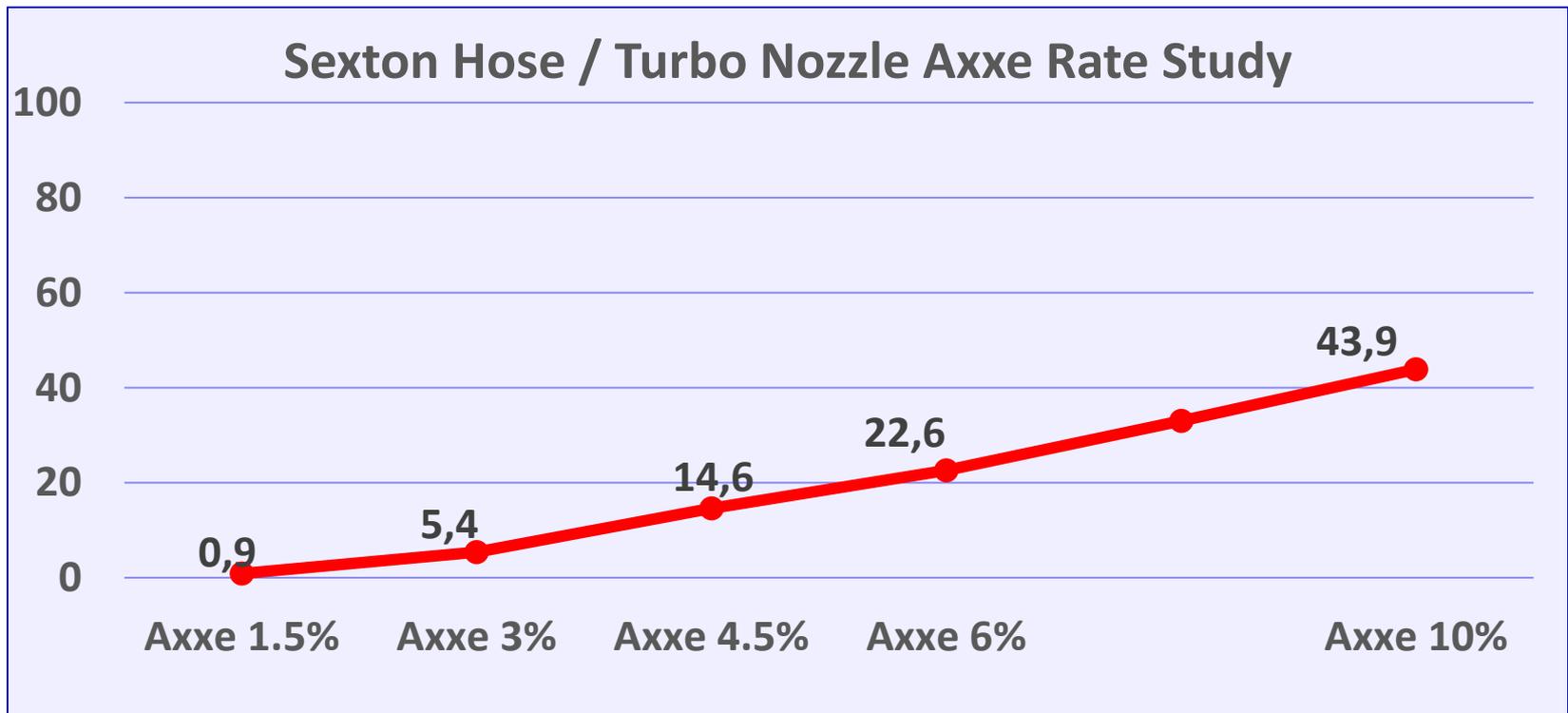
A Comparison of Sprayers: % Cones Killed at 6% Axze



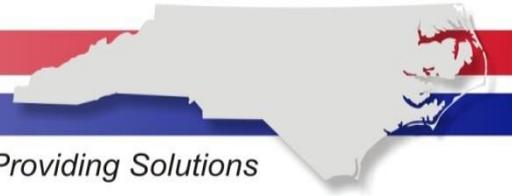
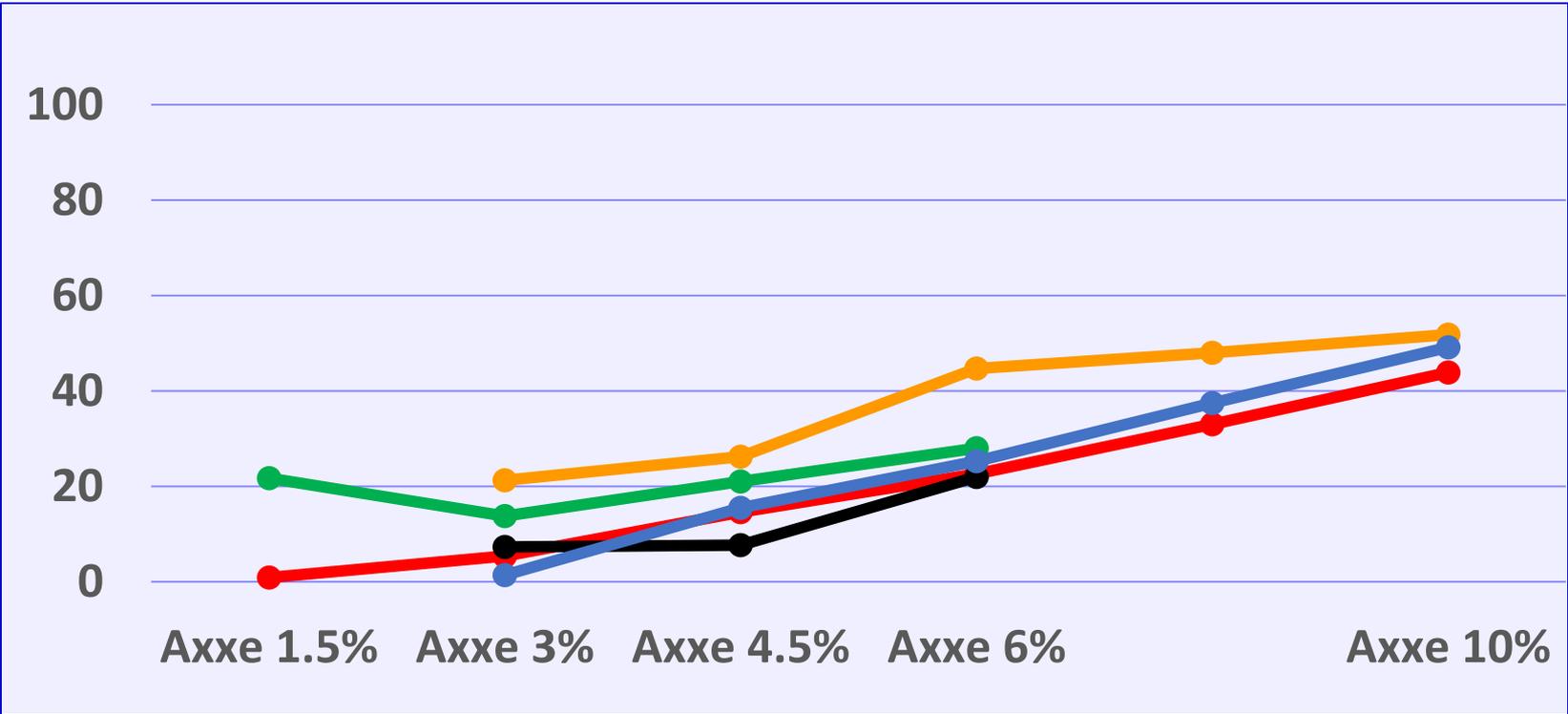
Mistblower Sprayers: Effective distance from the Road



Axxe Rate Study: Turbo Nozzle

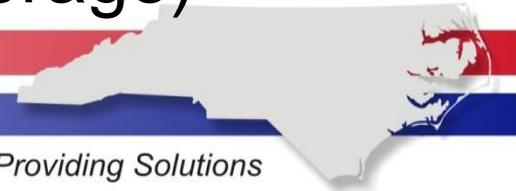


Five 2017 Axxe Rate Studies



Where did I go wrong?

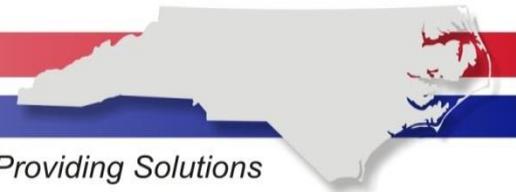
- Consistent 2017 results at multiple sites
- 2016 high pressure sprayer treatment mixing
 - Residual spray mix in 200 gallon sprayer tank
 - Residual spray mix in 100 meters of hose
 - Sprayed 15% Axxe first, then 10%, then 6%
 - My 6% Axxe was mixed with higher rates (?)
- 2017 assumptions
 - Focused solely on the best product from 2016
 - Focused on efficiency (time & coverage)



2018 Cone Work



- High pressure sprayer calibration
- Continue work on fatty acids like Axxe
- Work with other products again
- More sprayer and spray gun comparisons
- Not quite ready to work with BioSafe, Inc. to add Fraser Fir to Axxe label
- Funding from Christmas Tree Promotion Board as well as the NCCTA



Questions?

