

# Glyphosate Strategies

## Joel Fields

# Agenda

Glyphosate issues

Inland Empire current site prep mixes

Common Release Tank Mixes

Proposed tank mixes if we need them

# What are the Issues With Glyphosate?

- A concerned public
  - Anti/lawsuit commercials, social media?
  - Concerned employees, customers, neighbors
- Resistance management
  - We need to rotate modes of action to prevent the buildup of resistant weeds



# Do We Have To Use Organic Products?



**ROUNDUP IS THE MOST COMMONLY USED WEED KILLER IN AMERICAN AGRICULTURE**

GLYPHOSATE USE IN THE UNITED STATES

**MONSANTO ROUNDUP LEGAL HELPLINE**  
CALL Us Now! **1-800-510-3887**



*Diagnosed with  
Non-Hodgkin's  
Lymphoma after being  
exposed to Roundup or  
Glyphosate herbicide.*

**MONSANTO ROUNDUP LEGAL HELPLINE**  
CALL Us Now! **1-800-510-3887**

No but the public is moving in that general direction.....



# A Harsh Reality: Ag's Declining Political Influence

1950

- U.S. population – 150 million
- Farm population – 25 million
- Ag lobby has a formidable political presence.

2019

- U.S. population – 325 million
- Farm population – 3.2 million
- Ag lobby is outnumbered by larger political constituencies.

# 2018 Map

**Oregon**  
Italian ryegrass  
Kochia  
Russian Thistle

**Alberta**  
Saskatchewan  
Manitoba  
Idaho  
Wyoming  
Colorado  
Kochia

**North Dakota**  
Common ragweed  
Common waterhemp  
Kochia

**Iowa**  
Common waterhemp  
Giant ragweed  
Horseweed

**Michigan**  
Horseweed  
Palmer amaranth

**Indiana**  
Ohio  
Kentucky  
Common ragweed  
Common waterhemp  
Giant ragweed  
Horseweed  
Palmer amaranth

**Ontario**  
Common ragweed  
Common waterhemp  
Giant ragweed  
Horseweed

**California**  
Annual Bluegrass  
Hairy fleabane  
Horseweed  
Italian ryegrass  
Junglerice  
Palmer amaranth  
Rigid ryegrass

**Montana**  
Horseweed  
Kochia  
Russian Thistle

**South Dakota**  
Common ragweed  
Common waterhemp  
Horseweed  
Kochia

**Nebraska**  
Kansas  
Common ragweed  
Common waterhemp  
Giant ragweed  
Horseweed  
Kochia  
Palmer amaranth

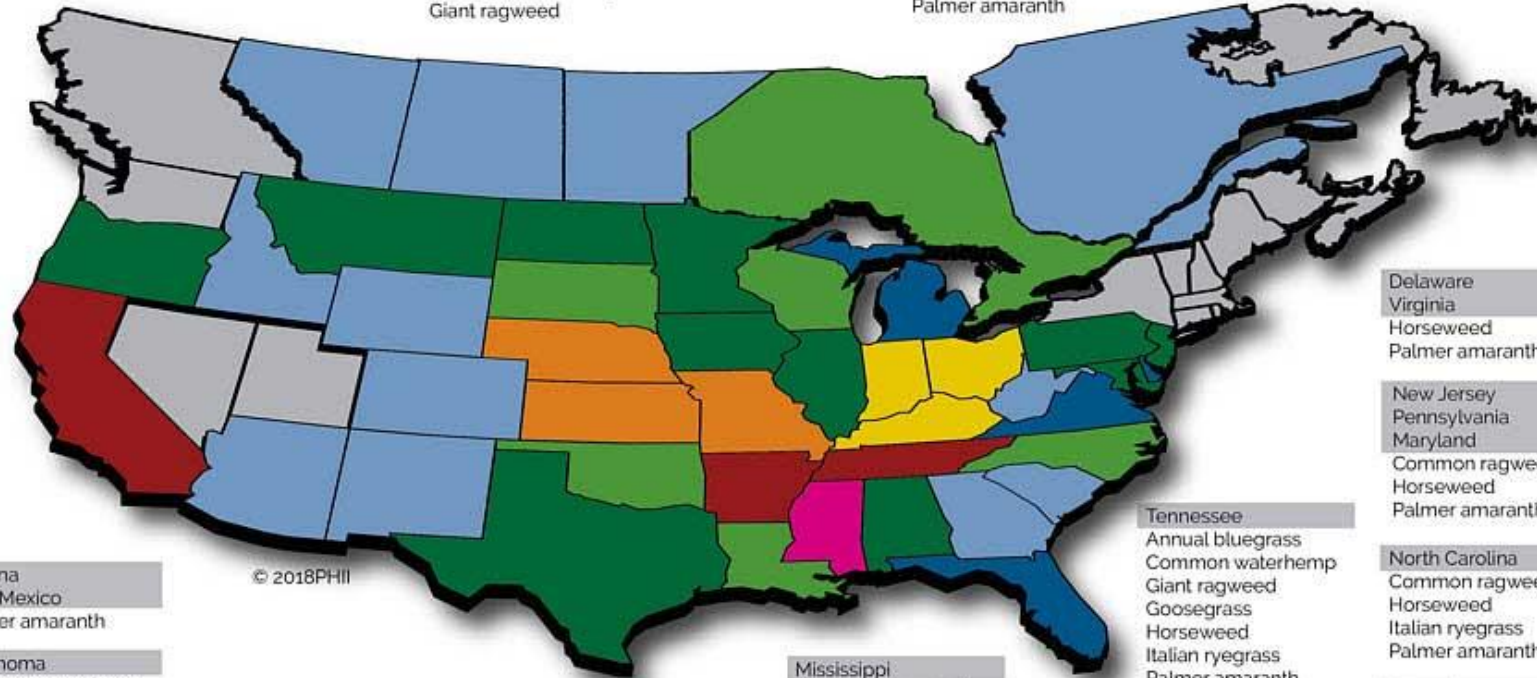
**Wisconsin**  
Common Waterhemp  
Giant ragweed  
Horseweed  
Palmer amaranth

**West Virginia**  
Horseweed

**Quebec**  
Birdsrape Mustard

**Minnesota**  
Common ragweed  
Common waterhemp  
Giant ragweed

**Illinois**  
Common waterhemp  
Horseweed  
Palmer amaranth



**Arizona**  
New Mexico  
Palmer amaranth

**Oklahoma**  
Common waterhemp  
Horseweed  
Kochia  
Palmer amaranth

**Texas**  
Common sunflower  
Common waterhemp  
Palmer amaranth

**Missouri**  
Annual bluegrass  
Common ragweed  
Common waterhemp  
Giant ragweed  
Horseweed  
Palmer amaranth

**Arkansas**  
Common ragweed  
Common waterhemp  
Giant ragweed  
Horseweed  
Italian ryegrass  
Johnsongrass  
Palmer amaranth

**Mississippi**  
Common ragweed  
Common waterhemp  
Giant ragweed  
Goosegrass  
Horseweed  
Italian ryegrass  
Johnsongrass  
Palmer amaranth  
Spiny amaranth

**Alabama**  
Common ragweed  
Horseweed  
Palmer amaranth

**Florida**  
Palmer amaranth  
Ragweed Parthenium

**Tennessee**  
Annual bluegrass  
Common waterhemp  
Giant ragweed  
Goosegrass  
Horseweed  
Italian ryegrass  
Palmer amaranth

**Delaware**  
Virginia  
Horseweed  
Palmer amaranth

**New Jersey**  
Pennsylvania  
Maryland  
Common ragweed  
Horseweed  
Palmer amaranth

**North Carolina**  
Common ragweed  
Horseweed  
Italian ryegrass  
Palmer amaranth

**Georgia**  
South Carolina  
Palmer amaranth

**Louisiana**  
Common waterhemp  
Italian ryegrass  
Johnsongrass  
Palmer amaranth

Glyphosate-Resistant Species



# History of Glyphosate Resistance

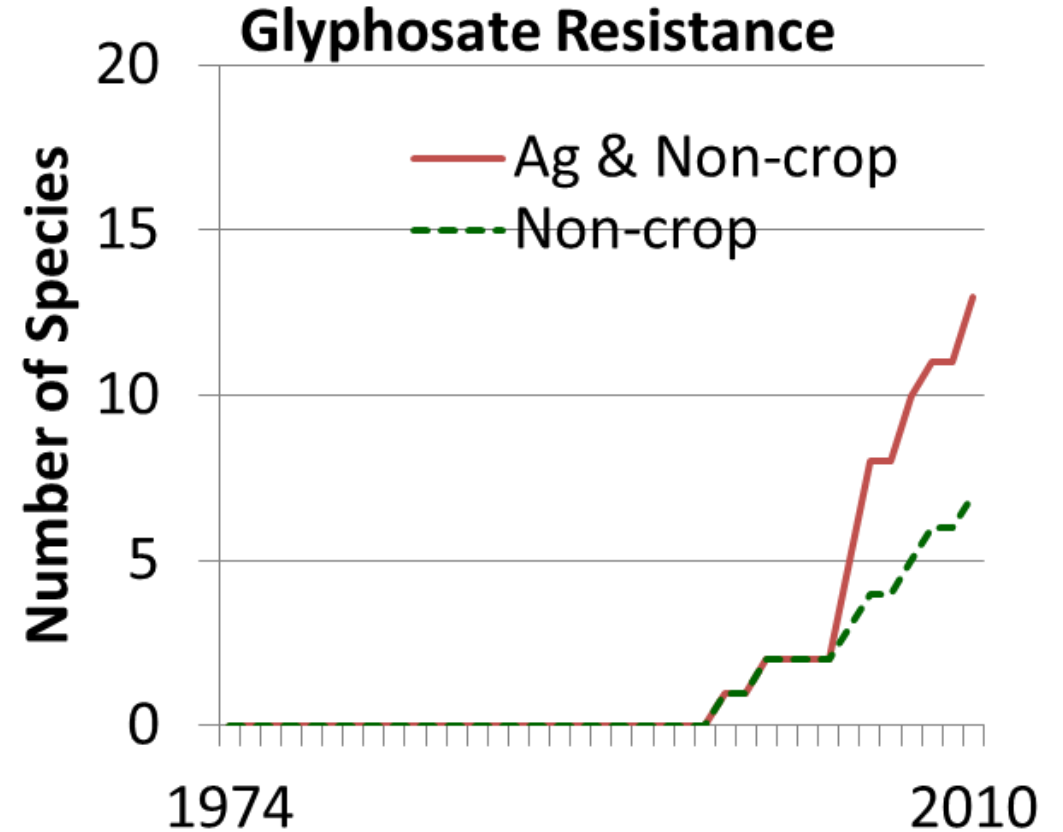
## Ag and Non-Crop in the United States

Roundup® brand herbicides have been used commercially since 1974

By 2010 in the United States, 13 weeds had confirmed resistance in both Ag and non-crop sites combined

7 annual weeds have confirmed resistance to glyphosate in non-crop areas

Name	Non-crop Site	Year
Rigid Ryegrass	Almonds (CA)	1998
Horseweed	Nurseries (MI), Roadsides (CA)	2000
Italian Ryegrass	Orchards (OR)	2004
Palmer Amaranth	Orchards (NM)	2005
Hairy Fleabane	Roadsides (CA), Vineyards (CA)	2007
Junglerice	Orchards (CA), Roadsides (CA)	2008
Annual Bluegrass	Turf (MO)	2010



For more information, please see [www.weedscience.org](http://www.weedscience.org)





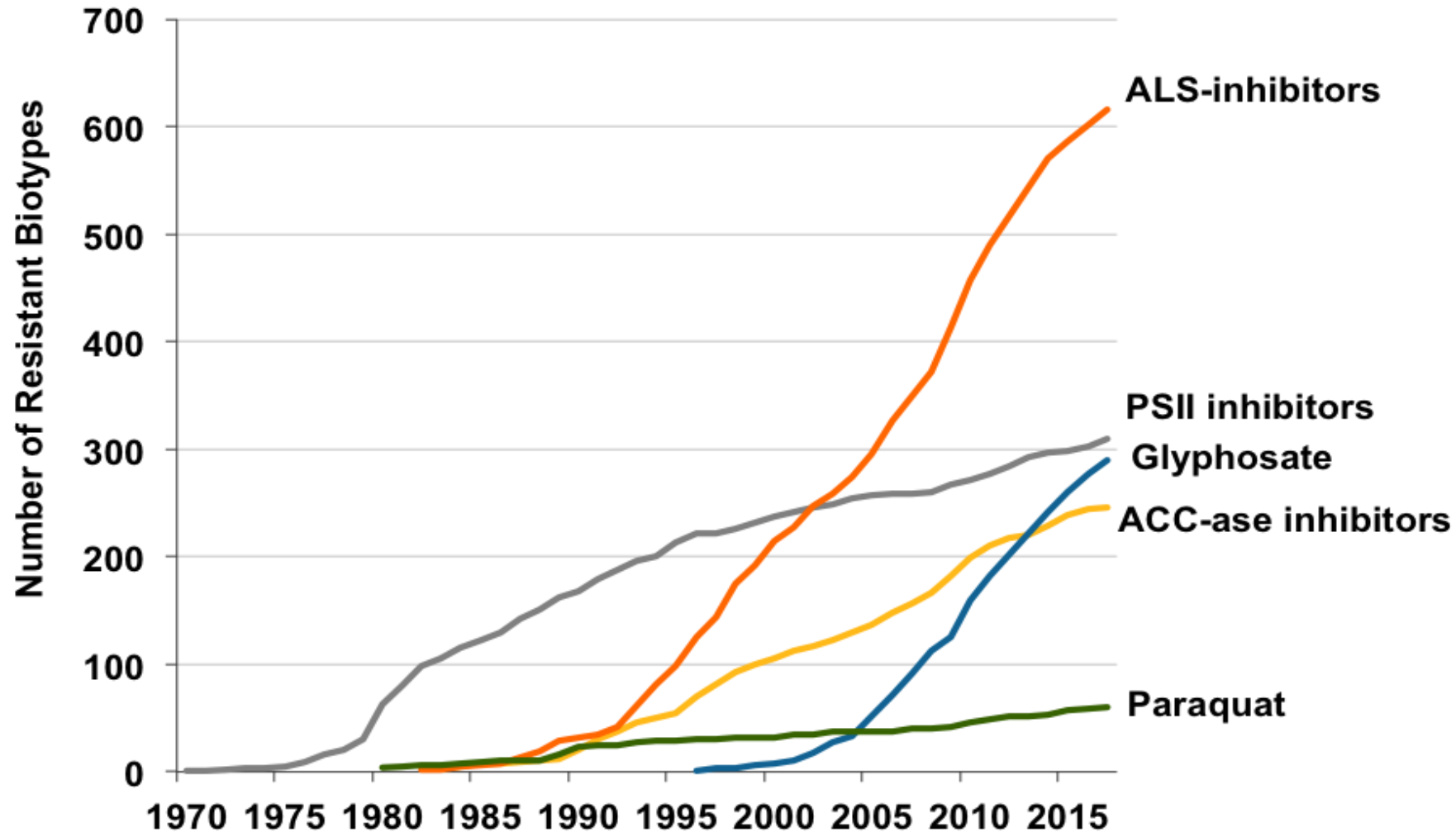
# Site Prep With Glyphosate

- At least 2 modes of action
- Glyphosate-Group 9
- Imazapyr-Group 2
- Oust/Escort – Group 2
- Growth Regulators Group 4

# Site Prep Without Glyphosate

- Imazapyr-Group 2
- Oust/Escort – Group 2
- We may need to add a growth regulator or a contact herbicide for resistance management!

# Resistance By Mode of Action





# No Glyphosate-More Mechanical Site Prep?

- Environmental advantages over mechanical methods, such as dozers & excavators
- Herbicide veg. control reduces the erosion of valuable topsoil and eliminates compaction associated with mechanical means
- Controls grass, weeds, and brush
- Reduces competition for moisture



# Site Prep Without Glyphosate?

- We can use more systemic products
  - Escort
  - Rotary
  - Transline
  - Opensight
  - Garlon, 2,4-D
- We can also use more soil residuals
  - Atrazine
  - Esplande F
  - Velpar
  - Cleantraxx

# Glyphosate Alternatives

- Axxe
- Suppress
- Finale
- Cheetah Pro
- We have to be careful when using contact herbicides with systemics
- They can burn leaf tissue and reduce uptake of systemic herbicides
- Further studies are needed!



# AXXE<sup>®</sup> Herbicide

A revolutionary non-selective herbicide that utilizes a reduced-risk chemistry for fast burn down results on a broad-spectrum of weeds.

- Non-selective weed control
- Results visible within few hours
- Labeled for Provides up to 4+ weeks of control
- No toxic residuals (breaks down within a few days)

## Mode of Action

Disrupts plant tissue through cell wall penetration, resulting in cease of plant growth and brown necrosis.

## Use Rates and Volumes

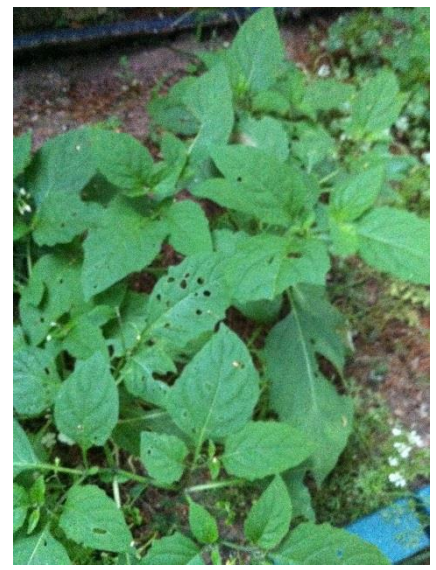
**Application rates:** 8%-15.0% v/v

**Spray volume:** 40-100 gallons/acre

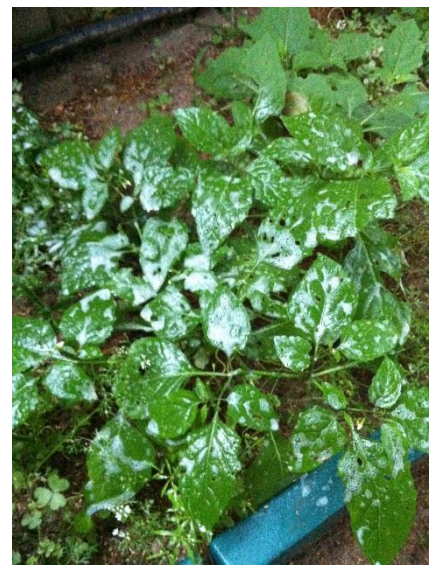


**Broadleaf  
Weeds**

**Before AXXE**



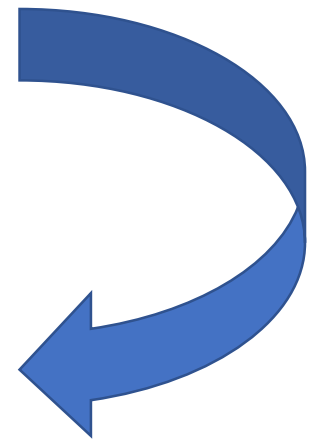
**Immediately after AXXE Spray (8.0% v/v)**



**48 hrs after AXXE Spray**



**24 hrs after AXXE Spray**



# Inland Empire Plantation Issues?



Moisture



Stands with multiple species  
including Larch



Application timing differences



# APPLICATION OPTIONS





# Aerial





# Waving Wand





## Directed w/ Shield





# Directed July Hand Spray

Release: Clopyralid, Glyphosate, Imazapyr





# Spot Application



- Velpar
- Atrazine
- Oust
- Transline





# Spot Application Over Seedlings

- Velpar L            128 oz.
- Crosshair            4 oz
- Hi-Light Dye        2 oz.
- Dormant PP, LP, DF, ES
  
- Atrazine            96 oz.
- Crosshair            4 oz
- All dormant conifer
  
- Oust XP            1.5 dry oz.
- Crosshair            4 oz
- Climb                0.25 oz.
- Hi-Light Dye        2 oz.
- All dormant conifers





# Meter-Jet gun



w/o  
DISK







**Low volume basal application**



# Low volume basal application

- 75% Web Oil
- 25 % Garlon 4







Cut Stump Treatment







Hack &  
Squirt



# Individual Plant Treatments

## **Tree Injection, Hack & Squirt / Frill or Girdle** Effective on standing hardwood trees

- Big Leaf Maple, Cherry, Alder, Cottonwood, etc.
- Apply anytime of year except during heavy sap flow, severe drought or when trees are frozen.
- **Tree Injection, Hack and Squirt**
  - **Expose cambium** using hatchet or machete and apply herbicide @  $\frac{1}{2}$  - 1 ml per hack into tree.
  - One hack per 1-3 in diameter of tree.
  - **Apply Vastlan, Garlon 3A, Capstone, Tordon 101M, Rodeo, Accord or imazapyr.**
    - Use herbicides **undiluted or mixed 50% in water.**
- **Frill or Girdle**
  - Tree is completely girdled using a hatchet, chain saw, or machete to expose cambium layer then herbicide is applied to exposed cambium @  $\frac{1}{2}$  - 1 ml/inch diameter.
  - More effective on larger or difficult to control woody plants.

# Site Preparation / Release

- **Site Preparation**
- Before you plant
- More effective
- Safer for seedlings
- Product specific
- Be Pro-active!  
Not re-active!
- Summer/Fall
- **Release**
- After planting /  
naturals
- Herbicide specific to
  - Target
  - Conifer species
  - Season
  - Dormancy
- Riskier for conifers
- Late Summer/Fall and  
early Spring



# Brush That Keeps Seedlings Short

- Maple
- Willow
- Cherry
- Alder
- RS & SL Ceanothus
- Serviceberry
- Elderberry
- Ninebark
- Ocean Spray
- Birch
- Cottonwood
- Aspen
- Thimbleberry\*
- Snowberry\*
- Raspberry\*
- Bracken Fern\*





# Site Preparation For Brush

- Seedling survival and growth decrease when brush cover is above 30%
- 2 months after planting





# Site Preparation For Grass

- Seedling survival is reduced above 50% cover
- Less than 40% cover for enough moisture needed for seedling 1<sup>st</sup> year survival and growth
- Grass can obtain 50% cover in 2 years after removal of closed canopy





# Site Prep. Mix With Glyphosate

Use July Thru Sept.

- Glyphosate 5.4      64 oz.
- Rotary SP          24 oz.
- Bronc Max         6.4 oz
- Crosshair          4 oz.
- Syl-Tac            6.4 oz.
- May add Escort for some brush species
- Oust for heavy grass?
- Opensight for Thistles?



# glyphosate, Rotary and Escort!





## Site Prep. Mix Without Glyphosate

Use July Thru Sept.

- Rotary SP 32 oz.
  - Escort XP 2 dry oz.
  - Oust XP 1.5 dry oz.
  - Crosshair 4 oz.
  - Syl-Tac 6.4 oz.
- 
- Will have to watch this for Pine seedling safety



# Additional Modes of Action Group 4

Garlon 3A

Opensight

Transline

Vengeance Plus

Broadrange 55----2,4-D



## Site Prep. Mix Without Glyphosate

Use July Thru Sept.

- Rotary SP 24 oz.
- Escort XP 2 dry oz.
- Oust XP 1.5 dry oz.
- Garlon 3A 1 quart
- Crosshair 4 oz.
- Syl-Tac 6.4 oz.



# Site Prep. Mix Without Glyphosate

Use July Thru Sept.

- Rotary SP 24 oz.
- Escort XP 1 dry oz.
- Oust XP 1.5 dry oz.
- Opensight 3 oz
- Crosshair 4 oz.
- Syl-Tac 6.4 oz.



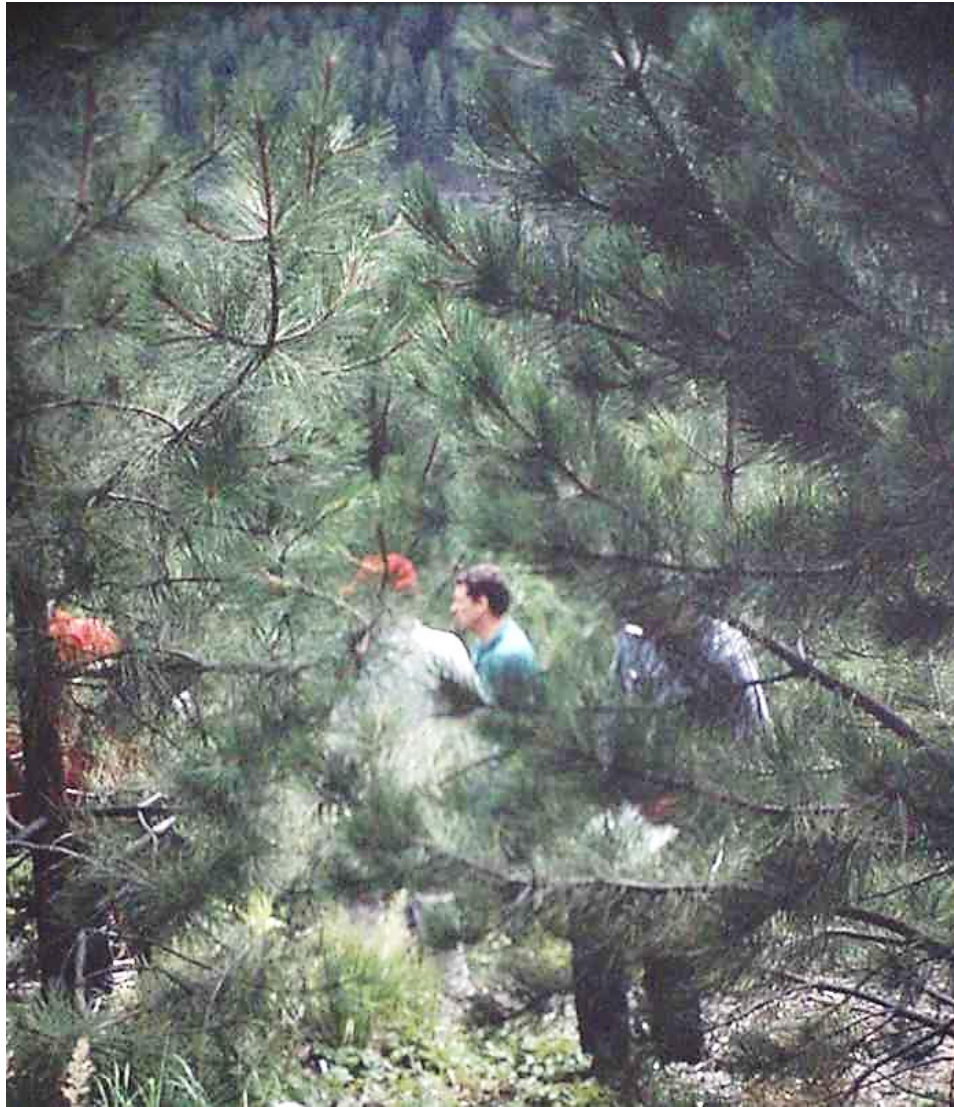


# Hexazinone Products

- **Velpar L & DF**
- Safe for PP; DF; LP; GF; ES  
Kills WL; WP
- Site prep or release applications  
Spring & Fall
- Soil & foliar active systemic
- Post & pre-emergent for;  
Grass, SL Ceanothus, Bear grass,  
Aspen, Willow, Hawthorn



# Velpar Site Prep Twelve Years Old



Use Spring Through Fall

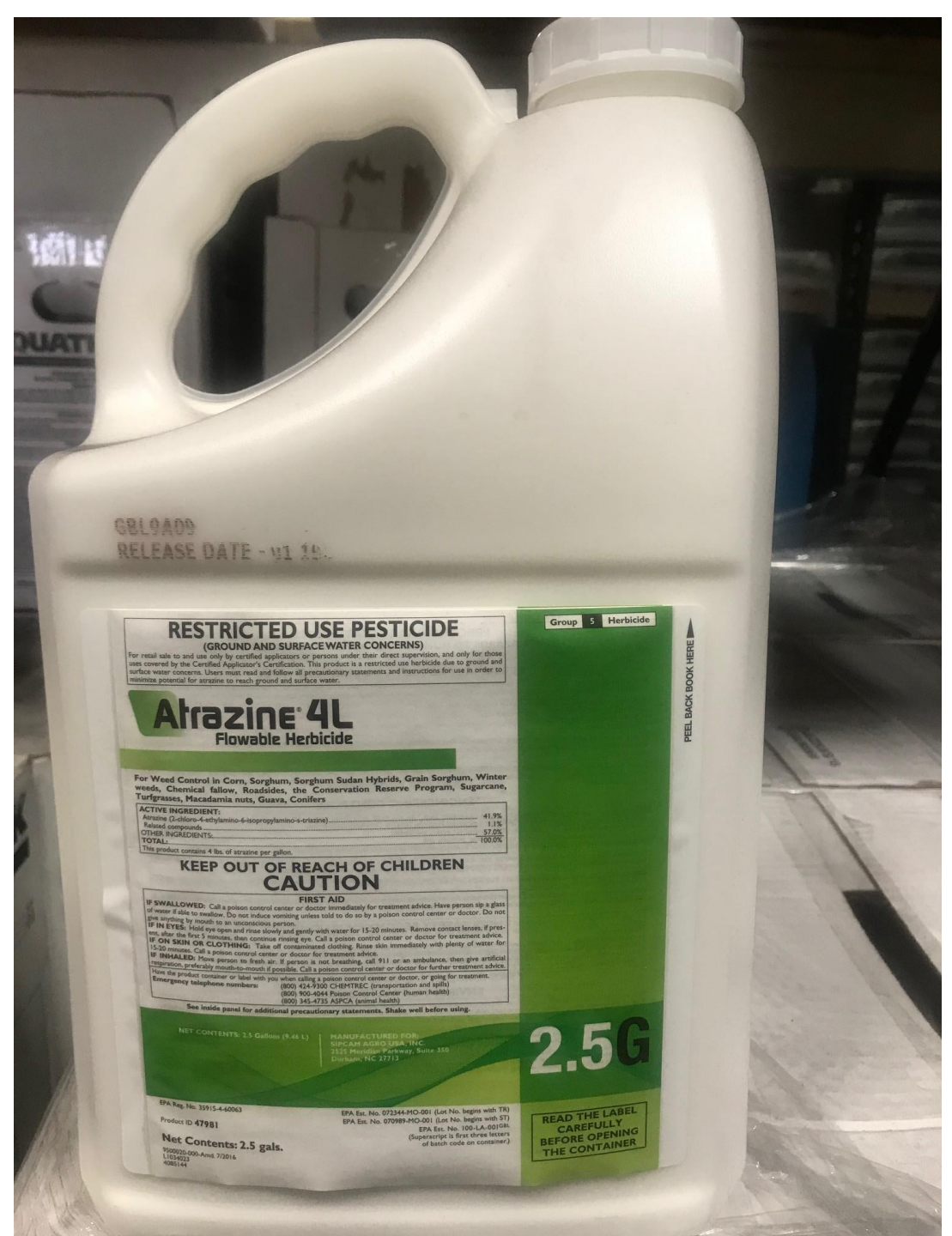


**SAME SITE, NO SITE  
PREP, 12 YEARS  
LATER**



# Atrazine

- Soil & foliar active, post, pre-emergent
- Good for grass, weeds, forbs, seed pre-emergent
- Can be sprayed on freshly burned or logged areas
- Site prep or release over top dormant conifers
- Federally restricted use, all states





# Soil From Treated Area On Shovel

- Atrazine Site Prep





## Late Fall Site Prep. Mix

- Atrazine      128  
oz.
- In-Place      8  
oz.





# Atrazine Test Strip



Use Spring Through Fall



# Same site





# Waving Wand Application



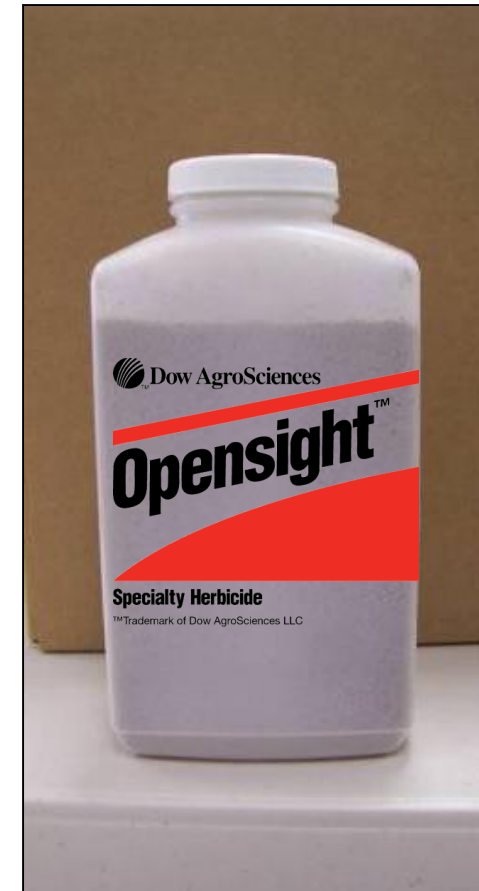


# Opensight™ Packaging

1.25 lb. and 10 lb. containers



**2 x 10 lb containers/case**  
**20 oz measuring device**



**6 x 1.25 lb containers/case**

# Species Controlled

- **Over 160 weeds listed on label**
- **General weeds**
  - **Horsenettle, bedstraw, ragweed's, horseweed (maretail), goldenrods, spiny amaranth, dandelion, wild carrot, ironweed, annual broomweed, biennial thistles**
- **Noxious weeds**
  - **Bull thistle, Canada thistle, Italian thistle, Scotch thistle, buttercup, sulfur cinquefoil, hawkweeds, knapweeds, common tansy, tansy ragwort, poison hemlock, pigweed, hoary cress (whiteweed), houndstongue, common mullein, *Sericea lespedeza***
- **Brush**
  - **Buckbrush, locust (black and honey), blackberry, gorse, hawthorn, poplar, salmonberry, Scotch broom, thimbleberry, dewberry, rose spp., wisteria, tree of heaven and mimosa.**



# Forestry Site Prep - Opensight

- Tank mix with Polaris/Rotary SP
- Will give better control of Canada thistle and many other hard to control weeds
- Use rate 2.5 to 3.3 oz per acre
- Have seen some slight stunting of seedlings
  - Skid trails.....

# Opensight for site prep Labeled by ground or air





# Excellent control when tank mixed with Polaris and Glyphosate





# Opensight





Site prep in North  
Idaho  
Shows skip the  
spring after a  
summer site prep  
spray







**Fall Release 10 MAT**

**Glyphosate 40 oz.**

**Oust XP 1.5 oz.**

**In-Place 11.5 oz.**



# Fall Conifer Release

- Aqua Neat 40 oz.
- Polaris AC 2 oz.
- R-11 1 oz.
  
- 8 MAT





# Fall Conifer Release without glyphosate

- We will have to fine tune the rates- alone or in combinations
- Atrazine
- Oust XP
- Esplanade F
- Transline





# Transline conifer release 16 oz/a over growing conifers





# Spring Conifer Release Mix

- Transline 16 oz.
- In-Place 4 oz.





# Transline Release



# Weed Shifts?

- Prickly lettuce
- Maretail
- Seen 1 to 2 years after chemical site prep
- Seems to be worse where we used SU's? Oust XP.....



# Spring release at early post bud break Transline and Esplanade F







# Good spring annual preemergent control





# Good over the top conifer tolerance







## Site Prep. Mix Without Glyphosate Use July Thru Sept.

Rotary SP 24 oz.

Escort XP 2 dry oz.

Esplanade F 5 oz.

Oust XP 1.5 oz

Crosshair 4 oz.

Syl-Tac 6.4 oz.







**ADJUVANTS**

*NPE Free Oil*

**EFFICAX™**



# EFFICAX™

## What is **EFFICAX**?

Deposition aid for soil-applied chemistry

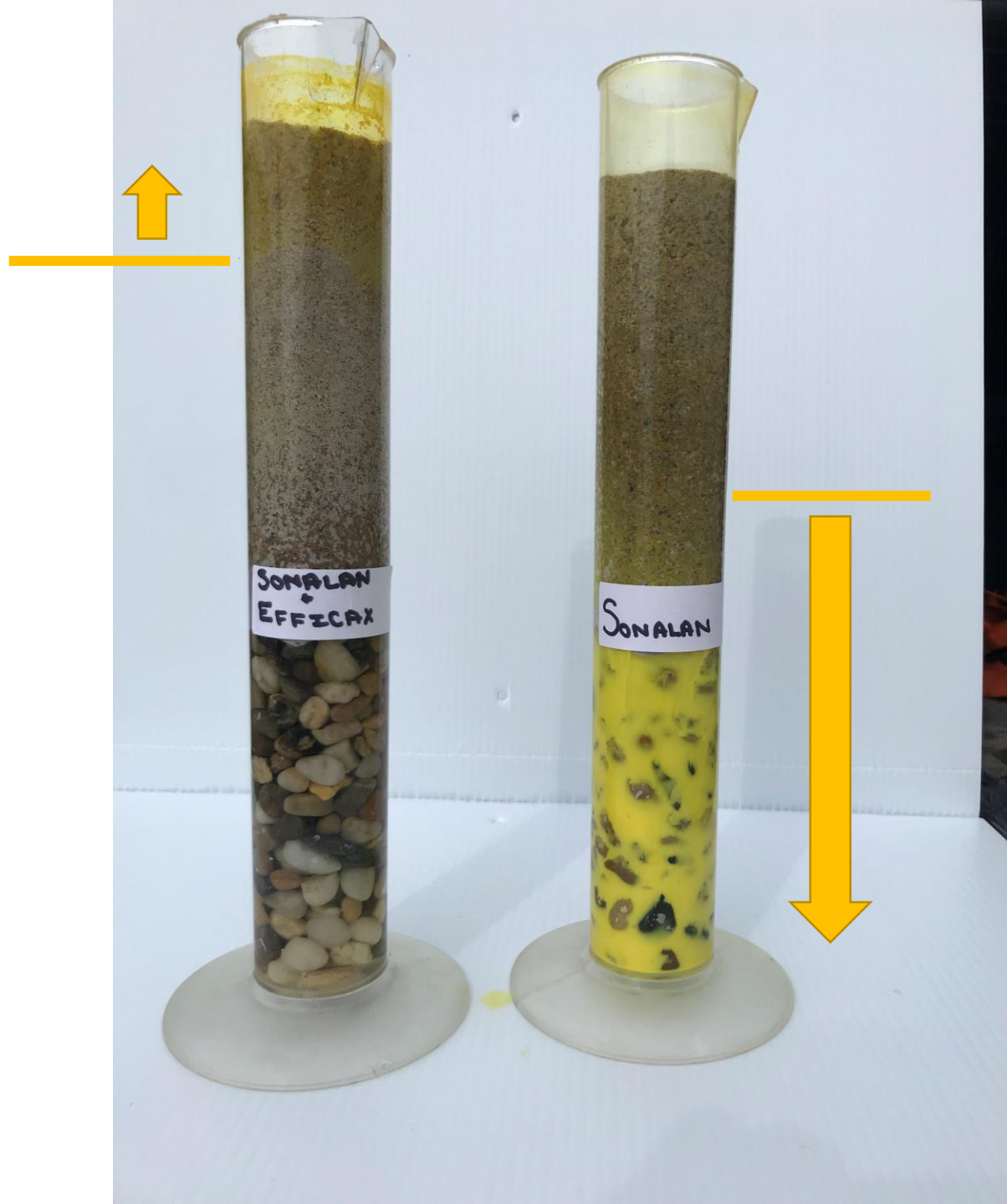
**EFFICAX** is specially formulated for use with most herbicides for soil application to improve deposition and residual of the active ingredient.





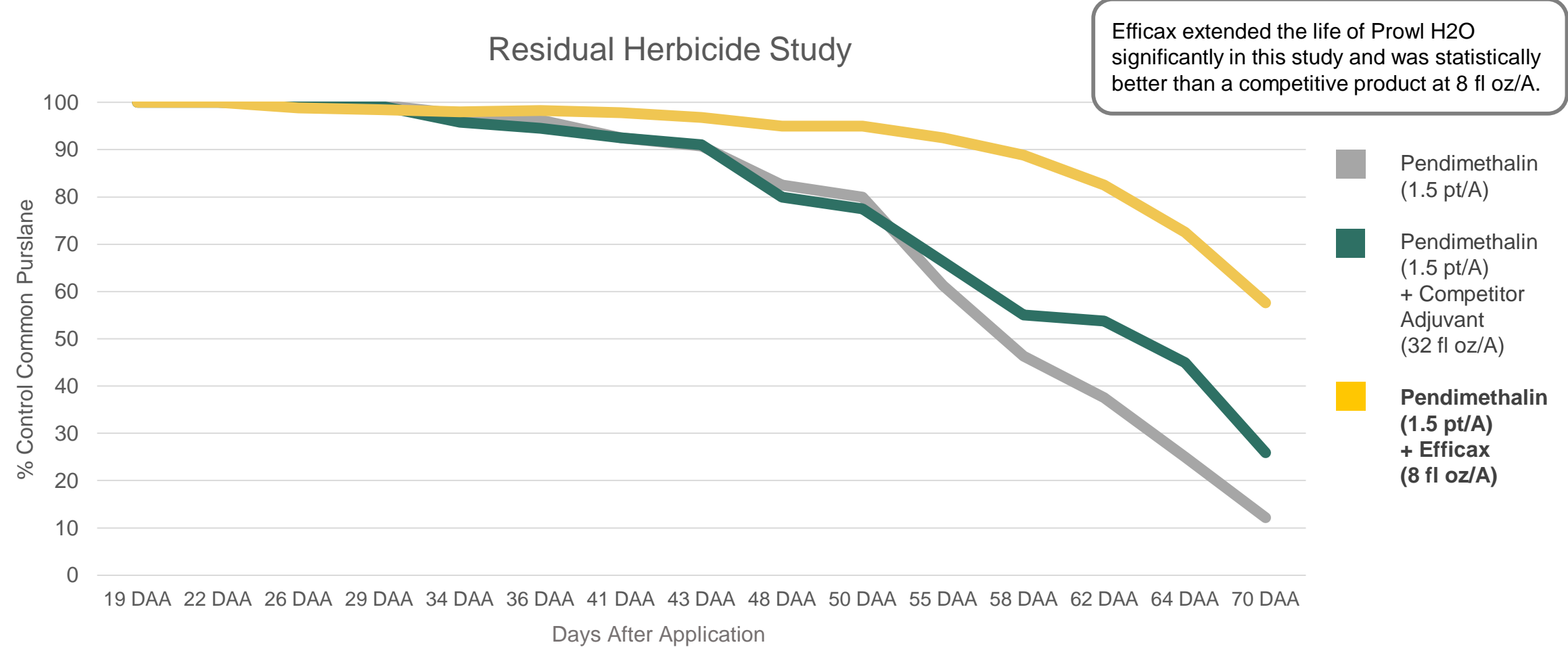
# EFFICAX™    The Science

- Benefits begin with increased deposit of product on target
- Oil component attracts active ingredient
- Enhances absorbance of active ingredient to organic matter
- Similar to a 'controlled release' effect
- Additional benefits may result from the adjuvant effects of the solution, allowing penetration into the soil of the active ingredients





# Comparing Soil Surfactants for Impact on Longevity of Prowl H2O Pre-Emergence Herbicide



# SUMMARY

- Site prep and release without glyphosate is possible
- Be prepared for higher costs
- Be prepared for weed shifts
- Be prepared for resistance issues



A scenic background image of a vast, dense evergreen forest covering rolling hills and mountains. The foreground shows sharp, detailed trees, while the background is hazy and layered, creating a sense of depth.

**Questions?**  
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