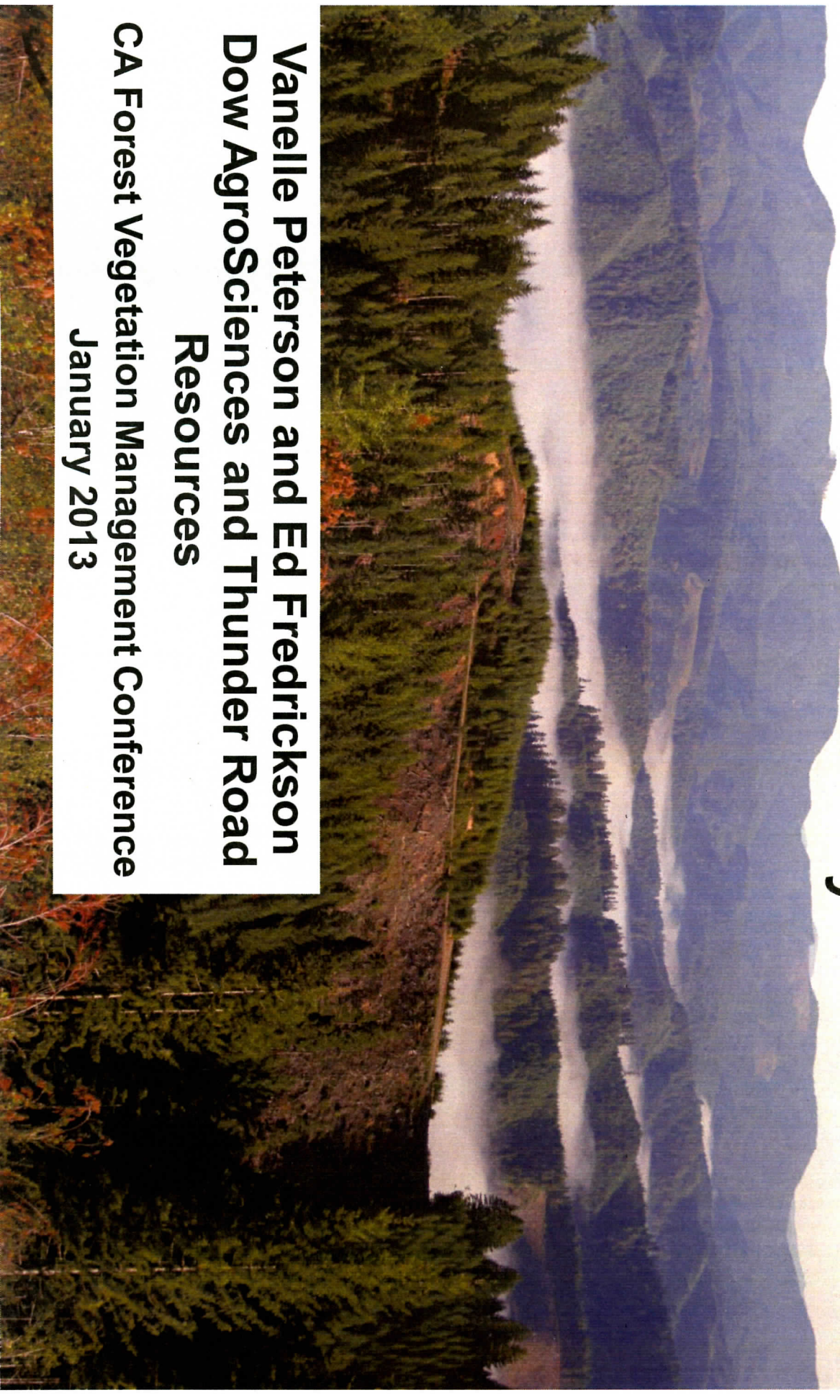


New Site Preparation Chemistry for Forestry

**Vanelle Peterson and Ed Fredrickson
Dow AgroSciences and Thunder Road
Resources**

**CA Forest Vegetation Management Conference
January 2013**



Agenda

- Review of aminopyralid products for forestry
- Brief review of aminopyralid research in forestry
- Introduction of potential new products for forestry site prep
- Review of research on these products



Forestry Uses for Products Containing Aminopyralid



- Milestone (aminopyralid)
 - state SLN labels for site prep, directed spray for release, cut surface
 - AL, GA, MS, MN, NC, SC, TX, VA
 - and soon in CA
 - Milestone SLN for forestry in CA comes off the final 30 day posting on January 26, 2013
 - state SLN labels for longleaf pine plantations
 - AL, GA, LA, NC, SC, TX, VA



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Forestry Uses for Products Containing Aminopyralid

- Capstone[®] (aminopyralid + triclopyr)
 - federal label for site prep, directed spray for release and cut surface
 - all states except NY
- Opensight[®] (aminopyralid + metsulfuron)
 - state SLN labels for site prep, directed spray for release
 - ID, OR and WA



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Public Agencies And Milestone®

National Environmental Policy Act (NEPA)

- Agencies that have approved Milestone

- US Forest Service



- <http://www.fs.fed.us/foresthhealth/pesticide/risk.shtm>,

- US Fish & Wildlife



- National Park Service



- Department of Defense

- State Fish and Game/Wildlife Departments

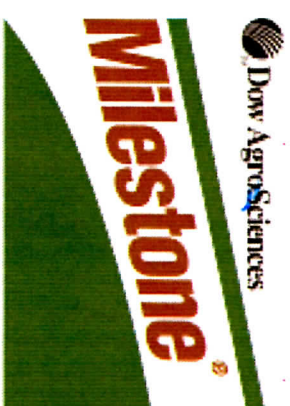


- Bureau of Land Management (BLM)



- In process: Risk Assessments on aminopyralid, fluroxypyr, 2,4-D, clopyralid, and rimsulfuron
- DRAFT EIS is available for public comment by Feb 19, 2013

Milestone®



- Aminopyralid
 - 2 lb ae/gal, SC liquid formulation
 - Auxinic (growth regulator) herbicide
 - Systemic
 - Absorbed by leaves and roots
 - **Pre and post emergent activity** on broadleaf weeds and pre emergent activity on medusahead
 - **NOT** a “restricted use” pesticide
 - Aminopyralid accepted as EPA **reduced risk pesticide**
- Can be applied to “seasonally dry wetlands” and applications can be made up to the waters edge



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Milestone®



• Aminopyralid

Completed additional studies in
aquatic sites and
Submitted to EPA for an aquatic
registration in October 2011

- Aminopyralid accepted as EPA **reduced risk pesticide**
- Can be applied to "seasonally dry wetlands" and applications can be made up to the waters edge



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Doing the “homework” on aminopyralid

- 2004 through 2012 research in forestry
 - Effects on key conifers when applied
 - broadcast over-the-top
 - around trees in the understory
 - at various rates
 - at various growth stages (timing of application)
 - combinations with Transline (clopyralid)
- What do the studies show?



Research Information

Species screened

Douglas-fir, <i>Pseudotsuga menziesii</i>	Slash pine, <i>P. elliotii</i>
Ponderosa pine, <i>Pinus ponderosa</i>	Loblolly pine, <i>P. taeda</i>
Lodgepole pine, <i>P. contorta</i>	Short-leaf pine, <i>P. echinata</i>
Grand fir, <i>Abies grandis</i>	Virginia Pine, <i>P. virginiana</i>
Noble fir, <i>Abies procera</i>	
Western hemlock, <i>Tsuga heterophylla</i>	
Western larch, <i>Larix occidentalis</i>	



Research Information

Trial Methods

- Small plot replicated research trials
- CO₂ backpack applications at 10-15 GPA
- Conifer tolerance treatment list included the field use rate and a **2X maximum label rate**
- Conifer injury evaluations taken at least 12 to 15 months after application
- Application timings
 - Broadcast over the top, late winter or fall dormant
 - Directed spray includes broadcast in understory



Ponderosa Pine after Milestone® at 5 fl oz/A broadcast
over the top at candle elongation
photo at 1 year after treatment

Milestone is registered for *site prep and directed spray* – it is NOT registered for broadcast, over-the-top applications



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Broadcast, understory applications and directed spray

- Results from broadcast understory or directed spray applications showed
 - Douglas-fir and Ponderosa pine were tolerant
 - There were few symptoms in the season of application at the 2X maximum label rate
 - Trees outgrew those symptoms in the year after treatment – no long term effects
 - In Idaho, optimal rate under Ponderosa pine was 3 oz/A Milestone® (vs. 7 oz/A)



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Douglas-fir buds after Milestone® at 2X maximum label rate applied broadcast in understory

Only a few trees and *only at this rate* showed this response

Terminal bud at end of season of treatment abnormal (swollen and hollow/empty)

Untreated bud hardened off normally



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Douglas-fir at 1 year after treatment with Milestone[®] at 2X
maximum label rate applied broadcast in the understory



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Ponderosa pine & Douglas-fir tolerance trials in CA

Applications in late April 2009 over the top compared to under the tree canopy

- 1) Douglas-fir
 - Trees with buds swelling
 - Buds broke 3 days after application
- 2) Ponderosa pine
 - 3 yr old trees
- 3) Ponderosa pine
 - 5 yr old trees



Ponderosa pine & Douglas-fir tolerance trials in CA

Trt	Name	Rate
1	MILESTONE® NONIONIC SURFACTANT	3 fl oz pr/a 0.25 % v/v
2	MILESTONE NONIONIC SURFACTANT	6 fl oz pr/a 0.25 % v/v
3	TRANSLINE® NONIONIC SURFACTANT	18.4 fl oz pr/a 0.25 % v/v
4	MILESTONE TRANSLINE NONIONIC SURFACTANT	3 fl oz pr/a 9.2 fl oz pr/a 0.25 % v/v
5	MILESTONE TRANSLINE NONIONIC SURFACTANT	6 fl oz pr/a 18.4 fl oz pr/a 0.25 % v/v
6	MILESTONE TRANSLINE NONIONIC SURFACTANT	3 fl oz pr/a 9.2 fl oz pr/a 0.25 % v/v
7	UNTREATED	

• Trts 1-5
over trees

• Trt 6 under
trees



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Ponderosa Pine Tolerance Studies with Milestone® in CA

3 yr old trees



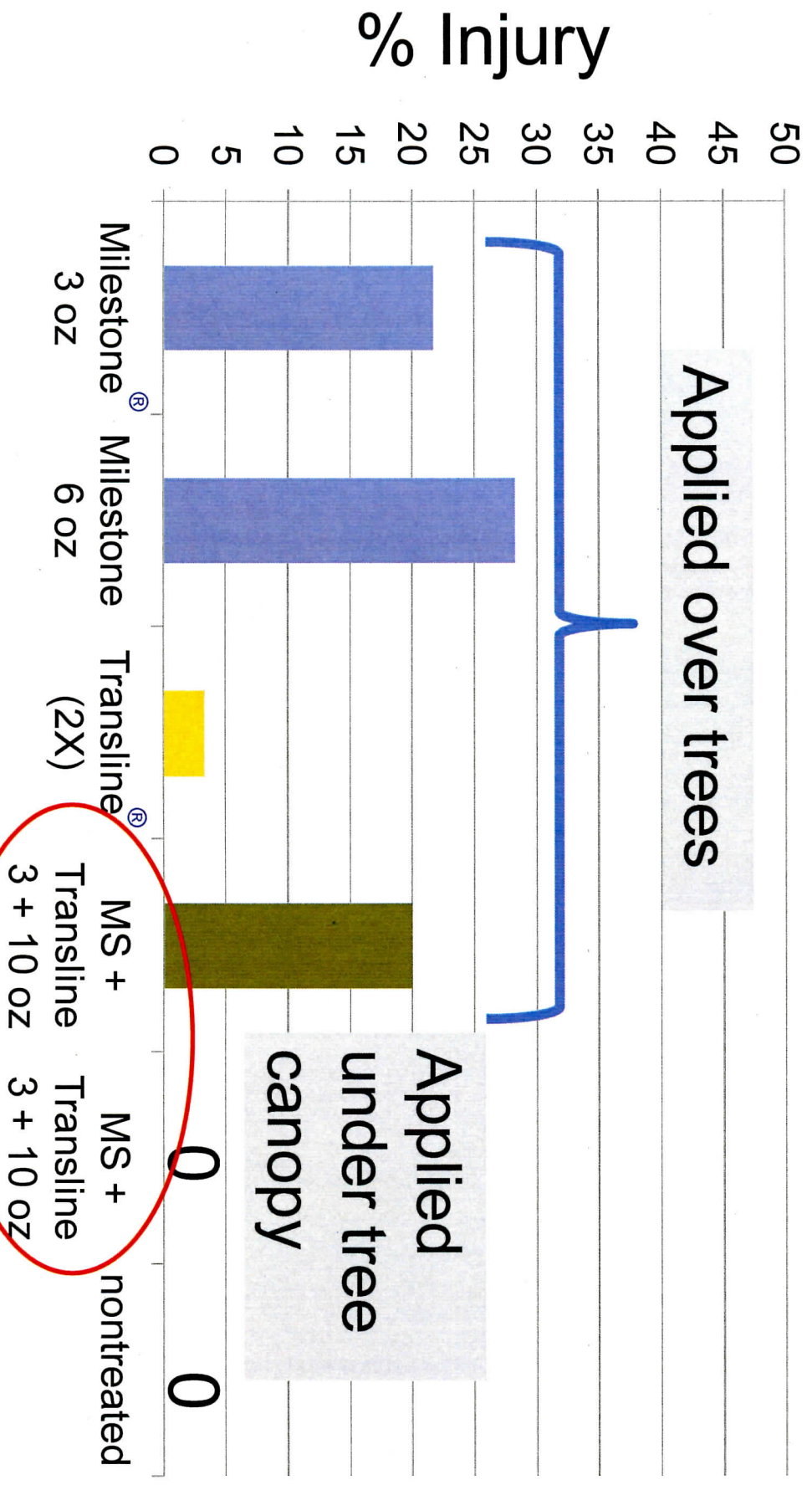
5 yr old trees



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% Injury of Douglas-fir at 15 Months After Spring Applications



Applied over trees

Applied under tree canopy

MS + Transline 3 + 10 oz

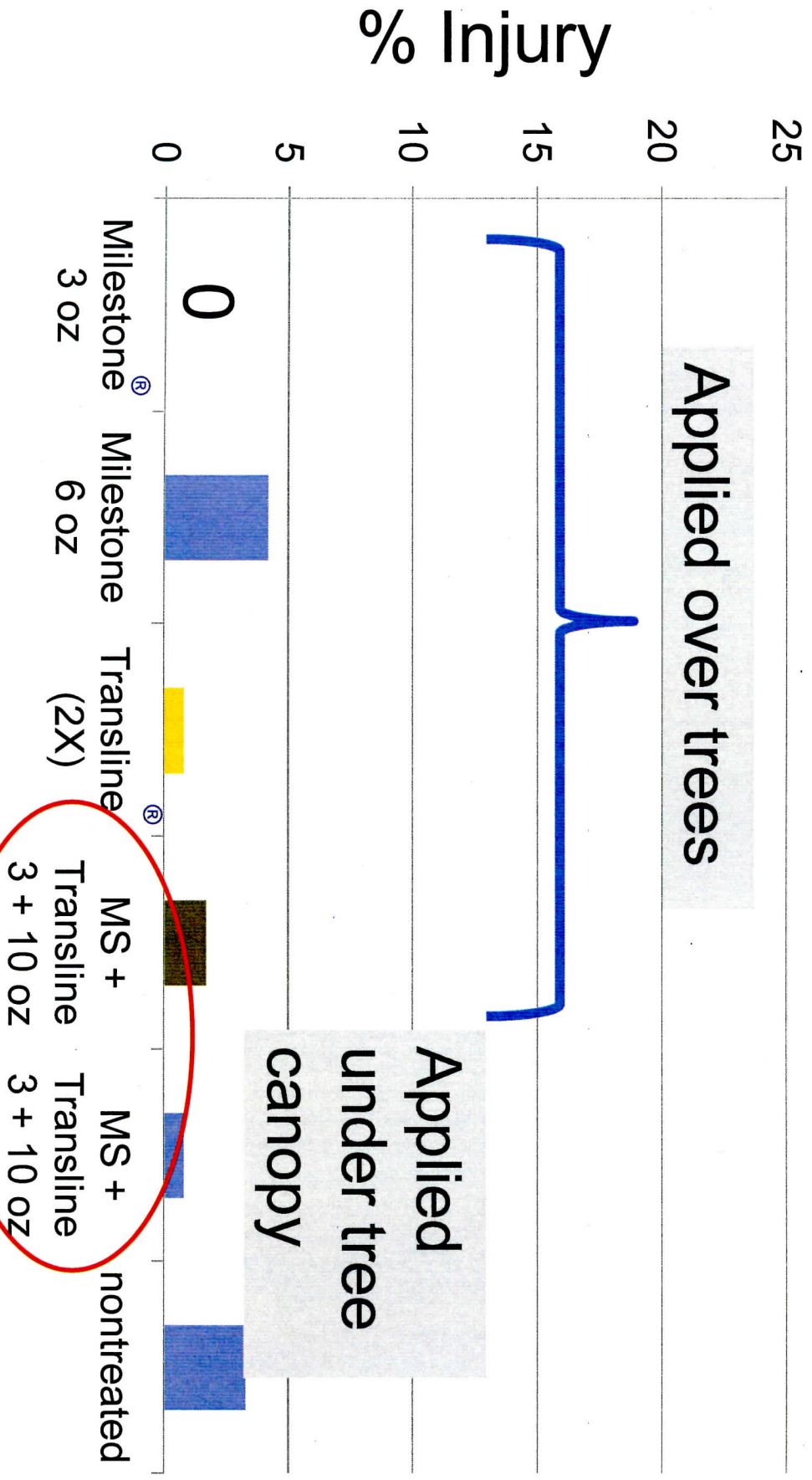
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Douglas-fir Tolerance to Milestone[®] + Transline[®]
(3 + 10 oz/A) at 500 days after application
over the top under tree




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% Injury of Ponderosa Pine at 15 Months After Spring Applications



Combined 2 sites: 3 and 5 yr old trees

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Milestone[®] at 3 fl oz/A
broadcast over the top
499 days after
application

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Milestone® in Site Preparation

- Objective:
- To understand the tolerance of commercial conifer species used in CA forestry spring or fall site preparation
- Trials were conducted for the Sierra Cascade Intensive Forest Management Cooperative and the Forest Stewardship Council (FSC) Research Group

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Milestone® in Site Preparation

- Dates and Locations for trials
 - Fall (October 6, 2010) = Dana
 - Spring (March 11, 2011) = Dunsmuir
- 10 GPA, 4 replications, 12 X 36 ft plots
- Conifers planted on April 8, 2011
 - 10 trees per species per plot (total 40 trees per treatment)
 - Ponderosa pine (styro 6)
 - Douglas-fir (styro 8)
- Evaluations in August 2011
 - Conifer injury (foliage and bud injury)
 - Weed control (percent cover by species)

Treatments for Site Prep Trials

Trt #	Treatment	Rate (per acre)	Timing
1	MILESTONE®	4 fl oz	fall
2	MILESTONE	7 fl oz	fall
3	MILESTONE	14 fl oz	fall
4	MILESTONE	7 fl oz	fall
	VELPAR DF	1.3 lb	
5	VELPAR DF	3.3 lb	fall
6	UNTREATED		fall
7	MILESTONE	4 fl oz	spring
8	MILESTONE	7 fl oz	spring
9	MILESTONE	14 fl oz	spring
10	MILESTONE	7 fl oz	spring
	VELPAR DF	1.3 lb	
11	VELPAR DF	3.3 lb	spring
12	UNTREATED		spring

Planted (08Apr11):

- 6 months after fall application
- 1 month after spring application

Conifer Tolerance

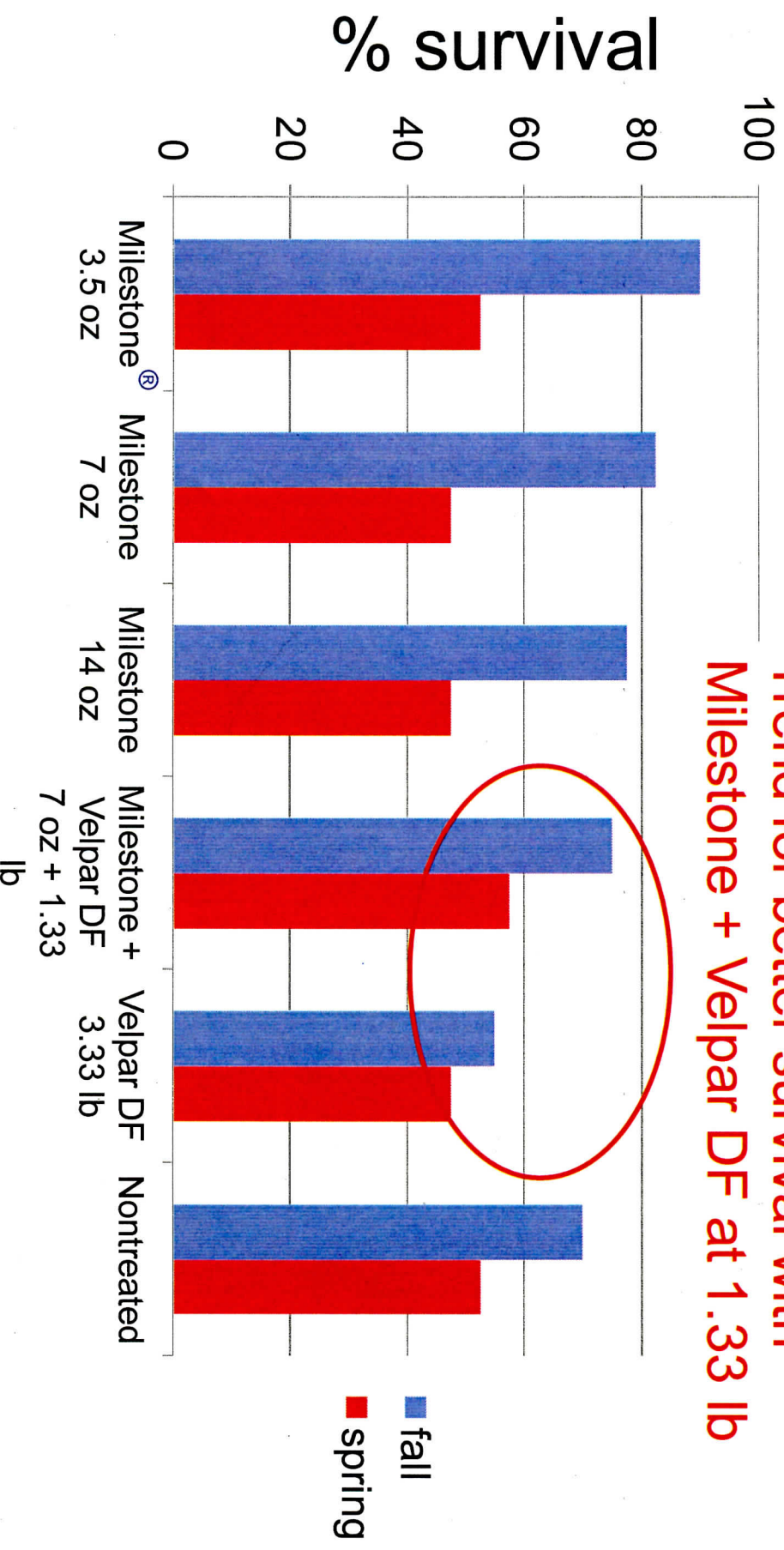
Evaluations made Aug 2011 and Aug 2012

- 2011 Ponderosa pine and Douglas-fir
 - There was no injury for any herbicide including Milestone® at 14 fl oz (2X the max label rate)
- 2012 Ponderosa pine
 - Excellent survival, no differences between treatments
 - Velpar DF at 3.33 lb and
 - Milestone + Velpar DF at 7 oz + 1.33 lb
 - Showed the same increased caliper, height and stem volume from spring treatments
 - fall applications showed no differences
- 2012 Douglas-fir (next slide)

Douglas-fir % Survival with Fall and Spring Site Prep Applications of Herbicides

17 (spring) or 22 (fall) months after application

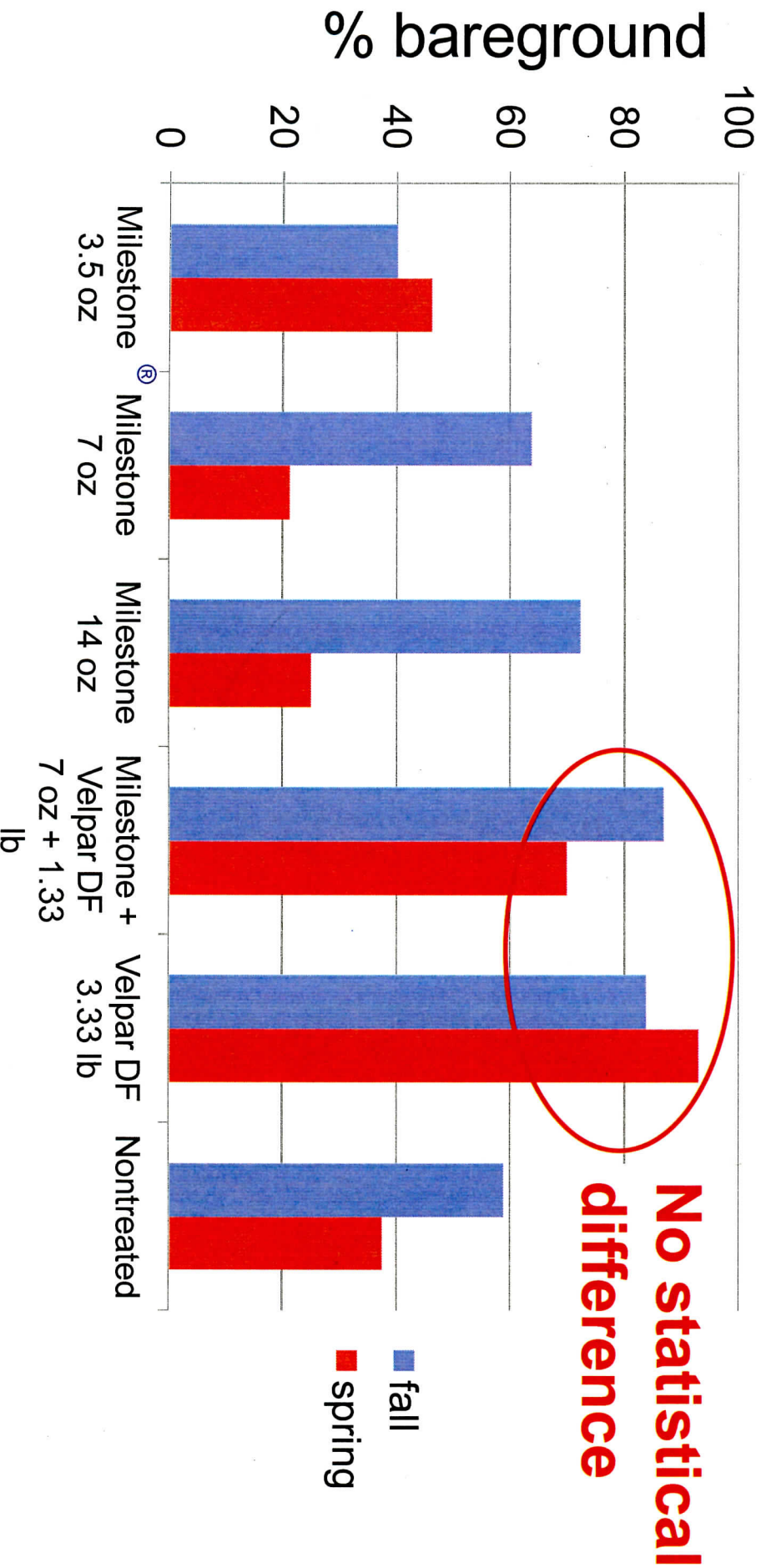
Trend for better survival with Milestone + Velpar DF at 1.33 lb



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% Bareground with Fall and Spring Site Prep Applications of Herbicides

17 (spring) or 22 (fall) months after application



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Conclusions

At 2 seasons after applications

- Ponderosa pine and Douglas-fir
 - can be planted at 1 to 6 months after fall or spring site preparation applications of Milestone
- Milestone® at 7 oz + Velpar DF at 1.33 lb/A applied in fall or spring
 - Gave weed control equal to Velpar DF at 3.33 lb/A
 - May improve conifer tolerance over Velpar DF at 3.33 lb/A

Milestone® herbicide

Guidelines for Use Around Woody Plants

Can I use Milestone® herbicide for weed control under trees?

Aminopyralid, the active ingredient in Milestone herbicide, has limited activity on woody species, including trees, when applied to the soil under the canopy. While it would be unlikely for broadcast applications of labeled rates to actually kill a mature tree (except legume species), there could be some leaf curling/cupping or other damage typical of growth regulator herbicides. Therefore, Milestone should **NOT** be used over the top of desirable trees. Milestone can be used **ONLY** as a directed spray under the canopy, or within the dripline, of certain trees, but not under desirable legume trees/shrubs.

Milestone CAN BE USED as an under-canopy soil application for the following trees:

Common name	Scientific name	Common name	Scientific name
alder	<i>Alnus rubrus</i>	maple	<i>Acer spp.</i>
ash	<i>Fraxinus spp.</i>	oaks	<i>Quercus spp.</i>
aspen	<i>Populus spp.</i>	poplar	<i>Populus spp.</i>
black cherry	<i>Prunus serotina</i>	southern yellow pine	<i>Pinus spp. (southern)</i>
cottonwood	<i>Populus spp.</i>	sweetgum	<i>Liquidambar styraciflua</i>
dogwood	<i>Cornus spp.</i>	sycamore	<i>Platanus occidentalis</i>
eastern red cedar	<i>Juniperus virginiana</i>	western white pine	<i>Pinus monticola</i>
eastern white pine	<i>Pinus strobus</i>	willow	<i>Salix spp.</i>
elm	<i>Ulmus spp.</i>	yellow poplar (transient leaf curling)	<i>Liriodendron tulipifera</i>

Caution is suggested for use of Milestone herbicide around these species.

Applications may be made to weeds and soil outside of the dripline, with wider margins of avoidance suggested on downward facing slopes immediately above sensitive trees. Be sure not to treat low hanging foliage and exposed roots.

Common name	Scientific name	Common name	Scientific name
birch	<i>Betula spp.</i>	hackberry	<i>Celtis spp.</i>
cherry (except black cherry)	<i>Malus spp.</i>	japanese elm	<i>Zelkova serrata</i>
Chinese elm	<i>Ulmus parviflora</i>	lodgepole pine	<i>Pinus contorta</i>
crabapple	<i>Prunus</i>	ponderosa pine	<i>Pinus ponderosa</i>
Douglas fir	<i>Pseudotsuga menziesii</i>	Virginia pine	<i>Pinus virginiana</i>
fir	<i>Tsuga spp.</i>		

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Milestone®

Specialty Herbicide

Product of Dow AgroSciences, U.S.

CAUTION: Milestone® herbicide can cause injury or death to desirable vegetation. Users are advised not to apply Milestone over the top of desirable trees or in the root zone of susceptible species where injury cannot be tolerated, especially at the 14 lb oz spot treatment.

Supplemental Labeling



Dow AgroSciences

Dow AgroSciences LLC 9330 Zionsville Road Indianapolis, IN 46268-1054 USA

Milestone[®]
EPA Reg. No. 62719-5-19

24(c) Special Local Need Registration SLN CA-XXXXX

For Control Of Herbaceous Broadleaf Weeds And Woody Plants In Forests And Grazed Areas In And Around These Sites

(For Distribution and Use Only in the State of CA)

Minimum interval of 2 months between application and planting

- ATTENTION**
- It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
 - This labeling must be in the possession of the user at the time of application.
 - Read this SLN labeling and the label affixed to the container for Milestone[®] herbicide before applying. All applicable use directions, precautions and restrictions on this SLN labeling and the label affixed to the product container must be followed.

Directions for Use

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about Personal Protective Equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 48 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves made of any waterproof material as polyethylene or polyvinyl chloride
- Shoes plus socks

Forests and Non-Crop Areas

Milestone[®] specially herbicide may be applied to forests and non-crop areas as an aerial or ground broadcast application, as a spot application, or as a high volume foliar application (see Application Methods section) to control herbaceous broadleaf weeds and woody plants. Avoid spray containing Milestone from coming in contact with foliage of desirable tree species. Milestone may be applied alone or in tank-mix combinations with labeled rates of other herbicides provided: (1) the tank mix product is labeled for the timing and method of application for the use site to be treated and (2) mixing is not

Products in New Research Trials

- **GoalTender®**

- Oxyfluorfen, 4 lb ai/gallon SC
- Preemergent and early post emergent weed control



- Registered for use on conifer seedbeds, transplants, container stock and Christmas trees

- Also on cottonwood, eucalyptus, tree fruits, nuts and vines and other crops

- **Pindar® GT**

- Oxyfluorfen + *penoxsulam*, 3.93 + 0.083 lb ai/gallon, SC
- Preemergent and early post emergent weed control
- Registered for use on noncropland and on nuts



- **Dimension® 2EW**

- Dithiopyr, 2 lb ai/gallon, EW
- Preemergent and early post emergent weed control
- Registered for use on noncropland, turf, ornamental plants,



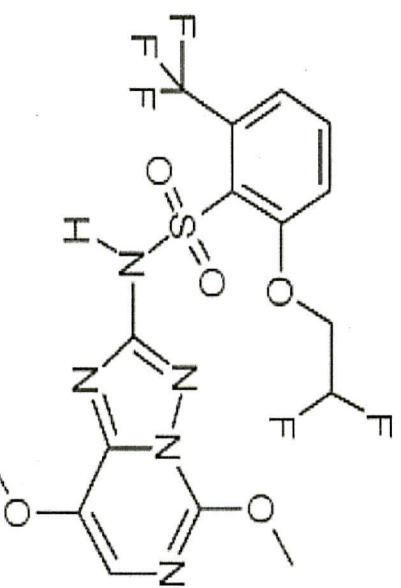
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What is Pindar GT?

- **A premix of:**
 - **Penoxsulam:** *A new ALS active ingredient with broad spectrum weed control for tree nut crops.*
 - **Oxyfluorfen:** *a long time agricultural standard for broad spectrum residual and contact weed control.*
- **SC Formulation containing:**
 - **Penoxsulam:** 0.083 lb/gallon.
 - **Oxyfluorfen:** 3.96 lb/gallon.



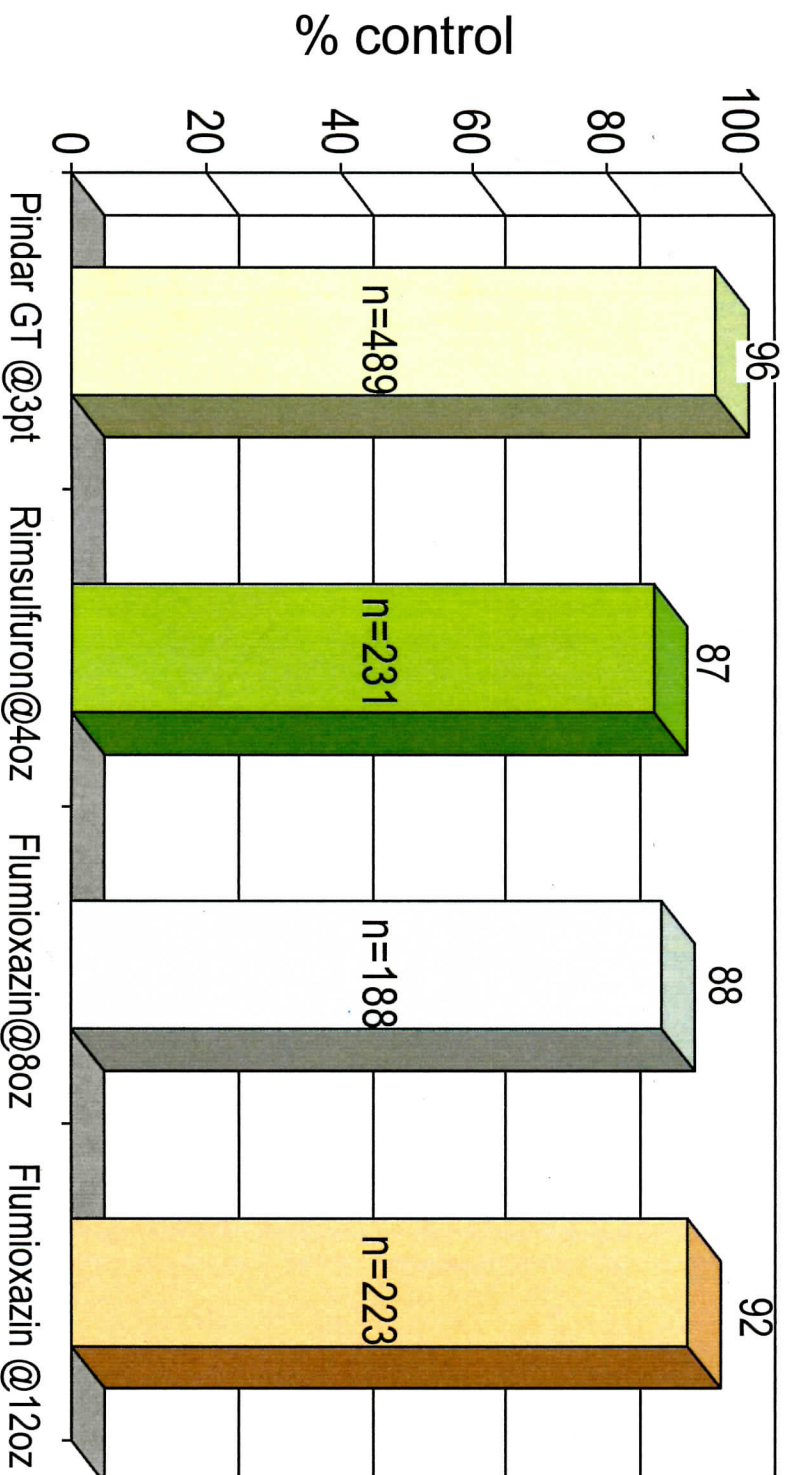
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Pindar® GT – Control across all broadleaf weeds

What are results from fall applications in CA after 6 months?

Summary includes over 100 efficacy trials from 2004-2009

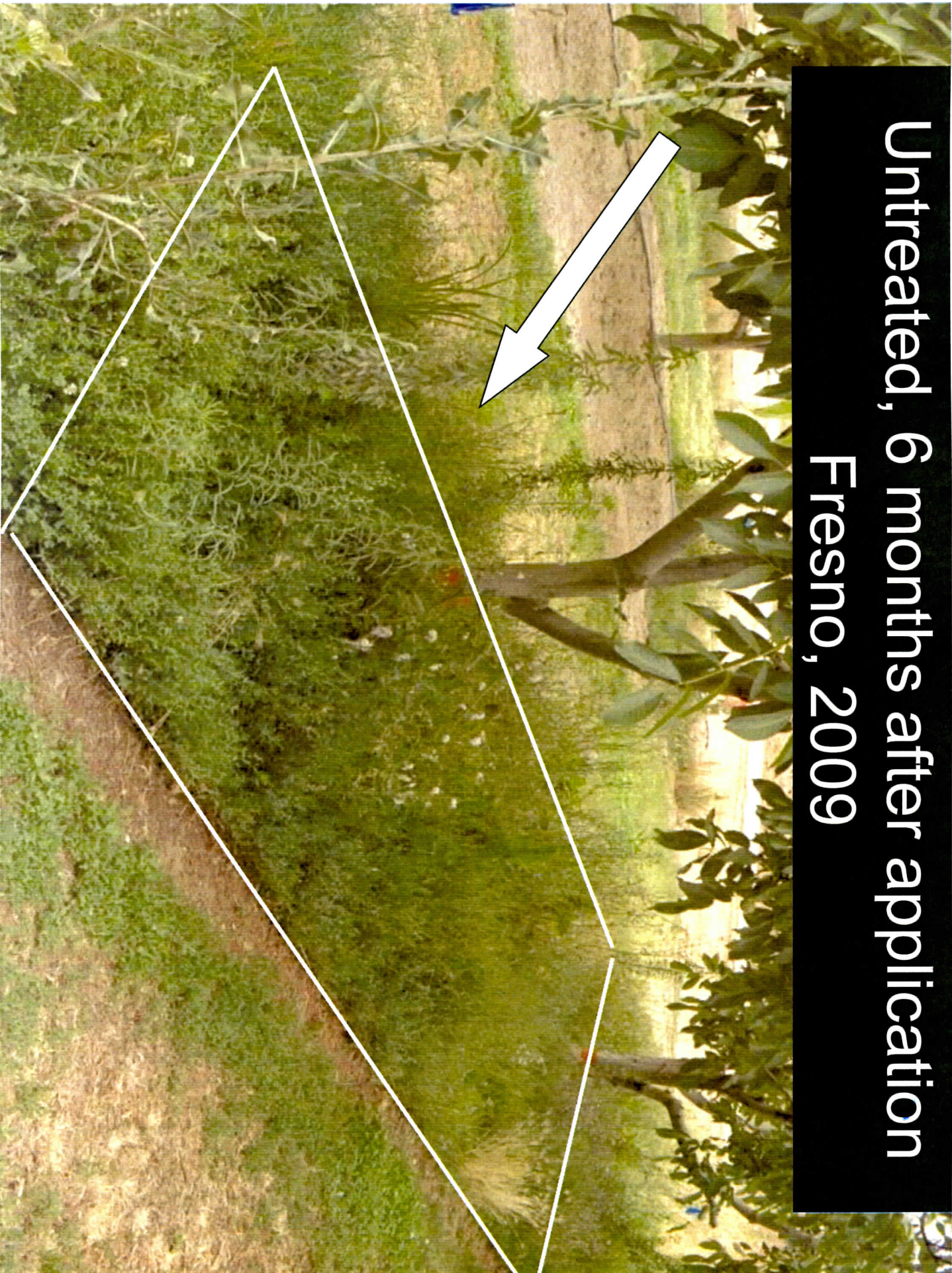


* n=number of obsvs.

**All treatments included Glyphosate 3pts

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Untreated, 6 months after application
Fresno, 2009



Pindar® GT @ 3pt, 6 months after 1 application Fresno, 2009



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Pindar® GT - Benefits

- **Broad Spectrum Weed Control**, over 65+ species in pre and post emergent, including glyphosate resistant species
- **Burndown and Residual Control**, up to 6 months after the application at the 3 pt/ac rate.
- **Tank mix compatibility**, can be tankmixed with other tree nut herbicides with no compatibility issues.
- **Crop Safety**, excellent safety to bearing and non-bearing tree nuts
- **Outstanding environmental and toxicological profile**, low toxicity to bees, parasitic wasps, lacewings, predatory mites, etc.

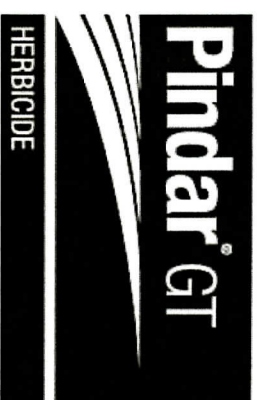


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Trials with Potential New Products for Site Prep



- Pindar® GT and GoalTender®
 - Fall and spring applications for site prep
 - Conifer tolerance and weed control
- Fall:
 - Sprayed October 20, 2011
 - Planted March 24, 2012 (about 150 DAT/5 MAT) Redding
 - New site sprayed fall 2012, not yet planted
 - Conifer tolerance with destruction sampling for root analysis
- Spring:
 - Sprayed April 4, 2012
 - Planted April 20, 2012 (16 DAT) Burney
 - New site planned for spring 2013
 - Conifer tolerance with destruction sampling for root analysis



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Site Preparation Trials

1. Milestone[®] + Pindar[®] GT + Accord[®] XRT II 7 oz + 3 pt + 2 pt
2. Milestone + GoalTender[®] + Accord XRT II 7 oz + 4 pt + 2 pt
3. Milestone + Dimension[®] EC + Acc XRT II 3 pt + 2 pt
4. Pindar GT + Accord XRT II 3 pt + 2 pt
5. GoalTender + Accord XRT II 4 pt + 2 pt
6. Dimension EC + Accord XRT II 3 pt + 2 lb + 2 pt
7. Pindar GT + Velpar DF + Accord XRT II
8. nontreated

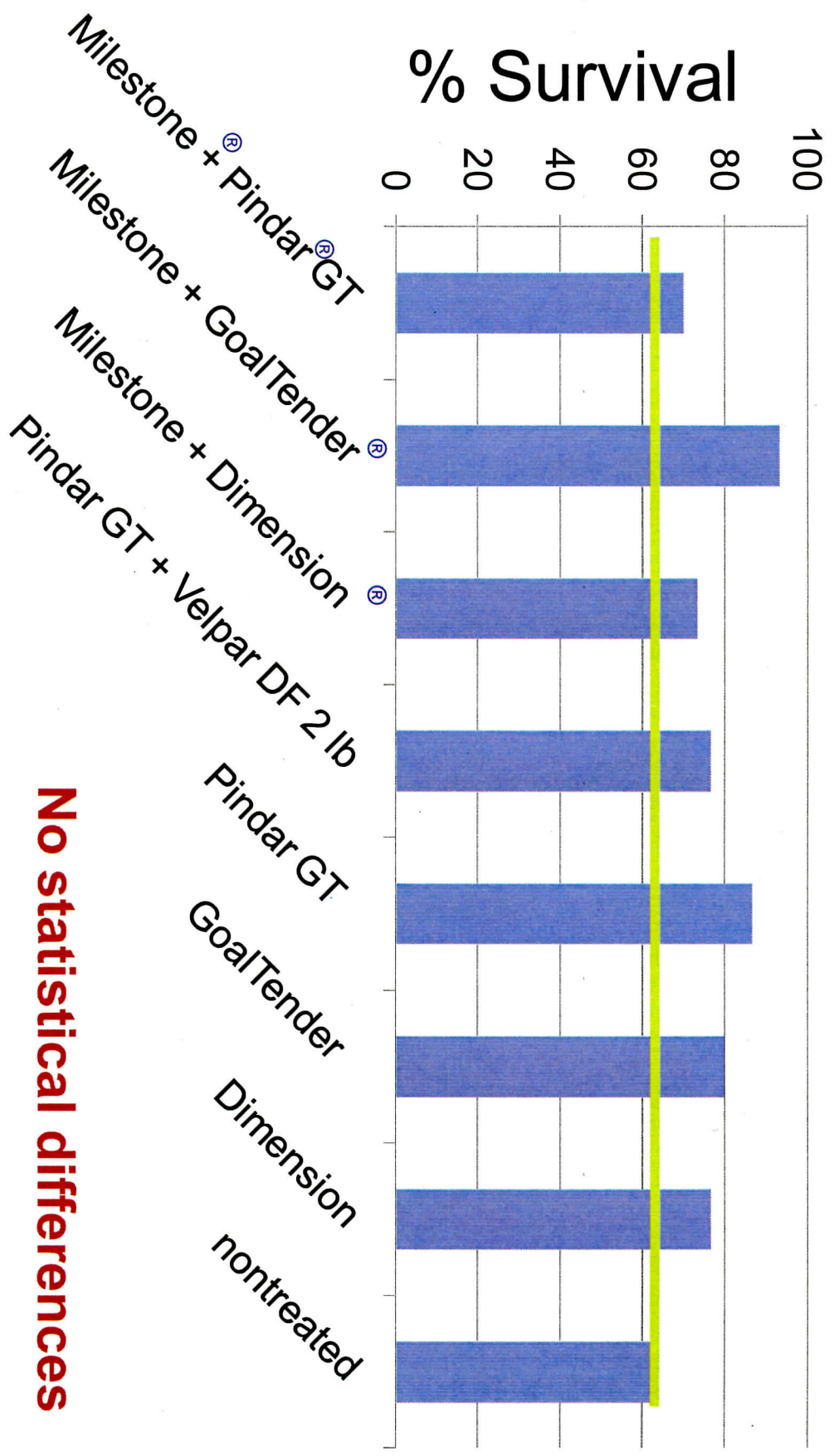
Application: October 20, 2011 and April 4, 2012
10 GPA



Dow AgroSciences

**FALL SITE PREP CONIFER
TOLERANCE**

% Survival of Douglas-fir at 1 Year After Fall Site Prep

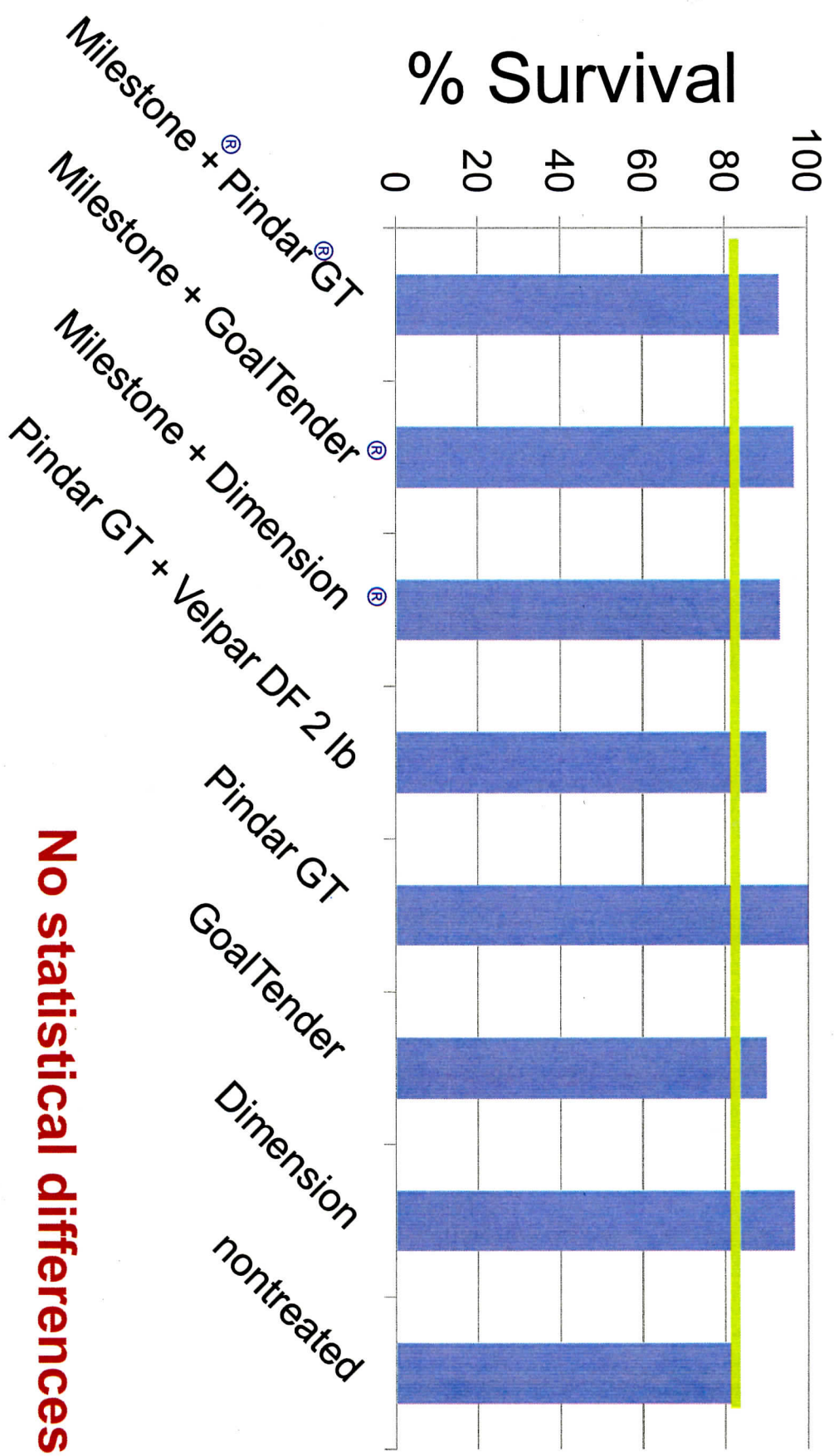


No statistical differences

About 5 months between treatment and planting

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% Survival of Sugar Pine at 1 Year After **F**all Site Prep

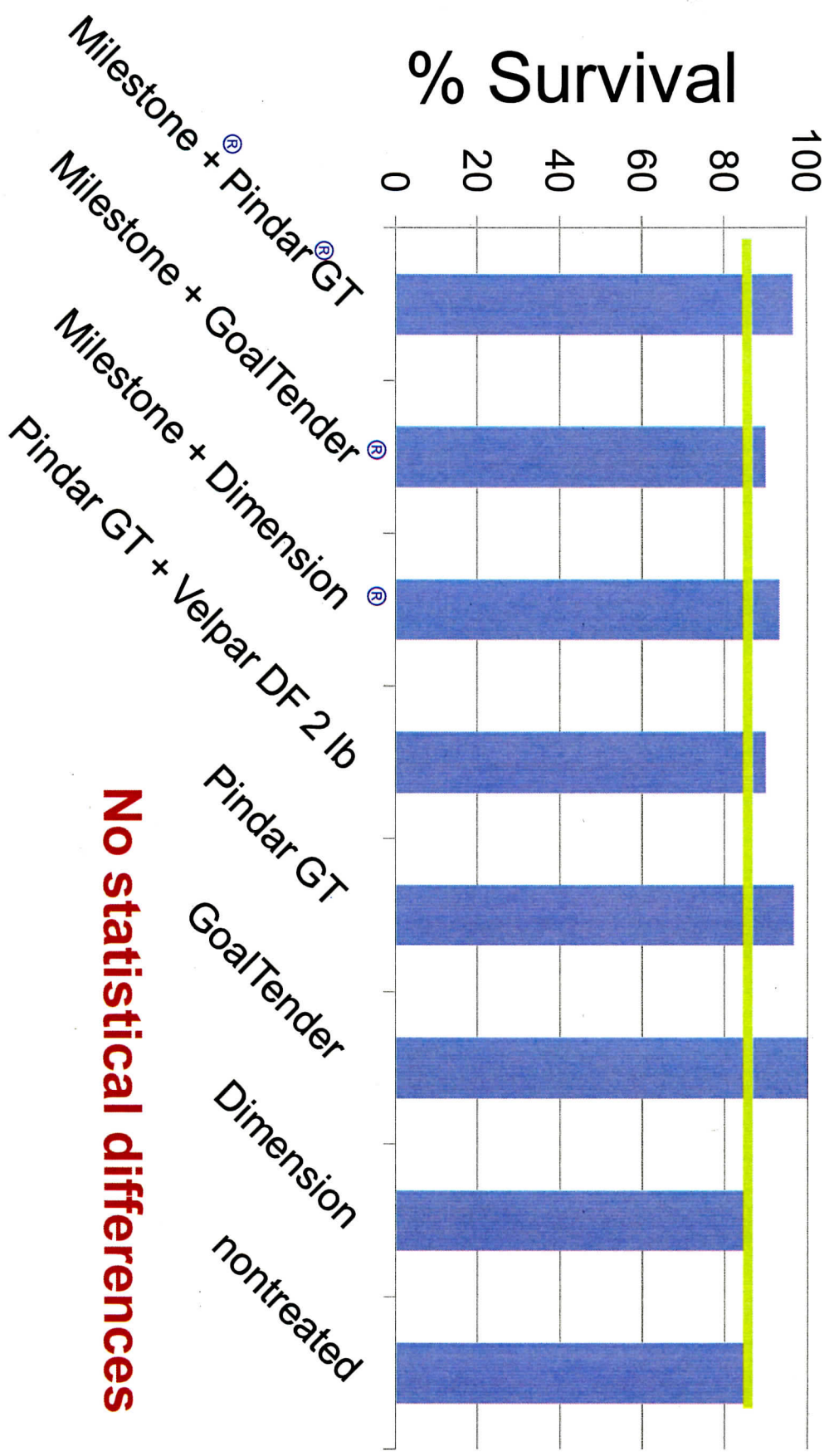


No statistical differences

About 5 months between treatment and planting

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% Survival of White Fir at 1 Year After Fall Site Prep



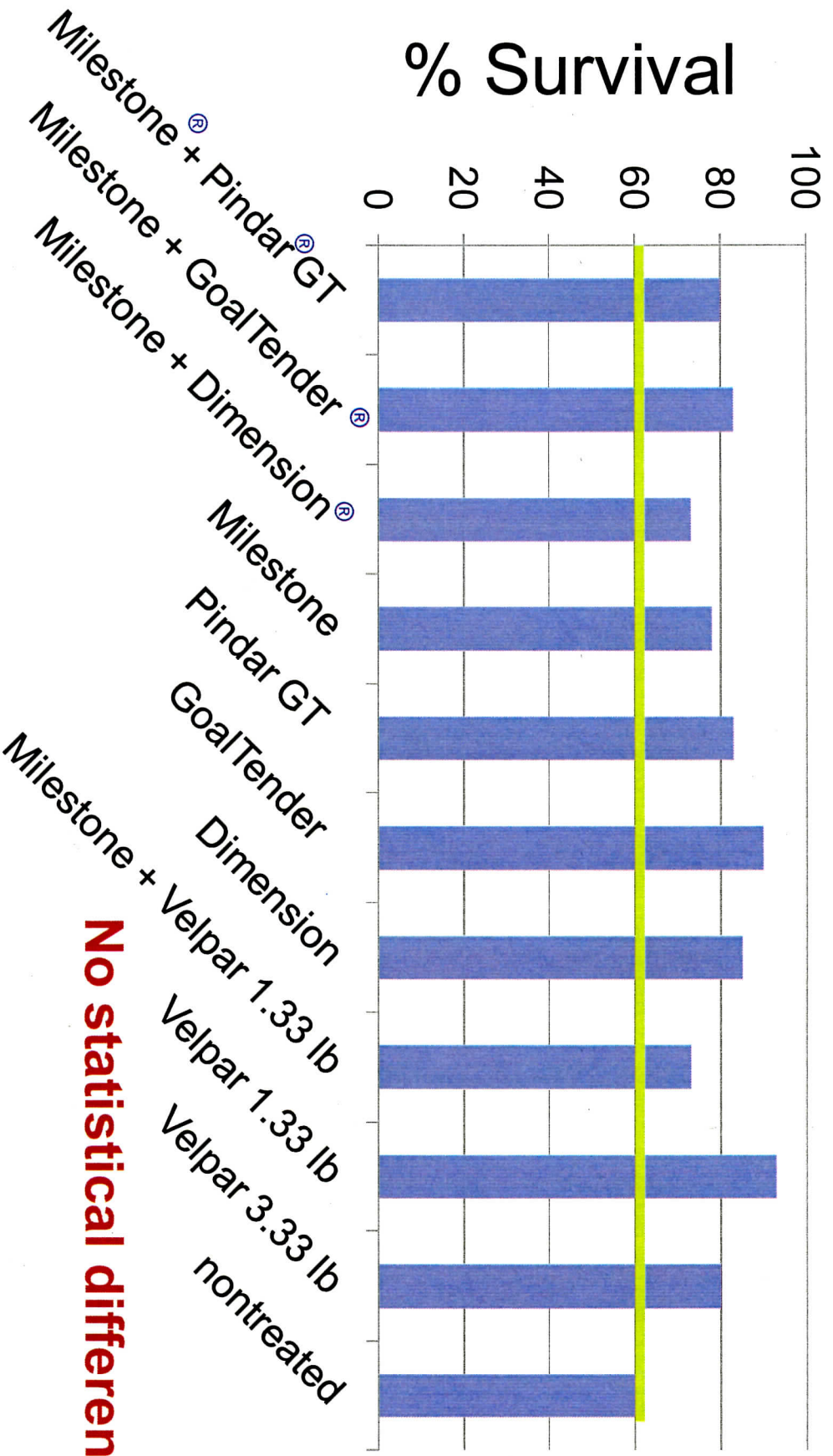
No statistical differences

About 5 months between treatment and planting

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SPRING SITE PREP CONIFER TOLERANCE

% Survival of Douglas-fir at 1 Year After Spring Site Prep

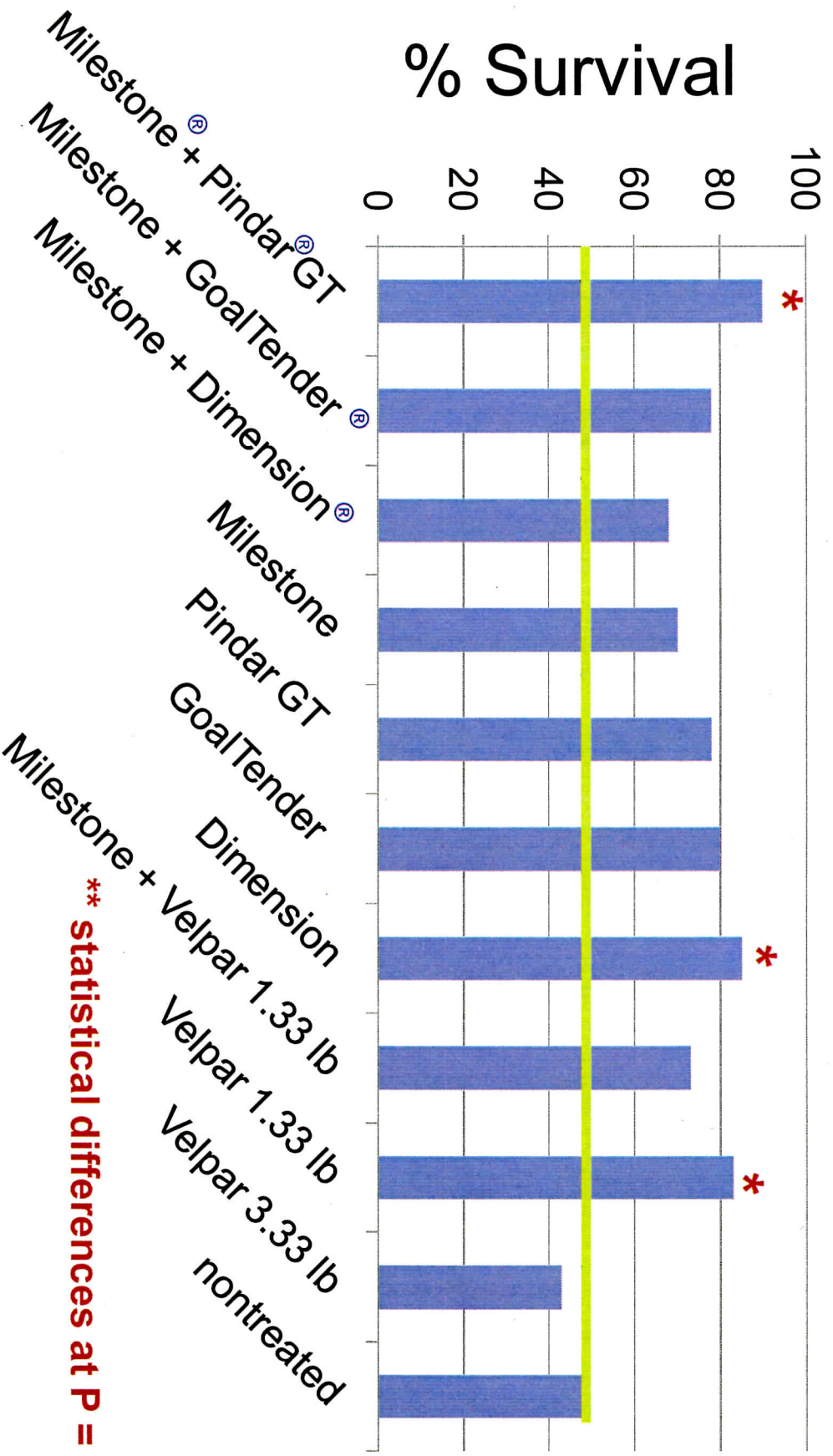


No statistical differences

About 16 days between treatment and planting

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% Survival of White fir at 1 Year After Spring Site Prep



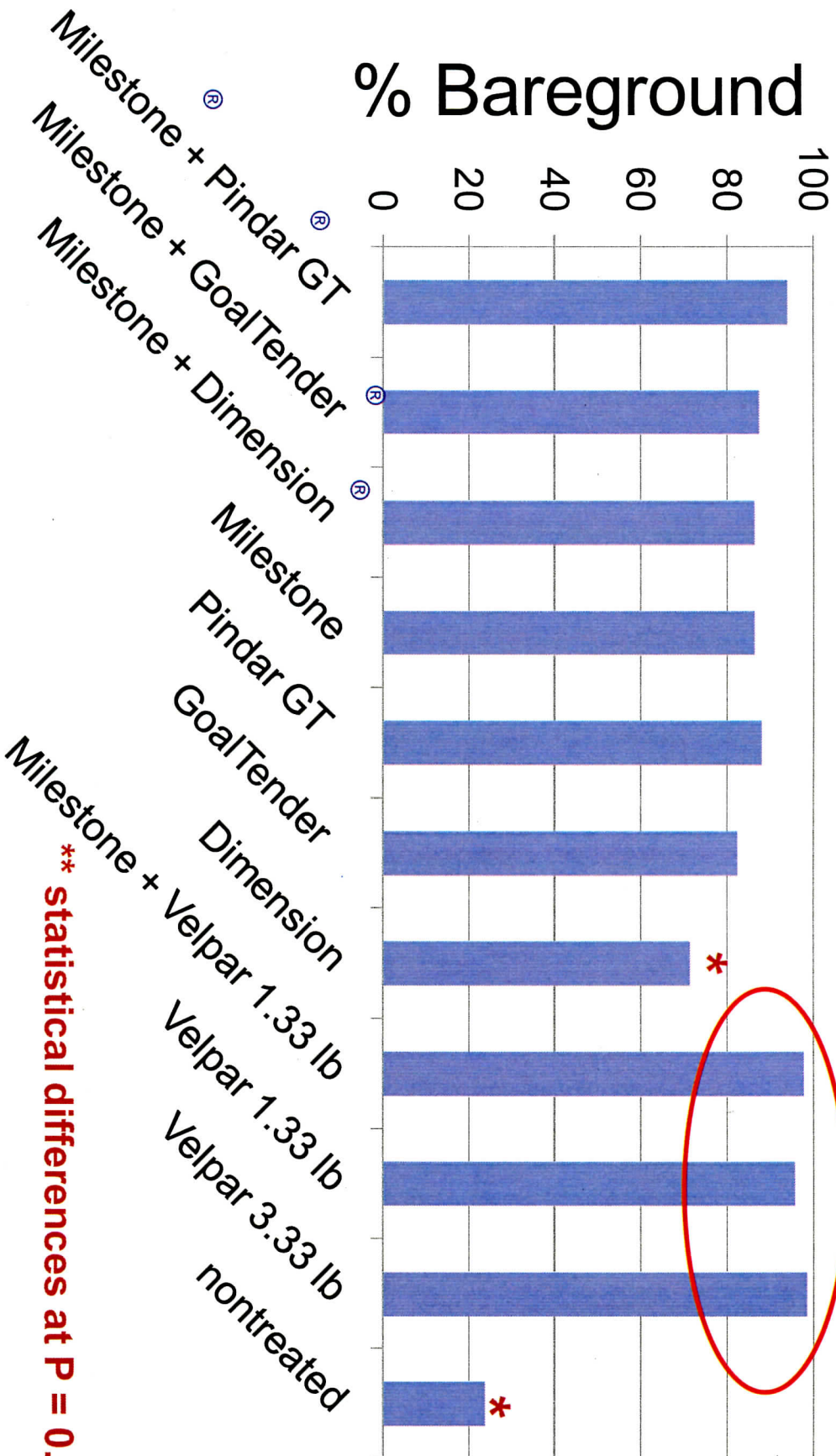
**** statistical differences at P = 0.0.5**

About 16 days between treatment and planting

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% Bareground

at 1 Year After Spring Site Prep



** statistical differences at P = 0.0.5

Summary for Potential New Products

- Started working on these products in 2011
 - Need more time to see the full potential fit
- GoalTender[®] and Pindar[®] GT have perhaps the best fit
- GoalTender is labeled for “conifer seedbeds, transplants, container stock...”
- Time will tell the full story - Stay tuned



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Summary for Milestone



- **SLN label for use in forestry on Jan 26**
 - Use in CA for site preparation and directed spray release applications
- **Milestone at 7 oz + Velpar DF at 1.33 lb/A**
 - Good weed control
 - Good conifer tolerance
 - Trend for increased survival with Douglas-fir and white fir
- **New fall 2012 trials in 3 locations on larger areas will tell us more**



Dow AgroSciences

Partnerships

- Dow AgroSciences is pleased and proud to partner with private timber companies, Thunder Road Resources, Sierra Cascade Forestry Cooperative, FSC Cooperative and others in forestry research
- Thank you for your continued dedication to growing trees for our future



Dow AgroSciences