



MILLESTONE® (aminopyralid)
A NEW TOOL IN FORESTRY
SITE PREPARATION AND
RELEASE

ED FREDRICKSON
THUNDER ROAD RESOURCES

MILLESTONE®

- AMINOPYRALID
 - 2 LB A.I. PER GALLON
- AUXINIC HERBICIDE (GROWTH REGULATOR)-SYSTEMIC
 - ABSORBED BY LEAVES AND ROOTS
- NOT A RESTRICTED USE PESTICIDE
- ACCEPTED BY THE E.P.A. AS A REDUCED RISK PESTICIDE
- EXTREMELY LOW USE RATES
- NO GRAZING RESTRICTIONS
- PRODUCTS HAVE PRE AND POST EMERGENT ACTIVITY ON TARGET BROADLEAVED WEEDS
- 24C LABEL APPROVED FOR FORESTRY SITE PREPARATION AND RELEASE IN CALIFORNIA IN THE EARLY SPRING OF 2013

KEY TRIAL OBJECTIVES

- TO DETERMINE THE TOLERANCE OF SEVERAL KEY COMMERCIAL CONIFER SPECIES TO AMINOPYRALID ALONE AND IN COMBINATION FOR FORESTRY SITE PREPARATION AND RELEASE APPLICATIONS
- TO DETERMINE THE INFLUENCE OF TIMING (FALL VS. SPRING) ON CONIFER TOLERANCE AND VEGETATION CONTROL WITH AMINOPYRALID
- TO DETERMINE THE MOST EFFECTIVE TANK MIX PARTNERS FOR MAXIMIZING EFFICACY AND REDUCING RISKS TO CONIFERS

FORESTRY TRIALS WITH AMINOPYRALID IN CALIFORNIA

- SINCE 2009
 - 3 REPLICATED “OVER THE TOP” RELEASE TRIALS
 - 3 DIRECTED RELEASE DEMO SITES
 - 5 AERIAL AND GROUND OPERATIONAL SITE PREP DEMOS
 - 16 REPLICATED PRE-PLANT SITE PREPARATION TRIALS
 - TRIALS CONDUCTED BY DOW AGROSCIENCES, SIERRA CASCADE IFMR CO-OP, AND THE CERTIFIED FOREST LANDOWNERS RESEARCH GROUP

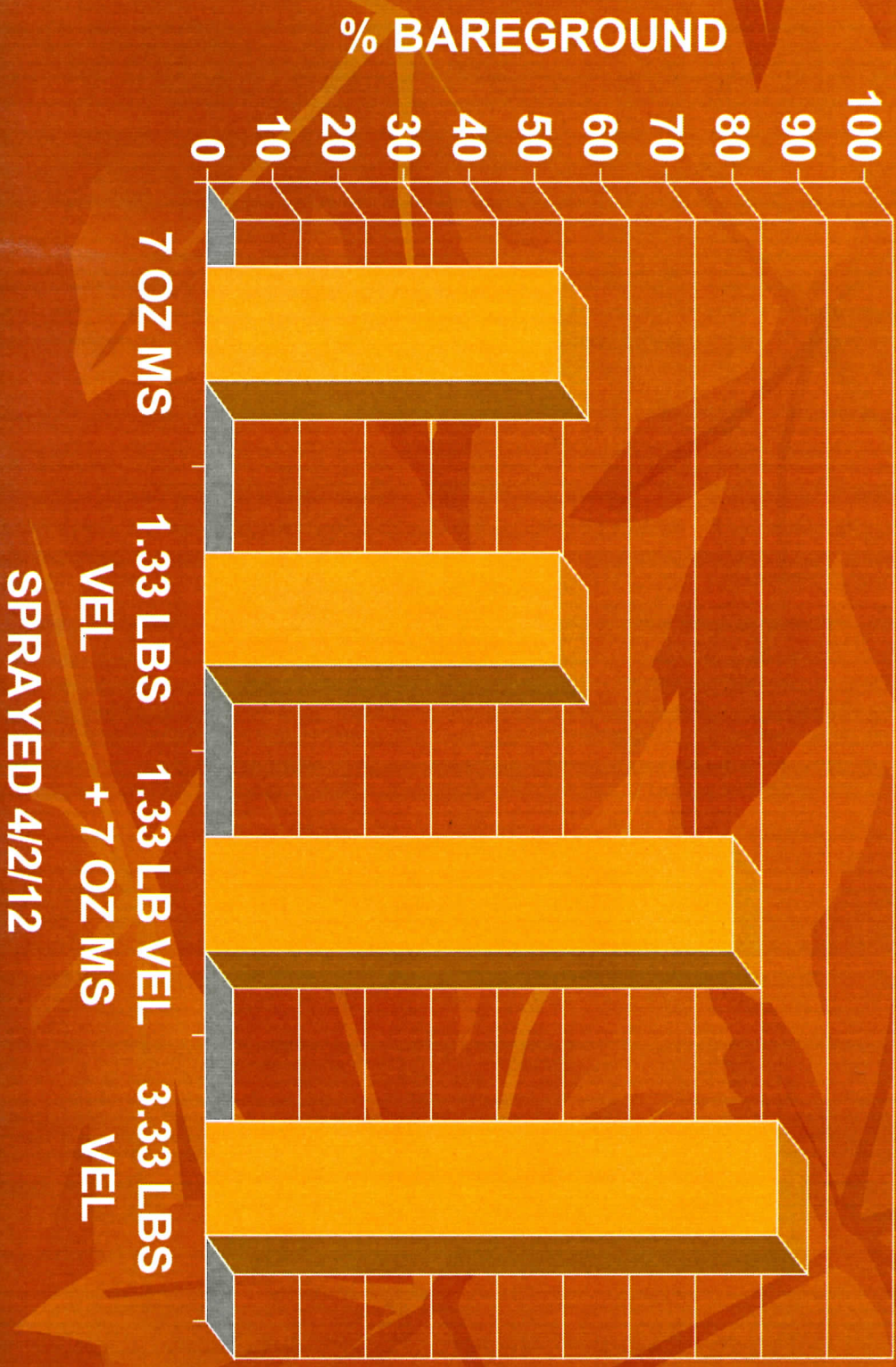
CONIFER SPECIES TESTED

- PONDEROSA PINE
- DOUGLAS-FIR
- WHITE FIR
- SUGAR PINE
- INCENSE CEDAR -- DEMO PLOTS ONLY
- WESTERN LARCH -- DEMO PLOTS ONLY

VEGETATION CONTROL WITH AMINOPYRALID

- PRIMARILY WORKS ON HERBACEOUS BROADLEAVES AND SOME ANNUAL GRASSES
- PRE AND POST EMERGENT CONTROL
- DOES NOT PHOTODEGRADE
- ADDITIVE EFFECTS WHEN TANK MIXED WITH OTHER PRODUCTS SUCH AS VELPAR DF, PINDAR GT OR GOALTENDER

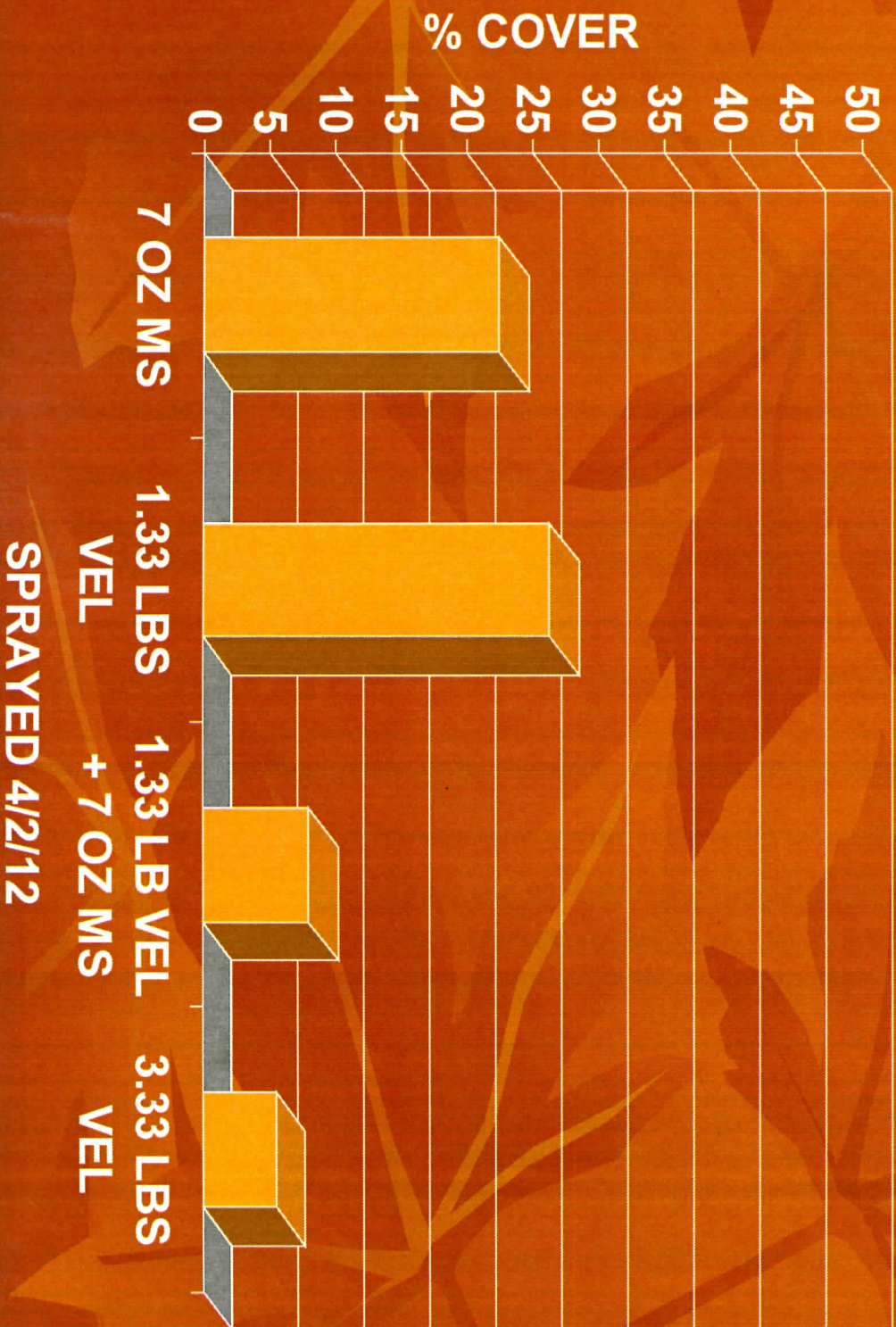
SIERRA CASCADE SPRING SITE PREPARATION TRIAL 2012 - 17 MAT



1.33 LBS VELLPAR DF + 7 OZ MILESTONE

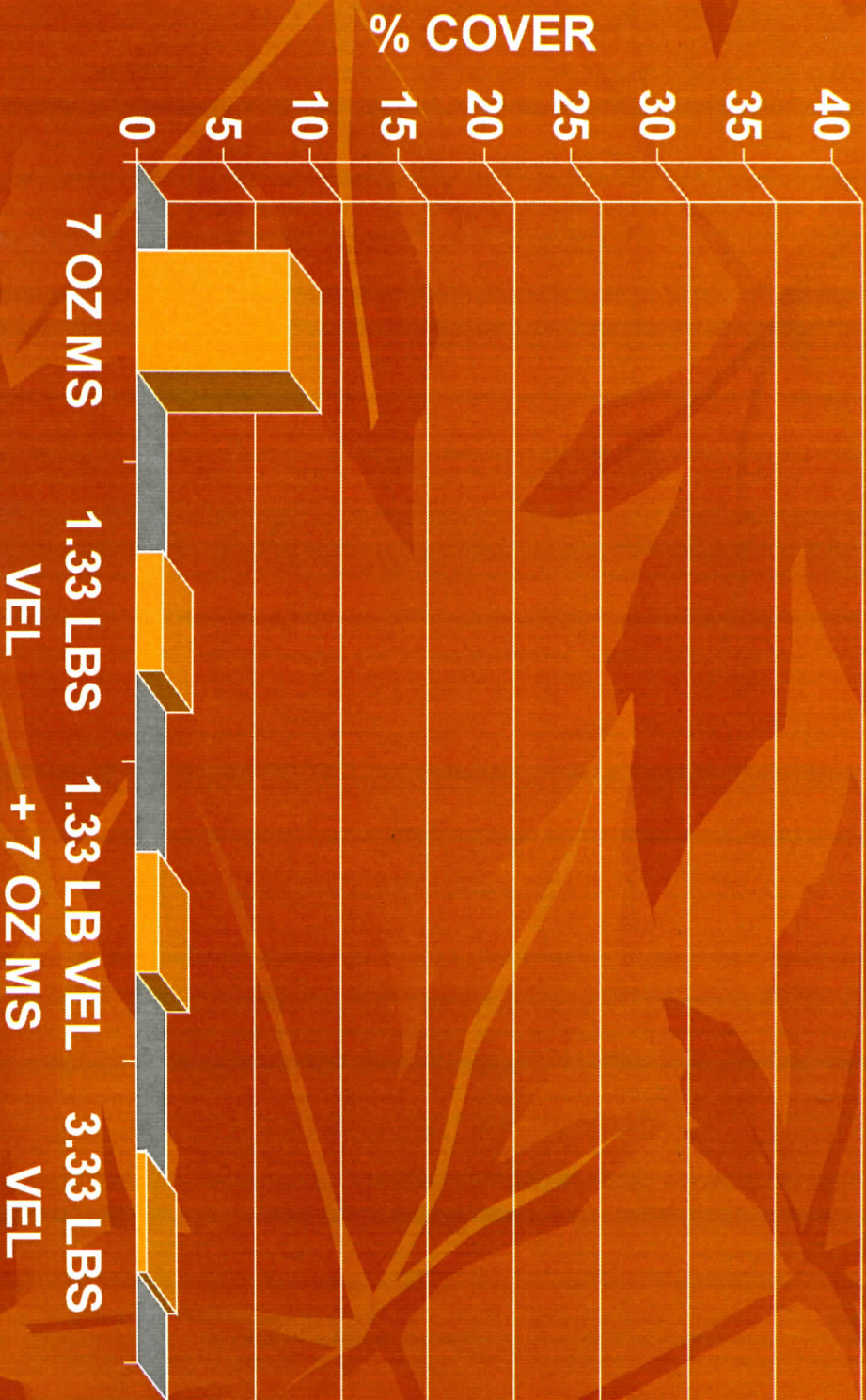


CHEAT GRASS % COVER - SIERRA CASCADE SPRING SITE PREPARATION TRIAL 2012 - 17 MAT



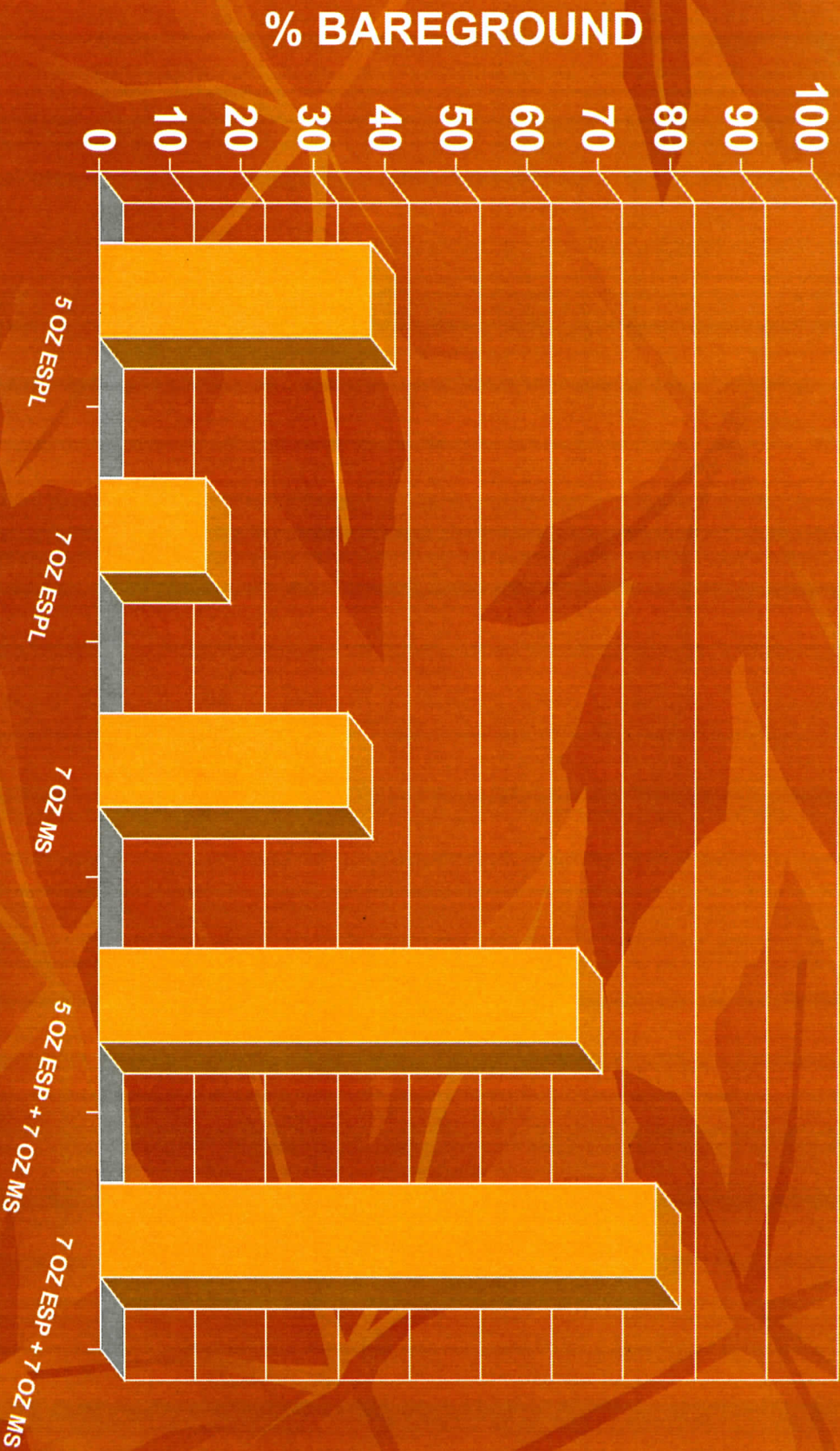
SPRAYED 4/2/12

COMMON MULLLEIN % COVER - SIERRA CASCADE SPRING SITE PREPARATION TRIAL 2012 - 17 MAT



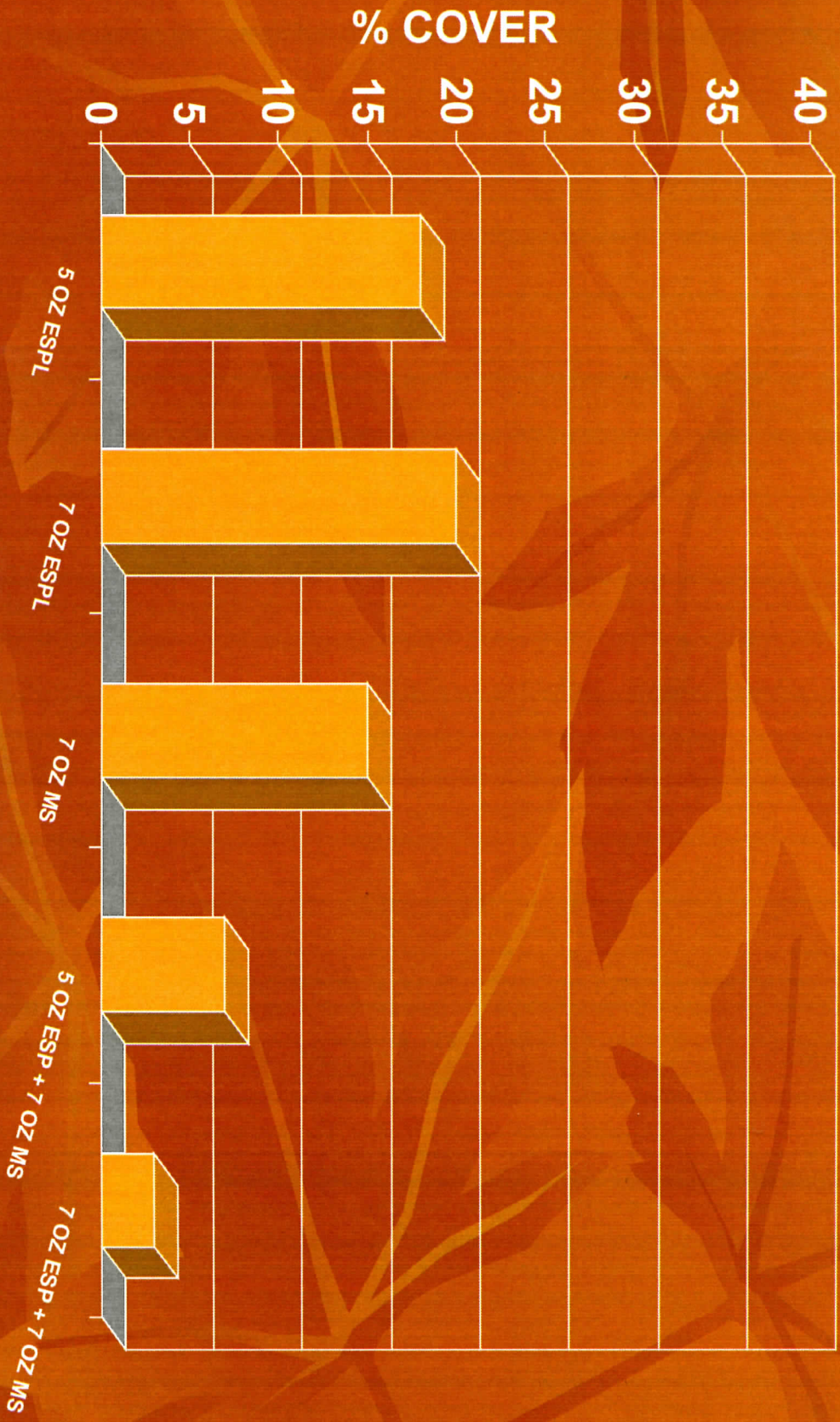
SPRAYED 4/2/12

CERTIFIED FOREST RESEARCH GROUP SPRING COAST SITE PREPARATION TRIAL 2013 - 6 MAT



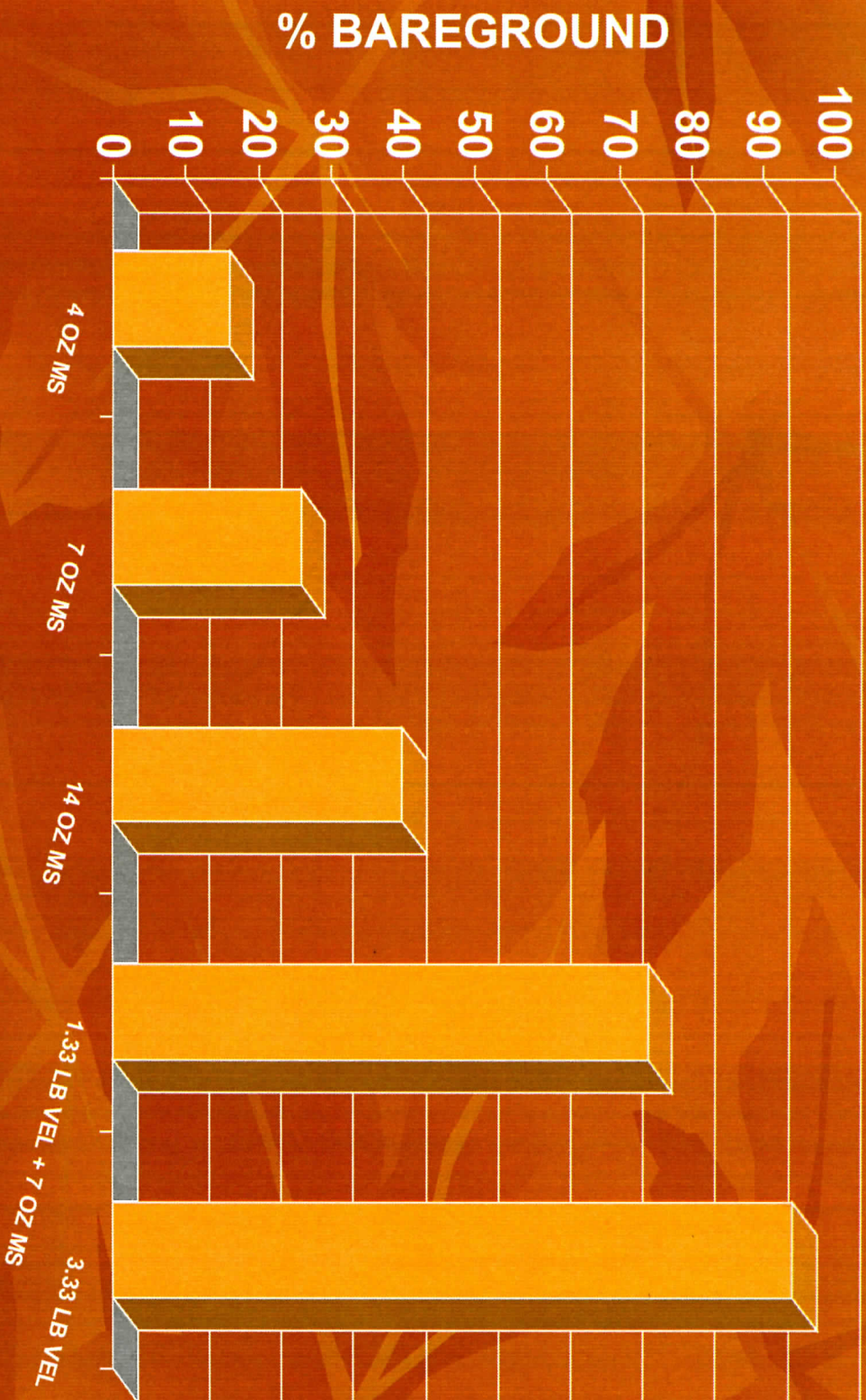
SPRAYED 3/13/13

FIREWEED % COVER - CERTIFIED FOREST RESEARCH GROUP SPRING COAST SITE PREPARATION TRIAL 2013 - 6 MAT



SPRAYED 3/13/13

SIERRA CASCADE IFM CO-OP FALL MILESTONE SITE PREP TRIAL 2010 - 10 MAT



SPRAYED 10/06/2010

DIRECTED RELEASE WITH MILLESTONE® IN FORESTRY

- USED ALONE OR IN CONJUNCTION WITH OTHER FORESTRY RELEASE HERBICIDES
- BENEFITS:
 - ADDS A RESIDUAL COMPONENT TO BRUSH AND HERBACEOUS TREATMENTS TO EXTEND CONTROL WINDOW
 - BROADENS THE CONTROL SPECTRUM
 - LACK OF PHOTODEGRADATION MAY INHIBIT SOME WINTER ANNUALS FROM GERMINATING
 - SPRING TREATMENTS ARE IDEAL TO CAPITALIZE ON RESIDUAL ACTIVITY – ESPECIALLY WITH GLYPHOSATE RELEASE TREATMENTS
- MUST PROTECT SEEDLINGS

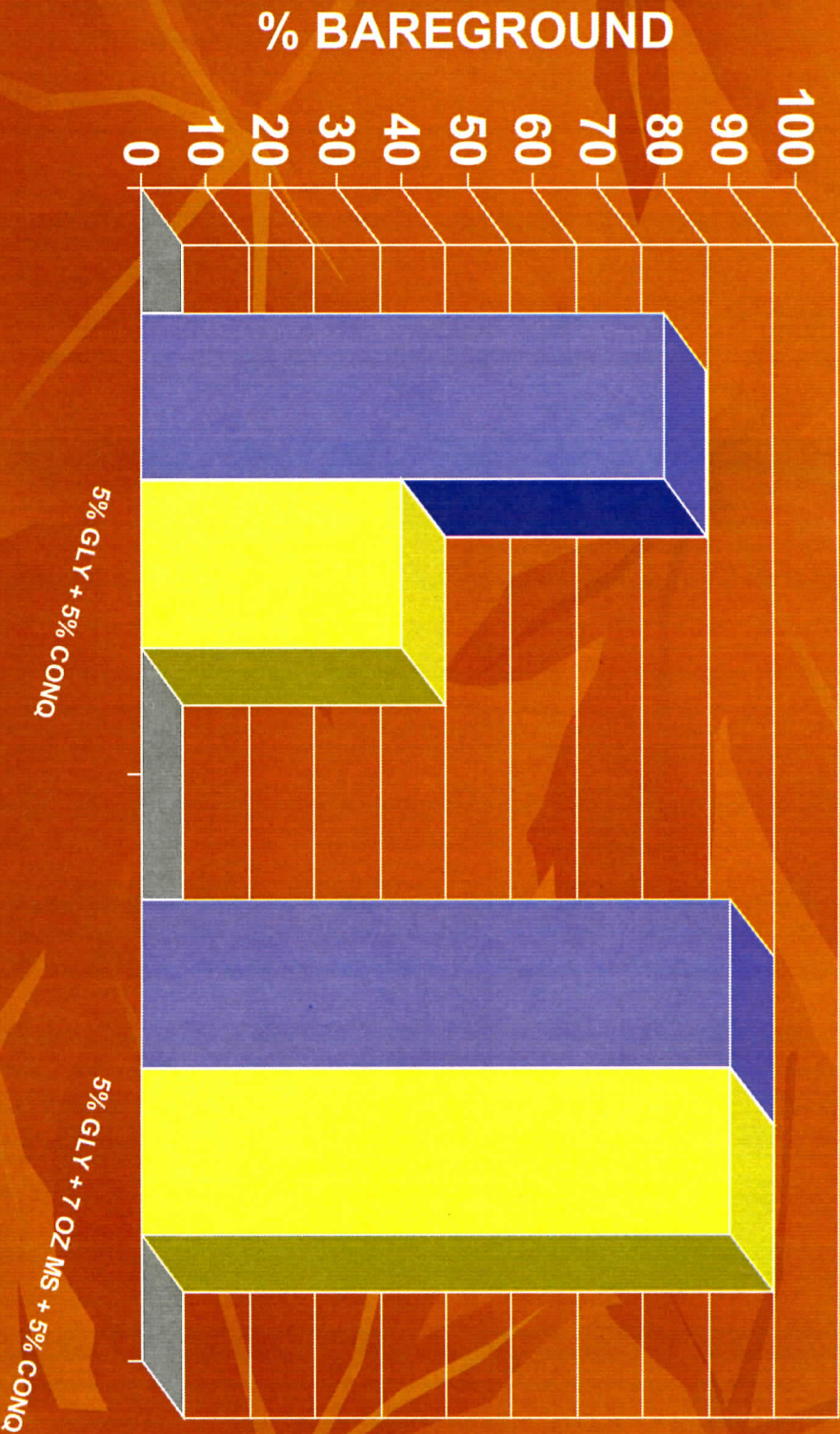
**5% GLYPHOSATE + 5% CONQUER (RIGHT)
5% GLYPHOSATE + 7 OZ MILESTONE® + 5% CONQUER® (LEFT)**



5% GLYPHOSATE + 5% CONQUER®



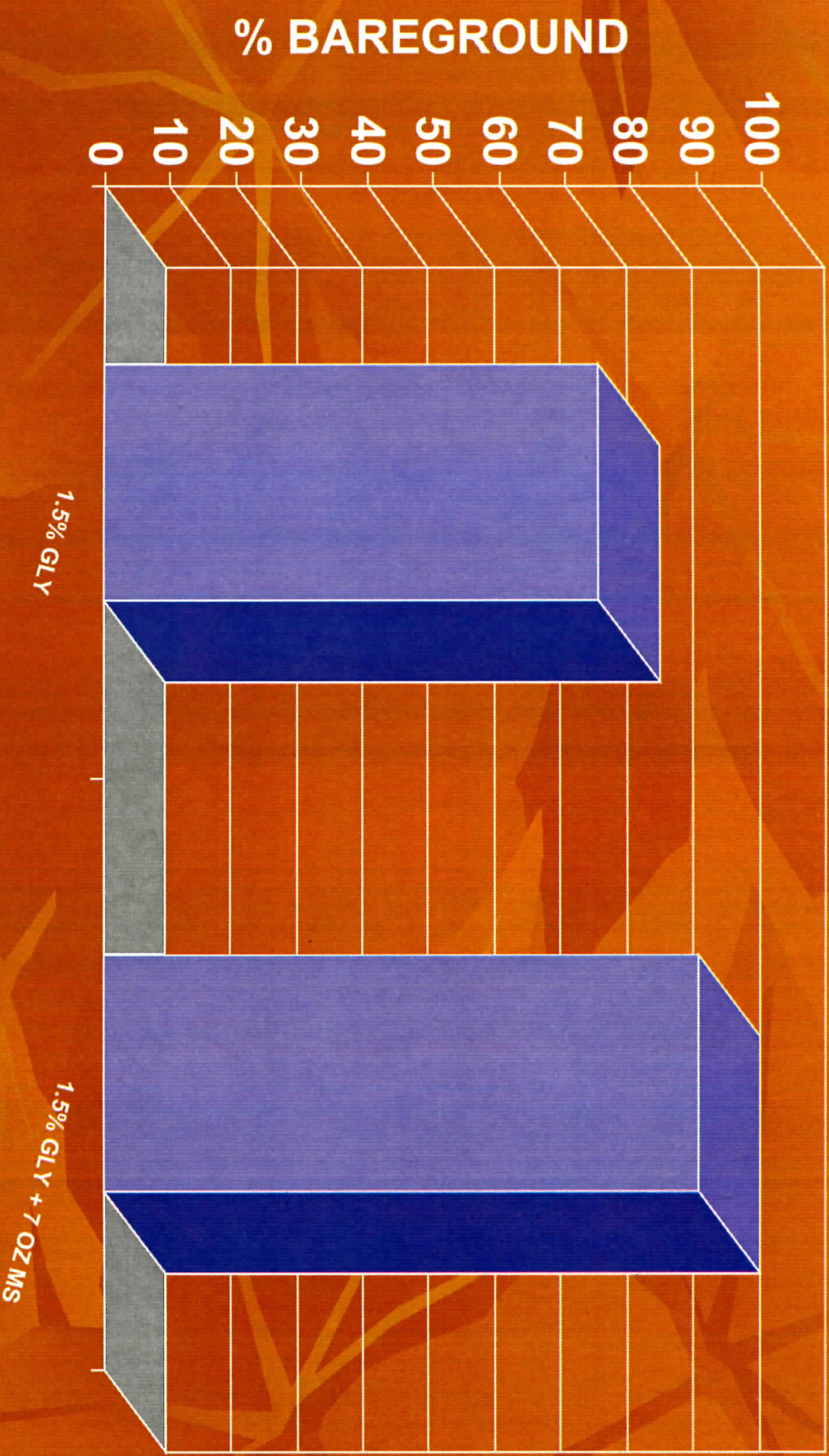
DOW OPERATIONAL GLYPHOSATE MILESTONE® DIRECTED SPRAY DEMOS



SPRAYED 05/07/13 - 3 MAT

■ RRC 1 ■ RRC 2

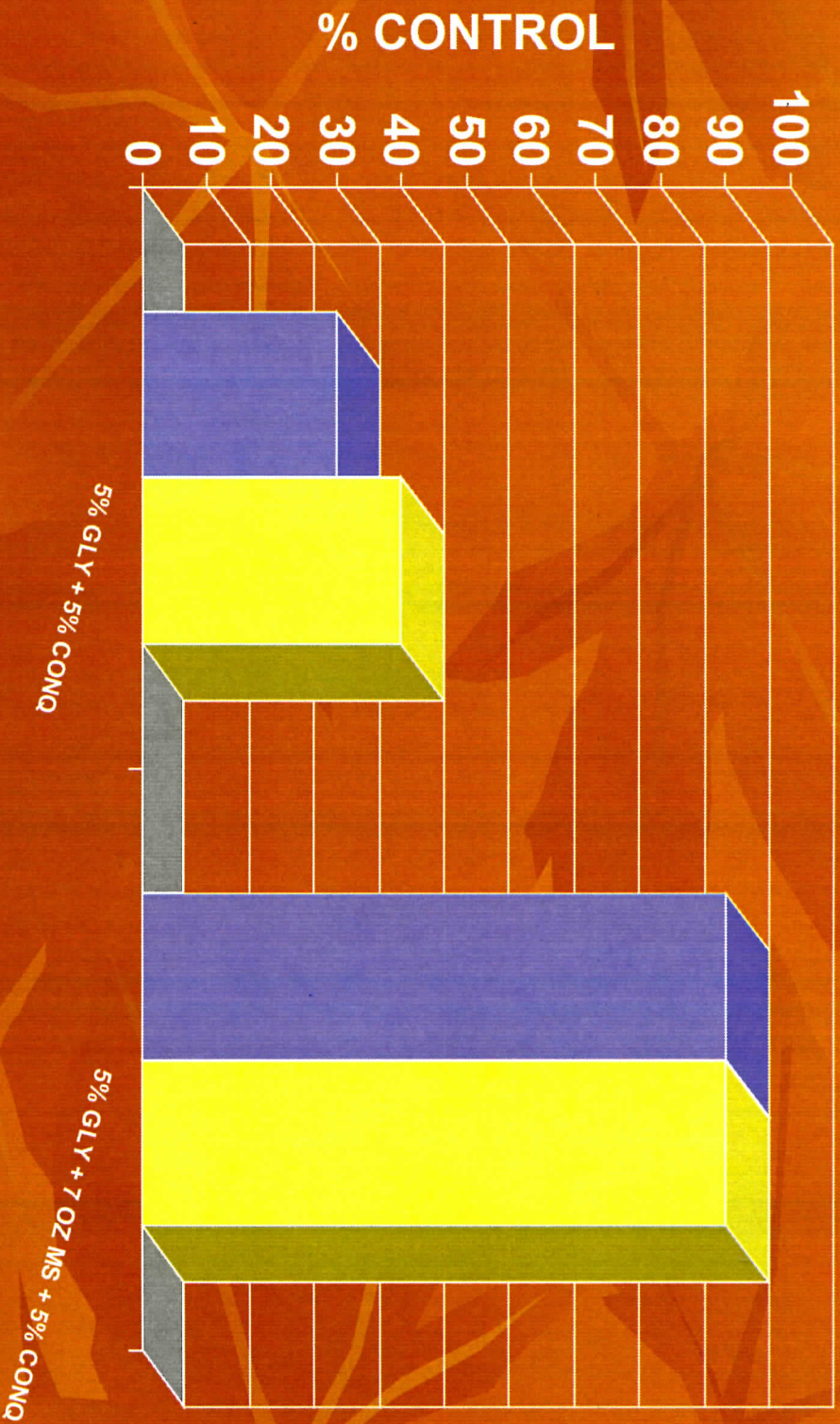
DOW OPERATIONAL GLYPHOSATE MILESTONE DIRECTED SPRAY DEMOS



SPRAYED 05/10/13 - 3 MAT

■ SPI 1

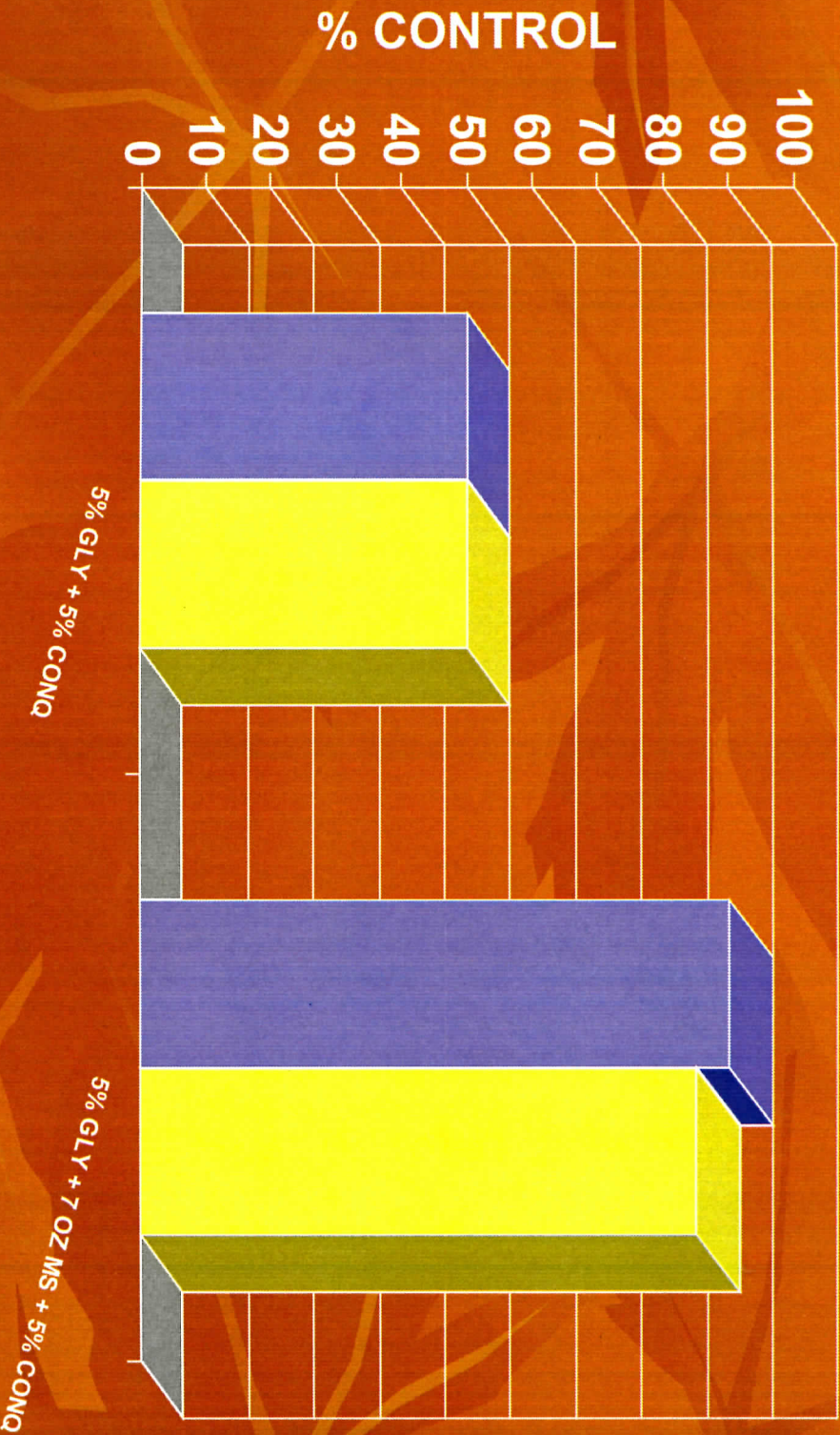
BLACKBERRY PERCENT CONTROL DIRECTED SPRAY DEMOS



SPRAYED 05/07/13 - 3 MAT

■ RRC 1 ■ RRC 2

ANNUAL GRASS PERCENT CONTROL DIRECTED SPRAY DEMOS



SPRAYED 05/07/13 - 3 MAT

■ RRC 1 ■ RRC 2

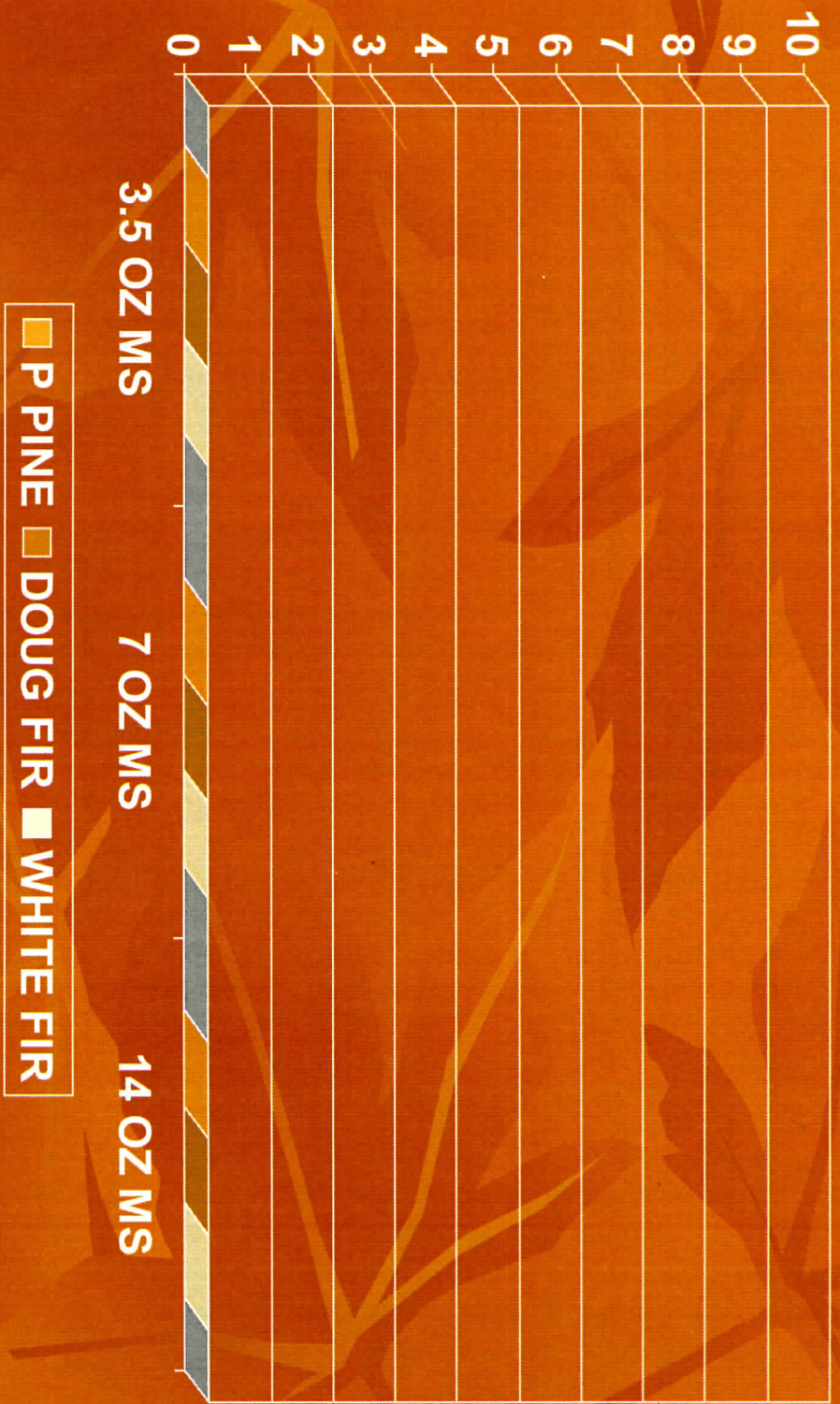
CONIFER TOLERANCE

- 2010 TO 2012 WE SAW NO VISIBLE INJURY TO P. PINE, DOUG-FIR OR WHITE FIR FROM MILESTONE® AS A PRE-PLANT SITE PREPARATION TREATMENT EVEN UP TO 14 OZ/AC (2X RATE)
- IN 2013, IN BOTH TRIAL WORK AND OPERATIONAL APPLICATIONS SOME INJURY WAS OBSERVED
- REASONS:
 - TIME BETWEEN APPLICATION AND PLANTING WAS REDUCED FROM 1 MONTH TO AS SOON AS 2 DAYS AFTER TREATMENT
 - SOIL TYPE
 - ODD WINTER WEATHER PATTERN??
- INJURY WAS IN THE FORM OF CURLED NEEDLES AND LARGE GLOBUS BUDDS
- THE INJURY IS RELATIVELY SHORT-TERM WITH MANY OF THE SEEDLINGS RECOVERING IN THE FIRST GROWING SEASON
- MORTALITY WAS NOT AN ISSUE

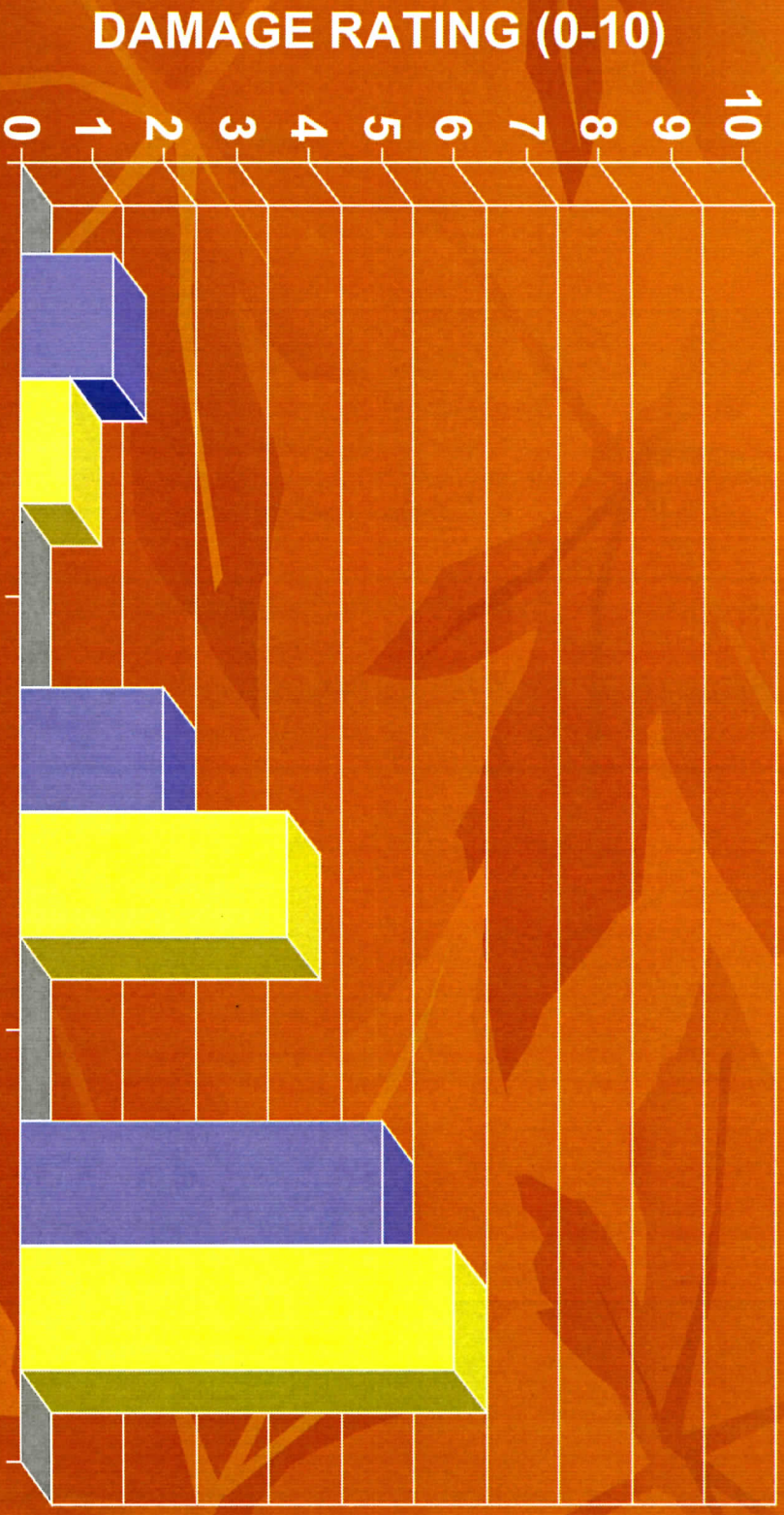
CONIFER DAMAGE RATINGS

- 0 = NO DAMAGE
- 1 = SLIGHT DISCOLORATION
- 2 = SLIGHT CHLOROSIS, NO BUD DAMAGE OR NEEDLE CURL
- 3 = SLIGHT CHLOROSIS, NO BUD DAMAGE, WITH NEEDLE CURL
- 4 = MODERATE CHLOROSIS, NO BUD DAMAGE, WITH NEEDLE CURL
- 5 = HEAVY CHLOROSIS, NO BUD DAMAGE WITH NEEDLE CURL
- 6 = MODERATE CHLOROSIS, WITH BUD DAMAGE AND NEEDLE CURL
- 7 = HEAVY CHLOROSIS, WITH BUD DAMAGE AND NEEDLE CURL
- 8 = LESS THAN 50% BROWN, WITH BUD DAMAGE
- 9 = GREATER THAN 50% BROWN, WITH BUD DAMAGE
- 10=DEAD

CONIFER DAMAGE RATINGS FOR EVERY TRIAL FROM 2010 TO 2012 SPRING OR FALL



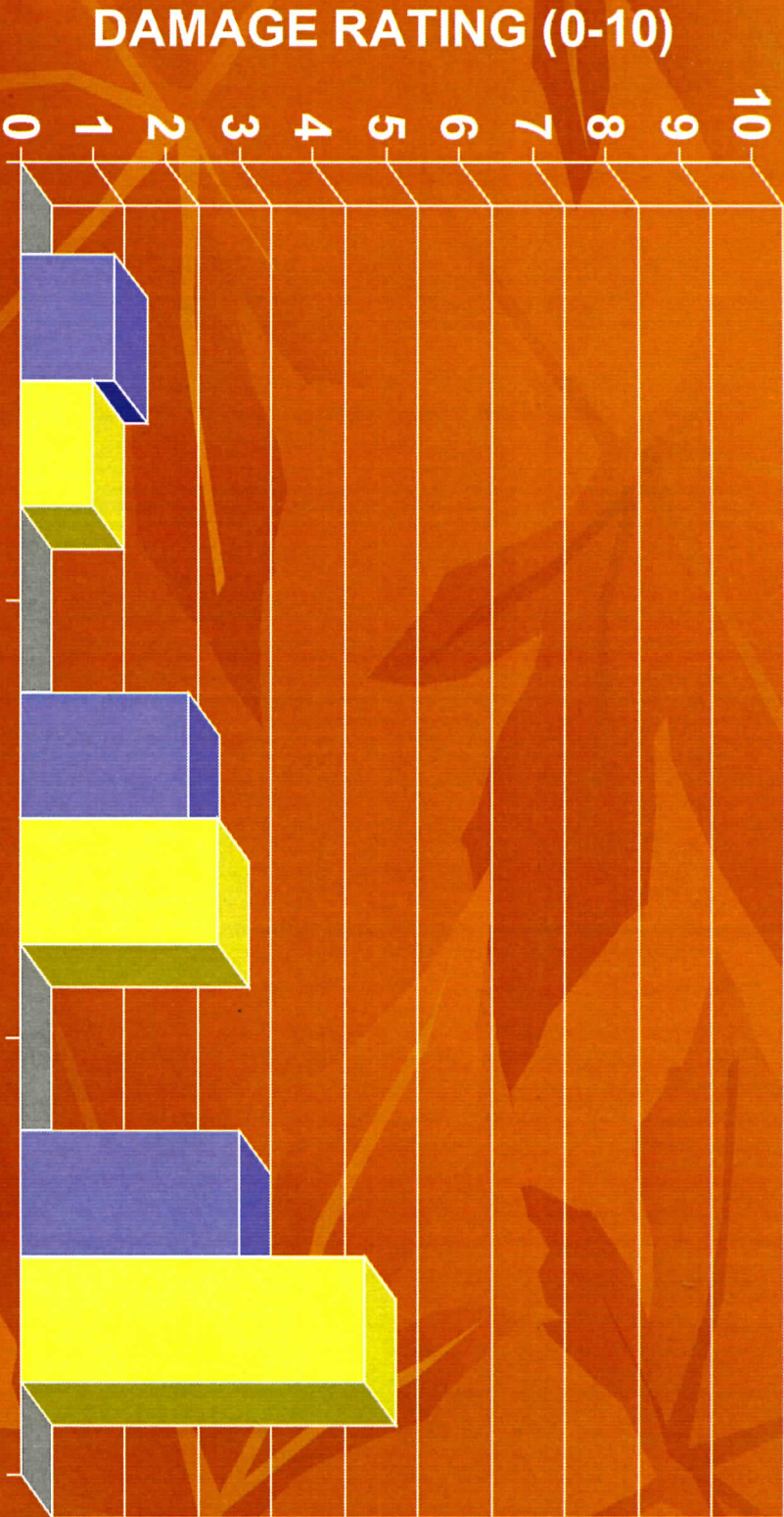
SUGAR PINE INJURY FOR FALL AND SPRING APPLICATIONS OF AMINOPYRALID (2012 & 2013)



SPRAYED 10/27/12 AND 02/06/13

■ FALL ■ SPRING

WHITE FIR INJURY FOR FALL AND SPRING APPLICATIONS OF AMINOPYRALID (2012 & 2013)

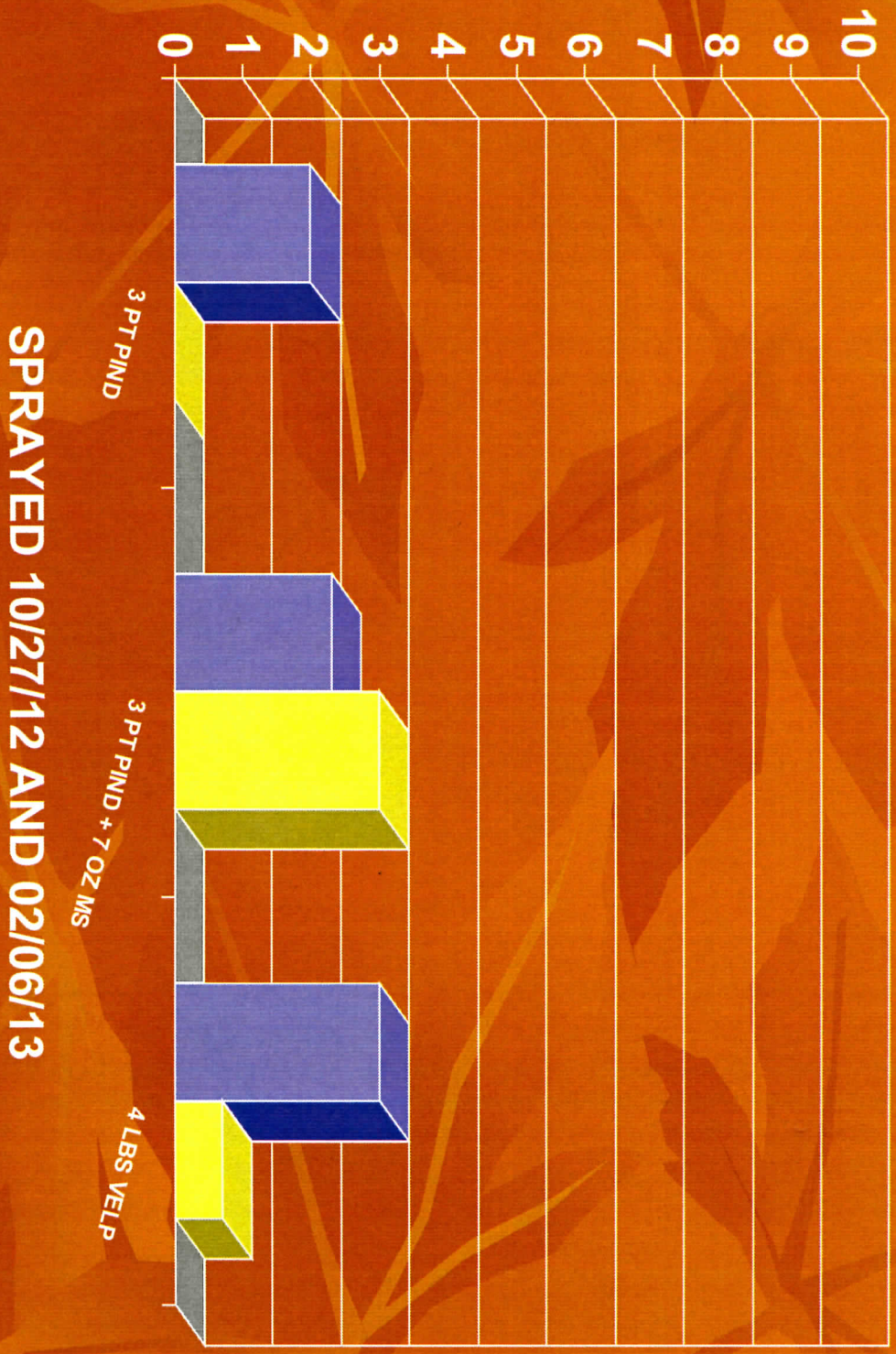


SPRAYED 10/27/12 AND 02/06/13

FALL SPRING

DOUGLAS FIR INJURY FOR FALL AND SPRING APPLICATIONS OF AMINOPYRALID (2012 & 2013)

DAMAGE RATING (0-10)



SPRAYED 10/27/12 AND 02/06/13

■ FALL ■ SPRING

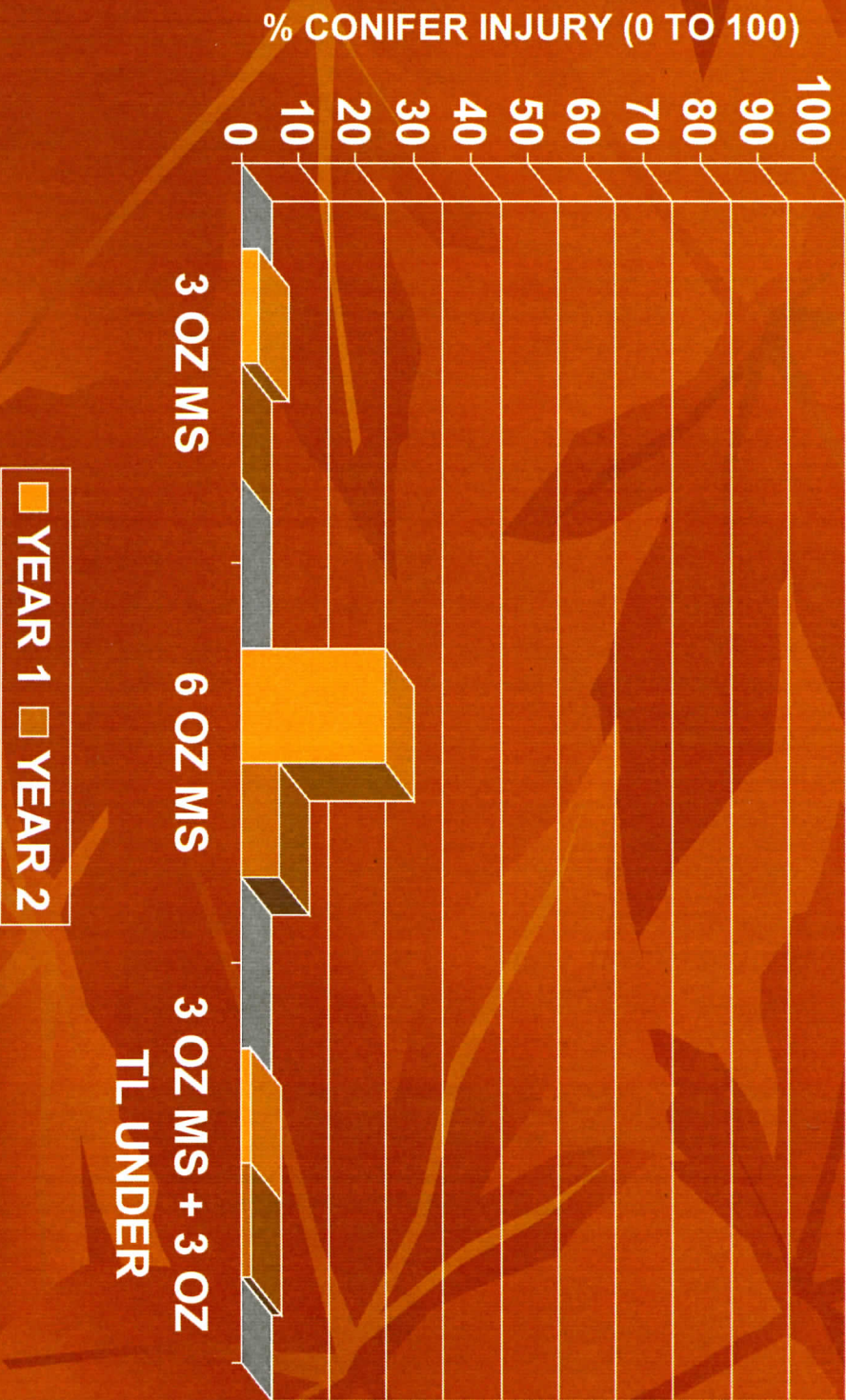
MILESTONE® SYMPTOMS ON WHITE FIR



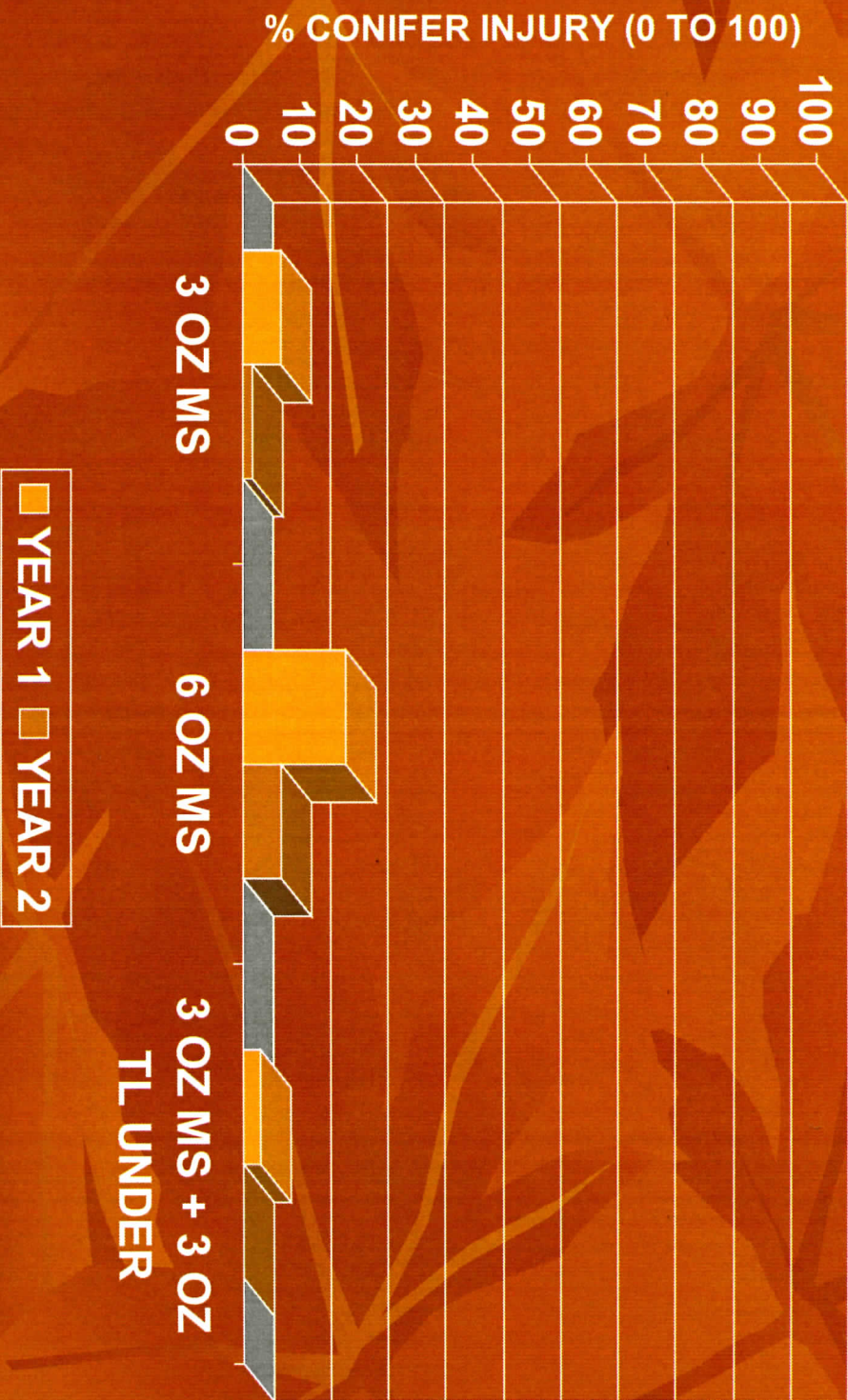
SUGAR PINE RECOVERING IN 1ST GROWING SEASON



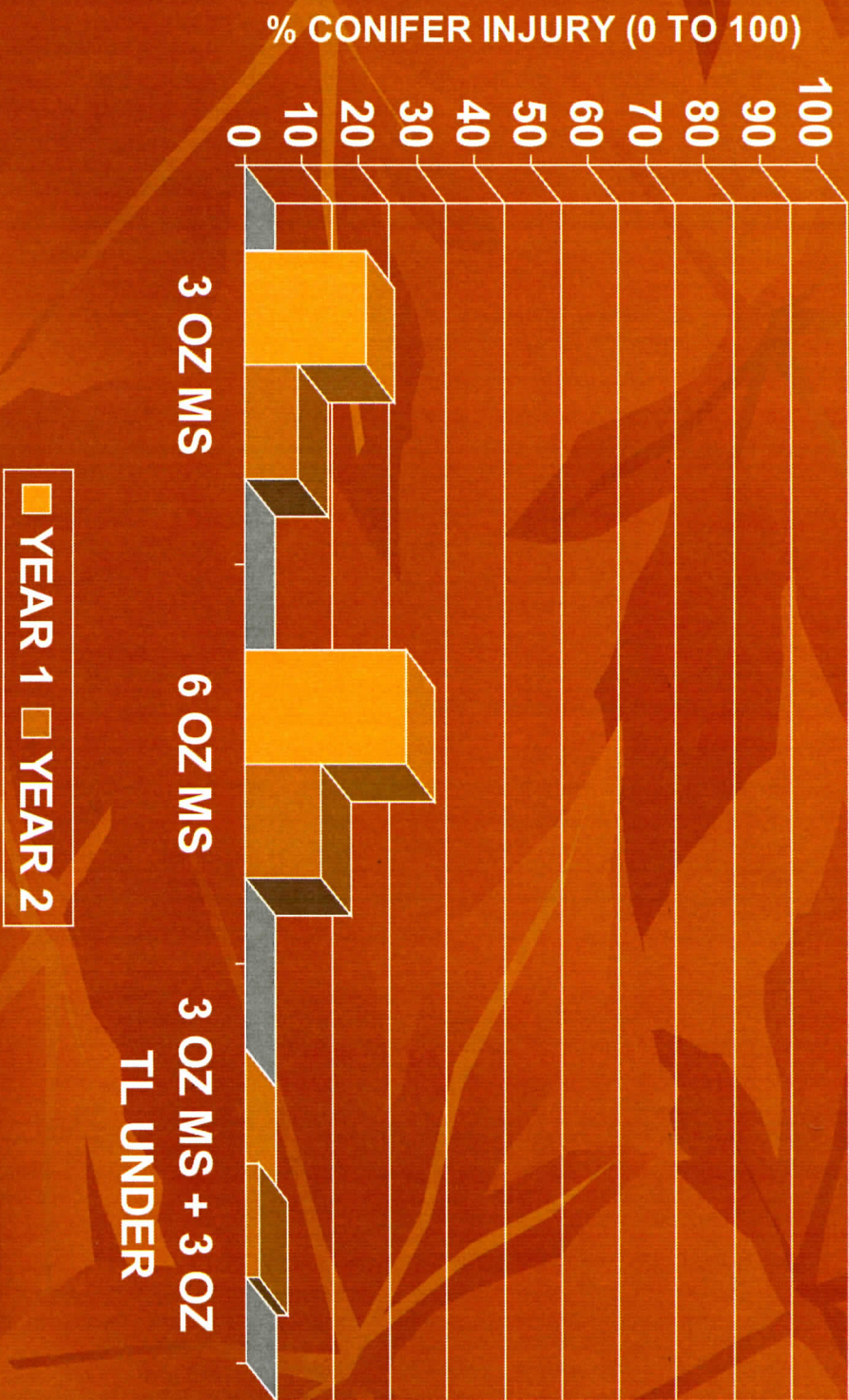
PERCENT 2 YR OLD P. PINE INJURY FROM "OVER THE TOP" APPLICATIONS OF AMINOPYRALID - APPLIED 4/27/09



PERCENT 4 YR OLD P. PINE INJURY FROM "OVER THE TOP" APPLICATIONS OF AMINOPYRALID - APPLIED 4/27/09



PERCENT DOUGLAS FIR INJURY FROM “OVER THE TOP” APPLICATIONS OF AMINOPYRALID – APPLIED 4/22/09



CONCLUSIONS

- ROUGHLY EQUAL CONTROL TO A FULL RATE OF VELPAR DF CAN BE ACHIEVED WITH 1.33 LBS VELPAR DF PLUS 7 OUNCES OF MILESTONE® IN THE FIRST GROWING SEASON, WITH SOME CARRY-OVER INTO THE SECOND SEASON
- THE ADDITION OF 7 OUNCES OF MILESTONE® TO SPRING DIRECTED RELEASE TREATMENTS EXTENDS THE DURATION OF CONTROL SIGNIFICANTLY
- MUST PROTECT THE TREES WITH DIRECTED APPLICATIONS
- WITH SPRING SITE PREP APPLICATIONS, DOWAGROSCIENCES RECOMMENDATION IS TO PLANT TWO MONTHS AFTER APPLICATION