

**Sierra Cascade Intensive Forest Management Research Cooperative Proposal 13-01**  
**Matrix SG**

Principal Investigator: Ed Fredrickson

Title: Pre-Plant Site Preparation with Matrix SG (Rimsulfuron)

Year Approved: 2013

**Executive Summary:**

One of the main priorities the last several years has been to find an alternative site preparation treatment for conifers intolerant to hexazinone. Many new and existing herbicides have been tested with mixed results. One product manufactured by DuPont that may have considerable potential is Matrix SG. Matrix SG is in the sulfonylurea family of herbicides and is primarily an ALS inhibitor, an enzyme necessary for plant growth. Matrix has been successfully used as a bare ground herbicide in non-crop applications and has tolerance on fruit, grapes, and nut crops. It is also labeled for range and pasture applications to control invasive species. Bare ground applications have been extremely successful with Matrix alone or in combination with Telar XP (chlorsulfuron), Milestone (aminopyralid), and Oust XP (sulfometuron). Given the tolerance to fruit and nut crops along with grapes, Matrix may provide adequate tolerance to conifers.

It also has the benefit of being an extremely low use rate product, typically in the two to four ounce per acre range. It has a very favorable toxicity profile with oral LD-50 values greater than 5000 mg/kg of body weight in rats and very little toxicity to birds, fish or aquatic invertebrates. It has a

moderately short half- life, generally around 30 days.

This proposal is for a trial that would evaluate the potential of Matrix SG alone and in combination for pre-plant site preparation applications on ponderosa pine, Douglas-fir, and white fir with spring and fall applications.

This trial would be established on a recent clearcut or wildfire that was ready for planting but had not been previously treated with any residual herbicides. The site for this trial should be on the west side of the Cascade Range on good site ground. Preferably, high site two or better. The preferred timing for this site would be a spring treatment followed by a spring plant.

This trial will be completely randomized with four replications per treatment. Plot size will be 12 feet by 36.3 feet (0.01 acres). The trial would be sprayed in the spring of 2013 and planted shortly after. All plots would be planted with 15 trees each of ponderosa pine, Douglas-fir, and white fir. Five trees of each species would be designated as "dig" trees to evaluate root growth. The remaining ten trees would be measurement trees. The first ten trees by

species in each plot would be initially measured for caliper and height at planting.

All applications will be at ten gallons per acre and applied with a CO<sub>2</sub> powered backpack sprayer with a twelve foot boom. The sprayer will be calibrated prior to application and each plot will be sprayed with one timed pass.

Treatments will include: 2 oz/acre, 4 oz/acre, or 8 oz/acre Matrix SG; 1.33 lbs/acre Velpar DF with 2 or 4 oz/acre Matrix SG; 1.33 lbs/acre Velpar DF; 3.33 lbs/acre Velpar DF; 7 oz/acre Milestone; 4 oz/acre Matrix SG + 7 oz/acre Milestone; and control. (Due to heavy herbaceous cover at the time of treatment, 1.5 quarts Accord XRT II were added to all treatments to provide burn down to enable evaluation of the residual control of the herbicides tested. An Accord XRT II control was also added to the trial).

Evaluations will occur in the fall of 2013 and the fall of 2014. Evaluations for the spring timing in the fall of 2013 and the fall of 2014 will consist of percent bare ground, percent cover by species, and total percent cover to assess vegetation control. The five trees designated for digging will be excavated and roots evaluated for number of new roots and root length. The measurement trees will be evaluated for percent survival, percent brownout, and vigor. No caliper or height measurements will be taken in 2013. The trial will be evaluated at the end of the second growing season and include all previous evaluation criteria (except "dig" tree data) plus caliper,

height, and stem volume for all ten measurement trees per species.

**2013:** A trial was installed on property owned and managed by Sierra Pacific Industries on March 18<sup>th</sup> to evaluate DuPont's Matrix SG herbicide alone and in combination with Velpar DF and Milestone for conifer site preparation. The site is located approximately three miles southwest of Round Mountain, California.

Plots were planned to be planted with 15 trees each of ponderosa pine, Douglas-fir, and white fir. Due to a shortage of white fir, only 12 white fir were planted per replication. Trees were planted on March 28<sup>th</sup>. Ten trees were marked for measurement and the remainder were slated as "dig" trees to evaluate root growth.

Evaluations (August 20<sup>th</sup>) included percent bare ground, percent cover by species, conifer survival, conifer percent brownout, conifer damage rating, number of new roots and root length for each conifer species.

Data were analyzed using SAS statistical software. Analysis of variance was used to determine significance of the main effects of treatment and orthogonal contrasts were used to make specific comparisons among treatments. Analysis of variance was used to determine if there were any differences in initial seedling size among treatments. If initial seedling size was found to be significantly different among treatments, analysis of co-variance was used to adjust for initial seedling size difference with initial tree size as the co-variate. Vegetation

data were analyzed using analysis of variance for the main effects, and multiple comparisons of means were done using Student Newman-Kuels least significant difference procedure. Orthogonal contrasts were used to make specific comparisons among treatments.

Seedling survival, percent brownout, or damage rating did not significantly differ by treatment for any species tested in this trial. Conifer safety was high for all treatments tested. Ponderosa pine and Douglas-fir had excellent survival overall. Survival was lower for white fir, but there was high variability among blocks (Table 2).

Treatment variables also did not affect number of new roots or length of new roots (see Appendix 1 page 11 for conifer damage and root codes). Number of new roots could not be analyzed due to no variability between observations (all seedlings had the maximum root number rating). No herbicide effect was apparent on any root observations (Table 3).

Vegetation control was very good for all treatments (Table 1). No significant differences existed for percent bare ground between herbicide treatments, but all herbicide treatments had significantly more bare ground than the control ( $P \leq 0.05$ ). All treatments controlled other annual grasses, rattail fescue, and hedge parsley significantly more than the controls, with the exception of the 7 ounce Milestone treatment for rattail fescue which was not significantly different than the control.

Overall, conifer tolerance was exceptional for all treatments. White fir mortality did not appear to be related to treatment. It was difficult to assess how much Matrix contributed to vegetation control at this 2013 rating. Treatments with Matrix only provided slightly more control than the Accord XRT II only treatment, but that was the case for the operational standard of Velpar DF as well. It appears the initial knock down from the addition of Accord XRT II to all treatments held the site fairly well.

TREAT	% BARE GROUND	% COV HEDGE PARSLEY	% COV TARWEED	% COV DEER BRUSH	% COV RATTAIL FESCUE	% COV OTHER ANN GR.	% COV ANN BLUE GRASS	% COV YEL NUT SEDGE	% COV MULLEIN	% COV BLACK BERRY	% COV OTHER
2 OZ MATRIX	95.5	0.8	1.0	0.0	0.5	0.0	0.2	0.2	0.2	0.0	2.0
4 OZ MATRIX	96.5	0.5	0.5	0.2	0.2	0.0	0.0	0.5	0.0	0.8	1.5
8 OZ MATRIX	96.5	0.0	0.5	0.2	0.2	0.2	0.2	0.0	0.0	0.5	1.8
2 OZ MATRIX + 1.33 LBS VELPAR DF	98.5	0.2	0.0	0.2	0.2	0.0	0.2	0.0	0.0	0.2	1.0
4 OZ MATRIX + 1.33 LBS VELPAR DF	96.8	0.5	0.5	0.0	0.5	0.5	0.8	0.2	0.0	0.5	1.2
4 OZ MATRIX + 7 OZ MILEST.	96.8	0.2	0.0	0.0	0.0	0.0	0.2	0.2	0.0	1.0	2.0
1.33 LBS VELPAR DF	96.0	1.0	0.0	0.0	0.0	0.2	0.5	0.8	0.5	1.0	1.2
7 OZ MILESTONE	93.8	0.0	0.0	0.5	3.2	0.5	0.5	0.5	0.0	0.0	1.2
3.33 LBS VELPAR DF	98.8	0.0	0.0	0.0	0.0	0.0	0.5	0.2	0.0	0.0	0.5
1.3 QTS ACCORD XRT II	93.8	0.8	0.8	0.5	1.5	0.5	0.0	0.0	1.0	1.2	2.0
CONTROL	61.2	3.0	3.2	0.0	5.5	19.5	2.0	0.5	0.2	1.5	3.8

Table 1. Percent bare ground and percent cover by species for the Spring Matrix Site Preparation Trial five months after treatment.

TREAT	PONDEROSA PINE			DOUGLAS-FIR			WHITE FIR		
	% SUR	% BO	DAM	% SUR	% BO	DAM	% SUR	% BO	DAM
2 OZ MATRIX	96.5	5.0	1.2	88.2	8.8	1.8	52.0	51.2	5.9
4 OZ MATRIX	98.2	3.8	0.2	96.5	3.8	0.8	75.0	28.8	4.2
8 OZ MATRIX	96.5	7.5	1.5	91.8	9.2	1.8	75.0	32.5	5.0
2 OZ MATRIX + 1.33 LBS VELPAR DF	95.0	5.0	1.2	91.5	10.0	1.8	56.0	45.0	6.2
4 OZ MATRIX + 1.33 LBS VELPAR DF	96.8	3.8	0.5	95.0	5.0	0.8	54.2	47.5	5.6
4 OZ MATRIX + 7 OZ MILEST.	94.8	3.8	0.8	98.2	7.5	2.5	81.2	31.2	4.5
1.33 LBS VELPAR DF	98.2	2.5	1.5	93.2	5.0	1.0	79.0	21.8	3.8
7 OZ MILESTONE	96.5	2.5	1.0	93.2	8.8	3.0	91.5	13.8	2.8
3.33 LBS VELPAR DF	94.8	5.0	0.8	88.2	11.2	1.8	52.2	53.8	6.5
1.3 QTS ACCORD XRT II	96.5	3.8	1.0	96.5	3.8	0.8	87.5	20.0	2.5
CONTROL	96.5	5.0	2.2	81.8	16.2	2.5	70.8	35.0	4.0

Table 2. Percent survival, percent brownout and conifer damage rating for the Spring Matrix Site Preparation Trial five months after treatment.

TREATMENT	PONDEROSA PINE		DOUGLAS-FIR		WHITE FIR	
	# NEW ROOTS	LENGTH OF NEW ROOTS	# NEW ROOTS	LENGTH OF NEW ROOTS	# NEW ROOTS	LENGTH OF NEW ROOTS
2 OZ MATRIX	5.8	7	6.0	6.2	6.0	8.5
4 OZ MATRIX	6.0	10.0	6.0	8.0	6.0	8.0
8 OZ MATRIX	6.0	9.2	6.0	6.0	6.0	5.7
2 OZ MATRIX + 1.33 LBS VELPAR DF	6.0	8.0	6.0	6.8	6.0	6.3
4 OZ MATRIX + 1.33 LBS VELPAR DF	6.0	8.0	6.0	8.0	6.0	6.0
4 OZ MATRIX + 7 OZ MILEST.	6.0	7.8	6.0	8.8	6.0	5.7
1.33 LBS VELPAR DF	6.0	10.0	6.0	8.2	6.0	8.2
7 OZ MILESTONE	6.0	7.5	6.0	6.5	6.0	4.8
3.33 LBS VELPAR DF	6.0	9.5	6.0	8.0	6.0	6.0
1.3 QTS ACCORD XRT II	6.0	8.8	6.0	8.8	6.0	7.5
CONTROL	6.0	8.5	6.0	6.5	6.0	6.3

Table 3. Number of new roots and length of new roots by treatment for the Spring Matrix Site Preparation trial five months after treatment.