Sierra Cascade Intensive Forest Management Research Cooperative Proposal 11-02
GF 9999 Site Preparation

Principal Investigator: Ed Fredrickson

Title: GF 9999 Site Preparation and Conifer Tolerance

Year Funded: 2011

Executive Summary:

GF 9999 is a foliar and soil active herbicide which has been in development for nearly six years. Due to the proprietary nature of this product, this trial must be done under a secrecy agreement and the actual active ingredient cannot be divulged at this time. GF 9999 is similar to other residual herbicides used in forestry. It has a broad spectrum of weed control and can be used at much lower rates than other residual herbicides used in forestry and is of low hazard to the environment. It also has extremely low toxicity to aquatic organisms and fish. It can be applied as either a pre or post emergent herbicide. It controls both grasses and broadleaved weeds.

This product has not been tested on forestry sites and conifer tolerance has not been established. It is also unclear how vegetation control will be influenced by forest soils, climate, and timing of application. There is however a strong potential that this will be an effective tool for forestry site preparation, especially on annual grasses and broadleaved weeds.

The stated objective of this study is to evaluate the effect of GF 9999 rate and timing on vegetation control and conifer tolerance of ponderosa pine and Douglas-fir when applied as a pre-plant site preparation spray. This proposal is for a trial that would look at the effect of site, rate, and timing on vegetation control and conifer tolerance of ponderosa pine and Douglas-fir for site preparation treatments with GF 9999 alone and in combination with Velpar DF and Accord XRT II compared to Velpar DF as the operational standard. Specific questions to be answered are: Does GF 9999 rate effect vegetation control or conifer tolerance? Can tank mixes of GF 9999 and a low rate of Velpar DF achieve similar vegetation control and conifer tolerance compared to the operational standard of Velpar DF alone? How does GF 9999 alone compare to the operational standard of Velpar DF regarding vegetation control and conifer tolerance? Does the addition of Accord XRT II to GF 9999 improve vegetation control?

The study will have two sites, one high elevation or east side Cascade site and a low elevation west side Cascade site (only one site was funded in 2011). Each site should be a fresh clear-cut or wildfire that has not had any chemical treatment prior to the trials. All plots will be laid out in the spring or fall of 2011. The plan will be to spray the high elevation site in the fall of 2011 and the low elevation site in the spring of 2012. Both sites will be planted in the spring of 2012.

The study design will be completely randomized block design with three replications. Plot size will be 12' x 36' (0.01 acre). Plots will be planted with

10 trees each of ponderosa pine and Douglas-fir in the same plot (two rows of each species). Stock type and seed-lot will be the same for all trees of each species in the study. The stock type will be similar to what is operationally planted on the site. Seedlings are to be provided by the cooperator as well as one or two planters to plant the plots. Planting will be supervised by Thunder Road Resources.

Two spray timings will be utilized in this study (October 2011 – high elevation and March 2012 – low elevation). Treatments will include GF 9999 at 2.1, 4.2, 6.3, and 8.4 ounces a.i. per acre; GF 9999 at 6.3 ounces a.i. per acre combined with Velpar DF at 1.0 pound a.i. per acre; GF 9999 at 6.3 ounces a.i. per acre combined with Accord XRT II at 2.6 pounds a.i. per acre; Velpar DF at 2.5 pounds a.i. per acre; and a control. Plots will be sprayed with a twelve foot boom sprayer at ten gallons per acre. All plots will be sprayed with one timed pass. The boom will be set with 4-9503 nozzles which provide a similar drop size spectrum to a helicopter set up with D-8 nozzles at a 45 degree angle. All chemical will be provided by Dow AgroSciences.

Seedling caliper and height will be measured initially at time of planting. End of season evaluations, which will take place at the end of the first and second growing seasons after treatment, consist of ocular estimation of vegetation percent cover by species for the weeds and brush, measurement of conifer seedling caliper and height, and an ocular rating of conifer damage. Stem volumes will be calculated for analysis. Analysis of variance and multiple comparison procedures for a completely randomized block design will be utilized to analyze data.

2011: The study site was established in October on ground owned and managed by Sierra Pacific Industries near Shingletown, CA. Elevation is approximately 4200 feet. Slope is 0 to 5 percent and of relatively negligible aspect. The site was pre-harvest sprayed with four percent Accord XRT and two percent MSO, logged, and ripped. No further site preparation activities have been conducted.

The trial was staked and sprayed on October 20th.

2012: The trial was planted on March 24th. The trial was planted with Styro 8 Douglas-fir and white fir and Styro 6 ponderosa pine. Seedlings were from Cal Forest Nursery. Ten trees of each species were planted in rows in each plot.

The trial was evaluated on August 12th. Visual assessments of vegetation control and conifer damage were recorded at the time. Initially this trial was slated to have conifer measurements taken at the end of the first and second growing seasons. The trial site was confounded by severe frost damage to the two fir species. It was decided to not measure conifer seedlings in 2012, but to take visual assessments only. The measurements that were to be taken in 2012 will be put off until 2014. The 2013 measurements will occur as planned.

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

The trial site had relatively low vegetative cover (Table 1). Treatment main effects were not significant for percent bare ground ($P<=0.05$), however, they were for percent total cover. The treatments with GF 9999 alone at any rate had greater total cover than the control or operational standard of 3.33 pounds Velpar DF. GF 9999 did not appear to have any effect on bull thistle whatsoever, which was the predominant species present. The best treatment overall was the Velpar DF alone.

While vegetation control appeared to be poor with GF 9999, conifer tolerance was excellent, even though all fir seedlings were seriously injured by frost. Neither survival or damage rating was affected by treatment for any species in the trial (Table 2). Survival was poor for Douglas-fir in general. The damage seen on the Douglas-fir and white fir did not significantly differ from that seen in the control or the operational standard of Velpar DF alone.

It was difficult to gauge the ability of GF 9999 to control competing vegetation due to the inherent low cover on the site. Annual grasses did appear to be reduced although the total presence of grass on the site was low. Conifer tolerance however, appears to be excellent for all species tested. Normally, phytotoxicity from herbicides is enhanced when there is some environmental stress added. There did not appear to be any associated with these treatments. Follow up evaluations should provide a clearer picture.

Product and Rate	% Bare Ground	% Total Cover	% Cover Bull Thist	% Cover Grass	% Cover Squaw Carp	% Cover Snow Berry	% Cover G.L. Manz
3 oz GF 9999	88.3	12.0	10.0	0.7	0.0	0.3	0.0
6 oz GF 9999	86.7	13.3	8.3	1.0	1.3	1.0	0.7
9 oz GF 9999	90.7	10.3	7.0	0.7	0.3	1.7	0.0
12 oz GF 9999	88.3	11.7	4.3	3.3	0.3	3.0	0.3
9 oz GF 9999 + 1.33 lbs Velp DF	90.0	10.0	10.0	0.0	0.0	0.0	0.0
9 oz GF 9999 + 2 qts Acc XRT II	96.7	3.7	0.7	0.0	0.3	1.0	0.7
3.33 lbs Velp DF	97.7	2.3	1.0	0.0	0.0	0.3	0.3
Control	93.3	7.0	1.3	2.3	0.3	1.7	0.3

Table 1. Total percent cover, percent bare ground and percent cover by species for GF 9999 site prep trial 10 months after treatment. All rates are pounds product per acre. Acc = Accord XRT II, Velp = Velpar DF

Product and Rate	White Fir % Survival	P. Pine % Survival	Doug Fir % Survival	White Fir Dam Code	P. Pine Dam Code	Doug Fir Dam Code
3 oz GF 9999	96.7	96.7	60.0	7.0	3.0	8.0
6 oz GF 9999	86.7	100.0	80.0	7.3	2.7	7.7
9 oz GF 9999	90.0	93.3	53.3	7.0	2.7	8.3
12 oz GF 9999	70.0	100.0	60.0	7.7	4.3	8.0
9 oz GF 9999 + 1.33 lbs Velp DF	73.3	96.7	63.3	8.0	4.3	8.0
9 oz GF 9999 + 2 qts Acc XRT II	73.3	100.0	76.7	7.3	2.7	7.3
3.33 lbs Velp DF	90.0	100.0	86.7	7.0	2.7	7.7
Control	80.0	90.0	93.3	7.7	4.3	7.7

Table 2. White fir, ponderosa pine and Douglas-fir percent survival and damage ratings 10 months after treatment. Damage codes: 0 = No Damage, 10 = Dead.