

Sierra Cascade Intensive Forest Management Research Cooperative Proposal 10-01
Milestone VM

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Title: Aminopyralid Site Preparation and Conifer Tolerance

Year Approved: 2010

Executive Summary:

Milestone VM (aminopyralid) is a relatively new product in California. It was registered for use in 2008 for non-crop sites. Currently Dow AgroScience is compiling data in the hope of obtaining a forestry label.

Milestone VM is a pre and post emergent herbicide that controls a wide variety of broadleaf weeds (including legumes) and brush. It is an auxin and has both foliar and soil activity. The residual control is proving to be quite good and the product is an excellent inhibitor of seed germination. It is also showing some unique properties for brush control when tank mixed with other products. It has very low use rates, with maximum label rates at seven ounces per acre (0.1 lb ae/ac).

Previous testing has indicated no conifer tolerance for "over the top" applications, but directed applications around trees appears to be feasible. There is also a strong potential to broaden the spectrum of control when tank mixed with Velpar DF. The major questions surrounding Milestone VM and forestry at this point are regarding conifer tolerance as a site preparation spray and the duration of control by season. Milestone VM might have a fit as a site preparation treatment for some of the chemically intolerant conifers such as sugar pine, cedar,

and redwood, although testing has yet to be done.

The stated objective of this study is to evaluate the effect of aminopyralid rate and timing on vegetation control and conifer tolerance of ponderosa pine and Douglas-fir when applied as a pre-plant site preparation treatment with Milestone VM alone and in combination with Velpar DF compared to Velpar DF as the operational standard.

The study will have two sites, one east side Cascade site and a low elevation west side Cascade site. Each site should be a fresh clear-cut or wildfire that has not had any chemical treatment prior to the trials. The plan will be to spray the east side site in the fall of 2010 and the low elevation site in the spring of 2011. Both sites will be planted in the spring of 2011. The study design will be a completely randomized block design with four replications. 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.

Treatments to be studied include: Milestone VM alone at 0.0625, 0.11, and 0.22 lbs. a.i./acre; Milestone VM at 0.11 lbs. a.i./acre plus Velpar DF at 1.0 a.i./acre, and Velpar

DF alone at 2.5 lbs. a.i./acre. All applications will be applied at 10 gallons per acre at 30 psi. Base line data for conifer height and caliper will be taken at time of planting. End of season evaluations will take place at the end of the first and second growing seasons after treatment and will consist of ocular estimates of vegetation percent cover by species for the weeds and brush, ocular rating of conifer damage, and measurement of conifer seedling height and caliper.

2010: The fall site is located on property owned and managed by Sierra Pacific Industries approximately 10 miles west of Dana, California. Elevation is approximately 4000 feet. Slope is between 0 and 10 percent. The site is a sub-soiled clear-cut that was planted three years ago and has never received any herbicide treatment. As a result, the site is dominated by herbaceous vegetation with relatively poor stocking. Study plots were established in areas with no conifer stocking. Plot size is 12 feet by 36.3 feet (0.01 acre).

The study site was installed and sprayed on October 6, 2010. All treatments were applied with a 12 foot backpack boom sprayer and all plots were sprayed with one timed pass. Sprayer was calibrated prior to application.

2011: The spring site is also located on property owned and managed by Sierra Pacific Industries approximately ten miles south of Dunsmuir, California in the Sacramento Canyon. Elevation of the site is approximately 3000 feet on a west aspect.

The site was pre-harvest sprayed with Chopper prior to logging. After logging, no further chemical or mechanical treatments were conducted.

The spring trial was installed and sprayed on March 11th, 2011. Treatments and application procedures were similar to those used on the fall site.

Plots were planted on both sites in the spring of 2011. Ten ponderosa pine and ten Douglas-fir were planted in each of two rows in every plot. All ponderosa pine were styro 6's and Douglas-fir were styro 8's. The spring site was planted on March 17, 2011 and the fall site was planted on May 6, 2011. All seedlings were initially measured for caliper and height at planting.

The spring and fall sites were evaluated on August 31, 2011. Percent cover for competing vegetation was visually estimated by species as was percent bare ground. Caliper and height were measured for all surviving trees and percent survival was calculated along with stem volume. Terminal bud damage and needle damage were assessed on a scale from 0 to 10 with 0=No Damage and 10=Most Severe.

Data were analyzed using SAS statistical software and analysis of variance with Tukeys HSD procedure for multiple comparisons. Data were analyzed as a completely randomized block design with four replications.

First year results indicated that Milestone VM by itself has extremely good tolerance

on both Douglas-fir and ponderosa pine at all rates tested in these trials at either timing. Vegetation control with Milestone VM by itself was poor. Control improved dramatically with the addition of Velpar DF at 1.33 lbs product per acre. See Tables 1 and 2 for efficacy data.

Percent bare ground was significantly greater for both the Velpar DF treatment at 3.33 lbs product per acre and the 1.33 lbs Velpar DF plus 7 oz of Milestone VM treatment compared to all other treatments and the control in the fall trial. The spring site had very little vegetation occupy the site in the first season after planting. At the end of the first season, percent bare ground in the controls averaged 87.5 percent. As a result, no significant differences were found between treatments regarding percent bare ground.

Annual grasses were controlled very well with the operational standard of 3.33 lbs Velpar DF in the fall having a percent cover of 1.5 percent compared to 52.5 percent in the controls. The result was significantly different from the controls and the lowest rate of Milestone VM by itself ($p < 0.05$). The tank mix of Velpar DF at 1.33 lbs plus Milestone VM at 7 oz did very well having an annual grass percent cover of 16.25 percent, however the result was not significantly different from the control. No significant differences were found on the spring site for annual grass control, but this was due to virtually no annual grass occupying the site.

The main effect of treatment was also significant for prickly lettuce control in the fall, however multiple comparisons between treatments failed to yield any treatments significantly different from each other. The Velpar treatment at 3.33 lbs, Velpar at 1.33 lbs plus 7 oz of Milestone VM and the 14 oz Milestone VM treatment gave good to excellent control (0%, 3.25% & 5.75% cover respectively) compared to 18.75% cover in the controls.

While treatment was determined to be significant regarding snowberry and deerbrush control in the spring, the results appear to be an artifact due to the overall lack of cover for either species. Therefore, the results are not deemed to be real. Similar results were found for yellow nutsedge in the fall trial but also are most likely the result of high variability between replications. No other individual species were significantly affected by treatment.

The ponderosa pine seedlings planted in the spring trial, appeared to suffer from some type of nursery issue, as seedlings suffered an abnormal amount of mortality even in the control plots.

Douglas-fir and ponderosa pine survival, height or stem volume was not significantly affected by treatment in either the spring or the fall trial ($p < 0.05$). Douglas-fir caliper was significantly larger in the treatment with Velpar DF at 3.33 lbs compared to the control trees in the fall. Caliper was not significantly different for Douglas-fir seedlings among any of the chemical treatments. Calipers were significantly

larger for ponderosa pine seedlings treated in the fall with either the Velpar DF alone at 3.33 lbs or 1.33 lbs Velpar DF plus 7 oz of Milestone VM compared to all other treatments with the exception of the 14 oz Milestone VM treatment. Caliper was not significantly affected by treatment in the spring trial. See Tables 3 through 6 for conifer tolerance data.

Stem volume in the fall timing for both Douglas-fir and ponderosa pine was largest with either the 7 oz Milestone VM plus 1.33 lb Velpar DF combination or the Velpar DF by itself at 3.33 lbs. The results were not statistically significant at the $p < 0.05$ level, but the values were very close and the trend is probably real.

Overall, Milestone VM appears to provide insufficient vegetation control by itself. However, in combination with low rates of Velpar DF, control is increased significantly. Ponderosa pine and Douglas-fir both appear to be very tolerant to Milestone VM in either the spring or fall, even up to twice the maximum label rate. No terminal bud or needle damage was noted in either species. The fact that no significant differences existed for seedling caliper, height, stem volume or survival for either Douglas-fir or ponderosa pine between the operational standard of Velpar DF alone at 3.33 lbs compared to the tank mix of 7 oz Milestone VM plus 1.33 lbs Velpar DF suggest that this may be a suitable alternative to straight Velpar, especially when intolerant conifers are involved. The tank mix also provided similar vegetation control. These data

compare well with the analogous trials conducted in the FSC Research Group. Final data will be collected in the fall of 2012 for both timings.

2012: The spring and fall sites were evaluated on August 28, 2012. Percent cover for competing vegetation was visually estimated by species as was percent bare ground cover. Caliper and height were measured for all surviving trees and percent survival was calculated along with stem volume. Terminal bud damage and needle damage were assessed on a scale from 0 to 10 with 0=no damage and 10=most severe.

Data were analyzed using SAS statistical software. Analysis of variance was used to determine significance of the main effects of treatments 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-variant. Vegetation data were analyzed using analysis of variance for the main effects, and multiple comparisons of means were done using Student Newman Kewls least significant difference procedure. Orthogonal contrasts were used to make specific comparisons among treatments.

Because of the low cover values in the spring trial, only total percent cover and percent bare ground were analyzed. Main

effects of treatment were not significantly different between treatments for either total cover or percent bare ground at the end of the second growing season for the spring trial ($P \leq 0.05$). Although not significant, percent bare ground did differ by over 40 percent for the Velpar treatments and the control (Table 8). Percent bare ground in the control ranged from 10 to 80 percent, and this high variability resulted in the treatments not being significant. The Velpar DF alone and Velpar DF plus 7 ounces of Milestone had the highest percent bare ground cover and the lowest percent total cover. The treatments did not significantly differ for percent bare ground or total cover.

The fall treatments analyzed total percent cover, percent bare ground, and downy brome cover (Table 7). Treatment effects were significant for downy brome in the fall ($P \leq 0.05$). Milestone only treatments had significantly more downy brome cover than the operational standard of Velpar DF alone, and the control also had greater downy brome cover than the Velpar DF standard. Treatment effects were not significantly different for total cover. Effect of treatment was significant for percent bare ground. Percent bare ground was highest in the Velpar DF alone treatment and lowest in the Milestone only treatments. The addition of 1.33 pounds Velpar DF to 7 ounces of Milestone significantly increased percent bare ground. The Velpar DF alone had similar percent total cover to the Velpar DF plus Milestone treatment, but the Velpar DF alone a higher percent bare ground. This is primarily due to more downy brome present in the Velpar DF plus Milestone treatment.

The two treatments did not differ significantly in percent bare ground or total cover, but the Velpar DF alone treatment had significantly less downy brome cover than the Velpar DF plus Milestone treatment.

Initial seedling size was significant for ponderosa pine in both the spring and fall trials. Therefore, seedling data had to be adjusted for initial size. Ponderosa pine survival was not affected by treatment in the spring or fall timings ($P \leq 0.05$). The main effect of treatment on height was not significant in the spring, nor were the multiple comparisons (Tables 11 and 12). Treatment differences did occur in the spring for caliper and stem volume, with the highest rate of Milestone and the Velpar DF alone having larger seedlings than the control. In the fall trial, all herbicide treatments resulted in significantly taller seedlings than the controls ($P \leq 0.05$). Contrasts indicated that seedlings were taller in the Velpar DF alone treatment compared to the other herbicide treatments, but differences were small. For both caliper and volume in the fall, all herbicide treatments were significantly larger than the controls. Velpar DF alone had significantly larger seedlings than the Milestone only treatments. Ponderosa pine seedlings were largest in both the spring and fall trials with Velpar DF alone. Ponderosa pine in the spring or fall did not significantly differ in caliper, height, stem volume, or survival for Velpar DF alone compared to the Velpar DF plus Milestone treatment.

Douglas-fir initial seedling size was also significant for both spring and fall trials (Tables 9 and 10). Seedling data again had to be adjusted for initial size. Douglas-fir survival was not significantly affected by treatment for either the spring or fall trial ($P \leq 0.05$). Survival was best on the spring site (Dunsmuir) and fairly poor on the fall site (Dana). There were large differences in survival by treatment in the fall trial, but due to high variability, the results were not significant. Velpar DF alone had the highest survival on the fall site (75%), differences in survival on the spring site were minimal. Douglas-fir caliper, height, and volume were greater in the Milestone only treatments and the Velpar DF alone compared to the controls. Multiple comparisons indicated this effect with the Milestone only treatments was primarily due to the 7 and 14 ounce per acre treatments having larger seedlings. No treatment effects were significant on Douglas-fir caliper, height, or stem volume in the fall trial. Seedlings were largest in the Velpar DF alone treatment but closely followed by the Velpar DF plus Milestone treatment. The lack of significance is most likely due to high variability and heavy mortality. Comparing Velpar DF alone to the Velpar DF plus Milestone treatment yielded no significant differences in survival in either the spring or fall. However, Velpar DF alone in the

spring produced significantly larger and taller seedlings.

Overall, Milestone by itself is not a suitable alternative to Velpar DF for forest site preparation. However, comparable control can be achieved by adding 7 ounces of Milestone to a very low rate of Velpar DF (1.33 pounds product). This is cheaper, but residual carryover into the second year may be less than with Velpar DF alone.

Douglas-fir survival was slightly less with this tank mix compared to Velpar DF alone in both the spring and fall treatments. This can mostly be attributed to less competition with the Velpar DF only treatment, especially in the fall trial. Analogous trials in the Forest Stewardship Council Research Group (FSCRG) had higher Douglas-fir survival for the tank mix. Competition was not as variable between treatments and the results are more likely a result of phytotoxicity. The Velpar DF plus Milestone tank mix did provide larger seedlings in the fall compared to controls and Milestone treatments alone.

All field work and evaluations are completed for this proposal. The complete report and all supporting data are available at the Co-op's office in Redding.

		% Cov	% Cov	% Cov	% Cov	% Cov
TREATMENT	%Bare Ground	Annual Grass	Prickly Lettuce	Deer Brush	Willow Herb	Yellow Nutsedge
4 oz/ac MVM	16.25	60.0	12.0	4.25	2.25	3.25
7 oz/ac MVM	26.25	42.5	15.0	1.25	0.75	4.5
14 oz/ac MVM	40.0	33.75	5.75	1.25	0.5	3.75
7 oz MVM + 1.33 lbs Velp DF/ac	73.75	16.25	3.25	1.0	0.25	1.25
3.33 lbs/ac Velp DF	93.75	1.5	0.0	0.0	0.5	0.0
Control	18.75	52.5	18.75	2.25	1.0	2.5

Table 1. Percent bareground and percent cover by species ten months after treatment for the Fall Milestone VM site preparation trial . MVM=Milestone VM, Velp DF=Velpar DF. All rates amount product per acre.

		% Cov	% Cov	% Cov	% Cov	% Cov	% Cov	% Cov
TREATMENT	%Bare Ground	Ann. Grass	Prickly Lettuce	Deer Brush	Bull Thistle	Snow Berry	Brack. Fern	Yellow Nutsedge
4 oz/ac MVM	92.75	2.5	0.0	0.25	0.0	0.5	2.25	0.75
7 oz/ac MVM	95.75	0.0	0.0	0.0	0.0	1.0	5.0	1.0
14 oz/ac MVM	95.0	0.0	0.0	0.25	0.0	0.0	4.25	1.0
7 oz MVM + 1.33 lbs Velp DF/ac	95.5	0.0	0.25	0.0	0.25	0.0	3.75	0.5
3.33 lbs/ac Velp DF	97.75	0.0	0.0	0.0	0.0	0.25	0.5	0.0
Control	87.5	0.0	0.5	1.5	0.0	0.25	7.5	1.25

Table 2. Percent bareground and percent cover by species five months after treatment for the Spring Milestone VM site preparation trial . MVM=Milestone VM, Velp DF=Velpar DF. All rates amount product per acre.

	Cal	Ht	Stem Vol	Percent	Terminal	Needle
TREATMENT	mm	cm	cm ³	Survival	Bud Rating	Rating
4 oz/ac MVM	3.64	25.04	3.74	92.5	0.0	0.0
7 oz/ac MVM	4.01	27.51	4.69	75.0	0.0	0.0
14 oz/ac MVM	4.06	25.45	4.69	95.0	0.0	0.0
7 oz MVM + 1.33 lbs Velp DF/ac	4.44	26.12	5.59	87.5	0.0	0.0
3.33 lbs/ac Velp DF	4.58	25.14	5.69	92.5	0.0	0.0
Control	3.41	22.82	2.88	90.0	0.0	0.0

Table 3. Douglas-fir measurements ten months after treatment for the Fall Milestone VM site preparation trial . MVM=Milestone VM, Velp DF=Velpar DF. All rates amount product per acre.

	Cal	Ht	Stem Vol	Percent	Terminal	Needle
TREATMENT	mm	cm	cm ³	Survival	Bud Rating	Rating
4 oz/ac MVM	5.55	33.23	11.49	97.5	0.0	0.0
7 oz/ac MVM	5.61	34.38	12.16	100.0	0.0	0.0
14 oz/ac MVM	5.85	34.22	12.41	92.5	0.0	0.0
7 oz MVM + 1.33 lbs Velp DF/ac	5.36	31.7	9.65	100.0	0.0	0.0
3.33 lbs/ac Velp DF	5.48	32.58	11.31	100.0	0.0	0.0
Control	5.37	32.18	10.36	95.0	0.0	0.0

Table 4. Douglas-fir measurements five months after treatment for the Spring Milestone VM site preparation trial . MVM=Milestone VM, Velp DF=Velpar DF. All rates amount product per acre.

	Cal	Ht	Stem Vol	Percent	Terminal	Needle
TREATMENT	mm	cm	cm ³	Survival	Bud Rating	Rating
4 oz/ac MVM	4.69	16.92	4.03	97.5	0.0	0.0
7 oz/ac MVM	4.68	18.44	4.21	92.5	0.0	0.0
14 oz/ac MVM	5.10	16.41	4.62	95.0	0.0	0.3
7 oz MVM + 1.33 lbs Velp DF/ac	5.57	20.43	6.65	95.0	0.0	0.0
3.33 lbs/ac Velp DF	5.61	17.53	5.77	97.5	0.0	0.0
Control	4.59	20.45	4.65	92.5	0.0	0.0

Table 5. Ponderosa pine measurements ten months after treatment for the Fall Milestone VM site preparation trial . MVM=Milestone VM, Velp DF=Velpar DF. All rates amount product per acre.

	Cal	Ht	Stem Vol	Percent	Terminal	Needle
TREATMENT	mm	cm	cm ³	Survival	Bud Rating	Rating
4 oz/ac MVM	5.79	20.29	7.04	72.50	0.0	0.0
7 oz/ac MVM	6.29	24.01	9.99	52.50	0.0	0.0
14 oz/ac MVM	5.83	18.7	6.79	72.5	0.0	0.0
7 oz MVM + 1.33 lbs Velp DF/ac	5.7	19.92	6.83	70.0	0.0	0.0
3.33 lbs/ac Velp DF	6.07	21.38	8.33	70.0	0.0	0.0
Control	5.68	21.38	7.59	62.5	0.0	0.0

Table 6. Ponderosa pine measurements five months after treatment for the Spring Milestone VM site preparation trial . MVM=Milestone VM, Velp DF=Velpar DF. All rates amount product per acre.

			% Cov	% Cov	% Cov	% Cov	% Cov
TREATMENT	% Bare Ground	% Total Cover	Annual Grass	Prickly Lettuce	Deer Brush	Willow Herb	Yellow Nutsedge
4 oz/ac MVM	9.0	93.2	15.5	6.8	2.0	1.8	4.0
7 oz/ac MVM	8.8	90.5	16.0	13.2	1.2	1.2	4.5
14 oz/ac MVM	12.5	94.5	7.5	10.8	1.8	0.8	3.0
7 oz MVM + 1.33 lbs Velp DF/ac	28.8	66.0	2.5	12.5	0.0	1.0	1.2
3.33 lbs/ac Velp DF	43.8	62.2	0.8	29.5	0.0	1.0	0.0
Control	19.0	80.2	15.0	8.8	4.8	0.8	1.5

Table 7. Percent bareground and percent cover by species 22 months after treatment for the Fall Milestone site preparation trial . MVM=Milestone, Velp DF=Velpar DF. All rates amount product per acre.

			% Cov	% Cov	% Cov	% Cov	% Cov	% Cov	% Cov
TREATMENT	% Bare Ground	% Total Cover	Ann. Grass	Prickly Lettuce	Deer Brush	Bull Thistle	Snow Berry	Brack. Fern	Yellow Nutsedge
4 oz/ac MVM	47.5	46.2	8.0	7.8	0.2	0.5	0.2	10.2	2.2
7 oz/ac MVM	61.2	30.2	2.5	6.0	1.0	0.8	0.8	14.8	2.2
14 oz/ac MVM	66.2	31.2	3.2	4.5	0.8	0.5	0.0	17.2	3.2
7 oz MVM + 1.33 lbs Velp DF/ac	83.0	17.5	1.8	3.0	0.8	0.5	1.2	8.5	1.8
3.33 lbs/ac Velp DF	85.0	14.2	2.0	4.0	0.5	0.2	0.0	6.0	0.8
Control	48.8	47.8	8.8	15.8	2.0	0.8	0.5	16.8	3.2

Table 8. Percent bareground and percent cover by species 17 months after treatment for the Spring Milestone site preparation trial . MVM=Milestone, Velp DF=Velpar DF. All rates amount product per acre.

	Cal	Ht	Stem Vol	Percent	Terminal	Needle
TREATMENT	mm	cm	cm³	Survival	Bud Rating	Rating
4 oz/ac MVM	5.0	28.7	7.6	52.5	0.0	0.0
7 oz/ac MVM	5.3	28.9	8.7	25.0	0.0	0.0
14 oz/ac MVM	5.7	27.5	10.8	30.0	0.0	0.0
7 oz MVM + 1.33 lbs Velp DF/ac	5.5	28.5	10.5	57.5	0.0	0.0
3.33 lbs/ac Velp DF	6.2	25.1	11.5	75.0	0.0	0.0
Control	4.1	25.0	5.0	50.0	0.0	0.0

Table 9. Douglas-fir measurements 22 months after treatment for the Fall Milestone site preparation trial .
MVM=Milestone, Velp DF=Velpar DF. All rates amount product per acre. .

	Cal	Ht	Stem Vol	Percent	Terminal	Needle
TREATMENT	mm	cm	cm³	Survival	Bud Rating	Rating
4 oz/ac MVM	10.6	46.7	59.1	95.0	0.0	0.0
7 oz/ac MVM	11.8	52.3	88.2	80.0	0.0	0.0
14 oz/ac MVM	11.4	48.8	72.1	82.5	0.0	0.3
7 oz MVM + 1.33 lbs Velp DF/ac	10.5	45.3	54.0	87.5	0.0	0.0
3.33 lbs/ac Velp DF	11.9	50.8	89.2	92.5	0.0	0.0
Control	8.8	42.6	39.5	85.0	0.0	0.0

Table 10. Douglas-fir measurements 17 months after treatment for the Spring Milestone site preparation trial .
MVM=Milestone, Velp DF=Velpar DF. All rates amount product per acre.

	Cal	Ht	Stem Vol	Percent	Terminal	Needle
TREATMENT	mm	cm	cm³	Survival	Bud Rating	Rating
4 oz/ac MVM	7.5	26.5	19.7	85.0	0.0	0.0
7 oz/ac MVM	7.0	26.1	14.4	85.0	0.0	0.0
14 oz/ac MVM	8.0	26.6	20.9	90.0	0.0	0.0
7 oz MVM + 1.33 lbs Velp DF/ac	9.5	31.5	32.1	92.5	0.0	0.5
3.33 lbs/ac Velp DF	9.9	31.3	35.8	97.5	0.0	0.0
Control	6.1	24.8	11.2	87.5	0.0	0.0

Table 11. Ponderosa pine measurements 22 months after treatment for the Fall Milestone site preparation trial . MVM=Milestone, Velp DF=Velpar DF. All rates amount product per acre.

	Cal	Ht	Stem Vol	Percent	Terminal	Needle
TREATMENT	mm	cm	cm³	Survival	Bud Rating	Rating
4 oz/ac MVM	13.6	40.7	87.0	70.0	0.0	0.0
7 oz/ac MVM	14.5	45.2	104.5	52.5	0.0	0.0
14 oz/ac MVM	14.7	40.6	94.3	72.5	0.0	0.0
7 oz MVM + 1.33 lbs Velp DF/ac	14.1	38.1	85.2	67.5	0.0	0.0
3.33 lbs/ac Velp DF	15.6	42.0	110.5	70.0	0.0	0.0
Control	11.4	37.0	57.5	60.0	0.0	0.0

Table 12. Ponderosa pine measurements 17 months after treatment for the Spring Milestone site preparation trial . MVM=Milestone, Velp DF=Velpar DF. All rates amount product per acre.