# 2003 Lassen County Weed Research Report

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This is a report of weed control experiments field tested in Lassen County in 2003. This publication includes research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed herein have been registered. Pesticides must be registered by appropriate federal and state agencies before they can be recommended.

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**The authors would like to specially thank all landowners who cooperated on experiments. Many cooperators donated valuable land, time, and equipment to make this research possible.**

# Herbicides and Weeds Used the Report

## Herbicides

| Common Name | Product used in experiments |
|---|---|
| chlorsulfuron | Telar® |
| clopyralid | Transline™ |
| dicamba | Banvel® |
| diflufenzopyr + dicamba | Distinct® |
| diuron | Karmex DF |
| glyphosate | Round-up Ultra® |
| hexazinone | Velpar® |
| imazamox | Raptor® |
| imazapic | Plateau® |
| imazethapyr | Pursuit® |
| metribuzin | Sencor 75DF® |
| paraquat | Gramoxone Max® |
| pro-carbazone-sodium | Olympus |
| triclopyr | Garlon 4A® |
| 2,4-DB | Butyrac 200® |
| 2,4-D + glyphosate | Landmaster II® |
| 2,4-D ester | Weedone LV6 or 2,4-D LV4® |

## Weeds

| Common Name | Scientific Name |
|---|---|
| Bulbous bluegrass | *Poa bulbosa* L. |
| Canada thistle | *Cirsium arvense* (L.) Scop. |
| common mallow | *Malva neglecta* Wallr. |
| dandelion | *Taraxacum officinale* Weber in Wiggers |
| downy brome | *Bromus tectorum* L. |
| foxtail barley | *Hordeum jubatum* L. |
| halogeton | *Halogeton glomeratus* (Stephen ex Bieb.) C.A. Mey |
| hare barley | *Hordeum leporinum* Link |
| Japanese brome | *Bromus japonicus* Thunb. |
| medusahead | *Taeniatherum caput-medusae* (L.) Nevski |
| perennial pepperweed or tall whitetop | *Lepidium latifolium* L. |
| redstem filaree | *Erodium cicutarium* (L.) L`Her. ex Ait. |
| Russian knapweed | *Centaurea repens* L. |
| prickly lettuce | *Lactuca seriola* L. |
| purslane | *Porulaca oleracea* L. |
| shepards-purse | *Capsella bursa-pastoris* (L.) Medik. |
| Scotch thistle | *Onopordum acanthium* L. |
| tansy mustard | *Descurainia pinnata* (Walt.) Britt. |
| tumble mustard | *Sisymbrium altissimum* L. |
| clasping pepperweed | *Lepidium perfoliatum* L. |

# 2002 Lassen County Weed Research Report
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# The Effect of Mowing Followed by Fall Herbicide Treatment on Perennial Pepperweed (Tall Whitetop) Control

**Introduction**: Perennial pepperweed is a noxious weed that reproduces via underground roots and seed. Research by Mark Renz (former UC Davis graduate student) suggests applying herbicides to perennial pepperweed re-growth after plants are mowed often improves herbicide control. This study tested the feasibility of Mark's mowing + herbicide technique in Lassen County. Perennial pepperweed plants were mowed in early August at peak flowering, and herbicides were applied in the fall to re-growth. Most mowed shoots produced new growth.

**Study Director**: Rob Wilson

**Cooperator**: KSUE Radio (located at the Radio Tower near McDonalds)

**Date and Time of Herbicide Applications**:
Herbicides were applied on October 15, 2001 at 11:00 am; Temperature 76 °F

**Plot Size and Application Method**: Plot size was 10 X 30 ft. The experiment was arranged in a randomized complete block design with four replications. Herbicides were applied at 20 gallons per acre using a 10 ft boom $CO_2$ backpack sprayer.

**Weather, Precipitation, and Soil Type/Moisture**: The study site historically receives 9 inches of precipitation a year. The soil is an alkali sandy loam. The soil surface and sub-surface were dry at the time of application.

**Plant Community Present at the Time of Application**: The site is heavily infested with perennial pepperweed with sporadic Canada thistle patches. Approximately, 60% of the perennial pepperweed plants were flowering and 40% were rosettes at the time of application. All Canada thistle plants were in the rosette stage. Favorable vegetation within the test site consisted of creeping wildrye, smooth brome, and inland saltgrass.

**Data Collected**: Evaluations were made on July 10, 2002 (9 MAT) and June 24, 2003 (20 MAT) in three 1 $m^2$ quadrats in each plot to determine herbicide effects on perennial pepperweed and favorable perennial grasses. Perennial pepperweed shoot density and perennial grass cover were the plant variables measured at each evaluation.

**Results**: All the herbicide treatments greatly reduced perennial pepperweed density nine months after treatment (9 MAT), but Telar and Plateau at 12 oz/A were the only herbicides to maintain good control 20 MAT. Telar at all rates reduced perennial pepperweed density by more than 95% 20 MAT. All fall treatments caused minimal injury to perennial grasses within the test site. Twenty MAT, perennial grass cover actually increased in plots treated with Telar at 1.5 oz/A compared to the control. For a complete listing of the experiment results see Table 1.

**Table 1. The effect of combining summer mowing with fall herbicides on perennial pepperweed shoot density and perennial grass cover.**

| Herbicide Treatment | Product Rate | 07/10/02 – 9 MAT | | 06/24/03- 20 MAT | |
|---|---|---|---|---|---|
| | | Perennial pepperweed shoot density | Perennial grass % cover | Perennial pepperweed shoot density | Perennial grass % cover |
| 1. Untreated Control | ----- | 15a* | 17a | 21a | 11d |
| 2. 2,4-D- 4 SC<br>non-ionic surfactant | 1.0 qt/A<br>0.25 % v/v | 3b | -- | 13b | -- |
| 3. 2,4-D- 4 SC<br>non-ionic surfactant | 2.0 qt/A<br>0.25 % v/v | 4b | 15a | 12b | 23bcd |
| 4. Distinct- 70 DF<br>non-ionic surfactant<br>ammonium sulfate | 6.0 oz/A<br>0.25 % v/v<br>5 lb/100 gal | 3bc | 41a | 9bc | 43abc |
| 5. Round-up- 4 L<br>ammonium sulfate | 4.0 qt/A<br>10 lb/100 gal | 2bc | 27a | 11b | 15cd |
| 6. Telar- 75 DF<br>non-ionic surfactant | 0.75 oz/A<br>0.25 % v/v | 0c | 45a | 1d | 46ab |
| 7. Telar- 75 DF<br>non-ionic surfactant | 1.5 oz/A<br>0.25 % v/v | 0c | 38a | 0d | 69a |
| 8. Plateau- 2 SL<br>methylated seed oil<br>ammonium sulfate | 6.0 fl oz/A<br>1.0 pt/A<br>10 lb/100 gal | 1bc | 41a | 13b | 33bcd |
| 9. Plateau- 2 SL<br>methylated seed oil<br>ammonium sulfate | 12.0 fl oz/A<br>1.0 pt/A<br>10 lb/100 gal | 1bc | 23a | 5cd | 29bcd |
| 10. 2,4-D- 4 SC<br>Round-up- 4L<br>non-ionic surfactant<br>ammonium sulfate | 1.0 qt/A<br>2.0 qt/A<br>0.25 % v/v<br>10 lb/100 gal | 3bc | -- | -- | -- |
| 11. Landmaster II- 2.2L<br>non-ionic surfactant | 4.0 qt/A<br>0.25 % v/v | 3bc | -- | -- | -- |

* - means followed by the same letter do not significantly differ (P= .05)

# Perennial Pepperweed (Tall Whitetop) Control with Herbicides Applied at the Rosette and Flower-bud Stage

**Introduction**: Perennial pepperweed is currently Lassen Counties' # 1 weed problem. The invasive plant spreads via underground roots and seed forming near monoculture populations within wildlife areas, rangeland, irrigated cropland, and waste areas. This experiment examined several herbicide treatments applied at the rosette and flower-bud stage to determine the best application time/herbicide combination for perennial pepperweed control before flowering. The plot area was mowed in early April (prior to perennial pepperweed green up) to reduce the amount of litter and facilitate better spray coverage at each herbicide application.

**Study Director**: Rob Wilson

**Cooperator**: CDFG Honey Lake Wildlife area

**Date and Time of Herbicide Applications**:
Rosette Application- April 16th, 2002 at 8:00 am; Temperature 44 degrees F
Flower-bud Application- May 30th, 2002 at 10:30 am; Temperature 85 degrees F

**Plot Size and Application Method**: Plot size was 10 X 30 ft. The experiment was arranged in a randomized complete block with four replications. Herbicides were applied at 20 gallons per acre using a 10 ft boom $CO_2$ backpack sprayer.

**Weather, Precipitation, and Soil Type/Moisture**: The study site historically receives approx. 6 inches of precipitation a year; the soil is a sodic, clay loam. The soil surface was dry and sub-surface was moist at the time of the rosette application; soil surface and sub-surface were dry at the time of the flower-bud application.

**Plant Community Present at the Time of Application**: The first three replications were heavily infested with perennial pepperweed. The fourth replication was moderately infested with perennial pepperweed and had considerable tall wheatgrass cover.

**Data Collected**: Evaluations were made in three 1 $m^2$ quadrats in each plot to determine herbicide effects on perennial pepperweed and tall wheatgrass. Perennial pepperweed shoot density and tall wheatgrass cover were measured on June 26, 2002 (2 MAT), July 29, 2002 (3 MAT), September 19, 2002 (5 MAT), and June 25, 2003 (14 MAT) in plots sprayed at the rosette stage. In plots sprayed at the flowerbud stage, perennial pepperweed density and tall wheatgrass cover were evaluated on July 29, 2002 (2 MAT), September 19, 2002 (4 MAT), and June 25, 2003 (13 MAT). An additional evaluation will be taken spring of 2004.

**Results**: Overall, herbicide treatments applied at the flower-bud stage provided better pepperweed control compared to treatments applied at the rosette stage (Figure 1). Telar, 2,4-D, and Plateau were the best treatments applied at the rosette stage (Figure 2). Round-up was not effective when applied at the rosette stage and failed to reduce perennial pepperweed density compared to the untreated control. Telar and Plateau at all rates were the best treatments applied at the flower-bud stage reducing perennial pepperweed density by more than 90% compared to the control 13 MAT (Figure 3). 2,4-D provided good control of perennial pepperweed 5 MAT, but perennial pepperweed densities rebounded 13 MAT suggesting yearly 2,4-D applications are needed to control perennial pepperweed. Unlike the rosette application, Round-up applied at the flower-bud stage provided good control of perennial pepperweed 13 MAT. See Table 1 for a complete listing of herbicide treatments applied at the rosette stage and Table 2 for all herbicide treatments applied at the flower-bud stage.

**Table 1. The effect of herbicides applied at the rosette stage on perennial pepperweed density and tall wheatgrass cover.**

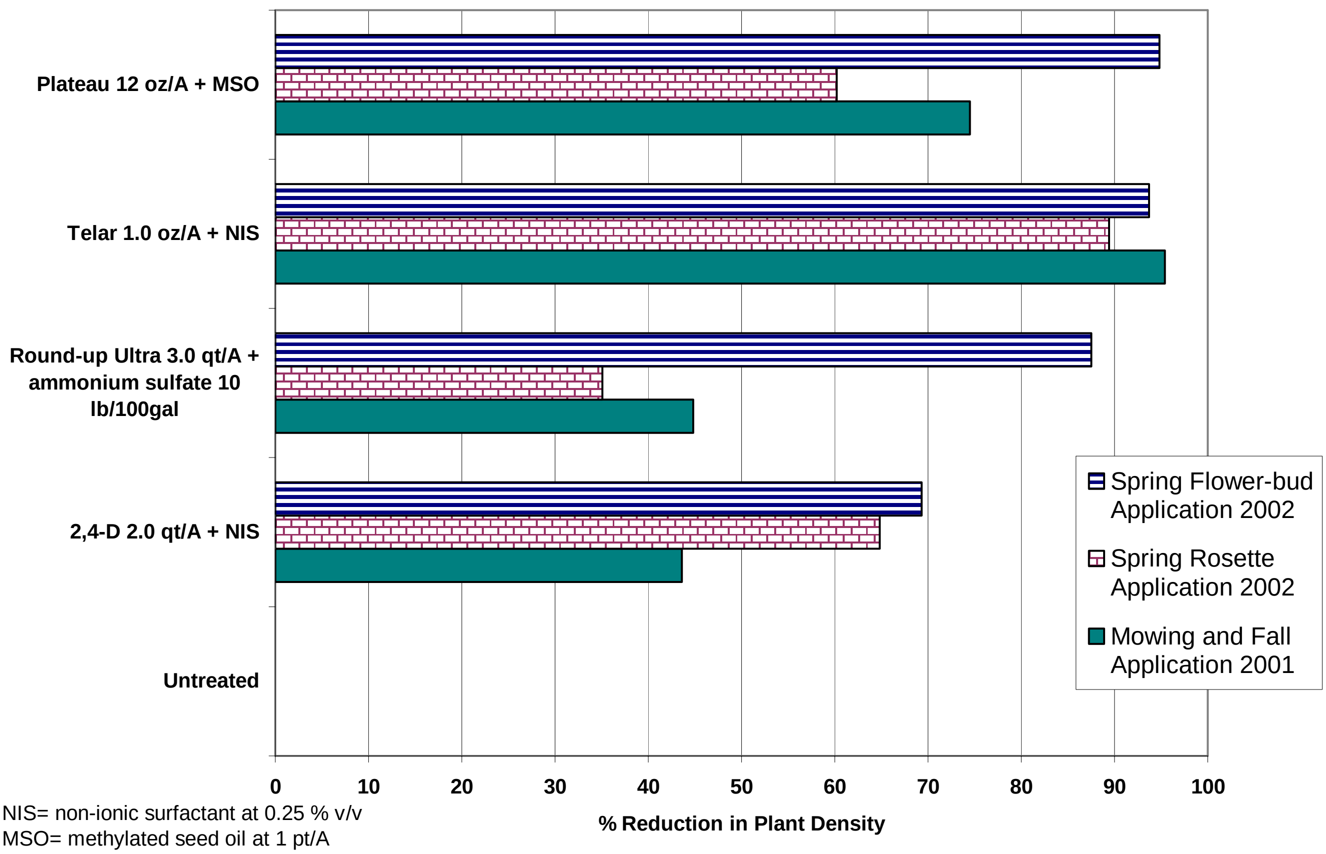
| Herbicide Treatment | Product Rate | 07/29/02 3 MAT | | 09/19/02 5 MAT | | 06/25/03 14 MAT | |
|---|---|---|---|---|---|---|---|
| | | P. Pepper-weed density | T. wheat-grass % cover | P. Pepper-weed density | T. wheat-grass % cover | P. Pepper-weed density | T. wheat-grass % cover |
| 1. Untreated Control | ----- | 22a | 19a | 18a | 12ab | 19a | 16ab |
| 2. Telar- 75 DF<br>non-ionic surfactant | 1.0 oz/A<br>0.25 % v/v | 2b | 19a | 2c | 12ab | 2c | 33a |
| 3. 2,4-D- 4 SC<br>non-ionic surfactant | 2.0 qt/A<br>0.25 % v/v | 7b | 14a | 7bc | 10ab | 7bc | 19ab |
| 4. Plateau- 2 SL<br>methylated seed oil<br>ammonium sulfate | 8.0 fl oz/A<br>1.0 pt/A<br>10 lb/100 gal | 9b | 14a | 4c | 9ab | 9b | 17ab |
| 5. Plateau- 2 SL<br>methylated seed oil<br>ammonium sulfate | 12.0 fl oz/A<br>1.0 pt/A<br>10 lb/100 gal | 7b | 20a | 3c | 16a | 8bc | 37a |
| 6. Round-up- 4L<br>ammonium sulfate | 3.0 qt/A<br>10 lb/100 gal | 19a | 0a | 13ab | 0b | 12ab | 5b |

**Table 2. The effect of herbicides applied at the flowerbud stage on perennial pepperweed density and tall wheatgrass % cover.**

| Herbicide Treatment | Product Rate | 09/19/02- 4 MAT | | 06/25/03- 13 MAT | |
|---|---|---|---|---|---|
| | | perennial pepperweed shoot density | tall wheatgrass % cover | Perennial pepperweed shoot density | Tall wheatgrass % cover |
| 1. Untreated Control | ----- | 19a | 5abc | 34a | 10e-h |
| 2. 2,4-D- 4 SC<br>non-ionic surfactant | 1.0 qt/A<br>0.25 % v/v | 7c-f | 9abc | 14de | 29abc |
| 3. 2,4-D- 4 SC<br>non-ionic surfactant | 2.0 qt/A<br>0.25 % v/v | 6c-f | 5abc | 10ef | 24a-f |
| 4. Distinct- 70 DF<br>non-ionic surfactant<br>ammonium sulfate | 6.0 oz/A<br>0.25 % v/v<br>5 lb/100 gal | 11a-e | 4abc | 25b | 17c-g |
| 5. Round-up- 4 L<br>ammonium sulfate | 3.0 qt/A<br>10 lb/100 gal | 10b-e | 0c | 4fgh | 0h |
| 6. Telar- 75 DF<br>non-ionic surfactant | 0.75 oz/A<br>0.25 % v/v | 0f | 8abc | 3gh | 39a |
| 7. Telar- 75 DF<br>non-ionic surfactant | 1.0 oz/A<br>0.25 % v/v | 1f | 3bc | 2gh | 21b-f |
| 8. Telar- 75 DF<br>non-ionic surfactant | 2.0 oz/A<br>0.25 % v/v | 1f | 5abc | 0h | 36ab |
| 9. Plateau- 2 SL<br>methylated seed oil<br>ammonium sulfate | 8.0 fl oz/A<br>1.0 pt/A<br>10 lb/100 gal | 4ef | 6abc | 4gh | 27a-d |
| 10. Plateau- 2 SL<br>methylated seed oil<br>ammonium sulfate | 12.0 fl oz/A<br>1.0 pt/A<br>10 lb/100 gal | 5def | 13a | 2gh | 26a-e |

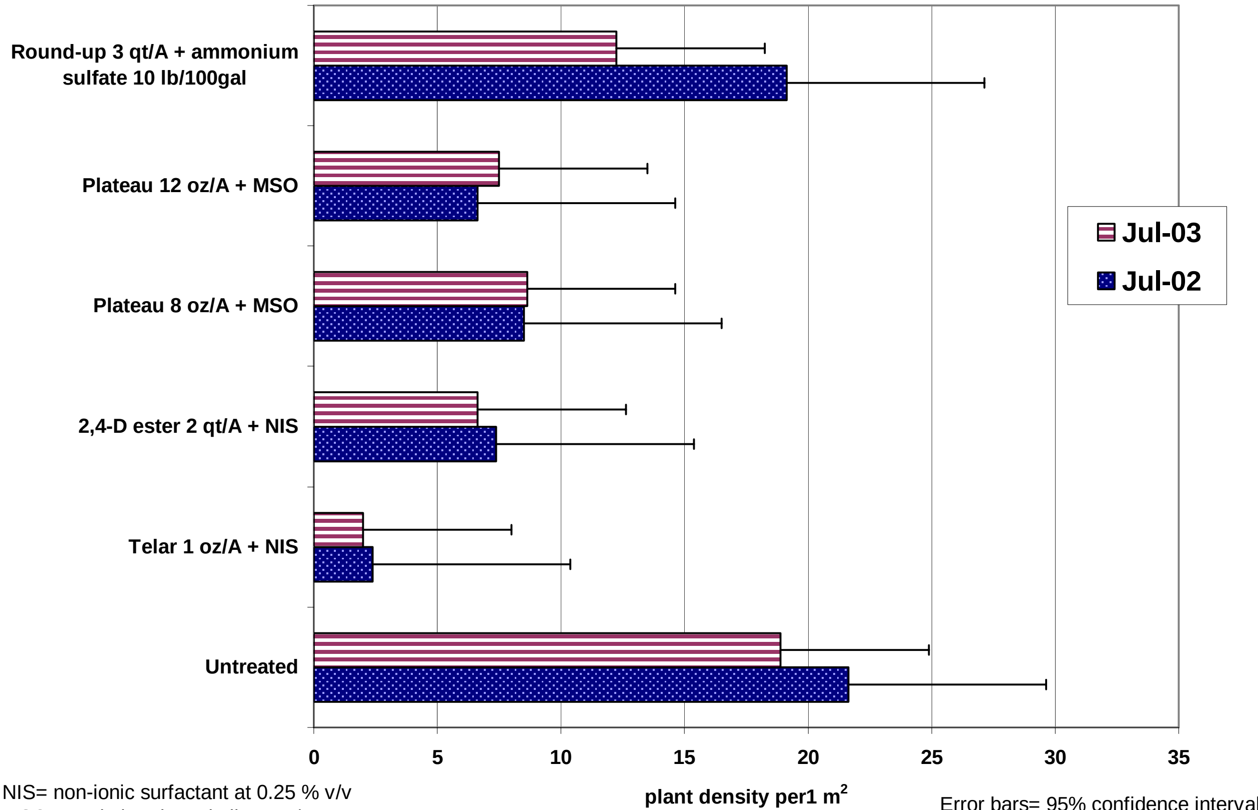
| | | | | | |
|---|---|---|---|---|---|
| 11. Landmaster II- 2.2L<br>non-ionic surfactant<br>ammonium sulfate | 3.0 qt/A<br>0.25 % v/v<br>10 lb/100 gal | 11a-e | 7abc | 7fg | 3gh |
| 12. Olympus- 70 DF<br>non-ionic surfactant | 0.9 oz/A<br>0.25 % v/v | 16ab | 2bc | 27b | 9fgh |
| 13. Olympus- 70 DF<br>non-ionic surfactant | 1.8 oz/A<br>0.25 % v/v | 15abc | 6ab | 22bc | 25a-f |
| 14. Garlon- 4 EC<br>Round-up- 4 L<br>non-ionic surfactant | 0.5 % v/v<br>0.5 % v/v<br>0.25 % v/v | 13a-d | 3bc | 18cd | 11d-h |

**Figure 1. The Effect of Herbicide and Application Time on Perennial Pepperweed Density July 2003**




NIS= non-ionic surfactant at 0.25 % v/v
MSO= methylated seed oil at 1 pt/A

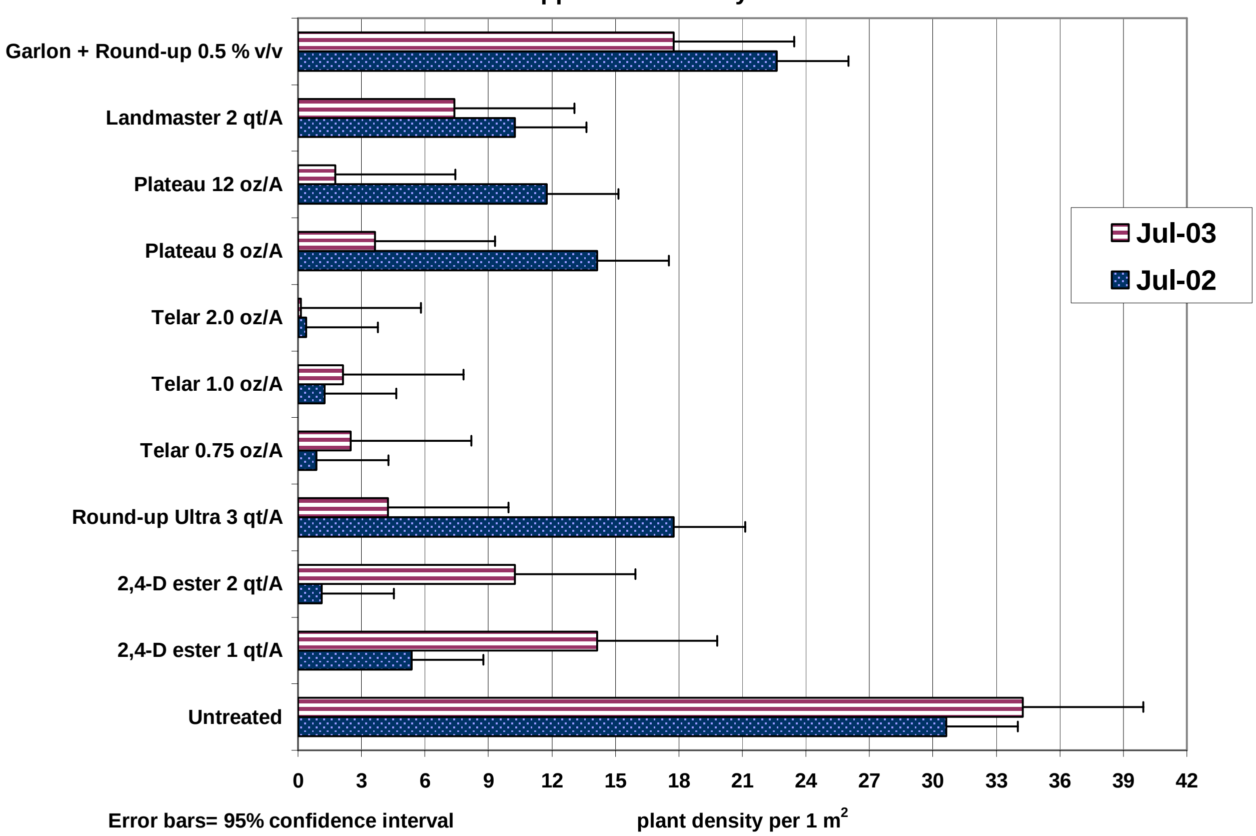
**Figure 2. The Effect of Herbicides Applied at the Rosette Stage in 2002 on Perennial Pepperweed Density**




NIS= non-ionic surfactant at 0.25 % v/v
MSO= methylated seed oil at 1pt/A

Error bars= 95% confidence interval

**Figure 3. The Effect of Herbicides Applied at the Flower-bud Stage in 2002 on Perennial Pepperweed Density**




Error bars= 95% confidence interval

# Russian Knapweed Control in Non-crop Areas

**Introduction**: Russian knapweed is becoming an increasing problem in Northeast California, and unfortunately few control methods exist. Spring and summer herbicide treatments are usually un-effective at controlling Russian knapweed, so CDFA regional biologists are seeking other control methods. Recently, researchers have obtained favorable results using late fall herbicide treatments applied after plant senescent. This experiment examined the use of a late fall herbicide application to control Russian knapweed.

**Study Director**: Rob Wilson

**Cooperator**: Richard Parker

**Date and Time of Herbicide Application**: October 11, 2002 at 10:00 am;
Temperature 67 degrees F

**Plot Size and Application Method**: Plot size was 6.5 X 20 ft. The experiment was arranged in a randomized complete block design with four replications. Herbicides were applied at 20 gallons per acre using a 6.5 ft boom $CO_2$ backpack sprayer.

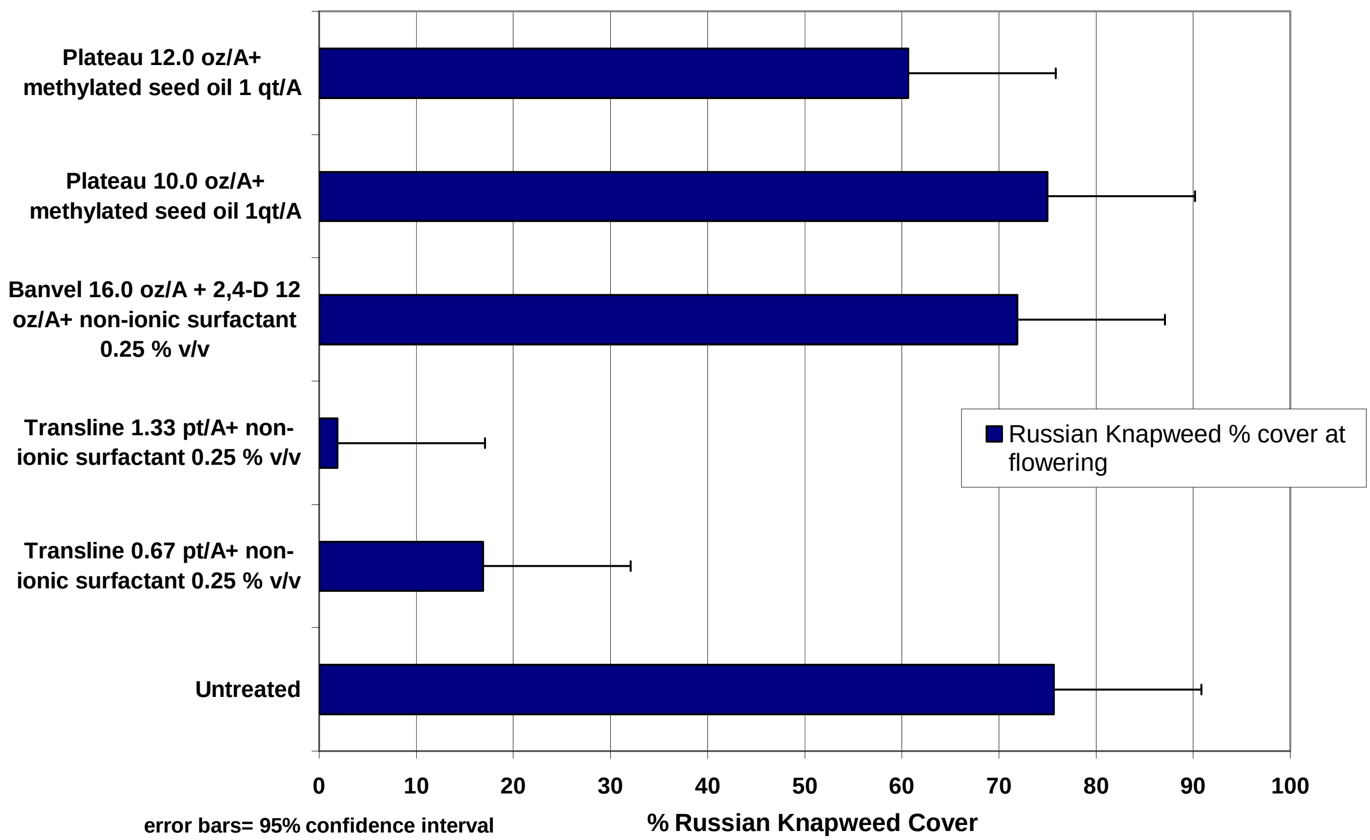
**Soil Type and Moisture**: loamy sand. The soil surface and sub-surface was dry at the time of herbicide application.

**Plant Community Present at the Time of Application**: The site is heavily infested with Russian knapweed and sporadic Canada thistle plants. The majority of Russian knapweed plants had completely senesced, although a few green rosettes were growing at the time of herbicide application.

**Data Collected**: An evaluation was made on June 27, 2003 (8 MAT) when Russian knapweed plants were beginning to flower. Russian knapweed density and % cover were measured in three 1 $m^2$ quadrats in each plot.

**Results Summary**: Transline was the only herbicide that reduced Russian knapweed density. Transline at 2/3 pt/A (maximum rate allowed in CA) reduced Russian knapweed density by 78% compared to the untreated control. Results suggest Transline applied in the fall is an effective option for controlling Russian knapweed. See Figure 1 for a complete listing of results.

**Figure 1. The Effect of Herbicides Applied in October 2002 on Russian Knapweed Cover July 2003**



# Scotch Thistle Control in Non-crop Areas

**Introduction:** Scotch thistle is a continual weed problem for land managers in Northeast California. The weed is primarily a pest in dryland range and non-crop areas. Scotch thistle's high seed production, long seed viability, and ability to grow in arid conditions make it a difficult to control. This experiment examined several herbicides applied at two application times to find effective herbicide treatments for controlling Scotch thistle.

**Study Director**: Rob Wilson

**Cooperator**: Bob Thompson

**Date and Time of Herbicide Application**: Rosette application- April 16, 2003 at 11:00 am; air temperature 50°F. Late Bolting application- June 18, 2003 at 10:00 am; air temperature 80°F.

**Plot Size and Application Method**: Plot size was 10 X 30 ft. The experiment was arranged in a randomized complete block with three replications. Herbicides were applied at 20 gallons per acre using a 10 ft boom $CO_2$ backpack sprayer.

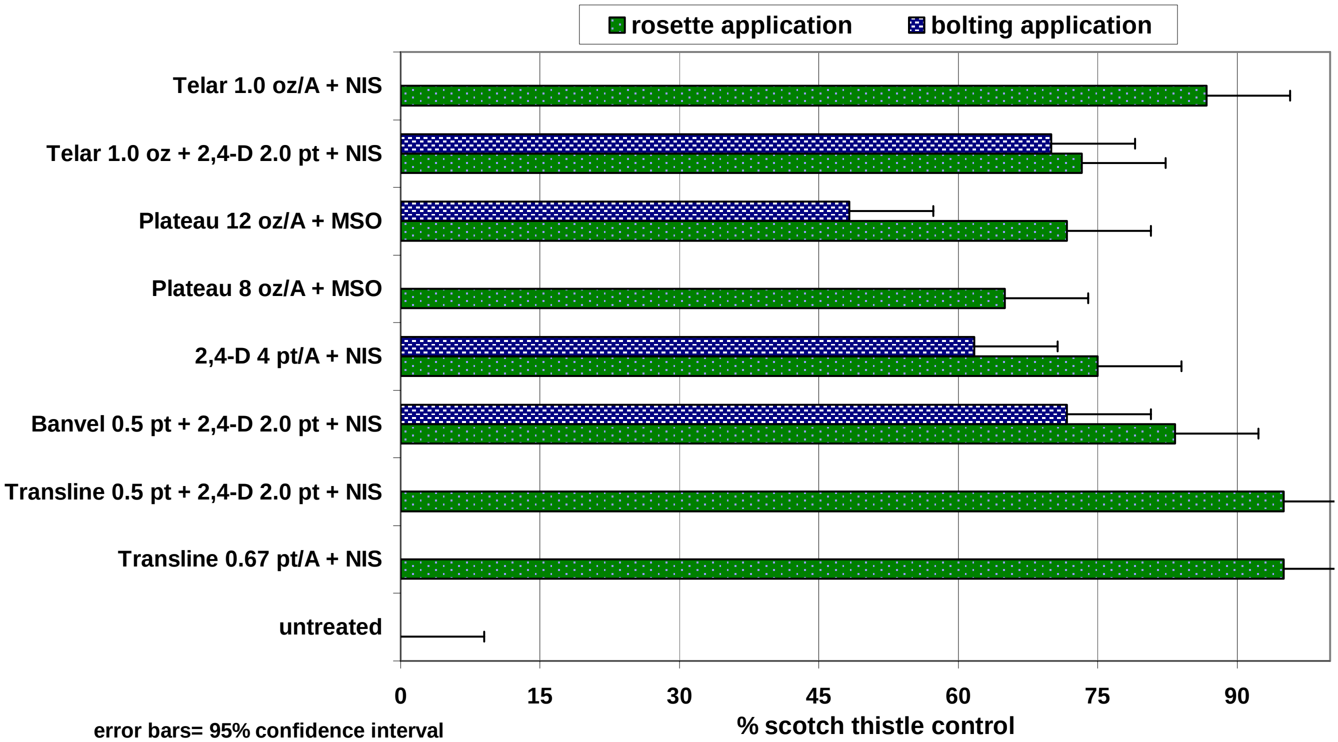
**Soil Type and Moisture**: sandy loam. The soil surface and sub-surface were moist at the time of the rosette application and dry at the time of the bolting application. Herbicides applied at the rosette stage received a 1/2 inch rain 20 hrs following application.

**Plant Community Present at the Time of Application**: The site is heavily infested with Scotch thistle. Other vegetation included medusahead, downy brome, bulbous bluegrass, alfalfa, fescue, and sporadic squarosse knapweed. Scotch thistle rosette diameters ranged from 6 inches to 2 feet at the time of the rosette application. Bolting scotch thistle plants were 2-5 ft tall and approximately 20% of the stems had flower-buds at the time of the bolting application.

**Data Collected**: Percent control evaluations were made on June 18, 2003 for the rosette application and July 30, 2003 for both application times. Scotch thistle density and % cover were not measured due to irregular Scotch thistle density in several plots.

**Results Summary**: Results suggest treating at the rosette stage is the best time to control Scotch thistle (Figure 1). Transline, Transline + 2,4-D, and Telar applied at the rosette stage were the best herbicide treatments providing $\geq$ 85 % Scotch thistle control compared to untreated plots. Banvel + 2,4-D and 2,4-D alone applied at the rosette stage controlled $\geq$ 75 % of the scotch thistle plants. Herbicides applied at the bolting stage provided mediocre control. Even though plants died within a month after treatment, several plants treated at the bolting stage produced viable seed. Banvel + 2,4-D or Telar + 2,4-D were the best treatments applied at the bolting stage.

**Figure 1. The Effect of Herbicide and Application time on Scotch Thistle Control 07/30/03**




error bars= 95% confidence interval

NIS= non-ionic surfactant at 0.25% V/V; MSO= methylated seed oil at 1.0 qt/A

# Weed Control in Established Alfalfa/Orchardgrass Mix

**Introduction**: Alfalfa/grass hay is becoming more popular in recent times due to increased demand from horse owners. Although alfalfa grass mixtures are relatively weed resistant, winter annual and perennial weeds can become a problem causing significant price reduction. Weeds in alfalfa/grass mixtures are difficult to control due to a lack of herbicide choice. This experiment examined potential herbicide options for early spring weed control in alfalfa/orchardgrass. It is important to note that several of the herbicides are not labeled in California for use in alfalfa/grass forage.

**Study Director**: Rob Wilson

**Cooperator**: Tim Garrod

**Date and Time of Herbicide Application**: February 26, 2003 at 11:00 am; Temperature 48°F.

**Plot Size and Application Method**: Plot size was 10 X 30 ft. The experiment was arranged in a randomized complete block with three replications. Herbicides were applied at 20 gallons per acre using a 10 ft boom $CO_2$ backpack sprayer.

**Soil Type/Moisture**: Sandy loam. The soil surface was dry and sub-surface was moist at the time of application. The soil was not frozen, but air temperatures feel below freezing the night after herbicides were applied.

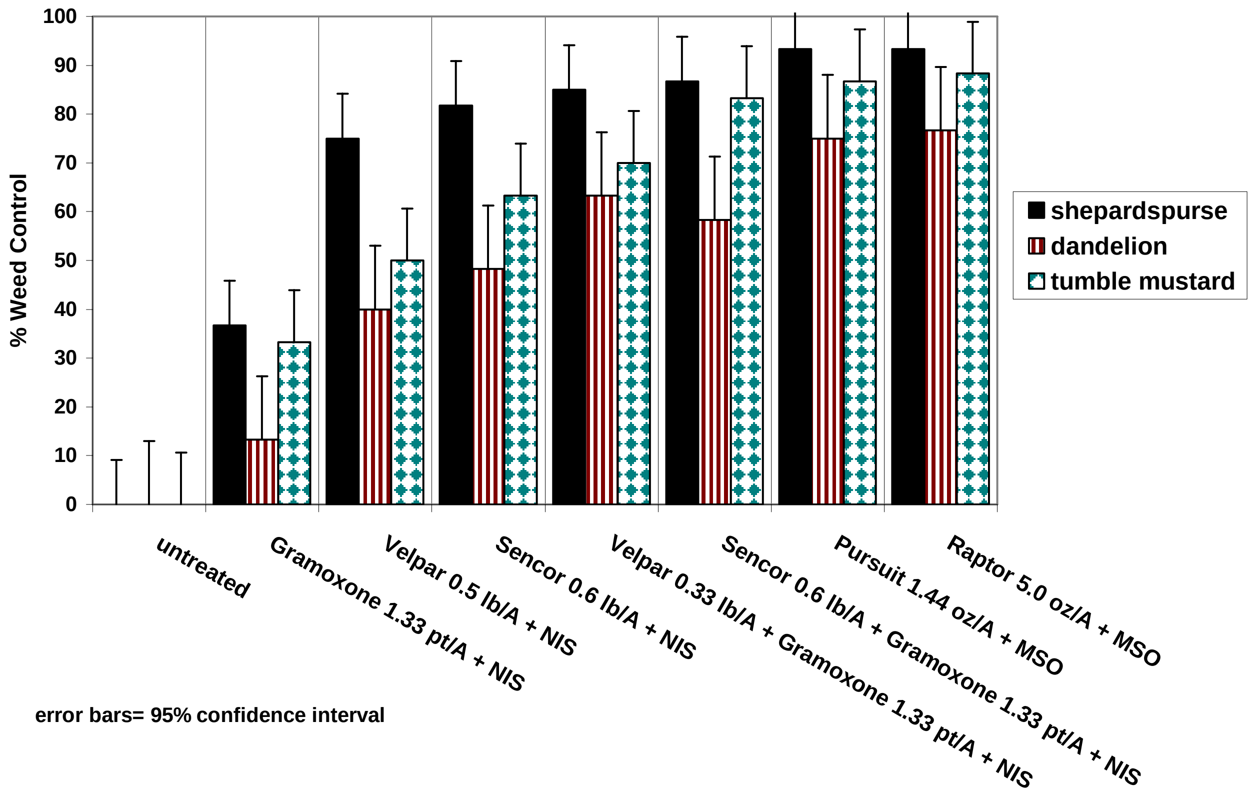
**Weed Species Present at time of application**: **shepard's-purse**- rosette 1-2 in diameter, **tumble mustard-** 1 in diameter sporadic through the field, **prickly lettuce-** 1-2 in tall and sporadic through the field, **dandelion-** rosette 1-3 in diameter.

**Crop Stage**: **alfalfa-** green up with 1 inch re-growth; **orchardgrass-** 1-4 inches re-growth.

**Data Collected**: A weed control evaluation was made on April 29, 2003 two months after herbicides were applied. Percent control of shepardspurse, tumble mustard, and dandelion along with percent injury of orchardgrass were measured in each plot. 100 % orchardgrass injury equaled complete stand loss.

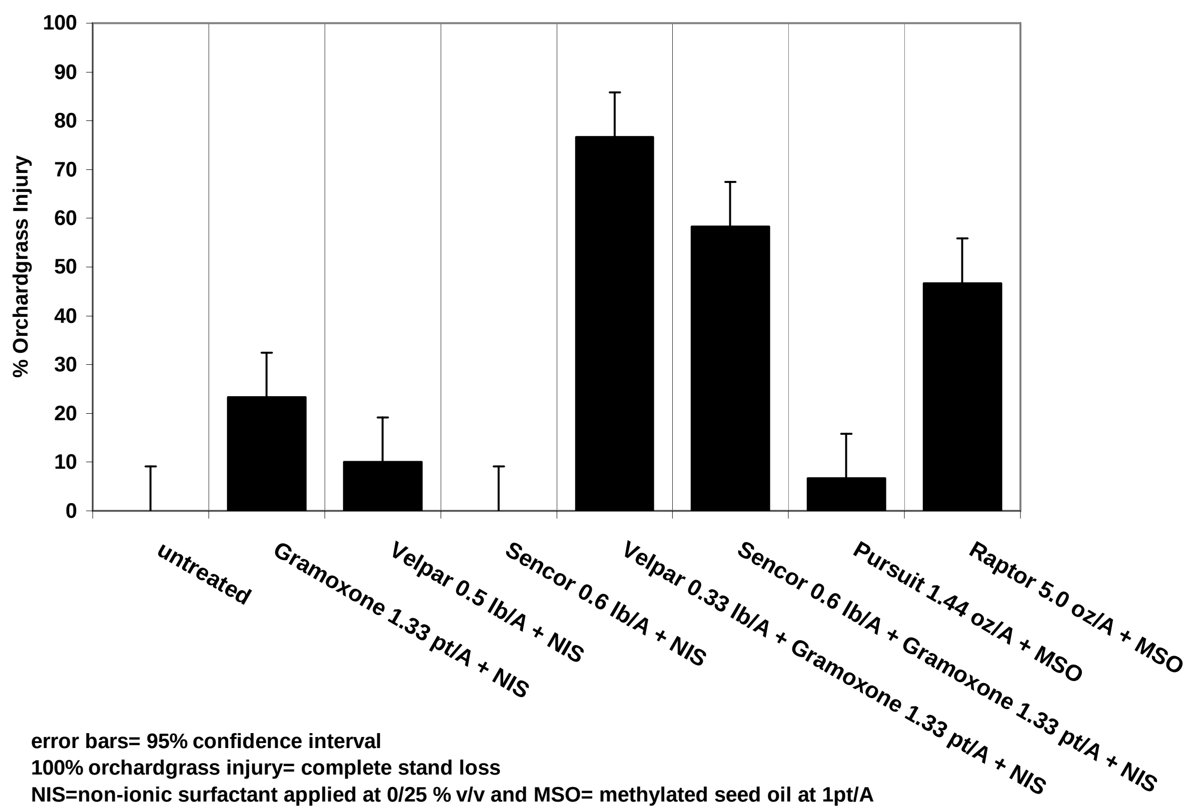
**Result Summary**: Pursuit was the best treatment in the experiment providing good weed control and minimal orchardgrass injury. Sencor and Velpar applied alone caused minimal injury to orchardgrass, but weed control was lower compared to Pursuit. In past weed control experiments in straight alfalfa, Sencor and Velpar provided good control of shepardspurse and tumble mustard if applied prior to weed emergence. Gramoxone provided poor weed control and caused significant injury to orchardgrass. Gramoxone + Sencor, Gramoxone +Velpar, and Raptor caused unacceptable orchardgrass injury and killed several orchardgrass plants. See figure 1 for weed control results and figure 2 for results regarding herbicide injury to orchardgrass.

**Figure 1. Percent Weed Control of Herbicides applied in Late Winter to an Alfalfa/Orchardgrass Mix**




error bars= 95% confidence interval

**Figure 2. Injury Caused to Orchardgrass From Late Winter Herbicide Treatments Applied to an Alfalfa/Orchardgrass Mix**




error bars= 95% confidence interval
100% orchardgrass injury= complete stand loss
NIS=non-ionic surfactant applied at 0/25 % v/v and MSO= methylated seed oil at 1pt/A

# The Effectiveness of Winter Dormant Herbicides at Different Application Times for Spring Weed Control in Established Alfalfa

**Introduction**: Most Intermountain alfalfa fields have winter annual weed problems that require herbicides to assure a weed free first cutting. Although most alfalfa fields have similar weed problems, grower choice in herbicides and application time differ significantly. Some growers apply herbicides in the winter before weed emergence, while other growers prefer applying herbicides in the spring after weed emergence. This experiment set out to determine the best herbicides and application times for winter annual weed control in established alfalfa. The experiment also examined Raptor's potential to be used as a post-emergent herbicide in established alfalfa. (Raptor is a new post-emergent herbicide commonly used in seedling alfalfa.)

**Study Directors**: Rob Wilson and Steve Orloff, Siskiyou County UCCE Farm Advisor
**Cooperators**: Tim Garrod and Fred Wemple

**Date of Herbicide Application**: **Fall application**- 11/06/02 Temperature 45°F; **Winter application**- 01/29/03 Temperature 53°F; and **Spring application**- 03/18/03 Temperature 50°F.

**Plot Size and Application Method**: Plot size was 10 X 30 ft. The experiment was arranged in a randomized complete block design with four replications. Herbicides were applied at 20 gallons per acre using a 10 ft boom $CO_2$ backpack sprayer.

**Soil Type/Moisture**: Bird Flat site-Sandy loam; Wemple site- loamy sand. The soil surface and sub-surface was moist at every application at both sites. The soil was not frozen, but air temperatures feel below freezing the night after herbicides were applied at every application.

**Weed Species Present at time of application**: **Bird Flat site**- shepardspurse, hare barley, dandelion, and prickly lettuce**. Wemple site**- shepardspurse, hare barley, redstem filaree, and common mallow.
**Crop Stage**: **Fall application-** 50 % of alfalfa dormant; **Winter application**- alfalfa completely dormant; **Spring application**- alfalfa green with 1-2 inch re-growth at Bird Flat site and 2-3 inch re-growth at Wemple site.

**Data Collected**: Weed control evaluations were made on 04/09/03 and 04/29/03 at both sites. Percent control for all weed species was measured in each plot during every evaluation. Percent alfalfa injury was also estimated on 04/09/03 and 04/29/03. Alfalfa yield was measured on 05/28/03 at the Bird Flat site and 05/29/03 at the Wemple site. Yields were measured by cutting a 3 X 10 ft strip out of every plot with a sicklebar mower. Wet weights and sub-sample dry weights were collected in each plot. Dry sub-samples at the Wemple site were submitted to the DANR lab for ADF and % protein forage quality.

**Result Summary**: Weed control results for all weeds and herbicide treatments are shown in Figures 1-5. In general, Sencor, Velpar, and Karmex provided the best weed control when applied in January compared to November or mid-March. Adding gramoxone to Sencor at the winter and spring application times improved hare barley and dandelion control compared to Sencor alone. In regards to alfalfa injury, herbicide treatments applied in November or January caused less alfalfa injury compared to herbicide treatments applied in mid-March (Figure 6). All mid-March herbicide treatments (except Gramoxone alone) caused significant reductions in first cutting yield compared to untreated plots (Figure 7). Alfalfa samples from all herbicide treated plots had significantly lower % ADF compared to samples taken from untreated plots suggesting weeds reduce forage quality (Figure 8). Overall, Sencor + Gramoxone applied in January was the best herbicide treatment displaying good weed control and minimal alfalfa injury.

**Figure 1. The Effect of Herbicide and Application Time on Hare Barley Control Averaged Across Both Sites**

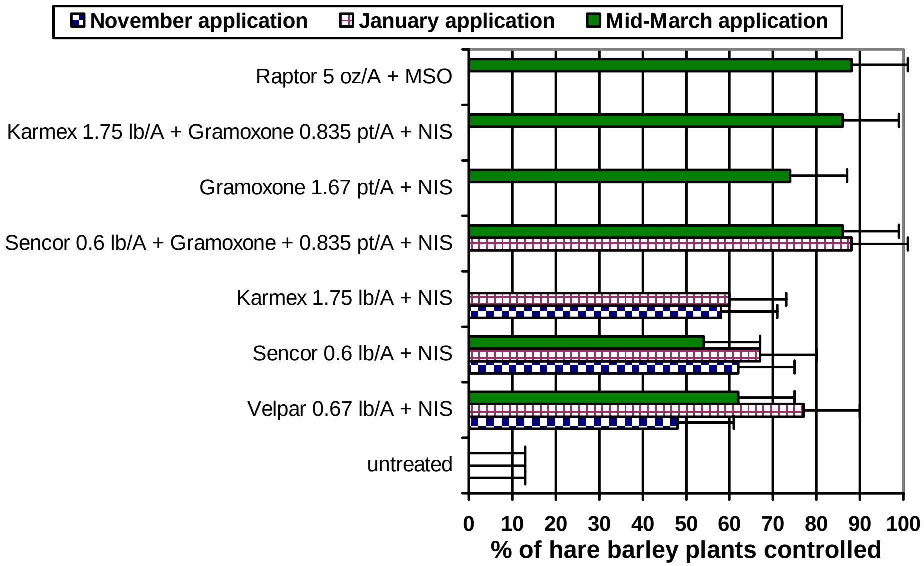



**Figure 2. The Effect of Herbicide and Application Time on Shepardspurse Control Averaged Across Both Sites**

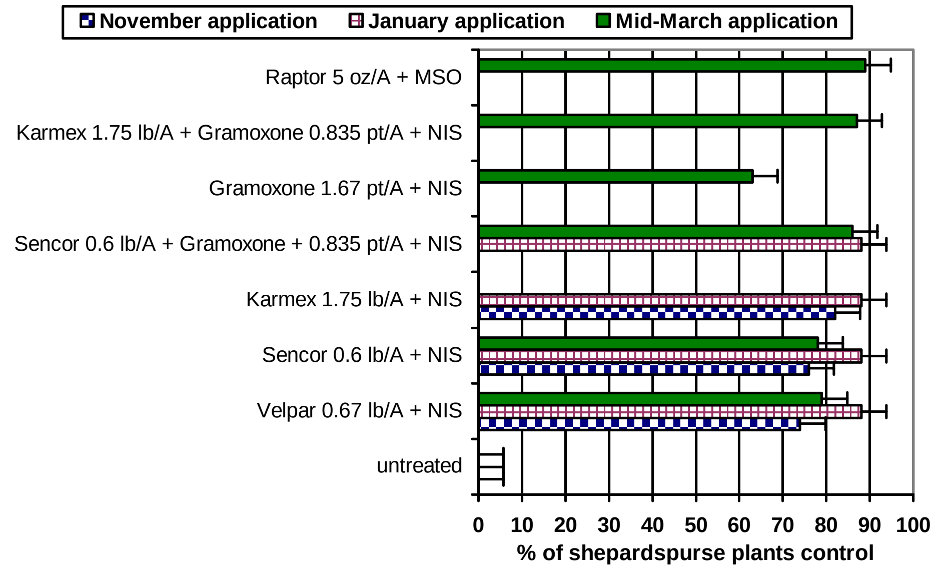



**Figure 3. The Effect of Herbicide and Application Time on Prickly Lettuce Control at the Bird Flat Site**

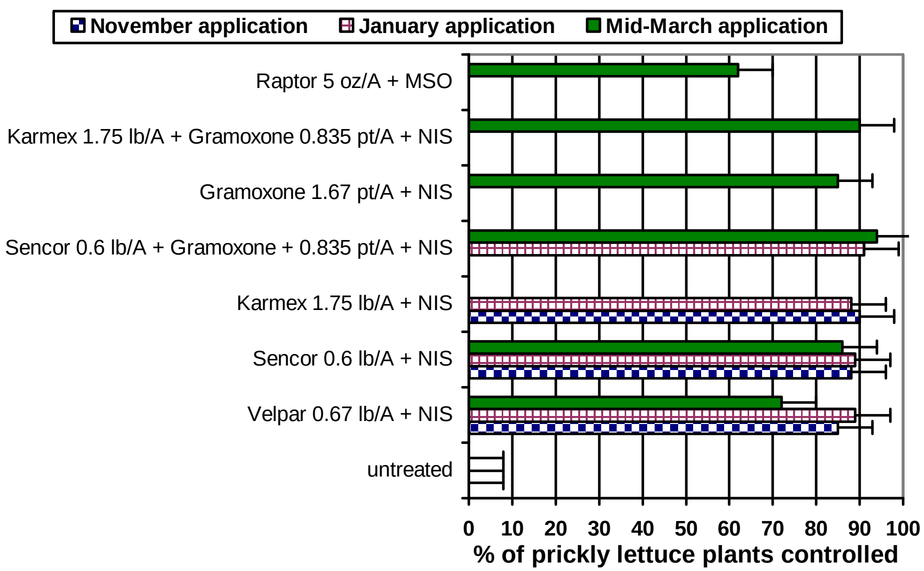



**Figure 4. The Effect of Herbicide and Application Time on Dandelion Control at the Bird Flat Site**

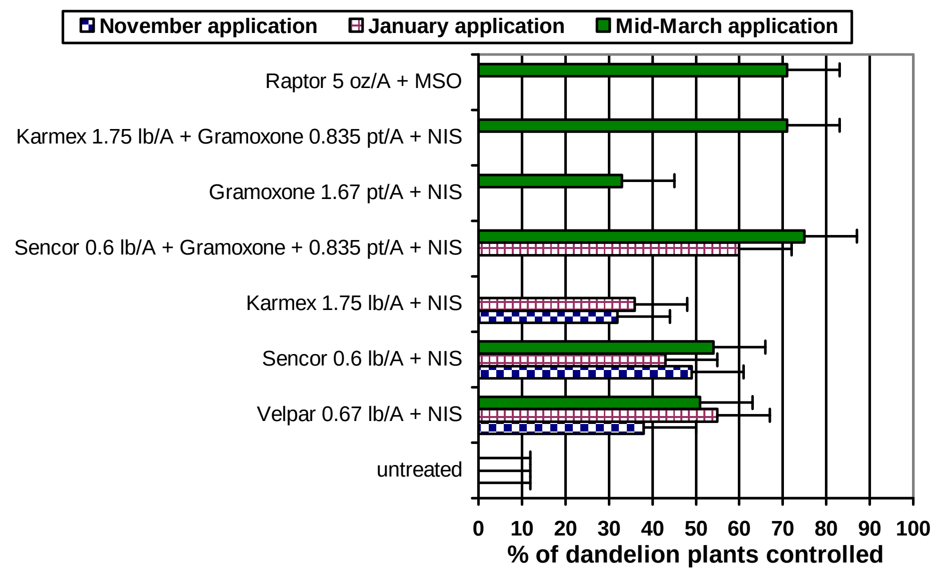


**Figure 5. The Effect of Herbicide and Application Time on Redstem Filaree Control at the Wemple Site**

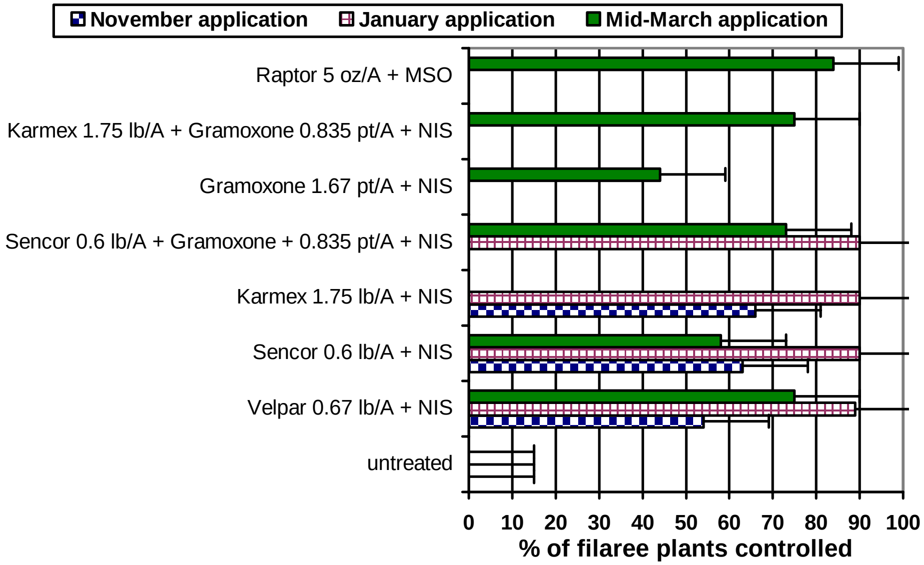



**Figure 6. The Effect of Herbicide and Application Time on Alfalfa Injury Averaged Across Both Sites on 04/09/03**

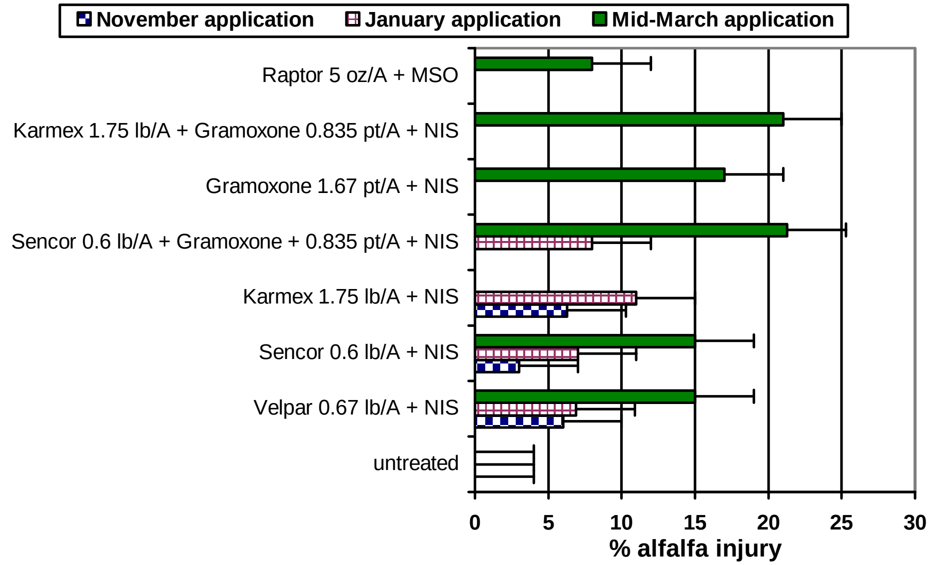



**Figure 7. The Effect of Herbicide and Application Time on First Cutting Alfalfa Yield Averaged Across Both Sites**

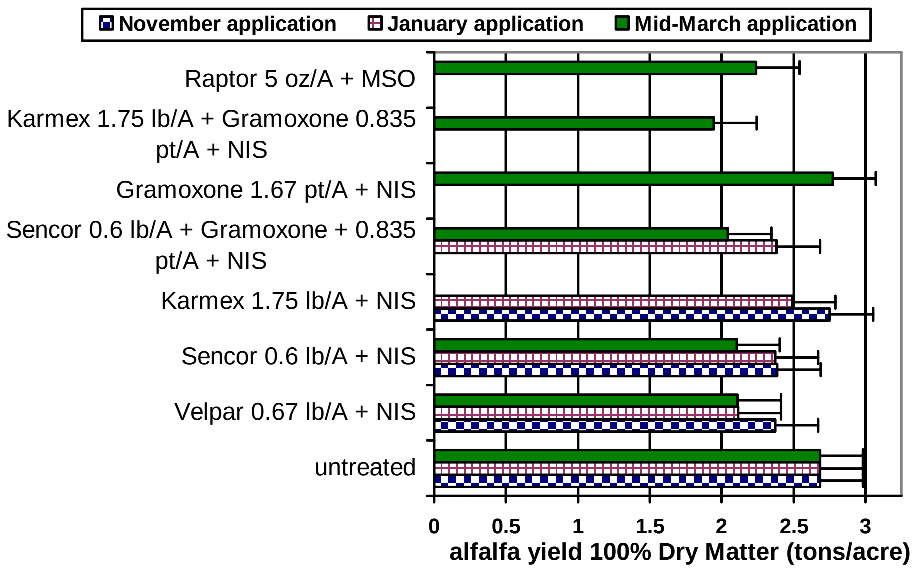
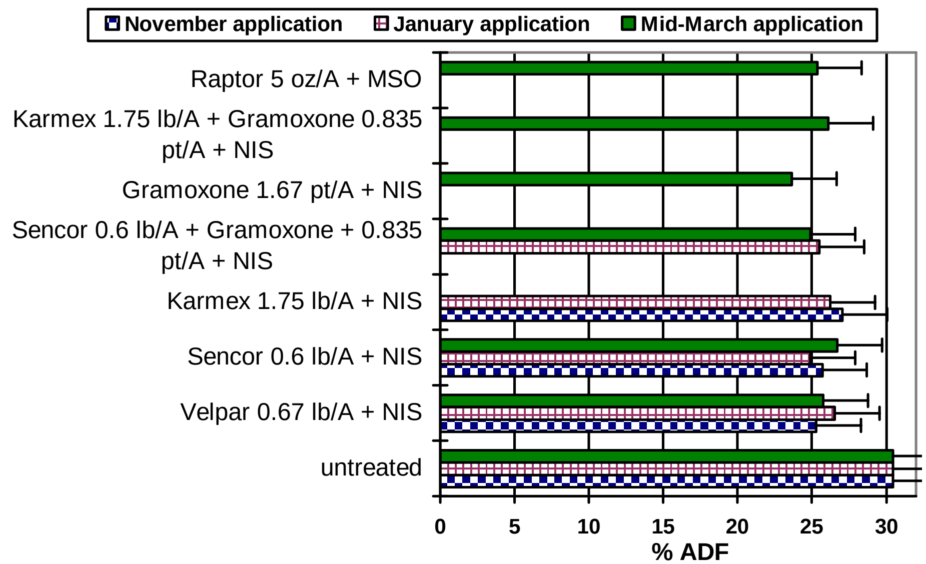



**Figure 8. The Effect of Herbicide and Application Time on First Cutting Alfalfa Forage Quality (ADF) at the Wemple Site**



# The Effect of Chlorsulfuron (Telar) on Tall Wheatgrass Establishment

**Introduction:** Chlorsulfuron (Telar) is the most effective herbicide for perennial pepperweed control, but concerns often arise regarding chlorsulfuron injury to perennial grasses seeded 1-12 months after treatment on alkali soils. This study looked at chlorsulfuron's residual effect on tall wheatgrass seeded 4 months after treatment. The soil at the study site was strongly alkali. Along with herbicide effects, the study also examined the effect of inoculating the soil with mycorrhizal fungi prior to seeding.

**Study Directors**: Rob Wilson, Ken Weaver- NRCS director Lassen County, and Dave Dyer- NRCS specialist

**Cooperator**: Richard Parker

**Date and Time of Herbicide Application**: All Telar rates were applied on May 6, 2002 at 10:00 am; Air Temperature was 72°F.

**Plot Size and Herbicide/Grass Seeding Methods**: The experiment was arranged in a randomized complete block with three replications and had total of eight treatments. Telar was applied at four rates (0, 0.75, 1.0, and 2.0 oz/acre) at 20 gallons per acre in 10 X 20 ft plots using a 10 ft boom $CO_2$ backpack sprayer. On 09/20/02, plots were split in half (10 X 10 ft) and mycorrhizal inoculant was broadcast at 2.0 oz per 10 $ft^2$ on half of the plot. All plots were spaded to a 3-5 in depth and raked to prepare a seedbed. Jose tall wheatgrass seed was broadcast at 17 lbs/acre and rake incorporated to a ½ inch depth in all plots the same day inoculant was incorporated.

**Soil Type and Moisture**: The study is located on a sodic clay loam soil with a pH of 8.1. The three replicates had an average SAR of 35.92 and EC of 9.3. The soil was dry at the time of herbicide application and received less than 1.0 inch of rainfall before the fall grass seeding.

**Plant Community Present at the Time of Application**: At the time of herbicide application, over 90% of the site was bare ground with a few scattered Russian thistle plants. The spring following herbicide application and grass seeding, vegetation besides seeded perennial grasses consisted of hair barley, halegeton, tansy mustard, and clasping pepperweed.

**Data Collected**: In every sub-plot on 06/02/03, seeded grass density, grass cover, and annual weed cover was measured in a 1 $m^2$ quadrat to determine chlorsulfuron's effect on grass establishment success. A final evaluation will be made spring 2004.

**Results Summary**: Perennial grass establishment was a success in all plots. Numerous spring rains from February to May (4.34 in) triggered germination and provided adequate soil moisture to ensure seedling survival. There were not any significant differences between herbicide rates and/or mycorrhizal inoculant treatments for perennial grass density or perennial grass cover (Figures 1 & 2). All Telar rates reduced annual weed cover (tansy mustard and clasping pepperweed) compared to untreated plots (Figure 3). Mycorrhizal inoculant had no effect on tall wheatgrass establishment success or annual weed cover. First year results suggest tall wheatgrass can be successfully seeded the fall following a spring Telar application on moderately alkali soils. It is important to note that 2003 spring rainfall was close to the Susanville average of 5.04 inches from February to May. In years with less than average rainfall, moisture stress and/or Telar injury could reduce seedling survival.

Figure 1. The Effect of Telar rate and Mycorrhizal inoculant on Tall Wheatgrass Density 06/02/03

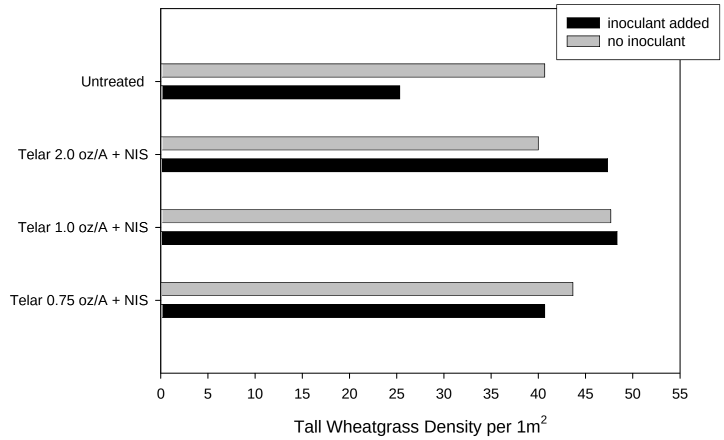



Figure 2. The Effect of Telar Rate and Mycorrhizal inoculant on Tall Wheatgrass % Cover 06/02/03

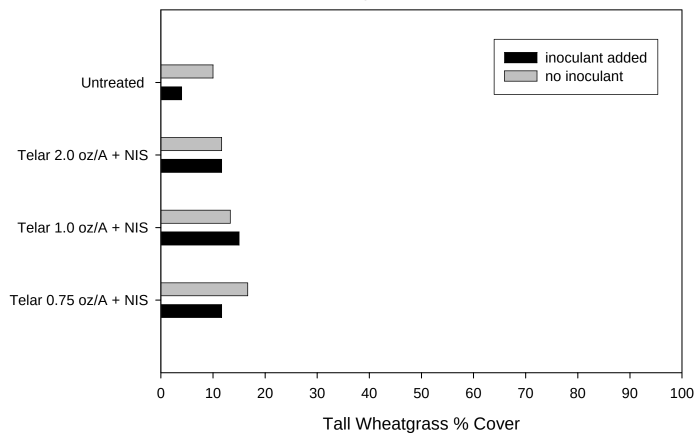
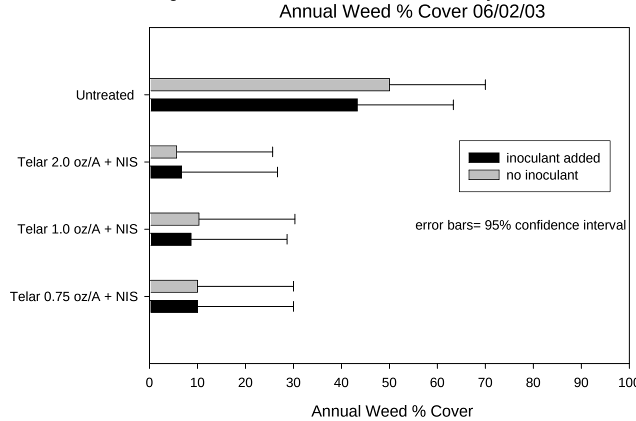



Figure 3. The Effect of Telar Rate and Mycorrhizal inoculant on Annual Weed % Cover 06/02/03



# Influence of Medusahead Residue Removal Techniques and Plateau on Medusahead Control and Perennial Grass Establishment

**Don Lancaster UCCE Farm Advisor Modoc County; David Lile and Rob Wilson UCCE Farm Advisors Lassen County; & Marni Porath OSU Extension Agent Lake County, OR**

## Site Information

The trial was initiated at two locations in the fall of 2001. One site is located near Likely, CA on rangeland heavily infested with medusahead. Precipitation at the CIMIS station near Likely from Nov. 2001- July 2002 was 5.2 in. Precipitation increased to 10.48 in from August 2003- July 2003; most of the 2003 precipitation (7.03 in) fell during March through May 2003. The soil at the Likely site is a Bieber cobbly loam consisting of grayish brown cobbly loam from the 0-6 in depth and dark grayish brown clay loam and brown clay from the 6-18 in depth. The likely site is extremely rocky and had approximately a ½ to 2 in medushead litter layer covering 60 % of the ground at the time of treatment initiation. Few perennial grasses or shrubs were present at the time of treatment initiation. The second site is located near Paisley, OR. The site is rangeland heavily infested with medusahead. The Paisley site is very similar to Likely with regard to soil type and rocks (cobbly loam soil). The precipitation at Paisley from Nov. 2001- July 2002 was 8.4 in. Precipitation at Paisley from August 2002- July 2003 was 10.28 in with 4.65 in falling between March through May 2003.

## Materials and Methods

At Likely, plots were tilled and burned on November 3, 2001. The plots were very difficult to till due to a plethora of large rocks. Due to soil type and terrain, tillage is unpractical at most medusahead sites in northeastern California. Plots were also difficult to burn due to a lack of consistent litter accumulation (a small amount of medusahead plants established the spring of 2001 due to drought conditions). The fire had to be carried with a propane torch to conduct a complete burn. Herbicide treatments were applied November 5$^{th}$, 2001 at 3:00 pm. The air temperature was 63 degrees F and wind speed was 0-2 mph at the time of application. Soil surface and sub-surface were dry and relative humidity was 28%. Medusahead seedlings had not germinated in the plots prior to the herbicide application. The plots were seeded with a western wheatgrass and squirreltail mix (10 lb/ac) the same day herbicides were applied. Seed was broadcast applied without incorporation due to the large number of rocks. Smaller plots located outside the experimental area were sprayed with the 4 oz rate of plateau and seeded with various native perennial grasses. In these plots, seed was broadcast and raked into the soil. In both areas, the same seed mixes were re-applied the spring of

2003 due to the lack of grass establishment in 2002. Crested wheatgrass was also added to the seed mix (3 lb/ac) in the large plots in 2003.

In Paisley, fall and spring litter removal/herbicide treatments were conducted. Fall plots were burned and tilled on November 10, 2001, and spring plots were burned and tilled on April 6, 2002. The plots were difficult to till and burn similar to the plots at Likely. The plots were especially difficult to burn in the spring due to increased moisture content in the soil and litter. Both sites were tilled with a spike tooth harrow.

Fall herbicide treatments were applied November 15$^{th}$, 2001 at 11:00 am. The air temperature was 46 degrees F and wind speed was 5-10 mph with gusts up to 15 mph. A long piece of tin was used as a windshield to try and minimize drift. Soil surface and sub-surface was dry. No medusahead seedlings had germinated in the plots prior to the fall herbicide application. Spring herbicide treatments were applied April 12$^{th}$, 2002 at 9:30 am. The air temperature was 52 degrees F and wind speed was 0-5 mph. Soil surface was dry and soil sub-surface was moist at the time of application. A lot of medusahead seedlings (1-2.5 in tall) had emerged in the plots prior to the spring herbicide application. Plots were seeded with a basin wildrye, bluebunch wheatgrass, and Idaho fescue mix (10 lb/ac) in the fall, and a squirreltail, sheep fescue, bluebunch wheatgrass, and crested wheatgrass mix (10 lb/ac) in the spring. Fall and spring planted seed was sown the same day herbicides were applied. The seed was broadcast applied without incorporation. The same seed mixes were re-applied in the fall of 2002 and spring 2003 because of the lack of grass establishment in 2002.

In late June 2002, plots were evaluated to determine treatment success at controlling medusahead and facilitating perennial grass establishment. In Likely, medusahead density, bare ground cover, and other vegetation cover was measured in two 1 $m^2$ quadrats per plot. Bare ground cover consisted of areas with only bare soil or thatch present. Other vegetation cover primarily consisted of native winter annual mustards, but sporadic lupine, perennial *Poa* species, bluebunch wheatgrass, and low sagebrush were also present. In Paisley, medusahead, bare ground, and other vegetation percent cover was measured in two 1 $m^2$ quadrats per plot. Bare ground cover consisted of areas with only bare soil or thatch present. Other vegetation cover primarily consisted of a mix of low sagebrush, Japanese brome, fiddleneck, crested wheatgrass, and alfalfa. Other vegetation that was sporadic in the plots included squirreltail, milk thistle, Mediterranean sage, kochia, vetch, and bulbous bluegrass.

Final evaluations were made on June 19, 2003 at the Likely and Paisley site to determine Plateau's effect on medusahead and perennial grass establishment one year after treatment. Medusahead density, perennial grass density, medusahead cover, bare ground cover, Japanese brome cover, prickly lettuce cover, and other vegetation cover were measured at the Likely and Paisley site in two 1 $m^2$ quadrats per plot. Alfalfa cover was also measured at the Paisley site. Other vegetation consisted of native and introduced winter annual mustards and low sagebrush.

## Results

### The Effect of Plateau on Perennial Grass Establishment

Perennial grass seeding was virtually a complete failure the spring of 2002. There was not a difference in seeding success between untreated plots and plots treated with plateau in 2002. The fall 2002 seeding failure was likely a result of winter frost heaving and lack of spring moisture. In past trials, perennial grasses have been inherently difficult to establish on heavy clay soils. The repeat seeding in 2003 yielded better results. Numerous spring rains during 2003 provided enough moisture for drought hardy perennials to establishment. Over 90% of perennial grass seedlings found at both sites were crested wheatgrass. Squirreltail was the best native grass to establish and made up approx. 8% of perennial grass seedlings counted in plots. (Seed David Lile study for more information on perennial grass establishment) Plateau treatments had an effect on perennial grass establishment at both sites the spring of 2003 (See Figure 6). At Likely, there was a trend for perennial grass density to increase as the Plateau rate increased. At Paisley, the fall applied Plateau treatments did not affect perennial grass density, but the spring applied Plateau treatments did. As the spring applied Plateau rate increased so did perennial grass density. This increase in perennial grass density as the Plateau rate increased is due to Plateau's control of annual grasses. In the field, plots with minimal annual grass pressure (lack of competition) had the most perennial grass seedlings regardless of Plateau rate. Tillage and burning had no effect on perennial grass establishment.

### The Effect of Plateau on Medusahead

At both sites during the June 2002 evaluation, all rates of Plateau significantly decreased medusahead cover and density. At Likely, the 2 oz rate **(herbicide rates are expressed as the amount of product per acre)** of Plateau decreased medusahead density by 73% compared to the control. The 4 oz rate of Plateau decreased medusahead density by 98% leaving less than one medusahead plant per 1 $m^2$. All Plateau rates greater than 4 ounces provided 100% control of medusahead. See Figure 1 for a complete listing of Plateau treatment effects on medusahead density at Likely in 2002.

At Paisley during the June 2002 evaluation, both spring and fall Plateau treatments provided good medusahead control. When comparing the spring vs. fall application at Paisley in 2002, it appears the spring

Plateau application provided slightly better medusahead control at rates less than 4 oz per acre. In plots that received rates higher than 6 oz of Plateau per acre (both spring and fall applied), medusahead cover was reduced by more than 85% and consisted of less than 10% of the total cover. See Figure 2 for a complete listing of Plateau treatment effects on medusahead cover at Paisley in 2002.

By the June 2003 evaluation, medusahead started to re-infest several of the Plateau plots. At Likely, all rates ≥ 2 oz per acre decreased medusahead density and rates ≥ 4 oz per acre decreased medusahead cover compared to the control (see Figure 5). At Paisley, spring applied Plateau treatments provided much better medusahead control compared to fall applied treatments (see Figure 5). Fall Plateau rates ≥ 4 oz per acre decreased medusahead density, but none of the Plateau rates ≤ 8 oz per acre decreased medusahead cover. Spring Plateau rates ≥ 2 oz per acre decreased medusahead density, and unlike fall treatments, spring Plateau rates ≥ 4 oz per acre decreased medusahead cover. At all sites, there was trend for low Plateau rates to decrease medusahead density but not medusahead cover. This trend was due to the fact that reducing medusahead density actually promoted growth of the remaining medusahead plants. Most medusahead plants in plots treated with low Plateau rates were twice as tall and had twice the number of tillers compared to medusahead plants growing in the control.

<u>Plateau Effect on Other Vegetation</u>

At both sites in 2002, there was general trend for bare ground cover to increase as the Plateau rate increased. The high rates of Plateau often had more than 95 % bare ground cover. At Likely, all rates above 2 oz had more than 90 % bare ground cover. Other vegetation cover tended to decrease as the Plateau rate increased. At Likely, other vegetation cover decreased by more than 90% in plots that received 4 oz or more of Plateau in the fall. At Paisley, other vegetation cover actually remained the same in plots that received 4 oz of Plateau in the spring or fall. The dissimilarity in Plateau's effect on other vegetation cover between sites is likely due to vegetation differences between sites. At Likely, the majority of other vegetation was annual mustards which are very susceptible to Plateau. At Paisley, the majority of other vegetation consisted of Japanese brome, fiddleneck, sagebrush, legumes, and perennial grasses. Since many of the perennial grasses, legumes, and shrubs are tolerant to Plateau, Plateau had less of an effect on the residual plant community at Paisley. See Figures 3 and 4 for a complete listing of Plateau treatment effects on bare ground and other vegetation cover at Likely and Paisley.

In 2003, bare ground made up significantly less cover compared to 2002. At Likely, there was still the trend for bare ground to increase as the Plateau rate increased, but the 12 oz Plateau rate only had 41% bare ground cover compared to 95 % cover in 2002. At Paisley, fall applied Plateau treatments were re-infested with medusahead and had relatively little bare ground and other vegetation. The Paisley spring applied Plateau treatments maintained better medusahead control and allowed other vegetation to establish. There was a trend for bare ground cover to increase as the spring Plateau rate increased, but prickly lettuce and alfalfa cover also increased with spring Plateau rates. In the field, we noticed several new alfalfa and clover seedlings in plots treated with high rates of Plateau.

**Figure 1. The Effect of Plateau Applied November 2001 on Medusahead Density June 2002- Likely, CA**

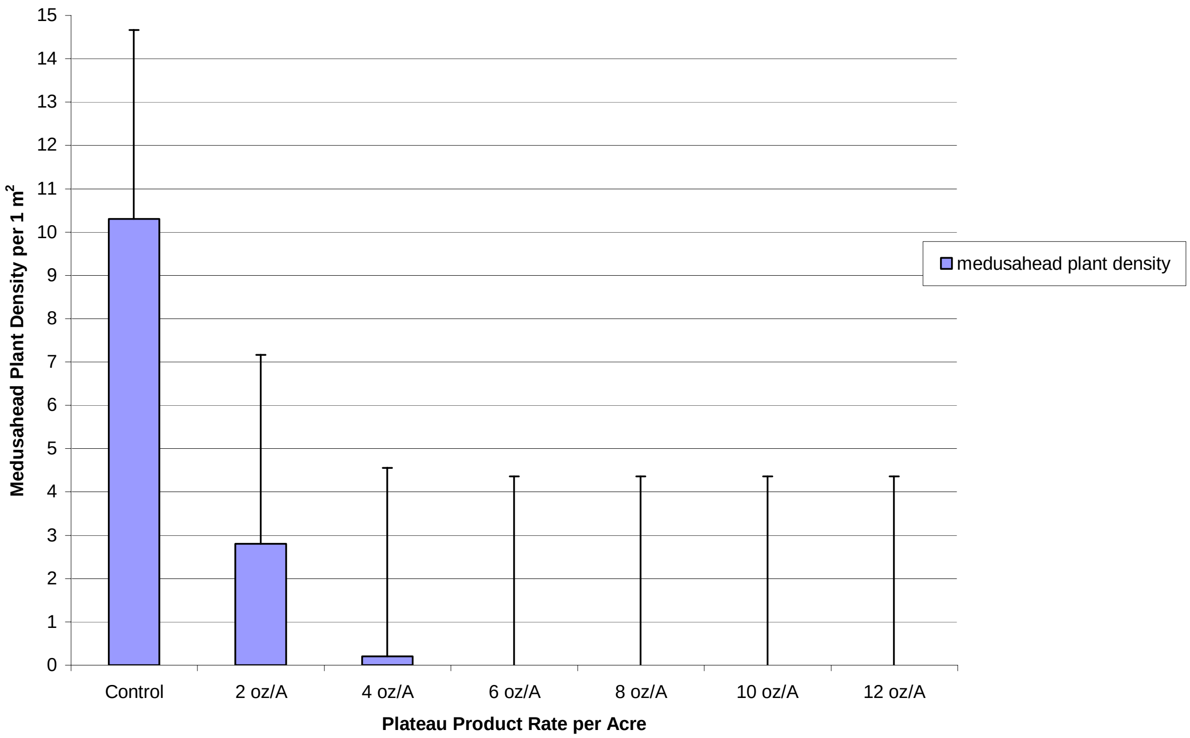



**Figure 2. The Effect of Plateau Application Time on Medusahead Cover June 2002- Paisley, OR**

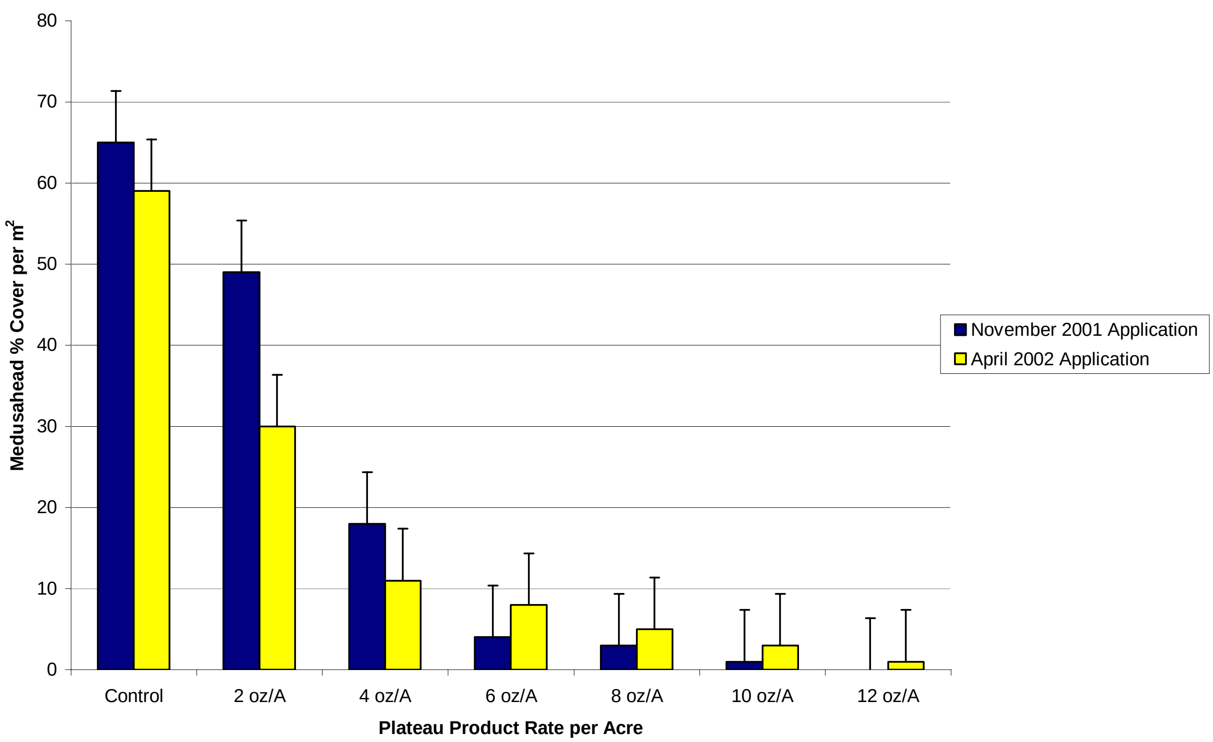


**Figure 3. The Effect of Plateau Applied November 2001 on Bareground and Other Vegetation Cover June 2002- Likely, CA**

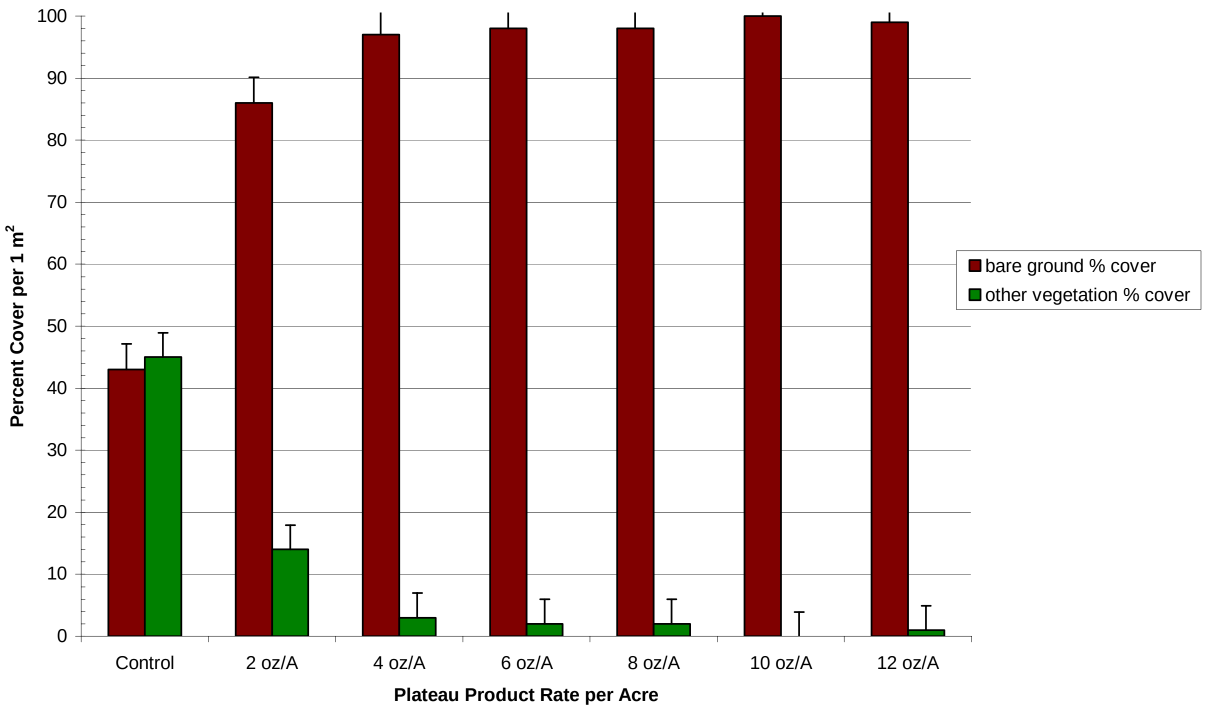



**Figure 4. The Effect of Plateau at Varying Rates on Medusahead, Bareground, and Other Vegetation Cover June 2002- Paisley, OR**

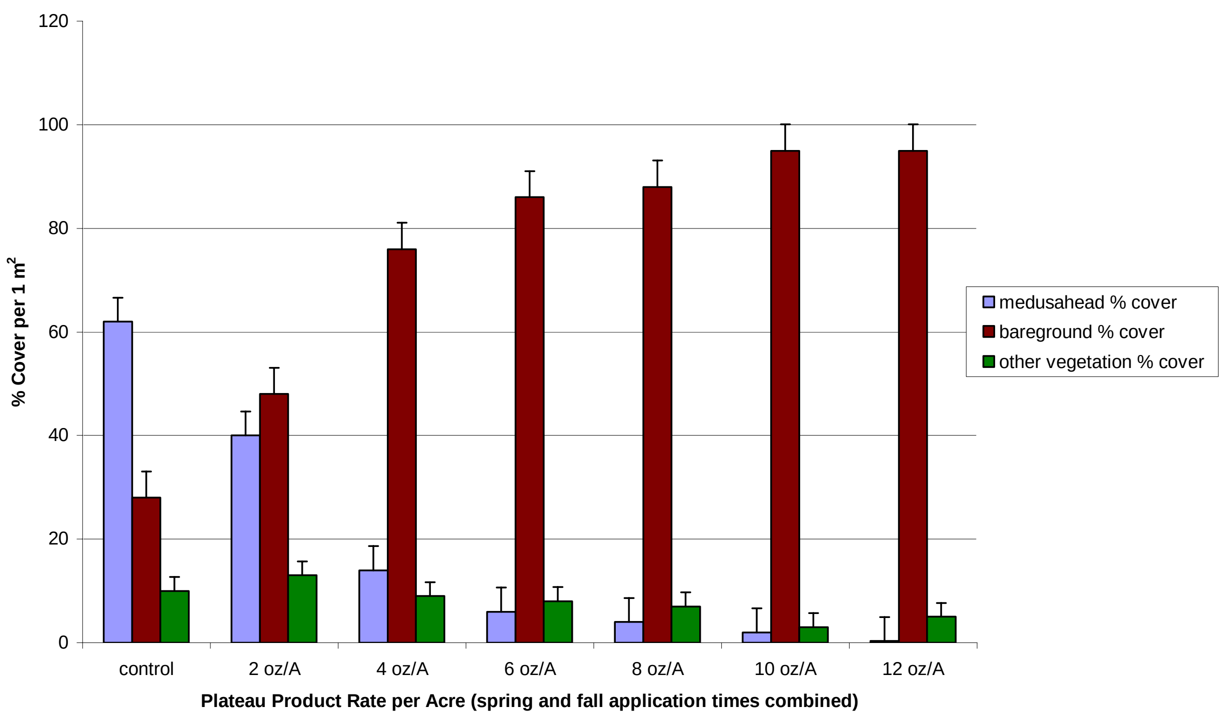


**Figure 5. The Effect of Plateau Applied November 2001 on Medusahead Density June 2003- Likely, CA and Paisley, OR**

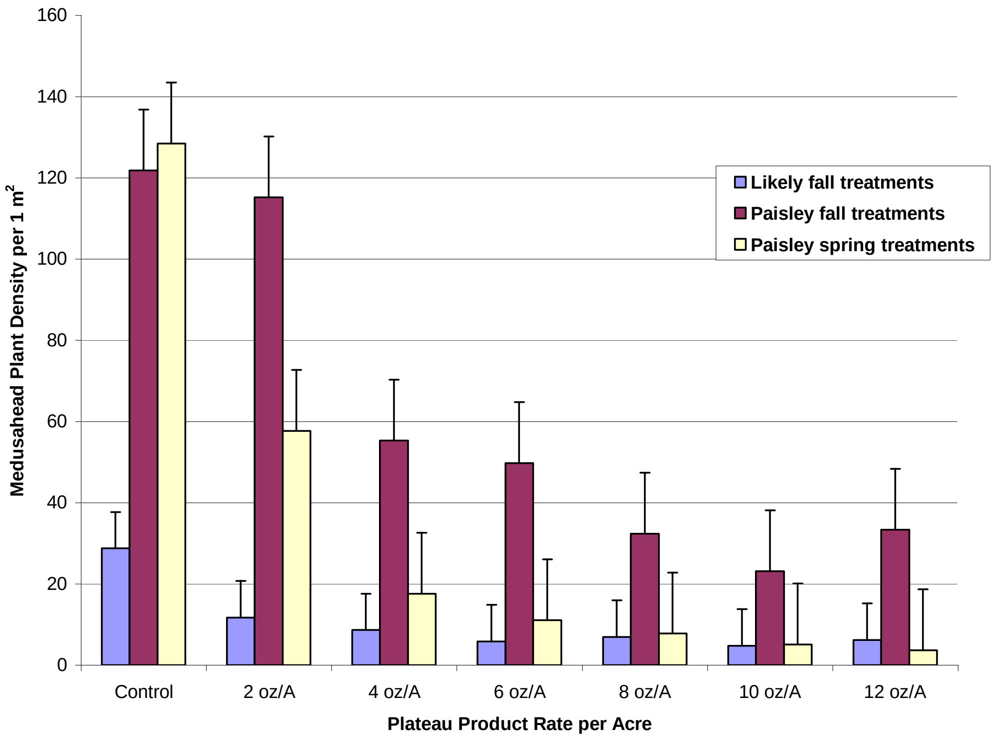



**Figure 6. The Effect of Plateau Applied November 2001 on Perennial grass establishment June 2003- Likely, CA and Paisley, OR**

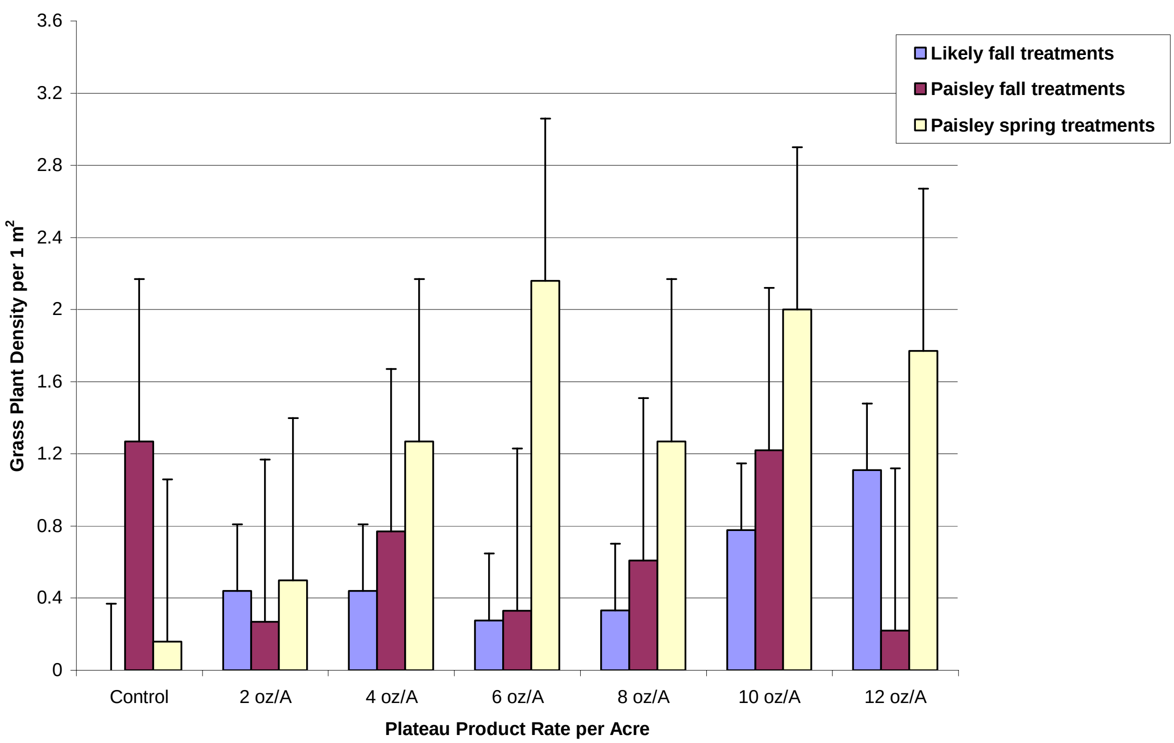


**Figure 7. The Effect of Plateau Applied November 2001 on Bareground and Other Vegetation Cover June 2003- Likely, CA**

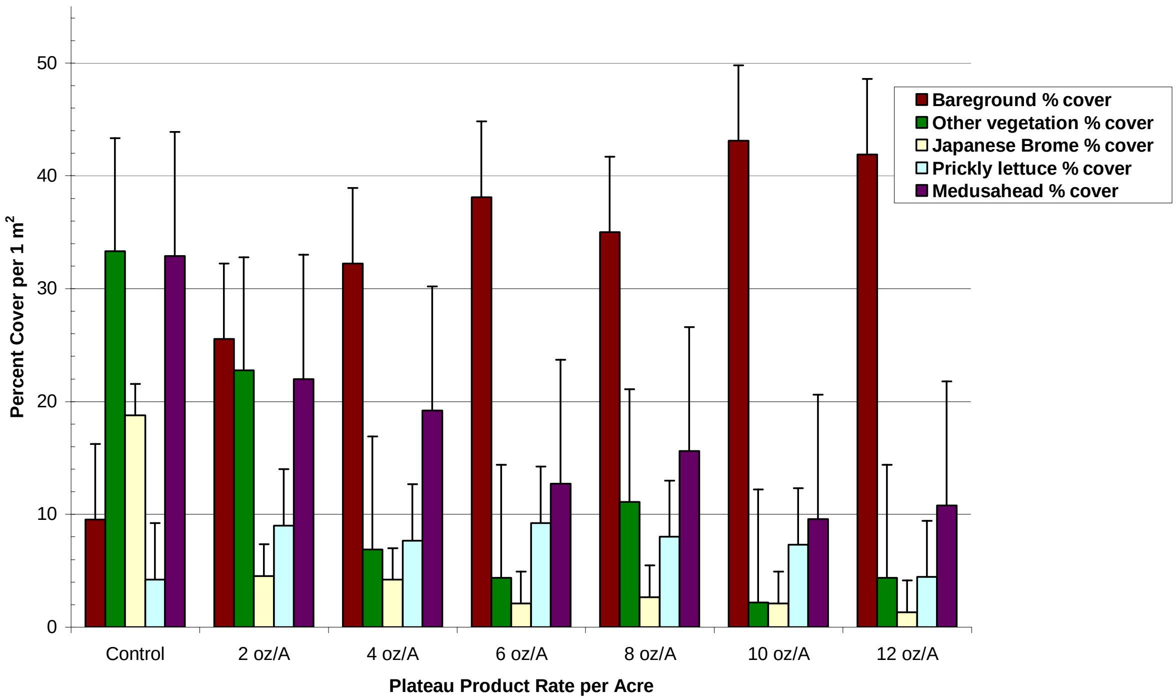



**Figure 8. The Effect of Plateau Applied November 2001 on Medusahead, Bareground, and Other Vegetation Cover June 2003- Paisley, OR**

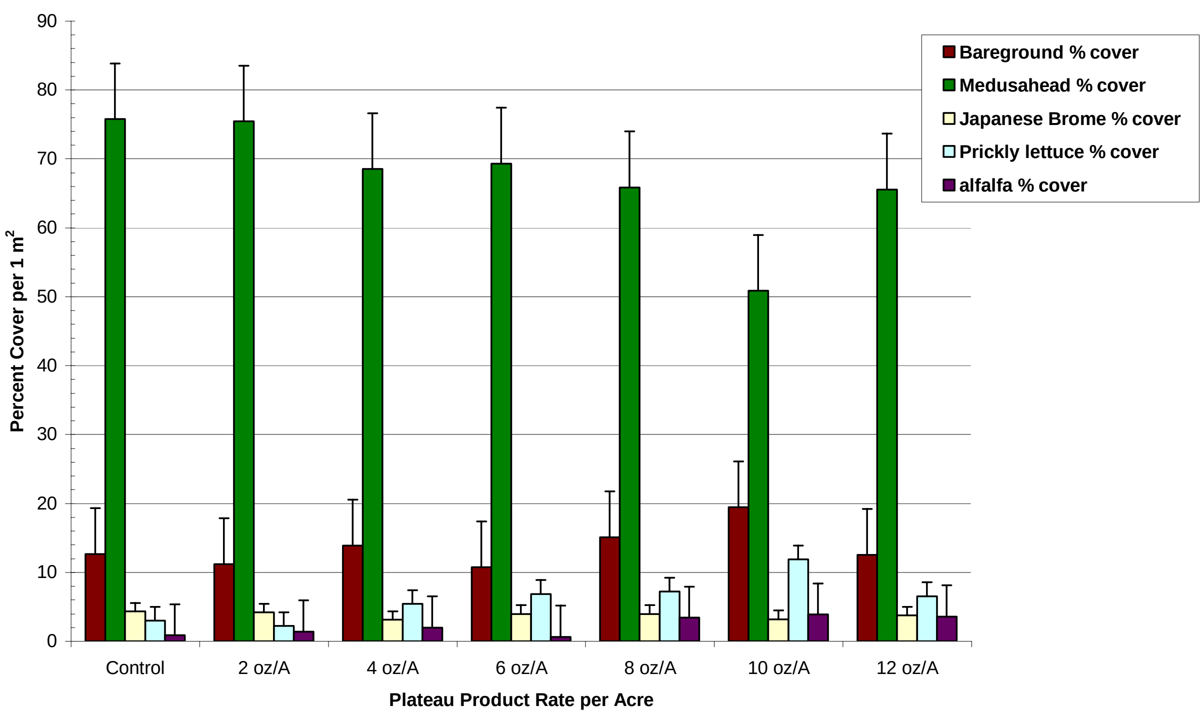


**Figure 9. The Effect of Plateau Applied April 2002 on Medusahead, Bareground, and Other Vegetation Cover June 2003- Paisley, OR**