2008 Lassen County Weed Research Report

Rob Wilson
UCCE Weed Ecology and Cropping Systems Farm Advisor
707 Nevada Street, Susanville, CA 96130

This report describes weed control experiments field tested by the Lassen County UCCE office in 2008. The report 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.

Commercial companies and products are mentioned in this publication solely for the purpose of providing specific information. Mention of a company or product does not constitute a guarantee by the University of California or an endorsement over products of other companies not mentioned.

For additional information on individual research experiments contact:
Rob Wilson
UCCE Weed Ecology/Cropping Systems Farm Advisor
707 Nevada Street
Susanville, CA 96130
530-251-8132
rgwilson@ucdavis.edu

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

2008 Lassen County Weed Research Report
Table of Contents

Weed Control and Crop Safety for Fall-Applied Herbicides Used for Grass Weed Control in Established Orchardgrass, Tall Fescue, and Timothy Grass Hays

Introduction: Grass hays have become popular throughout the intermountain region of Northern California. A common weed problem in perennial grass hay is unwanted grasses such as downy brome, foxtail barley, and hare barley. Growers occasionally experience problems with summer grasses such as sandbur and barnyardgrass. Most grass weeds lack labeled chemical control options in perennial grass hay. This trial examined the influence fall-applied herbicides have on weed control, crop injury, and first-cut yield for three grass hays grown in the intermountain region. Most herbicides in the trial are not labeled for use in perennial grass hay, thus a major trial objective is to develop data for product registration.

Cooperators: Travis Corder, Joe Bertotti, and Jay Dow

Date of Herbicide Application: Herbicides were applied in October shortly after the last cutting at each site.

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.

Weed and Crop Stage at the Time of Application: **Pittville timothy site**: downy brome- 1 to 4 inches tall; timothy- 3 to 5 inches tall and actively growing. **Standish orchardgrass site**: no weeds present at application; orchardgrass- 4 to 6 inches tall and actively growing. **Pittville orchardgrass site**: no weeds present at application; orchardgrass- 4 inches tall and actively growing. **Honey Lake tall fescue site**: foxtail barley (*Hordeum jubatum*)- 5 to 6 inches tall; tall fescue- 4 to 6 inches tall and actively growing.

Data Collected: Spring weed control was measured in May when weeds were flowering. Summer weed control was evaluated after first cutting. Crop injury was visually evaluated in April or early May after grasses had several inches of spring re-growth. First-cut yield was measured by harvesting a 3 ft by 16 ft swath with a Carter harvester shortly before grower harvest. Yield includes the combined yield for grass and weeds.

Result Summary: Fall-applied Sencor at rates ≤ 1.0 lb ai/A, Prowl H20 at rates ≤ 3.8 lb ai/A, Kerb at rates ≤ 0.375 lb ai/A, Olympus, DPX-KJM44, and Telar at 0.375 oz ai/A were safe on orchardgrass and tall fescue (Tables 1 and 2). These treatments did not cause significant visual crop injury in the spring or a reduction in first-cut yield. Timothy was less tolerant to herbicides compared to tall fescue and orchardgrass (Table 3). The only treatments that were safe on timothy were Prowl H20 at rates ≤ 3.8 lb ai/A, Olympus at 0.42 oz ai/A, DPX-KJM44, and Telar at 0.375 oz/A. Adding Gramoxone to fall-applied Prowl H20 or Sencor caused unacceptable injury to all grass species (Tables 1-3).

Sencor at all rates and Telar provided 100% control of shepherdspurse in orchardgrass (Table 1). Prowl H20 provided 98% or better control of sandbur (Table 1). None of the treatments provided > 90% control of foxtail barley, but Kerb reduced foxtail barley plant density. Kerb at 0.375 lb ai/A provided 65% foxtail barley control, and Kerb at 0.5 lb/A provided 87% control. Kerb at 0.5 lb/A injured tall fescue, but first-cut tall fescue yield was not significantly reduced. Downy brome control was challenging in this trial given downy brome plants were 1 to 4 inches tall at the time of application. Sencor at rates ≥ 0.75 lb ai/A, Kerb at rates ≥ 0.375 lb ai/A, and Matrix at 1.0 oz ai/A gave ≥ 85% control of downy brome, but all these treatments caused unacceptable injury to timothy (Table 3).

Table 1. Influence of fall-applied herbicides on weed control and orchardgrass at Lassen County sites.

	Rate	Shepherds-purse[1]	Sandbur[1]	Orchardgrass Injury[2]	Orchardgrass Yield[3]
	ai / acre[4]	--------- % control ---------		- % injury -	100% dry ton/acre
Untreated	--	0	0	0	3.33
Sencor 4SC[5]	0.5 lb	100	0	0	3.05
Sencor 4SC	0.75 lb	100	0	0	3.40
Sencor 4SC	1.0 lb	100	0	0	2.95
Sencor + Gramoxone	0.75lb+0.25lb	100	0	18	2.35
Prowl H20	1.9 lb	0	98	2	3.26
Prowl H20	2.9 lb	0	100	0	3.54
Prowl H20	3.8 lb	0	100	0	3.16
ProwlH20 + Gramoxone	2.9 lb+ 0.375lb	0	100	15	2.55
Kerb	0.25 lb	0	0	0	3.19
Kerb	0.375 lb	0	0	2	2.79
Kerb	0.5 lb	0	0	7	2.50
Matrix	0.5 oz	100	0	43	1.64
Matrix	1.0 oz	100	0	63	0.82
Olympus	0.42 oz	73	0	0	2.97
Olympus	0.63 oz	60	0	0	2.91
Plateau	1.25 oz	100	0	12	2.41
DPX-KJM44	1.0 oz	0	0	2	3.31
DPX-KJM44	2.0 oz	0	0	0	3.12
Telar	0.375oz	100	0	3	2.89
LSD (0.05)		18	9	6	0.57

[1] Weed control ratings were taken in a weedy one year old orchardgrass stand near Standish, CA. Shepherdspurse control was evaluated on 5/16/08. Sandbur control was evaluated on 7/3/08 after first cut.
[2] Orchardgrass injury was evaluated on 4/17/08 on a weed-free established orchardgrass stand near Pittville, CA.
[3] Orchardgrass first-cut yield was measured on 6/12/08 on a weed-free established orchardgrass stand near Pittville, CA.
[4] ai / acre = herbicide active ingredient per acre.
[5] All treatments included non-ionic surfactant (R-11) at 0.25 % v/v.

Table 2. Influence of fall-applied herbicides on foxtail barley control and tall fescue at Honey Lake.

	Rate	Foxtail barley[1]	Tall fescue injury[2]	Tall fescue yield[3]
	ai / acre[4]	---- % control ----	---- % injury -----	100% dry ton/acre
Untreated	--	0	0	0.81
Sencor 4SC[5]	0.5 lb	0	0	1.02
Sencor 4SC	0.75 lb	0	0	0.83
Sencor 4SC	1.0 lb	0	0	1.01
Sencor + Gramoxone	0.75lb+0.25lb	0	16	0.41
Prowl H20	1.9 lb	0	0	1.09
Prowl H20	2.9 lb	0	0	1.02
Prowl H20	3.8 lb	0	0	0.88
ProwlH20 + Gramoxone	2.9 lb+ 0.375lb	0	8	0.76
Kerb	0.25 lb	0	0	1.09
Kerb	0.375 lb	65	0	0.88
Kerb	0.5 lb	87	18	0.76
Matrix	0.5 oz	37	41	0.10
Matrix	1.0 oz	78	65	0.16
Olympus	0.42 oz	0	0	1.01
Olympus	0.63 oz	0	0	0.79
Plateau	1.25 oz	0	11	0.31
DPX-KJM44	1.0 oz	0	0	1.08
DPX-KJM44	2.0 oz	0	0	1.05
Telar	0.375oz	0	0	0.98
LSD (0.05)		19	7	0.48

[1] Foxtail barley control was evaluated on 5/29/08 shortly before first cutting.
[2] Tall fescue injury was evaluated on 5/14/08.
[3] Tall fescue yield was measured at first-cut on 6/4/08. Yield is expressed as total yield and includes weeds.
[4] ai / acre = herbicide active ingredient per acre.
[5] All treatments included non-ionic surfactant (R-11) at 0.25 % v/v.

Table 3. Influence of fall-applied herbicides on weed control and timothy at Pittville.

	Rate	Downy brome[1]	Timothy Injury[2]	Timothy Yield[3]
	ai / acre[4]	----- % control -----	----- % injury -----	100% dry ton/acre
Untreated	--	0	0	2.83
Sencor 4SC[5]	0.5 lb	64	23	1.43
Sencor 4SC	0.75 lb	85	18	1.58
Sencor 4SC	1.0 lb	91	28	1.01
Sencor + Gramoxone	0.75lb+0.25lb	90	32	0.81
Prowl H20	1.9 lb	0	4	2.13
Prowl H20	2.9 lb	0	5	2.24
Prowl H20	3.8 lb	0	6	2.51
ProwlH20 + Gramoxone	2.9 lb+ 0.375lb	56	28	2.66
Kerb	0.25 lb	80	78	0.66
Kerb	0.375 lb	93	85	0.51
Kerb	0.5 lb	99	90	0.23
Matrix	0.5 oz	82	85	0.22
Matrix	1.0 oz	96	88	0.06
Olympus	0.42 oz	36	3	2.21
Olympus	0.63 oz	30	8	2.04
Plateau	1.25 oz	76	67	0.85
DPX-KJM44	1.0 oz	24	0	2.16
DPX-KJM44	2.0 oz	24	0	2.87
Telar	0.375oz	0	8	2.31
LSD (0.05)		15	16	0.74

[1] Downy brome control was evaluated on 5/20/08.
[2] Timothy injury was evaluated on 4/17/08.
[3] Timothy first-cut yield was measured on 6/19/08. Yield is expressed as total yield and includes weeds.
[4] ai / acre = herbicide active ingredient per acre.
[5] All treatments included non-ionic surfactant (R-11) at 0.25 % v/v.

Spring and Summer Weed Control in Established Alfalfa with Prowl H_20 Tank-Mixes

Introduction: Prowl H20 herbicide is a water-based formulation of pendimethalin. Prowl H20 offers advantages over older pendimethalin formulations including: no odor, reduced staining, better performance in high surface residue, and no incorporation requirement. This trial examined control of winter annual and summer weeds in established alfalfa. The trial looked at tank mixing Prowl H20 with other herbicides labeled in established alfalfa to find full-season chemical control options using a late winter herbicide application.

Study Investigators: Rob Wilson and Steve Orloff

Cooperator: Fred Wemple

Date and Crop Stage of Herbicide Applications: **March application**: 3/6/08, alfalfa had 0 to 0.25 inch re-growth.

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.

Site Conditions: Established alfalfa stand irrigated with a center pivot; sandy loam soil.

Weed size at application: Shepherdspurse- 1 inch rosettes; yellow foxtail and lambsquarter emerged after the application.

Data Collected: Visual weed control and alfalfa injury were evaluated on 05/12/08 and 06/24/08.

Results: None of the treatments caused visual injury to the alfalfa on 5/12/08 or 06/24/08. Weed control results are presented in the Table on page 10. All treatments that included Velpar alone, Velpar + Gramoxone, Sencor + Gramoxone, and Karmex + Gramoxone provided 90 to 100% control of shepherdspurse. Gramoxone and Prowl H20 + Gramoxone provided < 60% control of shepherdspurse. Prowl H20 at rates ≥ 4 pints/acre provided over 90% control of yellow foxtail and lambsquarter. Prowl H20 efficacy on yellow foxtail and lambsquarter was not influenced by mixing it with Gramoxone, Velpar, Sencor, and/or Karmex. Gramoxone alone and Gramoxone + Sencor did not control yellow foxtail. Velpar + Gramoxone and Karmex + Gramoxone suppressed yellow foxtail, but control was less than 70%. Velpar + Gramoxone, Sencor + Gramoxone, and Karmex + Gramoxone provided 85%, 88%, and 77% lambsquarter control respectively.

Table. Spring and summer weed control from various herbicides applied in early March to established alfalfa.

	Product rate[1]	Shepherdspurse[2]	Yellow foxtail[3]	Lambsquarter[4]
	pint / acre	---------- % control ----------		
Untreated	--	0	0	0
Gramoxone Inteon[5]	2	42	0	0
Prowl H20 + Gramoxone Inteon	3 + 2	47	51	63
Prowl H20 + Gramoxone Inteon	4 + 2	40	93	91
Prowl H20 + Gramoxone Inteon	6 + 2	53	96	97
Prowl H20 + Gramoxone Inteon	8 + 2	53	100	100
Velpar L + Gramoxone Inteon	1.5 + 1	100	67	85
Prowl H20 + Velpar L + Gramoxone Inteon	4+1.5+1	100	100	100
Prowl H20 + Velpar L	4 + 2	100	97	100
Prowl H20 + Velpar L	6 + 2	100	98	97
Sencor 4SC + Gramoxone Inteon	0.75 + 1	100	0	88
Prowl H20 + Sencor 4SC + Gramoxone Inteon	4+0.75+1	100	92	97
Karmex 80DF + Gramoxone Inteon	1.9 lb + 1.5	97	42	77
Prowl H20 + Karmex 80DF + Gramoxone Inteon	4 + 1.9 lb +1.5	93	98	98
Prowl H20 + Sencor 4SC + Karmex 80DF + Gramoxone Inteon	4 + 0.75 + 1.9 lb +1	98	98	98
LSD (0.05)		17	12	13

[1] Herbicide rates are expressed as pints of product per acre except for Karmex 80DF which is expressed as pounds of product per acre.
[2] Shepherdspurse control was evaluated on 5/12/08 before first cutting.
[3] Yellow foxtail control was evaluated on 6/24/08 after first cutting.
[4] Lambsquarter control was evaluated on 6/24/08 after first cutting.
[5] All treatments included non-ionic surfactant (R-11) at 0.25 % v/v.

Medusahead Control on Rangeland with Various Herbicides

Introduction: The invasion of non-native annual grasses threatens most plant communities in the Great Basin. Experiments were established between fall 2006 and spring 2008 near Likely, CA, to evaluate herbicide efficacy for medusahead control in big sagebrush rangeland.

Study Investigators: Rob Wilson

Herbicide Application Information: The first experiment was established in 2006-2007. Herbicides were applied in fall 2006 or early spring 2007. The second experiment was established in 2007-2008. Herbicides were applied in fall 2007, early spring 2008, or late spring 2008.

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.

Plant Community Present at the Time of Application: The trial was located on rangeland heavily infested with medusahead. Vegetation was primarily medusahead with scattered squirreltail, California brome, and downy brome. Perennial grasses were dormant at fall herbicide application, and they were 2 to 3 inches tall at the spring application. Medusahead stage and height at the time of herbicide application are presented below.

Treatment application	Date	Medusahead stage/ height
2006-2007 experiment		
Fall application 2006	11/01/2006	pre-emergence
Spring application 2007	03/22/2007	2 to 3 leaf/ 1 to 2 inch
2007-2008 experiment		
Fall application 2007	10/25/2007	1 leaf/ 1 inch
Early spring application 2008	04/28/2008	tillering/ 2 to 3 inch
Late spring application 2008	05/30/2008	late boot/ 9 to 12 inch

Data Collected: For the 2006-2007 trial, weed control and injury ratings were taken on 6/4/07 and 6/30/08. Weed control ratings were taken on 6/30/08 for the 2007-2008 trial. Weed control was visually estimated based on percent density reduction compared to the untreated control.

Results: Fall application of Matrix at rates ≥ 1.0 oz ai/A gave 100% control of medusahead seven months after treatment (MAT) (Tables 1 and 2). Fall application of Oust or Landmark XP also gave 100% medusahead control 7 MAT (Tables 1 and 2). Spring application of Matrix or Landmark XP was not as effective as the fall application for medusahead control. Matrix applied in fall or spring caused minimal injury to California brome (Table 2).

Matrix gave < 30% medusahead control in June 2008 one year after treatment (YAT) suggesting rimsulfuron soil activity was minimal after the first growing season (Table 1). Plateau and Oust gave 68% to 83% control 1 YAT, but medusahead plants that survived in these plots were robust and produced a lot of seed (personal observation) due to low competition. The high density of medusahead plants in fall applied Matrix plots 1 YAT suggests that a significant amount of medusahead seed remains in the seedbank after one season of control.

Government land managers have interest in using Roundup (glyphosate) to control annual grasses on Great Basin rangeland. Spring-applied Roundup at the tillering and late boot stage gave 100% medusahead control except for the low 4 oz ai/A rate (Table 2).

Table 1. Medusahead control and visual grass injury from herbicides applied near Likely, CA, in 2006-2007.

Herbicide treatment	Rate	Application time	Medusahead control June 07	Medusahead control June 08	California brome injury June 07
	oz ai/A		------% control ------		---- % injury[1] ----
Untreated			0	0	0
Matrix + NIS[2]	0.5	fall	91	7	0
Matrix + NIS	0.75	fall	92	0	0
Matrix + NIS	1.0	fall	100	0	0
Matrix + NIS	1.25	fall	100	13	1
Matrix + NIS	1.5	fall	100	13	1
Matrix + Telar + NIS	1.0+0.38	fall	100	27	1
Oust + NIS	0.75	fall	100	83	10
Landmark XP + NIS	0.75	fall	100	80	9
Plateau + MSO[3]	1.5	fall	98	68	1
Sencor 75DF + NIS	0.75	fall	88	0	0
Matrix + NIS	0.75	spring	50	10	0
Matrix + NIS	1.0	spring	82	20	1
Matrix + NIS	1.5	spring	88	13	1
Matrix + Roundup + NIS	0.75+0.25	spring	90	0	4
$LSD_{(0.05)}$			8	19	3

[1] % injury was based on visual herbicide stunting and chlorosis compared to the untreated plot. 0 = no injury; 10 = plant death

[2] NIS = non-ionic surfactant (R-11) added at 0.25% v/v

[3] MSO = ethylated seed oil and non-ionic surfactant blend (Hasten) added at 1.0 pt/A

Table 2. Medusahead control from herbicides applied near Likely, CA, in 2007-2008.

Herbicide treatment	Rate	Application time	Medusahead control June 08
	oz ai/A		-----% control -----
Untreated			0
Matrix + NIS[1]	1.0	fall	100
Matrix + Telar + NIS	1.0+0.38	fall	100
Landmark XP + NIS	0.38	fall	100
Landmark XP + NIS	0.75	fall	100
Landmark XP + NIS	0.38	early spring	0
Roundup + NIS + AMS[2]	4	early spring	75
Roundup + NIS + AMS	8	early spring	100
Roundup + NIS + AMS	12	early spring	100
Roundup + NIS + AMS	16	early spring	100
Roundup + NIS + AMS	4	late spring	70
Roundup + NIS + AMS	8	late spring	100
Roundup + NIS + AMS	12	late spring	100
Roundup + NIS + AMS	16	late spring	100
$LSD_{(0.05)}$			3

[1] NIS = non-ionic surfactant (R-11) added at 0.25% v/v

[2] AMS = ammonium sulfate added at 10 lb per 100 gallons of spray solution

Established Perennial Grass Tolerance and Downy Brome Control with Matrix and Landmark XP

Introduction: This study examined established perennial grass and shrub tolerance to Matrix and Landmark XP applied in the fall one month after a killing frost. Perennial grasses were established for at least three years prior to herbicide application. The study was conducted within an abandoned dryland perennial grass variety trial infested with downy brome located near Likely, CA.

Study Investigators: Rob Wilson

Herbicide Application Information: Herbicides were applied on 10/25/07.

Plot Size and Application Method: Sub-plot size was 5 by 20 ft. The experiment was arranged in a split plot with three replications. Herbicides were applied at 20 gallons per acre using a 10 ft boom CO_2 backpack sprayer.

Plant Community Present at the Time of Application: Annual grasses were at the one-leaf stage and one inch tall. Perennial grasses and shrubs were going dormant, but many plants still had green tissue. The soil was a cobbly loam.

Data Collected: Weed control and injury data were collected on 6/30/08 when the majority of grasses were flowering. Visual injury ratings were made on a scale of 0 to 100 with 0 equal to no chlorosis or stunting compared to the untreated control and 100 equal to plant death.

Results: Matrix and Landmark XP gave 98% or better control of downy brome (Table 1). Perennial grasses and shrubs showed greater tolerance to Matrix compared to Landmark XP (Table 2). Matrix caused ≤ 5% injury to most wheatgrass species, sagebrush, and rabbitbrush and ≤ 20% injury to smooth brome and squirreltail. Matrix caused the greatest injury (32 to 40%) to Russian and beardless wildrye. Landmark XP caused > 30% injury to most grasses, but was safe (0% injury) on sagebrush and rabbitbrush. Crested wheatgrass, squirreltail, tall wheatgrass, western wheatgrass, and bluebunch wheatgrass showed the greatest tolerance to Landmark XP. Grass tolerance was not influenced by the rate of Landmark XP.

Table 1. Downy brome control from herbicides on 6/30/08.

Herbicide Treatment	Rate	Downy brome control
	oz ai/A	----------% control----------
Untreated control	----	0
Matrix + NIS[1]	1.0	99
Landmark XP + NIS	0.38	98
Landmark XP + NIS	0.75	100
$LSD_{(0.05)}$		4

[1] NIS = non-ionic surfactant (R-11) added at 0.25% v/v

Table 2. Injury from herbicides on 6/30/08.

	Herbicide injury		
	Matrix + NIS[1]	Landmark XP + NIS	
Species	1.0 oz ai/A	0.38 oz ai/A	0.75 oz ai/A
	----------% injury----------		
'Rosana' western wheatgrass	3	33	42
'Lincoln' smooth brome	13	65	60
'Secar' bluebunch wheatgrass	0	42	45
'Bannock' thickspike wheatgrass	5	55	60
'Hycrest' crested wheatgrass	0	35	25
'Oahe' intermediate wheatgrass	0	62	72
'Luna' pubescent wheatgrass	5	58	48
'Newhy' hybrid wheatgrass	13	67	68
'Alkar' tall wheatgrass	2	35	40
'Shoshone' beardless wildrye	40	72	67
'Sand hollow' squirreltail	20	33	32
'Bozoisky-Sel.' Russian wildrye	32	53	42
Wyoming big sagebrush	0	0	0
Gray rabbitbrush	0	0	0
$LSD_{(0.05)}$	---------- 16 ----------		

[1] NIS = non-ionic surfactant (R-11) added at 0.25% v/v

Squarrose Knapweed Control with Herbicides Applied at Rosette and Bolting Stage

Introduction: Squarrose knapweed is a common rangeland weed in Big Valley in Northeast California. This trial evaluated the efficacy of Milestone and other herbicides applied at the rosette and late bolting stage on squarrose knapweed. Land managers in Big Valley have used 2,4-D, Banvel, Transline, and Transline + 2,4-D to control squarrose knapweed.

Study Investigator: Rob Wilson

Cooperator: Carri Pirosko

Date of Herbicide Application: Rosette treatments: 04/23/07; Bolting treatments: 06/06/07.

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: Loam. The soil surface and sub-surface was moist at the time of the rosette application. The soil surface was moist and sub-surface was dry at the time of bolting application.

Plant Community Present at the Time of Application: The site was located in a horse pasture heavily infested with squarrose knapweed. Rosettes were 3 to 5 inches diameter and bolting plants were 1 to 2 ft tall with most bolting plants showing small flowerbuds. Other vegetation included downy brome, bulbous bluegrass, and sporadic sagebrush and rabbitbrush.

Data Collected: Squarrose knapweed burndown from herbicides was measured on 6/6/07 and 7/11/07, and percent control was measured on 8/14/07 and 5/20/08.

Results: Milestone at rates ≥ 1.25 oz ae/A applied at the rosette stage provided over 90% control of squarrose knapweed one year after treatment (YAT) (Figure 2). Milestone applications at the bolting stage required the high 1.75 oz ae/A rate to achieve > 90% control 1 YAT (Figure 2). When applied at the bolting stage, Milestone and Transline were slow-acting and several bolting plants retained green leaves and stems at the August 2007 evaluation. Adding 2,4-D to Milestone and Transline at the bolting stage gave quicker burn-down compared to applying Milestone or Transline alone (Figure 1), but the addition of 2,4-D did not influence control 1 YAT (Figure 2). Milestone and Transline's slow burn-down activity on bolting squarrose knapweed maybe a reason land managers have reported inconsistent control with these herbicides when they were not tank-mixed with 2,4-D.

Figure 1. Squarrose Knapweed Control with Herbicides Applied at the Rosette or Bolting Stage (evaluated 2 months after treatment)

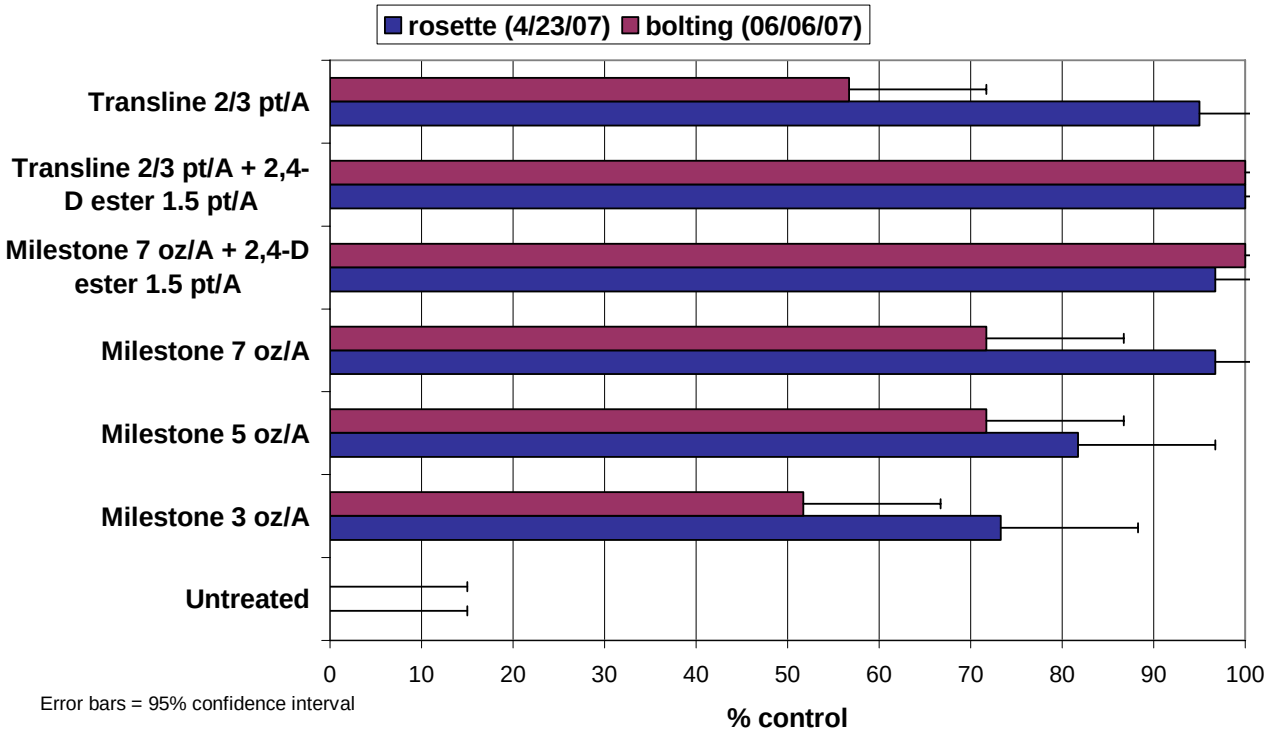
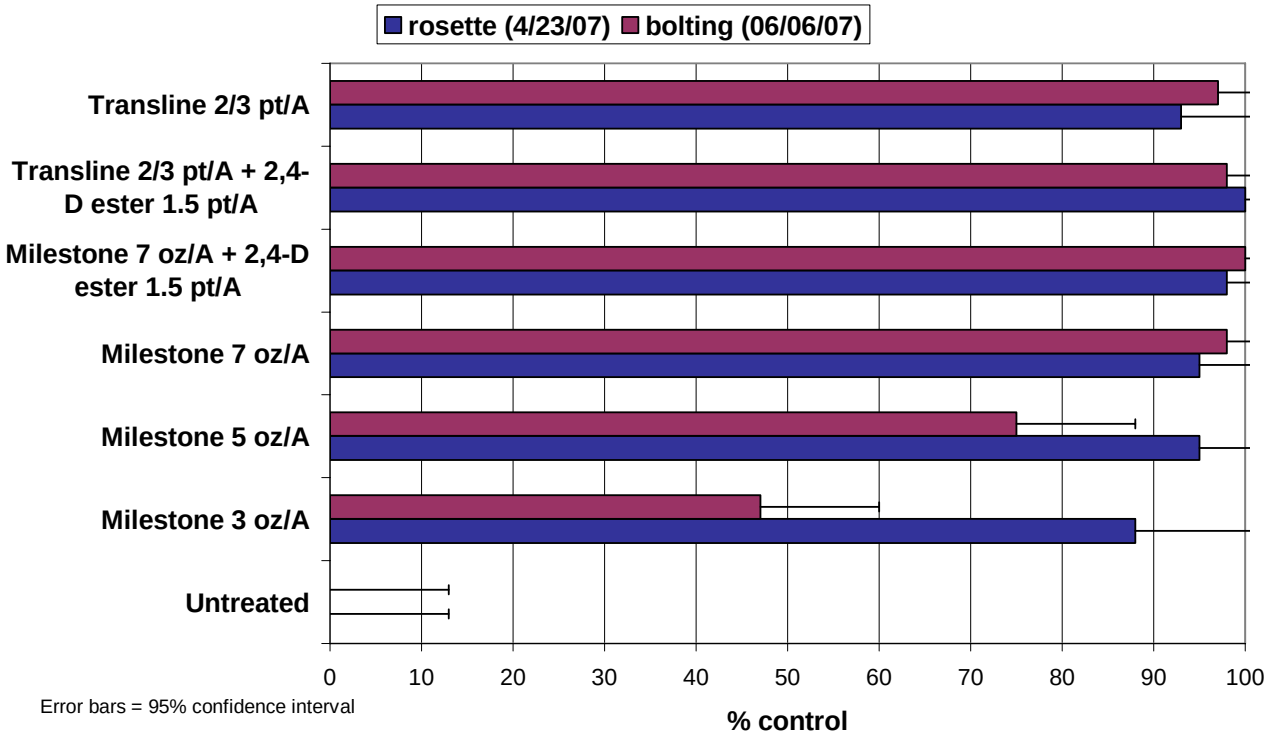


Figure 2. Squarrose Knapweed Control with Herbicides Applied at the Rosette or Bolting Stage (evaluated 1 year after treatment)



Bull Thistle, Prickly Lettuce, and Dandelion Control with Herbicides Applied at the Bolting Stage

Introduction: Bull thistle is a common weed in irrigated pastures, meadows, and forests in Northeast California. This trial evaluated the efficacy of several herbicides currently used for bull thistle control along with a experimental herbicide from DuPont labeled DPX- MAT28 and DPX- KJM44. Dandelion and prickly lettuce were other weeds with a high density in every plot.

Study Investigator: Rob Wilson

Cooperator: Dan Marlatt

Date of Herbicide Application: Bolting treatment: 07/01/08.

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.

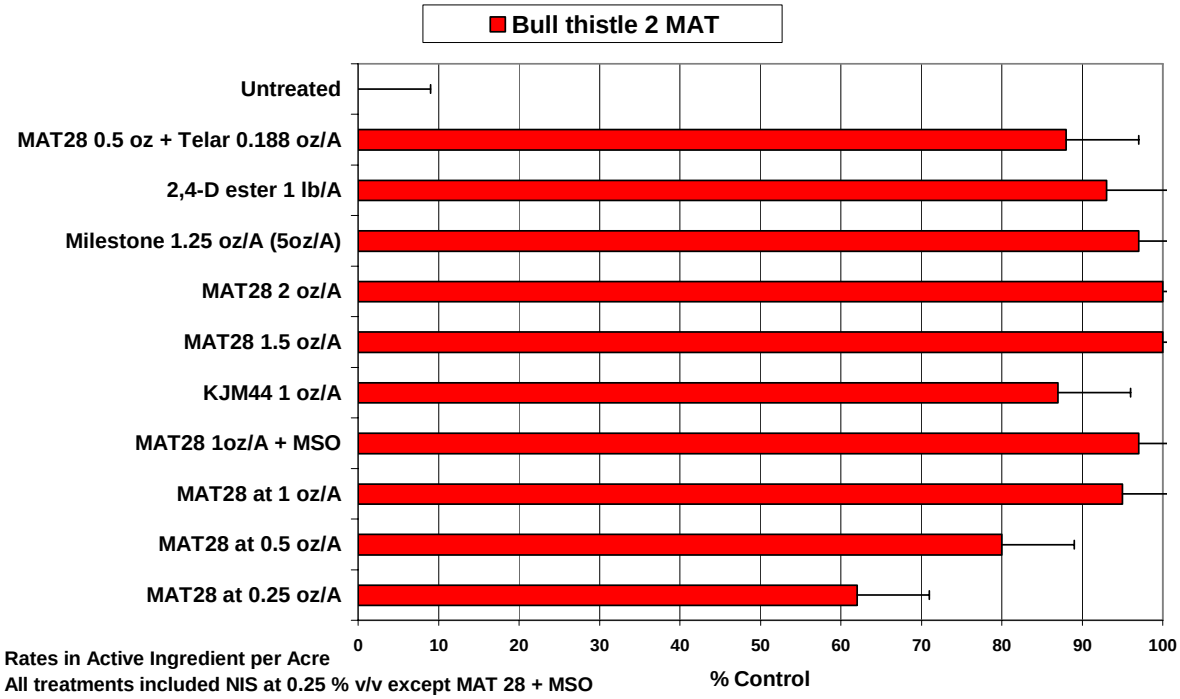
Soil Type and Moisture: Loam. The soil surface was dry and sub-surface was moist at the time of the application.

Plant Community Present at the Time of Application: The site was located in a tall fescue pasture infested with bull thistle. Bull thistle plants were a mix of 2 to 8 inch rosettes and 1 to 3 ft bolting plants. Prickly lettuce was 6 to 8 inches tall and bolting. Dandelion rosettes were 4 to 8 inch diameter. Tall fescue plants had 2 to 5 inch re-growth after grazing. The plot area was fenced after application.

Data Collected: Weed control and crop injury ratings were visually evaluated 2 weeks, 4 weeks, and 2 months after herbicide application.

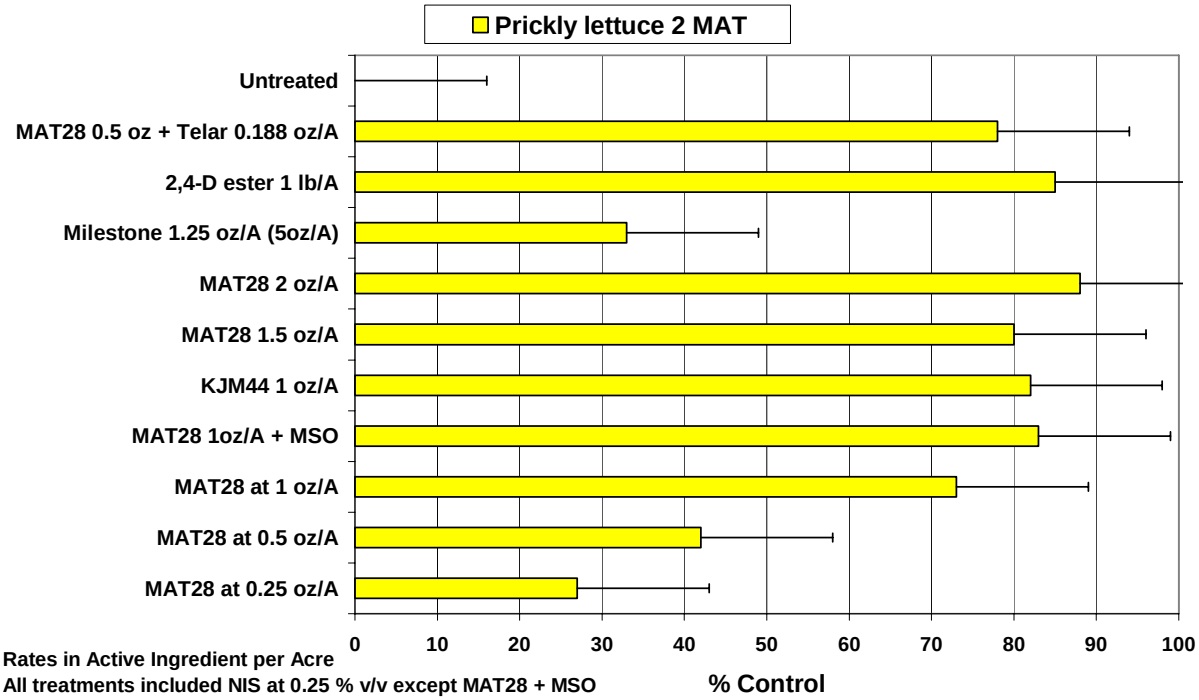
Results: DPX- MAT28 at rates ≥ 1 oz ai/A, Milestone at 1.25 oz ai/A (5 fl.oz. of product/acre), and 2,4-D ester at 1 lb ai/A provided over 90% control of bull thistle 2 months after treatment (Figure 1). DPX-MAT28 at rates ≥ 1 oz ai/A, DPX- MAT28 + Telar, and 2,4-D ester at 1 lb ai/A provided good suppression of prickly lettuce 2 months after treatment (Figure 2). DPX- MAT28 at 1 oz ai/A with methylated seed oil, DPX- MAT28 at rates ≥ 1.5 oz ai/A with NIS, DPX- MAT28 + Telar, and 2,4-D ester at 1 lb ai/A provided suppression of dandelion (Figure 3). Most treatments were safe on tall fescue (figure 4). The only treatment to cause greater than 10% injury to tall fescue 4 weeks after treatment was DPX-MAT28 + Telar.

Figure 1. The Influence of Herbicides applied at Bull Thistle Bolting on Control 2 Months After Treatment (MAT) near Susanville, CA



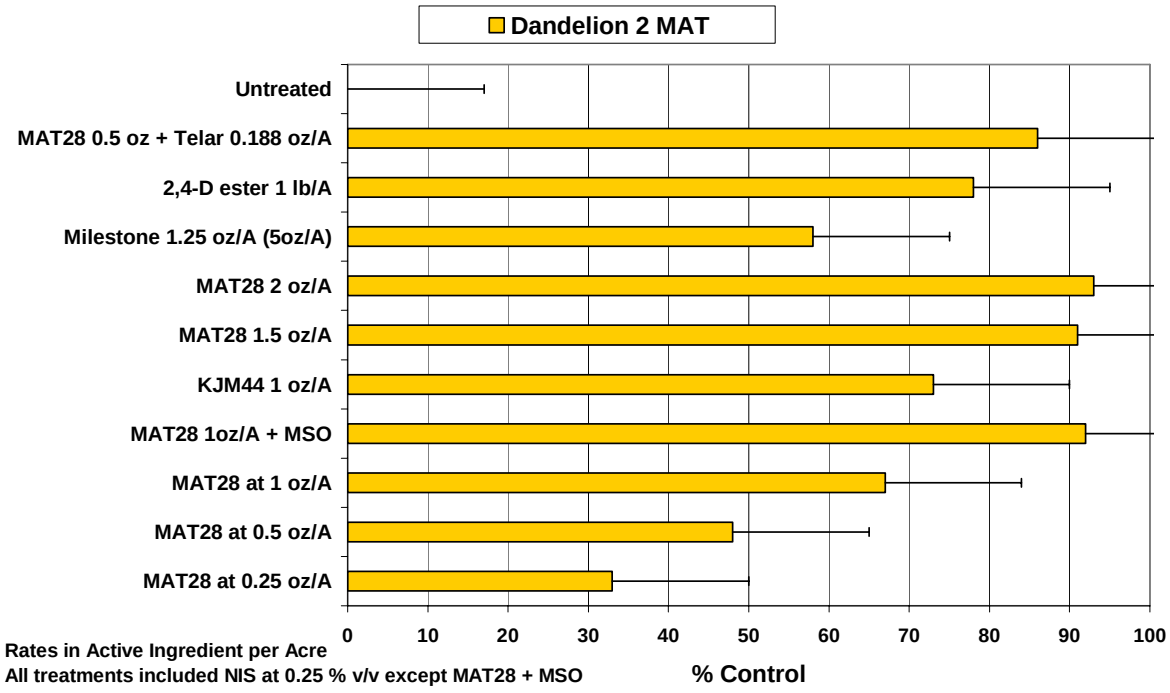
Rates in Active Ingredient per Acre
All treatments included NIS at 0.25 % v/v except MAT 28 + MSO

Figure 2. The Influence of Herbicides applied at Prickly Lettuce Bolting on Control 2 Months After Treatment (MAT) near Susanville, CA



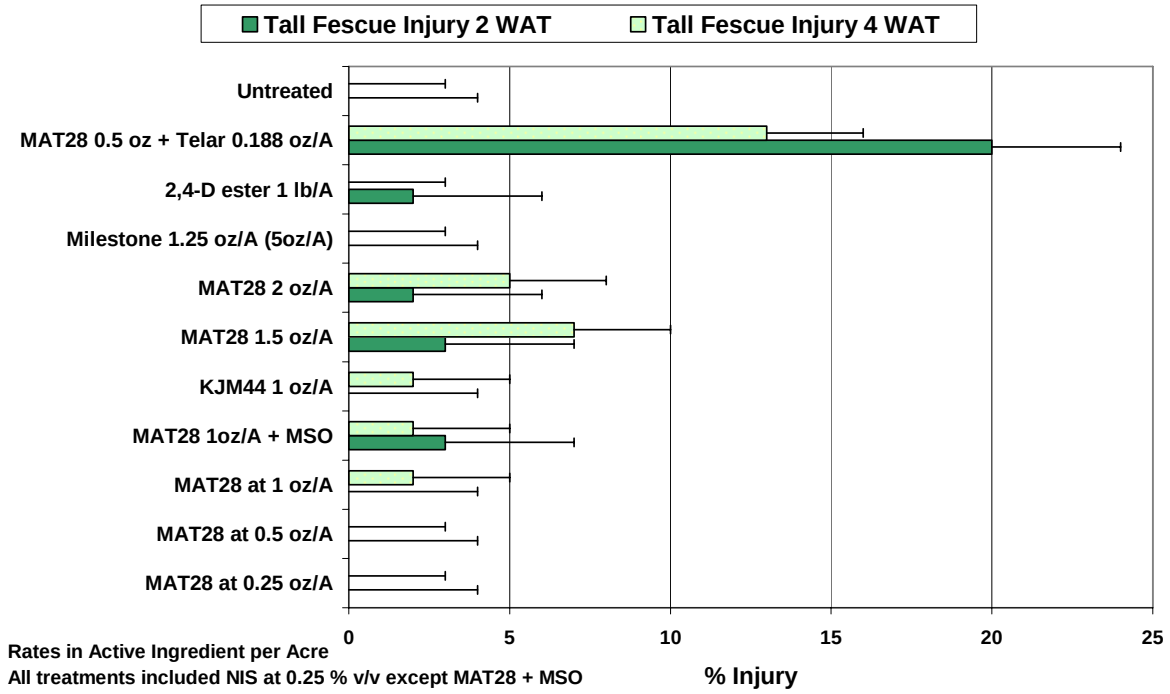
Rates in Active Ingredient per Acre
All treatments included NIS at 0.25 % v/v except MAT28 + MSO

Figure 3. The Influence of Herbicides on Summer Dandelion Control 2 Months After Treatment (MAT) near Susanville, CA



Rates in Active Ingredient per Acre
All treatments included NIS at 0.25 % v/v except MAT28 + MSO

Figure 4. The Influence of Herbicides on Tall Fescue Injury 2 and 4 Weeks after Treatment (WAT) near Susanville, CA



Rates in Active Ingredient per Acre
All treatments included NIS at 0.25 % v/v except MAT28 + MSO

Perennial Pepperweed and Canada Thistle Control with Various Herbicides

Study Investigator: Rob Wilson

Cooperator: Jack Hanson and California Department of Fish and Game

Date of Herbicide Application: 06/03/07

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: **Canada thistle site**: loam. The soil surface and sub-surface was wet at the time of application. The site was irrigated throughout the growing season. **Perennial Pepperweed site:** clay loam. The soil surface was dry and sub-surface was moist at the time of application.

Plant Community Present at the Time of Application: **Canada thistle site**: The site was located in an irrigated pasture infested with Canada thistle. The pasture was mix of Kentucky bluegrass, smooth brome, and tall fescue. The grass stand was excellent in most plots, and Canada thistle shoots were numerous in every plot. Other weeds present included scouring rush and sporadic dandelion. Canada thistle was 1 to 2 ft tall and bolting at the time of application. **Perennial Pepperweed site:** The site was located in dryland pasture heavily infested with perennial pepperweed. The pasture consisted of a sporadic stand of tall wheatgrass and saltgrass. Perennial pepperweed and poverty weed density were high in every plot. Perennial pepperweed was 3 to 5 ft tall in the flowerbud to flowering stage at the time of herbicide application.

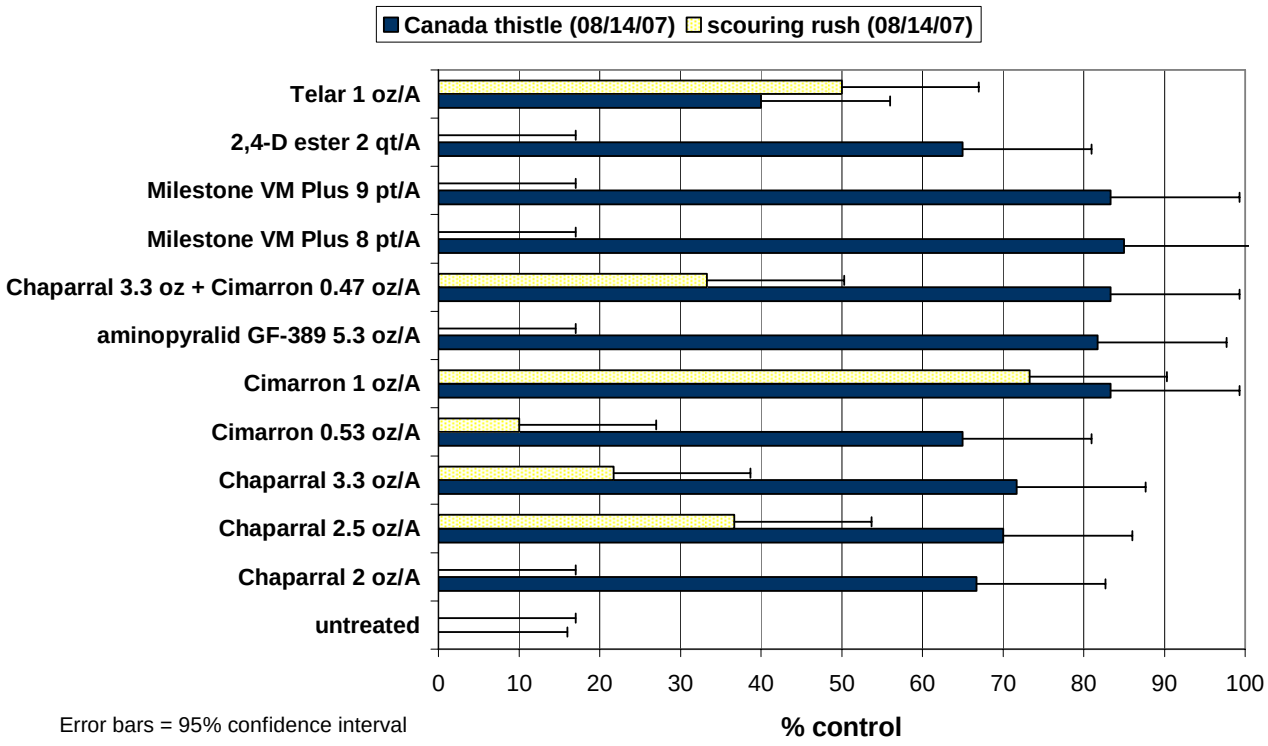
Data Collected: Canada thistle and perennial pepperweed burn-down was measured on 07/02/07 and percent control was measured on 08/14/07. One year after treatment, percent control was evaluated on 07/09/08 for perennial pepperweed and 7/31/08 for Canada thistle. Perennial grass injury was measured on 07/02/07, 08/14/07, and 7/31/08 at the Canada thistle site.

Results: Canada thistle control is presented in figures 1 and 2. Cimarron at 1 oz/A, aminopyralid GF-389 at 5.3 oz/A, Chaparral + Cimarron, and Milestone VM Plus gave > 80% control of Canada thistle 2 months after treatment (2 MAT) (figure 1). Chaparral at 3.3 oz/A, aminopyralid GF-389, Chaparral + Cimarron, and Milestone VM Plus at 9 pt/A gave ≥ 90% control of Canada thistle 1 YAT (figure 2). Cimarron at 1 oz/A provided the best control of scouring rush 2 MAT, and Cimarron at 1 oz/A, Chaparral + Cimarron, and Telar provided > 50% control of scouring rush 1 YAT. Chaparral, Cimarron, Chaparral + Cimarron, and Telar stunted and discolored Kentucky bluegrass and smooth brome 2 MAT, but none of the treatments caused grass stand reduction (figure 3). Visual grass injury from the herbicides was not observed 1 YAT.

Perennial pepperweed control is presented in figures 4 and 5. Telar at 1 oz/A, Chaparral at 2 to 3.3 oz/A, Cimarron at 1 oz/A, 2,4-D ester at 2 qt/A, and Chaparral + Cimarron provided over 90% control of perennial pepperweed 2 MAT (figure 4). 2,4-D ester at 2 qt/A provided over 90% control of poverty weed (*Iva axillaris*) 2 MAT (figure 4). Milestone VM Plus, Cimarron at 1 oz/A, Chaparral at 3 oz/A, and Chaparral + Cimarron suppressed poverty weed, but control did not exceed 80%. Aminopyralid GF-389 did not control perennial pepperweed or poverty weed.

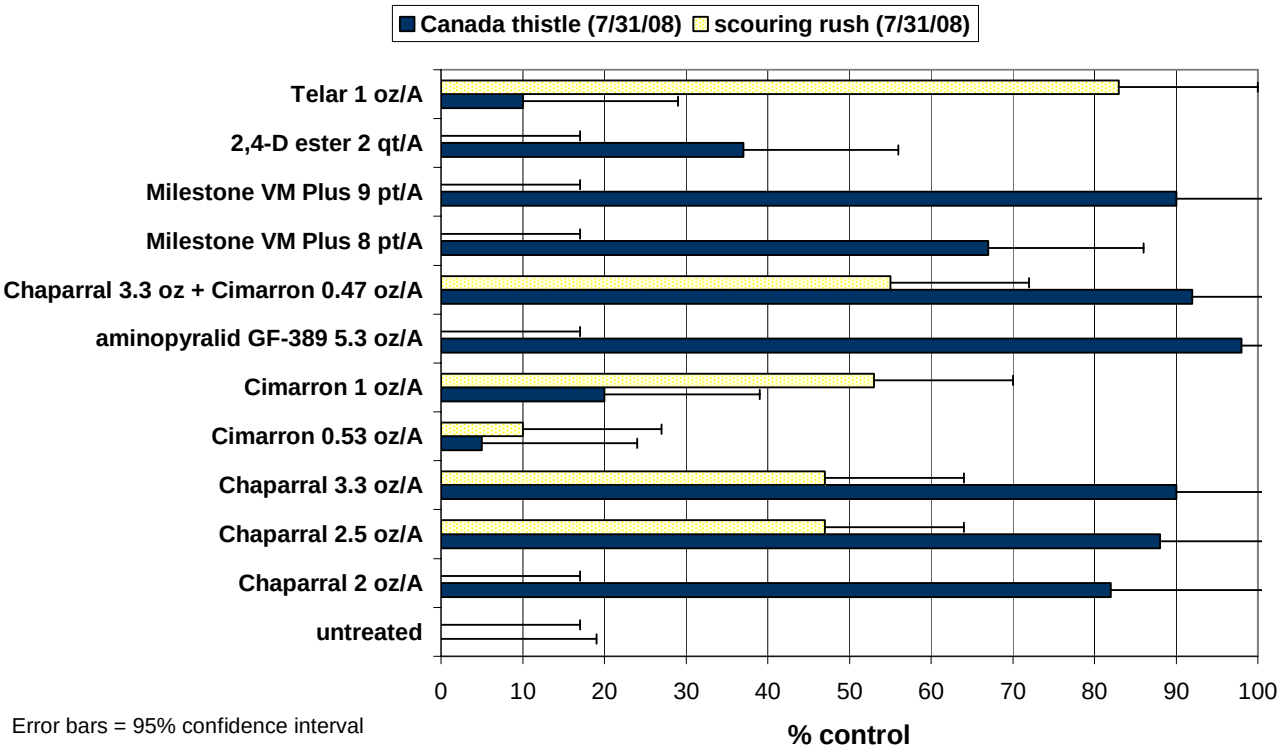
One year after treatment (1 YAT), Chaparral at 2.5 and 3.3 oz/A, Cimarron at 0.53 and 1.0 oz/A, Chaparral + Cimarron, and Telar gave > 80% perennial pepperweed control compared to untreated plots (figure 5). Chaparral + Cimarron, Milestone VM Plus, and 2,4-D ester gave > 50% control of povertyweed 1 YAT (figure 5).

Figure 1. Canada thistle and scouring rush control (2 MAT) from herbicides applied at Canada thistle bolting on 06/03/07



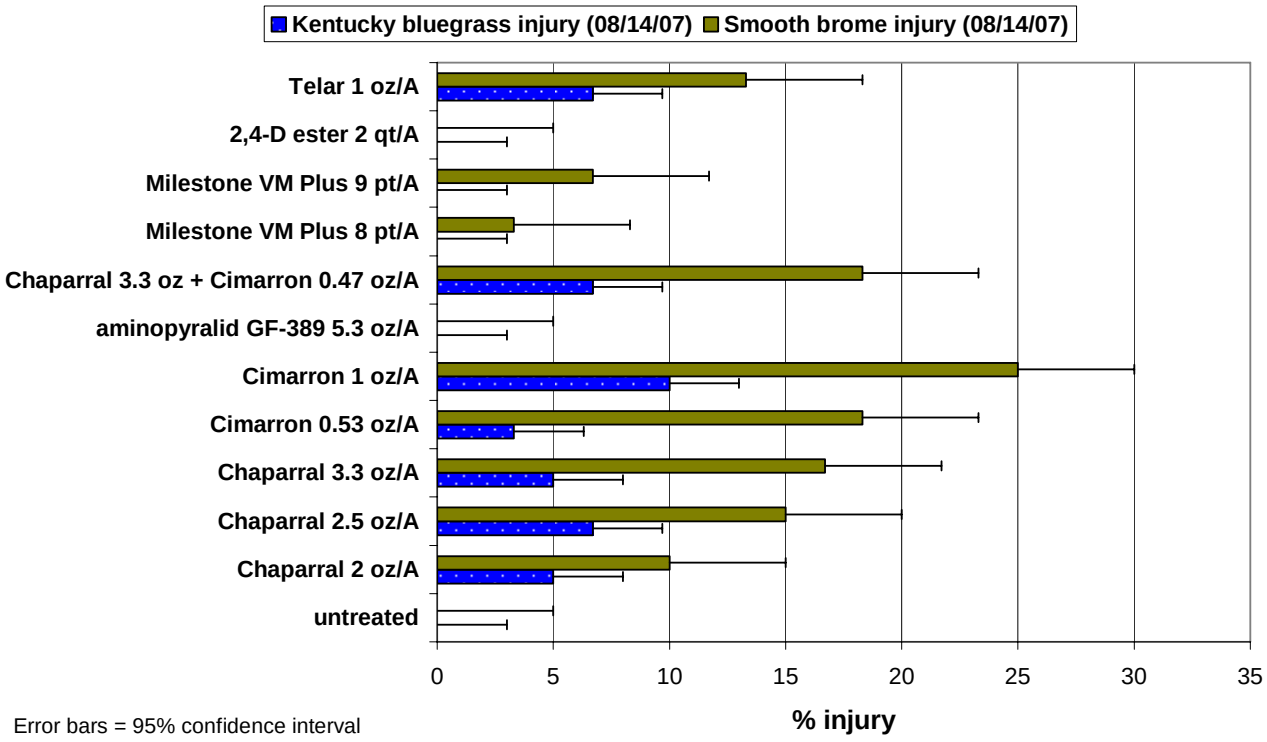
Error bars = 95% confidence interval

Figure 2. Canada thistle and scouring rush control (1 YAT) from herbicides applied at Canada thistle bolting on 06/03/07



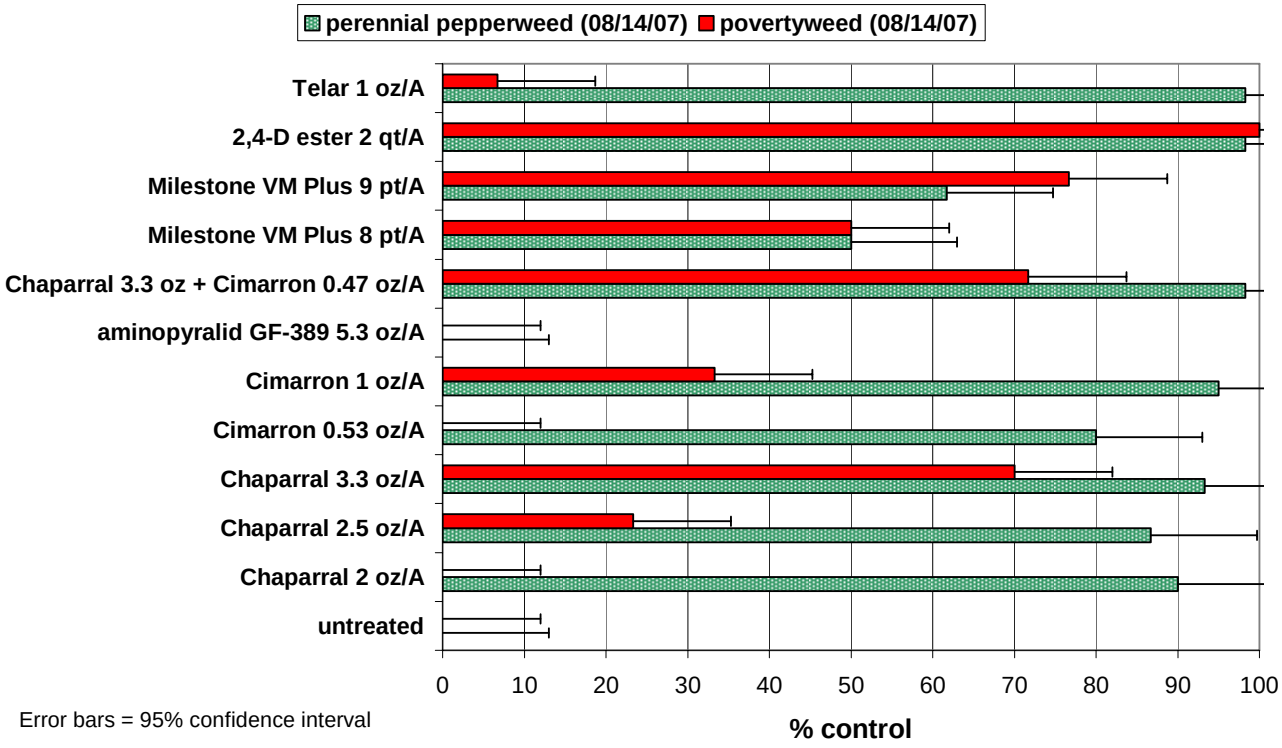
Error bars = 95% confidence interval

Figure 3. Kentucky bluegrass and smooth brome injury (2 MAT) from herbicides applied at Canada thistle bolting on 06/03/07



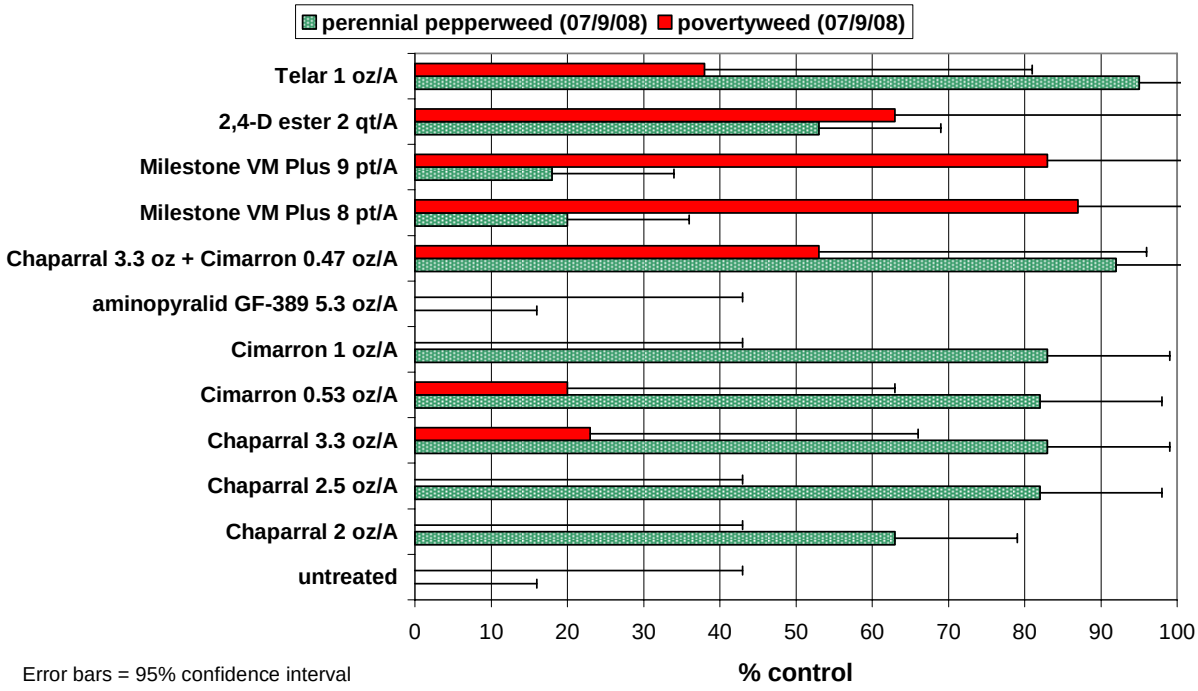
Error bars = 95% confidence interval

Figure 4. Perennial pepperweed and poverty weed control (2 MAT) from herbicides applied at perennial pepperweed flowering on 06/03/07



Error bars = 95% confidence interval

Figure 5. Perennial pepperweed and poverty weed control (1 YAT) from herbicides applied at perennial pepperweed flowering on 06/03/07



Error bars = 95% confidence interval