Aminopyralid applied alone or in combination with metsulfuron or picloram for absinth wormwood control. Rodney G. Lym. (Plant Sciences Department, North Dakota State University, Fargo, ND 58108-6050). Absinth wormwood is a perennial fragrant forb or herb that regrows from the soil level each spring from a large taproot. Absinth wormwood causes economic losses by reducing available forage, tainting the milk of cattle that graze it, and medically as a pollen source for allergies and asthma. The purpose of this research was to evaluate aminopyralid applied alone or with other herbicides in the spring or fall for absinth wormwood control.

The study was established on a wildlife production area in Barnes County, ND that recently had become infested with absinth wormwood. The treatments were applied June 26 or September 17, 2008 in separate experiments. June treatments were applied to absinth wormwood in the vegetative to bolting growth stage and 15 to 30 inches tall while plants were post-flower with woody stems and 24 to 36 inches tall when herbicides were applied in the fall.

Herbicides were applied using a hand-held boom sprayer delivering 17 gpa at 35 psi. Experimental plots were 10 by 30 feet and replicated four times in a randomized complete block design. Absinth wormwood control was evaluated visually using percent stand reduction compared to the untreated control.

Aminopyralid applied alone or with picloram in the spring or fall provided excellent absinth wormwood control (Tables 1 and 2). For instance, aminopyralid applied at 1.75 oz/A in the spring or fall averaged 100 and 99% control 12 MAT (months after treatment), respectively. However, absinth wormwood control with aminopyralid applied with metsulfuron tended to provide lower short-term control when spring applied and much lower control when fall applied than aminopyralid applied alone. Absinth wormwood control with aminopyralid plus metsulfuron applied in June was 55% in July averaged over application rate and adjuvant compared to an average of 91% with aminopyralid applied alone or with picloram (Table 1). Control increased to an average of 83% when 2,4-D ester was applied with aminopyralid plus metsulfuron. The reduction was short-lived and control increased to 99 to 100% regardless of treatment by June 2009 (12 MAT).

Aminopyralid applied with metsulfuron in the fall provided inconsistent absinth wormwood control. Control with aminopyralid plus metsulfuron applied at 1.05 + 0.19 oz/A with Activator 90 averaged 99% in Sept. 2009 but control averaged over the remaining three aminopyralid plus metsulfuron treatments was only 54% (Table 2). The addition of 2,4-D to the aminopyralid plus metsulfuron combination increased control to an average of 85%.

In summary, aminopyralid applied alone or with picloram provided excellent long-term absinth wormwood control regardless if applied in the spring or fall. However, absinth wormwood control with aminopyralid plus metsulfuron provided lower initial control in the spring and in general much lower long-term control in the fall than aminopyralid alone. Thus, aminopyralid alone provided the most cost-effective and consistent absinth wormwood control of the treatments evaluated in this study.

Table 1. Aminopyralid applied alone or with other herbicides and various adjuvants for absinth wormwood control in Barnes County, ND, on June 26, 2008.

Treatment	Rate	2008		2009	
		14 July	13 Aug	4 June	1 Sept
	—— oz/A ——	———— % control ————			
Aminopyralid + Activator 90[1]	1.75 + 0.25%	90	100	100	100
Picloram + Activator 90	6 + 0.25%	84	99	100	100
Aminopyralid + picloram + Activator 90	1.25 + 4.5 + 0.5%	92	100	100	100
Aminopyralid + metsulfuron[2] + Activator 90	1.05 + 0.19 + 0.25%	44	95	95	95
Aminopyralid + metsulfuron + Syl-Tac[3]	1.05 + 0.19 + 4%	53	99	99	99
Aminopyralid + metsulfuron + 2,4-D ester + Activator 90	1.05 + 0.19 + 8 + 0.25%	85	100	100	100
Aminopyralid + metsulfuron + Activator 90	1.32 + 0.23 + 0.25%	60	100	100	100
Aminopyralid + metsulfuron + 2,4-D ester + Activator 90	1.32 + 0.23 + 8 + 0.25%	82	99	99	99
Aminopyralid + metsulfuron + Activator 90	1.58 + 0.28 + 0.25%	62	98	100	100
Aminopyralid + picloram + Activator 90	1.25 + 3 + 0.25%	89	100	99	99
LSD (0.05)		27	3	NS	4

[1]Activator 90 surfactant by Loveland Products, Inc. P.O. Box 1286 Greeley, CO 80632.
[2]Aminopyralid plus metsulfuron was GF-2050 commercial formulation - Chaparral from Dow AgroSciences LLC, 9330 Zionsville Road, Indianapolis, IN 46268-1189.
[3]Syl-Tac surfactant by Wilbur-Ellis, 1801 Oakland Boulevard, Suite 210, Walnut Creek, CA 94596.

Table 2. Aminopyralid applied alone or with other herbicides and various adjuvants for absinth wormwood control in Barnes County ND, on September 17, 2008.

Treatment	Rate	2009 4 June	2009 1 Sept
	—— oz/A ——	— % control —	
Aminopyralid + Activator 90[1]	1.75 + 0.25%	100	100
Picloram + Activator 90	6 + 0.25%	99	100
Aminopyralid + picloram + Activator 90	1.25 + 4.5 + 0.5%	99	99
Aminopyralid + metsufuron[2] + Activator 90	1.05 + 0.19 + 0.25%	99	99
Aminopyralid + metsulfuron + Syl-Tac[3]	1.05 + 0.19 + 4%	87	77
Aminopyralid + metsulfuron + 2,4-D ester + Activator 90	1.05 + 0.19 + 8 + 0.25%	94	83
Aminopyralid + metsulfuron + Activator 90	1.32 + 0.23 + 0.25%	69	47
Aminopyralid + metsulfuron + 2,4-D ester + Activator 90	1.32 + 0.23 + 8 + 0.25%	94	86
Aminopyralid + metsulfuron + Activator 90	1.58 + 0.28 + 0.25%	60	38
Aminopyralid + picloram + Activator 90	1.25 + 3 + 0.25%	99	99
LSD (0.05)		14	26

[1]Activator 90 surfactant by Loveland Products, Inc. P.O. Box 1286 Greeley, CO 80632.
[2]Aminopyralid plus metsulfuron was GF-2050 commercial formulation - Chaparral from Dow AgroSciences LLC, 9330 Zionsville Road, Indianapolis, IN 46268-1189.
[3]Syl-Tac surfactant by Wilbur-Ellis, 1801 Oakland Boulevard, Suite 210, Walnut Creek, CA 94596.

Aminopyralid plus metsulfuron applied with various adjuvants for absinth wormwood control. Rodney G. Lym. (Plant Sciences Department, North Dakota State University, Fargo, ND 58108-6050). Absinth wormwood is a perennial fragrant forb that causes economic losses by reducing available forage, tainting the milk of cattle that graze it, and medically as a pollen source for allergies and asthma. Absinth wormwood infestation in North Dakota has increased from approximately 120,000 acres in 1995 to over 600,000 acres in 2007. The purpose of this research was to evaluate aminopyralid applied with metsulfuron and various adjuvants for absinth wormwood control.

The study was established on a wildlife production area in Barnes County, ND that had recently become infested with absinth wormwood. The treatments were applied June 26, 2000 to absinth wormwood in the vegetative to bolting growth stage and 15 to 30 inches tall. Herbicides were applied using a hand-held boom sprayer delivering 17 gpa at 35 psi. Experimental plots were 10 by 30 feet and replicated four times in a randomized complete block design. Absinth wormwood control was evaluated visually using percent stand reduction compared to the untreated control.

Absinth wormwood control averaged 70% regardless of adjuvant in July 2008, 3 weeks after treatment. Control increased to an average of 99% by August 2008 and was 100% in June and September 2009 and the increase was independent adjuvant.

Table. Aminopyralid plus metsulfuron applied with various adjuvants for absinth wormwood control at WPA Valley City, ND.

		2008		2009	
Treatment	Rate	14 July	13 Aug	4 June	1 Sept
	—— oz/A ——	—— % control ——			
Aminopyralid + metsufuron[1] + Cornbelt Premier 90	1.32 + 0.23 + 0.5 %	68	98	100	100
Aminopyralid + metsufuron + Linkage	1.32 + 0.23 + 0.5 %	68	100	100	100
Aminopyralid + metsufuron + Cornbelt N-Tense	1.32 + 0.23 + 0.5 %	69	100	100	100
Aminopyralid + metsufuron + Cornbelt Trophy Gold	1.32 + 0.23 + 0.25 %	70	100	100	100
Aminopyralid + metsufuron + GS 94	1.32 + 0.23 + 0.5 %	70	100	100	100
Aminopyralid + metsufuron + Syl-tac	1.32 + 0.23 + 0.25 %	77	99	100	100
LSD (0.05)		NS	NS	NS	NS

[1]Commercial formulation - Chaparral from Dow AgroSciences LLC, 9330 Zionsville Road, Indianapolis, IN 46268-1189.

The effect of mowing and time of treatment for Canada thistle control with aminopyralid. Rodney G. Lym. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58108-6050). Aminopyralid is a member of the pyridinecarboxylic acid family of herbicides and controls Canada thistle at lower use rates than other commonly used herbicides. Previous research has found that aminopyralid will control Canada thistle when applied in the spring prior to flowering or in the fall. Canada thistle often is found along roadsides and waste areas that are mowed during the summer, but the effect of mowing prior to aminopyralid application is unknown. The purpose of this research was to evaluate aminopyralid applied in the spring or fall for Canada thistle control on plants that were mowed in mid-summer.

Aminopyralid at 1.25 or 1.75 oz ae/A was applied to Canada thistle at two locations in North Dakota. Picloram at 6 oz ae/A was included as a standard comparison. Treatments were applied June 5, Sept. 19, Oct.1, or Oct. 29, 2007, near Fargo, ND on former crop-land. The same treatments were applied on June 20, Sept. 14, Oct. 1, or Oct. 29, 2007, near Eckelson, ND along a wind-break with a dense stand of perennial grasses. Herbicides were applied using a hand-held boom sprayer delivering 17 gpa at 35 psi. Whole plots were 10 by 30 feet and were subdivided by mowing the front or back half of each plot (10 by 15) in July 2007. There were four replicates in a randomized split-block design. Canada thistle was in the bolt to early bud growth stage when treated in June. Plants were in the rosette stage in the mowed plots at all fall treatment dates and varied from post seed-set in mid-September to plants with brown top growth and stems following several hard frosts by the late October application date in the non-mowed plots. Canada thistle stem density averaged 15 and 12 stems/m^2 at the Fargo and Eckelson locations, respectively. Control was visually evaluated using percent stand reduction compared to the untreated control.

In general, long-term Canada thistle control was higher at the Eckelson compared to the Fargo location and the data could not be combined (Tables 1 and 2). Canada thistle control in June 2008 averaged over all treatments applied in June 2007 [12 MAT (months after treatment)] was 46% at Fargo compared to 97% at Eckelson. The dense grass stand at Eckelson likely competed with Canada thistle and reduced regrowth compared to the generally bare ground following treatment at Fargo. Mowing did not effect Canada thistle control regardless of treatment or application date at either location. For instance, control in August 2008 at Eckelson was 89 and 92% (20 to 22 MAT) averaged over all non-mowed and mowed treatments, respectively.

Aminopyralid provided excellent Canada thistle control even when applied after several killing frosts in late-October. All plants in the mowed treatment were green and in the rosette growth stage compared to plants in the non-mowed areas which had brown stems and little or no green tissue remaining. Control from all aminopyralid treatments applied in late-October averaged 93 and 96% at Fargo and Eckelson, respectively, 10 MAT. Canada thistle control with picloram at the Fargo location declined from an average of 92 to 44% when applied in September compared to late October. However, control was similar regardless of fall application date at Eckelson and averaged 93% in August 2008.

Aminopyralid applied in the fall provided very good Canada thistle control 23 to 24 MAT (Tables 1 and 2). Control averaged over application rate and timing was 85% at both the Fargo and Eckelson locations. There was a trend for long-term control to be slightly higher in the non-mowed compared to mowed plots at Eckelson in Sept. 2008, but the difference was generally less than a few percentage points and would not warrant changes in a land management program to avoid mowing prior to herbicide treatment. In summary, aminopyralid provided excellent Canada thistle control when applied in the fall, even after several killing frosts. Long-term control was enhanced when there was good grass cover to compete with Canada thistle regrowth compared to little or no cover. Control was similar regardless if Canada thistle had been mowed or not prior to treatment.

Table 1. Effect of time of treatment and mowing on Canada thistle control with aminopyralid applied at four application dates near Fargo, ND.

		Evaluation date/mowing treatment[1]									
		2007		2008				2009			
		6 August		17 June		20 August		29 June		2 Sept.	
Treatment[2] / date	Rate	Mow	No-mow	Mow	No-mow	Mow	No-mow	Mow	No-mow	Mow	No-mow
	— oz/A —	%									
Applied 5 June 2007											
Aminopyralid	1.25	99	97	41	39	42	31	42	42	41	46
Aminopyralid	1.75	99	99	72	58	57	56	50	59	49	43
Picloram	6	92	92	38	28	31	35	27	26	26	26
Applied 19 Sept. 2007											
Aminopyralid	1.25			92	99	98	96	94	96	93	90
Aminopyralid	1.75			99	100	95	96	92	86	85	83
Picloram	6			100	99	92	92	86	86	84	85
Applied 1 Oct. 2007											
Aminopyralid	1.25			99	99	98	97	93	92	76	71
Aminopyralid	1.75			100	100	96	99	94	88	91	95
Picloram	6			96	99	82	77	73	89	95	87
Applied 29 Oct. 2007											
Aminopyralid	1.25			99	100	93	89	77	81	88	79
Aminopyralid	1.75			99	99	93	95	87	88	93	89
Picloram	6			84	80	45	44	27	29	41	38
LSD (0.05)		NS		19		22		24		24	

[1]Front or back half of each plot mowed on 9 July 2007.
[2]Surfactant Activator 90 at 0.25% v/v was applied with all treatments, Loveland Products, Greeley, CO 80632.

Table 2. Effect of time of treatment and mowing on Canada thistle control with aminopyralid applied at four application dates near Eckelson, ND.

		Evaluation date/mowing treatment[1]									
		2007		2008				2009			
		6 August		17 June		20 August		24 June		1 Sept.	
Treatment[2] / date	Rate	Mow	No-mow	Mow	No-mow	Mow	No-mow	Mow	No-mow	Mow	No-mow
	— oz/A —	— % —									
Applied 5 June 2007											
Aminopyralid	1.25	91	91	99	97	69	90	74	83	55	65
Aminopyralid	1.75	94	94	95	99	90	84	71	89	54	79
Picloram	6	93	93	96	95	75	65	53	74	40	45
Applied 19 Sept. 2007											
Aminopyralid	1.25			100	100	98	94	96	94	88	89
Aminopyralid	1.75			99	99	97	90	81	94	75	94
Picloram	6			99	99	92	93	86	95	75	87
Applied 1 Oct. 2007											
Aminopyralid	1.25			99	100	93	81	74	97	71	89
Aminopyralid	1.75			100	100	99	97	93	95	86	91
Picloram	6			100	100	98	97	91	94	72	94
Applied 29 Oct. 2007											
Aminopyralid	1.25			98	100	95	96	85	94	73	79
Aminopyralid	1.75			100	99	99	94	93	97	88	93
Picloram	6			100	100	97	82	82	96	78	85
LSD (0.05)		— NS —		— 3 —		— 15 —		— 17 —		— 33 —	

[1]Front or back half of each plot mowed on 9 July 2007.
[2]Surfactant Activator 90 at 0.25% v/v was applied with all treatments, Loveland Products, Greeley, CO 80632.

Evaluation of aminocyclopyrachlor for weed control in pasture and rangeland. Rodney G. Lym. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58108-6050). Aminocyclopyrachlor (KJM44-062 or MAT28) is a new and currently non-classified herbicide from E. I. DuPont company. Initial evaluations of this compound for general pasture and invasive weed control was promising on a variety of species. The purpose of this research was to evaluate aminocyclopyrachlor for control of invasive and troublesome weeds in pasture and rangeland.

For all studies the aminocyclopyrachlor methyl ester (DPX KJM44-062) was used. Herbicides were applied using a hand-held boom sprayer delivering 17 gpa at 35 psi. Experimental plots were 10 by 30 feet and replicated three or four times in a randomized complete block design. Control of each species was evaluated visually using percent stand reduction compared to the untreated control. Results were compared to other commonly used herbicides applied at the general use rate for each weed species.

The first and second studies evaluated the control of leafy spurge with aminocyclopyrachlor applied alone from 1 to 3 oz ai/A in the spring or fall. The first experiment was established near Walcott, ND in an ungrazed area of pasture with a dense stand of leafy spurge (92 stems/m^2). Treatments were applied June 5, 2007 when leafy spurge was in the true-flower growth stage. All herbicides were reapplied on June 30, 2009 to evaluate long-term control and possible grass injury. The second experiment was established on abandoned cropland near Fargo, ND on September 19, 2007 when leafy spurge was in the fall regrowth stage with a stand density of 30 stems/m^2.

Aminocyclopyrachlor applied at 2 oz/A or higher provided better long-term leafy control than the standard treatments of picloram at 8 oz/A or picloram plus imazapic plus 2,4-D at 4 + 1 + 16 oz/A (Table 1). For instance, aminocyclopyrachlor applied at 2 oz/A provided 90 and 88% leafy spurge control in June and August 2008, respectively, compared to 58 and 45% control respectively, with picloram at 8 oz/A. Control averaged >80% with aminocyclopyrachlor at 2 to 3 oz/A in June 2009 (24 MAT) but had declined to 48 to 65% with aminocyclopyrachlor applied at 1 to 1.5 oz/A. The major grass species present were Kentucky bluegrass and smooth brome and less than 5% grass injury was observed 2 MAT (data not shown). Control was greater than 90% in August 2009 following reapplication of the herbicides in June.

Leafy spurge control 11 MAT with aminocyclopyrachlor applied in the fall increased from 89 to 99% as the application rate increased from 1 to 3 oz/A (Table 2). Control was similar to picloram at 16 oz/A . No grass injury was observed with either herbicide (data not shown). Leafy spurge control averaged over treatments was 97% in June 2009 but declined to 83% by September (24 MAT).

The third study was established near Fargo, ND on June 5, 2007 to evaluate control of Canada thistle, perennial sowthistle, curly dock, and common dandelion with aminocyclopyrachlor. Dandelion was in the flowering growth stage, while the other three species were vegetative to beginning to bolt.

Initial Canada thistle and perennial sowthistle control with aminocyclopyrachlor tended to be lower than the commonly used treatments of picloram at 8 oz/A or aminopyralid at 1.5 oz/A (Table 3). For instance, aminocyclopyrachlor at 2 oz/A provided 79 and 75% Canada thistle and perennial sowthistle control, respectively, approximately 3 weeks after application compared to 96 and 88%, respectively, with picloram. Aminocyclopyrachlor provided complete control of dandelion but did not control curly dock regardless of application rate.

Canada thistle control with aminocyclopyrachlor at 1.5 oz/A or higher provided an average of 96% Canada thistle control in September 2007 (3 MAT) compared to 88 and 92% with picloram and aminopyralid, respectively. Canada thistle control with aminocyclopyrachlor remained high the year after treatment. Control in June and September 2008 with aminocyclopyrachlor at 1.5 oz/A or more averaged 97 and 95%, respectively, compared to 58% or less with picloram and aminopyralid. Aminocyclopyrachlor provided excellent control of perennial sowthistle in the year of treatment, but control averaged less than 50% by 12 MAT regardless of application rate. Canada thistle control averaged 95% control in June 2009 (21 MAT) with aminocyclopyrachlor applied at 2 to 3 oz/A compared to 0 and 23% with picloram and aminopyralid.

In summary, aminocyclopyrachlor provided similar or better control of leafy spurge, Canada thistle, and perennial sowthistle than commonly used herbicides. Aminocyclopyrachlor did not provide adequate control of curly dock. This herbicide shows promise for broadleaf weed control including several invasive species and should be further evaluated. The soil residual potential of aminocyclopyrachlor to move off site or into groundwater is not yet known.

Table 1. Evaluation of aminocyclopyrachlor for leafy spurge control applied in June 2007 and again in June 2009 near Walcott, ND.

		Leafy spurge control/evaluation date				
		2007	2008		2009	
Treatment	Rate	6 Aug	9 June	19 Aug	10 June	18 Aug
	oz/A	%				
Aminocyclopyrachlor[1]	1	92	79	55	48	92
Aminocyclopyrachlor	1.5	98	87	71	65	95
Aminocyclopyrachlor	2	99	90	88	81	95
Aminocyclopyrachlor	2.5	99	97	92	86	98
Aminocyclopyrachlor	3	99	96	92	87	100
Picloram	8	86	58	45	41	98
Picloram + imazapic + 2,4-D	4 + 1 + 16	97	45	56	38	95
LSD (0.05)		7	31	23	36	NS

[1]MSO was added to all treatments at 1% v/v except at 1 qt/A with picloram + imazapic + 2,4-D. Scoil by AGSCO, 1168 12th St NE, Grand Forks, ND 58201.

Table 2. Evaluation of aminocyclopyrachlor for leafy spurge control applied in September 2007 at Fargo, ND.

Treatment	Rate	Leafy spurge control/evaluation date			
		2008		2009	
		20 June	20 Aug	12 June	3 Sept
	— oz/A —	%			
Aminocyclopyrachlor[1]	1	93	89	92	74
Aminocyclopyrachlor	2	99	97	98	85
Aminocyclopyrachlor	3	100	99	98	89
Picloram	16	99	97	98	82
LSD(0.05)		NS	7	4	NS

[1]MSO was added to all treatments at 1% v/v except at 1 qt/A with picloram. Scoil by AGSCO, 1168 12th St NE, Grand Forks, ND 58201.

Table 3. Evaluation of aminocyclopyrachlor applied in June 2007 for Canada thistle, perennial sowthistle, curly dock, and dandelion control at Fargo, ND.

Treatment	Rate	Control/evaluation date/species										
		2007							2008			2009
		29 June				5 September			20 June		26 Sept.	29 June
		CT[1]	PEST[1]	Curly dock	Dande lion	CT	PEST	Curly dock	CT	PEST	CT	CT
	— oz/A —	%										
Aminocyclopyrachlor [2]	1	43	35	0	100	54	100	25	56	0	43	37
Aminocyclopyrachlor	1.5	75	71	0	100	93	99	0	95	6	88	76
Aminocyclopyrachlor	2	79	75	0	100	100	100	0	97	45	95	91
Aminocyclopyrachlor	2.5	82	77	0	100	99	100	0	98	47	99	98
Aminocyclopyrachlor	3	84	77	5	100	93	100	38	97	39	97	96
Picloram	8	96	88	41	100	88	98	100	5	86	0	0
Aminopyralid[3]	1.5 + 0.25%	92	80	16	96	92	92	100	30	58	58	23
LSD (0.05)		12	15	8	NS	17	5	35	29	43	39	22

[1]Abbreviations: CT = Canada thistle, PEST = perennial sowthistle.
[2]MSO was added to all treatments at 1% v/v except Activator 90 was applied with aminopyralid. Scoil, by AGSCO, 1168 12th St N, Grand Forks, ND 58201. [3]Activator 90 surfactant by Loveland Products, Inc. P.O. Box 1286 Greeley, CO 80632.

Evaluation of aminocyclopyrachlor for cattail, poison ivy, and Russian olive control. Rodney G. Lym. (Department of Plant Sciences, North Dakota State University, Fargo, ND 58108-6050). Aminocyclopyrachlor (KJM44-062 or MAT28) is a new and currently non-classified herbicide from E. I. DuPont company. Initial evaluations of this compound found this herbicide controlled wide spread invasive weeds such as leafy spurge and Canada thistle. However, the effect of aminocyclopyrachlor on other invasive or troublesome weeds is largely unknown. The purpose of this research was to evaluate aminocyclopyrachlor efficacy on cattail (*Typha* spp.), poison ivy [*Toxiodendron rydbergii* (Small ex Rydb.) Greene], and Russian olive (*Elaeagnus angustifolia* L.).

The first study was established along a drainage ditch near Fargo, ND that was heavily infested with cattails. Herbicides were applied using a four-wheel all terrain vehicle with a flexible boom that maintained a 10 foot spray pattern with 8002 nozzles delivering 17.5 gpa. Experimental plots were 10 by 30 feet and replicated four times. Plot sequence was linear in a west to east direction along the drainage and treatments were randomized within each rep. Herbicides were applied on June 10, 2008 when cattails were in the vegetative growth stage and 3 to 4 feet tall or on July 22, 2008 when plants were 5 to 8 feet tall with catkins present. Control was evaluated visually using percent stand reduction compared to the untreated control.

Aminocyclopyrachlor provided very good cattail control the year after treatment when applied during flowering, but did not control cattails when applied earlier in the growing season (Table 1). Initial cattail control with aminocyclopyrachlor was less than 20% during the season of application regardless of timing. However, aminocyclopyrachlor provided 92 to 96% control in June 2009, 11 MAT (months after treatment) and 80 to 96% 13 MAT. Cattail control increased as aminocyclopyrachlor application rate increased and was similar to the standard glyphosate treatment.

The study to evaluate poison ivy control was established on the Albert Ekre Ranch near Walcott, ND. Herbicides were applied using a hand-held boom sprayer delivering 17 gpa at 35 psi. Experimental plots were 10 by 20 feet and replicated three times in a randomized complete block design. Smooth bromegrass and Kentucky bluegrass were the only other plant species in the study site. Herbicides were applied on September 12, 2008 when poison ivy was 8 to 18 inches tall, with red leaves and beginning to set seed or on June 10, 2009 when plants were 6 to 10 inches tall with green leaves.

Aminocyclopyrachlor provided good initial poison ivy control and also reduced smooth bromegrass cover by an average of 95% when applied at 2 or 3 oz/A in September (Table 2). Poison ivy control averaged 100% in June 2009 regardless of aminocyclopyrachlor application rate in the fall, but control declined to 56% or less 12 MAT. Aminocyclopyrachlor applied in June provided an average of 72% poison ivy control 20 days after treatment but control increased to an average of 90% by3 MAT. Smooth bromegrass cover decreased by 91% 12 MAT with aminocyclopyrachlor applied at 3 oz/A in the fall, but only 36% 3 months after a spring applied treatment. Kentucky bluegrass cover was not reduced by aminocyclopyrachlor.

A study to evaluate aminocyclopyrachlor as a cut-stump treatment for control of Russian olive regrowth was established on the Sheyenne National Grassland in cooperation with the U.S. Forest Service near Hankinson, ND. Russian olive originally had been planted as part of a shelter belt but had spread into an adjacent pasture. The trees were 15 to 25 feet tall and ranged in age from approximately 10 to over 50 years old. The trees were cut by Forest Service personnel on April 21, 2008 and herbicides were applied to the stumps on May 28, 2008. Each treatment was applied to 6 trees (reps) and each replicate consisted of similar size tree stumps. The first replicate contained the smallest tree stumps which averaged 11 inches in diameter while replicate 6 contained the largest diameter stumps which averaged 19.5 inches.

Herbicides were applied on a percent solution basis in a petroleum based oil (herbicide:oil v:v) with a single nozzle hand-held pump sprayer. The aminocyclopyrachlor formulation was DPX MAT28-038 2 SL. Stumps were thoroughly covered to the point of run-off. Control was evaluated by counting the number of shoots arising from the stump and root collar of treated compared to non-treated stumps.

All cut-stump treatments provided excellent control of Russian olive regrowth (Table 3). An average of 98 stems/stump regrew from untreated trees compared to near zero regrowth from any of the treated stumps. No regrowth was observed on any treated stump in 2009, 13 MAT, compared to an average of 68 and 33 stems/stump in the untreated control in June and August 2009, respectively. Although aminocyclopyrachlor provided excellent control of regrowth from Russian olive cut-stumps the spray solution became increasingly viscous as the aminocyclopyrachlor rate increased. Aminocyclopyrachlor treatments applied at 15 or 30% were extremely difficult to apply and resembled frosting applied to cake rather than a smooth oil coating of the stump. Also, grass and brush species surrounding the cut-stumps died even though the herbicide was not directly applied to these plants. The area of total vegetation control around each stump increased as the aminocyclopyrachlor application rate increased.

In summary, aminocyclopyrachlor controlled cattail similarly to the standard treatment of glyphosate when applied at the catkin growth stage. Poison ivy control was variable as spring but not fall-applied treatments provided season-long control. Aminocyclopyrachlor provided excellent Russian olive control when applied as a cut-stump treatment, but the liquid formulation was difficult to apply at the higher treatment rates. Severe reduction of smooth bromegrass and control of non-treated plants in the cut-stump experiment indicate this herbicide has efficacy on many species.

Table 1. Aminocyclopyrachlor evaluated for cattail control at two growth stages near Fargo, ND.

Cattail growth stage/ treatment[1]	Rate	Evaluation date 2008 25 June	2008 28 July	2008 29 Aug	2009 2 June	2009 28 Aug
	— oz/A —	% control				
Vegetative						
Aminocyclopyrachlor	2 + 0.25 %	1	5	4	15	15
Aminocyclopyrachlor	4 + 0.25 %	1	1	4	0	5
Aminocyclopyrachlor	8 + 0.25 %	1	8	0	0	0
Glyphosate[2]	40 + 0.25 %	12	14	16	15	13
Flowering						
Aminocyclopyrachlor	2 + 0.25 %		2	4	92	80
Aminocyclopyrachlor	4 + 0.25 %		3	1	95	86
Aminocyclopyrachlor	8 + 0.25 %		4	15	98	96
Glyphosate[2]	40 + 0.25 %		51	71	96	87
Untreated	...	0	0	0	5	3
LSD (0.05)		2	4	12	16	15

[1]Herbicide treatments were applied with surfactant X-77 from Loveland Products Inc. PO Box 1296 Greeley, CO 80632-1286 on either June 10 (vegetative) or July 22, 2009 (flowering).
[2]Commercial formulation - Rodeo from Dow AgroSciences LLC, 9330 Zionsville Road, Indianapolis, IN 46268-1189.

Table 2. Evaluation of fall or spring applied aminocyclopyrachlor for poison ivy control at Walcott, ND.

		Evaluation date				
		30 June 2009			Sept 2009	
Treatment[1]	Rate	Poison ivy	Smooth brome	Kentucky bluegrass	Poison ivy	Smooth brome
	— oz/A —	% control				
Applied Sept. 2008						
Aminocyclopyrachlor	1	100	78	0	33	66
Aminocyclopyrachlor	2	100	95	3	53	83
Aminocyclopyrachlor	3	100	97	2	56	91
Triclopyr	24	83	18	0	67	10
Applied June 2009						
Aminocyclopyrachlor	1	51	0	0	79	30
Aminocyclopyrachlor	2	80	0	0	94	30
Aminocyclopyrachlor	3	85	3	0	97	36
Triclopyr	24	99	3	0	87	80
LSD (0.05)		10	37	NS	43	38

[1]All treatments were applied with MSO at 1% v/v on September 28, 2008 (fall) or June 10, 2009 (spring). The MSO was Scoil, by AGSCO, 20600 Mill Rd, Grand Forks, ND 58203.

Table 3. Evaluation of aminocyclopyrachlor in combination with bark oil as a cut stump treatment for Russian olive control on the Sheyenne Grassland near Hankinson, ND

		Evaluation date			
		2008		2009	
Treatment[1]	Rate	2 July	12 Sept	3 June	18 Aug
	— % v/v —	stem regrowth/stump			
Aminocyclopyrachlor[2]	2.5	<1	0	0	0
Aminocyclopyrachlor	5	0	0	0	0
Aminocyclopyrachlor	10	0	0	0	0
Aminocyclopyrachlor	15	<1	0	0	0
Triclopyr ester[3]	30	0	0	0	0
Triclopyr ester	15	0	0	0	0
2,4-D ester	21	<1	<1	0	0
Triclopyr ester + imazapyr[4]	20 + 1	0	0	0	0
Aminocyclopyrachlor + imazapyr	10 + 1	0	0	0	0
Untreated		98	95	68	33
LSD (0.05)		30	16	25	28

[1]All herbicides applied on May 28, 2008 in Bark Oil Blue LT from UAP Distribution Inc., 7251 West 4th St., Greeley, CO 80634.
[2]The aminocyclopyrachlor formulation was DPX MAT28-038 LS.
[3]Commercial formulation - Garlon 4 from Dow AgroSciences LLC, 9330 Zionsville Road, Indianapolis, IN 46268-1189.
[4]Commercial formulation - Stalker from BASF Corporation, 100 Campus Drive, Florham Park, ND 07932.

Evaluation of leafy spurge and yellow toadflax control with pyrasulfotole plus bromoxynil. Rodney G. Lym. (Plant Sciences Department, North Dakota State University, Fargo, ND 58108-6050). Pyrasulfotole plus bromoxynil (trade name Huskie by Bayer CropScience) is commonly used to control weeds in small grain crops. Recent research in Colorado indicated pyrasulfotole plus bromoxynil may control several species of invasive weeds found in pasture and rangeland. The purpose of this research was to evaluate pyrasulfotole applied with bromoxynil and other herbicides for leafy spurge and yellow toadflax control.

For both studies, herbicides were applied using a hand-held boom sprayer delivering 17 gpa at 35 psi. Experimental plots were 10 by 30 feet and replicated four times in a randomized complete block design. Control of each species was evaluated visually using percent stand reduction compared to the untreated control. Results were compared to other commonly used herbicides applied at the general use rate for each weed species.

The first study evaluated the control of leafy spurge with pyrasulfotole plus bromoxynil applied alone or with MCPA or 2,4-D. The experiment was established near Walcott, ND in an ungrazed area of pasture with a dense stand of leafy spurge (92 stems/m^2). Treatments were applied June 16, 2008 when leafy spurge was in the true-flower growth stage.

Pyrasulfotole plus bromoxynil did not control leafy spurge (Table 1). Leafy spurge control 1 MAT (month after treatment) was 5% or less with all pyrasulfotole plus bromoxynil treatments except when 2,4-D was included. 2,4-D commonly kills leafy spurge topgrowth, but the plant regrows within 2 to 3 months. Leafy spurge control averaged over all treatments that included pyrasulfotole plus bromoxynil was only 38% 2 MAT (August 2008) compared to 93% with the standard treatment of picloram plus 2,4-D plus imazapic. Leafy spurge was not controlled with any treatment that included pyrasulfotole plus bromoxynil 12 MAT (data not shown).

The second study was established on a wildlife production area in Barnes County, ND that had recently become infested with yellow toadflax. The treatments were applied July 14, 2008 when yellow toadflax was in the vegetative to flowering growth stage and 12 to 20 inches tall.

Pyrasulfotole plus bromoxynil did not control yellow toadflax regardless if applied alone or with MCPA or 2,4-D 1 or 13 MAT (Table 2). In summary, pyrasulfotole plus bromoxynil did not provide satisfactory leafy spurge or yellow toadflax control.

Table 1. Leafy spurge control with pyrasulfotole plus bromoxynil applied on June 16, 2008 near Walcott, ND.

Treatment	Rate	Evaluation 2008	
		17 July	19 Aug
	—— oz/A ——	—— % control ——	
Pyrasulfotole & bromoxynil[1] + X-77 + AMS	3.5+0.5%+8	3	21
Pyrasulfotole & bromoxynil + X-77 + AMS	3.9+0.5%+8	4	34
Pyrasulfotole & bromoxynil + MCPA + X-77 + AMS	3.5+6+0.5%+8	5	33
Pyrasulfotole & bromoxynil + MCPA + X-77 + AMS	3.9+6+0.5%+8	5	18
Pyrasulfotole & bromoxynil + 2,4-D ester + X-77 + AMS	3.5+15.2+0.5%+8	97	53
Pyrasulfotole & bromoxynil + 2,4-D amine + X-77 + AMS	3.5+15.2+0.5%+8	95	68
Picloram + 2,4-D amine	6 +15.2	97	83
Picloram + 2,4-D amine + imazapic + MSO	4+16+1+1 qt	99	93
LSD (0.05)		3	28

[1]Commercial formulation - Huskie from Bayer CropScience, 2 T.W. Alexander Drive, Research Triangle PK, NC 27709.

Table 2. Yellow toadflax control with pyrasulfotole plus bromoxynil applied on July 14, 2008 at a wildlife production area near Valley City, ND

		Evaluation date			
		13 Aug 08		4 Aug 09	
Treatment	Rate	YETF[1] control	Grs[1] inj.	YETF control	Grs inj
	—— oz/A ——	—————— % ——————			
Pyrasulfotole & bromoxynil[2] + X-77 + AMS	3.5+0.5%+8	0	0	0	0
Pyrasulfotole & bromoxynil + X-77 + AMS	3.9+0.5%+8	0	0	3	0
Pyrasulfotole & bromoxynil + MCPA + X-77 + AMS	3.5+6+0.5%+8	1	0	0	0
Pyrasulfotole & bromoxynil + MCPA + X-77 + AMS	3.9+6+0.5%+8	7	0	4	0
Pyrasulfotole & bromoxynil + 2,4-D ester + X-77 + AMS	3.5+15.2+0.5%+8	12	0	8	0
Pyrasulfotole & bromoxynil + 2,4-D amine + X-77 + AMS	3.5+15.2+0.5%+8	10	0	3	0
Picloram + 2,4-D amine	6+15.2	15	4	8	0
Picloram + diflufenzopyr + X-77	16+6.4+0.25%	56	21	74	15
LSD (0.05)		6	2	13	2

[1]Abbreviations: YETF = yellow toadflax; Grs. inj. = grass injury.
[2]Commercial formulation - Huskie from Bayer CropScience, 2 T.W. Alexander Drive, Research Triangle PK, NC 27709.