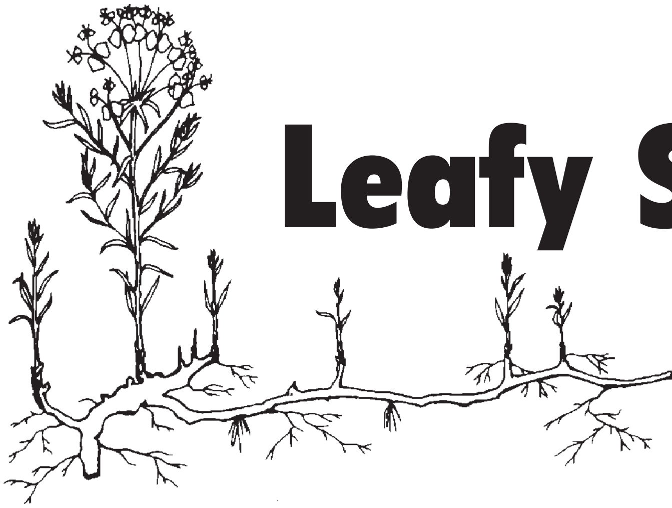

Leafy Spurge *News*

Agricultural Experiment Station
NDSU Extension Service
North Dakota State University, Fargo, ND 58105

Volume XXVI, Issue 1 August 2004

From the Editor's Desk

This issue is late due to several factors the main one being that it took longer than expected to get enough material to make a worthwhile issue. Secondly my old computer crashed and I am just getting used to my new one; programs have really changed in 6 years! I hope the delay did not cause you any problems. As I mentioned before, I need input from the field from you, who have problems with leafy spurge. Are you being able to control it with the many techniques that have been developed by TEAM Leafy Spurge?

I need your input on an important question. Should the scope of the **Leafy Spurge** Newsletter be expanded to cover some of the other invasive weeds that are giving many of you lots of problems? Some which come to mind are saltcedar and some of the knapweeds. Please let me know. I really need your input on this one.

In this issue are two articles, feedback from users that should be of interest to many of you. If you were ever wondering how much leafy spurge and other weeds are present in North Dakota, the information by county is in this issue for your perusal.

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A New Pocket Weed Guide Available

The "North Dakota Noxious and Troublesome Weed Guide" has been revised and re-released by Rod Lym, Professor of Weed Science at NDSU. The guide includes photos of 28 weedy or troublesome weeds including all of those on the state noxious weed list. The guide includes native species that are generally not considered weedy but are often misidentified as weeds such as wavy leaf thistle, flodman thistle, and goldenrod. Troublesome weeds include poison ivy, common ragweed, dames rocket and swamp ragwort.

The guide is 4 by 5¾ inches for easy carrying. There are photos of the mature plants as well as close-ups of key distinguishing characteristics such as flowers, leaves, and seeds. The guide is available at any NDSU County Extension Service office and costs $4.00 per copy.

Honor Award for TEAM Leafy Spurge

TEAM Leafy Spurge, a 6-year, integrated pest management (IPM) research and demonstration program, was a recipient of a U. S. Department of Agriculture 2004 Secretary's Honor Award for exemplary service and achievement. The Honor Awards are the most prestigious awards given by USDA and the winners represent outstanding service in many fields, including stewardship of natural resources, scientific research, disease control, environmental innovations,

Award continued on page 8

Leafy Spurge Suppression by Flea Beetles in the Little Missouri River Drainage Basin

The Ecological Area-wide Management (TEAM) Leafy Spurge began collecting and distributing flea beetles (*Aphthona* spp.) to demonstration sites and landowners throughout the Little Missouri River drainage basin to control leafy spurge in 1998. A study to evaluate the long term effects of leafy spurge (*Euphorbia esula* L.) control by flea beetles was initiated in 2002 on leafy spurge-infested range and pastureland in the Little Missouri River drainage in Montana, North Dakota, South Dakota, and Wyoming. Data was collected at flea beetle release sites in June and July of 2002 and 2003 during the period of adult beetle activity, which is typically in June and July. A total of 292 flea beetle release sites were analyzed for leafy spurge stem density and cover, flea beetle density, and vegetation composition.

Leafy spurge stem density was impacted by flea beetles at 91% of the release sites, and reduced from greater than 100 stems/m^2 to fewer than 25 stems/m^2 on nearly two-thirds of the sites. Leafy spurge foliar cover was less than 5% on approximately two-thirds of the flea beetle release sites and less than 25% on over 90% of the release sites. Leafy spurge stem density decreased significantly in Montana and North Dakota, and leafy spurge foliar cover decreased significantly in Montana, North Dakota, and South Dakota. Area of flea beetle control ranged from little or no leafy spurge control to areas greater than 30,000 m^2. Approximately 40% of the release sites experienced a control of 1,000 to 5,000 m^2, and 14% of the release sites had greater than 10,000 m^2 of leafy spurge control. Of the 27 sites with no suppression, 18 had soils that were either sandy loams or loamy sands. There were no other environmental factors that were related to the site with no suppression. It is unknown if this high incidence of sandy soils is significant since many sites with suppression did occur on sandy soil. Additional research may be needed to determine if there is a negative relationship of flea beetles with sandy soils. The only other factor that was directly observed that could account for the lack of suppression was the flooding of some sites that could have resulted in a significant number of beetles not surviving. In addition, there could have been errors in release sites having no beetles released, the beetles released did not survive, the location of the release site was inaccurate, or some particular aspect of the site did not promote beetle survival. Given the low incidence of suppression failure, we feel that all sites with leafy spurge within the Little Missouri River drainage would be expected to have some suppression from flea beetles irrespective of environment.

The study found that 4 to 5 years post-release, flea beetles, on average, reduced leafy spurge stem density and cover 5 to 6 times in comparison to pre-release conditions in 91% of the sites within the Little Missouri River drainage basin. The resulting plant community after leafy spurge suppression resembled communities that result from non-use (no grazing and no fire). The management implications are 1) flea beetles will suppress leafy spurge and the continued release of beetles will hasten the process, 2) most sites will have some leafy spurge suppression from flea beetles with only a small number of sites having no leafy spurge suppression, and 3) because the suppressed sites are characteristic of non-use plant communities, prescribed grazing or burning should be initiated.

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Using Goat Grazing to Control Leafy Spurge in Southern Idaho

Since 1998 Bannock County, has been involved in a study to determine if goat grazing can be used to control leafy spurge. It was proposed that goats be used to graze spurge populations, and over time debilitate the root system of this weed. It was also proposed to use chemical control along with the grazing in order to increase the pressure on the spurge.

In the spring of 1998 four large enclosures were set up. The enclosures were built to prevent grazing inside their perimeters. Each of these enclosures was paired with an adjacent plot that was grazed. Inside each plot smaller plots were marked and sprayed with 2,4-D and picloram either in the spring or fall. This experiment was replicated four times. The number of leafy spurge stems in the plots were counted each spring and fall.

During the first few years the number of leafy spurge stems increased in response to goat grazing pressure. (See Figure 1.) This effect may be due to the extremely large tap root of the spurge plant. After Spurge is grazed, mowed, or sprayed, it will initiate re-grow from the root by growing new shoots. It will continue to re-grow until root reserves are depleted. Shoot re-growth following grazing was found to be very vigorous for the first few years of the experiment. This study demonstrates that if a grazing program is begun, it must be maintained for a few years in order to be effective.

In our study, the vigor of leafy spurge plants was not reduced until the fourth year of the study. (See Figures 2 and 3.) The grazing of the leafy spurge plots continued until the spring of 2003. At that time all plots were sprayed to kill out the remaining leafy spurge plants. (See Figure 4.)

We also found that herbicides had an almost immediate effect on the control of leafy spurge. (See Figure 5) Herbicide effects became evident the first year of the study. The ability of 2,4-D and picloram to reduce the number of leafy spurge shoots remained evident for the duration of the study. However, as time passed

Goat grazing continued on page 4

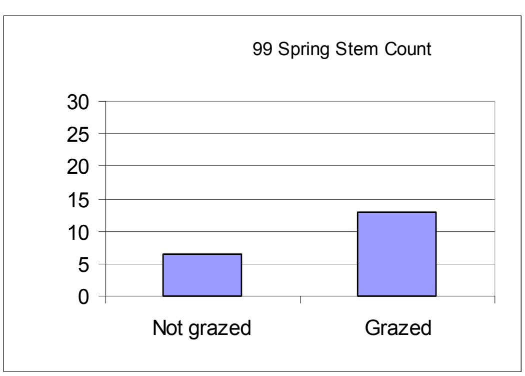

Figure 1

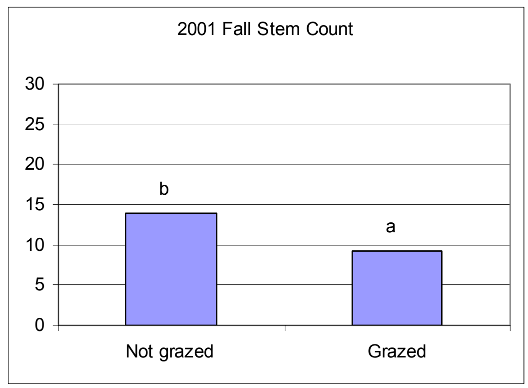

Figure 2

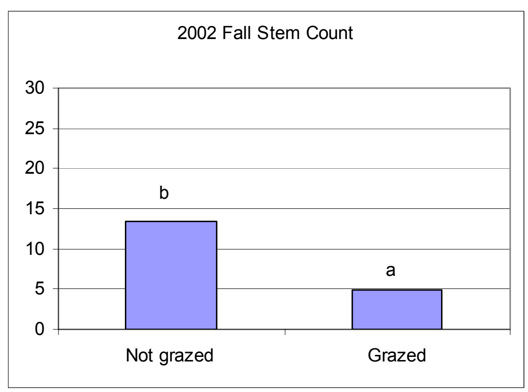

Figure 3

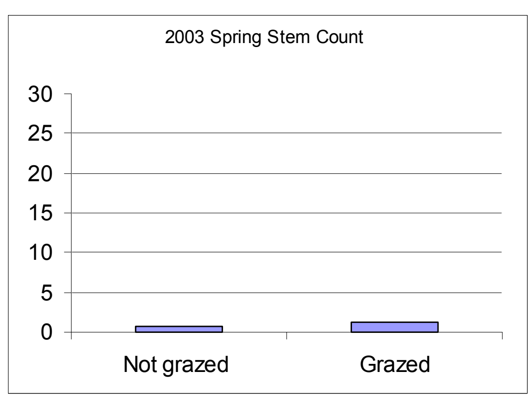

Figure 4

Goat grazing continued from page 3

we found that spring spraying was more effective than fall spraying. (See Figure 6.)

This study will continue in 2004 and 2005 with out spraying or grazing the plots. Spring and fall stem counts will be taken each year. This data will be collected to determine if or how fast debilitated spurge plants are able to rebound and initiate shoot growth following years of grazing and chemical control.

Summary

The study has shown that in the initial years of a spurge control program, herbicide effects become evident rapidly. The initial effects of grazing stimulate the crowns to put out more shoots than non grazed plants. The study demonstrated that the debilitation of spurge plants by grazing takes four years and must be sustained in order to lower the number of spurge shoots in an area. No interaction effects between herbicides and grazing were found in this study.

Reed Findlay
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Extension Educator, Bannock County

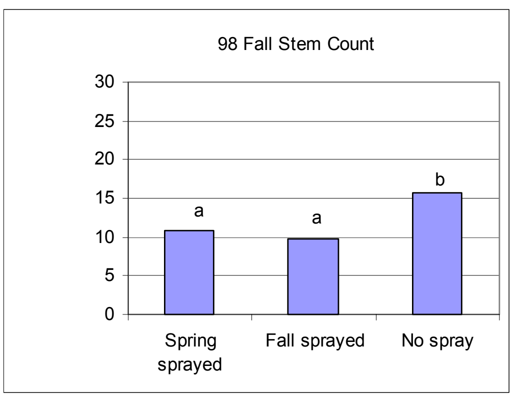

Figure 5

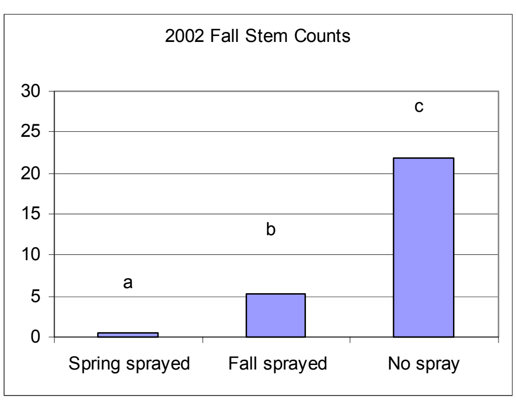

Figure 6

Aphthona Flea Beetle Population Development and Leafy Spurge Growth Pattern Across a Diversity of Habitats in North Dakota

In their native range in Eurasia, *Aphthona* flea beetles can be found in wet to dry habitats consisting of loamy, clay, course, or sandy soils, and with sparse to dense stands of leafy spurge. The brown flea beetle, *A. nigriscutis*, is found in dry to very dry habitats with course, sandy or clay soil in its native range in eastern Europe and western central Asia. The black flea beetle, *A. lacertosa* is adaptable to a wider range of habitat types, from wet to dry, where it is found in eastern European. When *A. lacertosa* and *A. nigrisctus* were introduced into Upper Great Plains very little was known about the habitat conditions necessary for their establishment in this region. Mixed populations of adult *A. lacertosa and A. czwalinae*, and populations of adult *A. nigriscutis* were released in North Dakota across a diversity of habitats infested with leafy spurge. Flea beetle population development was monitored and the leafy spurge growth pattern was measured in the different habits during a four to eight year period following the release of the beetles.

A mixed population of *A. lacertosa* and *A. czwalinae* established in habitats ranging from high and dry to habitats that were cooler and moister with shade and denser stands of spurge. The soil varied across these habitats from a silt loam, silt clay loam, loam clay, loam fine sand, or loam/fine sand loam with 6-10% organic matter. The leafy spurge stem density decreased an average of 70 to 98% and the flea beetle population peaked at 56-279 adults per ft^2 within three to four years after their initial release in these habitats where they established (Table 1). In three of these habitats, the leafy spurge decreased to 2-11% of the initial study year stand densities. Because cattle and most wildlife avoid spurge infested land with a 10 to 20% spurge cover, the productive value of these sites would expect to increase. In all of these habitats where the beetles established at high numbers, the range of the *Aphthona* flea beetles expanded and there was a decrease in the leafy spurge infestations outside of the study areas. In one habitat where the soil is a loam fine sand with 6.8 and 2.4% organic matter, the beetle population ranged from 20-60% lower compared to the populations at sites where the leafy spurge infestation substantially decreased between the initial and final study year. A small reduction (19%) in all leafy spurge variables was recorded at this site. At two other study habitats where the soil is a fine sand and fine sand loam, the population development was very poor for the *Aphthona* flea beetle species. A fine sand soil appears to prevent the development of the spurge fibrous roots in the top few inches of the soil surface. Consequently, newly emerged larvae at the soil surface may not find their food source (fibrous roots) soon after emergence, resulting in reduced population development under these conditions. There was a 38-49% increase in the leafy spurge stand density by the end of the study period in these two habitats.

The potential impact of *A. czwalinae* by itself is unknown in North Dakota, but is expected to be low because as few as 2% of the mixed population consisted of this species five years after the beetles were released. Two years after releasing the *Aphthona* flea beetles at the original release site (Katie Olson Wildlife Management Area, north of Valley City, North Dakota), the ratio of *A. lacertosa*:*A. czwalinae* was 1:1 compared to the original ratio of 9:16. The species ratios in similar habitats, located approximately 164 feet away, also shifted toward *A. lacertosa.* Within five years after their release, adults collected at the initial release site for redistribution consisted of 75% *lacertosa*. After five years, the population consisted of 98% *A. lacertosa*. This indicates that *A. lacertosa* was

Table 1. Leafy spurge stem density and *Aphthona lacertosa* and *A. czwalinae* population development across a diversity of habitats in North Dakota.

Site	Topography	Soil class	Study period starting year	Study period final year	LS stem density % change	Number released	Study period peak year mean density/ft^2	Study period final year mean density/ft^2	Study duration (Years)
			Spurge stem density (ft^2)			- - - *Aphthona* spp. population - - -			
1	Slope	Silt loam	34	0.7	-98	80	279	3.5	8
2	Flat	Silt clay loam	12	1.4	-88	250	56	28	6
3	Flat	Loam fine sand	11	8.9	-19	250	26	26	4
4	Flat	Fine sand	8	13	+38	250	1	1	4
5	Slope	Loam/fine sand loam	12	3.6	-70	250	39.5	39	4
6	Slope	Loam fine sand	9	1	-89	250	67	67	3
7	Rolling	Loam clay	17.4	1.8	-90	250	60	60	3
8	Flat	Fine sand loam	11.8	23	+49	250	0.6	0.4	3

Table 2. Leafy spurge stem density and *Aphthona nigriscutis* population development across a diversity of habitats in North Dakota.

Site	Topography	Soil class	Study period starting year	Study period final year	LS stem density % change	Number released	Study period peak year mean density/ft^2	Study period final year mean density/ft^2	Study duration (Years)
			Spurge stem density (ft^2)			- - - *A. nigriscutis* population - - -			
1	Flat	Fine sand loam	16	5	-69	250	17	9	5
2	Flat	Fine sand	8	29	+72	250	1	1	4
3	Rolling	Loam	17	1.7	-90	230	46.5	8	7
4	Slope	Loam	13.5	1.4	-90	455	65	12	7
5	Rolling	Loam fine sand	21	2	-90	120	37	9	7
6	Flat	Fine sand loam	12	5	-58	250	20.5	20.5	5
7	Slope	Fine sand	12	12	0	250	0.7	0.3	5
8	Flat	Loam	11	7	-36	250	4.5	4	5

generally the more successful at establishing of the two species and that any impact on the leafy spurge stem density by larval feeding at all of the release sites was influenced mainly by *A. lacertosa*.

Aphthona nigriscutis was more successful in areas with well-drained loam type soil with 2.5 to 10% organic matter, and initial spurge densities of 12-21 stems per ft^2. Under these conditions, *A. nigriscutis* populations developed from moderate to very high numbers within three to four years of the initial release of 250 beetles, and the leafy spurge stem density decreased by an average of 58-90% within seven years after the initial release (Table 2). As with mixed populations of *A. lacertosa* and *A. czwalinae*, the population development of *A. nigriscutis* appears to be considerably lower where the soil is classified fine sand with of 2% or less soil organic matter. Under these conditions the brown flea beetle populations peaked at only 0.7-1 adult per ft^2 and the leafy spurge stem density increased up to 72% from the original plant stand by the end of the study period.

The ability of *A. lacertosa* and *A. nigriscutis* to establish at high population levels and the subsequent substantial decline in the spurge density indicates that these flea beetle species are important in contributing to the control of leafy spurge in North Dakota. In North Dakota, *Aphthona lacertosa* can establish in habitats ranging from high and dry to habitats that are cooler and moister with shade and denser stands of spurge. Six years after a single release of a mixed population of 80 adult *A. czwalinae* and *A. lacertosa*, the leafy spurge infestation declined by 98% across a diversity of habitats over numerous hectares at the Katie Olson Wildlife Management Area. Extremely high numbers of flea beetles developed from the original mixed population of 80 adults released that, during five collection seasons, greater than 25 million adults were collected from the Katie Olson Wildlife Management Area and redistributed to almost all 53 North Dakota counties and to surrounding states. The brown flea beetle is most successful in drier habitats with well-drained loam type soil in North Dakota. At one of the sites where *A. nigrisctus* was successful, the habitat changed to a wooded environment approximately 300 feet away from the initial release point. Upon observing this wood habitat, *A. nigriscutis* did not appear to move into this area and the reduction in leafy spurge plant variables stopped at this point. At another site, the topography was open rolling terrain with depressions or swales. A reduction in leafy spurge density in the depressions was not noticeable or limited to the perimeter of the infestation. When releasing the *Aphthona* flea beetles for leafy spurge control, it will be important to target the brown flea beetle to its preferred habitats, whereas the black flea beetle has a greater tolerance to a diversity of habitats.

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Adult Feeding Impacts of *Aphthona nigriscutis,* a Biological Control Agent for *Euphorbia esula* (Leafy Spurge) on a Native Plant *Euphorbia robusta*

Aphthona nigriscutis Foudras, a biological control agent for *Euphorbia esula* L. (leafy spurge) has been established in Fremont County, Wyoming since 1992. Near one *A. nigriscutis* release site a mixed stand of *E. esula* and a native plant, *Euphorbia robusta* Engelm, was discovered in 1998. During July of 1999, *A. nigriscutis* was observed feeding on both *E. esula* and *E. robusta*. A total of 31 *E. robusta* plants were located and marked on about 1.5 hectares of land which had a visually estimated *E. esula* ground cover of over 50%. Eighty-seven percent of the *E. robusta* plants showed adult feeding damage. There was 36% mortality for plants with heavy feeding, 12% mortality for plants with light feeding, and no mortality for plants with no feeding. By August of 2002, the *E. esula* ground cover had declined to less than 6% and the *E. robusta* had increased to 542 plants of which only 14 plants (2.6%) showed any feeding damage. For the four-year period, the *E. esula* ground cover was inversely correlated to *E. robusta* density and positively correlated to *A. nigriscutis* feeding damage showing that as *E. esula* density declines so does *Aphthona nigriscutis* feeding on *E. robusta.*

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NORTH DAKOTA DEPARTMENT OF AGRICULTURE

2003 NOXIOUS WEEDS LIST SURVEY - REPORTED ACRES

13 MAY 2004

COUNTY/CITY WEED BOARD DATA	OTHER DATA INCLUDED	Absinth Wormwood	Canada Thistle	Dalmatian toadflax	Diffuse Knapweed	Field Bindweed	Leafy Spurge	Musk Thistle	Purple Loosestrife	Russian Knapweed	Saltcedar	Spotted Knapweed	Yellow Starthistle	
		Artemisia absinthium	*Cirsium arvense*	*Linaria genistifolia*	*Centaurea diffusa*	*Convolvulus arvensis*	*Euphorbia esula*	*Carduus nutans*	*Lythrum salicaria*	*Centaurea repens*	*Tamarix ramosissima*	*Centaurea maculosa*	*Centaurea solstitialis*	
NOXIOUS WEED ACREAGE RANKING		4	2	10	11	3	1	5	9	6	8	7	12	Total Acres
Adams		0.01	1,235				1,125				0.02			2,360
Barnes	9	3,806	13,093			3,000	20,802		30			225		40,956
Benson	9, 10	36,205.8	27,112.7			5,800	52,160.5	11,550		850				133,679
Billings		9	575			85	3,115			16	0.4	2		3,802
Bottineau	8, 9, 10, 13	328.8	12,738.7			2,512	23,076.8							38,656
Bowman	9	5.3	7,131.5				13,755.3	25		115	129	25		21,186
Burke	13	3,135	9,659			5,550	8,752			0.3				27,096
Burleigh	1, 12, 13	6,337.3	6,321			1,739.3	4,692.6		54		2.1	1		19,147
Cass	9	16.25	3,711				6,725							10,452
Cavalier	9	800	60,000				10,063	100						70,963
Dickey	9	4,099.1	10,196.1			6,500	16,117	520	100					37,532
Divide	13	500	3,705			2,600	411			0.3		4		7,220
Dunn	13	6,627.2	12,126			14,400	5,547.5				35			38,736
Eddy	9	4,110	20,330			215	27,590	50						52,295
Emmons	13	40,133.3	45,050			45,250	15,700				14.5			146,148
Foster	9	2,380	3,900				7,885		2					14,167
Golden Valley	9	31.3	14,077.5			10,060	10,051.3		6	505		33		34,764
Grand Forks	5, 9, 10	3.2	18,548.3			572	18,530.8	420.2	50					38,124
Grant	12	1,845	13,329		1	42,250	22,548			82	SP			80,055
Griggs							103,480							103,480
Hettinger	13	1,970	18,038			19,200	15,150.1			2	100	5		54,465
Kidder	13	3,433.3	16,874	5		525	27,800	5		20	1	124		48,787
LaMoure	9	10,200	65,210			50,000	32,352							157,762
Logan	9, 10	19,148.3	7,508			33,200	3,700.1					176		63,732
McHenry	9, 13	6,980	5,820			15,400	71,660		2			3		99,865
McIntosh	9	21,650	25,962			18,000	1,550							67,162
McKenzie	9	11,503.8	22,220.0			1,220	20,013.3		3	3	521	12		55,496
McLean	9, 10, 12, 13	1,729.4	7,407.7			2,543.3	1,518.7	40			20	0.1		13,259
Mercer	9, 10	5,406.6	30,500.2			26,500	15,610		1	30	30	10		78,088
Morton	6, 10	7,306.8	21,782	1		8,850	96,077		25	2	2	28		134,074
Mountrail	9	1,125	10,936			3,145	11,635				44.8			26,886
Nelson	9	2,450	26,000				31,207	3,610	1			300		63,568
Oliver	10	2,606.7	19,851.8			3,200	19,650.6				3			45,312
Pembina	9, 10	1,048.2	31,000.2			2,000	12,762.9	610						47,421
Pierce	13	87,590	80,070			3,050	156,250							326,960
Ramsey	2, 10	1,205.8	27,019.7				5,681.5	3,150	2					37,059
Ransom	9, 10, 14	250.3	4,746.2			150	40,065.9	150	1					45,363
Renville		95	5,700			2,300	585		3	2				8,685
Richland	9, 14	243	21,660			1,500	103,000	115	35					126,553
Rolette	9, 13	1,500	20,750				36,738							58,988
Sargent	9, 12, 13	30,023	36,120			30,000	18,349.5	2,550	3		1			117,047
Sheridan	9, 12, 13	150,947	30,985			47,819.3	937.6							230,689
Sioux		400	460			6,630	9,600							17,090
Slope	9, 13	2.6	4,664.5	2		164,264	4,222.1			2		0.6		173,158
Stark	3	25,648	60,591			39,780	17,189		5.1	0.35		4.5		143,218
Steele		405	2,980			70	5,520	190						9,165
Stutsman	9	17,421	30,222			20,010	15,767		5			0.5		83,426
Towner	9	125	28,400			6,500	5,402	500	1					40,928
Traill		150	4,500				6,900		1					11,551
Walsh	9	6,815	46,950			855	11,004	8,260	2					73,886
Ward	9, 13	1,836	7,327			1,410	15,198	32.5	11			26		25,841
Wells	9	7,620	7,476			1,900	10,886							27,882
Williams	9, 10, 13		22,115.7			3,550	20,461.9		1	20.3	0.5	2		46,151
GRAND TOTALS		539,207	1,034,686	8	1	654,105	1,216,572	31,878	344	1,650	904*	982	0	3,479,432
CITY DATA INCLUDED WITHIN RESPECTIVE COUNTY DATA														
Bismarck City		354	271			96	92		2		<0.1			815
Devils Lake City			7				18		2					27
Dickinson City		75	45			35	100		5					260
Fargo City														[——]
Grand Forks City		3				2	3		20					28
Mandan City							3.25							3

REPORTING IN *OTHER DATA INCLUDED* COLUMN

1 - Bismarck City Weed Board
2 - Devils Lake City Weed Board
3 - Dickinson City Weed Board
4 - Fargo City Weed Board [——]
5 - Grand Forks City Weed Board
6 - Mandan City Weed Board
7 - North Dakota Department of Transportation [——]
8 - North Dakota Forest Service Department
9 - North Dakota Game & Fish Department
10 - North Dakota Parks & Recreation Department
11 - North Dakota State Land Department [——]
12 - United State Bureau of Reclamation
13 - United States Fish & Wildlife Service
14 - United State Forest Service

* Actual GPS data was reported at 373 acres

[——] no reported data for 2003 survey

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educational outreach, emergency response to disasters, food safety, farm and food program delivery, trade and export development and rural economic development.

TEAM (The Ecological Area-wide Management of) Leafy Spurge is headquartered at the USDA Agricultural Research Service's Northern Plains Agricultural Research Laboratory (NPARL) in Sidney, Montana. The program was nominated for its development and implementation of a highly effective, biologically based IPM system for managing the noxious weed leafy spurge across wide geographic and political boundaries. The system incorporated biological control agents with other more traditional management tools leading not only to dramatic reductions in leafy spurge infestations, but also to significant reductions in herbicide use, further protecting and enhancing the environment. In accomplishing its goals, TEAM Leafy Spurge developed far-reaching partnerships with numerous federal and state agencies, land-grant universities, local entities and organizations and private landowners and has been hailed as a model for tackling other noxious weeds by leaders in the field and program participants alike.

TEAM Leafy Spurge members honored with the award include Program Directors Drs. Gerry Anderson and Lloyd Wendell, Program Coordinator Dr. Chad Prosser, Operations Coordinator Dr. Robert Richard, Technical Information Specialist Bethany Redlin and her assistant, Jill Miller. Dr. Anderson, Redlin and Miller are all with USDA-ARS-NPARL in Sidney, MT; Dr. Wendell and Dr. Richard are with USDA-APHIS and Dr. Prosser, formerly with the Sidney lab, is now employed with the National Park Service in Medora ND.

Dr. Anderson represented TEAM Leafy Spurge at the awards ceremony in Washington, DC on June 25th.

Bethany Redlin