



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Perceptions of Leafy Spurge and Evaluation of the TEAM Leafy Spurge Project by Public Land Managers, Local Decision Makers, and Ranch Operators

Nancy M. Hodur, F. Larry Leistritz, and Dean A. Bangsund*

Introduction

Leafy spurge is an exotic, noxious, perennial weed which is widely established in the north central United States and is an especially serious problem in the northern Great Plains (Bangsund et al. 1999). While no single control method can eradicate established infestations, expansion can be controlled with a combination of biological and chemical control mechanisms in an integrated pest management (IPM) framework (Messersmith 1989; Lym and Messersmith 1994; Lym and Zollinger 1995; Lym et al. 1997). In 1997, the Agriculture Research Service and the Animal and Plant Health Inspection Service, U.S. Department of Agriculture, initiated a major IPM research and demonstration project, TEAM Leafy Spurge, to develop and communicate ecological, economical, and sustainable leafy spurge management techniques to land managers. The primary goal of TEAM Leafy Spurge (TLS) was to develop and demonstrate ecologically based IPM strategies that can produce effective, affordable leafy spurge control. The TEAM Leafy Spurge project focused on a multi-county area in southwestern North Dakota, southeastern Montana, northeastern Wyoming, and northwestern South Dakota (Figure 1).

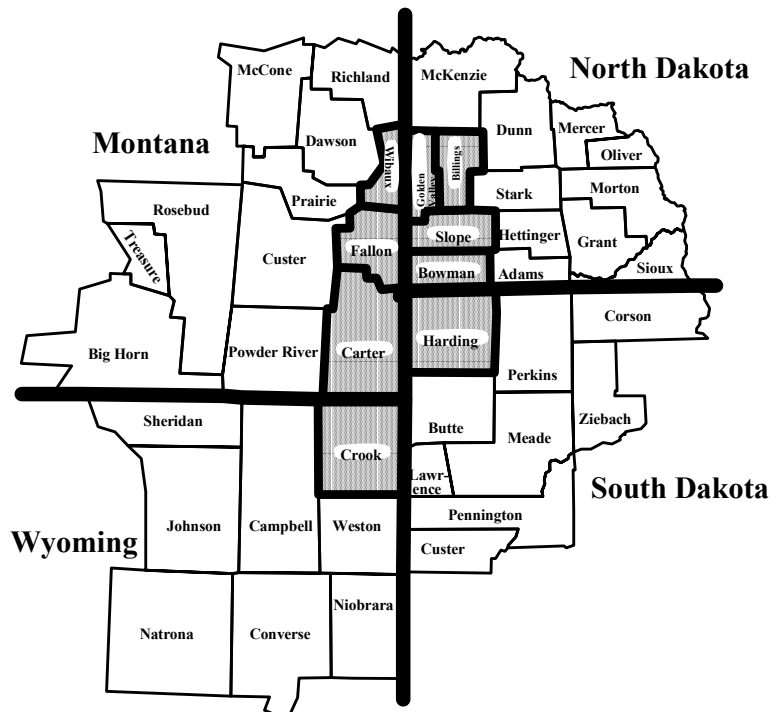


Figure 1. Study Counties, Ranch Operator Perceptions of Leafy Spurge Management, 2001

*Hodur is a research associate, Leistritz is a professor, and Bangsund is a research scientist, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo.

In one of the first phases of the overall project and phase one of the socio-economic component of the study, ranchers, local decision makers, and public land managers in the TEAM Leafy Spurge project area were surveyed to evaluate managerial, institutional, and social factors that might affect the rate and extent of implementation of various control strategies (Sell et al. 1998a, Sell et al. 1998b, Sell et al. 1999). In 2001, near the conclusion of the TEAM Leafy Spurge project, a second survey of the same group of ranchers and public land managers was conducted. The 2001 survey was undertaken to (1) assess any changes in land managers' perceptions of weed problems, control alternatives, and related issues, and (2) evaluate the impact of the TEAM Leafy Spurge project on the respondents' weed control practices. The primary focus of the analyses presented in this report was to compare the responses of ranchers; local decision makers (LDM); public land managers, grazing land (PLMG); and public land managers, non-grazing land (PLMNG) to the 2001 survey. A complete discussion of ranchers', decision makers', and public land managers' perceptions are detailed in Hodur et al. (2002a) and Hodur et al. (2002b).

Methods

A questionnaire was mailed to the same sample of ranchers surveyed by Sell et al. (1998a, 1999). PLMG agencies surveyed included the USDA Bureau of Land Management, USDA Forest Service, USDI Bureau of Indian Affairs, North Dakota Department of Corrections, and the State Land Departments in Montana, North Dakota, South Dakota, and Wyoming. The survey of PLMNG included Theodore Roosevelt National Park, Devils Tower National Monument, USDI Bureau of Reclamation, USDI Fish and Wildlife Service, and the Game and Fish Management Departments and Departments of Transportation in Montana, North

Dakota, South Dakota, and Wyoming. State legislators, county extension agents, county commissioners, and county weed board members were surveyed to elicit perspectives and opinions from individuals who make or influence weed control decisions in their localities (LDM). Questionnaires were mailed to 927 ranchers, 97 LDM, 37 PLMG, and 21 PLMNG in July 2001. One follow-up mailing resulted in response rates of 35 percent, 50 percent, 67 percent, and 76 percent, respectively.

Problems Faced by Livestock Grazing Operations

Ranchers, local decision makers, and public land managers of grazing land were presented with a series of issues related to problems faced by livestock grazing operations and were asked to rate each issue as either a major problem, not a problem, or a minor problem. The same issues were presented to respondents in the 1998 and 1999 surveys. 'Adverse weather conditions' was most frequently rated as a major problem by LDM (60 percent) and ranchers (55 percent). While 65 percent of PLMG indicated adverse weather conditions were a major problem, 75 percent indicated noxious or invasive weeds were a major problem (Table 1). When asked which problem was the most serious for area livestock grazing operations, PLMG most often identified noxious or invasive weeds (39 percent), followed by adverse weather conditions and livestock prices (22 percent each). LDM most often cited adverse weather conditions (36 percent) as the most serious problem, followed by noxious weeds and livestock prices (20 percent each). The PLMG and LDM appear to view noxious or invasive weeds as a more critical problem than ranchers as only 10 percent of ranchers identified noxious weeds as the most serious problem. Ranchers most frequently cited adverse weather conditions and livestock prices as the most serious problems (Table 1).

Table 1. Problems Faced by Livestock Grazing Operations, Ranchers, Local Decision Makers, and Public Land Managers—Grazing, 2001 and 1998-1999

Issue	<u>Ranchers</u>		<u>Local Decision Makers</u>		<u>Public Land Managers, Grazing</u>	
	2001 ¹	1998-1999	2001 ¹	1998-1999	2001 ¹	1998 ²
-----percent indicating a major problem-----						
Adverse weather conditions	54.7	61.4	60.4	51.7	65.0	34.8
Livestock prices	54.4	85.9	52.1	86.2	40.0	45.0
Cost of feed and supplies	52.6	54.3	52.1	56.9	30.0	17.7
Regulations affecting use of public lands	45.8	34.3	50.0	44.6	20.0	4.8
Noxious or invasive weeds	36.0	23.8	47.9	56.1	75.0	47.8
Predators	26.1	26.3	27.1	38.6	20.0	19.1
Availability of grazing land	23.8	27.5	12.5	25.9	20.0	9.5
Use of CRP for haying or grazing	13.0	14.1	6.3	8.9	5.0	14.3
(n)	(263)	--	(48)	--	(20)	--
-----percent indicating most serious problem-----						
Adverse weather conditions	25.2	23.7	35.6	17.0	22.2	13.0
Livestock prices	21.7	40.9	20.0	44.7	22.2	30.4
Cost of feed and supplies	16.5	7.8	15.6	14.9	0.0	8.7
Regulations affecting use of public lands	12.6	8.1	4.4	4.3	11.1	0.0
Noxious or invasive weeds	10.4	6.2	20.0	8.5	38.9	26.1
Availability of grazing land	8.3	6.5	4.4	2.1	5.6	13.0
Predators	3.0	4.2	0.0	4.3	0.0	13.0
Use of CRP for haying or grazing	1.3	0.7	0.0	5.6	0.0	0.0
(n)	(263)	--	(45)	--	(18)	--
-----percent indicating problem had become worse-----						
Regulations affecting use of public lands	58.4	54.1	72.9	63.0	30.0	13.6
Cost of feed and supplies	57.0	59.6	60.4	70.7	25.0	38.9
Noxious or invasive weeds	45.8	35.8	70.8	55.2	70.0	72.7
Predators	34.7	36.8	37.5	46.4	30.0	5.3
Availability of grazing land	29.1	31.3	22.9	19.6	20.0	16.7
Livestock prices	19.1	78.8	14.9	81.5	10.0	40.0
Adverse weather conditions	12.2	20.8	16.7	8.8	15.0	11.8
Use of CRP for haying or grazing	11.9	52.6	8.3	50.0	5.0	6.7
(n)	(263)	--	(48)	--	(20)	--

¹ Detail does not add to total because of multiple responses.

² Results are from the 1998 survey only.

When 2001 survey responses were compared to the 1998 and 1999 surveys, more respondents in each survey group in the 2001 survey indicated noxious weeds were the most serious problem facing grazing operations in their area. Respondents in all groups were also more concerned about regulations affecting the use of public lands. More respondents in all groups in the 2001 survey indicated that regulations affecting the use of public lands was a serious problem, the most serious problem, and a problem that had become worse in the last five years than in the 1998 and 1999 surveys.

Nature and Seriousness of Weed Problems

In addition to commenting on general issues affecting livestock grazing operations, respondents were asked to rate the effect of several weed species on livestock grazing operations in their area. Leafy spurge was identified as a major problem by a majority of local decision makers (81 percent) and ranchers (52 percent), while thistles were most frequently cited by PLMG as a major problem (71 percent). Leafy spurge was identified by a majority of respondents in each group as the weed that is the most serious problem for grazing operations.

In contrast to the question regarding weed problems in their area, the four groups of respondents were asked to rate the seriousness of weed problems on their ranch, on land they manage, or in the case of LDM, land in their area. More respondents perceive noxious weeds as a serious problem for grazing operations in general, than believe noxious weeds are a serious problem on their own land, the land they manage, or land in their area (Table 2). Fifty-one

percent of ranchers, 81 percent of LDM, 80 percent of PLMG, and 64 percent of PLMNG indicated noxious weeds were a serious problem for grazing operations. However, only 15 percent of ranchers, 54 percent of LMD, 68 percent of PLMG, and 50 percent of PLMNG consider weeds a major problem on their own land (Table 2). These responses would suggest respondents believe noxious weeds are more serious elsewhere than on the land they own or manage.

Further, leafy spurge infestations were prevalent across all groups. Almost 56 percent of the ranchers, 94 percent of the PLMNG, and 100 percent of the PLMG reported that they had leafy spurge on land they own or manage with average infestations ranging from 124 acres for ranchers to over 5,000 acres for PLMG. Infestations ranged in size from less than an acre to over 50,000 acres (Table 3).

Weed Control Practices

Herbicide use was widespread. Ninety-three percent of ranchers, 94 percent of PLMG, and 100 percent of PLMNG used herbicides to control leafy spurge (Table 4). Use of biological control agents was also prevalent with over half of the ranchers (53 percent), three-fourths of the PLMNG, and 95 percent of the PLMG respondents using biological control agents. The Integrated Pest Management (IPM) concept also appeared to be gaining more widespread acceptance, as 51 percent of ranchers, 75 percent of PLMNG, and 100 percent of PLMG respondents were currently using this approach. Respondents' use of various control practices did not appear to change markedly from practices reported in the 1998 and 1999 surveys.

Table 2. Weeds Posing Greatest Problems for Livestock Grazing Operations, Ranchers, Local Decision Makers, Public Land Managers, 2001 and 1998-1999

Weeds	Ranchers		Local Decision Makers		Public Land Managers, Grazing Land		Public Land Managers, Non-grazing Land	
	2001	1998-1999	2001	1998-1999	2001	1998 ²	2001	1998 ²
-----percent indicating a major problem-----								
Leafy spurge	51.5	41.6	80.8	76.7	80.0	63.6	64.7	75.0
Thistles	34.2	21.4	30.4	28.8	55.0	15.0	70.6	33.0
Field bindweed	26.1	24.8	23.4	15.5	21.1	11.0	17.6	6.7
Sagebrush	13.5	9.9	8.5	6.9	0.0	10.0	0.0	7.5
Annual brome grasses	9.5	10.9	11.9	11.1	22.2	30.0	23.5	38.5
Prickly pear	8.3	5.6	4.3	3.8	5.3	10.5	0.0	0.0
Knapweed(s)	5.5	5.9	6.4	3.6	20.0	9.5	11.8	33.0
Wormwood (absinth)	1.2	0.5	0.0	2.6	0.0	5.9	5.9	0.0
Others ¹	8.4	62.7	0.0	0.0	0.0	33.0	0.0	100.0
(n)	(262)	--	(47)	--	(20)	--	(17)	--
-----percent indicating the most important weed problem-----								
Leafy spurge	53.4	50.8	71.1	88.9	75.0	73.9	52.9	62.5
Thistles	20.2	13.1	15.6	5.6	5.0	13.0	41.2	18.8
Sagebrush	8.4	11.5	4.4	0.0	0.0	0.0	0.0	0.0
Annual brome grasses	7.6	6.4	2.2	1.9	5.0	8.7	0.0	6.3
Field bindweed	2.9	4.0	2.2	0.0	0.0	0.0	0.0	0.0
Knapweed(s)	1.7	3.0	2.2	0.0	10.0	4.4	5.9	12.5
Prickly pear	1.7	2.4	2.2	1.8	0.0	0.0	0.0	0.0
Wormwood (absinth)	0.4	.3	0.0	0.0	0.0	0.0	0.0	0.0
Others ¹	3.8	62.7	1.9	5.0	0.0	0.0	0.0	0.0
(n)	(238)	--	(45)	--	(20)	--	(17)	--
Perceived Severity of Weed Problem:								
Not a problem	13.8	22.0	2.3	1.7	0.0	0.0	0.0	0.0
Minor problem	71.1	67.0	43.2	38.3	31.6	68.2	50.0	56.3
Major problem	15.0	11.0	54.6	60.0	68.4	31.8	50.0	48.3
(n)	(246)	(n/a)	(44)	(n/a)	(19)	(n/a)	(16)	(n/a)

¹ Other weeds: Any weeds, Saltcedar, Houndstongue, Bindweed, Sulfur cinquefoil, Wild licorice, Canada thistle, Burdock, Tansey, Foxtail, Cheatgrass, Cocklebur, Fringed sagebrush.

² Results are from the 1998 survey only.

Table 3. Average Acres of Leafy Spurge, Ranchers and Public Land Managers, 2001

Issue	Ranchers	Public Land Managers, Grazing	Public Land Managers, Non-grazing
		-----acres-----	
Average acres of leafy spurge on farm/ranch or public lands ¹	124	5,827	969
(n)	(124)	(14)	(11)
Total acres of leafy spurge reported by all respondents	15,422	81,590	10,662
(n)	(124)	(14)	(11)
Range of acres of leafy spurge reported by all respondents	0 to 5,000	10 to 50,000	1 to 4,000
(n)	(124)	(14)	(11)

¹Only those respondents that reported leafy spurge and indicated the size of the infestation are included in the calculation.

Table 4. Use of Selected Practices to Control Leafy Spurge, Ranchers and Public Land Managers, 2001 and 1998-1999

Control Practice	Ranchers		Public Land Managers, Grazing		Public Land Managers, Non-grazing	
	2001 ¹	1998 ² - 1999	2001 ¹	1998 ²	2001 ¹	1998 ²
-----percent-----						
Currently using control practice:						
Herbicides	93.0	97.4	94.7	100.0	100.0	100.0
Biological control	52.9	47.2	94.7	95.2	75.0	71.4
Sheep or goat grazing	17.8	25.7	73.7	83.3	12.5	37.5
Tillage and reseeding with competing grasses	27.0	13.3	21.1	10.5	18.8	25.0
Integrated Pest Management (IPM)	50.8	n/a	100.0	n/a	75.0	n/a
(n)	(143)	--	(19)	--	(16)	--

¹Detail does not add to total because of multiple responses.

²Question was phrased slightly different in the 1998 questionnaire. The 1998 questionnaire asked the respondent if they had used a control practice in the past, compared to the 2001 questionnaire that asked the respondent if they were currently using the control practice.

Evaluation of TEAM Leafy Spurge Project

Because outreach efforts were a major component of the TEAM Leafy Spurge program, respondents were asked a series of questions designed to gauge respondent awareness of the program. Overall, awareness of the program was quite high with the vast majority of PLMG and LDM aware of the program, 90 and 85 percent, respectively. Levels of awareness were also favorable for ranchers (46 percent) and PLMNG (66 percent). In addition to gauging respondent awareness, the questionnaire measured respondent participation at a number of TLS events,¹ specifically the two Spurgefest events, other TLS meetings, and TLS demonstration sites.

The Spurgefest field tour events held in Medora, ND in 1999 and 2001 were more widely attended by LDM and public land managers, than ranchers (Table 5). Almost 37 percent of the LDM, 30 percent of PLMG, and 19 percent of PLMNG attended the 1999 Spurgefest compared to about 7 percent of the ranchers. Ratings of the event were quite favorable, ranging from 5.6 to 6.7 on a 7-point scale (1 = poor and 7 = excellent). Attendance at the 2001 Spurgefest ranged from 35 percent for the PLMG to 2.6 percent for the ranchers, and again the ratings were favorable, ranging from 5.6 (LDM) to 6.9 (PLMG). The Spurgefest meetings were not the only outreach method used. TEAM Leafy Spurge personnel gave numerous presentations at a variety of state and local meetings and events. Examples would include county weed board meetings and state weed control conferences. Twenty percent of the ranchers, 60 percent of the LDM and

PLMG, and 30 percent of PLMNG had either attended one of the Spurgefest events or attended another TLS meeting or event. TLS also had three demonstration sites. Twenty three percent of ranchers, 62 percent of LDM, 53 percent of PLMG, and 24 percent of PLMNG had visited at least one of TLS demonstration sites. A third of the ranchers and PLMNG and approximately 70 percent of LDM and PLMG attended at least one demonstration site or attended at least one TLS event or meeting. All events were positively rated by respondents. Scores ranged from 5.4 to 6.7 on the 7 point scale. Responses are detailed in Table 5.

Because many of the TLS events offered land owners and land managers an opportunity to collect or receive insects, this study offered an excellent opportunity to estimate how many event participants collected or received insects, to what degree the insects have established, and the level of control exhibited to date. Some respondents from each of the four survey groups collected and/or received insects at a TLS event. Most of the respondents in each group felt that the insects had affected the leafy spurge stands where they were released (Table 6). Respondents were also asked to rate the degree to which insects have established. All groups rated the degree of establishment positively with average scores ranging from a low of 4.2 (PLMG) to a high of 5.8 (PLMNG) (based on a scale of 1 to 7 where 1 is poor and 7 is excellent). Respondents also rated the level of control exhibited by the insects positively. Scores ranged from 4.4 to 5.8. Although the actual number of responses was small, the generally high average scores are encouraging (Table 7).

¹ Spurgefest I and II were symposiums highlighting leafy spurge management strategies featuring research and demonstration site tours.

Table 5. Attendance and Ratings of TEAM Leafy Spurge Events, Ranchers, Local Decision Makers, and Public Land Managers, 2001

	Rancher		LDM		PLMG		PLMNG	
	%	avg. score ¹	%	avg. score ¹	%	avg. score ¹	%	avg. score ¹
Attendance TLS Event or Meeting:								
1999 Spurgefest	6.7	5.6	36.6	5.9	30.0	6.3	18.8	6.7
2001 Spurgefest	2.6	6.2	21.6	5.6	35.0	6.9	23.5	6.7
TLS presentation at another event/ meeting	16.3	5.9	46.0	5.4	31.6	5.4	29.4	6.3
Any Spurgefest event or other event or meeting	21.2	--	60.8	--	60.0	--	29.4	--
(n) ²	(240)	(19)	(47)	(13)	(20)	(6)	(17)	(6)
Visited at least one TLS demonstration site	23.3	--	61.7	--	52.6	--	23.5	--
(n) ²	(252)	--	(43)	--	(19)	--	(17)	--
Visited at least one demonstration site or attended at least one TLS event or meeting	29.4	--	72.3	--	70.0	--	29.4	--
(n) ²	(252)	--	(43)	--	(19)	--	(17)	--

¹ Based on a scale of 1 to 7, where 1 is poor and 7 is excellent.

² Average number of respondents for each event or demonstration site.

Table 6. Respondents that Collected or Received Insects, Ranchers, Local Decision Makers, and Public Land Managers, 2001

	Ranchers	LDM	PLMG	PLMNG
	-----percent-----			
Respondents that collected or received insects	20.0	45.6	45.0	41.2
(n)	(262)	(46)	(20)	(17)
Respondents that indicated insects have affected leafy spurge stands	60.2	86.7	84.6	54.6
(n)	(93)	(30)	(13)	(17)

Table 7. Respondents' Perceptions of Insect Establishment and Level of Control, Ranchers, Local Decision Makers, and Public Land Managers, 2001

	Ranchers	LDM	PLMG	PLMNG
	-----average score ¹ -----			
Degree to which insects have established	4.9	5.4	4.2	5.8
(n)	(53)	(24)	(10)	(6)
Level of leafy spurge control to date from biological control	4.4	4.8	4.2	5.8
(n)	(52)	(26)	(10)	(6)

¹ Average score based on scale of 1 to 7 where 1 is poor and 7 is excellent.

All four groups were asked to respond to a series of general statements about the effectiveness of TEAM Leafy Spurge. More than two-thirds of the LDM, PLMG, and ranchers agreed that the TLS project had been effective in demonstrating and communicating leafy spurge control options to ranchers and land managers (Table 8). The program received similar marks when respondents were asked about TLS effectiveness demonstrating herbicide use and biological control agents. Marks were slightly higher for TLS efforts related to biological control. A majority of respondents in all groups indicated they had personally benefitted from the project, including 82 percent of LDM and 76 percent of PLMG. Ninety-two percent of the LDM, 71 percent of PLMG, and 70 percent of the ranchers agreed that project funding should be extended to continue research and education programs (Table 8).

Respondents in each of the four groups were asked to indicate how the TLS project had affected their weed control strategies (Tables 9-11). Responses were compared to similar questions in the 1998 and 1999 surveys to gauge any changes in weed control strategies. Roughly half of the ranchers and LDM and one-third of the public land managers, both for grazing and non-grazing land, indicated TLS had influenced their decision to use herbicides (Table 9). Among the ranchers, LDM, and PLMG who indicated that TLS had influenced their plans, most often respondents indicated they currently were planning to use herbicides to stop infestations from spreading and integrating herbicides with other control measures. Among those who said that TLS had not influenced their plans to use herbicides, the most common explanation was that they were already using herbicides (ranging from 74 percent of ranchers to 100 percent of PLMG). When the reasons why TLS had not influenced respondents' plans were

compared to the reasons why respondents were not using herbicides in the 1998 and 1999 surveys, respondents were generally less negative about the constraints to using herbicides, especially the rancher group. For example, nearly 60 percent of ranchers cited environmental restrictions as an impediment to herbicide use in 1998 and 1999, while only 29 percent cited environmental restrictions as an impediment to herbicide use in the 2001 survey. Environmental impediments were cited far less frequently by both public land manager groups. Also, in the 1998 survey, 85 and 82 percent of the PLMG and PLMNG, respectively, indicated that environmental restrictions prevented herbicide use, compared to only 27 and 37 percent, respectively, in the 2001 survey. Responses are detailed in Table 9.

Responses were similar when respondents were asked about TLS influence on biological control practices (Table 10). Over half of the respondents in each group indicated TLS has influenced their decision to use biological control agents with a majority of respondents in each group indicating they are now planning to use biological control as a result of TLS. Additionally, half of the ranchers and 80 percent of the LDM indicated they were now going to try biological control because insects are free and readily available.

Among those who indicated that TLS had not altered their plans, frequent explanations were that infestations were too small (53 percent of ranchers and 80 percent of PLMNG) or not suitable for biological control (57 percent of LDM). LDM signaled their constituents were still somewhat uncertain about the effectiveness of biological control, as 71 percent of LDM said their constituents still were not convinced that biological control will work. As was the case with herbicides, many of the reasons cited in the 1998 and 1999

surveys as impediments to using biological control appear to be less prevalent. For example, in the 1998 and 1999 surveys one-third of the ranchers indicated they did not know how to use biological control agents or where to collect insects. In the 2001 survey, only 7 percent of ranchers indicated they were not using biological control agents because they did not know how to use them and only 3 percent said they did not know where to collect insects (Table 10).

Responses regarding TLS impact on decisions regarding sheep grazing by PLMNG had a different pattern than the other groups. The nature of their land holdings and/or agency management objectives may preclude the use of sheep grazing in many instances. Thus, while 47 percent of ranchers, 50 percent of LDM, and 65 percent of PLMG felt TLS had satisfactorily demonstrated the effectiveness of grazing sheep to control leafy spurge, only 23 percent of PLMNG agreed with this statement. Finally, 17 percent of ranchers, 29 percent of LDM, and 35 percent of PLMG indicated that TLS had influenced their plans to graze sheep to control leafy spurge, compared to only 8 percent of PLMNG (Table 11).

While TLS may not have influenced as many respondents' decisions to use sheep or goat grazing to control leafy spurge, many respondents indicated the reasons for not grazing sheep were factors outside their control. Ranchers, LDM, and PLMG all indicated TLS did not influence their decision because there were simply too many constraints (fencing, stock, and equipment) to sheep grazing. Other constraints were that the infestation was too small (36 percent of ranchers and 40 percent of PLMG), do not have resources to manage sheep (75 percent of LDM), or land was not suitable for grazing (36 percent of PLMNG). As was the case with biological control and

herbicides, respondents seemed generally less negative in the 2001 survey regarding constraints associated with using sheep grazing as a leafy spurge control practice. For example, while ranchers' most frequent response to why they were not incorporating sheep grazing is still "too many constraints to grazing", only 41 percent of respondents responded accordingly compared to 72 percent in the 1998 and 1999 surveys.

The last issue addressed by the survey was the applicability of the TLS approach to other weeds. Respondents in all groups overwhelmingly agreed that the TLS approach would be applicable to both Canada thistle and knapweeds, two problem weeds in the survey area. A minimum of 80 percent of the respondents in each survey group indicated the TEAM Leafy Spurge format would be applicable to weed management programs directed at Canada thistle and Knapweeds. When asked about changes to increase the effectiveness of the TLS approach if it were adapted to another weed, ranchers and PLMNG most often indicated that the addition of a monthly bulletin, newsletter, or e-mail notice would be desirable.

Key Findings

Leafy spurge continues to pose major problems for ranchers, local decision makers, and public land managers throughout the northern Great Plains.

The survey results indicate that noxious weeds are increasingly perceived as an important problem. Heightened awareness of the severity of the noxious weed issue was evident in all study groups.

In evaluating weed control practices, all groups of survey respondents reported extensive use of biological control and the IPM approach, and they plan to continue to use these control practices in the future.

While biological control and the IPM approach also were used extensively by all groups, herbicides continue to be the control practice of choice. However, the growing use of biological control and IPM strategies suggest landowners and land managers are using alternative control practices to complement herbicide treatment programs.

TEAM Leafy Spurge appeared to successfully influence landowners' weed control plans as relatively high percentages of respondents indicated that the project had influenced their plans to use various leafy spurge control strategies. This was particularly evident in regard to biological control—80 percent of LDM and 65 percent of PLMG, as well as 54 percent of PLMNG and 42 percent of ranchers, indicated that TLS had influenced their plans to use biological agents to control leafy spurge. It also appears that many of the constraints to using biological control have moderated. The number of ranchers, local decision makers, and public land managers that indicated they were not using biological control because they either were not able to collect sufficient quantities of insects, did not know where to collect insects, or did not know how to use them, is substantially less than in the 1998 and 1999 surveys.

The TEAM Leafy Spurge project also has been successful in reaching a substantial percentage of its target audience. TLS events and demonstration sites were well attended with one-third of ranchers and PLMNG and roughly 70 percent of LDM

and PLMG attending at least one TLS event or demonstration site. All TLS events were well received with above average ratings from respondents in all study groups. Further, 92 percent of local decision makers, 71 percent of public land managers, and 70 percent of ranchers supported extending funding, and a large majority of respondents believe the TEAM Leafy Spurge model would be applicable to other problem weeds (Hodur et al. 2001b).

Conclusions

While more options for leafy spurge control are currently available than even just a few years ago, leafy spurge continues to be a problem for ranchers and land managers throughout the survey area. The goal of TEAM Leafy Spurge was to develop and deliver economical, effective leafy spurge control techniques to both private land owners and public land managers. Based on the results of the 2001 survey, it would appear that the program has successfully reached a substantial portion of its target audience. The program has developed and communicated weed management strategies to a substantial number of land owners and land managers in an effort to address what continues to be a significant issue for not only private land managers' grazing operations, but for public land managers as well.

Table 8. Attitudes Regarding TEAM Leafy Spurge, Ranchers, Local Decision Makers, and Public Land Managers, 2001

	Ranchers		Local Decision Makers		Public Land Managers, Grazing		Public Land Managers, Non-grazing	
	percent agree	average score ¹	percent agree	average score ¹	percent agree	average score ¹	percent agree	average score ¹
The project has been effective in demonstrating and communicating leafy spurge treatment and control options to ranchers and land managers	69.2	3.9	81.6	4.0	70.6	4.3	50.0	3.6
The project has clearly demonstrated the effectiveness of herbicides in controlling leafy spurge	54.7	3.6	60.5	3.6	76.5	4.1	50.0	3.5
The project has clearly demonstrated the effectiveness of biological control agents (flea beetles) in controlling leafy spurge	63.6	3.9	81.6	4.4	88.2	4.5	64.3	3.8
The project has clearly demonstrated the effectiveness of sheep grazing in controlling leafy spurge	43.2	3.4	41.7	3.3	64.7	3.9	21.4	3.2
I (my agency) have/has benefitted from the project	42.1	3.4	82.1	4.2	76.5	4.1	57.1	3.8
Project funding should be extended to continue research and education programs	69.2	4.1	92.3	4.5	70.6	4.3	57.1	3.9
(n) ²	(128)		(38)		(17)		(14)	

¹ Average score based on a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree.

² Average number of respondents for each item.

Table 9. Impact of TEAM Leafy Spurge Project on Weed Control Strategies using Herbicides, Ranchers, Local Decision Makers, and Public Land Managers, 2001, 1998 and 1999

	Ranchers		Local Decision Makers		Public Land Manager, Grazing Land		Public Land Managers, Non-grazing Land	
	2001 ¹	1998&99 ²	2001 ¹	1998&99 ²	2001 ¹	1998 ³	2001 ¹	1998 ³
	-----percent-----							
TEAM Leafy Spurge has influenced my plans to use herbicides to control leafy spurge	52.5	n/a	45.0	n/a	35.3	n/a	35.3	n/a
(n)	(80)	--	(40)	--	(17)	--	(12)	--
If Yes:								
Plan to use herbicides to stop infestations from spreading	60.0	n/a	64.7	n/a	83.3	n/a	50.0	n/a
Plan to integrate herbicides with other control methods	55.0	n/a	88.2	n/a	100.0	n/a	50.0	n/a
Plan to spray more of my leafy spurge	12.5	n/a	47.1	n/a	50.0	n/a	0.0	n/a
Plan to switch herbicides	15.0	n/a	23.5	n/a	66.7	n/a	0.0	n/a
Plan to change herbicide application rates	10.0	n/a	11.8	n/a	33.3	n/a	100.0	n/a
Plan to use herbicides on different infestations	10.0	n/a	23.5	n/a	33.3	n/a	0.0	n/a
Plan to reduce herbicides & switch to other controls	10.0	n/a	35.3	n/a	16.7	n/a	25.0	n/a
(n) ⁴	(40)	--	(17)	--	(6)	--	(4)	--
If No:								
Currently using herbicides	74.2	n/a	74.2	n/a	90.9	n/a	100.0	n/a
Currently using other control methods	38.0	n/a	40.0	n/a	18.2	n/a	12.5	n/a
Infestations are inaccessible to sprayers	32.3	45.9	60.0	50.0	27.3	66.7	37.5	54.6
Environmental restrictions prevent herbicide use	29.0	58.9	40.0	n/a	27.3	85.7	37.5	82.8
Do not have time to spray ⁵	25.8	26.9	25.0	39.7	18.2	28.3	0.0	n/a
Not economical to use herbicides	25.8	43.5	30.0	41.4	18.2	57.1	0.0	n/a
Infestations are too large, herbicides would be prohibitively expensive	22.6	46.3	65.0	75.9	27.3	71.4	12.5	45.5
Not convinced herbicides are effective ⁶	19.4	25.3	40.0	20.7	9.1	38.1	12.5	36.4
Cost share programs are no longer available	19.3	30.4	10.0	n/a	n/a	n/a	n/a	n/a
Potential damage to non-target species	12.9	n/a	15.0	22.4	9.1	42.9	12.5	63.6
Cannot afford to purchase herbicides ⁷	9.7	n/a	45.0	n/a	18.1	28.6	n/a	n/a
Lack equipment, expertise, or access to certified applicators	9.7	24.1	25.0	22.4	18.1	28.6	0.0	18.2
(n) ⁴	(30)	--	(20)	--	(20)	--	(8)	--

¹Only respondents that indicated they were aware of TEAM Leafy Spurge are included in the distribution of responses.

²Source: Sell et al. (1998a), Sell et al. (1998b), Sell et al. (1999).

³Source: Sell et al. (1998).

⁴Average number of respondents for each variable.

⁵The public land manager questionnaires were stated in terms of "do not have labor resources to spray."

⁶The public land manager questionnaires were stated in terms of "agency is not convinced herbicides are effective."

⁷The public land manager questionnaires were stated in terms of "agency lacks funding to purchase herbicides."

Table 10. Impact of TEAM Leafy Spurge Project on Weed Control Strategies using Biological Control Agents, Ranchers, Local Decision Makers, and Public Land Managers, 2001, 1998 and 1999

	Ranchers		Local Decision Makers		Public Land Manager, Grazing Land		Public Land Managers, Non-grazing Land	
	2001 ¹	1998&99 ²	2001 ¹	1998&99 ²	2001 ¹	1998 ³	2001 ¹	1998 ³
	-----percent-----							
TEAM Leafy Spurge has influenced my plans to use biological control agents to control leafy spurge in the future	58.4	n/a	79.5	n/a	64.7	n/a	53.8	n/a
(n)	(77)	--	(39)	--	(17)	--	(13)	--
If Yes:								
Currently planning to use biological control as a result of TLS	75.0	n/a	80.7	n/a	72.7	n/a	71.4	n/a
Because insects are free and readily available, I am now trying biological control	50.0	n/a	80.7	n/a	18.2	n/a	18.2	n/a
Plan to change how I collect and release insects	15.0	n/a	22.6	n/a	45.5	n/a	14.3	n/a
Plan to modify where I use insects	10.0	n/a	48.4	n/a	45.5	n/a	57.1	n/a
(n) ⁴	(40)	--	(31)	--	(11)	--	(7)	--
If No:								
Infestation is too small to use biological control	53.6	n/a	42.9	n/a	33.3	n/a	80.0	n/a
Still not convinced biological control will work	32.1	n/a	71.4	n/a	0.0	n/a	0.0	n/a
Currently using other control methods	32.1	n/a	28.6	n/a	0.0	n/a	20.0	n/a
Infestations not suitable for biological control	19.4	15.2	57.1	n/a	0.0	n/a	0.0	0.0
Biological control with insects works too slowly	17.8	42.4	28.6	55.1	0.0	n/a	0.0	11.1
Already using insects	16.1	n/a	28.6	n/a	66.7	n/a	20.0	n/a
Do not have time to collect/release insects	10.7	20.0	28.6	22.5	0.0	n/a	0.0	n/a
Do not know how to use biological control	7.1	29.5	14.3	55.1	0.0	n/a	20.0	23.5
Limited access to insects, cannot collect sufficient numbers	7.1	43.3	28.6	57.1	0.0	n/a	0.0	33.3
Insects have not been effective on my infestations in the past	7.1	n/a	28.6	n/a	0.0	n/a	0.0	n/a
Do not know where to collect insects	3.6	31.4	14.3	46.9	0.0	n/a	0.0	23.5
Biological control agents are not economical	3.6	10.5	14.3	4.1	0.0	n/a	0.0	n/a
Afraid biological agents will harm other plants	3.6	14.8	0.0	n/a	0.0	n/a	0.0	n/a
Biological control agents will spread without my help	0.0	4.8	14.3	8.2	0.0	n/a	0.0	n/a
(n) ⁴	(40)	--	(20)	--	(6)	--	(8)	--

¹ Only respondents that indicated they were aware of TEAM Leafy Spurge are included in the distribution of responses.

² Source: Sell et al. (1998a), Sell et al. (1998b), Sell et al. (1999).

³ Source: Sell et al. (1998b).

⁴ Average number of respondents for each variable.

Table 11. Impact of TEAM Leafy Spurge Project on Weed Control Strategies using Sheep Grazing, Ranchers, Local Decision Makers, and Public Land Managers, 2001, 1998 and 1999

	Ranchers		Local Decision Makers		Public Land Manager, Grazing Land		Public Land Managers, Non-grazing Land	
	2001 ¹	1998&99 ²	2001 ¹	1998&99 ²	2001 ¹	1998 ³	2001 ¹	1998 ³
	-----percent-----							
TEAM Leafy Spurge has influenced my plans to graze sheep to control leafy spurge in the future	17.1	n/a	28.6	n/a	35.3	n/a	7.7	n/a
(n)	(73)	--	(35)	--	(17)	--	(13)	--
If Yes:								
Currently using sheep as a control method	63.6	n/a	40.0	n/a	83.3	n/a	100.0	n/a
While grazing works, do not have resources to implement a grazing program	36.7	n/a	70.0	n/a	66.7	n/a	0.0	n/a
I am planning to use sheep grazing as a result of TLS	18.2	n/a	40.0	n/a	33.3	n/a	100.0	n/a
(n) ⁴	(11)	--	(10)	--	(6)	--	(1)	--
If No:								
Too many constraints (fencing, stock, equipment)	43.4	n/a	62.5	84.2	50.0	72.0	27.3	14.3
Infestation is too small	35.9	n/a	20.8	n/a	40.0	n/a	9.1	n/a
Do not want another enterprise on the ranch	30.2	n/a	16.7	n/a	n/a	n/a	n/a	n/a
Do not like sheep or goats	28.3	15.2	54.2	n/a	n/a	n/a	n/a	n/a
Do not have resources to manage sheep	22.6	42.4	75.0	n/a	30.0	n/a	36.4	n/a
Still not convinced sheep grazing will work	22.6	n/a	62.5	n/a	10.0	n/a	54.6	n/a
Sheep or goat grazing is too time consuming	15.1	20.0	20.8	33.3	n/a	33.3	n/a	14.3
Sheep will compete with cattle for forage	15.1	29.5	29.2	n/a	n/a	n/a	n/a	n/a
Do not know enough about sheep management	11.3	43.3	33.3	47.4	20.0	40.3	18.2	n/a
Sheep grazing will negatively affect non-target species	11.3	n/a	20.8	22.8	10.0	19.1	18.2	28.6
Pasture acreage is too small to graze sheep	9.4	n/a	4.2	n/a	40.0	n/a	18.2	n/a
Sheep grazing is too costly, not economical	5.7	n/a	12.5	14.0	10.0	38.1	9.1	14.3
Sheep grazing was ineffective in the past	3.8	31.4	20.8	n/a	10.0	4.8	9.1	n/a
Infestation not suitable for sheep grazing	0.0	n/a	4.2	n/a	0.0	n/a	36.4	n/a
Agency policy prevent sheep grazing	n/a	n/a	n/a	n/a	10.0	9.5	9.1	28.6
Grazing cannot or has never been considered	n/a	n/a	n/a	n/a	n/a	n/a	n/a	41.7
(n) ⁴	(53)	--	(24)	--	(10)	--	(11)	--

¹Only respondents that indicated they were aware of TEAM Leafy Spurge are included in the distribution of responses.

²Source: Sell et al. (1998a), Sell et al. (1998b), Sell et al. (1999).

³Source: Sell et al. (1998b).

⁴Average number of respondents for each variable.

References

- Bangsund, D. A., F. L. Leistritz, and J. A. Leitch. 1999. "Assessing economic impacts of biological control of weeds: The case of leafy spurge in the northern Great Plains of the United States." *Journal of Environmental Management* 56: 35-43.
- Hodur, Nancy M., F. Larry Leistritz, and Dean A. Bangsund. 2002a. *Ranch Operators' Perceptions of Leafy Spurge Management and Evaluation of the TEAM Leafy Spurge Project*. Agribusiness & Applied Economics Report No. 493. Fargo: North Dakota State University, Dept. of Agribusiness & Applied Economics.
- Hodur, Nancy M., F. Larry Leistritz, and Dean A. Bangsund. 2002b. *Perceptions of Leafy Spurge Evaluation of the TEAM Leafy Spurge Project by Public Land Managers, Local Decision Makers, and Ranch Operators*. Agribusiness & Applied Economics Report No. 499. Fargo: North Dakota State University, Dept. of Agribusiness & Applied Economics.
- Lym., R. G., and C. G. Messersmith. 1994. "A Decade of Herbicide Treatments Controlled Leafy Spurge." *North Dakota Farm Research* 50:9-12.
- Lym., R. G., and R. K. Zollinger. 1995. "Integrated Management of Leafy Spurge." Extension Publication W-866. Fargo, ND: North Dakota State University Extension Service.
- Lym., R. G., K. K. Sedivc, and D. R. Kirby. 1997. "Leafy spurge control with angora goats and herbicides." *Journal of Range Manage* 50:123-128.
- Messersmith, G. G. 1989. "Leafy spurge control: reflections on 17 years of research." Pages in R. M. Nowierski, ed., Proc. 1989 Leafy Spurge Symposium. Montana Agricultural Experiment Station, Montana State University, Bozeman, MT.
- Sell, Randall S., Dean A. Bangsund, F. Larry Leistritz, and Dan Nudell. 1998a. *Ranch Operators' Perceptions of Leafy Spurge*. Agr. Econ. Rpt. No. 400. Fargo: North Dakota State University, Dept. of Agricultural Economics.
- Sell, Randall S., Dean A. Bangsund, F. Larry Leistritz, and Dan Nudell. 1998b. *Perceptions of Leafy Spurge by Public Land Managers, Local Decision Makers, and Ranch Operators*. Agr. Econ. Rpt. No. 406. Fargo: North Dakota State University, Dept. of Agricultural Economics.
- Sell, Randall S., Dean A. Bangsund, F. Larry Leistritz, and Dan Nudell. 1999. *Perceptions of Leafy Spurge by Ranch Operators and Local Decision Makers: An Update*. Agr. Econ. Stat. Series Rpt. No. 56. Fargo: North Dakota State University, Dept. of Agricultural Economics.

Acknowledgments

This study contributes to an integrated pest management (IPM) research and demonstration project, titled *The Ecological Area-wide Management of Leafy Spurge* (TEAM Leafy Spurge). The authors express appreciation to the TEAM Leafy Spurge project (Drs. Gerald Anderson and Lloyd Wendel, principal investigators) for their financial support. Sincere appreciation is extended to all the ranchers, local decision makers, and public land managers who took time to complete and mail back the questionnaire.

How to Obtain Additional Information

This document is a summary of a more comprehensive report which contains additional information. Additional copies of this summary and single copies of the main report, *Perceptions of Leafy Spurge and Evaluation of the TEAM Leafy Spurge Project by Public Land Managers, Local Decision Makers, and Ranch Operators*, Report No. 499, are available free of charge. Please address your requests to Carol Jensen, Department of Agribusiness and Applied Economics, North Dakota State University, P.O. Box 5636, Fargo, ND 58105-5636, (phone 701-231-7441, fax 701-231-7400), E-mail cjensen@ndsuxext.nodak.edu, or these documents are available on the world wide web at: <http://agecon.lib.umn.edu/>.

NDSU is an equal opportunity institution.

