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Yellow Starthistle in North-Central Idaho: A Survey of Farmers' and Ranchers' Behavior and Attitudes (1982 and 1988)

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Introduction

Yellow starthistle (*Centaurea solstitialis* L.), an introduced Eurasian weed, presently infests over 3 million acres in California, Idaho, Oregon and Washington. A 1981 survey showed that yellow starthistle infested 185,000 acres of rangeland in northern Idaho. By 1989 the infestation had spread to more than 200,000 acres, an increase of about 6,000 acres per year (Callihan et al. 1989).

Yellow starthistle thrives on well-drained soils in rainfall regions of more than 15 inches a year, but it can survive where precipitation is as low as 10 inches. Extensive infestations usually occur at elevations below 5,000 feet. Nearly all rangeland in the western United States is potentially subject to yellow starthistle infestation.

Yellow starthistle invades range and pasture lands and competes with existing vegetation. Once established, it becomes the only plant species available for grazing and causes the loss of grazing and recreational uses of the land. A toxic chemical in the plant can kill horses from chewing disease, and the plant's long, sharp spines can damage the eyes of grazing cattle.

Efforts to control yellow starthistle have spanned the past 30 years and focused primarily on chemical and biological control methods. However, the documented increase of yellow starthistle over the past 6 years suggests that a feasible means of controlling the species has not been developed. Efforts to locate, import and establish parasitic insects and pathogens of foreign origin are under way, and some parasites have been released.

Surveys of farmers and ranchers at different points in time allow an assessment of changing perceptions regarding the extent of weed infestation and spread, the seriousness of weed problems and the relationships of grazing systems to weed problems. Farmers' and ranchers' attitudes and perceptions are important in developing public policy and in determining the economic feasibility of future prescribed management practices.

The objective of this study was to assess changes in the attitudes and behavior of north-central Idaho farmers and ranchers toward weed problems in general and yellow starthistle in particular from 1982 to 1987. Specific objectives were to:

1. Assess changes in the perceived extent of weed problems in general.

- Assess changes in the perceived extent of the following aspects of the yellow starthistle problem:
 a. Its severity
 - b. Alternatives for control
 - c. The willingness of farmers and ranchers to pay for control.
- Determine the relationship of socioeconomic background to the issues addressed in objectives 1 and 2.

The Surveys

The first survey was mailed in September 1982 to a random sample of 249 farmers and ranchers in five north-central Idaho counties (Latah, Lewis, Nez Perce, Clearwater and Idaho). The counties were not equally represented because the sample was chosen from farmers and ranchers residing within an area defined as being infested with yellow starthistle. Names of all ranchers and farmers in the infested area were obtained from county Extension agents and weed control supervisors. Fifty percent of the names on the list were randomly chosen for the survey sample.

The questionnaire was pretested on a small group of farmers and ranchers before being mailed to the sample. An initial mailing and up to three follow-ups were sent to the sample of 249 people. This procedure resulted in 158 usable questionnaires for a response rate of 63 percent.

The survey sought information on extent of weed problems, perceptions of control alternatives and costs of control. Farmers' and ranchers' attitudes were examined using a number of socioeconomic background variables including age, education, income level and acres farmed (Carlson, Konn and Michalson 1985).

Regression analysis and cross tabulation tables were used to assess the influence of age, education, income level and acres farmed on the variables under consideration. Only those relationships statistically significant at the .05 level are reported.

The second survey was conducted in February 1988. It was sent to the respondents of the 1982 survey and contained many of the questions from that survey and some new questions related to the respondents' control of yellow starthistle since the first survey. A total 104 usable questionnaires were returned for a response rate of 70 percent. Since the first survey, 20 farmers and ranchers had died, 48 were no longer farming and 17 could not be contacted.

Characteristics of Respondents

Socioeconomic Background

The same background data were requested in both surveys. Because these data were similar in both years, only the 1982 data are presented (Table 1).

The educational level of respondents ranged from less than high school to college graduate. Most (55 percent) were well educated with at least some college education; their spouses had similar backgrounds.

Gross family income was grouped into four categories. Sixteen percent of the respondents had gross annual incomes less than \$10,000, 30 percent grossed between \$10,000 and \$49,999, 16 percent grossed between \$50,000 and \$99,999 and 39 percent grossed \$100,000 or more.

Twenty-six percent of the respondents were between 24 and 43 years old, 26 percent were between 44 and 56, 24 percent were between 57 and 65, and 24 percent were 66 or older.

Of the total respondents, 95 percent were male. Most (62 percent) resided in Nez Perce County.

Type of Farm Enterprise

Fifty-six percent of the respondents who described their operations in 1982 said they had a combination livestock and crop operation. In 1988, 25 percent had a combination operation. Thirteen percent of the operations were primarily livestock operations in 1982 compared with 24 percent in 1988, and 31 percent were primarily crop production operations in 1982 compared to 51 percent in 1988 (Table 2).

About half (53 percent) of the respondents used 990 acres or less in 1982; about one-third did so in 1988. The majority (56 percent) owned title to a portion of their land in 1988.

Table 1. Selected characteristics of respondents.

store of commissionshifternatives and cos	(%)
Sex Male Female	95 5
Age Under 44 44 to 65 66 and older	26 50 24
Gross income Under \$10,000 \$10,000 to \$49,999 \$50,000 to \$99,999 \$100,000 or more	16 30 16 39
Education Less than high school High school graduate Some college College graduate	18 28 30 25
County of residence Latah Nez Perce Clearwater Idaho Lewis	11 62 62 12

Respondents' Perceptions Of Weed Problems

Given a list of 15 rangeland weeds, respondents were asked whether they perceived each to be a serious problem, moderate problem, slight problem or no problem on their own farm or ranch (Table 3). In 1982, respondents indicated that yellow starthistle was their most serious weed problem. Its perceived seriousness was closely related to the degree of infestation of the respondents' land.

One-fourth of the respondents felt Canada thistle was a serious problem, and 43 percent thought it was a moderate problem. Respondents identified field bindweed (morning glory) and downey brome as the third and fourth most serious weed problems. Seventeen percent felt field bindweed was a serious problem on their land, and 29 percent said it was a moderate problem. Downey brome was a moderate problem for 28 percent of the respondents and a serious problem for 14 percent.

Yellow starthistle and goatweed were viewed as more serious by respondents who owned livestock or combination operations than by respondents who grew crops only. Crop production operators viewed field bindweed and Canada thistle as more serious than did respondents

Table 2. Characteristics of operations.

	1982	1988
one income and recreational cam	(%)	(%)
Kind of operation		
Livestock	13	24
Crop production	31	51
Combination	56	25
Total acres used		
1 to 450	27	19
451 to 990	26	15
991 to 1,800	26	42
1,801 or more	22	24

Table 3. Respondents' perceptions of the severity of the problem of selected weeds.

	1982		198	38
	Moderate	Serious	Moderate	Serious
ers at Afferded point	(%)	(%)	(%)	(%)
1. Yellow starthistle	16	53	13	67
2. Canada thistle	43	25	49	18
3. Morning glory				
(field bindweed)	29	17	36	19
4. Downey brome				
(cheatgrass)	28	14	31	7
5. Goatweed	20	6	12	4
6. Scotch thistle	15	3	18	2
7. Medusa head	9	4	4	3
8. Spotted knapweed	8	1	6	1
9. Skeletonweed	2	2	3	0
10 Diffuse knapweed	1	2	3	0
11. Common crupina	0	3	8	0
12. Mediterranean				
sage	0	3	2	1
13. Dalmatian toadflax	(1	0	0	0
14. Musk thistle	1	0	3	0
15. Sagebrush	0	0	0	0

with livestock or combination operations. Downey brome was viewed equally serious by livestock and crop production operators. Responses were similar in 1988, except respondents reported significant increases in the seriousness of yellow starthistle and field bindweed.

When asked in 1982 which weed was most serious on their cropland or rangeland, most respondents (54 percent) indicated that the most serious cropland weed was Canada thistle, and 74 percent said the most serious rangeland weed was yellow starthistle (Table 4). In 1988, yellow starthistle was reported among the three most serious rangeland weeds by almost 90 percent of respondents; it was also among the three most important cropland weeds, replacing downey brome. In 1982, no respondents said that yellow starthistle was the most serious cropland weed, but in 1988, 12 percent said it was the most serious. Canada thistle was the secondmost serious rangeland weed in both surveys.

Most respondents in 1982 were very concerned about weeds and felt that other farmers and ranchers were too. Most (88 percent) disagreed with a questionnaire statement saying weeds have no effect on production, and 72 percent disagreed with a statement saying most ranchers aren't concerned about weeds (Table 5).

Several background variables were regressed against reactions to these two statements. Respondents with larger gross incomes were more likely to disagree with both statements than were those with smaller incomes. Age, education and size of farm were not statistically

Table 4. Cropland and rangeland weeds judged "most serious" by respondents.

	Cropland			Rang	eland
	1982	1988		1982	1988
8291	(%)	(%)	noliment	(%)	(%)
Canada thistle	54	51	Yellow starthistle	74	87
Morning glory	19	24	Canada thistle	15	10
Downey brome	9	0	Spotted knapweed	4	0
Yellow starthistle	0	12	Downey brome	0	1

Table 5. Farmers' and ranchers' concerns about weed problems as perceived by respondents.

Statement	Disagree	Strongly disagree	Mean ¹	·N
-in all he where not be an	(%)	(%)	-	1 F
Weeds are something we don't need to worry about because they don't have much affect on production of cropland or rangeland.	in problem and their risk the pro-	formi of the reservebor reservebor		
1982	10	#78	4.59	112
1988	15	75	4.58	103
Most farmers in this area aren't very concerned about weed problems on their farms.				
1982	46	26	3.77	112
1988	42	28	3.83	103

¹The mean was based on scores ranging from 1 to 5 with 1 being "strongly agree" and 5 being "strongly disagree." significant factors in this response. In the 1988 survey, results were essentially the same.

Respondents' Weed Control

The farmers and ranchers were asked to respond to a series of statements related to weed control. Most statements were used to determine their preference for biological control compared to chemical control (Table 6).

In 1982 the vast majority of respondents (91 percent) felt they were doing everything they reasonably could to control weeds on their own land. Eighty-eight percent felt that spraying noxious weeds was the best method of control. Respondents were uncertain about biological control. Less than half felt that biological control was the best method of controlling noxious weeds. However, only 17 percent were willing to agree that biological control will never be successful, and 75 percent felt that more research should be done on biological control.

Results from the 1988 survey, however, suggest that respondents see biological control as having greater potential than they did earlier. They were also less likely to believe that spraying is the best means of controlling weeds. No significant relationships were observed

Table 6. Respondents' attitudes toward weed control.

Statement	Agree	Strongly agree	Mean ¹	N
or spread is further rein-	(%)	(%)	otio at	
The best way of controlling weeds on grazing lands is through biological methods.			0.00	100
1982	33	14	2.80	99
In the long run biological control methods offer the best means of controlling noxious weeds.	10 000	anignar	inorana	ch mi
1982	26	17	2.82	123
1988	36	17	2.60	97
I am doing everything I can reasonably do to control weeds on my ranch.				
1982	47	44	1.69	133
In comparison with other types of weed control bio- logical control will never be successful.	1	22	1.86	104
1982	13	4	3.33	123
More research should focus on the biological control			0.41	J.
1982	47	28	2.06	123
1988	44	30	2.01	95
Spraying of noxious weeds is the best method of control that I know of.				
1982	48	40	1.74	141
1988	56	22	2.12	102

¹The mean was based on scores ranging from 1 to 5 with 1 being "strongly agree" and 5 being "strongly disagree." when background variables were added to the analysis of the variables in Table 6.

In the 1988 survey, respondents were also asked how they felt about the effectiveness of their efforts to control the most serious weed problem on their rangeland and cropland. They generally felt that they were fairly effective at controlling the most serious problem on their cropland but not very effective at controlling the most serious problem on their rangeland (Table 7).

The Yellow Starthistle Problem Rate of Spread and Infestation

Farmers and ranchers were asked their perceptions of the rate of spread of yellow starthistle from 1941 to 1988 (Table 8). About three-fourths of the respondents said they "don't know" the rate of spread of yellow starthistle in the 1940s, but fewer than 10 percent indicated they did not know the rate of spread during the past decade. The majority (over three-fourths) believed the rate of spread had increased substantially during the past decade, indicating that most respondents consider the rate of spread of yellow starthistle to be a severe problem.

Age was the only background variable to have any significant influence, and it affected responses related to the 1941 to 1950 decade only. Older respondents were more likely to indicate an increase during that decade. The 1988 survey showed the same trends as the 1982 survey, reflecting the continuing spread of yellow starthistle.

The perception of continuing spread is further reinforced by the amount of yellow starthistle infestation that farmers and ranchers report having on their lands (Table 9). In 1982, 46 percent reported infestations on less than 6 percent of their land. Thirty-two percent had infestations ranging from 6 to 30 percent, and 23 per-

Table 7. Respondents' views of their effectiveness at controlling their most serious weed problem on grazing land and cropland.

Effectiveness	Cropland	Grazing land
ECT (0) 1 14	(%)	(%)
Not effective	3	57
Slightly effective	19	19
Somewhat effective	57	21
Very effective	21	3
	(N = 86)	(N = 88)

Table 8. Respondents' perceptions of the rate of spread of yellow starthistle.

	Don't know		Increased substantially			
Time period	1982	1988	19	82	19	88
	(%)	(%)	(%)	(N)	(%)	(N)
1941-50	75	70	14	105	14	80
1951-60	59	63	23	107	16	82
1961-70	23	38	55	114	40	86
1971-80	8	5	82	133	76	95
1981-87		2		-	82	95

cent had infestations of more than 30 percent. By 1988, only 22 percent had infestations on less than 6 percent of their land. Thirty-one percent had infestations ranging from 6 to 30 percent. The percentage of respondents with over 30 percent of their land infested had doubled, and 28 percent reported infestations on more than 50 percent of their land.

Farmers and ranchers were asked how severe they felt the yellow starthistle problem was on their own rangeland and how they felt other landowners in the area viewed the starthistle problem on rangeland. Clearly, farmers and ranchers in 1982 viewed the yellow starthistle problem as more severe on other people's land than on their own land (Table 10). This perception is not unusual as it tends to relieve landowners of their responsibility to deal with the problem (Carlson, McLeod and Dillman 1976).

In 1988, perceptions of the severity of infestation on other farms in the area remained about the same. However, respondents were much more likely to indicate that they had a severe infestation on their own land (64 percent in 1988 compared with 46 percent in 1982). This suggests that over the 6 years from 1982 to 1988 farmers and ranchers came to realize that they have to deal with the yellow starthistle problem on their own farms and ranches and that the weed is not a problem for their neighbors only.

Regression analysis indicated that the extent of infestation was the only variable to influence respondents' perceptions of the severity of yellow starthistle infestation on their own farms; those with greater infestations perceived the problem as more severe. Respondents

Table 9. Respondents' perceptions of the percentage of their lands infested with yellow starthistle.

Extent of infestation	1982	1988
(%)	(%)	(%)
None	18	11
1 to 5	28	11
6 to 10	12	10
11 to 15	8	3
16 to 20	5	8
21 to 30	7	10
Over 30	23	47
	(N = 134)	(N = 91

Table 10. Respondents' perceptions of the severity of the yellow starthistle problem on their own land (respondent's land) and their perceptions of how other landowners view the problem.

Severity of	Other farm	ers in area	Respondent's land		
problem	1982	1988	1982	1988	
	(%)	(%)	(%)	(%)	
Severe	78	81	46	64	
Moderate	13	12	21	13	
Slight	7	6	16	11	
Not a problem	2	1	17	11	
Mean ¹	1.33 (N = 137)	1.28 (N = 98)	2.04 (N = 135)	1.70 (N = 97)	

¹The lower the mean, the greater the perceived severity.

with greater infestations and those with larger incomes were more likely to say that other farmers in the area had a severe yellow starthistle problem.

Respondents were asked to indicate the importance of a number of factors to the spread of yellow starthistle (Table 11). In 1982 there was a definite break between the three factors respondents judged most important and those remaining. Improper management practices, overgrazing and livestock movement were viewed as being most important. The top two — improper management practices and overgrazing — are factors over which the operator has a great deal of control. Younger respondents were more likely to assign importance to these two factors.

In 1988 the ranking of factors was similar, except that two additional factors were included in the survey, and they ranked higher than all the other factors. Respondents most frequently reported lack of control on public lands and lack of control on private lands as important reasons for the spread of yellow starthistle.

Respondents were also asked to indicate which grazing systems and which cropping systems produced the most and least yellow starthistle (Table 12). A clear picture emerged when looking at perceptions of the effect of cropping systems on yellow starthistle infestation. Perennial cropping was perceived as producing the most yellow starthistle, and summer fallow was perceived as producing the least. Results were similar in 1982 and 1988.

The picture is not nearly as clear-cut, however, when looking at operators' perceptions of grazing systems. In 1982, continuous grazing and no grazing were both seen as producing the most yellow starthistle and the least yellow starthistle. Further analysis showed that respondents with crop production operations were much more likely than those with livestock or combination operations to say that continuous grazing resulted in the most yellow starthistle. The crop producers also felt that no grazing resulted in the least yellow starthistle. On the other hand, respondents with livestock or combination operations felt that no grazing resulted in the

Table 11. Respondents' perceptions of the importance of selected factors affecting the spread of yellow starthistle.

	Importance score ¹		
Factor	1982	1988	
Lack of control on public lands ²		3.47	
Lack of control on private lands ²	-	3.38	
Improper management practices	3.22	2.88	
Overgrazing	3.18	2.86	
Livestock movement	3.00	2.83	
Road building	2.23	2.34	
Human traffic (hunting, etc.)	2.16	2.14	
Summer fallow	1.76	1.47	
Continuous annual cropping	1.64	1.81	

¹The importance score is the mean score for each factor where 1 is "not important," 2 "slightly important," 3 "somewhat important" and 4 "very important." The higher the score, the more important the factor in the spread of yellow starthistle.

²These items were not included in the 1982 survey.

most yellow starthistle and that continuous grazing resulted in the least yellow starthistle. Thus, type of operation had an important impact on perceptions of the causes for the spread of yellow starthistle.

Perceptions of which grazing system was most effective in controlling yellow starthistle differed in 1982 and 1988. In 1988, rotational grazing and spring grazing only were thought to produce the least yellow starthistle. This was a reversal of the 1982 findings, when these systems ranked lower than both continuous grazing and no grazing in their ability to produce the least yellow starthistle.

The 1988 survey asked additional questions to gain a greater perspective on the spread of yellow starthistle (Table 13). While nearly half the respondents agreed that the real problem with yellow starthistle is that it infests their best land, only 10 percent agreed strongly. Moreover, slightly more than a third believed that they are going to have to learn to live with yellow starthistle.

Table 12. Respondents' perceptions of which cropping and grazing systems produce the most and least yellow starthistic.

	Most yellow starthistle			Le yel start	ast low histle
stature teres topolo	1982	1988		1982	1988
	(%)	(%)		(%)	(%)
	C	roppin	a systems		
Perennial					
cropping	66 ¹	68	Summer fallow	65	44
Annual cropping	27	25	Annual cropping	19	41
Summer fallow	7	8	Perennial cropping	17	15
	G	irazino	a systems		
Continuous					
grazing	45	58	Continuous grazing	29	20
No grazing Summer grazing	33	36	No grazing	25	19
only	9	0	Spring grazing only	20	26
Rotational grazing Spring grazing	1	3	Rotational grazing	9	28
only	8	3			

¹Numbers indicate the percentage of respondents ranking the item first in each category.

Table 13. Attitudes of respondents toward the spread of yellow starthistle, 1988.

Statement	Agree	Strongly agree	Mean ¹	N
4	(%)	(%)		111
Highway and railroad rights-of- way are major contributors to the spread of yellow starthistle.	39	26	2.17	92
The real problem with yellow starthistle is that it usually infests the best grazing land.	39	10	2.82	93
In the long run farmers and ranchers will adjust to the presence of yellow starthistle as being something they have to		and the second sec		
live with.	32	4	3.13	93

¹The mean was calculated from scores ranging from 1 to 5, with 1 being "strongly agree" and 5 being "strongly disagree."

Yellow Starthistle Control

The spread of yellow starthistle has stimulated a great deal of interest in control methods. Respondents were asked a number of questions related to their satisfaction with efforts to control yellow starthistle, the effectiveness of various control alternatives, reasons for not controlling the weed and costs to control yellow starthistle. In 1988 respondents were asked a general question about their satisfaction with their own efforts to control yellow starthistle (Table 14).

Respondents' reported satisfaction with control measures differed dramatically between cropland and grazing land. Over three-fourths of the respondents were satisfied with their ability to control yellow starthistle on cropland, but the same proportion were dissatisfied with their ability to control the weed on grazing land.

Respondents generally felt that most mechanical and chemical control methods were more effective than grazing systems for controlling yellow starthistle on grazing land (Table 15). More of them also indicated that they didn't know the effectiveness of most grazing systems in controlling the weed than indicated they didn't know the effectiveness of cropping systems and mechanical and chemical systems. Respondents tended

Table 14. Respondents' satisfaction with their own attempts to control yellow starthistle on cropland and grazing land, 1988.

Satisfaction	Cropland	Grazing land
and follows and the	(%)	(%)
Very dissatisfied	15	59
Somewhat dissatisfied	8	18
Somewhat satisfied	53	20
Very satisfied	24	3
	(N = 78)	(N = 82)

to view all methods of control on cropland as quite effective; summer fallow was thought to be most effective.

In 1988, spring grazing only and rotational grazing were seen as more effective than they had been in 1982. Also in 1988, less effectiveness was attributed to spraying as a means of control than in 1982; however, spraying was still thought to be the best control alternative except for cropping systems. Cultivation and seeding practices were seen as more effective in the 1988 survey than they had been in the 1982 survey. Biological control was indicated as an effective method by onequarter of the respondents in the 1988 survey but was not included in the 1982 survey.

Respondents were also asked about potential barriers to controlling yellow starthistle (Table 16). In 1982, they considered expense and inaccessibility of land

Table 16. Importance of selected reasons for not controlling yellow starthistle.

	Importan	ce score ¹
Reason	1982	1988
Too expensive	3.76	3.83
Land is inaccessible	3.45	3.28
Land not valuable enough ²	-	3.35
Lack of support by public and private		
agencies ²		3.29
Inadequate information	2.66	2.42
Technology not available	2.49	2.75
Difficult with existing grazing systems	2.47	2.41
Lack of time	2.37	2.44
Machinery not available	2.37	2.30
Labor not available	2.26	2.43
Not aware of the problem	2.08	1.91

¹The importance score is the mean score for each item where 1 is "not important," 2 "slightly important," 3 "somewhat important" and 4 "very important."

²These items were not included in the 1982 survey.

Table 1	5. Respo	ndents'	perceptions of	the	effectiveness	of	selected	methods	of	vellow	starthistle	control
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	19	82	1988		
Method of control	Somewhat effective	Very effective	Somewhat effective	Very effective	
100	(%)	(%)	(%)	(%)	
		Grazing	systems		
Spring grazing only	14	2	19	7	
No grazing	9	6	4	4	
Continuous grazing	10	4	7	5	
Rotational grazing	12	1	10	5	
Summer grazing only	4	3	6	2	
		Cropping	g systems		
Summer fallow	18	45	28	40	
Continuous annual cropping	31	25	34	29	
Continuous perennial cropping	18	24	32	17	
		Mechanical and	chemical methods		
Broadcast spray then spot spray	32	41	41	25	
Broadcast spray only	38	15	32	14	
Spot spray only	35	11	23	10	
Annual cultivation	20	18	20	19	
Seeding	21	2	29	4	
Biological control ¹	to peditive - a pedied	I merile within these a	15	9	
Single cultivation	14	3	15	5	
Burning	12	and open portion of the	11	2	

¹This item was not included in 1982.

the two most important barriers. These two reasons scored substantially higher than others on the list. In 1988, two additional reasons — land is not valuable enough and lack of support from public and private agencies — were included among the choices. They ranked second and third as reasons for not controlling yellow starthistle.

In 1982 and 1988, farmers and ranchers were asked how much they would be willing to spend to control yellow starthistic using two alternative methods. The first method was broadcast spraying only. The second method was a management system involving eradication of yellow starthistle followed by 2 or 3 years without grazing during which restoration would take place. It was assumed that this management practice would result in forage production on restored acres 3 to 5 times greater than before.

In 1982, the respondents were also asked how receptive farmers and ranchers would be to such a program. Close to half (41 percent) indicated that they didn't know how receptive farmers and ranchers would be to the management system method of control (Table 17). Only a third (34 percent) thought farmers and ranchers would be moderately to highly receptive.

When asked in 1982 how much they were willing to pay for the two treatment programs, respondents indicated a willingness to pay about the same amount for each of them (Table 18). In 1988 over half (56 per-

Table 17. Farmers' and ranchers' acceptance of a management system for controlling yellow starthistle as perceived by respondents.

Receptivity	service laterally ag	i mokten i
And the second second	elling and was the policial	(%)
Don't know		41
Not receptive		8
Slightly receptive		17
Moderately receptive		22
Highly receptive		12
	s lesson and innelions	(N = 131)

Table	18.	Respondents' willingness to pay for broadcast s	spray-
		ing or for a management system to control y	ellow

	Broad	icast ay	Management system		
Amount ¹	1982	1988	1982	1988	
(\$/acre)	(%)	(%)	(%)	(%)	
None	15	17	16	19	
\$1.00 to \$4.00	_	29	_	18	
\$1.00 to \$9.00	39	- > 56	33	- > 39	
\$5.00 to \$9.00	-	27/	-	21	
\$10.00 to \$19.00	30	22	27	22	
\$20.00 to \$29.00	6	2	9	10	
\$30.00 to \$39.00	4	0	5	1	
\$40.00 to \$49.00	3	0	5	1	
\$50.00 or more	4	2	5	7	
	(N = 115)	(N = 82)	(N = 110)	(N = 77)	

¹The \$1.00 to \$9.00 category was included in the 1982 survey only. The \$1.00 to \$4.00 and \$5.00 to \$9.00 categories were included in the 1988 survey only. cent) were willing to spend from \$1.00 to \$9.00 for broadcast spraying. Thirty-nine percent were willing to spend the same amount to adopt the management system. These percentages were substantially higher than those in 1982 for both the management system and broadcast spraying.

In 1982 a slightly greater percentage of respondents were willing to spend over \$20.00 per acre for the management system approach than for the broadcast spray approach. By 1988 the differential was much greater, with 19 percent willing to spend over \$20.00 for management control compared with 4 percent willing to spend as much for broadcast control. However, in 1988 fewer respondents were willing to pay more than \$20.00 for the management system or for broadcast spraying than had been in 1982.

Even though farmers and ranchers were willing to spend more for management than for broadcast spraying, they were not willing to spend much to control yellow starthistle. Over three-fourths of the respondents in 1982 and 1988 were not willing to spend more than \$20.00 per acre on either method of control. These results reinforce the finding that cost is a major barrier to the control of yellow starthistle. Even when restoration of the range would result in 3 to 5 times more forage, cost was still a limiting factor.

One might expect farmers and ranchers with the highest infestations of yellow starthistle to be most willing to pay for its eradication. However, this was not the case. Those with higher infestations were more highly represented than those with lower infestations among those willing to pay the least for control, either by broadcast spraying or by a management system approach.

Most respondents (78 percent) in 1988 generally felt they were doing all they could to control yellow starthistle (see Table 19 on page 10). Most also felt that without biological control and support of public and private interests control would not be effective.

Respondents (66 percent) did not place a very high economic value on the land that was most heavily infested, and less than a third (29 percent) believed they would go out of the farming business as a result of yellow starthistle. Respondents believed it would take more than enforcement of current laws to adequately control the weed.

Summary and Conclusions

In 1988, a sample of farmers and ranchers in Latah, Lewis, Nez Perce, Clearwater and Idaho counties was sent a mail survey about their weed problems in general and about yellow starthistle in particular. The same farmers and ranchers had been surveyed in 1982. Results of the two surveys can be summarized as follows:

- Farmers and ranchers were very concerned about weed problems in the area and on their own farms.
- The most serious weed overall was yellow starthistle, and its severity increased from 1982 to 1988.

Table	19.	Respondents'	attitudes	toward	the	control	of	yellow
		starthistle, 19	88.					

Statement	Agree	Strongly agree	Mean ¹	N
	(%)	(%)		
Unless some type of biological control is found the spread of yellow starthistle cannot be	30	53	1 71	96
Without a cooperative effort be- tween both public and private interests to control yellow star- thistle, anything I do to control the weed will have little effect	50		1.71	30
in the long run. I am doing all I can reasonably do to control yellow starthistle	37	51	1.73	93
on my land. The land infested with yellow starthistle is not valuable enough for me to invest the	61	17	2.12	92
money needed to control it. Enforcement of existing weed control laws would go a long ways toward controlling vellow	39	27	2.37	93
starthistle. My ability to control yellow star- thistle on my land will determine	24	8	3.11	93
continue my farming operation.	22	7	3.22	93

¹The mean was calculated from scores ranging from 1 to 5, with 1 being "strongly agree" and 5 being "strongly disagree."

It was considered the most serious weed on rangeland. Canada thistle was considered the most serious weed on cropland.

- In 1988, spraying was thought to be the best method of weed control, but its perceived effectiveness had decreased since 1982 and respondents had a greater expectation that biological control is a viable alternative.
- Respondents noticed increased infestations of yellow starthistle from 1982 to 1988 and were more willing to acknowledge the weed as a serious problem on their own land.
- Respondents placed most of the blame for the spread of yellow starthistle on lack of control on public lands and private agency lands (railroads, timberlands, etc.). This was followed by livestock management and movement as a reason for its spread.
- Respondents appeared to disagree about which grazing systems cause the most and least yellow starthistle.
- In general, respondents were dissatisfied with yellow starthistle control on their grazing land. They felt that spraying was the most effective control method at the present time.
- Expense, land inaccessibility and low land value were seen as the major reasons for lack of control of yellow starthistle. Lack of support from public and pri-

vate agencies was also deemed an important reason, although type of support was not specified.

• Most respondents would not pay more than \$9.00 per acre to control yellow starthistle regardless of the method of control. This was true even if the control method resulted in substantially more forage.

These findings suggest that control of yellow starthistle will be difficult. First, there was a strong tendency to blame large public and private landowners for the lack of control. A number of written comments said that control would be impossible if these owners did not take the initiative. Several respondents said control on their own lands was not worth the effort unless a viable attempt was made by the large landowners.

Second, the productivity of the land infested by yellow starthistle is relatively low, and the costs of control are perceived to be too high. In only a few cases did the respondents consider the future of the farm or ranch operation to depend on the ability to control yellow starthistle.

Finally, the cultural setting of the western rancher does not favor spending a lot of money on yellow starthistle control. Research has shown that ranchers tend to emphasize the intangible values of ranching in addition to the rate of economic return from their operation (Smith and Martin 1972). If a problem develops, the rancher will deal with it only when it becomes serious enough to cause a noticeable reduction in income. But weed problems are often subtle. Although their effects on rangeland may be substantial, they take place over many years. By the time the effects are noticeable, the infestations are so severe that the cost of restoration is prohibitive. Intensifying the problem, much of the infested land was marginally productive prior to noxious weed infestation. Furthermore, in many cases ranchers lease a portion of their rangeland from public agencies. Control of weed infestations on public lands requires cooperation and financial commitments from both the lessee and landlord.

To deal with the yellow starthistle problem on cattle ranches requires a good understanding of the social values that underlie decision-making on a cattle ranch. Smith and Martin (1972) suggested that traditional economic analyses of ranches "are too mechanical and gloss over the complex social interrelationships so important in the business of small rural communities." Little progress in controlling the yellow starthistle problem will be made if these complex interrelationships are ignored.

Yellow starthistle may be a problem more and more farmers and ranchers have to adapt to unless an effective biological control method becomes available or unless the public feels the problem is serious enough to pay for containing its spread. It is highly unlikely that control will be done by the farmers and ranchers who use the infested land.

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