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Economic Analysis of Herbicide Control of Leafy Spurge (*Euphorbia esula* L.) in Rangeland

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HIGHLIGHTS

*Leafy spurge (*Euphorbia esula *L.), a widely established exotic, noxious, perennial weed is a major threat to the viability of commercial grazing and to the beneficial outputs of wildlands in the Upper Great Plains. Herbicide treatments for leafy spurge are usually based on indicators of physical control, rather than economic criteria. The way leafy spurge spreads, the host of economic variables affecting individual land managers, the difficulty in quantifying benefits from control over time, the high cost of control treatments, and the potential economy-wide benefits from control, all support (1) the identification of economical control methods and (2) an understanding of the economic factors influencing long-term treatment decisions.*

A deterministic, simulation model was developed that included the benefits of recapturing grazing outputs from current infestations, the benefits of maintaining existing grazing outputs by preventing patch expansion, and the costs of herbicide treatment programs. The economic viability of various treatment programs was evaluated by comparing discounted annual costs to discounted annual returns over a 20-year period.

Herbicide control of leafy spurge was limited to two strategies: (1) treating the entire infestation or (2) treating only the perimeter of the infestation. Control strategies were evaluated by (1) comparing treatment costs with treatment returns (i.e., classic cost/returns approach) and (2) comparing losses with herbicides to losses without control (least-loss, cost minimization, or cost-effective approach).

Fifteen treatment programs, comprised of various herbicides (i.e., picloram, dicamba, 2,4-D ester and amine, and glyphosate), application rates, and frequencies were evaluated. Plausible scenarios were developed to (1) evaluate the long-term economic feasibility of herbicide treatments in a range of situations and (2) assess the influence of various economic and physical factors. All treatment scenarios were evaluated at carrying capacities that represented a likely range of productivity for most grazing land infested with leafy spurge in the Northern Plains.

A base scenario, developed as a typical treatment situation and used as a reference point for evaluating other treatment situations, was comprised of a one-acre leafy spurge infestation, grazing valued at $15.50/AUM, patch expanding at 2.0 radial feet/year, and patch cover had reached maximum leafy spurge density. Seven of the 15 treatments, evaluated for spraying the entire infestation, generated positive returns at carrying capacities greater than 0.65 AUMs/acre; however, the most economical treatment broke even at only 0.50 AUMs/acre. Four treatments had least-loss carrying capacities (minimum carrying capacity needed for the treatment to result in less loss than no treatment) at or near 0.30 AUMs/acre. Of the six perimeter treatment programs evaluated, two had positive returns at

carrying capacities as low as 0.35 AUMs/acre and three had least-loss carrying capacities down to 0.20 AUMs/acre.

Economic and physical factors evaluated for treating entire infestations included infestation size, spread rate, herbicide cost, grazing value, control level, patch density, and treatment longevity. The physical factors having the greatest economic influence included infestation size, spread rate, land productivity, and structure (i.e., frequency and rates) of herbicide treatments. As could be expected, economic variables such as grazing values and herbicide costs also had direct impacts on the economic feasibility of control.

Generally, most treatment programs evaluated provided positive discounted net returns over 20 years when applied to small (one-half acre or less) infestations. However, few treatments, even under favorable conditions, provided positive returns as infestations approached 50 acres, although some treatments provided attractive economic alternatives to no control with large infestations. Perimeter treatments, however, were economical with large infestations, even in situations when broadcast treatments would not be recommended.

The confidence of results in this study could be improved with refined information on grazing recovery and spread characteristics. Current herbicide treatments cannot provide long-term positive returns from leafy spurge control in all rangeland conditions found in the Northern Plains. Although the results should be viewed with some caution, long-term control of leafy spurge with herbicides provides attractive economic alternatives to no treatment. As alternatives to using herbicides to control leafy spurge are sought, the long-term economic viability of those methods should be assessed.

Economic Analysis of Herbicide Control of Leafy Spurge in Rangeland

Dean A. Bangsund, Jay A. Leitch, and F. Larry Leistritz*

INTRODUCTION

Leafy spurge (*Euphorbia esula* L.) was first introduced in North America in the 19th century, was found in North Dakota in 1909, and was considered a threat to rangeland in the Great Plains as early as 1933 (Hanson and Rudd 1933). The weed currently infests large amounts of untilled land in the Plains and Mountain states. Cultivation will control leafy spurge, but is not a feasible control method in rangeland and other untilled land. Once established on untilled land, the weed spreads quickly, displacing native vegetation. Leafy spurge has unique characteristics that give it a competitive advantage over most native plants and provide it with natural defenses against cattle grazing. Leafy spurge can create serious economic losses for land owners and ranchers.

Current herbicide technologies are ineffective in eradicating established infestations. Control of the plant can be approached through chemical and/or biological strategies. However, long-term control of leafy spurge with herbicides is difficult because it resists chemical agents and sustains itself against repeated treatments, and biological controls, while showing promise, are still being developed and lack wide-spread adoption. Nonetheless, herbicide treatments remain the cornerstone of control efforts. Control with herbicides, by the very nature of the ineffectiveness of current agents, is a long-term management strategy. However, the most effective herbicides are expensive and the benefits of treatments are difficult to quantify, leaving many questions unanswered about the long-term economic feasibility of herbicide control.

Objectives

The purpose of this study is to provide an economic analysis of conventional herbicide control of leafy spurge. Specific objectives include

1) estimate benefits of leafy spurge control,
2) estimate costs of leafy spurge control,
3) identify factors affecting net returns from leafy spurge control, and
4) evaluate the long-term economic viability of control.

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Background

Leafy spurge (*Euphorbia esula* L.), a perennial weed native to Europe and Asia, was introduced to North America in the 19th century. It first appeared in the Upper Midwest in North Dakota in 1909. By 1933, the weed was established in Minnesota, North Dakota, Montana, and several eastern states (Hanson and Rudd 1933); since then it has continued to spread to several midwestern states. Wide-spread infestations of leafy spurge can now be found in North Dakota, South Dakota, Montana, Minnesota, Nebraska, Colorado, Idaho, and Wyoming. The four-state region of Montana, North Dakota, South Dakota, and Wyoming alone is estimated to have 657,435 hectares (1,624,500 acres) of leafy spurge infested land. Leafy spurge infestations, until recently, were doubling about every ten years. However, the rate of infestation has slowed due largely to aggressive treatment efforts. About 6 percent of North Dakota's untilled land remains infested.

The plant is found primarily in nontilled agricultural land (pasture, rangeland, hayland, and idle cropland) and in other nontilled land (road ditches, shelterbelts, wildlife areas, around lakes and along rivers, and in parks). Because leafy spurge exhibits exceptional ability to spread and thrive in a variety of habitats, is hardy, and resists control, it has become a serious problem for farmers, ranchers, park operators, and other land managers. Leafy spurge competes with existing native vegetation for nutrients and moisture (Watson 1985; Belcher and Wilson 1989; Messersmith et al. 1985), eventually creating a near monoculture. This ability poses serious threats to the outputs of wildland and grazing land. Dense stands of leafy spurge are a less desirable habitat for indigenous wildlife and directly reduce grazing capacity for most domestic livestock.

Research has been conducted to examine the effectiveness of herbicide treatments in controlling leafy spurge (Lym and Messersmith 1994, Messersmith 1989, Lym and Messersmith 1985). Herbicide treatments vary in effectiveness depending on the agent, application rate, timing of application, and age and size of the leafy spurge plant. The effectiveness of herbicides in controlling leafy spurge growth, cost of treatment applications, and value of rangeland production using conventional economic analyses have indicated that the returns from most treatments are less than the costs (Thompson et al. 1990, Messersmith 1989, Lym and Messersmith 1983).

The recognition of this plant's persistent and aggressive nature, combined with current infestation rates in many areas of the Upper Great Plains, has prompted concern over the impact this weed has on area economies and the amount of resources that should be devoted to developing efficient leafy spurge control technologies. These concerns led to analyses of the impact the weed has on local, state, and regional economies.

Leitch et al. (1994) estimated leafy spurge impacts on grazing land and wildland in Montana, North Dakota, South Dakota, and Wyoming to be nearly $130 million annually. Thus, the economic losses from leafy spurge have heightened the awareness of the potentially serious effects of the weed, as well as demonstrating the potential benefits from effective long-term control.

As early as 1933, leafy spurge was recognized as a serious threat to cattle growers' incomes (Hanson and Rudd 1933). The "leafy spurge problem" has continued to be thought of as a range management concern, although the weed currently infests large amounts of nonagricultural land. However, most measurable economic losses from leafy spurge occur on grazing land (92 percent) as opposed to wildland (8 percent) (Leitch et al. 1994). Current impact estimates for leafy spurge infestations suggest the weed has substantial negative effects on local and regional economies.

Recent research efforts to control leafy spurge have focused on developing, expanding, and improving biological agents (insects and plant diseases), due in part to growing environmental concern over chemical use and the apparent ineffectiveness of herbicides to provide economical long-term control. Leafy spurge has been considered a potentially viable candidate for biological control since natural forces hold the plant in check in its native European habitat (Carlson and Littlefield 1983, Moran 1992).

Although biological control has shown promise in combating the weed, the efficacy of wide-spread use of biological control agents remains uncertain. Research is ongoing to answer the remaining questions (e.g., what are the most effective biological agents and the environmental variables most likely to insure their effectiveness?). Although private use of biological agents to control leafy spurge is currently practiced, access to and knowledge of biological control remains limited. In addition, biological control agents are expensive to introduce, raising some of the same long-term economical treatment questions currently surrounding herbicide control. Thus, even though biological control offers promise in the battle against the weed, the cornerstone of current control efforts is still herbicide control.

Because of leafy spurge's growth and spread characteristics and the ineffectiveness of current control technologies, leafy spurge control must be approached as a long-term management problem. Questions remain unanswered about the economic viability of many control treatments. Several factors combine to accentuate the need to identify economically advantageous control methods and to identify economic concerns regarding treatment options under a variety of economic situations. These components include the rate of spread and difficulty in controlling leafy spurge, the number of economic factors affecting individual land managers, the high cost of herbicide treatments, the quantification of control benefits over time, and the potential economy-wide benefits from control.

PROCEDURES

A deterministic, simulation model was developed to evaluate the economics of using herbicides to control leafy spurge. The model was also used to analyze the effects of changes in general inputs, as well as to determine which variables influence the economic feasibility of various control strategies. Economic feasibility compares long-term costs with long-term benefits. Financial feasibility, which generally addresses cash flow issues and financial constraints, was not addressed.

Given an initial leafy spurge infestation, the model predicts leafy spurge spread and the corresponding annual losses in grazing output from that infestation (Figure 1). The effects of herbicide treatments on patch density and spread rates were incorporated. The dynamics of control (i.e., the interaction of changes in density and rate of spread) were based on secondary information and consultation with weed control scientists. The annual difference between treatment expenses and the value of grazing outputs recovered and retained through treatment were discounted over time to provide a long-term perspective for each treatment scenario.

Discounting future costs and benefits facilitates comparisons of events occurring over time. A 4 percent discount rate was used because it represents a reasonable rate for long-term planning, given 1995 conditions. A lower rate would improve the returns relative to the costs of herbicide control, conversely a higher rate would reduce returns relative to costs.

Model Development

Leafy spurge control is a long-term management problem since (1) the weed cannot be eradicated economically with current technology,[1] (2) uncontrolled infestations have detrimental long-term consequences for grazing land, and (3) time lags often exist between treatments and results. The overall framework for the economic analysis was based on evaluating control in near-real situations.

[1]Leafy spurge has been eradicated using tillage activities in combination with fertilization in cropland (Lym and Messersmith 1993). However, the techniques used are not feasible in grazing land situations.

Figure 1. Economic Evaluation Model of Herbicide Control of Leafy Spurge in Rangeland

The model starts with initial values describing the physical and economic characteristics of an infestation. The opportunity cost of no control is measured by estimating the loss of grazing from the initial infestation and the subsequent losses from expansion. The benefits of control include (1) recapturing grazing outputs from current infestations and (2) maintaining existing grazing outputs by preventing patch expansion. The costs of control include material, labor, and equipment expenses. The model estimates the economic viability of control, given information on control effectiveness and costs, by comparing discounted annual costs and returns for up to 20 years.

Leafy spurge control is a multi-year effort due to the plant's biophysical characteristics. Most treatment programs provide control for several years (some up to eight years). Also, since some of the benefits of leafy spurge control include preventing future damage, many control programs do not break even until several years into the future. This study assumed programs that did not break even by the 20th year would not be attractive to landowners.

Many of the model components were adapted from previous work. A leafy spurge growth model was used to estimate infestation sizes over time given various expansion rates (Bangsund et al. 1993). The interaction between lost grazing capacity and infestation densities was estimated from Lym et al. (1993) and Thompson (1990). The functions of control, rate of spread, and density reduction over time, given initial treatment effectiveness, were estimated from Lym et al. (1993) and from consultation with weed scientists.

Two control strategies were considered: (1) treat the entire infestation, or (2) treat only the perimeter of the infestation to prevent expansion. Under the first strategy, the entire infestation is treated to reduce existing infestation densities and also prevent plant spread. The second strategy of preventing patch expansion is an option when the first strategy proves uneconomical. Under this strategy, only the infestation periphery is treated to prevent expansion from lateral root growth (patch expansion results almost entirely from lateral root spread [Best et al. 1980]).

The model was structured to assess control strategies by (1) comparing only treatment costs with treatment returns (i.e., classic economic cost/returns approach) and (2) determining potential overall losses of control versus losses without control (least-loss or cost-effective approach). The first economic analysis considers only treatment benefits and costs. Treatments where cumulative discounted annual returns are greater than cumulative discounted annual costs are economically feasible. In the second approach, treatments that are not economical (i.e., costs greater than returns) may still result in less economic loss than incurred without control. Under those conditions, treatments would be economically advisable, provided better control programs were not available. In the event that current herbicide programs (regardless of the strategy) result in more loss than without control, a "do nothing" strategy or one employing other methods might be optimal.

Model Outputs and Assumptions

Leafy spurge expansion was based on a model adapted from Bangsund et al. (1993). Established leafy spurge patches in the Upper Midwest expand at a rate of about two radial feet annually. However, the rate of annual spread was allowed to change, accounting for possible variations in growth environments. Unless the growth rate was modified, expansion was assumed uninterrupted without constraints from other weed patches, cropland boundaries, water boundaries, roadways, or other natural or man-made obstacles. The area of leafy spurge infestation was used to estimate grazing losses and the size of the treatment area.

Grazing land output is typically measured by livestock carrying capacity. Carrying capacity was assumed to be the highest sustainable stocking rate possible without incurring damage to vegetation or related resources. Carrying capacities are generally measured in animal unit months (AUMs). An AUM is an average amount of forage needed to feed one animal unit (AU) for one month. An AU is typically considered a mature cow weighing approximately 1,000 pounds or an equivalent grazing animal(s) based on an average feed consumption of 26 pounds of dry matter per day (Shaver 1977). Carrying capacities of uninfested land were assumed to remain unchanged during the treatment period.

AUM values were estimated using grazing land rental rates and county-wide carrying capacities (Appendix A). Cash rents represent an analytically attractive measure of the value of grazing since (1) they should closely approximate the contribution of a unit of grazing to a rancher's income under conditions of a competitive market, (2) variations among land tracts or areas should reflect differences in productivity, and (3) they should reflect differences in profitability of livestock production. Rental rates divided by carrying capacities provide market values for AUMs.

Long-term control of leafy spurge with herbicides is difficult because the plant generates regrowth after treatments and can rapidly return to pre-treatment densities. Herbicide rates and prices and application costs were input variables. Treatment area was equivalent to the size of the infestation, except with 'perimeter only' strategies. Annual control costs were based on treatment area and herbicide and application costs.

Regrowth was based on the level of control (Lym et al. 1993). The amount of control from each treatment was an input variable. More effective control (70 percent or greater) results in less regrowth; however, as control drops below 50 percent, regrowth approaches 100 percent. Density of the infestation each year was estimated from initial density, amount of control, and regrowth. The rate of spread (patch expansion) following treatments was based upon the amount of control. Expansion rates were assumed to be unrelated to infestation densities. Spread after treatment, expressed as a percentage of the pretreatment

rate, became zero with greater than 50 percent control. Conversely, as control approached zero, the rate of spread increased to 100 percent of the pretreatment rate.

A Grazing Reduction Model (GRM) (Figure 2) was used to estimate grazing use by cattle (percent of uninfested land) within leafy spurge infestations based upon infestation density (Lym et al. 1993). The percentage of grazing use, the land's carrying capacity, and the area of infestation were used to estimate the number of lost AUMs. Correspondingly, the increase in available AUMs resulting from reductions in infestation densities were estimated using the GRM. Additional benefits of control were estimated from the difference in infestation spread following treatment and infestation spread without control. The difference in infestation areas was used with carrying capacity rates and AUM values to estimate the benefit from preventing expansion. The values of AUM retention (preventing spread) and AUM recovery (gain in grazing from reducing infestation density) were summed annually to estimate total returns from control. Benefits less control costs were estimated annually and discounted back to the present to assess the economic viability of a control program.

Figure 2. Grazing Reduction Model for Cattle Grazing Within Leafy Spurge Infestations

Source: Lym et al. (1993).

Considering current herbicide control technologies, 100 percent grazing recovery from leafy spurge infestations is unlikely. Thus, even with effective herbicide control some grazing capacity would likely be lost. The difference between uninfested grazing capacity (i.e., 100 percent of the highest sustainable rate) and grazing use after treatment, represented the loss of grazing output with control. The value of this lost grazing capacity was combined with the net value (+/-) of the treatment and compared to the loss of grazing under no control. If the combination of grazing losses/gains from control and uncontrollable losses during treatment were greater than losses under no control, the use of that treatment option would result in greater loss than if no control was adopted.

RESULTS

The factors involved in leafy spurge control decisions can be complex. A host of economic and environmental variables are involved with each treatment decision. The treatment programs analyzed followed commonly accepted recommendations for leafy spurge control in grazing land and followed other general guidelines (i.e., timing of application, environmental restrictions). Not only will actual control and treatment conditions differ from the simulations used in this study, but economic variables specific to individual situations are likely to vary as well. Thus, economic evaluation of general treatment options was conducted across a wide range of environmental and economic values.

Potential Returns to Control

The first step in evaluating the economic feasibility of long-term herbicide treatments was to estimate the potential returns of leafy spurge control (forgone benefits of no treatment). The cost of no control includes lost grazing outputs from the current infestation plus lost outputs from patch expansion. Losses from decreased land values were not included. The present value (PV) of lost grazing outputs from an initial infestation and subsequent expansion was estimated for various carrying capacities, AUM values, and expansion rates (Table 1).

The value of lost grazing outputs from leafy spurge infestations increases with more productive land, higher AUM values, and greater rates of spread. The PV of grazing losses from a one-acre leafy spurge infestation spreading 2 radial feet/year for 20 years on grazing land with a carrying capacity of 0.50 AUMs/acre and a $12 AUM value is $107 (Table 1). The loss increases to $136 when spread changes from 2 to 4 radial feet/year. Likewise, the PV of lost grazing outputs increases from $107 to $169 when AUM values increase from $12 to $19, holding other variables constant. Similarly, if carrying capacity increases from 0.50 to

0.75 AUMs/acre and other factors remain constant, the PV of lost grazing outputs increases from $107 to $160.

Changes in carrying capacities result in proportional changes in losses. Changes in AUM values also result in proportional changes in lost grazing values; however, AUM values fluctuate much less than carrying capacities (Bangsund and Leistritz 1991). Doubling the rate of leafy spurge spread from 2 radial feet per year to 4 feet increases losses only 28 percent over 20 years (Table 1). Grazing losses from leafy spurge increase as grazing land increases in productivity, as AUMs become more valuable, and as leafy spurge spreads more quickly.

Table 1. Present Value of Forgone Grazing Benefits From a One-Acre Leafy Spurge Infestation Expanding at Various Rates Over 20 Years

Carrying Capacity	$12 per AUM Radial Spread ft/yr			$15.50 per AUM Radial Spread ft/yr			$19 per AUM Radial Spread ft/yr		
	2	3	4	2	3	4	2	3	4
AUMs/acre	---------- dollars[a] ----------								
0.20	43	48	55	55	62	70	68	77	86
0.25	53	60	68	69	78	88	84	96	108
0.30	64	73	82	83	94	106	101	115	130
0.35	75	85	95	96	109	123	118	134	151
0.40	85	97	109	110	125	141	135	153	173
0.45	96	109	123	124	141	159	152	172	194
0.50	107	121	136	138	156	176	169	191	216
0.55	117	133	150	152	172	194	186	211	238
0.60	128	145	164	165	187	211	203	230	259
0.65	139	157	177	179	203	229	219	249	281
0.70	149	169	191	193	219	247	236	268	302
0.75	160	181	205	207	234	264	253	287	324
0.80	171	193	218	220	250	282	270	306	346
0.85	181	206	232	234	266	300	287	326	367
0.90	192	218	246	248	281	317	304	345	389
0.95	203	230	259	262	297	335	321	364	410
1.0	213	242	273	275	312	352	338	383	432

[a] Present value of lost benefits discounted at 4 percent.

Herbicide Treatment Costs

The degree of effectiveness of a herbicide depends upon application rate, timing of application, combination with other agents, and age and size of the leafy spurge plant. Herbicides (alone and in combination with others), application rates, and timing of applications have been identified that result in the most effective physical control of leafy spurge (Lym et al. 1993, Messersmith 1989). While average measures of control were used for the herbicide treatments in this analysis, the ability to change control effectiveness was incorporated into the model. Thus, since actual control will likely vary from site to site for any given treatment and vary over time at any given site, reductions from average control were included in the economic evaluation.

The most common herbicides providing effective physical control of leafy spurge include picloram (trade name Tordon®), dicamba (trade name Banvel®), 2,4-D ester and amine, and glyphosate (trade name Landmaster®). Although the number of herbicides most commonly used to control leafy spurge is limited, the possible combinations of agents, rates, and applications are numerous. To more succinctly discuss assessments of treatment programs, several combinations were identified (Table 2).

The cost of controlling leafy spurge with herbicides varies with herbicide prices, application rates, additional tank mixes (surfactants), number of applications per year, and application costs (e.g., fuel, repairs, equipment depreciation, labor). Herbicide prices were reflective of 1995 retail prices in North Dakota (Zollinger 1995). Although some applications may include a surfactant (i.e., an agent to enhance effect of herbicide), treatments evaluated in this study did not contain surfactants or other tank additives. Application costs vary depending upon method of application (e.g., rope wick vs. aerial spray), terrain of infestation, machinery costs (e.g., rented vs. owned equipment, pull sprayer vs. spray coupe), and labor charges. Other factors influencing spray costs include travel to and from treatment areas, equipment efficiency, setup requirements, cleanup, and any additional fencing or livestock handling requirements resulting from treatments.

Swenson (1995) estimated spray application costs average $1.85 to $2.20 per acre, assuming an owned 25-foot pull-type sprayer operating at 70 percent efficiency using 0.13 hours of labor per acre. Estimates of other labor requirements were not available. North Dakota Agricultural Statistics Service (1995) reported an overall average custom rate for broadcast liquid herbicide (cropland and grazing land) with surface vehicles to be $2.48 per acre, while the most common rate was $2.00 per acre. Separate rates for cropland and grazing land applications were not available. An application cost of $2.25 per acre was used in this study.

Table 2. Selected Herbicide Treatments for Leafy Spurge in Grazing Land

Treatment Label	Herbicides Used	Application Rate				Control in Years After Last Treatment[a]				
		Yr 1	Yr 2	Yr 3	Yr 4	First	Second	Third	Fourth	Fifth
		lbs/ac				%				
Pic.25	Picloram	0.25	0.25	0.25	0.25	60	40	20	0	0
Pic.5	Picloram	0.5	0.5	0.5	0.5	95	85	78	60	20
Pic1	Picloram	1.0	0	0	0	75	20	0	0	0
Pic2	Picloram	2.0	0	0	0	95	80	75	25	0
Pic.25+24D	Picloram & 2,4-D	0.25,1	0.25,1	0.25,1	0.25,1	90	85	70	20	0
Pic.5+24D	Picloram & 2,4-D	0.5,1	0.5,1	0.5,1	0.5,1	95	85	70	20	0
Pic.5+24Ds	Picloram & 2,4-D	0.5,1	0.5,1	0.5,1	0,0	90	80	70	20	0
Dic2	Dicamba	2.0	2.0	2.0	2.0	95	85	70	20	0
Dic8	Dicamba	8.0	0	0	0	80	35	0	0	0
Dic2s	Dicamba	2.0	2.0	2.0	0	95	85	70	20	0
24D1[b]	2,4-D	1.0 annually				na				
24D2[b]	2,4-D	2.0 annually				na				
Glph.75	Glyphosate	0.75	0	0	0	80	10	0	0	0
GlPic+24D[c]	Glyphosate & 2,4-D and Picloram & 2,4-D	0.4,0.6	0.25,1	0.25,1	0.25,1	90	85	75	30	0
GlPic+24Ds[c]	Glyphosate & 2,4-D and Picloram & 2,4-D	0.4,0.6	0.25,1	0,0	0,0	90	78	50	20	0

[a] Control in year of application is generally 100 percent of top growth. Control for herbicide treatments is usually stated as the amount of control received in years following treatment.

[b] 24D1 and 24D2 treatments were applied annually.

[c] Glyphosate and 2,4-D applied in year 1 with picloram and 2,4-D applied in years 2 through 4.

SOURCE: Adapted from Lym et al. (1993).

Annualized costs were estimated for several recommended herbicide treatments (Table 3). Herbicide costs ranged from 74 to 99 percent of total treatment expenses. With the exception of annual treatments, overall costs are most sensitive to fluctuations in herbicide application rates and prices. Annualized treatment costs ranged from $4.24 per acre (GlPic+24Ds) to $110.75 per acre (Dic2) (Table 3).

Table 3. Costs of Herbicide Treatments for Control of Leafy Spurge, 1995

Treatment Label	Herbicides[b]	Annualized Costs[a] Application[c]	Total	Years of Effective Control in Treatment
		dollars per acre		
Pic.25		5.71	7.00	7
Pic.5		8.89	9.89	9
Pic1		13.33	14.08	3
Pic2		16.00	16.45	5
Pic.25+24D		6.63	7.75	8
Pic.5+24D		11.63	12.75	8
Pic.5+24Ds		9.96	10.93	7
Dic2		41.25	42.38	8
Dic8		110.00	110.75	3
Dic2s		35.36	36.32	7
24D1		3.25	5.50	1
24D2		6.50	8.75	1
Glph.75		3.58	4.33	3
GlPic+24D		5.93	7.05	8
GlPic+24Ds		3.49	4.24	6

[a] Costs divided by years of control for the treatment. Most treatments incur costs in fewer years than the effective control period.
[b] Herbicide prices based on 1995 retail prices in North Dakota (Zollinger 1995).
[c] Application cost was $2.25 per acre.

Feasibility of Long-term Control

Treatments were approached from two control perspectives and evaluated from two economic perspectives. Control strategies were limited to treating the entire infestation to recover lost grazing or to treating the perimeter to prevent future losses. Economic evaluations were based on cost/return analysis (revenues compared to expenses) and least-loss analysis (treatments result in less loss than without treatment). Within each framework, a baseline scenario was used to analyze the various treatment programs. Environmental and economic variables were changed systematically, creating scenarios from which comparisons against the baseline were made.

Economic and environmental variables for all treatment scenarios were fixed for carrying capacities ranging from 0.20 to 1.0 AUMs/acre, which represents a likely range of productivity for most grazing land infested with leafy spurge in the Northern Plains. Treatment programs were repeated over 20 years each time control reached zero. The base scenario used the following values:

- $15.50 per AUM (the average value of grazing in North Dakota from 1992 through 1994),
- spread at 2.0 radial feet/year (the average rate of leafy spurge spread in the Upper Midwest [Stroh et al. 1990]),
- infestation size of one acre
- dense stands (leafy spurge within patch reached maximum density).

Control Entire Infestation

A common approach to leafy spurge control in rangeland is to treat the entire infestation to reduce stand density and inhibit seed development, thereby simultaneously recovering grazing capacity and stopping the infestation's ability to spread. Considering the multitude of possible treatment scenarios, several assumptions were made as a reasonable situation for treatment comparisons (base scenario). A base scenario provided initial evaluation of each treatment (Table 4). Break-even carrying capacities, the level of land productivity where returns from treatments become positive, ranged from 0.50 AUMs/acre (Glph.75) to 11 AUMs/acre (Dic2). Least-loss carrying capacities, the level of land productivity needed for treatments to result in less loss than without control, were as low as 0.25 AUMs/acre.

Six of 15 treatment programs evaluated showed positive returns at carrying capacities at or above 0.65 AUMs/acre. Initial returns from the dicamba treatments (Dic2, Dic8, Dic2s) suggested there is no economic justification for using those treatments to control leafy spurge at current herbicide prices, and as such, they were not evaluated beyond the base scenario. The most economical treatments were Glph.75 and GlPic+24Ds, both providing positive returns at carrying capacities as low as 0.55 AUMs/acre and generating the greatest returns at higher carrying capacities. No herbicide treatment, under conditions of the base scenario, provided positive returns for carrying capacities under 0.50 AUMs/acre; however, four treatments would result in less loss than no treatment if applied to land with carrying capacities as low as 0.30 AUMs/acre.

Table 4. Long-term Net Returns From Herbicide Control of Leafy Spurge in Rangeland[a]

Carrying Capacity	Herbicide Treatments														
	Pic.25	Pic.5	Pic1	Pic2	Pic.25 +24D	Pic.5 +24D	Pic.5 +24Ds	Dic2	Dic8	Dic2s	24D1	24D2	Glph.75	GlPic +24D	GlPic +24Ds
AUMs/acre	dollars/acre[b]														
0.20	(70)	(125)	(191)	(219)	(91)	(175)	(134)	(672)	(1,613)	(526)	(48)	(85)	(39)	(81)	(46)
0.25	(60)	(116)	(184)	(212)	(81)	(165)	(125)	(662)	(1,606)	(517)	(41)	(76)	(32)	(71)	(38)
0.30	(51)	(107)	(177)	(205)	(72)	(155)	(116)	(652)	(1,598)	(508)	(34)	(68)	(25)	(61)	(31)
0.35	(42)	(98)	(170)	(198)	(62)	(145)	(108)	(642)	(1,591)	(499)	(28)	(59)	(18)	(51)	(23)
0.40	(32)	(88)	(163)	(191)	(52)	(136)	(99)	(633)	(1,583)	(490)	(21)	(51)	(10)	(42)	(16)
0.45	(23)	(79)	(156)	(184)	(42)	(126)	(90)	(623)	(1,576)	(481)	(14)	(42)	(3)	(32)	(8)
0.50	(14)	(70)	(149)	(177)	(33)	(116)	(81)	(613)	(1,568)	(472)	(7)	(34)	4	(22)	(0)
0.55	(5)	(61)	(142)	(170)	(23)	(106)	(73)	(603)	(1,561)	(463)	(1)	(25)	11	(12)	7
0.60	5	(52)	(135)	(163)	(13)	(96)	(64)	(593)	(1,553)	(454)	6	(17)	19	(2)	15
0.65	14	(43)	(128)	(156)	(3)	(87)	(55)	(584)	(1,546)	(445)	13	(8)	26	8	22
0.70	23	(34)	(121)	(149)	6	(77)	(46)	(574)	(1,538)	(436)	20	0	33	17	30
0.75	33	(25)	(113)	(142)	16	(67)	(38)	(564)	(1,531)	(428)	26	9	40	27	38
0.80	42	(16)	(106)	(135)	26	(57)	(29)	(554)	(1,523)	(419)	33	17	48	37	45
0.85	51	(7)	(99)	(128)	35	(47)	(20)	(544)	(1,516)	(410)	40	26	55	47	53
0.90	60	2	(92)	(121)	45	(38)	(12)	(535)	(1,508)	(401)	47	34	62	57	60
0.95	70	11	(85)	(114)	55	(28)	(3)	(525)	(1,501)	(392)	53	43	69	67	68
1.00	79	20	(78)	(107)	65	(18)	6	(515)	(1,493)	(383)	60	51	77	76	76
	Least-loss Carrying Capacity[c]														
	0.30	0.45	0.80	0.90	0.35	0.55	0.55	>1.0	>1.0	>1.0	0.30	0.35	0.25	0.35	0.30

[a] Treatment scenario: $15.50 per AUM, patch spread at 2.0 radial feet/year, 1-acre infestation, and maximum leafy spurge density.
[b] Present value of returns from herbicide treatments, 20-year period, 4 percent discount rate.
[c] Minimum carrying capacity needed for the treatment to result in less loss than without treatment.

Physical Factors

Several treatment scenarios were used to assess the effects on returns from long-term herbicide control (Appendix B). Under conditions of faster-than-normal spread (3.0 to 4.0 radial feet/year), break-even carrying capacities decreased by 0.10 to 0.15 AUMs/acre and net returns increased at each carrying capacity when compared to normal spread rates (Table 5). Two treatments (Glph.75 and GlPic+24Ds) under scenarios of rapid spread, provided positive net benefits down to carrying capacities of 0.35 AUMs/acre and had least-loss carrying capacities of 0.20 AUMs/acre.

Initial leafy spurge densities were set at 50 and 20 percent of total cover for 1-acre, 25-acre, and 50-acre infestations. Lower initial densities resulted in small increases in net returns for all-sized infestations; however, break-even and least-loss carrying capacities remained unchanged from scenarios with maximum leafy spurge density (Table 5).

The effect of restarting treatments in years when control dropped to 20 percent or less was evaluated. For example, in year seven of the Pic.25 treatment, predicted control drops to 20 percent, with treatment restarting in year eight; however, treatment was restarted in year seven. Results were mixed. For Pic.25, Pic.5, and Pic.5+24Ds, returns decreased, while for Pic.25+24D, Pic.5+24D, Glph.75, GlPic+24D, and GlPic+24Ds returns improved. Changes in returns, whether positive or negative, were about $10 or less per acre and resulted in 0.05 AUMs/acre change in break-even carrying capacities.

In another scenario, effective control for the most economical treatments was reduced by 10 percent in treatment years and reduced 20 percent in years following applications. The effect of reduced control decreased returns slightly, but did not change break-even carrying capacities.

Returns from treating infestations of less than one acre in size were substantially more attractive than results from treating patches larger than one acre in size (Table 5). When infestation area was increased beyond one acre, returns diminished quickly; however, as infestation areas increased beyond 5 acres, returns diminished much less. For example, moving from one acre to 5-acre infestations, returns diminished $15 to $25 per acre and returns decreased $20 to $30 per acre when treatment area moved from one acre to 10 acres. However, returns only decreased $3 to $10 per acre when infestations went from 10- to 25- and 50-acre infestations. Returns across all treatments decreased $30 to $55 per acre when infestation area increased from 0.25 to 50 acres. Changes in break-even and least-loss carrying capacities were substantial.

For example, the Pic.25+24D treatment on a 0.25-acre infestation broke even at 0.50 AUMs/acre, whereas, using the same treatment on a 50-acre infestation resulted in a 0.95 AUMs/acre break-even carrying capacity. Least-loss carrying capacities, when treating 50-acre infestations as compared to one-acre infestations, generally increased 0.10 to 0.15 AUMs/acre.

Table 5. Effects of Physical and Economic Factors on the Economics of Long-term Herbicide Control of Leafy Spurge Infestations in Rangeland

Factors[a]	Returns[b]	Break-even Carrying Capacity[c]	Least-loss Carrying Capacity[d]
	-- $/acre --	---------- AUMs/acre ----------	
Spread Rates (radial ft/yr)			
3.0	15 to 30	decrease 0.10 to 0.15	decrease 0.05
4.0	30 to 50	decrease 0.10 to 0.25	decrease 0.10
Infestation Size			
10, 25, 50 acres	-20 to -30	increase 0.15 to 0.25	increase 0.10
0.25 acre	40 to 50	decrease 0.10 to 0.25	decrease 0.10
0.50 acre	15 to 20	decrease 0.05 to 0.10	decrease 0.05
from 0.25 acre to 0.50 acre	-25 to -30	increase 0.05 to 0.15	increase 0.05
from 25 acres to 50 acres	-5	no change	no change
Restart Treatments Early[e]	mixed	mixed	mixed
Reduced Control[f]	-10 to -20	increase 0.05 to 0.10	increase 0.05
Reduced Herbicide Cost[g]	15 to 25	decrease 0.05 to 0.15	decrease 0.05
Value of Grazing			
AUM valued at $19	15 to 30	decrease 0.10 to 0.20	decrease 0.10
AUM valued at $12	-20 to -30	increase 0.15 to 0.25	increase 0.10

[a] Most comparisons made to results from treatments under base scenario conditions. Base scenario consisted of $15.50 per AUM, patch spread at 2.0 radial feet/year, 1-acre infestation, and maximum leafy spurge density.

[b] Present value of returns from herbicide treatments, 20-year period, 4 percent discount rate.

[c] The level of land productivity where returns from the treatment become positive.

[d] The level of land productivity needed for the treatment to result in less loss than without treatment.

[e] Multiple-year treatments were restarted when control reached 20 percent or less. Returns increased slightly for some treatments and decreased slightly for others.

[f] Control of leafy spurge was set at 90 percent in years of herbicide application and normal control was reduced 20 percent in years following herbicide applications. Also, grazing recovery in years 3 and 4 of multiple-year treatments was reduced from 98 to 90 percent; in other treatments grazing recovery was reduced by about 10 percent.

[g] Herbicide prices were reduced 20 percent.

The relationship between infestation size and break-even carrying capacities (i.e., the point where net returns become positive) was averaged for the six most economical treatments (Pic.25, Pic.25+24D, 24D1, 24D2, GlPic+24D, and GlPic+24Ds). As infestation size changed from small patches (0.05 acres) to large areas (50 acres), the average break-even point moved from 0.20 AUMs/acre to about 0.90 AUMs/acre (Figure 3).

Figure 3. High, Low, and Average Break-even Carrying Capacities for the Six Most Economical Treatment Programs, 20 Years of Leafy Spurge Control in Rangeland

Small infestations, with normal and faster-than-normal spread rates, provided the most attractive returns of any of the physical situations examined. Under scenarios of 0.25 acre infestations doubling in size every ten years (2.8 radial ft/yr), net returns at break-even carrying capacities across all treatments increased about $85 per acre from scenarios with one-acre infestations having baseline expansion rates and resulted in break-even carrying capacities as low as 0.30 AUMs/acre for some treatments. Least-loss carrying capacities for six treatments dropped to 0.20 AUMs/acre. Returns were greatest for infestations of 0.022 acres in size (about 35 feet in diameter). Seven treatments generated positive returns at 0.20 AUMs/acre with 0.022 acre infestations. Returns from 0.022-acre infestations increased $350 per acre, averaged across all treatments, when compared to returns at break-even carrying capacities from one-acre infestations. (See Appendix B for a complete listing of all treatments and results.)

Economic Variables

Economic values were adjusted to assess the effect on returns from long-term herbicide control (Appendix B). AUM values were changed to $19 and $12, reflecting average high and low regional grazing values in North Dakota from 1992 to 1994. Regional grazing values were estimated from information obtained from North Dakota Agricultural Statistics Service (various years) and Sedivec (1993) (Appendix A). At $19 per AUM, returns increased across most treatments about $10 per acre at low carrying capacities to nearly $50 per acre at high carrying capacities, depending upon treatment and infestation size. The break-even carrying capacities declined about 0.10 to 0.20 AUMs/acre for treatments having break-even capacities of 0.70 AUMs/acre or higher, but declined less (0.05 to 0.10 AUMs/acre) when previous break-even capacities were at 0.50 AUMs/acre or lower. Raising AUM values essentially made returns greater at all carrying capacities, thereby lowering break-even and least-loss carrying capacities. Returns decreased proportionately and break-even and least-loss carrying capacities increased when grazing was valued at $12 per AUM. Lowering the AUM value essentially decreased returns at all carrying capacities.

Herbicide prices were reduced 20 percent to evaluate the effect of reduced herbicide costs on long-term returns. Increases in per acre returns varied by treatment, but typically ranged from $10 to $25 per acre. The largest decreases in break-even carrying capacities (0.05 to 0.15 AUMs/acre) came from treatments with high herbicide costs and high break-even carrying capacities (Pic1, Pic2, Pic.5+24D, and Pic.5+24Ds). Three treatments (24D1, Glph.75, and GlPic+24Ds), with 20 percent lower herbicide costs, had least-loss carrying capacities down to 0.25 AUMs/acre with one-acre infestations. (See Appendix B for a complete listing of all treatments and results.)

Perimeter Control

An alternative to controlling the entire infestation would be to treat only the perimeter of an infestation, preventing the infestation from expanding. The herbicide treatments used for controlling entire infestations, in most cases, were developed to reduce stand density and provide long-term control. Although those treatment programs would be physiologically acceptable for perimeter control, they generally are much more intensive (and expensive) than required to only suppress the weed's spread. Treatments appropriate for preventing spread were developed by adjusting the application frequency of long-term treatments.

Six treatment programs were developed to prevent spread and minimize treatment costs. The Pic.25 treatment was reduced to a three-year program (Pic.25-pc); herbicide applied for two years, skipping every third year. The 24D1 treatment was used for perimeter control (24D1-pc), but not modified from its previous structure. The Pic.5 (Pic.5-pc), Pic.25+24D (Pic.25+24D-pc), Glph.75 (Glph.75-pc), and GlPic+24D (GlPic+24D-pc) programs were converted to biennial treatments.

Values for physical and economic variables were varied from a base scenario to determine the factors affecting perimeter treatments. The base scenario for perimeter control remained unchanged from that used for treating the entire infestation. Under baseline conditions, break-even carrying capacities ranged from 0.35 AUMs/acre (24D1-pc and GlPic+24D-pc) to 0.65 AUMs/acre (Pic.5-pc) (Table 6). Least-loss carrying capacities were generally 0.35 AUMs/acre or less. Discounted returns for perimeter treatments were reported as totals for the treatment. The magnitude of total returns varied little (about $3) from one carrying capacity to another under baseline conditions (Table 6).

Table 6. Long-term Returns From Perimeter Treatment of Leafy Spurge Infestations Using Herbicides[a]

Carrying Capacity	Herbicide Treatment Programs					
	Pic.25-pc	Pic.5-pc	Pic.25+24D-pc	24D1-pc	Glph.75-pc	GlPic+24D-pc
AUMs/acre	total dollars[b]					
0.20	(19)	(29)	(16)	(7)	(11)	(8)
0.25	(15)	(26)	(13)	(4)	(8)	(5)
0.30	(12)	(22)	(10)	(1)	(5)	(2)
0.35	(9)	(19)	(6)	2	(2)	1
0.40	(6)	(16)	(3)	6	2	4
0.45	(2)	(13)	0	9	5	8
0.50	1	(9)	3	12	8	11
0.55	4	(6)	7	15	11	14
0.60	7	(3)	10	19	14	17
0.65	10	0	13	22	18	21
0.70	14	4	16	25	21	24
0.75	17	7	19	28	24	27
0.80	20	10	23	32	27	30
0.85	23	13	26	35	31	34
0.90	27	17	29	38	34	37
0.95	30	20	32	41	37	40
1.00	33	23	36	45	40	43
	Least-loss Carrying Capacity[c]					
	0.25	0.35	0.25	0.20	0.20	0.20

[a] Treatment situation: $15.50 per AUM, patch spread at 2.0 radial feet/year, 1-acre infestation, maximum leafy spurge density, and 15 feet of periphery treated.

[b] Present value of total returns, 20-year period, 4 percent discount rate.

[c] Minimum carrying capacity needed for the treatment to result in less loss than without treatment.

Physical Factors

A variety of environmental situations were assessed to estimate the effect on returns from long-term perimeter control (Appendix B). Under conditions of faster-than-baseline spread (3.0 and 4.0 radial feet/year), break-even carrying capacities decreased by 0.10 to 0.25 AUMs/acre and net returns increased at each carrying capacity when compared to baseline spread rates. Three treatments, 24D1-pc, Glph.75-pc, and GlPic+24D-pc, under scenarios of rapid spread (4.0 radial feet/year), provided positive net returns down to carrying capacities of 0.20 AUMs/acre and had least-loss carrying capacities of 0.20 AUMs/acre. Returns from perimeter treatments were much more sensitive to slower-than-normal spread (1.0 radial foot/year) rates. Spread rates of 1.0 radial foot/year generally decreased returns by $45 when compared at break-even carrying capacities under baseline spread rates (Table 7). Slower-than-baseline spread rates increased break-even carrying capacities by 0.45 AUMs/acre and increased least-loss carrying capacities by 0.20 AUMs/acre.

Size of the infestation did not materially affect returns from long-term perimeter control (Table 7). Perimeter treatments for infestations of 1, 5, 10, 25, and 50 acres were evaluated. Total returns from treating the perimeters of infestations of 1 to 50 acres changed only $5 to $15 at break-even carrying capacities. Break-even carrying capacities and least-loss carrying capacities changed little as infestation size increased.

The amount of periphery treated was reduced from 15 radial feet to 12.5 and 10 radial feet. For each 2.5 radial feet reduction in periphery treated, break-even carrying capacities decreased 0.05 AUMs/acre. Returns increased about $10 per every 0.05 AUMs/acre carrying capacity for each 2.5 feet of reduced periphery treated (Table 7). (See Appendix B for all perimeter treatment returns.)

Economic Variables

Economic values were adjusted to assess the effect on returns from long-term perimeter control (Appendix B). AUM values were changed from $15.50 to $19 and $12, reflecting high and low extremes in grazing values. Compared to baseline conditions, break-even carrying capacities decreased only 0.05 AUMs/acre with high grazing values. Most least-loss carrying capacities did not change (most were already at 0.20 AUMs/acre). Returns from increased grazing values, compared to baseline values at break-even carrying capacities, increased about $6 across all treatments. When compared to returns from 50-acre infestations under baseline AUM values, returns with higher grazing values increased about $45 across all treatments. Returns from high and low AUM values, when compared to baseline conditions at break-even carrying capacities and averaged across all infestation sizes, increased most ($30) with the Pic.5-pc treatment and increased least ($15) with the 24D1-pc and GlPic+24D-pc treatments.

Reduced grazing values ($12/AUM) increased break-even carrying capacities about 0.10 AUMs/acre and increased least-loss carrying capacities about 0.05 AUMs/acre. Reducing

herbicide prices by 20 percent resulted in similar changes in returns and break-even carrying capacities as observed with increased grazing values. (See Appendix B for all perimeter treatment returns.)

Table 7. Effects of Physical and Economic Factors on the Economics of Long-term Perimeter Treatments of Leafy Spurge Infestations

Factors[a]	Returns[b]	Break-even Carrying Capacity[c]	Least-loss Carrying Capacity[d]
	-- total $ --	---------- AUMs/acre ----------	
Spread Rates (radial ft/yr)			
1.0	-35 to -50	increase 0.35 to 0.55	increase 0.20
3.0	10 to 20	decrease 0.10	no change
4.0	30 to 40	decrease 0.15	decrease 0.05
Infestation Size (acres)			
5	<= 5	no change	no change
10	2 to 7	no change	no change
25	5 to 10	no change	no change
50	10 to 15	no change	no change
Reduced Periphery (ft)[e]			
12.5	7 to 12	decrease 0.05	no change
10.0	10 to 15	decrease 0.10	decrease 0.05
Reduced Herbicide Cost[f]	4 to 8	decrease 0.05	no change
Value of Grazing			
1-acre infestation			
AUM valued at $19	5 to 10	decrease 0.05 to 0.10	no change
AUM valued at $12	-5 to -10	increase 0.10 to 0.15	increase 0.05
50-acre infestation			
AUM valued at $19	35 to 55	decrease 0.05 to 0.10	no change
AUM valued at $12	-35 to -55	increase 0.10 to 0.15	increase 0.05

[a] Most comparisons made to results from treatments under base scenario conditions. Base scenario consisted of $15.50 per AUM, patch spread at 2.0 radial feet/year, 1-acre infestation, maximum leafy spurge density, and 15 feet of periphery beyond patch perimeter treated.

[b] Present value of typical returns from herbicide treatments, 20-year period, 4 percent discount rate.

[c] The level of land productivity where returns from the treatment become positive.

[d] The level of land productivity needed for the treatment to result in less loss than without treatment.

[e] Perimeter of infestation treated to control spread.

[f] Herbicide prices were reduced 20 percent.

Case Study

Two counties in North Dakota with wide-spread leafy spurge infestations and contrasting grazing land productivities and AUM values, Slope and Ransom, were chosen to illustrate potential differences in the economics of long-term herbicide control of leafy spurge. Ransom County, in the southeast corner of the state, has relatively productive grazing land (i.e., high carrying capacities) and moderate AUM values (i.e., $12 to $14/AUM). Slope County, in the western part of North Dakota, has less productive grazing land with relatively low carrying capacities and higher AUM values. No evidence was found that other treatment characteristics (e.g., percent control, rates of spread, etc.) in each of the counties differed from the values used in the general analysis. Thus, values for input parameters remained unchanged from previous treatment situations, except for grazing values.

Slope County

The county-wide carrying capacity for grazing land in Slope County is 0.45 AUMs/acre (Sedivec 1993). AUMs were valued at $19.23 (average from 1992 through 1994). Based on a base scenario using $19.23/AUM and a desired break-even carrying capacity of at least 0.45 AUMs/acre, only four of the 10 treatment programs evaluated resulted in positive returns (Appendix C). Across all treatment programs, net returns were negative for infestation sizes over 5 acres. Although the least-loss carrying capacities for some treatments applied to large infestations were higher than the county average carrying capacity, under all scenarios at least one or more treatments would provide a least-loss option to no control. Thus, even though the most economical treatment programs may result in negative net returns depending upon the treatment scenario, herbicide treatments should result in less loss than no control. Perimeter control was not evaluated for Slope County since earlier results (see Table 6) indicated that some perimeter treatments would be economical in Slope County.

Ransom County

The average carrying capacity for grazing land in Ransom County is about 0.95 AUMs/acre (Sedivec 1993). AUMs were valued at $13.93 (average from 1992 through 1994). Based on a base scenario using $13.93/AUM and a desired break-even carrying capacity of 0.95 AUMs/acre, 7 of the 11 treatment programs evaluated resulted in positive returns (Appendix C). Positive net returns could be realized across all treatment scenarios, even for infestations as large as 50 acres. Under all scenarios, at least one or more treatments would provide positive net returns at the county average carrying capacity. Thus, given the productive nature of grazing land in Ransom County, the use of herbicides to control leafy spurge could result in positive returns for a variety of treatment situations.

The economic conditions found in Slope and Ransom Counties help demonstrate that long-term net returns from chemical treatments are largely influenced by land productivity and grazing values. Some treatments may be more economical than others for any particular situation;

however, a treatment that is not economical in one situation may be economical in another. Thus, site-specific economic criteria play an equally important part (i.e., compared to physical treatment relationships) in assessing the economics of long-term chemical control of leafy spurge.

DISCUSSION

Assessing the benefits of leafy spurge control requires consideration of a variety of issues and concerns. Issues surrounding public assistance for leafy spurge control may arise now that additional information is available to policymakers and managers regarding the long-term viability of herbicide control. These issues and some general interpretations and recommendations are discussed in the following sections.

Implications

The results in this study were based on repeating treatment programs over 20 years, which is a long time to wage war on any weed infestation. However, considering the current effectiveness of control methods, 5, 10, or 15 years of treatments are not likely going to produce a change in the weed's ability to reduce grazing outputs. Thus, leafy spurge, given current technology, is truly a long-term problem and 20 years appears to be a reasonable period to evaluate current control methods. Even though the time frame for this analysis may be appropriate, it does raise some important considerations.

First, if many treatment programs require roughly 20 years to generate positive net returns, landowners and producers must recognize the long-term commitment required to combat the weed. Granted, more effective controls may appear within that time frame, however, no guarantees exist that adopting those controls at that time would be preferable to no treatment today. Also, some treatments may generate positive net returns in time periods shorter than 20 years; however, whether treatments produce positive net returns in 6, 12, or 16 years is not entirely relevant. In the absence of superior control methods, treatments should continue since the weed will likely continue to thrive. Current herbicide control technology stresses the importance of long-term commitments to leafy spurge control. Similarly, economics of control suggest that long time periods may be required to recapture the initial investment in herbicide treatments. Treatments may appear to be a bad investment after 10 years, but may ultimately be a good investment after 20 years.

Since herbicide treatments require long time periods to generate positive returns, a need exists to find control methods that can produce positive returns in shorter time periods. Some treatments evaluated in this study will produce positive net returns in less than 20 years. However, the exact nature of the benefit stream for each treatment under a variety of situations was not evaluated. The time frames, along with all of the other commitments required for long-term herbicide control, may deter individuals from pursuing such intensive treatment programs.

Thus, even though herbicide treatments can be economically attractive alternatives to no control, the small margins involved and the time required may not justify the effort.

Results of this study provide a useful first approximation of the grazing conditions under which the use of herbicides to control leafy spurge would be economical. Knowing (1) the approximate break-even range of treatments, (2) the approximate amount of grazing land that meets those requirements, and (3) the distribution of leafy spurge on those lands may have important implications in addressing state-wide efforts to combat the weed.

About two-thirds of the privately-owned grazing land in North Dakota is less productive than the most common break-even point (0.60 AUMs/acre) for long-term herbicide treatments of leafy spurge (Appendix D). However, only about 40 percent of all leafy spurge infestations are found on grazing land with carrying capacities less than 0.60 AUMs/acre. The remaining one-third of private grazing land in North Dakota, having carrying capacities over 0.60 AUMs/acre, contains about 60 percent of the state's leafy spurge infestations (on grazing land).

A substantial number of the leafy spurge infestations on private grazing land may not meet minimum economic thresholds for economical treatment. Without additional economic incentives, wide-scale efforts to combat the weed may not succeed. This raises implications for continued public support of noxious weed control, such as cost-share and landowner assistance programs throughout the state. Issues not clearly resolved include the legitimacy of public funded support for leafy spurge control, such as whether or not public funds should be used to combat the weed, and if so;

1) the amount of public resources needed;
2) the manner in which those resources should be collected and distributed;
3) the appropriate roles for various governmental units; and
4) the potential long-term returns from the use of public funds for leafy spurge control.

Results from this study demonstrate that a need exists to find economical long-term control programs for leafy spurge. Additional research is needed to pursue (1) more economical long-term herbicide treatments and/or (2) develop alternative treatment methods that can substitute or complement existing programs. This raises implications for developing and determining if other methods, such as cultural (grazing, plant competition) or biological control (insects and plant diseases), used independently or cooperatively, would be economical. Additional information on grazing recovery rates and on the characteristics of spreading infestations would help narrow the confidence limits of the estimates. Field observations over time would add validity to key relationships that are currently "best guesses" or based on unquantified assumptions.

Economic Relationships

Results from this study are presented as point estimates; however, they should be used only as general guides to assist in control decisions. Weed control specialists should be consulted when developing a long-term weed management program.

Probably the most pronounced finding in this study is the inverse relationship between infestation area and treatment payoff, which indicates early detection and control are best (Figure 4). Results for the most economical treatments show that average net returns become negative between 1- to 2-acre infestations (carrying capacities ranging from 0.40 to 0.60 AUMs/acre). As carrying capacity increases for any treatment situation, net returns increase and the maximum treatment area that can produce positive returns increases (Figure 4).

Figure 4. Net Returns Averaged From the Six Most Economical Leafy Spurge Treatment Programs Across Various Infestation Sizes, 20 Years of Control

The economic relationship between infestation area and treatment returns can be understood by considering patch expansion dynamics (Appendix E). Small (less than an acre in size) patches spread much faster, as a percent of original area, than do large infestations. A patch of leafy spurge 75 feet in diameter spreading at 2.0 radial feet/year will increase in size 330 percent over 20 years, whereas, a 10-acre infestation spreading at the same radial rate will increase in size only 23 percent. As such, small patches of leafy spurge generate proportionally more grazing loss from expansion than from the original infestation.

The relationship between grazing loss from the original patch and from expansion becomes dominated by original patch area as infestations become larger. Large patches consume more area as they expand than small patches, but treating small infestations captures relatively more returns through maintaining existing grazing outputs (grazing retention) than from recapturing grazing outputs from the infestation (grazing recovery). However, as the dynamics of patch expansion change when moving from small to large infestations, returns become more sensitive to the amount of grazing recovery and less sensitive to the amount of grazing retention.

A critical aspect of herbicide treatment is being able to get cattle to graze within or near infestations. Treating large infestations is more risky than treating small patches since a relatively large cash outlay is incurred in an attempt to recover grazing potential from the infestation. Grazing recovery rates are uncertain since (1) most treatment programs will not eliminate all plants and as such, will not totally remove the aversion cattle may have for grazing in the patch and (2) less than expected control could cause cattle to avoid the infestation area altogether.

Given current economic criteria, treatment involving large infestations, particularly in less productive land (lower AUMs/acre), will likely be more risky than those for small patches. A less risky alternative to treating the entire (large) infestation is perimeter control. A perimeter control strategy should incur less time and money than other treatment approaches.

More frequent treatments at lower herbicide rates (e.g., Pic.25 and Pic.25+24D) appear more economical than less frequent treatments using higher herbicide rates (e.g., Pic1 and Pic2). Typically, in order to achieve leafy spurge control for two or more years following a single treatment, relatively high rates of herbicide are required per application. Whereas, treatments applied at lower rates for several years appear more economical. Multiple-year treatments are generally more effective in reducing stand density over time, thereby increasing chances for grazing recovery. Multiple-year treatments are less risky than high-rate, single-year treatments since stand reduction and control are less responsive to a single application. Also, generally multiple-year treatments are less expensive in terms of cumulative treatment costs.

Break-even points are sensitive to spread rates. Thus, spread differing from the assumed 2.0 radial feet/year rate used in this study will likely affect long-term returns and influence long-term treatment strategies. When treating small infestations, faster-than-normal spread rates enhance an already economical situation, whereas, with acre-sized infestations, faster spread rates push break-even carrying capacities down to levels equal to the less productive grazing land in North Dakota. Faster-than-normal spread rates in large infestations (five acres and larger) do

little to improve the long-term returns from treating the entire infestation; however, those rates influence returns from "control only" approaches to large infestations. Likewise, slower-than-normal spread rates have negative effects on treatment returns. The best way to determine the effect on individual situations is to estimate the rate of leafy spurge spread, perhaps through observation.

Method and Data Shortcomings

Leafy spurge infestation spread rates were simplified to patches with distinct boundaries, consistent expansion rates, and no constraints to continue expanding. In reality, leafy spurge infestations often start out as small patches, expanding and becoming more dense over time and wide-spread infestations do not necessarily have convenient boundaries or homogenous densities. Densities vary from solid leafy spurge stands to a few plants per area. Also, not all leafy spurge expansion is constant and unlimited. Patches within large infested areas will converge over time, while others run into man-made and natural boundaries, and still others may expand at various/inconsistent rates.

Leafy spurge spread rates used in this study may not be consistent with what takes place in the field. Infestations of varying sizes and/or densities next to each other or other barriers, will likely expand into each other or expand in limited directions. Under these conditions the benefits from expansion used in this study will likely be overstated from those realized in the field. A benefit of control not quantified is prevention of seed development--a major source of new infestations. No documentation could be found to quantify the influence of established infestations creating new infestations through seed dispersal.

Herbicide prices and the amount of herbicide use assumed in this study will differ from actual treatment programs. Factors influencing the amount of herbicide used include sprayer calibration, rate of travel, overlap and skips, terrain of the infestation, "using up extra chemical," and so on. Buying practices, shifting market prices over time, cost-share programs, and other factors can influence herbicide prices. Application costs are likely to vary from those used in this study. Thus, individual herbicide application practices and changing herbicide prices will influence overall costs of treatments.

An important assumption used in this study was the amount of grazing recovery received from treatments and stocking rates for infested land. First, grazing recovery for many of the years in all of the treatment programs was explicitly defined (i.e., predetermined based upon control measures received from treatments). These grazing recovery rates were based upon (1) top growth or density of infestations being sufficiently reduced so that cattle will graze within the infestations, (2) the pasture being stocked at a rate sufficient that cattle graze within the treated infestations, and (3) other factors. The first assumption is straightforward--leafy spurge must be sufficiently controlled as to remove the avoidance factor cattle have for it, since cattle are basically intolerant of the plant. If control is ineffective, it would be unreasonable to expect cattle to graze in or near infestations.

The second factor influencing grazing recovery can be affected by several things. First, a pasture that is under stocked may not entice cattle to graze in treated areas. Cattle may find less intrusive forage in other areas of the pasture, due largely to forage that goes ungrazed, and also, even the most effective treatments will not remove all leafy spurge plants, thereby still generating some avoidance for cattle. Second, timing of herbicide applications must be conducive to producing available forage. Only allowing forage in the infestations to be grazed for short time periods (e.g., one month) will result in lower returns from treatment. Fall treatments that provide little long-term control will unlikely, even with acceptable short-term control, produce the grazing recovery rates used in this study. Third, the effects of rainfall on herbicide effectiveness and grass production were not included. Finally, the amount of herbicide applied, timing of herbicide applications, and choice of herbicide can affect grass injury, which was not addressed in this study, but could directly affect grazing recovery.

One of the problems with projecting returns and costs 20 years into the future is the amount of uncertainty in the analysis. Twenty years represents a long time to assume constant technology and static economic values. The effect of changing technology (changes in herbicide control or the development/discovery of other methods), environmental regulations, societal preferences, and other intangible factors are unknown. As key constants in the analysis change, the economics of long-term control should be reassessed.

Individual results from management programs that skip years, switch treatment programs, or include activities that change costs and returns during the period will likely differ from those reported in this study. The results presented in this study represent only *an attempt* to provide insight on the economics of long-term control of leafy spurge using herbicides. They are first approximations of average conditions.

CONCLUSIONS

Leafy spurge, a troublesome weed in untilled land, spreads rapidly, resists control, and reduces land outputs, presenting long-term problems to land managers in the Upper Midwest. A variety of intensive herbicide treatment programs, currently the mainstay of combating the weed, has been effective in controlling, but not eradicating, the weed. Thus, efforts to control and restrict the spread of leafy spurge require long-term commitments; however, tradeoffs between control costs and returns from control have until now remained unquantified.

Under rangeland conditions found in North Dakota (i.e., grazing values, land carrying capacities, spread rates, herbicide effectiveness, and treatment costs), long-term (20 years) herbicide control of leafy spurge can provide positive returns. Discounted present returns, however, vary across a variety of physical, environmental, and economic factors.

Annual applications of 2,4-D at moderate rates, picloram alone or picloram with 2,4-D at light rates repeated for several years, and glyphosate with 2,4-D combinations applied annually or biennially at moderate rates provided the most economically attractive returns from long-term

treatments of leafy spurge. Individual strategies to combat leafy spurge will vary depending upon a host of factors. However, an overall recommendation would be to intensively treat small infestations and at the very least, attempt to control the spread of large infestations.

The physical/environmental conditions having the greatest influence on returns from long-term herbicide control included treatment size, spread rates, land productivity, and structure (i.e., frequency and rate) of herbicide applications. As could be expected, grazing values and herbicide costs had direct impacts on the economic feasibility of control.

Treatment area was a major factor influencing returns from long-term herbicide control of leafy spurge. Generally, most treatment programs evaluated provided positive discounted returns when applied to small (one-half acre or less) infestations over 20 years. However, even under favorable physical, and optimistic economic conditions, few treatments provided acceptable returns as infestation area approached 50 acres. As treatment area moved from infestations of less than an acre to over five acres, returns diminished quickly, implying a sensitive relationship between treatment size and returns. Treatments across a wide range of infestation sizes provided attractive economic alternatives to no treatment.

In all situations, faster-than-baseline rates of spread made treatments more economical and correspondingly, slower-than-baseline rates made treatments less economical. When treating the entire infestation, returns from large infestations improved the least from more rapid spread, whereas, the rate of spread affected returns substantially when only treating to control the spread of large infestations.

An obvious direct relationship was noticed between land productivity, value of grazing, and returns from treatment. As land productivity ranged from low to high capacity with fixed grazing values, returns improved noticeably for all treatments. In relatively unproductive land, few treatments were economical, in contrast to highly productive land, where most treatments provided positive returns. In many cases, the change in returns from the most valuable grazing scenario to the least valuable scenario would be sufficient to influence decisions regarding the implementation and/or continuation of specific treatment programs.

Other factors affecting returns included treatment costs, grazing recovery, and level of control. Grazing recovery was more important to single-year treatment programs than to multiple-year programs, due largely to the structure of the treatment programs and the way grazing recovery was handled in treatment years versus years after herbicide applications. Multiple-year treatments using low-to-moderate rates of herbicide fared better than single-year treatments using high rates of herbicide. Reductions in infestation densities increased returns negligibly. Similarly, small reductions in control reduced returns only slightly.

The level of productivity at which most herbicide treatment programs break even is higher than the levels of productivity found in much of North Dakota's grazing land. Substantial amounts of leafy spurge infested grazing land exist that may not produce sufficient economic

incentives for individuals to commit to long-term herbicide control, raising questions about public support for control and the impacts of cost-share and landowner assistance programs.

Confidence with the results in this study could be improved with refined information on key relationships and assumptions, particularly grazing recovery and spread characteristics. Current herbicide technologies cannot provide long-term positive returns from leafy spurge control in all rangeland conditions found in North Dakota. As alternatives to controlling leafy spurge with herbicides are sought, the long-term economic viability of those methods also needs to be assessed.

Although the results should be viewed with some caution, in general, long-term herbicide control of leafy spurge provides attractive economic alternatives to no treatment.

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APPENDIX A

Private Grazing Values, North Dakota, 1992-1994

Appendix Table A1. Private Grazing Land Cash Rent, Nominal and Adjusted (1994 Dollars), 1992 Through 1994, North Dakota

County/ Region	1992 Cash Rent Nominal	1992 Cash Rent Adjusted	1993 Cash Rent Nominal	1993 Cash Rent Adjusted	1994 Nominal	Average Adj Value
	$/acre					
Divide	8.20	8.75	6.80	7.04	6.70	7.50
McKenzie	7.60	8.11	6.60	6.84	7.80	7.58
Williams	5.60	5.98	6.60	6.84	6.30	6.37
Region 1						
Bottineau	8.50	9.07	9.80	10.15	9.50	9.57
Burke	6.20	6.62	7.00	7.25	7.30	7.06
McHenry	9.30	9.92	8.90	9.22	9.50	9.55
Mountrail	6.20	6.62	7.50	7.77	6.40	6.93
Pierce	8.60	9.18	8.80	9.12	8.90	9.06
Renville	8.80	9.39	9.30	9.63	11.00	10.01
Ward	8.10	8.64	8.80	9.12	8.50	8.75
Region 2						
Benson	7.90	8.43	8.20	8.50	9.20	8.71
Cavalier	8.50	9.07	9.30	9.63	8.30	9.00
Eddy	10.20	10.88	11.90	12.33	11.20	11.47
Ramsey	9.30	9.92	11.00	11.40	12.00	11.11
Rolette	8.20	8.75	10.60	10.98	12.70	10.81
Towner	9.60	10.24	8.50	8.81	9.60	9.55
Region 3						
Grand Forks	9.30	9.92	8.20	8.50	9.30	9.24
Nelson	8.50	9.07	9.60	9.95	9.70	9.57
Pembina	16.10	17.18	8.70	9.01	12.60	12.93
Walsh	9.10	9.71	10.40	10.77	11.00	10.49
Region 4						
Cass	13.30	14.19	16.80	17.40	14.90	15.50
Ransom	14.20	15.15	13.80	14.30	11.50	13.65
Richland	13.40	14.30	16.90	17.51	14.90	15.57
Sargent	12.40	13.23	12.50	12.95	14.10	13.43
Steele	10.00	10.67	10.40	10.77	10.00	10.48
Traill	15.90	16.97	0.00	0.00	12.80	9.92
Region 5						

- continued -

Appendix Table A1. Continued

County/ Region	1992 Cash Rent Nominal	1992 Cash Rent Adjusted	1993 Cash Rent Nominal	1993 Cash Rent Adjusted	1994 Nominal	Average Adj Value
			$/acre			
Barnes	11.20	11.95	11.20	11.60	10.90	11.48
Dickey	11.20	11.95	11.60	12.02	13.80	12.59
Foster	10.40	11.10	11.90	12.33	11.00	11.48
Griggs	10.60	11.31	11.10	11.50	11.00	11.27
LaMoure	11.30	12.06	11.90	12.33	12.40	12.26
Logan	9.80	10.46	10.90	11.29	11.10	10.95
McIntosh	11.30	12.06	11.00	11.40	11.00	11.48
Stutsman	11.10	11.84	11.40	11.81	11.90	11.85
Wells	8.90	9.50	9.50	9.84	10.60	9.98
Region 6						
Burleigh	9.30	9.92	10.10	10.46	9.90	10.10
Emmons	9.70	10.35	10.30	10.67	10.60	10.54
Grant	8.60	9.18	8.70	9.01	9.50	9.23
Kidder	10.50	11.20	10.80	11.19	11.30	11.23
McLean	8.90	9.50	7.90	8.18	9.30	8.99
Mercer	8.30	8.86	8.40	8.70	8.50	8.69
Morton	9.10	9.71	8.90	9.22	10.40	9.78
Oliver	8.50	9.07	8.70	9.01	9.00	9.03
Sheridan	8.60	9.18	8.30	8.60	8.90	8.89
Sioux	5.80	6.19	7.70	7.98	8.20	7.46
Region 7						
Adams	8.10	8.64	10.10	10.46	9.00	9.37
Billings	8.30	8.86	10.50	10.88	9.20	9.64
Bowman	7.20	7.68	7.30	7.56	8.20	7.82
Dunn	9.10	9.71	9.10	9.43	9.90	9.68
Golden Valley	5.70	6.08	6.50	6.73	6.10	6.31
Hettinger	9.70	10.35	9.70	10.05	10.00	10.13
Slope	7.70	8.22	8.10	8.39	8.80	8.47
Stark	9.80	10.46	9.80	10.15	11.00	10.54
Region 8						

Source: North Dakota Agricultural Statistics Service (various years); U.S. Department of Commerce (various years).

Appendix Table A2. Private and Public Grazing Land, Animal Unit Months, and Carrying Capacities, North Dakota, 1992

County/ Region	Grazing Land			Animal Unit Months			Carrying Capacity	
	Total	Public	Private	Total	Private	Public	Private	Public
	Acres			AUMs			AUMs/Acre	
Divide	143,365	22,724	120,641	74,090	61,027	13,063	0.506	0.575
McKenzie	1,135,841	574,494	561,347	435,347	253,657	181,691	0.452	0.316
Williams	346,499	41,163	305,336	177,246	154,457	22,789	0.506	0.554
Region 1	1,625,705	638,380	987,324	686,684	469,141	217,543	0.475	0.341
Bottineau	51,450	3,959	47,491	30,710	28,970	1,740	0.610	0.440
Burke	165,941	18,225	147,715	86,506	75,335	11,172	0.510	0.613
McHenry	303,158	27,774	275,384	200,134	181,753	18,381	0.660	0.662
Mountrail	429,508	39,641	389,867	239,116	218,325	20,791	0.560	0.524
Pierce	90,253	13,588	76,665	59,868	50,599	9,269	0.660	0.682
Renville	27,603	6,068	21,535	15,839	12,060	3,780	0.560	0.623
Ward	213,959	14,835	199,123	120,690	111,509	9,181	0.560	0.619
Region 2	1,281,871	124,090	1,157,781	752,864	678,551	74,314	0.586	0.599
Benson	103,058	10,576	92,481	81,462	73,523	7,939	0.795	0.751
Cavalier	19,792	1,827	17,965	15,263	14,282	981	0.795	0.537
Eddy	79,909	9,628	70,281	62,774	55,874	6,900	0.795	0.717
Ramsey	34,395	825	33,569	27,331	26,688	644	0.795	0.780
Rolette	73,657	6,877	66,780	54,591	51,087	3,504	0.765	0.510
Towner	13,368	6,003	7,364	10,556	5,634	4,923	0.765	0.820
Region 3	324,177	35,736	288,441	251,978	227,086	24,892	0.787	0.697
Grand Forks	60,131	4,472	55,659	49,422	47,477	1,945	0.853	0.435
Nelson	50,110	1,865	48,245	42,608	41,153	1,455	0.853	0.780
Pembina	31,167	0	31,167	26,585	26,585	0	0.853	0.000
Walsh	25,362	308	25,054	21,544	21,371	173	0.853	0.561
Region 4	166,769	6,645	160,124	140,159	136,586	3,573	0.853	0.538
Cass	27,874	75	27,799	27,293	27,243	50	0.980	0.660
Ransom	91,460	43,366	48,094	80,584	47,132	33,451	0.980	0.771
Richland	80,878	29,344	51,534	73,084	50,504	22,580	0.980	0.770
Sargent	53,997	1,305	52,692	52,631	51,638	993	0.980	0.761
Steele	19,417	0	19,417	19,028	19,028	0	0.980	0.000
Traill	29,013	40	28,973	28,416	28,394	22	0.980	0.560
Region 5	302,638	74,129	228,509	281,035	223,938	57,097	0.980	0.770

- continued -

Appendix Table A2. Continued

County/ Region	Grazing Land			Animal Unit Months			Carrying Capacity	
	Total	Public	Private	Total	Private	Public	Private	Public
	Acres			AUMs			AUMs/Acre	
Barnes	61,264	2,831	58,433	54,787	52,590	2,197	0.900	0.776
Dickey	103,063	3,364	99,699	91,980	89,729	2,251	0.900	0.669
Foster	45,718	3,093	42,624	38,550	36,231	2,319	0.850	0.750
Griggs	40,115	1,925	38,191	33,582	32,462	1,120	0.850	0.582
LaMoure	34,367	1,609	32,758	30,701	29,482	1,219	0.900	0.758
Logan	273,870	11,406	262,463	221,752	215,220	6,532	0.820	0.573
McIntosh	156,197	7,093	149,104	126,167	122,265	3,902	0.820	0.550
Stutsman	317,986	16,681	301,304	282,854	271,174	11,681	0.900	0.700
Wells	48,309	5,303	43,006	40,222	36,555	3,667	0.850	0.692
Region 6	1,080,887	53,304	1,027,583	920,597	885,708	34,889	0.862	0.655
Burleigh	412,844	27,857	384,987	262,362	246,777	15,586	0.641	0.559
Emmons	311,566	14,999	296,567	198,431	190,100	8,331	0.641	0.555
Grant	571,136	35,432	535,704	307,107	289,816	17,292	0.541	0.488
Kidder	327,451	30,216	297,235	221,305	205,389	15,916	0.691	0.527
McLean	268,638	24,230	244,407	155,989	142,001	13,988	0.581	0.577
Mercer	289,213	15,395	273,818	154,879	148,135	6,744	0.541	0.438
Morton	589,101	17,982	571,119	317,195	308,975	8,219	0.541	0.457
Oliver	187,710	7,315	180,395	101,165	97,594	3,571	0.541	0.488
Sheridan	168,755	26,462	142,293	99,242	84,095	15,146	0.591	0.572
Sioux	502,661	29,593	473,067	269,585	255,929	13,655	0.541	0.461
Region 7	3,629,073	229,480	3,399,593	2,087,260	1,968,812	118,448	0.579	0.516
Adams	225,258	17,156	208,102	108,707	99,972	8,735	0.480	0.509
Billings	576,238	321,758	254,479	207,561	115,466	92,095	0.454	0.286
Bowman	370,460	62,679	307,780	137,787	123,235	14,551	0.400	0.232
Dunn	819,548	49,297	770,251	401,246	385,434	15,812	0.500	0.321
G. Valley	328,726	124,605	204,121	120,121	81,730	38,391	0.400	0.308
Hettinger	94,096	9,881	84,215	45,595	40,457	5,138	0.480	0.520
Slope	418,297	162,261	256,035	169,656	112,758	56,898	0.440	0.351
Stark	244,225	6,095	238,130	122,268	119,160	3,108	0.500	0.510
Region 8	3,076,846	753,733	2,323,113	1,312,940	1,078,211	234,729	0.464	0.311
State	11,487,965	1,915,498	9,572,467	6,433,516	5,668,033	765,483	0.592	0.400

Source: Bangsund and Olson (1993); Sedivec (1993).

Appendix Table A3. Value of Animal Unit Months of Grazing on Rented Private Grazing Land, North Dakota, 1994

County/ Region	Rental Rate	Amount Rented	Rented Acres	Rented AUMs	Carrying Capacity	Value per Rented AUM	Weighted Average
	-$/acre-	- % -			- AUMs/acre -		- $/AUM -
Divide	7.50	0.50	60,304	30,505		$14.82	
McKenzie	7.58	0.41	229,565	103,734		$16.78	
Williams	6.37	0.49	149,253	75,501		$12.59	
Region 1	$7.16		439,123	209,741	0.48		**$14.99**
Bottineau	9.57	0.54	25,703	15,679		$15.70	
Burke	7.06	0.54	79,860	40,729		$13.83	
McHenry	9.55	0.44	121,167	79,970		$14.47	
Mountrail	6.93	0.45	175,407	98,228		$12.37	
Pierce	9.06	0.41	31,471	20,771		$13.73	
Renville	10.01	0.57	12,350	6,916		$17.87	
Ward	8.75	0.51	101,848	57,035		$15.63	
Region 2	$8.18		547,807	319,328	0.58		**$14.04**
Benson	8.71	0.49	45,045	35,810		$10.95	
Cavalier	9.00	0.58	10,333	8,215		$11.32	
Eddy	11.47	0.50	35,341	28,096		$14.43	
Ramsey	11.11	0.57	19,199	15,263		$13.97	
Rolette	10.81	0.44	29,175	22,319		$14.13	
Towner	9.55	0.60	4,388	3,357		$12.48	
Region 3	$10.18		143,480	113,060	0.79		**$12.92**
Grand Forks	9.24	0.62	34,721	29,617		$10.83	
Nelson	9.57	0.56	27,240	23,236		$11.22	
Pembina	12.93	0.59	18,466	15,752		$15.16	
Walsh	10.49	0.59	14,681	12,522		$12.30	
Region 4	$10.24		95,108	81,127	0.85		**$12.01**
Cass	15.50	0.61	16,971	16,631		$15.81	
Ransom	13.65	0.54	26,084	25,562		$13.93	
Richland	15.57	0.55	28,097	27,535		$15.89	
Sargent	13.43	0.50	26,194	25,670		$13.70	
Steele	10.48	0.62	11,955	11,716		$10.70	
Traill	9.92	0.59	17,042	16,702		$10.12	
Region 5	$13.48		126,343	123,816	0.98		**$13.75**

- continued -

Appendix Table A3. Continued

County/ Region	Rental Rate	Amount Rented	Rented Acres	Rented AUMs	Carrying Capacity	Value per Rented AUM	Weighted Average
	-$/acre-	- % -			- AUMs/acre -		- $/AUM -
Barnes	11.48	0.55	31,963	28,766		$12.76	
Dickey	12.59	0.47	46,730	42,057		$13.99	
Foster	11.48	0.48	20,257	17,218		$13.50	
Griggs	11.27	0.58	22,198	18,868		$13.26	
LaMoure	12.26	0.50	16,391	14,752		$13.62	
Logan	10.95	0.40	105,240	86,297		$13.35	
McIntosh	11.48	0.35	51,446	42,186		$14.01	
Stutsman	11.85	0.51	153,956	138,560		$13.17	
Wells	9.98	0.52	22,400	19,040		$11.74	
Region 6	$11.54		470,580	407,744	0.87		**$13.32**
Burleigh	10.10	0.38	147,452	94,517		$15.75	
Emmons	10.54	0.32	95,675	61,328		$16.44	
Grant	9.23	0.38	203,801	110,256		$17.06	
Kidder	11.23	0.38	112,538	77,764		$16.25	
McLean	8.99	0.50	121,947	70,851		$15.48	
Mercer	8.69	0.41	111,502	60,322		$16.06	
Morton	9.78	0.37	213,889	115,714		$18.07	
Oliver	9.03	0.47	85,444	46,225		$16.69	
Sheridan	8.89	0.46	65,924	38,961		$15.05	
Sioux	7.46	0.35	165,417	89,491		$13.78	
Region 7	$9.36		1,323,589	765,429	0.58		**$16.19**
Adams	9.37	0.44	91,778	44,090		$19.50	
Billings	9.64	0.72	183,558	83,286		$21.26	
Bowman	7.82	0.39	120,861	48,393		$19.52	
Dunn	9.68	0.30	231,900	116,043		$19.34	
Golden Valley	6.31	0.46	94,645	37,896		$15.75	
Hettinger	10.13	0.50	42,221	20,283		$21.09	
Slope	8.47	0.49	126,670	55,785		$19.23	
Stark	10.54	0.43	102,375	51,229		$21.06	
Region 8	$9.05		994,008	457,005	0.46		**$19.68**
State	$9.32		4,140,037	2,477,250	0.60		**$15.57**

Source: Bangsund and Olson (1993).

APPENDIX B

Additional Treatment Results

This appendix provides additional results for most of the leafy spurge treatments evaluated in this study. The additional results were included to assist in understanding the changes in long-term returns that occur with different treatment programs and scenarios. The information was included for illustrative purposes. Individual results for landowners or ranchers will likely differ from those in this study. Economic information should be used with other sources as part of a long-term management approach to controlling leafy spurge.

Results are organized by the two treatment approaches analyzed. Results from treating the entire infestation are presented first, followed by results for perimeter treatments. The specific treatment program, approach, and scenario are listed on the top of each page. The treatment scenarios included different grazing values, reduced herbicide cost, restarting treatment programs early, and reduced control and grazing recovery. Break-even carrying capacities for each treatment scenario are bracketed, while the least-loss carrying capacities are listed separately. To aid in observing changes in results from one treatment scenario to the next, base scenario break-even carrying capacities were highlighted by single brackets, whereas break-even carrying capacities for alternative treatment situations were highlighted with double brackets.

Returns for treating the entire infestation are listed in dollars per acre. To determine total returns for the specific situation dollars per acre should be multiplied by the acreage. Returns for perimeter treatments are listed as totals for each specific situation (i.e., they have not been adjusted for treatment size or infestation size). Small infestations of 0.022, 0.05, 0.1, and 0.25 acres equate to patches (i.e., circular infestations) of 35, 50, 75, and 120 feet in diameter, respectively.

Treat the Entire Infestation

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (Pic.25)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(70)	32	(17)	(40)	(57)	(65)	(75)	(77)	(78)	(78)	(69)	(64)	(57)	(73)	(71)	(78)	(77)
0.25	(60)	72	8	(22)	(44)	(54)	(68)	(70)	(71)	(72)	(60)	(53)	(44)	(65)	(62)	(71)	(70)
0.30	(51)	111	33	(4)	(31)	(43)	(60)	(62)	(64)	(65)	(50)	(42)	(31)	(57)	(53)	(64)	(63)
0.35	(42)	150	58	14	(18)	(33)	(53)	(55)	(58)	(59)	(41)	(31)	(18)	(49)	(44)	(57)	(56)
0.40	(32)	189	83	32	(5)	(22)	(45)	(48)	(51)	(52)	(32)	(19)	(5)	(40)	(35)	(51)	(49)
0.45	(23)	228	108	51	8	(11)	(38)	(41)	(44)	(46)	(22)	(8)	8	(32)	(26)	(44)	(42)
0.50	(14)	267	133	69	21	(0)	(31)	(34)	(37)	(39)	(13)	3	21	(24)	(17)	(37)	(35)
0.55	(5)	306	157	87	34	11	(23)	(27)	(31)	(32)	(3)	14	34	(16)	(8)	(30)	(28)
0.60	5	345	182	105	47	21	(16)	(20)	(24)	(26)	6	25	47	(8)	1	(24)	(21)
0.65	14	384	207	123	60	32	(8)	(13)	(17)	(19)	15	36	60	0	10	(17)	(14)
0.70	23	424	232	142	73	43	(1)	(6)	(11)	(13)	25	47	73	9	18	(10)	(7)
0.75	33	463	257	160	86	54	7	1	(4)	(6)	34	58	86	17	27	(3)	(0)
0.80	42	502	282	178	99	64	14	8	3	0	44	69	99	25	36	3	7
0.85	51	541	307	196	112	75	22	15	10	7	53	80	112	33	45	10	14
0.90	60	580	332	214	125	86	29	22	16	13	62	91	125	41	54	17	20
0.95	70	619	357	232	138	97	37	29	23	20	72	103	138	50	63	24	27
1.00	79	658	382	251	151	107	44	36	30	26	81	114	151	58	72	30	34
LCC**	0.30	0.20	0.20	0.20	0.25	0.30	0.35	0.40	0.40	0.40	0.30	0.25	0.25	0.30	0.40	0.40	0.40

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (Pic.5)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(125)	(20)	(70)	(94)	(112)	(120)	(131)	(132)	(133)	(134)	(124)	(119)	(112)	(128)	(126)	(133)	(132)
0.25	(116)	20	(46)	(76)	(99)	(109)	(123)	(125)	(127)	(127)	(115)	(108)	(99)	(120)	(117)	(126)	(126)
0.30	(107)	59	(21)	(58)	(86)	(99)	(116)	(118)	(120)	(121)	(106)	(97)	(86)	(112)	(108)	(120)	(119)
0.35	(98)	98	4	(40)	(73)	(88)	(109)	(112)	(114)	(115)	(97)	(86)	(73)	(105)	(100)	(114)	(112)
0.40	(88)	137	29	(22)	(61)	(77)	(102)	(105)	(107)	(109)	(88)	(75)	(61)	(97)	(91)	(107)	(106)
0.45	(79)	176	54	(4)	(48)	(67)	(95)	(98)	(101)	(102)	(78)	(64)	(48)	(89)	(82)	(101)	(99)
0.50	(70)	215	79	14	(35)	(56)	(87)	(91)	(94)	(96)	(69)	(53)	(35)	(81)	(74)	(94)	(92)
0.55	(61)	254	104	32	(22)	(46)	(80)	(84)	(88)	(90)	(60)	(43)	(22)	(73)	(65)	(88)	(85)
0.60	(52)	294	128	50	(9)	(35)	(73)	(78)	(82)	(84)	(51)	(32)	(9)	(65)	(56)	(81)	(79)
0.65	(43)	333	153	68	4	(25)	(66)	(71)	(75)	(77)	(42)	(21)	4	(57)	(48)	(75)	(72)
0.70	(34)	372	178	86	16	(14)	(59)	(64)	(69)	(71)	(33)	(10)	16	(49)	(39)	(68)	(65)
0.75	(25)	411	203	104	29	(4)	(51)	(57)	(62)	(65)	(23)	1	29	(41)	(30)	(62)	(59)
0.80	(16)	450	228	122	42	7	(44)	(51)	(56)	(59)	(14)	12	42	(33)	(22)	(55)	(52)
0.85	(7)	489	253	140	55	17	(37)	(44)	(50)	(52)	(5)	23	55	(25)	(13)	(49)	(45)
0.90	2	528	278	158	68	28	(30)	(37)	(43)	(46)	4	34	68	(17)	(4)	(42)	(39)
0.95	11	568	302	176	81	38	(23)	(30)	(37)	(40)	13	44	81	(10)	4	(36)	(32)
1.00	20	607	327	194	94	49	(16)	(23)	(30)	(34)	22	55	94	(2)	13	(30)	(25)
LCC**	0.45	0.20	0.20	0.25	0.35	0.40	0.60	0.60	0.65	0.65	0.45	0.40	0.35	0.55	0.50	0.65	0.60

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 1.0 lb/acre (Pic1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(191)	(168)	(184)	(189)	(191)	(191)	(190)	(190)	(190)	(189)	(190)	(191)	(191)	(190)	(191)	(190)	(190)
0.25	(184)	(133)	(162)	(173)	(180)	(183)	(185)	(185)	(185)	(185)	(183)	(182)	(180)	(184)	(184)	(185)	(185)
0.30	(177)	(97)	(140)	(158)	(170)	(174)	(179)	(180)	(180)	(181)	(176)	(174)	(170)	(178)	(177)	(180)	(180)
0.35	(170)	(62)	(118)	(142)	(159)	(166)	(174)	(175)	(176)	(176)	(169)	(165)	(159)	(172)	(171)	(176)	(175)
0.40	(163)	(26)	(96)	(127)	(149)	(157)	(169)	(170)	(171)	(172)	(162)	(156)	(149)	(166)	(164)	(171)	(170)
0.45	(156)	9	(74)	(112)	(138)	(149)	(163)	(165)	(166)	(167)	(155)	(147)	(138)	(160)	(157)	(166)	(166)
0.50	(149)	45	(52)	(96)	(127)	(140)	(158)	(160)	(162)	(163)	(147)	(139)	(127)	(154)	(151)	(162)	(161)
0.55	(142)	80	(30)	(81)	(117)	(132)	(153)	(155)	(157)	(158)	(140)	(130)	(117)	(149)	(144)	(157)	(156)
0.60	(135)	116	(9)	(65)	(106)	(124)	(148)	(150)	(153)	(154)	(133)	(121)	(106)	(143)	(137)	(152)	(151)
0.65	(128)	151	13	(50)	(96)	(115)	(142)	(145)	(148)	(149)	(126)	(112)	(96)	(137)	(131)	(148)	(146)
0.70	(121)	187	35	(34)	(85)	(107)	(137)	(140)	(143)	(145)	(119)	(104)	(85)	(131)	(124)	(143)	(141)
0.75	(113)	222	57	(19)	(74)	(98)	(132)	(135)	(139)	(140)	(112)	(95)	(74)	(125)	(117)	(138)	(136)
0.80	(106)	258	79	(3)	(64)	(90)	(126)	(131)	(134)	(136)	(105)	(86)	(64)	(119)	(110)	(134)	(132)
0.85	(99)	293	101	12	(53)	(81)	(121)	(126)	(130)	(132)	(97)	(78)	(53)	(113)	(104)	(129)	(127)
0.90	(92)	329	123	28	(43)	(73)	(116)	(121)	(125)	(127)	(90)	(69)	(43)	(107)	(97)	(125)	(122)
0.95	(85)	364	145	43	(32)	(65)	(110)	(116)	(120)	(123)	(83)	(60)	(32)	(101)	(90)	(120)	(117)
1.00	(78)	400	167	59	(22)	(56)	(105)	(111)	(116)	(118)	(76)	(51)	(22)	(95)	(84)	(115)	(112)
LCC**	0.80	0.25	0.35	0.45	0.60	0.70	1.00	na	na	na	0.80	0.65	0.60	0.90	0.85	na	na

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 2.0 lb/acre (Pic2)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

											Infestation						
	Base	Infestation Sizes (acres)									Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(219)	(132)	(175)	(195)	(209)	(215)	(223)	(224)	(225)	(225)	(218)	(214)	(209)	(221)	(220)	(225)	(224)
0.25	(212)	(95)	(153)	(179)	(198)	(207)	(218)	(219)	(220)	(221)	(211)	(205)	(198)	(215)	(213)	(220)	(219)
0.30	(205)	(59)	(130)	(163)	(188)	(198)	(213)	(214)	(216)	(217)	(204)	(197)	(188)	(210)	(206)	(216)	(215)
0.35	(198)	(22)	(108)	(148)	(177)	(190)	(207)	(210)	(211)	(212)	(197)	(188)	(177)	(204)	(200)	(211)	(210)
0.40	(191)	14	(85)	(132)	(166)	(181)	(202)	(205)	(207)	(208)	(190)	(179)	(166)	(198)	(193)	(207)	(205)
0.45	(184)	51	(63)	(116)	(156)	(173)	(197)	(200)	(203)	(204)	(183)	(170)	(156)	(192)	(186)	(202)	(201)
0.50	(177)	87	(40)	(100)	(145)	(164)	(192)	(195)	(198)	(200)	(176)	(162)	(145)	(186)	(180)	(198)	(196)
0.55	(170)	124	(18)	(84)	(134)	(156)	(187)	(190)	(194)	(195)	(169)	(153)	(134)	(180)	(173)	(193)	(191)
0.60	(163)	161	5	(69)	(123)	(147)	(182)	(186)	(189)	(191)	(162)	(144)	(123)	(174)	(167)	(189)	(187)
0.65	(156)	197	27	(53)	(113)	(139)	(176)	(181)	(185)	(187)	(155)	(135)	(113)	(168)	(160)	(184)	(182)
0.70	(149)	234	50	(37)	(102)	(131)	(171)	(176)	(180)	(182)	(148)	(127)	(102)	(162)	(153)	(180)	(177)
0.75	(142)	270	72	(21)	(91)	(122)	(166)	(171)	(176)	(178)	(141)	(118)	(91)	(157)	(147)	(175)	(173)
0.80	(135)	307	95	(6)	(81)	(114)	(161)	(167)	(171)	(174)	(133)	(109)	(81)	(151)	(140)	(171)	(168)
0.85	(129)	344	117	10	(70)	(105)	(156)	(162)	(167)	(170)	(126)	(100)	(70)	(145)	(133)	(166)	(163)
0.90	(121)	380	140	26	(59)	(97)	(150)	(157)	(163)	(165)	(119)	(91)	(59)	(139)	(127)	(162)	(159)
0.95	(114)	417	162	42	(49)	(88)	(145)	(152)	(158)	(161)	(112)	(83)	(49)	(133)	(120)	(158)	(154)
1.00	(107)	453	185	58	(38)	(80)	(140)	(147)	(154)	(157)	(105)	(74)	(38)	(127)	(114)	(153)	(149)
LCC**	0.90	0.20	0.30	0.45	0.60	0.75	na	na	na	na	0.90	0.75	0.60	na	0.95	na	na

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.25+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Baseline

		Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Base Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(91)	14	(37)	(61)	(78)	(86)	(97)	(98)	(99)	(100)	(91)	(85)	(78)	(95)	(92)	(99)	(99)
0.25	(81)	53	(12)	(42)	(65)	(75)	(89)	(91)	(92)	(93)	(81)	(74)	(65)	(86)	(83)	(92)	(91)
0.30	(72)	93	14	(23)	(51)	(64)	(81)	(83)	(85)	(86)	(71)	(62)	(51)	(77)	(74)	(85)	(84)
0.35	(62)	133	40	(5)	(38)	(52)	(73)	(76)	(78)	(79)	(61)	(50)	(38)	(69)	(64)	(78)	(77)
0.40	(52)	173	65	14	(24)	(41)	(65)	(68)	(71)	(72)	(51)	(39)	(24)	(60)	(55)	(71)	(69)
0.45	(42)	213	91	33	(11)	(30)	(58)	(61)	(64)	(65)	(41)	(27)	(11)	(52)	(45)	(64)	(62)
0.50	(33)	253	116	52	3	(19)	(50)	(53)	(57)	(58)	(31)	(16)	3	(43)	(36)	(56)	(54)
0.55	(23)	293	142	70	16	(7)	(42)	(46)	(50)	(51)	(22)	(4)	16	(34)	(27)	(49)	(47)
0.60	(13)	333	167	89	30	4	(34)	(39)	(42)	(44)	(12)	7	30	(26)	(17)	(42)	(40)
0.65	(3)	372	193	108	43	15	(26)	(31)	(35)	(38)	(2)	19	43	(17)	(8)	(35)	(32)
0.70	6	412	219	127	57	26	(18)	(24)	(28)	(31)	8	31	57	(9)	1	(28)	(25)
0.75	16	452	244	145	71	38	(10)	(16)	(21)	(24)	18	42	71	0	11	(21)	(18)
0.80	26	492	270	164	84	49	(2)	(9)	(14)	(17)	28	54	84	9	20	(13)	(10)
0.85	35	532	295	183	98	60	6	(1)	(7)	(10)	37	65	98	17	30	(6)	(3)
0.90	45	572	321	202	111	71	13	6	0	(3)	47	77	111	26	39	1	5
0.95	55	612	347	220	125	83	21	14	7	4	57	88	125	34	48	8	12
1.00	65	652	372	239	138	94	29	21	14	11	67	100	138	43	58	15	19
LCC**	0.35	0.20	0.20	0.20	0.25	0.30	0.45	0.45	0.45	0.50	0.35	0.30	0.25	0.40	0.35	0.45	0.45

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.5+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(175)	(80)	(127)	(148)	(164)	(171)	(180)	(181)	(182)	(182)	(174)	(170)	(164)	(178)	(176)	(182)	(181)
0.25	(165)	(40)	(101)	(129)	(150)	(159)	(172)	(173)	(175)	(175)	(164)	(158)	(150)	(169)	(166)	(174)	(174)
0.30	(155)	(1)	(76)	(111)	(137)	(148)	(164)	(166)	(167)	(168)	(154)	(146)	(137)	(160)	(157)	(167)	(166)
0.35	(145)	39	(50)	(92)	(123)	(137)	(156)	(158)	(160)	(161)	(145)	(135)	(123)	(152)	(147)	(160)	(159)
0.40	(136)	79	(24)	(73)	(109)	(125)	(148)	(151)	(153)	(154)	(135)	(123)	(109)	(143)	(138)	(153)	(151)
0.45	(126)	119	1	(54)	(96)	(114)	(140)	(143)	(146)	(147)	(125)	(111)	(96)	(134)	(129)	(146)	(144)
0.50	(116)	159	27	(35)	(82)	(103)	(132)	(136)	(139)	(140)	(115)	(100)	(82)	(126)	(119)	(138)	(137)
0.55	(106)	199	53	(17)	(69)	(91)	(124)	(128)	(132)	(133)	(105)	(88)	(69)	(117)	(110)	(131)	(129)
0.60	(96)	239	78	2	(55)	(80)	(116)	(121)	(124)	(126)	(95)	(77)	(55)	(108)	(100)	(124)	(122)
0.65	(87)	279	104	21	(41)	(69)	(108)	(113)	(117)	(119)	(85)	(65)	(41)	(100)	(91)	(117)	(114)
0.70	(77)	319	129	40	(28)	(58)	(100)	(106)	(110)	(112)	(75)	(53)	(28)	(91)	(82)	(110)	(107)
0.75	(67)	359	155	59	(14)	(46)	(92)	(98)	(103)	(105)	(65)	(42)	(14)	(82)	(72)	(102)	(99)
0.80	(57)	399	181	77	(1)	(35)	(84)	(90)	(96)	(98)	(55)	(30)	(1)	(74)	(63)	(95)	(92)
0.85	(47)	439	206	96	13	(24)	(77)	(83)	(88)	(91)	(45)	(18)	13	(65)	(53)	(88)	(85)
0.90	(38)	479	232	115	27	(12)	(69)	(75)	(81)	(84)	(36)	(7)	27	(56)	(44)	(81)	(77)
0.95	(28)	519	258	134	40	(1)	(61)	(68)	(74)	(77)	(26)	5	40	(48)	(34)	(73)	(70)
1.00	(18)	559	283	153	54	10	(53)	(60)	(67)	(70)	(16)	16	54	(39)	(25)	(66)	(62)
LCC**	0.55	0.20	0.25	0.30	0.45	0.50	0.70	0.75	0.75	0.80	0.55	0.50	0.45	0.65	0.60	0.75	0.75

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (3 year application) (Pic.5+24Ds)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(134)	(36)	(84)	(106)	(122)	(129)	(139)	(140)	(141)	(142)	(133)	(128)	(122)	(137)	(135)	(141)	(141)
0.25	(125)	3	(59)	(88)	(110)	(119)	(132)	(134)	(135)	(136)	(125)	(118)	(110)	(130)	(127)	(135)	(134)
0.30	(116)	42	(35)	(71)	(97)	(109)	(125)	(127)	(129)	(130)	(116)	(107)	(97)	(122)	(118)	(129)	(128)
0.35	(108)	80	(10)	(53)	(85)	(99)	(119)	(121)	(123)	(124)	(107)	(97)	(85)	(114)	(110)	(123)	(122)
0.40	(99)	119	14	(35)	(72)	(88)	(112)	(114)	(117)	(118)	(98)	(86)	(72)	(107)	(101)	(117)	(115)
0.45	(90)	157	38	(18)	(60)	(78)	(105)	(108)	(111)	(112)	(89)	(76)	(60)	(99)	(93)	(110)	(109)
0.50	(81)	196	63	(0)	(47)	(68)	(98)	(101)	(105)	(106)	(80)	(65)	(47)	(91)	(85)	(104)	(102)
0.55	(73)	235	87	18	(35)	(58)	(91)	(95)	(98)	(100)	(71)	(55)	(35)	(84)	(76)	(98)	(96)
0.60	(64)	273	112	35	(22)	(48)	(84)	(88)	(92)	(94)	(63)	(44)	(22)	(76)	(68)	(92)	(89)
0.65	(55)	312	136	53	(10)	(37)	(77)	(82)	(86)	(88)	(54)	(33)	(10)	(69)	(60)	(86)	(83)
0.70	(46)	351	161	71	3	(27)	(70)	(75)	(80)	(82)	(45)	(23)	3	(61)	(51)	(79)	(77)
0.75	(38)	389	185	88	15	(17)	(63)	(69)	(74)	(76)	(36)	(12)	15	(53)	(43)	(73)	(70)
0.80	(29)	428	210	106	28	(7)	(56)	(62)	(68)	(70)	(27)	(2)	28	(46)	(34)	(67)	(64)
0.85	(20)	467	234	124	40	4	(49)	(56)	(61)	(64)	(18)	9	40	(38)	(26)	(61)	(57)
0.90	(12)	505	258	141	53	14	(42)	(49)	(55)	(58)	(9)	19	53	(30)	(18)	(55)	(51)
0.95	(3)	544	283	159	65	24	(36)	(43)	(49)	(52)	(1)	30	65	(23)	(9)	(48)	(45)
1.00	6	583	307	177	78	34	(29)	(36)	(43)	(46)	8	40	78	(15)	(1)	(42)	(38)
LCC**	0.55	0.20	0.20	0.30	0.45	0.50	0.65	0.75	0.75	0.80	0.55	0.50	0.45	0.55	0.55	0.70	0.65

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 1.0 lb/acre (24D1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

											Infestation						
	Base	Infestation Sizes (acres)									Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(48)	74	16	(11)	(32)	(42)	(55)	(57)	(58)	(59)	(46)	(40)	(32)	(52)	(49)	(58)	(57)
0.25	(41)	111	39	4	(22)	(33)	(50)	(52)	(54)	(55)	(39)	(32)	(22)	(47)	(43)	(54)	(53)
0.30	(34)	148	61	20	(11)	(25)	(45)	(48)	(50)	(51)	(32)	(23)	(11)	(41)	(36)	(50)	(49)
0.35	(28)	185	84	36	(1)	(17)	(41)	(43)	(46)	(47)	(25)	(15)	(1)	(35)	(30)	(46)	(44)
0.40	(21)	222	107	52	10	(9)	(36)	(39)	(42)	(43)	(18)	(6)	10	(30)	(24)	(42)	(40)
0.45	(14)	259	130	68	21	(0)	(31)	(35)	(38)	(39)	(11)	3	21	(24)	(17)	(37)	(35)
0.50	(7)	296	152	84	31	8	(26)	(30)	(34)	(35)	(4)	11	31	(19)	(11)	(33)	(31)
0.55	(1)	333	175	99	42	16	(21)	(26)	(30)	(32)	3	20	42	(13)	(5)	(29)	(27)
0.60	6	370	198	115	52	24	(16)	(21)	(25)	(28)	10	28	52	(7)	2	(25)	(22)
0.65	13	407	220	131	63	33	(11)	(17)	(21)	(24)	17	37	63	(2)	8	(21)	(18)
0.70	20	444	243	147	74	41	(6)	(12)	(17)	(20)	24	46	74	4	15	(17)	(14)
0.75	26	481	266	163	84	49	(2)	(8)	(13)	(16)	31	54	84	9	21	(13)	(9)
0.80	33	519	288	178	95	58	3	(3)	(9)	(12)	38	63	95	15	27	(8)	(5)
0.85	40	556	311	194	105	66	8	1	(5)	(8)	45	71	105	21	34	(4)	(1)
0.90	47	593	334	210	116	74	13	6	(1)	(4)	52	80	116	26	40	(0)	4
0.95	53	630	357	226	127	82	18	10	3	(0)	59	89	127	32	46	4	8
1.00	60	667	379	242	137	91	23	15	7	4	66	97	137	38	53	8	13
LCC**	0.30	0.20	0.20	0.20	0.20	0.25	0.40	0.45	0.50	0.50	0.30	0.25	0.20	0.35	0.30	0.50	0.50

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 2.0 lb/acre (24D2)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(85)	36	(21)	(49)	(70)	(79)	(92)	(94)	(95)	(96)	(84)	(77)	(70)	(89)	(86)	(95)	(94)
0.25	(76)	75	3	(31)	(57)	(69)	(86)	(88)	(90)	(90)	(75)	(67)	(57)	(82)	(78)	(89)	(88)
0.30	(68)	114	28	(13)	(45)	(59)	(79)	(82)	(84)	(85)	(66)	(57)	(45)	(75)	(70)	(83)	(82)
0.35	(59)	153	52	4	(32)	(49)	(72)	(75)	(78)	(79)	(58)	(46)	(32)	(67)	(62)	(78)	(76)
0.40	(51)	192	77	22	(20)	(39)	(66)	(69)	(72)	(73)	(49)	(36)	(20)	(60)	(54)	(72)	(70)
0.45	(42)	231	101	39	(8)	(29)	(59)	(63)	(66)	(68)	(40)	(26)	(8)	(53)	(46)	(66)	(64)
0.50	(34)	269	126	57	5	(19)	(53)	(57)	(60)	(62)	(31)	(15)	5	(45)	(38)	(60)	(58)
0.55	(25)	308	150	75	17	(9)	(46)	(50)	(54)	(56)	(23)	(5)	17	(38)	(29)	(54)	(52)
0.60	(17)	347	175	92	29	1	(39)	(44)	(49)	(51)	(14)	5	29	(30)	(21)	(48)	(45)
0.65	(8)	386	199	110	42	11	(33)	(38)	(43)	(45)	(5)	16	42	(23)	(13)	(42)	(39)
0.70	0	425	224	127	54	21	(26)	(32)	(37)	(39)	3	26	54	(16)	(5)	(36)	(33)
0.75	9	464	248	145	66	31	(19)	(26)	(31)	(34)	12	36	66	(8)	3	(30)	(27)
0.80	17	503	272	162	79	42	(13)	(19)	(25)	(28)	21	47	79	(1)	11	(24)	(21)
0.85	26	541	297	180	91	52	(6)	(13)	(19)	(22)	30	57	91	6	19	(19)	(15)
0.90	34	580	321	198	103	62	1	(7)	(13)	(17)	38	67	103	14	28	(13)	(9)
0.95	43	619	346	215	116	72	7	(1)	(7)	(11)	47	78	116	21	36	(7)	(3)
1.00	51	658	370	233	128	82	14	6	(2)	(5)	56	88	128	29	44	(1)	4
LCC**	0.35	0.20	0.20	0.20	0.25	0.30	0.45	0.50	0.55	0.55	0.35	0.30	0.25	0.45	0.40	0.55	0.50

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (Glph.75)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(39)	38	(0)	(18)	(31)	(36)	(43)	(44)	(45)	(45)	(39)	(35)	(31)	(42)	(40)	(45)	(44)
0.25	(32)	74	22	(2)	(20)	(27)	(38)	(39)	(40)	(40)	(31)	(26)	(20)	(35)	(33)	(40)	(39)
0.30	(25)	109	44	13	(9)	(19)	(32)	(34)	(35)	(36)	(24)	(17)	(9)	(29)	(26)	(35)	(34)
0.35	(18)	145	66	29	2	(10)	(27)	(28)	(30)	(31)	(17)	(8)	2	(23)	(19)	(30)	(29)
0.40	(10)	180	87	44	12	(1)	(21)	(23)	(25)	(26)	(9)	1	12	(17)	(12)	(25)	(24)
0.45	(3)	215	109	60	23	7	(15)	(18)	(20)	(22)	(2)	9	23	(11)	(6)	(20)	(19)
0.50	4	251	131	75	34	16	(10)	(13)	(16)	(17)	5	18	34	(4)	1	(15)	(14)
0.55	11	286	153	91	45	24	(4)	(8)	(11)	(12)	13	27	45	2	8	(10)	(9)
0.60	19	322	175	107	55	33	1	(3)	(6)	(8)	20	36	55	8	15	(6)	(4)
0.65	26	357	197	122	66	42	7	3	(1)	(3)	27	45	66	14	22	(1)	2
0.70	33	392	219	138	77	50	12	8	4	2	35	54	77	20	29	4	7
0.75	40	428	241	153	88	59	18	13	9	7	42	63	88	27	36	9	12
0.80	48	463	263	169	98	68	23	18	14	11	49	72	98	33	43	14	17
0.85	55	499	285	184	109	76	29	23	18	16	57	81	109	39	50	19	22
0.90	62	534	307	200	120	85	35	28	23	21	64	90	120	45	57	24	27
0.95	69	569	329	216	131	93	40	34	28	25	72	99	131	52	64	29	32
1.00	77	605	351	231	141	102	46	39	33	30	79	108	141	58	70	34	37
LCC**	0.25	0.20	0.20	0.20	0.20	0.25	0.30	0.35	0.35	0.35	0.25	0.20	0.20	0.30	0.25	0.35	0.35

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (GlPic+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(81)	30	(23)	(48)	(67)	(75)	(87)	(89)	(90)	(91)	(80)	(74)	(67)	(85)	(82)	(90)	(89)
0.25	(71)	70	3	(29)	(53)	(64)	(79)	(81)	(83)	(84)	(70)	(63)	(53)	(76)	(73)	(83)	(82)
0.30	(61)	110	28	(11)	(40)	(53)	(71)	(74)	(76)	(77)	(60)	(51)	(40)	(67)	(63)	(75)	(74)
0.35	(51)	150	54	8	(26)	(41)	(63)	(66)	(68)	(70)	(51)	(39)	(26)	(59)	(54)	(68)	(67)
0.40	(42)	191	80	27	(13)	(30)	(55)	(59)	(61)	(63)	(41)	(28)	(13)	(50)	(44)	(61)	(59)
0.45	(32)	231	106	46	1	(19)	(47)	(51)	(54)	(56)	(31)	(16)	1	(41)	(35)	(54)	(52)
0.50	(22)	271	131	65	15	(7)	(40)	(43)	(47)	(48)	(21)	(4)	15	(33)	(25)	(46)	(44)
0.55	(12)	311	157	84	28	4	(32)	(36)	(40)	(41)	(11)	7	28	(24)	(16)	(39)	(37)
0.60	(2)	351	183	103	42	15	(24)	(28)	(32)	(34)	(1)	19	42	(15)	(6)	(32)	(29)
0.65	8	391	208	122	56	27	(16)	(21)	(25)	(27)	9	31	56	(6)	3	(25)	(22)
0.70	17	431	234	140	69	38	(8)	(13)	(18)	(20)	19	42	69	2	12	(17)	(15)
0.75	27	471	260	159	83	49	0	(6)	(11)	(13)	29	54	83	11	22	(10)	(7)
0.80	37	511	286	178	97	61	8	2	(4)	(6)	39	66	97	20	31	(3)	1
0.85	47	551	311	197	110	72	16	10	4	1	49	77	110	28	41	4	8
0.90	57	591	337	216	124	83	24	17	11	8	59	89	124	37	50	11	15
0.95	67	631	363	235	138	95	32	25	18	15	69	101	138	46	60	19	23
1.00	76	671	388	254	151	106	40	32	25	22	79	112	151	54	69	26	30
LCC**	0.35	0.20	0.20	0.20	0.25	0.30	0.40	0.40	0.45	0.45	0.35	0.30	0.25	0.35	0.35	0.45	0.40

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (2 year treatment) (GlPic+24Ds)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Base Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(46)	56	6	(17)	(34)	(41)	(52)	(53)	(54)	(54)	(45)	(40)	(34)	(49)	(47)	(54)	(53)
0.25	(38)	93	30	(0)	(22)	(32)	(46)	(47)	(49)	(50)	(38)	(31)	(22)	(43)	(40)	(49)	(48)
0.30	(31)	130	53	16	(11)	(23)	(40)	(42)	(44)	(45)	(30)	(21)	(11)	(36)	(33)	(44)	(43)
0.35	(23)	167	76	33	0	(14)	(34)	(37)	(39)	(40)	(22)	(12)	0	(30)	(25)	(39)	(37)
0.40	(16)	205	99	49	12	(5)	(28)	(31)	(34)	(35)	(15)	(3)	12	(23)	(18)	(34)	(32)
0.45	(8)	242	122	65	23	4	(23)	(26)	(29)	(30)	(7)	7	23	(17)	(11)	(28)	(27)
0.50	(0)	279	145	82	34	13	(17)	(21)	(24)	(25)	1	16	34	(10)	(4)	(23)	(21)
0.55	7	316	168	98	46	22	(11)	(15)	(19)	(20)	9	26	46	(4)	4	(18)	(16)
0.60	15	353	191	115	57	31	(5)	(10)	(14)	(16)	16	35	57	3	11	(13)	(11)
0.65	22	390	214	131	68	40	1	(4)	(9)	(11)	24	44	68	9	18	(8)	(6)
0.70	30	428	238	147	79	49	6	1	(4)	(6)	32	54	79	16	25	(3)	(0)
0.75	38	465	261	164	91	59	12	6	2	(1)	39	63	91	22	33	2	5
0.80	45	502	284	180	102	68	18	12	7	4	47	72	102	29	40	7	10
0.85	53	539	307	197	113	77	24	17	12	9	55	82	113	35	47	12	16
0.90	60	576	330	213	125	86	29	23	17	14	62	91	125	42	54	17	21
0.95	68	614	353	229	136	95	35	28	22	19	70	101	136	48	61	22	26
1.00	76	651	376	246	147	104	41	33	27	23	78	110	147	55	69	27	31
LCC**	0.30	0.20	0.20	0.20	0.20	0.25	0.35	0.35	0.40	0.40	0.25	0.25	0.20	0.30	0.30	0.40	0.40

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (Pic.25)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

		Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Base Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(78)	(3)	(40)	(57)	(69)	(75)	(82)	(83)	(84)	(84)	(78)	(74)	(69)	(80)	(79)	(84)	(83)
0.25	(71)	27	(20)	(43)	(59)	(66)	(76)	(77)	(79)	(79)	(70)	(65)	(59)	(74)	(72)	(78)	(78)
0.30	(64)	58	(1)	(29)	(49)	(58)	(71)	(72)	(73)	(74)	(63)	(57)	(49)	(68)	(65)	(73)	(72)
0.35	(56)	88	18	(14)	(39)	(50)	(65)	(67)	(68)	(69)	(56)	(48)	(39)	(61)	(58)	(68)	(67)
0.40	(49)	118	38	(0)	(29)	(41)	(59)	(61)	(63)	(64)	(48)	(39)	(29)	(55)	(51)	(63)	(62)
0.45	(42)	148	57	14	(19)	(33)	(53)	(56)	(58)	(59)	(41)	(31)	(19)	(49)	(44)	(58)	(56)
0.50	(35)	179	76	28	(9)	(25)	(47)	(50)	(53)	(54)	(34)	(22)	(9)	(42)	(37)	(52)	(51)
0.55	(28)	209	95	42	2	(16)	(42)	(45)	(47)	(49)	(27)	(14)	2	(36)	(30)	(47)	(45)
0.60	(20)	239	115	56	12	(8)	(36)	(39)	(42)	(44)	(19)	(5)	12	(30)	(24)	(42)	(40)
0.65	(13)	270	134	70	22	0	(30)	(34)	(37)	(39)	(12)	3	22	(24)	(17)	(37)	(35)
0.70	(6)	300	153	84	32	9	(24)	(28)	(32)	(34)	(5)	12	32	(17)	(10)	(31)	(29)
0.75	1	330	173	98	42	17	(19)	(23)	(27)	(28)	2	21	42	(11)	(3)	(26)	(24)
0.80	8	360	192	112	52	26	(13)	(17)	(21)	(23)	10	29	52	(5)	4	(21)	(19)
0.85	15	391	211	126	62	34	(7)	(12)	(16)	(18)	17	38	62	2	11	(16)	(13)
0.90	23	421	231	140	72	42	(1)	(6)	(11)	(13)	24	46	72	8	18	(11)	(8)
0.95	30	451	250	154	82	51	5	(1)	(6)	(8)	32	55	82	14	25	(5)	(2)
1.00	37	482	269	169	92	59	10	4	(1)	(3)	39	64	92	21	32	(0)	3
LCC**	0.40	0.20	0.20	0.25	0.30	0.35	0.50	0.50	0.55	0.55	0.40	0.35	0.30	0.45	0.40	0.55	0.50

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (Pic.5)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(133)	(55)	(93)	(111)	(124)	(129)	(137)	(138)	(139)	(139)	(132)	(126)	(124)	(135)	(134)	(139)	(138)
0.25	(126)	(25)	(74)	(97)	(114)	(121)	(132)	(133)	(134)	(134)	(125)	(120)	(114)	(129)	(127)	(134)	(133)
0.30	(119)	6	(54)	(83)	(104)	(113)	(126)	(128)	(129)	(130)	(118)	(112)	(104)	(123)	(120)	(129)	(128)
0.35	(112)	36	(35)	(69)	(94)	(105)	(120)	(122)	(124)	(125)	(111)	(103)	(94)	(117)	(114)	(124)	(123)
0.40	(105)	66	(16)	(55)	(84)	(97)	(115)	(117)	(119)	(120)	(104)	(95)	(84)	(111)	(107)	(119)	(118)
0.45	(98)	97	3	(41)	(74)	(88)	(109)	(112)	(114)	(115)	(97)	(86)	(74)	(105)	(100)	(114)	(112)
0.50	(91)	127	23	(27)	(64)	(80)	(104)	(107)	(109)	(110)	(90)	(78)	(64)	(99)	(93)	(109)	(107)
0.55	(84)	157	42	(13)	(54)	(72)	(98)	(101)	(104)	(105)	(83)	(70)	(54)	(93)	(87)	(104)	(102)
0.60	(77)	187	61	1	(44)	(64)	(93)	(96)	(99)	(101)	(76)	(61)	(44)	(86)	(80)	(99)	(97)
0.65	(70)	218	80	15	(34)	(56)	(87)	(91)	(94)	(96)	(69)	(53)	(34)	(80)	(73)	(94)	(92)
0.70	(63)	248	100	29	(24)	(48)	(81)	(86)	(89)	(91)	(62)	(44)	(24)	(74)	(67)	(89)	(87)
0.75	(56)	278	119	43	(14)	(39)	(76)	(80)	(84)	(86)	(54)	(36)	(14)	(68)	(60)	(84)	(81)
0.80	(49)	309	138	57	(6)	(31)	(70)	(75)	(79)	(81)	(47)	(27)	(6)	(62)	(53)	(79)	(76)
0.85	(42)	339	157	71	6	(23)	(65)	(70)	(74)	(76)	(40)	(19)	6	(56)	(46)	(74)	(71)
0.90	(35)	369	176	85	16	(15)	(59)	(65)	(69)	(71)	(33)	(11)	16	(50)	(40)	(69)	(66)
0.95	(28)	400	196	99	26	(7)	(54)	(59)	(54)	(67)	(26)	(2)	26	(43)	(33)	(64)	(61)
1.00	(21)	430	215	113	36	1	(48)	(54)	(59)	(62)	(19)	6	36	(37)	(26)	(59)	(56)
LCC**	0.60	0.20	0.25	0.30	0.45	0.50	0.75	0.80	0.80	0.85	0.60	0.50	0.45	0.70	0.60	0.80	0.80

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 1.0 lb/acre (Pic1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(197)	(200)	(204)	(203)	(200)	(199)	(195)	(194)			(197)	(199)	(200)				
0.25	(192)	(173)	(187)	(191)	(192)	(192)	(191)	(190)			(191)	(192)	(192)				
0.30	(186)	(145)	(170)	(179)	(184)	(186)	(187)	(187)			(186)	(185)	(184)				
0.35	(181)	(118)	(153)	(167)	(176)	(179)	(183)	(183)			(180)	(179)	(176)				
0.40	(175)	(90)	(136)	(155)	(168)	(173)	(178)	(179)			(175)	(172)	(168)				
0.45	(170)	(63)	(119)	(143)	(159)	(166)	(174)	(175)			(169)	(165)	(159)				
0.50	(165)	(35)	(102)	(131)	(151)	(160)	(170)	(171)			(164)	(158)	(151)				
0.55	(159)	(8)	(85)	(119)	(143)	(153)	(166)	(168)			(158)	(152)	(143)				
0.60	(154)	20	(68)	(107)	(135)	(146)	(162)	(164)			(153)	(145)	(135)				
0.65	(148)	47	(51)	(95)	(127)	(140)	(158)	(160)			(147)	(138)	(127)				
0.70	(143)	75	(34)	(83)	(119)	(133)	(154)	(156)			(141)	(131)	(119)				
0.75	(137)	102	(17)	(71)	(110)	(127)	(150)	(152)			(136)	(125)	(110)				
0.80	(132)	130	(0)	(59)	(102)	(120)	(145)	(148)			(130)	(118)	(102)				
0.85	(126)	157	17	(47)	(94)	(114)	(141)	(145)			(125)	(111)	(94)				
0.90	(121)	185	34	(35)	(86)	(107)	(137)	(141)			(119)	(104)	(86)				
0.95	(116)	212	51	(23)	(78)	(101)	(133)	(137)			(114)	(98)	(78)				
1.00	(110)	240	68	(11)	(69)	(94)	(129)	(133)			(108)	(91)	(69)				
LCC**	na	0.30	0.45	0.55	0.75	0.90	na	na	na	na	1.0	0.85	0.75	na	na	na	na

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 2.0 lb/acre (Pic2)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(225)	(165)	(196)	(209)	(219)	(223)						(222)	(219)				
0.25	(220)	(137)	(178)	(197)	(210)	(216)						(215)	(210)				
0.30	(214)	(108)	(161)	(185)	(202)	(210)						(209)	(202)				
0.35	(209)	(80)	(144)	(173)	(194)	(203)						(202)	(194)				
0.40	(203)	(52)	(126)	(160)	(186)	(196)						(195)	(186)				
0.45	(198)	(23)	(109)	(148)	(177)	(190)						(188)	(177)				
0.50	(193)	5	(91)	(136)	(169)	(183)						(181)	(169)				
0.55	(187)	33	(74)	(124)	(161)	(177)						(175)	(161)				
0.60	(182)	61	(56)	(111)	(152)	(170)						(168)	(152)				
0.65	(176)	90	(39)	(99)	(144)	(164)						(161)	(144)				
0.70	(171)	118	(22)	(87)	(136)	(157)						(154)	(136)				
0.75	(166)	146	(4)	(75)	(128)	(151)						(147)	(128)				
0.80	(160)	175	13	(63)	(119)	(144)						(141)	(119)				
0.85	(155)	203	31	(50)	(111)	(138)						(134)	(111)				
0.90	(149)	231	48	(38)	(103)	(131)						(127)	(103)				
0.95	(144)	260	66	(26)	(94)	(125)						(120)	(94)				
1.00	(139)	288	83	(14)	(86)	(118)						(114)	(86)				
LCC**	na	0.25	0.40	0.55	0.80	1.00	na	na	na	na	na	0.95	0.80	na	na	na	na

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] $15.50/AUM

[ ] $12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.25+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

		Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Base Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(100)	(22)	(60)	(78)	(91)	(96)	(104)	(105)	(106)	(106)	(100)	(96)	(91)	(102)	(101)	(106)	(105)
0.25	(92)	8	(40)	(63)	(80)	(88)	(98)	(99)	(100)	(101)	(92)	(87)	(80)	(96)	(93)	(100)	(100)
0.30	(85)	39	(21)	(49)	(70)	(79)	(92)	(94)	(95)	(96)	(84)	(78)	(70)	(89)	(86)	(95)	(94)
0.35	(77)	70	(1)	(34)	(59)	(70)	(86)	(88)	(89)	(90)	(77)	(69)	(59)	(82)	(79)	(89)	(88)
0.40	(70)	101	19	(20)	(49)	(61)	(80)	(82)	(84)	(85)	(69)	(60)	(49)	(76)	(72)	(84)	(82)
0.45	(62)	132	39	(5)	(38)	(53)	(74)	(76)	(78)	(79)	(61)	(51)	(38)	(69)	(64)	(78)	(77)
0.50	(55)	163	59	9	(28)	(44)	(68)	(70)	(73)	(74)	(54)	(42)	(28)	(62)	(57)	(73)	(71)
0.55	(47)	194	78	24	(17)	(35)	(61)	(65)	(67)	(69)	(46)	(33)	(17)	(56)	(50)	(67)	(65)
0.60	(40)	225	98	38	(7)	(27)	(55)	(59)	(62)	(63)	(38)	(24)	(7)	(49)	(43)	(61)	(60)
0.65	(32)	255	118	53	4	(18)	(49)	(53)	(56)	(58)	(31)	(15)	4	(42)	(35)	(56)	(54)
0.70	(24)	286	138	67	14	(9)	(43)	(47)	(51)	(53)	(23)	(6)	14	(36)	(28)	(50)	(48)
0.75	(17)	317	158	82	25	(1)	(37)	(41)	(45)	(47)	(16)	3	25	(29)	(21)	(45)	(43)
0.80	(9)	348	177	96	35	8	(31)	(36)	(40)	(42)	(8)	12	35	(22)	(14)	(39)	(37)
0.85	(2)	379	197	111	46	17	(25)	(30)	(34)	(36)	(0)	21	46	(16)	(6)	(34)	(31)
0.90	6	410	217	125	56	26	(19)	(24)	(29)	(31)	7	30	56	(9)	1	(28)	(25)
0.95	13	441	237	140	67	34	(13)	(18)	(23)	(26)	15	39	67	(2)	8	(23)	(20)
1.00	21	472	257	154	77	43	(6)	(12)	(18)	(20)	23	48	77	4	15	(17)	(14)
LCC**	0.45	0.20	0.20	0.25	0.35	0.40	0.55	0.60	0.60	0.60	0.45	0.45	0.35	0.50	0.45	0.60	0.60

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.5+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(184)	(116)	(150)	(165)	(176)	(181)	(187)	(188)	(188)	(189)	(183)	(180)	(176)	(186)	(184)	(188)	(188)
0.25	(176)	(86)	(130)	(151)	(166)	(172)	(181)	(182)	(183)	(183)	(176)	(171)	(166)	(179)	(177)	(183)	(182)
0.30	(168)	(55)	(110)	(136)	(155)	(163)	(175)	(176)	(177)	(176)	(168)	(162)	(155)	(172)	(170)	(177)	(176)
0.35	(161)	(24)	(91)	(122)	(145)	(154)	(168)	(170)	(172)	(172)	(160)	(153)	(145)	(166)	(162)	(171)	(171)
0.40	(153)	7	(71)	(107)	(134)	(146)	(162)	(164)	(166)	(167)	(153)	(144)	(134)	(159)	(155)	(166)	(165)
0.45	(146)	38	(51)	(92)	(123)	(137)	(156)	(158)	(160)	(161)	(145)	(135)	(123)	(152)	(148)	(160)	(159)
0.50	(138)	69	(31)	(78)	(113)	(128)	(150)	(153)	(155)	(156)	(137)	(126)	(113)	(145)	(140)	(155)	(153)
0.55	(131)	100	(11)	(63)	(102)	(119)	(144)	(147)	(149)	(151)	(130)	(117)	(102)	(139)	(133)	(149)	(148)
0.60	(123)	131	9	(49)	(92)	(111)	(138)	(141)	(144)	(145)	(122)	(108)	(92)	(132)	(126)	(144)	(142)
0.65	(115)	162	29	(34)	(81)	(102)	(132)	(135)	(138)	(140)	(114)	(99)	(81)	(125)	(119)	(138)	(136)
0.70	(108)	193	48	(20)	(71)	(93)	(125)	(129)	(133)	(134)	(106)	(90)	(71)	(119)	(111)	(132)	(130)
0.75	(100)	224	68	(5)	(60)	(84)	(119)	(124)	(127)	(129)	(99)	(81)	(60)	(112)	(104)	(127)	(125)
0.80	(93)	255	88	9	(50)	(76)	(113)	(118)	(122)	(124)	(91)	(72)	(50)	(105)	(97)	(121)	(119)
0.85	(85)	286	108	24	(39)	(67)	(107)	(112)	(116)	(118)	(83)	(63)	(39)	(98)	(89)	(116)	(113)
0.90	(77)	316	128	39	(29)	(58)	(101)	(106)	(110)	(113)	(76)	(54)	(29)	(92)	(82)	(110)	(107)
0.95	(70)	347	148	53	(18)	(50)	(95)	(100)	(105)	(107)	(68)	(45)	(18)	(85)	(75)	(104)	(102)
1.00	(62)	378	168	68	(8)	(41)	(89)	(94)	(99)	(102)	(60)	(36)	(8)	(78)	(68)	(99)	(96)
LCC**	0.70	0.20	0.30	0.40	0.55	0.65	0.90	0.95	0.95	1.00	0.70	0.60	0.55	0.80	0.75	0.95	0.95

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (3 year application) (Pic.5+24Ds)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(142)	(71)	(106)	(122)	(134)	(139)	(146)	(146)	(147)	(147)	(141)	(138)	(134)	(144)	(143)	(147)	(147)
0.25	(135)	(41)	(87)	(108)	(124)	(131)	(140)	(141)	(142)	(143)	(135)	(130)	(124)	(138)	(136)	(142)	(142)
0.30	(128)	(11)	(68)	(95)	(114)	(123)	(135)	(136)	(137)	(138)	(128)	(122)	(114)	(132)	(130)	(137)	(137)
0.35	(122)	19	(49)	(81)	(105)	(115)	(129)	(131)	(133)	(133)	(121)	(113)	(105)	(126)	(123)	(133)	(132)
0.40	(115)	49	(30)	(67)	(95)	(107)	(124)	(126)	(128)	(129)	(114)	(105)	(95)	(120)	(117)	(128)	(127)
0.45	(108)	79	(11)	(54)	(85)	(99)	(119)	(121)	(123)	(124)	(107)	(97)	(85)	(115)	(110)	(123)	(122)
0.50	(101)	109	8	(40)	(76)	(91)	(113)	(116)	(118)	(120)	(100)	(89)	(76)	(109)	(104)	(118)	(117)
0.55	(94)	139	27	(26)	(66)	(83)	(108)	(111)	(114)	(115)	(93)	(81)	(66)	(103)	(97)	(113)	(112)
0.60	(88)	169	46	(13)	(56)	(75)	(103)	(106)	(109)	(110)	(87)	(73)	(56)	(97)	(91)	(109)	(107)
0.65	(81)	199	64	1	(46)	(67)	(97)	(101)	(104)	(106)	(80)	(64)	(46)	(91)	(84)	(104)	(102)
0.70	(74)	229	83	15	(37)	(59)	(92)	(96)	(99)	(101)	(73)	(56)	(37)	(85)	(78)	(99)	(97)
0.75	(67)	258	102	28	(27)	(52)	(87)	(91)	(95)	(96)	(66)	(48)	(27)	(79)	(71)	(94)	(92)
0.80	(61)	288	121	42	(17)	(44)	(81)	(86)	(90)	(92)	(59)	(40)	(17)	(73)	(65)	(89)	(87)
0.85	(54)	318	140	56	(8)	(36)	(76)	(81)	(85)	(87)	(52)	(32)	(8)	(67)	(58)	(85)	(82)
0.90	(47)	348	159	69	2	(28)	(71)	(76)	(80)	(82)	(45)	(24)	2	(61)	(52)	(80)	(77)
0.95	(40)	378	178	83	12	(20)	(65)	(71)	(76)	(78)	(39)	(15)	12	(55)	(45)	(75)	(72)
1.00	(34)	408	197	97	21	(12)	(60)	(66)	(71)	(73)	(32)	(7)	21	(50)	(39)	(70)	(67)
LCC**	0.65	0.20	0.25	0.35	0.45	0.55	0.80	0.85	0.90	0.90	0.65	0.55	0.45	0.75	0.65	0.90	0.85

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 1.0 lb/acre (24D1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(54)	40	(4)	(26)	(42)	(49)	(60)	(61)	(62)	(63)	(53)	(48)	(42)	(57)	(55)	(62)	(61)
0.25	(49)	69	13	(13)	(34)	(43)	(56)	(57)	(59)	(60)	(47)	(41)	(34)	(53)	(50)	(59)	(58)
0.30	(43)	97	31	(1)	(26)	(36)	(52)	(54)	(56)	(56)	(42)	(35)	(26)	(49)	(45)	(55)	(54)
0.35	(38)	126	48	11	(17)	(30)	(48)	(51)	(52)	(53)	(36)	(28)	(17)	(44)	(40)	(52)	(51)
0.40	(33)	155	66	23	(9)	(24)	(45)	(47)	(49)	(50)	(31)	(22)	(9)	(40)	(35)	(49)	(48)
0.45	(28)	184	83	36	(1)	(17)	(41)	(44)	(46)	(47)	(26)	(15)	(1)	(36)	(30)	(46)	(44)
0.50	(23)	212	101	48	7	(11)	(37)	(40)	(43)	(44)	(20)	(8)	7	(31)	(25)	(43)	(41)
0.55	(17)	241	119	60	15	(4)	(33)	(37)	(40)	(41)	(15)	(2)	15	(27)	(20)	(39)	(38)
0.60	(12)	270	136	72	24	2	(29)	(33)	(37)	(38)	(9)	5	24	(23)	(16)	(36)	(34)
0.65	(7)	298	154	85	32	8	(26)	(30)	(33)	(35)	(4)	12	32	(18)	(11)	(33)	(31)
0.70	(2)	327	171	97	40	15	(22)	(26)	(30)	(32)	2	18	40	(14)	(6)	(30)	(27)
0.75	4	356	189	109	48	21	(18)	(23)	(27)	(29)	7	25	48	(10)	(1)	(27)	(24)
0.80	9	385	206	121	56	28	(14)	(19)	(24)	(26)	13	32	56	(5)	4	(23)	(21)
0.85	14	413	224	134	65	34	(10)	(16)	(21)	(23)	18	38	65	(1)	9	(20)	(17)
0.90	19	442	242	146	73	40	(7)	(13)	(18)	(20)	24	45	73	3	14	(17)	(14)
0.95	25	471	259	158	81	47	(3)	(9)	(14)	(17)	29	52	81	8	19	(14)	(11)
1.00	30	499	277	170	89	53	1	(6)	(11)	(14)	35	58	89	12	24	(11)	(7)
LCC**	0.40	0.20	0.20	0.20	0.25	0.30	0.50	0.55	0.60	0.65	0.40	0.30	0.25	0.45	0.40	0.60	0.60

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 2.0 lb/acre (24D2)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(93)	1	(43)	(64)	(81)	(88)	(98)	(100)	(101)	(101)	(92)	(87)	(81)	(96)	(94)	(101)	(100)
0.25	(86)	31	(24)	(51)	(71)	(80)	(93)	(95)	(96)	(97)	(85)	(79)	(71)	(90)	(87)	(96)	(95)
0.30	(79)	61	(5)	(37)	(62)	(72)	(88)	(90)	(92)	(92)	(78)	(71)	(62)	(85)	(81)	(91)	(90)
0.35	(73)	92	14	(24)	(52)	(65)	(83)	(85)	(87)	(88)	(72)	(63)	(52)	(79)	(75)	(87)	(86)
0.40	(66)	122	33	(10)	(42)	(57)	(78)	(80)	(83)	(84)	(65)	(55)	(42)	(73)	(69)	(82)	(81)
0.45	(60)	152	52	4	(33)	(49)	(73)	(76)	(78)	(79)	(58)	(47)	(33)	(68)	(62)	(78)	(76)
0.50	(53)	182	70	17	(23)	(41)	(68)	(71)	(74)	(75)	(51)	(39)	(23)	(62)	(56)	(73)	(72)
0.55	(46)	212	89	31	(14)	(34)	(62)	(66)	(69)	(70)	(44)	(31)	(14)	(56)	(50)	(69)	(67)
0.60	(40)	242	108	44	(4)	(26)	(57)	(61)	(64)	(66)	(38)	(23)	(4)	(50)	(43)	(64)	(62)
0.65	(33)	272	127	58	5	(18)	(52)	(56)	(60)	(62)	(31)	(15)	5	(45)	(37)	(60)	(57)
0.70	(27)	302	146	72	15	(10)	(47)	(51)	(55)	(57)	(24)	(7)	15	(39)	(31)	(55)	(53)
0.75	(20)	332	165	85	25	(2)	(42)	(47)	(51)	(53)	(17)	1	25	(33)	(24)	(50)	(48)
0.80	(14)	362	184	99	34	5	(37)	(42)	(46)	(48)	(11)	9	34	(28)	(18)	(46)	(43)
0.85	(7)	392	203	113	44	13	(32)	(37)	(42)	(44)	(4)	17	44	(22)	(12)	(41)	(38)
0.90	(0)	422	222	126	53	21	(26)	(32)	(37)	(40)	3	25	53	(16)	(6)	(37)	(34)
0.95	6	452	241	140	63	29	(21)	(27)	(33)	(35)	10	33	63	(10)	1	(32)	(29)
1.00	13	482	260	153	72	36	(16)	(23)	(28)	(31)	16	41	72	(5)	7	(28)	(24)
LCC**	0.50	0.20	0.20	0.25	0.35	0.40	0.60	0.65	0.70	0.70	0.45	0.40	0.35	0.55	0.50	0.70	0.65

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (Glph.75)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $12/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(46)	7	(20)	(32)	(40)	(44)	(48)	(49)	(49)	(49)	(45)	(43)	(40)	(47)	(46)	(49)	(49)
0.25	(40)	34	(3)	(20)	(32)	(37)	(44)	(45)	(45)	(46)	(40)	(36)	(32)	(42)	(41)	(45)	(45)
0.30	(35)	61	14	(8)	(24)	(30)	(40)	(41)	(42)	(42)	(34)	(29)	(24)	(38)	(36)	(42)	(41)
0.35	(29)	89	31	4	(15)	(24)	(35)	(37)	(38)	(38)	(28)	(23)	(15)	(33)	(30)	(38)	(37)
0.40	(23)	116	48	16	(7)	(17)	(31)	(33)	(34)	(35)	(23)	(16)	(7)	(28)	(25)	(34)	(33)
0.45	(18)	144	65	28	1	(10)	(27)	(29)	(30)	(31)	(17)	(9)	1	(23)	(20)	(30)	(29)
0.50	(12)	171	82	40	10	(4)	(22)	(25)	(27)	(28)	(11)	(2)	10	(18)	(14)	(26)	(25)
0.55	(7)	198	99	52	18	3	(18)	(21)	(23)	(24)	(6)	5	18	(14)	(9)	(23)	(21)
0.60	(1)	226	116	64	26	10	(14)	(17)	(19)	(20)	0	12	26	(9)	(4)	(19)	(17)
0.65	5	253	133	76	35	16	(10)	(13)	(15)	(17)	6	19	35	(4)	2	(15)	(13)
0.70	10	281	150	89	43	23	(5)	(9)	(12)	(13)	12	26	43	1	7	(11)	(9)
0.75	16	308	167	101	51	30	(1)	(5)	(8)	(9)	17	33	51	6	12	(7)	(6)
0.80	21	335	184	113	60	36	3	(1)	(4)	(6)	23	40	60	10	18	(4)	(2)
0.85	27	363	201	125	68	43	8	3	(0)	(2)	29	47	68	15	23	0	2
0.90	33	390	218	137	76	50	12	7	4	2	34	53	76	20	29	4	6
0.95	38	418	235	149	85	56	16	11	7	5	40	60	85	25	34	8	10
1.00	44	445	252	161	93	63	21	15	11	9	46	67	93	30	39	11	14
LCC**	0.35	0.20	0.20	0.20	0.25	0.30	0.40	0.45	0.45	0.45	0.30	0.30	0.25	0.35	0.35	0.45	0.45

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (GlPic+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated $12/AUM

		Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Base Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(90)	(6)	(46)	(65)	(79)	(86)	(95)	(96)	(97)	(97)	(89)	(85)	(79)	(93)	(91)	(96)	(96)
0.25	(82)	25	(26)	(51)	(69)	(77)	(88)	(90)	(91)	(92)	(82)	(76)	(69)	(86)	(83)	(91)	(90)
0.30	(74)	56	(6)	(36)	(58)	(68)	(82)	(84)	(85)	(86)	(74)	(67)	(58)	(79)	(76)	(85)	(84)
0.35	(67)	87	13	(21)	(48)	(59)	(76)	(78)	(80)	(81)	(66)	(58)	(48)	(72)	(69)	(80)	(79)
0.40	(59)	118	33	(7)	(37)	(51)	(70)	(72)	(74)	(75)	(59)	(49)	(37)	(66)	(61)	(74)	(73)
0.45	(52)	149	53	8	(27)	(42)	(64)	(66)	(69)	(70)	(51)	(40)	(27)	(59)	(54)	(68)	(67)
0.50	(44)	180	73	22	(16)	(33)	(58)	(60)	(63)	(64)	(43)	(31)	(16)	(52)	(47)	(63)	(61)
0.55	(36)	211	93	37	(5)	(24)	(51)	(55)	(58)	(59)	(35)	(22)	(5)	(46)	(39)	(57)	(55)
0.60	(29)	242	113	52	5	(15)	(45)	(49)	(52)	(53)	(28)	(13)	5	(39)	(32)	(52)	(50)
0.65	(21)	273	133	66	16	(7)	(39)	(43)	(46)	(48)	(20)	(4)	16	(32)	(25)	(46)	(44)
0.70	(14)	304	153	81	26	2	(33)	(37)	(41)	(43)	(12)	5	26	(25)	(17)	(40)	(38)
0.75	(6)	335	173	95	37	11	(27)	(31)	(35)	(37)	(5)	15	37	(19)	(10)	(35)	(32)
0.80	2	366	193	110	47	20	(20)	(25)	(30)	(32)	3	24	47	(12)	(3)	(29)	(27)
0.85	9	397	213	125	58	28	(14)	(20)	(24)	(26)	11	33	58	(5)	5	(24)	(21)
0.90	17	428	232	139	69	37	(8)	(14)	(18)	(21)	18	42	69	2	12	(18)	(15)
0.95	24	459	252	154	79	46	(2)	(8)	(13)	(15)	26	51	79	8	19	(12)	(9)
1.00	32	490	272	168	90	55	4	(2)	(7)	(10)	34	60	90	15	27	(7)	(4)
LCC**	0.40	0.20	0.20	0.25	0.30	0.35	0.50	0.55	0.55	0.55	0.40	0.35	0.30	0.45	0.45	0.55	0.55

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (2 year treatment) (GlPic+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated $12/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(53)	22	(14)	(31)	(44)	(49)	(57)	(58)	(59)	(59)	(52)	(49)	(44)	(55)	(54)	(58)	(58)
0.25	(47)	51	3	(19)	(35)	(42)	(52)	(54)	(55)	(55)	(46)	(41)	(35)	(50)	(48)	(54)	(54)
0.30	(41)	80	21	(6)	(26)	(35)	(48)	(49)	(51)	(51)	(40)	(34)	(26)	(45)	(42)	(51)	(50)
0.35	(35)	109	39	7	(18)	(28)	(43)	(45)	(47)	(48)	(34)	(27)	(18)	(40)	(37)	(47)	(46)
0.40	(29)	137	57	19	(9)	(21)	(39)	(41)	(43)	(44)	(29)	(20)	(9)	(35)	(31)	(43)	(42)
0.45	(23)	166	75	32	(0)	(14)	(34)	(37)	(39)	(40)	(23)	(12)	(0)	(30)	(26)	(39)	(37)
0.50	(17)	195	93	45	9	(7)	(30)	(33)	(35)	(36)	(17)	(5)	9	(25)	(20)	(35)	(33)
0.55	(12)	224	111	57	17	(0)	(25)	(29)	(31)	(32)	(11)	2	17	(20)	(14)	(31)	(29)
0.60	(6)	253	129	70	26	7	(21)	(24)	(27)	(29)	(5)	10	26	(15)	(9)	(27)	(25)
0.65	0	281	147	83	35	14	(16)	(20)	(23)	(25)	1	17	35	(10)	(3)	(23)	(21)
0.70	6	310	164	96	44	21	(12)	(16)	(19)	(21)	7	24	44	(5)	2	(19)	(17)
0.75	12	339	182	108	52	28	(8)	(12)	(16)	(17)	13	31	52	0	8	(15)	(13)
0.80	18	368	200	121	61	35	(3)	(8)	(12)	(14)	19	39	61	5	14	(11)	(9)
0.85	24	396	218	134	70	42	1	(3)	(8)	(10)	25	46	70	10	19	(7)	(5)
0.90	30	425	236	146	79	49	6	1	(4)	(6)	31	53	79	15	25	(3)	(1)
0.95	35	454	254	159	87	56	10	5	0	(2)	37	60	87	20	30	1	3
1.00	41	483	272	172	96	63	15	9	4	1	43	68	96	25	36	5	8
LCC**	0.35	0.20	0.20	0.20	0.25	0.30	0.45	0.45	0.50	0.50	0.35	0.30	0.25	0.40	0.35	0.50	0.50

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (Pic.25)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $19/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(61)	68	5	(24)	(46)	(55)	(69)	(70)	(72)	(72)	(61)	(54)	(46)	(66)	(63)	(71)	(71)
0.25	(50)	116	36	(2)	(30)	(42)	(59)	(62)	(63)	(64)	(49)	(40)	(30)	(56)	(52)	(63)	(62)
0.30	(38)	164	67	21	(14)	(29)	(50)	(53)	(55)	(56)	(38)	(27)	(14)	(46)	(41)	(55)	(54)
0.35	(27)	212	97	43	2	(15)	(41)	(44)	(47)	(48)	(26)	(13)	2	(36)	(30)	(47)	(45)
0.40	(16)	260	128	65	18	(2)	(32)	(36)	(39)	(40)	(15)	1	18	(26)	(19)	(38)	(37)
0.45	(4)	307	158	88	34	11	(23)	(27)	(30)	(32)	(3)	14	34	(16)	(8)	(30)	(28)
0.50	7	355	189	110	50	24	(14)	(18)	(22)	(24)	9	28	50	(6)	3	(22)	(19)
0.55	18	403	219	132	66	37	(5)	(10)	(14)	(16)	20	41	66	4	14	(14)	(11)
0.60	30	451	250	154	82	51	5	(1)	(6)	(8)	32	55	82	14	25	(5)	(2)
0.65	41	499	281	177	98	64	14	8	2	(0)	43	69	98	25	36	3	6
0.70	53	547	311	199	114	77	23	16	11	8	55	82	114	35	47	11	15
0.75	64	595	342	221	130	90	32	25	19	16	66	96	130	45	58	19	23
0.80	75	643	372	244	146	103	41	34	27	24	78	109	146	55	69	28	32
0.85	87	691	403	266	162	117	50	42	35	32	89	123	162	65	79	36	40
0.90	98	739	433	288	178	130	59	51	43	40	101	137	178	75	90	44	49
0.95	109	787	464	310	194	143	69	60	52	48	112	150	194	85	101	53	57
1.00	121	835	495	330	210	156	78	68	60	56	124	164	210	95	112	61	66
LCC**	0.25	0.20	0.20	0.20	0.20	0.25	0.30	0.35	0.35	0.35	0.25	0.20	0.20	0.30	0.25	0.35	0.35

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (Pic.5)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $19/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(116)	16	(48)	(78)	(100)	(110)	(124)	(126)	(127)	(128)	(116)	(109)	(100)	(121)	(118)	(127)	(126)
0.25	(105)	64	(18)	(56)	(85)	(97)	(115)	(117)	(119)	(120)	(105)	(95)	(85)	(111)	(107)	(119)	(118)
0.30	(94)	112	13	(34)	(69)	(84)	(106)	(109)	(111)	(113)	(93)	(82)	(69)	(102)	(97)	(111)	(110)
0.35	(83)	160	43	(12)	(53)	(71)	(98)	(101)	(104)	(105)	(82)	(69)	(53)	(92)	(86)	(103)	(102)
0.40	(72)	208	74	10	(37)	(58)	(89)	(93)	(96)	(97)	(71)	(55)	(37)	(82)	(75)	(95)	(93)
0.45	(61)	256	104	33	(22)	(46)	(80)	(84)	(88)	(90)	(60)	(42)	(22)	(73)	(65)	(87)	(85)
0.50	(50)	304	135	55	(6)	(33)	(71)	(76)	(80)	(82)	(49)	(29)	(6)	(63)	(54)	(80)	(77)
0.55	(39)	352	165	77	10	(20)	(62)	(68)	(72)	(74)	(37)	(16)	10	(53)	(44)	(72)	(69)
0.60	(28)	400	196	99	26	(7)	(54)	(59)	(64)	(67)	(26)	(2)	26	(43)	(33)	(64)	(61)
0.65	(17)	448	226	121	41	6	(45)	(51)	(56)	(59)	(15)	11	41	(34)	(22)	(56)	(53)
0.70	(6)	496	257	143	57	19	(36)	(43)	(48)	(51)	(4)	24	57	(24)	(12)	(48)	(44)
0.75	5	544	287	165	73	32	(27)	(34)	(41)	(44)	8	38	73	(14)	(1)	(40)	(36)
0.80	16	592	318	187	89	45	(18)	(26)	(33)	(36)	19	51	89	(5)	10	(32)	(28)
0.85	28	639	348	209	104	58	(10)	(18)	(25)	(28)	30	64	104	5	20	(24)	(20)
0.90	39	687	379	231	120	71	(1)	(9)	(17)	(21)	41	78	120	15	31	(16)	(12)
0.95	50	735	409	254	136	84	8	(1)	(9)	(13)	52	91	136	24	41	(8)	(3)
1.00	61	783	439	276	152	97	17	7	(1)	(5)	64	104	152	34	52	(0)	5
LCC**	0.40	0.20	0.20	0.20	0.30	0.35	0.50	0.50	0.55	0.55	0.40	0.35	0.30	0.45	0.40	0.55	0.50

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 1.0 lb/acre (Pic1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $19/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(184)	(136)	(164)	(175)	(181)	(183)	(185)	(185)	(185)	(195)	(184)	(183)	(181)	(185)	(185)	(185)	(185)
0.25	(176)	(93)	(137)	(156)	(168)	(173)	(179)	(179)	(180)	(180)	(175)	(172)	(168)	(178)	(176)	(180)	(179)
0.30	(167)	(49)	(110)	(137)	(155)	(163)	(172)	(173)	(174)	(174)	(166)	(162)	(155)	(170)	(168)	(174)	(173)
0.35	(159)	(6)	(83)	(118)	(142)	(152)	(166)	(167)	(168)	(169)	(158)	(151)	(142)	(163)	(160)	(168)	(168)
0.40	(150)	38	(57)	(99)	(129)	(142)	(159)	(161)	(163)	(164)	(149)	(140)	(129)	(156)	(152)	(163)	(162)
0.45	(141)	81	(30)	(80)	(116)	(132)	(153)	(155)	(157)	(158)	(140)	(130)	(116)	(148)	(144)	(157)	(156)
0.50	(133)	125	(3)	(61)	(103)	(121)	(146)	(149)	(151)	(153)	(131)	(119)	(103)	(141)	(135)	(151)	(150)
0.55	(124)	168	24	(42)	(91)	(111)	(140)	(143)	(146)	(147)	(123)	(108)	(91)	(134)	(127)	(146)	(144)
0.60	(116)	212	51	(23)	(78)	(101)	(133)	(137)	(140)	(142)	(114)	(98)	(78)	(126)	(119)	(140)	(138)
0.65	(107)	256	78	(4)	(65)	(90)	(127)	(131)	(134)	(136)	(105)	(87)	(65)	(119)	(111)	(134)	(132)
0.70	(98)	299	105	15	(52)	(80)	(120)	(125)	(129)	(131)	(96)	(76)	(52)	(112)	(103)	(128)	(126)
0.75	(90)	343	131	34	(39)	(70)	(114)	(119)	(123)	(125)	(88)	(65)	(39)	(104)	(94)	(123)	(120)
0.80	(81)	386	158	53	(26)	(59)	(107)	(113)	(118)	(120)	(79)	(55)	(26)	(97)	(86)	(117)	(114)
0.85	(72)	430	185	72	(13)	(49)	(100)	(107)	(112)	(114)	(70)	(44)	(13)	(90)	(78)	(111)	(108)
0.90	(64)	473	212	90	0	(39)	(94)	(101)	(106)	(109)	(61)	(33)	0	(82)	(70)	(106)	(102)
0.95	(55)	517	239	109	13	(28)	(87)	(94)	(101)	(104)	(52)	(23)	13	(75)	(62)	(100)	(96)
1.00	(47)	560	266	128	26	(18)	(81)	(88)	(95)	(98)	(44)	(12)	26	(68)	(53)	(94)	(90)
LCC**	0.65	0.20	0.30	0.35	0.45	0.55	0.85	0.90	0.95	0.95	0.65	0.55	0.45	0.75	0.70	0.95	0.90

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 2.0 lb/acre (Pic2)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $19/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(212)	(99)	(155)	(181)	(199)	(207)	(218)				(212)	(206)	(199)	(216)	(214)		
0.25	(204)	(54)	(128)	(161)	(186)	(197)	(212)				(203)	(196)	(186)	(209)	(205)		
0.30	(195)	(9)	(100)	(142)	(173)	(187)	(206)				(195)	(185)	(173)	(202)	(197)		
0.35	(187)	36	(72)	(123)	(160)	(176)	(199)				(186)	(174)	(160)	(194)	(189)		
0.40	(178)	80	(45)	(103)	(147)	(166)	(193)				(177)	(163)	(147)	(187)	(181)		
0.45	(170)	125	(17)	(84)	(134)	(156)	(187)				(169)	(153)	(134)	(180)	(173)		
0.50	(161)	170	10	(65)	(121)	(145)	(180)				(160)	(142)	(121)	(173)	(165)		
0.55	(152)	215	38	(45)	(108)	(135)	(174)				(151)	(131)	(108)	(166)	(157)		
0.60	(144)	260	66	(26)	(94)	(125)	(168)				(143)	(120)	(94)	(158)	(149)		
0.65	(135)	305	93	(7)	(81)	(114)	(161)				(134)	(110)	(81)	(151)	(141)		
0.70	(127)	349	121	13	(68)	(104)	(155)				(125)	(99)	(68)	(144)	(132)		
0.75	(118)	394	148	32	(55)	(93)	(148)				(117)	(88)	(55)	(137)	(124)		
0.80	(110)	439	176	52	(42)	(83)	(142)				(108)	(77)	(42)	(129)	(116)		
0.85	(101)	484	203	71	(29)	(73)	(136)				(99)	(67)	(29)	(122)	(108)		
0.90	(93)	529	231	90	(16)	(62)	(129)				(91)	(56)	(16)	(115)	(100)		
0.95	(84)	574	259	110	(3)	(52)	(123)				(82)	(45)	(3)	(108)	(92)		
1.00	(75)	619	286	129	11	(42)	(117)				(73)	(34)	11	(101)	(84)		
LCC**	0.75	0.20	0.25	0.35	0.50	0.65	1.00	na	na	na	0.75	0.60	0.50	0.85	0.80	na	na

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.25+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $19/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(82)	50	(14)	(44)	(66)	(76)	(90)	(92)	(93)	(94)	(82)	(75)	(66)	(87)	(84)	(93)	(92)
0.25	(70)	98	17	(21)	(50)	(62)	(80)	(82)	(84)	(85)	(70)	(60)	(50)	(76)	(72)	(84)	(83)
0.30	(58)	147	49	2	(33)	(48)	(71)	(73)	(76)	(77)	(58)	(46)	(33)	(66)	(61)	(75)	(74)
0.35	(46)	196	80	25	(16)	(35)	(61)	(64)	(67)	(68)	(45)	(32)	(16)	(55)	(49)	(67)	(65)
0.40	(35)	245	111	48	0	(21)	(51)	(55)	(58)	(60)	(33)	(18)	0	(45)	(38)	(58)	(56)
0.45	(23)	294	143	71	17	(7)	(42)	(46)	(49)	(51)	(21)	(4)	17	(34)	(26)	(49)	(47)
0.50	(11)	343	174	94	33	7	(32)	(37)	(41)	(43)	(9)	10	33	(24)	(15)	(40)	(38)
0.55	1	392	205	117	50	20	(22)	(27)	(32)	(34)	3	25	50	(13)	(3)	(31)	(29)
0.60	13	441	237	140	67	34	(13)	(18)	(23)	(26)	15	39	67	(2)	8	(23)	(20)
0.65	25	490	268	163	83	48	(3)	(9)	(14)	(17)	27	53	83	8	20	(14)	(11)
0.70	37	538	300	186	100	62	7	0	(6)	(9)	39	67	100	19	31	(5)	(2)
0.75	49	587	331	209	116	76	16	9	3	(0)	51	81	116	29	43	4	7
0.80	61	636	362	232	133	89	26	18	12	8	63	96	133	40	54	12	16
0.85	73	685	394	255	150	103	36	28	20	17	75	110	150	50	65	21	25
0.90	85	734	425	278	166	117	45	37	29	25	87	124	166	61	77	30	35
0.95	97	783	456	301	183	131	55	46	38	34	99	138	183	71	88	39	44
1.00	109	832	488	324	200	145	65	55	47	42	112	152	200	82	100	47	53
LCC**	0.30	0.20	0.20	0.20	0.20	0.25	0.30	0.35	0.40	0.40	0.30	0.25	0.20	0.35	0.30	0.40	0.40

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.5+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $19/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(166)	(44)	(104)	(131)	(152)	(160)	(173)	(174)	(175)	(176)	(165)	(159)	(152)	(170)	(167)	(175)	(174)
0.25	(154)	5	(72)	(108)	(135)	(146)	(163)	(165)	(166)	(167)	(153)	(145)	(135)	(159)	(156)	(166)	(165)
0.30	(142)	54	(41)	(85)	(118)	(133)	(153)	(156)	(158)	(159)	(141)	(131)	(118)	(149)	(144)	(157)	(156)
0.35	(130)	103	(9)	(62)	(102)	(119)	(143)	(146)	(149)	(150)	(129)	(116)	(102)	(138)	(133)	(149)	(147)
0.40	(118)	152	22	(39)	(85)	(105)	(134)	(137)	(140)	(142)	(117)	(102)	(85)	(127)	(121)	(140)	(138)
0.45	(106)	200	53	(16)	(68)	(91)	(124)	(128)	(131)	(133)	(105)	(88)	(68)	(117)	(109)	(131)	(129)
0.50	(94)	249	85	7	(51)	(77)	(114)	(119)	(123)	(124)	(92)	(74)	(51)	(106)	(98)	(122)	(120)
0.55	(82)	298	116	30	(35)	(63)	(104)	(109)	(114)	(116)	(80)	(59)	(35)	(96)	(86)	(113)	(111)
0.60	(70)	347	148	53	(18)	(50)	(95)	(100)	(105)	(107)	(68)	(45)	(18)	(85)	(75)	(104)	(102)
0.65	(58)	396	179	76	(1)	(36)	(85)	(91)	(96)	(99)	(56)	(31)	(1)	(74)	(63)	(96)	(92)
0.70	(46)	445	211	99	15	(22)	(75)	(82)	(87)	(90)	(44)	(17)	15	(64)	(52)	(87)	(83)
0.75	(34)	494	242	122	32	(8)	(65)	(72)	(79)	(82)	(32)	(2)	32	(53)	(40)	(78)	(74)
0.80	(22)	543	273	145	49	6	(56)	(63)	(70)	(73)	(20)	12	49	(42)	(29)	(69)	(65)
0.85	(10)	592	305	168	65	20	(46)	(54)	(61)	(64)	(7)	26	65	(32)	(17)	(60)	(56)
0.90	2	641	336	191	82	34	(36)	(45)	(52)	(56)	5	40	82	(21)	(6)	(51)	(47)
0.95	14	690	368	214	99	47	(27)	(36)	(43)	(47)	17	55	99	(11)	6	(43)	(38)
1.00	26	739	399	238	115	61	(17)	(26)	(35)	(39)	29	69	115	0	18	(34)	(29)
LCC**	0.45	0.20	0.20	0.25	0.35	0.40	0.55	0.60	0.60	0.65	0.45	0.40	0.35	0.50	0.50	0.60	0.60

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (3 year application) (Pic.5+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated $19/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(126)	(1)	(62)	(90)	(111)	(120)	(133)	(135)	(136)	(137)	(125)	(119)	(111)	(130)	(127)	(136)	(135)
0.25	(115)	47	(32)	(68)	(96)	(108)	(125)	(127)	(128)	(129)	(115)	(106)	(96)	(121)	(117)	(128)	(127)
0.30	(105)	94	(2)	(47)	(80)	(95)	(116)	(119)	(121)	(122)	(104)	(93)	(80)	(112)	(107)	(121)	(119)
0.35	(94)	141	28	(25)	(65)	(83)	(108)	(111)	(113)	(115)	(93)	(80)	(65)	(102)	(97)	(113)	(111)
0.40	(83)	189	58	(3)	(50)	(70)	(99)	(103)	(106)	(107)	(82)	(67)	(50)	(93)	(86)	(105)	(104)
0.45	(72)	236	88	18	(34)	(57)	(91)	(95)	(98)	(100)	(71)	(54)	(34)	(84)	(76)	(98)	(96)
0.50	(62)	283	118	40	(19)	(45)	(82)	(87)	(91)	(93)	(60)	(41)	(19)	(74)	(66)	(90)	(88)
0.55	(51)	331	148	61	(4)	(32)	(74)	(79)	(83)	(85)	(49)	(28)	(4)	(65)	(56)	(83)	(80)
0.60	(40)	378	178	83	12	(20)	(65)	(71)	(76)	(78)	(39)	(15)	12	(55)	(45)	(75)	(72)
0.65	(30)	426	208	105	27	(7)	(57)	(63)	(68)	(71)	(28)	(2)	27	(46)	(35)	(67)	(64)
0.70	(19)	473	238	126	42	5	(48)	(55)	(60)	(63)	(17)	10	42	(37)	(25)	(60)	(56)
0.75	(8)	520	268	148	58	18	(40)	(47)	(53)	(56)	(6)	23	58	(27)	(14)	(52)	(49)
0.80	3	568	298	170	73	30	(31)	(39)	(45)	(49)	5	36	73	(18)	(4)	(45)	(41)
0.85	13	615	328	191	88	43	(23)	(31)	(38)	(41)	16	49	88	(9)	6	(37)	(33)
0.90	24	662	358	213	104	55	(14)	(23)	(30)	(34)	27	62	104	1	16	(29)	(25)
0.95	35	710	388	235	119	68	(6)	(15)	(23)	(27)	37	75	119	10	27	(22)	(17)
1.00	45	757	418	256	134	81	3	(7)	(15)	(19)	48	88	134	19	37	(14)	(9)
LCC**	0.40	0.20	0.20	0.25	0.30	0.35	0.50	0.55	0.60	0.60	0.40	0.35	0.30	0.45	0.45	0.55	0.55

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM Break-even carrying capacity unchanged

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 1.0 lb/acre (24D1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $19/AUM

	Base	Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(42)	107	37	3	(23)	(34)	(51)	(53)	(55)	(55)	(40)	(33)	(23)	(47)	(43)	(54)	(53)
0.25	(33)	153	64	22	(10)	(24)	(45)	(47)	(50)	(51)	(31)	(22)	(10)	(40)	(36)	(49)	(48)
0.30	(25)	198	92	42	3	(14)	(39)	(42)	(45)	(46)	(23)	(12)	3	(33)	(28)	(44)	(43)
0.35	(17)	243	120	61	16	(4)	(33)	(36)	(40)	(41)	(14)	(1)	16	(27)	(20)	(39)	(37)
0.40	(9)	289	148	80	29	6	(27)	(31)	(34)	(36)	(5)	10	29	(20)	(12)	(34)	(32)
0.45	(0)	334	176	100	42	16	(21)	(25)	(29)	(31)	3	20	42	(13)	(4)	(29)	(27)
0.50	8	380	204	119	55	27	(15)	(20)	(24)	(27)	12	31	55	(6)	3	(24)	(21)
0.55	16	425	231	139	68	37	(9)	(15)	(19)	(22)	20	41	68	1	11	(19)	(16)
0.60	25	471	259	158	81	47	(3)	(9)	(14)	(17)	29	52	81	8	19	(14)	(11)
0.65	33	516	287	177	94	57	3	(4)	(9)	(12)	38	62	94	15	27	(9)	(5)
0.70	41	562	315	197	107	67	9	2	(4)	(7)	46	73	107	22	35	(4)	0
0.75	49	607	343	216	120	77	15	7	1	(3)	55	83	120	28	43	1	5
0.80	58	653	371	236	133	57	21	13	6	2	64	94	133	35	50	7	11
0.85	66	698	398	255	146	98	27	18	11	7	72	104	146	42	58	12	16
0.90	74	743	426	274	159	108	33	24	16	12	81	115	159	49	66	17	22
0.95	82	789	454	294	172	118	39	29	21	17	90	125	172	56	74	22	27
1.00	91	834	482	313	185	128	45	35	26	22	98	136	185	63	82	27	32
LCC**	0.25	0.20	0.20	0.20	0.20	0.20	0.35	0.35	0.40	0.40	0.25	0.20	0.20	0.30	0.25	0.40	0.35

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 2.0 lb/acre (24D2)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $19/AUM

											Infestation						
	Base	Infestation Sizes (acres)									Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(77)	72	1	(33)	(58)	(70)	(86)	(88)	(90)	(91)	(76)	(68)	(58)	(83)	(79)	(90)	(89)
0.25	(67)	119	31	(11)	(43)	(57)	(78)	(81)	(83)	(84)	(65)	(55)	(43)	(74)	(69)	(83)	(81)
0.30	(56)	167	61	10	(28)	(45)	(70)	(73)	(76)	(77)	(55)	(43)	(28)	(65)	(59)	(75)	(74)
0.35	(46)	214	91	32	(13)	(33)	(62)	(65)	(69)	(70)	(44)	(30)	(13)	(56)	(49)	(68)	(66)
0.40	(35)	262	121	54	2	(21)	(54)	(58)	(61)	(63)	(33)	(17)	2	(47)	(39)	(61)	(59)
0.45	(25)	310	151	75	17	(8)	(46)	(50)	(54)	(56)	(22)	(5)	17	(38)	(29)	(54)	(51)
0.50	(15)	357	181	97	33	4	(38)	(43)	(47)	(49)	(12)	8	33	(29)	(19)	(47)	(44)
0.55	(4)	405	211	118	48	16	(29)	(35)	(40)	(42)	(1)	21	48	(19)	(9)	(39)	(36)
0.60	6	452	241	140	63	29	(21)	(27)	(33)	(35)	10	33	63	(10)	1	(32)	(29)
0.65	17	500	271	161	78	41	(13)	(20)	(25)	(28)	20	46	78	(1)	11	(25)	(21)
0.70	27	548	301	183	93	53	(5)	(12)	(18)	(21)	31	59	93	8	21	(18)	(14)
0.75	38	595	331	204	108	65	3	(4)	(11)	(14)	42	71	108	17	31	(10)	(6)
0.80	48	643	361	226	123	78	11	3	(4)	(7)	53	84	123	26	41	(3)	1
0.85	58	690	391	248	139	90	19	11	3	(0)	63	97	139	35	51	4	9
0.90	69	738	421	269	154	102	28	18	11	7	74	110	154	44	61	11	16
0.95	79	786	451	291	169	115	36	26	18	14	85	122	169	53	71	19	24
1.00	90	833	481	312	184	127	44	34	25	21	95	135	184	62	81	26	31
LCC**	0.30	0.20	0.20	0.20	0.20	0.25	0.40	0.40	0.45	0.45	0.30	0.25	0.20	0.35	0.30	0.45	0.40

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (Glph.75)
Control Strategy Treat the Entire Infestation
Scenario Evaluated $19/AUM

		Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Base Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(33)	70	20	(4)	(21)	(28)	(38)	(39)	(40)	(41)	(32)	(27)	(21)	(36)	(34)	(40)	(40)
0.25	(24)	114	46	15	(8)	(18)	(31)	(33)	(34)	(35)	(23)	(16)	(8)	(28)	(25)	(34)	(33)
0.30	(15)	157	73	34	5	(7)	(25)	(27)	(28)	(29)	(14)	(5)	5	(21)	(17)	(28)	(27)
0.35	(6)	201	100	53	19	4	(18)	(20)	(22)	(24)	(5)	6	19	(13)	(8)	(22)	(21)
0.40	3	244	127	72	32	14	(11)	(14)	(17)	(18)	4	17	32	(6)	0	(16)	(15)
0.45	12	287	154	92	45	25	(4)	(8)	(11)	(12)	13	28	45	2	8	(10)	(8)
0.50	21	331	181	111	58	35	3	(1)	(5)	(6)	22	38	58	10	17	(4)	(2)
0.55	29	374	208	130	71	46	9	5	1	(1)	31	49	71	17	25	2	4
0.60	38	418	235	149	85	56	16	11	7	5	40	60	85	25	34	8	10
0.65	47	461	262	168	98	67	23	18	13	11	49	71	98	32	42	14	16
0.70	56	504	289	187	111	78	30	24	19	17	58	82	111	40	51	20	23
0.75	65	548	315	206	124	88	37	30	25	22	67	93	124	48	59	26	29
0.80	74	591	342	225	137	99	44	37	31	28	76	104	137	55	68	32	35
0.85	83	634	369	244	150	109	50	43	37	34	85	115	150	63	76	38	41
0.90	92	678	396	263	164	120	57	50	43	40	94	126	164	71	85	44	48
0.95	100	721	423	282	177	130	64	56	49	46	103	137	177	78	93	50	54
1.00	109	765	450	301	190	141	71	62	55	51	112	148	190	86	102	56	60
LCC**	0.20	0.20	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.30	0.20	0.20	0.20	0.25	0.20	0.30	0.30

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (GlPic+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated $19/AUM

											Infestation						
	Base	Infestation Sizes (acres)									Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(72)	67	0	(31)	(55)	(65)	(80)	(82)	(84)	(84)	(71)	(64)	(55)	(77)	(74)	(83)	(82)
0.25	(60)	116	32	(8)	(38)	(51)	(70)	(73)	(75)	(76)	(59)	(49)	(38)	(66)	(62)	(74)	(73)
0.30	(48)	165	63	15	(21)	(37)	(61)	(63)	(66)	(67)	(47)	(35)	(21)	(56)	(50)	(66)	(64)
0.35	(36)	214	95	38	(5)	(24)	(51)	(54)	(57)	(58)	(35)	(21)	(5)	(45)	(39)	(57)	(55)
0.40	(24)	263	126	61	12	(10)	(41)	(45)	(48)	(50)	(23)	(7)	12	(34)	(27)	(48)	(46)
0.45	(12)	312	158	84	29	4	(31)	(36)	(39)	(41)	(10)	8	29	(24)	(16)	(39)	(37)
0.50	0	361	189	108	46	18	(22)	(26)	(31)	(33)	2	22	46	(13)	(4)	(30)	(28)
0.55	12	410	221	131	62	32	(12)	(17)	(22)	(24)	14	36	62	(2)	8	(21)	(18)
0.60	24	459	252	154	79	46	(2)	(8)	(13)	(15)	26	51	79	8	19	(12)	(9)
0.65	36	508	284	177	96	60	8	1	(4)	(7)	38	65	96	19	31	(3)	(0)
0.70	49	557	315	200	113	74	18	11	5	2	51	79	113	30	42	5	9
0.75	61	606	347	223	129	88	27	20	14	10	63	94	129	40	54	14	18
0.80	73	656	378	246	146	102	37	29	22	19	75	108	146	51	66	23	27
0.85	85	705	410	269	163	116	47	39	31	28	87	122	163	62	77	32	36
0.90	97	754	441	293	180	129	57	48	40	36	99	136	180	72	89	41	46
0.95	109	803	473	316	196	143	66	57	49	45	112	151	196	83	100	50	55
1.00	121	852	504	339	213	157	76	66	58	54	124	165	213	94	112	59	64
LCC**	0.25	0.20	0.20	0.20	0.20	0.25	0.35	0.35	0.35	0.35	0.25	0.25	0.20	0.30	0.30	0.35	0.35

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (2 year treatment) (GlPic+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated $19/AUM

		Infestation Sizes (acres)									Infestation Density	1-Acre Infestation		5-Acre Infestation		50-Acre Infestation	
	Base Scenario*	0.022	0.05	0.1	0.25	0.5	5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre																
0.20	(39)	89	27	(2)	(23)	(33)	(46)	(48)	(49)	(50)	(38)	(32)	(23)	(44)	(40)	(49)	(48)
0.25	(30)	135	56	18	(10)	(22)	(39)	(41)	(43)	(44)	(29)	(20)	(10)	(36)	(32)	(43)	(42)
0.30	(20)	181	84	38	4	(11)	(32)	(35)	(37)	(38)	(20)	(9)	4	(28)	(23)	(37)	(35)
0.35	(11)	226	112	59	18	0	(25)	(28)	(31)	(32)	(10)	3	18	(20)	(14)	(31)	(29)
0.40	(2)	272	141	79	32	11	(18)	(22)	(25)	(26)	(1)	14	32	(12)	(5)	(24)	(22)
0.45	7	317	169	99	46	23	(11)	(15)	(18)	(20)	9	26	46	(4)	4	(18)	(16)
0.50	17	363	197	119	60	34	(4)	(8)	(12)	(14)	18	37	60	4	13	(12)	(9)
0.55	26	408	226	139	74	45	3	(2)	(6)	(8)	28	49	74	12	22	(6)	(3)
0.60	35	454	254	159	87	56	10	5	0	(2)	37	60	87	20	30	1	3
0.65	45	500	282	179	101	67	18	11	6	4	47	72	101	28	39	7	10
0.70	54	545	311	199	115	78	25	18	12	10	56	83	115	36	48	13	16
0.75	63	591	339	219	129	89	32	25	19	16	65	95	129	44	57	19	23
0.80	73	636	367	239	143	100	39	31	25	22	75	106	143	52	66	25	29
0.85	82	682	396	260	157	111	46	38	31	28	84	118	157	60	75	32	36
0.90	91	727	424	280	171	123	53	45	37	34	94	129	171	68	84	38	42
0.95	101	773	452	300	185	134	60	51	43	40	103	141	185	76	92	44	49
1.00	110	819	481	320	198	145	67	58	50	45	113	152	198	84	101	50	55
LCC**	0.25	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30	0.35	0.25	0.20	0.20	0.30	0.25	0.30	0.30

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

$15.50/AUM

$19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (Pic.25)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Reduced Herbicide Costs (20%)

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(52)	(39)	(47)	(59)	(61)	(61)	(52)	(46)	(39)
0.25	(43)	(26)	(36)	(52)	(54)	(55)	(42)	(35)	(26)
0.30	(34)	(13)	(26)	(45)	(47)	(48)	(33)	(24)	(13)
0.35	(24)	(0)	(15)	(38)	(40)	(42)	(23)	(13)	(0)
0.40	(15)	13	(4)	(31)	(34)	(35)	(14)	(2)	13
0.45	(6)	26	7	(24)	(27)	(28)	(5)	9	26
0.50	4	39	17	(17)	(20)	(22)	5	20	39
0.55	13	52	28	(10)	(14)	(15)	14	32	52
0.60	22	65	39	(3)	(7)	(9)	24	43	65
0.65	31	78	50	4	(0)	(2)	33	54	78
0.70	41	91	60	11	6	4	42	65	91
0.75	50	104	71	18	13	11	52	76	104
0.80	59	117	82	25	20	17	61	87	117
0.85	69	130	93	32	27	24	71	98	130
0.90	78	143	104	39	33	30	80	109	143
0.95	87	156	114	46	40	37	89	120	156
1.00	96	169	125	53	47	43	99	131	169
LCC**	0.25	0.20	0.25	0.35	0.35	0.35	0.25	0.25	0.20

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (Pic.5)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Reduced Herbicide Costs (20%)

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(96)	(83)	(91)	(103)	(104)	(105)	(95)	(89)	(83)
0.25	(87)	(70)	(80)	(97)	(98)	(99)	(86)	(79)	(70)
0.30	(78)	(57)	(69)	(90)	(92)	(93)	(77)	(68)	(57)
0.35	(69)	(44)	(59)	(83)	(85)	(86)	(68)	(57)	(44)
0.40	(60)	(31)	(48)	(76)	(79)	(80)	(59)	(46)	(31)
0.45	(51)	(18)	(38)	(69)	(72)	(74)	(49)	(35)	(18)
0.50	(41)	(6)	(27)	(63)	(66)	(68)	(40)	(24)	(6)
0.55	(32)	7	(17)	(56)	(60)	(61)	(31)	(13)	7
0.60	(23)	20	(6)	(49)	(53)	(55)	(22)	(3)	20
0.65	(14)	33	4	(42)	(47)	(49)	(13)	8	33
0.70	(5)	46	15	(36)	(40)	(43)	(4)	19	46
0.75	4	59	25	(29)	(34)	(36)	5	30	59
0.80	13	72	36	(22)	(27)	(30)	15	41	72
0.85	22	84	46	(15)	(21)	(24)	24	52	84
0.90	31	97	57	(8)	(15)	(18)	33	63	97
0.95	40	110	68	(2)	(8)	(11)	42	74	110
1.00	49	123	78	5	(2)	(5)	51	84	123
LCC**	0.40	0.30	0.35	0.50	0.55	0.55	0.40	0.35	0.30

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 1.0 lb/acre (Pic1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Reduced Herbicide Costs (20%)

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(149)	(147)	(149)	(150)	(150)	(150)	(149)	(148)	(147)
0.25	(142)	(136)	(140)	(145)	(146)	(146)	(142)	(140)	(136)
0.30	(135)	(126)	(132)	(140)	(141)	(141)	(135)	(131)	(126)
0.35	(128)	(115)	(123)	(135)	(136)	(137)	(127)	(122)	(115)
0.40	(121)	(104)	(115)	(130)	(132)	(132)	(120)	(113)	(104)
0.45	(114)	(94)	(106)	(125)	(127)	(128)	(113)	(105)	(94)
0.50	(107)	(83)	(98)	(120)	(122)	(123)	(106)	(96)	(83)
0.55	(100)	(73)	(89)	(116)	(118)	(119)	(99)	(87)	(73)
0.60	(93)	(62)	(81)	(111)	(113)	(115)	(92)	(78)	(62)
0.65	(86)	(51)	(73)	(106)	(109)	(110)	(85)	(70)	(51)
0.70	(79)	(41)	(64)	(101)	(104)	(106)	(77)	(61)	(41)
0.75	(72)	(30)	(56)	(96)	(99)	(101)	(70)	(52)	(30)
0.80	(65)	(20)	(47)	(91)	(95)	(97)	(63)	(43)	(20)
0.85	(58)	(9)	(39)	(86)	(90)	(92)	(56)	(35)	(9)
0.90	(51)	1	(30)	(81)	(86)	(88)	(49)	(26)	1
0.95	(44)	12	(22)	(76)	(81)	(83)	(42)	(17)	12
1.00	(37)	23	(14)	(71)	(76)	(79)	(35)	(9)	23
LCC**	0.65	0.45	0.55	0.90	0.95	0.95	0.65	0.55	0.45

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.25+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Reduced Herbicide Costs (20%)

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(69)	(56)	(64)	(76)	(78)	(78)	(68)	(63)	(56)
0.25	(59)	(42)	(52)	(69)	(70)	(71)	(59)	(51)	(42)
0.30	(49)	(29)	(41)	(61)	(63)	(64)	(49)	(39)	(29)
0.35	(40)	(15)	(30)	(54)	(56)	(57)	(39)	(28)	(15)
0.40	(30)	(2)	(19)	(47)	(49)	(50)	(29)	(16)	(2)
0.45	(20)	12	(8)	(39)	(42)	(43)	(19)	(5)	12
0.50	(10)	26	4	(32)	(35)	(36)	(9)	7	26
0.55	(1)	39	15	(24)	(28)	(30)	1	18	39
0.60	9	53	26	(17)	(21)	(23)	10	30	53
0.65	19	66	37	(9)	(13)	(16)	20	41	66
0.70	29	80	49	(2)	(6)	(9)	30	53	80
0.75	38	93	60	6	1	(2)	40	65	93
0.80	48	107	71	13	8	5	50	76	107
0.85	58	120	82	21	15	12	60	88	120
0.90	67	134	94	28	22	19	70	99	134
0.95	77	147	105	36	29	26	79	111	147
1.00	87	161	116	43	36	33	89	122	161
LCC**	0.30	0.25	0.25	0.40	0.40	0.40	0.30	0.25	0.25

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.5+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Reduced Herbicide Costs (20%)

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(136)	(124)	(131)	(142)	(143)	(144)	(135)	(130)	(124)
0.25	(126)	(110)	(120)	(135)	(136)	(137)	(125)	(119)	(110)
0.30	(116)	(97)	(109)	(127)	(129)	(130)	(115)	(107)	(97)
0.35	(106)	(83)	(97)	(120)	(122)	(123)	(106)	(95)	(83)
0.40	(97)	(70)	(86)	(112)	(115)	(116)	(96)	(84)	(70)
0.45	(87)	(56)	(75)	(105)	(108)	(109)	(86)	(72)	(56)
0.50	(77)	(42)	(63)	(97)	(100)	(102)	(76)	(60)	(42)
0.55	(67)	(29)	(52)	(90)	(93)	(95)	(66)	(49)	(29)
0.60	(57)	(15)	(41)	(82)	(86)	(88)	(56)	(37)	(15)
0.65	(48)	(2)	(29)	(75)	(79)	(81)	(46)	(26)	(2)
0.70	(38)	12	(18)	(67)	(72)	(74)	(36)	(14)	12
0.75	(28)	26	(7)	(60)	(64)	(67)	(26)	(2)	26
0.80	(18)	39	4	(52)	(57)	(60)	(16)	9	39
0.85	(8)	53	16	(44)	(50)	(53)	(6)	21	53
0.90	1	66	27	(37)	(43)	(46)	3	33	66
0.95	11	80	38	(29)	(36)	(39)	13	44	80
1.00	21	94	50	(22)	(29)	(32)	23	56	94
LCC**	0.45	0.35	0.40	0.60	0.60	0.65	0.45	0.40	0.35

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (3 year application) (Pic.5+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Reduced Herbicide Costs (20%)

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	----------	----------	----------	----------	$/acre	----------	----------	----------	----------
0.20	(103)	(91)	(98)	(110)	(111)	(112)	(103)	(97)	(91)
0.25	(94)	(78)	(88)	(104)	(105)	(106)	(94)	(87)	(78)
0.30	(86)	(66)	(78)	(97)	(99)	(100)	(85)	(76)	(66)
0.35	(77)	(53)	(68)	(91)	(93)	(94)	(76)	(66)	(53)
0.40	(68)	(41)	(57)	(84)	(87)	(88)	(67)	(55)	(41)
0.45	(59)	(28)	(47)	(78)	(80)	(82)	(58)	(45)	(28)
0.50	(51)	(16)	(37)	(71)	(74)	(76)	(50)	(34)	(16)
0.55	(42)	(3)	(27)	(65)	(68)	(70)	(41)	(23)	(3)
0.60	(33)	9	(17)	(58)	(62)	(64)	(32)	(13)	9
0.65	(24)	22	(6)	(52)	(56)	(58)	(23)	(2)	22
0.70	(16)	34	4	(45)	(50)	(52)	(14)	8	34
0.75	(7)	47	14	(38)	(43)	(46)	(5)	19	47
0.80	2	59	24	(32)	(37)	(40)	4	29	59
0.85	11	72	35	(25)	(31)	(34)	13	40	72
0.90	19	84	45	(19)	(25)	(28)	21	50	84
0.95	28	97	55	(12)	(19)	(22)	30	61	97
1.00	37	109	65	(6)	(13)	(16)	39	72	109
LCC**	0.40	0.30	0.35	0.55	0.60	0.60	0.40	0.35	

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 1.0 lb/acre (24D1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Reduced Herbicide Costs (20%)

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(39)	(24)	(33)	(48)	(49)	(50)	(38)	(32)	(24)
0.25	(32)	(13)	(25)	(44)	(45)	(46)	(31)	(23)	(13)
0.30	(25)	(2)	(16)	(39)	(41)	(42)	(24)	(14)	(2)
0.35	(19)	8	(8)	(35)	(37)	(38)	(16)	(6)	8
0.40	(12)	19	0	(30)	(33)	(34)	(9)	3	19
0.45	(5)	29	8	(26)	(29)	(31)	(2)	11	29
0.50	2	40	17	(21)	(25)	(27)	5	20	40
0.55	8	51	25	(17)	(21)	(23)	12	29	51
0.60	15	61	33	(12)	(17)	(19)	19	37	61
0.65	22	72	42	(8)	(13)	(15)	26	46	72
0.70	29	82	50	(3)	(8)	(11)	33	54	82
0.75	35	93	58	1	(4)	(7)	40	63	93
0.80	42	104	66	6	(0)	(3)	47	72	104
0.85	49	114	75	10	4	1	54	80	114
0.90	56	125	83	14	8	5	61	89	125
0.95	62	135	91	19	12	9	68	97	135
1.00	69	146	99	23	16	13	75	106	146
LCC**	0.25	0.20	0.20	0.40	0.45	0.45	0.25	0.20	0.20

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 2.0 lb/acre (24D2)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Reduced Herbicide Costs (20%)

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(67)	(52)	(61)	(76)	(78)	(78)		(60)	(52)
0.25	(59)	(39)	(51)	(70)	(72)	(73)		(49)	(39)
0.30	(50)	(27)	(41)	(64)	(66)	(67)		(39)	(27)
0.35	(42)	(15)	(31)	(58)	(60)	(61)		(29)	(15)
0.40	(33)	(2)	(21)	(51)	(54)	(56)		(18)	(2)
0.45	(25)	10	(11)	(45)	(48)	(50)		(8)	10
0.50	(16)	22	(1)	(39)	(43)	(44)		2	22
0.55	(8)	35	9	(33)	(37)	(39)		13	35
0.60	1	47	19	(27)	(31)	(33)		23	47
0.65	9	59	29	(20)	(25)	(27)		33	59
0.70	18	72	39	(14)	(19)	(22)		44	72
0.75	26	84	49	(8)	(13)	(16)		54	84
0.80	35	96	59	(2)	(7)	(10)		64	96
0.85	43	109	69	5	(2)	(5)		75	109
0.90	52	121	79	11	4	1		85	121
0.95	60	133	89	17	10	7		95	133
1.00	69	146	99	23	16	13		106	146

LCC**

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (Glph.75)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Reduced Herbicide Costs (20%)

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(28)	(18)	(24)	(33)	(34)	(35)	(28)	(23)	(18)
0.25	(21)	(8)	(16)	(28)	(29)	(30)	(20)	(15)	(8)
0.30	(14)	3	(7)	(23)	(24)	(25)	(13)	(6)	3
0.35	(6)	14	2	(18)	(20)	(20)	(5)	3	14
0.40	1	25	10	(13)	(15)	(16)	2	12	25
0.45	8	35	19	(7)	(10)	(11)	9	21	35
0.50	15	46	27	(2)	(5)	(6)	17	30	46
0.55	23	57	36	3	(0)	(2)	24	39	57
0.60	30	68	45	8	5	3	31	48	68
0.65	37	78	53	13	10	8	39	57	78
0.70	44	89	62	18	14	12	46	66	89
0.75	52	100	71	24	19	17	53	75	100
0.80	59	111	79	29	24	22	61	84	111
0.85	66	121	88	34	29	27	68	93	121
0.90	73	132	96	39	34	31	75	101	132
0.95	81	143	105	44	39	36	83	110	143
1.00	88	154	114	50	44	41	90	119	154
LCC**	0.20	0.20	0.20	0.30	0.30	0.30	0.20	0.20	0.20

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (GlPic+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Reduced Herbicide Costs (20%)

							Infestation		
	Base	Infestation Sizes (acres)					Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(61)	(47)	(55)	(69)	(70)	(71)	(60)	(54)	(47)
0.25	(51)	(33)	(44)	(61)	(63)	(64)	(50)	(42)	(33)
0.30	(41)	(19)	(32)	(54)	(56)	(57)	(40)	(31)	(19)
0.35	(31)	(6)	(21)	(46)	(48)	(50)	(30)	(19)	(6)
0.40	(21)	8	(10)	(38)	(41)	(42)	(20)	(7)	8
0.45	(11)	22	2	(31)	(34)	(35)	(10)	4	22
0.50	(2)	35	13	(23)	(27)	(28)	(0)	16	35
0.55	8	49	24	(16)	(20)	(21)	10	28	49
0.60	18	63	36	(8)	(12)	(14)	19	39	63
0.65	28	76	47	(1)	(5)	(7)	29	51	76
0.70	38	90	58	7	2	(0)	39	63	90
0.75	48	104	70	14	9	7	49	74	104
0.80	57	117	81	22	16	14	59	86	117
0.85	67	131	92	30	24	21	69	98	131
0.90	77	145	104	37	31	28	79	109	145
0.95	87	158	115	45	38	35	89	121	158
1.00	97	172	126	52	45	42	99	133	172
LCC**	0.30	0.20	0.25	0.35	0.35	0.40	0.30	0.25	0.20

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (2 year treatment) (GlPic+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Reduced Herbicide Costs (20%)

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(33)	(21)	(28)	(40)	(42)	(42)	(33)	(27)	(21)
0.25	(26)	(9)	(19)	(35)	(37)	(37)	(25)	(18)	(9)
0.30	(18)	2	(10)	(30)	(32)	(32)	(17)	(8)	2
0.35	(10)	13	(1)	(24)	(26)	(28)	(10)	1	13
0.40	(3)	25	8	(19)	(21)	(23)	(2)	10	25
0.45	5	36	17	(14)	(16)	(18)	6	20	36
0.50	12	47	26	(8)	(11)	(13)	13	29	47
0.55	20	59	35	(3)	(6)	(8)	21	38	59
0.60	28	70	44	3	(1)	(3)	29	48	70
0.65	35	81	53	8	4	2	37	57	81
0.70	43	93	62	13	9	7	44	67	93
0.75	50	104	71	19	14	11	52	76	104
0.80	58	115	80	24	19	16	60	85	115
0.85	65	127	90	30	24	21	67	95	127
0.90	73	138	99	35	29	26	75	104	138
0.95	81	149	108	40	34	31	83	113	149
1.00	88	160	117	46	39	36	91	123	160
LCC**	0.25	0.20	0.20	0.30	0.35	0.35	0.25	0.20	0.20

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Reduced Herbicide Cost

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (Pic.25)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Restart treatments when control reached 20 percent or less

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(79)	(65)	(74)	(88)	(89)	(90)		(73)	(65)
0.25	(69)	(51)	(62)	(80)	(82)	(83)		(61)	(51)
0.30	(59)	(37)	(51)	(72)	(75)	(76)		(49)	(37)
0.35	(49)	(23)	(39)	(65)	(67)	(68)		(37)	(23)
0.40	(39)	(10)	(28)	(57)	(60)	(61)		(26)	(10)
0.45	(29)	4	(16)	(49)	(52)	(54)		(13)	4
0.50	(19)	18	(4)	(41)	(45)	(47)		(1)	18
0.55	(9)	32	7	(34)	(37)	(39)		11	32
0.60	1	46	19	(26)	(30)	(32)		22	46
0.65	11	60	30	(18)	(23)	(25)		34	60
0.70	21	74	42	(10)	(15)	(18)		46	74
0.75	31	88	53	(3)	(8)	(10)		58	88
0.80	41	101	65	5	(0)	(3)		70	101
0.85	51	115	76	13	7	4		82	115
0.90	61	129	88	21	14	11		94	129
0.95	71	143	100	28	22	18		106	143
1.00	81	157	111	36	29	26		118	157
LCC**	0.30	0.25	0.30	0.40	0.45	0.45		0.30	0.25

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Restart early

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (Pic.5)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Restart treatments when control reached 20 percent or less

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(143)	(128)	(137)	(152)	(154)	(155)		(136)	(128)
0.25	(133)	(114)	(126)	(145)	(147)	(147)		(124)	(114)
0.30	(123)	(100)	(114)	(137)	(139)	(140)		(112)	(100)
0.35	(114)	(87)	(103)	(130)	(132)	(133)		(101)	(87)
0.40	(104)	(73)	(91)	(122)	(125)	(126)		(89)	(73)
0.45	(94)	(59)	(80)	(114)	(117)	(119)		(77)	(59)
0.50	(84)	(45)	(69)	(107)	(110)	(112)		(65)	(45)
0.55	(74)	(32)	(57)	(99)	(103)	(105)		(54)	(32)
0.60	(64)	(18)	(46)	(91)	(96)	(98)		(42)	(18)
0.65	(54)	(4)	(34)	(84)	(88)	(91)		(30)	(4)
0.70	(44)	10	(23)	(76)	(81)	(84)		(18)	10
0.75	(34)	23	(11)	(68)	(74)	(77)		(7)	23
0.80	(24)	37	(0)	(61)	(67)	(69)		5	37
0.85	(14)	51	11	(53)	(59)	(62)		17	51
0.90	(5)	65	23	(46)	(52)	(55)		29	65
0.95	5	78	34	(38)	(45)	(48)		40	78
1.00	15	92	46	(30)	(38)	(41)		52	92
LCC**	0.50	0.35	0.45	0.60	0.65	0.65		0.40	0.35

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Restart early

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 1.0 lb/acre (Pic1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Restart treatments when control reached 20 percent or less

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(260)	(245)	(254)	(269)				(253)	(245)
0.25	(252)	(233)	(245)	(264)				(243)	(233)
0.30	(244)	(221)	(235)	(258)				(233)	(221)
0.35	(236)	(209)	(225)	(252)				(223)	(209)
0.40	(228)	(197)	(216)	(246)				(213)	(197)
0.45	(220)	(185)	(206)	(240)				(203)	(185)
0.50	(212)	(173)	(196)	(234)				(193)	(173)
0.55	(203)	(161)	(187)	(229)				(183)	(161)
0.60	(195)	(149)	(177)	(223)				(173)	(149)
0.65	(187)	(137)	(167)	(217)				(163)	(137)
0.70	(179)	(125)	(158)	(211)				(153)	(125)
0.75	(171)	(113)	(148)	(205)				(143)	(113)
0.80	(163)	(101)	(138)	(199)				(133)	(101)
0.85	(155)	(89)	(129)	(193)				(123)	(89)
0.90	(147)	(77)	(119)	(188)				(113)	(77)
0.95	(138)	(65)	(110)	(182)				(103)	(65)
1.00	(130)	(53)	(100)	(176)				(93)	(53)
LCC**	0.95	0.65	0.80	na	na	na		0.75	0.65

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Restart early

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.25+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Restart treatments when control reached 20 percent or less

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(91)	(76)	(85)	(100)	(101)	(102)		(84)	(76)
0.25	(81)	(62)	(73)	(92)	(94)	(95)		(72)	(62)
0.30	(71)	(48)	(62)	(84)	(86)	(88)		(60)	(48)
0.35	(60)	(34)	(50)	(76)	(79)	(80)		(48)	(34)
0.40	(50)	(20)	(38)	(69)	(41)	(73)		(36)	(20)
0.45	(40)	(6)	(27)	(61)	(64)	(66)		(24)	(6)
0.50	(30)	8	(15)	(53)	(56)	(58)		(12)	8
0.55	(20)	22	(3)	(45)	(49)	(51)		0	22
0.60	(10)	36	8	(37)	(41)	(44)		12	36
0.65	0	50	20	(29)	(34)	(36)		24	50
0.70	11	64	32	(21)	(26)	(29)		36	64
0.75	21	78	44	(14)	(19)	(22)		48	78
0.80	31	92	55	(6)	(11)	(14)		60	92
0.85	41	106	67	2	(4)	(7)		72	106
0.90	51	120	79	10	4	0		84	120
0.95	61	134	90	18	11	8		96	134
1.00	71	148	102	26	19	15		108	148
LCC**	0.35	0.25	0.30	0.45	0.45	0.45		0.30	0.25

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Restart early

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.5+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Restart treatments when control reached 20 percent or less

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(175)	(160)	(169)	(185)	(186)	(187)		(168)	(160)
0.25	(165)	(146)	(158)	(177)	(178)	(179)		(156)	(146)
0.30	(155)	(132)	(146)	(169)	(171)	(172)		(144)	(132)
0.35	(145)	(118)	(134)	(161)	(163)	(165)		(132)	(118)
0.40	(135)	(104)	(122)	(153)	(156)	(157)		(120)	(104)
0.45	(124)	(90)	(111)	(145)	(148)	(150)		(108)	(90)
0.50	(114)	(76)	(99)	(137)	(141)	(142)		(96)	(76)
0.55	(104)	(62)	(87)	(129)	(133)	(135)		(84)	(62)
0.60	(94)	(48)	(76)	(121)	(125)	(128)		(72)	(48)
0.65	(84)	(34)	(64)	(113)	(118)	(120)		(60)	(34)
0.70	(73)	(19)	(52)	(105)	(110)	(113)		(47)	(19)
0.75	(63)	(5)	(40)	(97)	(103)	(105)		(35)	(5)
0.80	(53)	9	(29)	(89)	(95)	(98)		(23)	9
0.85	(43)	23	(17)	(81)	(88)	(91)		(11)	23
0.90	(32)	37	(5)	(74)	(80)	(83)		1	37
0.95	(22)	51	7	(66)	(72)	(76)		13	51
1.00	(12)	65	18	(58)	(65)	(68)		25	65
LCC**	0.55	0.40	0.50	0.70	0.75	0.75		0.45	0.40

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario — Break-even carrying capacity unchanged

Restart early

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (3 year application) (Pic.5+24Ds)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Restart treatments when control reached 20 percent or less

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(157)	(142)	(151)	(166)	(168)	(168)		(150)	(142)
0.25	(148)	(128)	(140)	(159)	(161)	(162)		(138)	(128)
0.30	(138)	(115)	(129)	(152)	(154)	(155)		(127)	(115)
0.35	(129)	(102)	(118)	(145)	(147)	(149)		(116)	(102)
0.40	(119)	(89)	(107)	(138)	(141)	(142)		(105)	(89)
0.45	(110)	(75)	(96)	(131)	(134)	(135)		(93)	(75)
0.50	(101)	(62)	(85)	(124)	(127)	(129)		(82)	(62)
0.55	(91)	(49)	(75)	(116)	(120)	(122)		(71)	(49)
0.60	(82)	(36)	(64)	(109)	(114)	(116)		(60)	(36)
0.65	(73)	(23)	(53)	(102)	(107)	(109)		(48)	(23)
0.70	(63)	(9)	(42)	(95)	(100)	(103)		(37)	(9)
0.75	(54)	4	(31)	(88)	(93)	(96)		(26)	4
0.80	(44)	17	(20)	(81)	(87)	(89)		(15)	17
0.85	(35)	30	(9)	(74)	(80)	(83)		(4)	30
0.90	(26)	44	2	(67)	(73)	(76)		8	44
0.95	(16)	57	13	(59)	(66)	(70)		19	57
1.00	(7)	70	24	(52)	(60)	(63)		30	70
LCC**	0.55	0.40	0.45	0.70	0.75	0.75		0.45	0.40

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Restart early

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (Glph.75)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Restart treatments when control reached 20 percent or less

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(58)	(42)	(51)	(67)	(68)	(69)		(50)	(42)
0.25	(49)	(30)	(42)	(61)	(63)	(64)		(40)	(30)
0.30	(41)	(18)	(32)	(55)	(57)	(58)		(30)	(18)
0.35	(33)	(6)	(23)	(49)	(52)	(53)		(20)	(6)
0.40	(25)	6	(13)	(43)	(46)	(48)		(10)	6
0.45	(17)	18	(3)	(38)	(41)	(42)		(0)	18
0.50	(9)	30	6	(32)	(35)	(37)		10	30
0.55	(1)	42	16	(26)	(30)	(32)		20	42
0.60	7	54	26	(20)	(24)	(26)		30	54
0.65	16	66	35	(14)	(19)	(21)		40	66
0.70	24	77	45	(8)	(13)	(16)		49	77
0.75	32	89	55	(2)	(8)	(11)		59	89
0.80	40	101	64	3	(2)	(5)		69	101
0.85	48	113	74	9	3	0		79	113
0.90	56	125	83	15	9	5		89	125
0.95	64	137	93	21	14	11		99	137
1.00	72	149	103	27	20	16		109	149
LCC**	0.30	0.20	0.25	0.40	0.45	0.45		0.25	0.20

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Restart early

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (GlPic+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Restart treatments when control reached 20 percent or less

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(82)	(66)	(76)	(91)	(92)	(93)		(74)	(66)
0.25	(72)	(52)	(64)	(83)	(85)	(86)		(62)	(52)
0.30	(61)	(38)	(52)	(75)	(77)	(78)		(50)	(38)
0.35	(51)	(24)	(41)	(67)	(70)	(71)		(38)	(24)
0.40	(41)	(10)	(29)	(59)	(62)	(64)		(26)	(10)
0.45	(31)	4	(17)	(52)	(55)	(56)		(14)	4
0.50	(21)	18	(6)	(44)	(47)	(49)		(2)	18
0.55	(11)	32	6	(36)	(40)	(42)		10	32
0.60	(1)	46	18	(28)	(32)	(34)		22	46
0.65	10	60	29	(20)	(25)	(27)		34	60
0.70	20	74	41	(12)	(17)	(20)		46	74
0.75	30	88	53	(4)	(10)	(12)		58	88
0.80	40	102	64	4	(2)	(5)		70	102
0.85	50	116	76	11	5	2		82	116
0.90	60	130	88	19	13	10		94	130
0.95	70	144	99	27	20	17		106	144
1.00	81	158	111	35	28	24		118	158
LCC**	0.35	0.25	0.50	0.40	0.45	0.45		0.30	0.25

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Restart early

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (2 year treatment) (GlPic+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Restart treatments when control reached 20 percent or less

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(44)	(29)	(38)	(53)	(55)	(55)		(37)	(29)
0.25	(36)	(17)	(29)	(47)	(49)	(50)		(27)	(17)
0.30	(28)	(5)	(19)	(41)	(43)	(44)		(17)	(5)
0.35	(19)	7	(9)	(35)	(38)	(39)		(7)	7
0.40	(11)	19	1	(29)	(32)	(33)		3	19
0.45	(3)	31	11	(23)	(26)	(28)		14	31
0.50	5	43	20	(17)	(21)	(22)		24	43
0.55	14	56	30	(11)	(15)	(17)		34	56
0.60	22	68	40	(5)	(9)	(11)		44	68
0.65	30	80	50	1	(3)	(6)		54	80
0.70	39	92	60	7	2	(0)		64	92
0.75	47	104	70	13	8	5		74	104
0.80	55	116	79	19	14	11		85	116
0.85	64	128	89	25	19	16		95	128
0.90	72	141	99	31	25	22		105	141
0.95	80	153	109	37	31	27		115	153
1.00	89	165	119	43	36	33		125	165
LCC**	0.25	0.20	0.20	0.35	0.35	0.40		0.20	0.20

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Restart early

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (Pic.25)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and 20% in following years; grazing recovery in 3rd & 4th years reduced to 90 percent

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(72)	(61)	(68)	(79)	(80)	(80)		(67)	(61)
0.25	(63)	(48)	(58)	(72)	(73)	(74)		(56)	(48)
0.30	(55)	(36)	(47)	(65)	(67)	(68)		(46)	(36)
0.35	(46)	(23)	(37)	(59)	(61)	(62)		(35)	(23)
0.40	(37)	(11)	(27)	(52)	(54)	(56)		(25)	(11)
0.45	(28)	2	(16)	(46)	(48)	(50)		(14)	2
0.50	(19)	14	(6)	(39)	(42)	(43)		(3)	14
0.55	(11)	27	4	(32)	(36)	(37)		7	27
0.60	(2)	39	14	(26)	(29)	(31)		18	39
0.65	7	52	25	(19)	(23)	(25)		28	52
0.70	16	64	35	(12)	(17)	(19)		39	64
0.75	25	77	45	(6)	(11)	(13)		50	77
0.80	33	89	55	1	(4)	(7)		60	89
0.85	42	102	66	7	2	(1)		71	102
0.90	51	114	76	14	8	5		81	114
0.95	60	127	86	21	14	11		92	127
1.00	69	139	97	27	21	17		103	139
LCC**	0.35	0.25	0.30	0.40	0.45	0.45		0.30	0.35

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (Pic.5)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and 20% in following years; grazing recovery in 3rd & 4th years reduced to 90 percent

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(129)	(118)	(125)	(136)	(137)	(138)		(124)	(118)
0.25	(121)	(106)	(115)	(130)	(132)	(132)		(114)	(106)
0.30	(113)	(94)	(106)	(124)	(126)	(127)		(104)	(94)
0.35	(105)	(82)	(96)	(119)	(121)	(122)		(94)	(82)
0.40	(97)	(71)	(87)	(113)	(115)	(117)		(85)	(71)
0.45	(89)	(59)	(77)	(107)	(110)	(111)		(75)	(59)
0.50	(81)	(47)	(68)	(101)	(104)	(106)		(65)	(47)
0.55	(73)	(35)	(58)	(96)	(99)	(101)		(55)	(35)
0.60	(65)	(23)	(49)	(90)	(94)	(95)		(45)	(23)
0.65	(57)	(12)	(39)	(84)	(88)	(90)		(35)	(12)
0.70	(49)	0	(30)	(78)	(83)	(85)		(25)	0
0.75	(51)	12	(20)	(72)	(77)	(80)		(16)	12
0.80	(33)	24	(11)	(67)	(72)	(74)		(6)	24
0.85	(25)	36	(1)	(61)	(66)	(69)		4	36
0.90	(17)	48	8	(55)	(61)	(64)		14	48
0.95	(9)	59	18	(49)	(55)	(59)		24	59
1.00	(1)	71	27	(43)	(50)	(53)		34	71
LCC**	0.55	0.35	0.45	0.70	0.75	0.80		0.45	0.35

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 1.0 lb/acre (Pic1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Control reduced 10% in treatment years and 20% in following years

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	---------- $/acre ----------								
0.20	(195)	(197)	(196)	(194)				(196)	(197)
0.25	(189)	(187)	(189)	(189)				(188)	(187)
0.30	(183)	(178)	(181)	(185)				(181)	(178)
0.35	(177)	(168)	(174)	(181)				(173)	(168)
0.40	(171)	(158)	(166)	(177)				(165)	(158)
0.45	(165)	(149)	(159)	(173)				(157)	(149)
0.50	(159)	(139)	(151)	(169)				(150)	(139)
0.55	(152)	(130)	(144)	(165)				(142)	(130)
0.60	(146)	(120)	(136)	(161)				(134)	(120)
0.65	(140)	(110)	(129)	(157)				(126)	(110)
0.70	(134)	(101)	(121)	(153)				(118)	(101)
0.75	(128)	(91)	(114)	(148)				(111)	(91)
0.80	(122)	(82)	(106)	(144)				(103)	(82)
0.85	(116)	(72)	(99)	(140)				(95)	(72)
0.90	(110)	(62)	(91)	(136)				(87)	(62)
0.95	(103)	(53)	(84)	(132)				(79)	(53)
1.00	(97)	(43)	(76)	(128)				(72)	(43)
LCC**	0.90	0.65	0.80	na	na	na		0.75	0.65

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.25+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and 20% in following years; grazing recovery in 3rd & 4th years reduced to 90 percent

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(95)	(83)	(91)	(102)	(104)	(104)		(89)	(83)
0.25	(87)	(70)	(80)	(96)	(97)	(98)		(79)	(70)
0.30	(78)	(58)	(70)	(90)	(91)	(92)		(68)	(58)
0.35	(69)	(45)	(60)	(83)	(85)	(86)		(58)	(45)
0.40	(61)	(33)	(50)	(77)	(79)	(80)		(47)	(33)
0.45	(52)	(20)	(39)	(70)	(73)	(74)		(37)	(20)
0.50	(43)	(8)	(29)	(64)	(67)	(69)		(26)	(8)
0.55	(34)	5	(19)	(57)	(61)	(63)		(16)	5
0.60	(26)	17	(9)	(51)	(55)	(57)		(5)	17
0.65	(17)	30	1	(44)	(49)	(51)		5	30
0.70	(8)	42	12	(38)	(43)	(45)		16	42
0.75	0	55	22	(31)	(36)	(39)		26	55
0.80	9	67	32	(25)	(30)	(33)		37	67
0.85	18	80	42	(19)	(24)	(27)		47	80
0.90	27	11	52	(12)	(18)	(21)		58	11
0.95	35	105	63	(6)	(12)	(15)		69	105
1.00	44	117	73	1	(6)	(9)		79	117
LCC**	0.40	0.30	0.35	0.50	0.55	0.55		0.35	0.30

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (Pic.5+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and 20% in following years; grazing recovery in 3rd & 4th years reduced to 90 percent

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(179)	(168)	(175)	(185)	(186)	(186)		(174)	(168)
0.25	(170)	(156)	(164)	(178)	(179)	(180)		(163)	(156)
0.30	(161)	(143)	(154)	(172)	(173)	(174)		(153)	(143)
0.35	(152)	(130)	(144)	(165)	(167)	(168)		(142)	(130)
0.40	(144)	(118)	(134)	(159)	(161)	(162)		(131)	(118)
0.45	(135)	(105)	(123)	(152)	(155)	(156)		(121)	(105)
0.50	(126)	(93)	(113)	(145)	(148)	(150)		(110)	(93)
0.55	(117)	(80)	(103)	(139)	(142)	(144)		(99)	(80)
0.60	(108)	(67)	(92)	(132)	(136)	(138)		(89)	(67)
0.65	(100)	(55)	(82)	(126)	(130)	(132)		(78)	(55)
0.70	(91)	(42)	(72)	(119)	(124)	(126)		(67)	(42)
0.75	(82)	(29)	(61)	(113)	(117)	(120)		(57)	(29)
0.80	(73)	(17)	(51)	(106)	(111)	(114)		(46)	(17)
0.85	(64)	(4)	(41)	(99)	(105)	(108)		(35)	(4)
0.90	(55)	8	(30)	(93)	(99)	(102)		(25)	8
0.95	(47)	21	(20)	(86)	(92)	(96)		(14)	21
1.00	(38)	34	(10)	(80)	(86)	(90)		(4)	34
LCC**	0.65	0.45	0.55	0.85	0.85	0.90		0.55	0.45

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre plus 2,4-D at 1.0 lb/acre (3 year application) (Pic.5+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and 20% in following years; grazing recovery in 3rd year reduced to 90 percent

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(139)	(127)	(134)	(145)	(146)	(146)		(133)	(127)
0.25	(131)	(116)	(125)	(139)	(141)	(141)		(124)	(116)
0.30	(123)	(105)	(116)	(134)	(136)	(137)		(114)	(105)
0.35	(116)	(93)	(107)	(129)	(131)	(132)		(105)	(93)
0.40	(108)	(82)	(98)	(123)	(126)	(127)		(96)	(82)
0.45	(100)	(70)	(89)	(118)	(121)	(122)		(86)	(70)
0.50	(93)	(59)	(80)	(112)	(115)	(117)		(77)	(59)
0.55	(85)	(48)	(70)	(107)	(110)	(112)		(67)	(48)
0.60	(78)	(36)	(61)	(102)	(105)	(107)		(58)	(36)
0.65	(70)	(25)	(52)	(96)	(100)	(102)		(48)	(25)
0.70	(62)	(14)	(43)	(91)	(95)	(97)		(39)	(14)
0.75	(55)	(2)	(34)	(85)	(90)	(92)		(30)	(2)
0.80	(47)	9	(25)	(80)	(85)	(88)		(20)	9
0.85	(39)	21	(16)	(74)	(80)	(83)		(11)	21
0.90	(32)	32	(7)	(69)	(75)	(78)		(1)	32
0.95	(24)	43	2	(64)	(70)	(73)		8	43
1.00	(16)	55	12	(58)	(65)	(68)		18	55
LCC**	0.60	0.40	0.50	0.80	0.85	0.85		0.50	0.40

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 1.0 lb/acre (24D1)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and grazing recovery reduced from 33.3 to 25 percent

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(51)	(36)	(45)	(60)	(62)	(63)	(50)	(44)	(36)
0.25	(45)	(26)	(38)	(57)	(59)	(59)	(44)	(36)	(26)
0.30	(40)	(16)	(30)	(53)	(55)	(56)	(37)	(28)	(16)
0.35	(34)	(7)	(23)	(50)	(52)	(53)	(31)	(21)	(7)
0.40	(28)	3	(16)	(46)	(49)	(50)	(25)	(13)	3
0.45	(22)	13	(8)	(42)	(46)	(47)	(19)	(5)	13
0.50	(16)	22	(1)	(39)	(42)	(44)	(12)	2	22
0.55	(10)	32	7	(35)	(39)	(41)	(6)	10	32
0.60	(4)	42	14	(32)	(36)	(38)	(0)	18	42
0.65	2	52	21	(28)	(33)	(35)	6	26	52
0.70	7	61	29	(24)	(29)	(32)	12	33	61
0.75	13	71	36	(21)	(26)	(29)	19	41	71
0.80	19	81	44	(17)	(23)	(26)	25	49	81
0.85	25	90	51	(14)	(20)	(23)	31	57	90
0.90	31	100	58	(10)	(17)	(20)	37	64	100
0.95	37	110	66	(6)	(13)	(17)	44	72	110
1.00	43	120	73	(3)	(10)	(14)	50	80	120
LCC**	0.35	0.20	0.30	0.55	0.60	0.65	0.35	0.25	0.20

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 2.0 lb/acre (24D2)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and grazing recovery reduced from 50 to 40 percent

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(89)	(74)	(83)	(98)	(100)	(100)		(82)	(74)
0.25	(82)	(62)	(74)	(93)	(95)	(96)		(72)	(62)
0.30	(74)	(51)	(65)	(88)	(90)	(91)		(63)	(51)
0.35	(67)	(40)	(56)	(83)	(85)	(86)		(54)	(40)
0.40	(59)	(29)	(47)	(78)	(80)	(82)		(45)	(29)
0.45	(52)	(17)	(38)	(72)	(76)	(77)		(35)	(17)
0.50	(44)	(6)	(29)	(67)	(71)	(73)		(26)	(6)
0.55	(37)	5	(20)	(62)	(66)	(68)		(17)	5
0.60	(29)	17	(11)	(57)	(61)	(63)		(7)	17
0.65	(22)	28	(2)	(52)	(56)	(59)		2	28
0.70	(15)	39	7	(47)	(52)	(54)		11	39
0.75	(7)	51	16	(41)	(47)	(49)		21	51
0.80	0	62	25	(36)	(42)	(45)		30	62
0.85	8	73	34	(31)	(37)	(40)		39	73
0.90	15	84	43	(26)	(32)	(35)		49	84
0.95	23	96	52	(21)	(27)	(31)		58	96
1.00	30	107	61	(15)	(23)	(26)		67	107
LCC**	0.40	0.30	0.35	0.60	0.65	0.65		0.35	0.30

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (Glph.75)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and 20% in following years; grazing recovery in reduced from 50 to 40 percent

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(61)	(46)	(55)	(71)	(72)	(73)		(54)	(47)
0.25	(54)	(35)	(47)	(66)	(67)	(68)		(45)	(36)
0.30	(47)	(24)	(38)	(61)	(63)	(64)		(36)	(25)
0.35	(40)	(13)	(29)	(56)	(58)	(60)		(27)	(14)
0.40	(33)	(2)	(21)	(51)	(54)	(55)		(18)	(3)
0.45	(26)	9	(12)	(46)	(49)	(51)		(9)	8
0.50	(18)	20	(3)	(41)	(45)	(47)		0	18
0.55	(11)	31	5	(36)	(40)	(42)		9	29
0.60	(4)	42	14	(31)	(36)	(38)		18	40
0.65	3	53	23	(27)	(31)	(34)		27	51
0.70	10	64	32	(22)	(27)	(29)		36	62
0.75	17	75	40	(17)	(22)	(25)		45	73
0.80	25	86	49	(12)	(18)	(20)		54	83
0.85	32	97	58	(7)	(13)	(16)		63	94
0.90	39	108	66	(2)	(9)	(12)		72	105
0.95	46	119	75	3	(4)	(7)		81	116
1.00	53	130	84	8	0	(3)		90	127
LCC**	0.35	0.25	0.30	0.50	0.50	0.55		0.25	0.25

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (GlPic+24D)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and 20% in following years; grazing recovery in 3rd & 4th years reduced to 90 percent

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(86)	(73)	(81)	(93)	(95)	(95)		(80)	(73)
0.25	(77)	(61)	(71)	(87)	(88)	(89)		(69)	(61)
0.30	(69)	(48)	(61)	(81)	(82)	(83)		(59)	(48)
0.35	(60)	(36)	(50)	(74)	(76)	(77)		(48)	(36)
0.40	(51)	(23)	(40)	(68)	(70)	(71)		(38)	(23)
0.45	(43)	(11)	(30)	(61)	(64)	(66)		(27)	(11)
0.50	(34)	2	(20)	(55)	(58)	(60)		(17)	2
0.55	(25)	14	(10)	(48)	(52)	(54)		(6)	14
0.60	(16)	27	1	(42)	(46)	(48)		4	27
0.65	(8)	39	11	(35)	(40)	(42)		15	39
0.70	1	52	21	(29)	(34)	(36)		25	52
0.75	10	64	31	(22)	(27)	(30)		36	64
0.80	18	77	41	(16)	(21)	(24)		46	77
0.85	27	89	52	(10)	(15)	(18)		57	89
0.90	36	102	62	(3)	(9)	(12)		68	102
0.95	45	114	72	3	(3)	(6)		78	114
1.00	53	127	82	10	3	(0)		89	127
LCC**	0.35	0.25	0.30	0.50	0.50	0.55		0.30	0.25

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (2 year treatment) (GlPic+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Control reduced 10% in treatment years and 20% in following years; grazing recovery in 2nd year reduced from 85 to 75 percent

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(51)	(39)	(46)	(57)	(58)	(59)		(45)	(39)
0.25	(44)	(29)	(38)	(53)	(54)	(55)		(37)	(29)
0.30	(38)	(19)	(30)	(48)	(50)	(51)		(29)	(19)
0.35	(31)	(9)	(22)	(44)	(46)	(47)		(20)	(9)
0.40	(25)	2	(14)	(40)	(42)	(43)		(12)	2
0.45	(18)	12	(6)	(35)	(38)	(39)		(4)	12
0.50	(12)	22	2	(31)	(34)	(36)		4	22
0.55	(5)	32	10	(27)	(30)	(32)		13	32
0.60	1	42	18	(22)	(26)	(28)		21	42
0.65	8	53	26	(18)	(22)	(24)		29	53
0.70	15	63	33	(14)	(18)	(20)		38	63
0.75	21	73	41	(9)	(14)	(16)		46	73
0.80	28	83	49	(5)	(10)	(13)		54	83
0.85	34	93	57	(1)	(6)	(9)		62	93
0.90	41	103	65	4	(2)	(5)		71	103
0.95	47	114	73	8	2	(1)		79	114
1.00	54	124	81	12	6	3		87	124
LCC**	0.30	0.20	0.25	0.45	0.50	0.50		0.25	0.20

* Base scenario conditions: patch spread at 2 radial feet/year, maximum patch density, 1-acre infestation, $15.50/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario

Break-even carrying capacity unchanged

Reduced control and grazing recovery

Perimeter Treatments

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 1.0 lb/acre (24D1-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $12/AUM

						5-acre Patch		10 acres	Rate of Spread	
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres	50 acres
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------
0.20	(10)	(23)	(32)	(50)	(71)		(15)	(47)		(37)
0.25	(8)	(17)	(24)	(38)	(54)		(10)	(43)		(13)
0.30	(5)	(12)	(17)	(27)	(38)		(4)	(40)		12
0.35	(3)	(7)	(9)	(15)	(22)		1	(36)		37
0.40	(0)	(1)	(2)	(4)	(5)		6	(32)		61
0.45	2	4	5	8	11		12	(29)		86
0.50	5	9	13	20	27		17	(25)		111
0.55	7	15	20	31	44		22	(21)		135
0.60	10	20	28	43	60		28	(18)		160
0.65	12	25	35	54	76		33	(14)		185
0.70	15	31	43	66	93		38	(10)		209
0.75	17	36	50	78	109		43	(7)		234
0.80	20	41	57	89	125		49	(3)		259
0.85	22	47	65	101	141		54	1		283
0.90	25	52	72	112	158		59	4		308
0.95	27	57	80	124	174		65	8		332
1.00	30	63	87	136	190		70	12		357
LCC**	0.25	0.25	0.25	0.25	0.25		0.20	0.45		0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (applied 2 out of 3 years) (Pic.25-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $12/AUM

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(22)	(47)	(66)	(104)	(147)		(35)	(81)			(114)	
0.25	(19)	(42)	(59)	(93)	(131)		(30)	(78)			(89)	
0.30	(17)	(37)	(51)	(81)	(114)		(25)	(74)			(64)	
0.35	(14)	(31)	(44)	(69)	(98)		(20)	(70)			(40)	
0.40	(12)	(26)	(37)	(58)	(82)		(14)	(67)			(15)	
0.45	(9)	(21)	(29)	(46)	(66)		(9)	(63)			9	
0.50	(7)	(15)	(22)	(35)	(49)		(4)	(59)			34	
0.55	(4)	(10)	(14)	(23)	(33)		2	(56)			59	
0.60	(2)	(5)	(7)	(11)	(17)		7	(52)			83	
0.65	1	0.7	0.5	0	(0)		12	(49)			108	
0.70	3	6	8	12	16		18	(45)			133	
0.75	6	11	15	23	32		23	(41)			157	
0.80	8	17	23	35	49		28	(38)			182	
0.85	11	22	30	47	65		34	(34)			207	
0.90	13	27	38	58	81		39	(30)			231	
0.95	16	33	45	70	98		44	(27)			256	
1.00	18	38	53	81	114		50	(23)			281	
LCC**	0.35	0.35	0.35	0.35	0.35		0.30	0.70			0.25	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (biennial treatment) (Pic.5-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $12/AUM

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(32)	(69)	(97)	(152)	(215)		(54)	(112)			(182)	
0.25	(29)	(64)	(90)	(141)	(199)		(48)	(108)			(157)	
0.30	(27)	(58)	(82)	(129)	(182)		(43)	(105)			(132)	
0.35	(24)	(53)	(75)	(118)	(166)		(38)	(101)			(108)	
0.40	(22)	(48)	(67)	(106)	(150)		(32)	(97)			(83)	
0.45	(19)	(42)	(60)	(94)	(133)		(27)	(94)			(58)	
0.50	(17)	(37)	(52)	(83)	(117)		(22)	(90)			(34)	
0.55	(14)	(32)	(45)	(71)	(101)		(16)	(87)			(9)	
0.60	(12)	(27)	(38)	(60)	(84)		(11)	(83)			16	
0.65	(9)	(21)	(30)	(48)	(68)		(6)	(79)			40	
0.70	(7)	(16)	(23)	(36)	(52)		(0)	(76)			65	
0.75	(4)	(11)	(15)	(25)	(36)		5	(72)			89	
0.80	(2)	(5)	(8)	(13)	(19)		10	(68)			114	
0.85	1	0	(0)	(2)	(3)		16	(65)			139	
0.90	3	5	7	10	13		21	(61)			163	
0.95	6	11	14	22	30		26	(57)			188	
1.00	8	16	22	33	46		31	(54)			213	
LCC**	0.45	0.45	0.45	0.45	0.45		0.40	0.90			0.30	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (biennial treatment) (Pic.25+24D-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $12/AUM

						5-acre Patch		10 acres	Rate of Spread	
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres	50 acres
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------
0.20	(19)	(42)	(59)	(92)	(130)		(31)	(74)		(97)
0.25	(17)	(36)	(51)	(81)	(114)		(26)	(70)		(72)
0.30	(14)	(31)	(44)	(69)	(97)		(20)	(66)		(47)
0.35	(12)	(26)	(36)	(57)	(81)		(15)	(63)		(23)
0.40	(9)	(20)	(29)	(46)	(65)		(10)	(59)		2
0.45	(7)	(15)	(21)	(34)	(48)		(4)	(55)		27
0.50	(4)	(10)	(14)	(23)	(32)		1	(52)		51
0.55	(2)	(4)	(7)	(11)	(16)		6	(48)		76
0.60	1	0.9	0.8	0.7	0.6		12	(44)		101
0.65	4	6	8	12	17		17	(41)		125
0.70	6	12	16	24	33		22	(37)		150
0.75	9	17	23	36	50		28	(33)		175
0.80	11	22	31	47	66		33	(30)		199
0.85	14	28	38	59	82		38	(26)		224
0.90	16	33	45	70	98		44	(22)		248
0.95	19	38	53	82	115		49	(19)		273
1.00	21	43	60	94	131		54	(15)		298
LCC**	0.30	0.30	0.30	0.30	0.30		0.25	0.65		0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (biennial treatment) (Glph.75-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $12/AUM

						5-acre Patch		10 acres	Rate of Spread	
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres	50 acres
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------
0.20	(14)	(31)	(44)	(70)	(98)		(22)	(59)		(65)
0.25	(12)	(26)	(37)	(58)	(82)		(17)	(56)		(40)
0.30	(9)	(21)	(29)	(47)	(66)		(12)	(52)		(16)
0.35	(7)	(16)	(22)	(35)	(50)		(7)	(48)		9
0.40	(4)	(10)	(15)	(23)	(33)		(1)	(45)		33
0.45	(2)	(5)	(7)	(12)	(17)		4	(41)		58
0.50	1	0	0	(0)	(1)		9	(37)		83
0.55	3	6	8	11	16		15	(34)		107
0.60	6	11	15	23	32		20	(30)		132
0.65	8	16	23	35	48		25	(27)		157
0.70	11	22	30	46	65		31	(23)		181
0.75	13	27	37	58	81		36	(19)		206
0.80	16	32	45	70	97		41	(16)		231
0.85	18	38	52	81	114		47	(12)		255
0.90	21	43	60	93	130		52	(8)		280
0.95	23	48	67	104	146		57	(5)		305
1.00	26	54	75	116	163		63	(1)		329
LCC**	0.25	0.25	0.25	0.30	0.30		0.25	0.55		0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.4 lb/acre plus 2,4-D at 0.6 lb/acre (biennial treatment) (GlPic-24D-pc)

Control Strategy Perimeter Treatments

Scenario Evaluated $12/AUM

						5-acre Patch		10 acres	Rate of Spread	
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres	50 acres
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------
0.20	(11)	(25)	(35)	(56)	(79)		(17)	(50)		(45)
0.25	(9)	(20)	(28)	(44)	(62)		(12)	(47)		(21)
0.30	(6)	(14)	(20)	(32)	(46)		(7)	(43)		4
0.35	(4)	(9)	(13)	(21)	(30)		(1)	(39)		29
0.40	(1)	(4)	(6)	(9)	(13)		4	(36)		53
0.45	1	2	2	2	3		9	(32)		78
0.50	4	7	9	14	19		15	(28)		103
0.55	6	12	17	26	36		20	(25)		127
0.60	9	17	24	37	52		25	(21)		152
0.65	11	23	32	49	68		31	(18)		177
0.70	14	28	39	60	85		36	(14)		201
0.75	16	33	46	72	101		41	(10)		226
0.80	19	39	54	84	117		47	(7)		251
0.85	21	44	61	95	134		52	(3)		275
0.90	24	49	69	107	150		57	1		300
0.95	26	55	76	118	166		63	4		325
1.00	29	60	83	130	182		68	8		349
LCC**	0.25	0.25	0.25	0.25	0.25		0.20	0.45		0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $12/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $12/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 1.0 lb/acre (24D1-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Baseline

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	total $											
0.20	(7)	(16)	(23)	(36)	(52)	(1)	(9)	(43)	(2)	14	(9)	35
0.25	(4)	(9)	(13)	(21)	(31)	5	(2)	(38)	9	28	23	78
0.30	(1)	(3)	(4)	(7)	(9)	12	5	(33)	19	42	55	121
0.35	2	4	6	8	12	19	12	(28)	30	57	87	163
0.40	6	11	15	23	33	26	19	(24)	40	71	119	206
0.45	9	18	25	38	54	33	26	(19)	51	85	151	249
0.50	12	25	34	53	75	40	32	(14)	62	100	183	292
0.55	15	32	44	68	96	47	39	(10)	72	114	214	334
0.60	19	39	54	83	117	54	46	(5)	83	128	246	377
0.65	22	46	63	98	138	60	53	(0)	93	143	278	420
0.70	25	52	73	113	159	67	60	5	104	157	310	463
0.75	28	59	82	128	180	74	67	9	114	171	342	505
0.80	32	66	92	143	201	81	74	14	125	186	374	548
0.85	35	73	102	158	222	88	80	19	135	200	405	591
0.90	38	80	111	173	243	95	87	24	146	214	437	634
0.95	41	87	121	188	265	102	94	28	156	229	469	676
1.00	45	94	130	203	286	109	101	33	167	243	501	719
LCC**	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.35	0.20	0.20	0.20	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (applied 2 out of 3 years) (Pic.25-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Baseline

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	----------	total $ ----------	----------	----------	----------	----------
0.20	(19)	(41)	(58)	(91)	(128)	(18)	(41)	(77)	(26)	(11)	(60)	(28)
0.25	(15)	(34)	(48)	(76)	(107)	(11)	(34)	(72)	(16)	3	(37)	2
0.30	(12)	(27)	(38)	(61)	(86)	(4)	(27)	(68)	(5)	18	(14)	33
0.35	(9)	(20)	(29)	(46)	(65)	3	(20)	(63)	5	32	8	63
0.40	(6)	(13)	(19)	(31)	(44)	10	(13)	(58)	16	46	31	94
0.45	(2)	(7)	(10)	(16)	(23)	17	(7)	(54)	26	61	54	125
0.50	1	0	(0)	(1)	(2)	24	0	(49)	37	75	76	155
0.55	4	7	10	14	19	30	7	(44)	47	89	99	186
0.60	7	14	19	29	41	37	14	(39)	58	104	122	216
0.65	10	21	29	44	62	44	21	(35)	69	118	145	247
0.70	14	28	38	59	83	51	28	(30)	79	132	167	278
0.75	17	35	48	74	104	58	35	(25)	90	147	190	308
0.80	20	41	57	89	125	65	41	(20)	100	161	213	339
0.85	23	48	67	104	146	72	48	(16)	111	175	235	369
0.90	27	55	77	119	167	78	55	(11)	121	190	258	400
0.95	30	62	86	134	188	85	62	(6)	132	204	281	430
1.00	33	69	96	149	209	92	69	(2)	142	219	304	461
LCC**	0.25	0.25	0.30	0.30	0.30	0.25	0.25	0.55	0.20	0.20	0.20	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (biennial treatment) (Pic.5-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Baseline

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	total $											
0.20	(29)	(63)	(88)	(139)	(196)	(32)	(47)	(108)	(48)	(33)	(153)	(109)
0.25	(26)	(56)	(79)	(124)	(175)	(25)	(41)	(103)	(38)	(19)	(121)	(66)
0.30	(22)	(49)	(69)	(109)	(154)	(18)	(34)	(98)	(27)	(4)	(89)	(24)
0.35	(19)	(42)	(60)	(94)	(133)	(12)	(27)	(94)	(17)	10	(57)	19
0.40	(16)	(35)	(50)	(79)	(112)	(5)	(20)	(89)	(6)	24	(26)	62
0.45	(13)	(28)	(40)	(64)	(91)	2	(13)	(84)	4	39	6	105
0.50	(9)	(22)	(31)	(49)	(70)	9	(6)	(80)	15	53	38	147
0.55	(6)	(15)	(21)	(34)	(48)	16	1	(75)	26	68	70	190
0.60	(3)	(8)	(12)	(19)	(27)	23	8	(70)	36	82	102	233
0.65	0	(1)	(2)	(4)	(6)	30	14	(65)	47	96	134	276
0.70	4	6	8	11	15	37	21	(61)	57	111	165	318
0.75	7	13	17	26	36	43	28	(56)	68	125	197	361
0.80	10	20	27	41	57	50	35	(51)	78	139	229	404
0.85	13	26	36	56	78	57	42	(46)	89	154	261	447
0.90	17	33	46	71	99	64	49	(42)	99	168	293	489
0.95	20	40	56	86	120	71	56	(37)	110	182	325	532
1.00	23	47	65	101	141	78	62	(32)	120	197	357	575
LCC**	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.70	0.25	0.20	0.25	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (biennial treatment) (Pic.25+24D-pc)

Control Strategy Perimeter Treatments

Scenario Evaluated Baseline

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(16)	(35)	(50)	(79)	(111)	(14)	(25)	(69)	(21)	(6)	(68)	(24)
0.25	(13)	(29)	(40)	(64)	(90)	(7)	(18)	(65)	(10)	9	(36)	19
0.30	(10)	(22)	(31)	(49)	(69)	(0)	(11)	(60)	0	23	(4)	61
0.35	(6)	(15)	(21)	(34)	(48)	7	(4)	(55)	11	38	28	104
0.40	(3)	(8)	(12)	(19)	(27)	13	3	(51)	21	52	59	147
0.45	0	(1)	(2)	(4)	(6)	20	10	(46)	32	66	91	190
0.50	3	6	8	11	16	27	17	(41)	42	81	123	232
0.55	7	13	17	26	37	34	23	(36)	53	95	155	275
0.60	10	20	27	41	58	41	30	(32)	63	109	187	318
0.65	13	26	36	56	79	48	37	(27)	74	124	219	361
0.70	16	33	46	71	100	55	44	(22)	85	138	251	403
0.75	19	40	56	86	121	62	51	(17)	95	152	282	446
0.80	23	47	65	101	142	68	58	(13)	106	167	314	489
0.85	26	54	75	116	163	75	65	(8)	116	181	346	532
0.90	29	61	84	131	184	82	71	(3)	127	195	378	574
0.95	32	68	94	146	205	89	78	1	137	210	410	617
1.00	36	75	104	161	226	96	85	6	148	224	442	660
LCC**	0.25	0.25	0.25	0.25	0.25	0.20	0.20	0.50	0.20	0.20	0.20	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (biennial treatment) (Glph.75-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Baseline

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	total $											
0.20	(11)	(25)	(36)	(56)	(79)	(7)	(16)	(55)	(11)	5	(36)	7
0.25	(8)	(18)	(26)	(41)	(58)	(0)	(9)	(50)	(0)	19	(5)	50
0.30	(5)	(12)	(16)	(26)	(37)	6	(3)	(46)	10	33	27	93
0.35	(2)	(5)	(7)	(11)	(16)	13	4	(41)	21	48	59	136
0.40	2	2	3	4	5	20	11	(36)	32	62	91	178
0.45	5	9	12	19	26	27	18	(32)	42	76	123	221
0.50	8	16	22	34	47	34	25	(27)	53	91	155	264
0.55	11	23	31	49	68	41	32	(22)	63	105	187	307
0.60	14	30	41	64	89	48	39	(17)	74	119	218	349
0.65	18	37	51	79	110	54	46	(13)	84	134	250	392
0.70	21	43	60	94	131	61	52	(8)	95	148	282	435
0.75	24	50	70	109	152	68	59	(3)	105	162	314	478
0.80	27	57	79	124	173	75	66	2	116	177	346	520
0.85	31	64	89	139	195	82	73	6	126	191	378	563
0.90	34	71	99	154	216	89	80	11	137	206	409	606
0.95	37	78	108	169	237	96	87	16	147	220	441	649
1.00	40	85	118	184	258	103	94	20	158	234	473	691
LCC**	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.40	0.20	0.20	0.20	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.4 lb/acre plus 2,4-D at 0.6 lb/acre (biennial treatment) (GlPic+24D-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Baseline

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(8)	(19)	(27)	(42)	(60)	(3)	(11)	(46)	(4)	11	(16)	27
0.25	(5)	(12)	(17)	(27)	(38)	4	(4)	(41)	6	25	15	70
0.30	(2)	(5)	(7)	(12)	(17)	11	3	(37)	17	40	47	113
0.35	1	2	2	3	4	17	10	(32)	27	54	79	155
0.40	4	9	12	18	25	24	17	(27)	38	68	111	198
0.45	8	15	21	33	46	31	23	(23)	48	83	143	241
0.50	11	22	31	48	67	38	30	(18)	59	97	175	284
0.55	14	29	40	63	88	45	37	(13)	70	111	206	326
0.60	17	36	50	78	109	52	44	(8)	80	126	238	369
0.65	21	43	60	93	130	59	51	(4)	91	140	270	412
0.70	24	50	69	108	151	66	58	1	101	155	302	455
0.75	27	57	79	123	172	72	65	6	112	169	334	497
0.80	30	64	88	138	193	79	71	10	122	183	366	540
0.85	34	70	98	153	214	86	78	15	133	198	397	583
0.90	37	77	108	168	236	93	85	20	143	212	429	626
0.95	40	84	117	183	257	100	92	25	154	226	461	669
1.00	43	91	127	198	278	107	99	29	164	241	493	711
LCC**	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.35	0.20	0.20	0.20	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 1.0 lb/acre (24D1-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $19/AUM

						5-acre Patch		10 acres	Rate of Spread	
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres	50 acres
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	total $											
0.20	(4)	(10)	(14)	(23)	(33)		(3)	(38)				20
0.25	(0)	(2)	(3)	(5)	(7)		6	(33)				59
0.30	4	7	9	14	19		14	(27)				98
0.35	8	15	21	32	45		23	(21)				137
0.40	12	24	33	51	71		31	(15)				176
0.45	15	32	44	69	97		39	(9)				215
0.50	19	40	56	87	122		48	(4)				254
0.55	23	49	68	106	148		56	2				293
0.60	27	57	80	124	174		65	8				332
0.65	31	66	91	142	200		73	14				371
0.70	35	74	103	161	226		82	20				411
0.75	39	83	115	179	252		90	25				450
0.80	43	91	127	198	277		98	31				489
0.85	47	99	138	216	303		107	37				528
0.90	51	108	150	234	329		115	43				567
0.95	55	116	162	253	355		124	48				606
1.00	59	125	174	271	381		132	54				645
LCC**	0.20	0.20	0.20	0.20	0.20		0.20	0.30				0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (applied 2 out of 3 years) (Pic.25-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $19/AUM

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(16)	(35)	(49)	(77)	(109)		(23)	(73)			(39)	
0.25	(12)	(26)	(37)	(59)	(83)		(15)	(67)			(12)	
0.30	(8)	(18)	(25)	(40)	(57)		(6)	(61)			16	
0.35	(4)	(9)	(14)	(22)	(32)		2	(56)			44	
0.40	0	(1)	(2)	(4)	(6)		11	(50)			72	
0.45	4	7	10	15	20		19	(44)			100	
0.50	8	16	22	33	46		27	(38)			128	
0.55	12	24	33	51	72		36	(32)			156	
0.60	16	33	45	70	98		44	(27)			183	
0.65	20	41	57	88	123		53	(21)			211	
0.70	24	49	69	107	149		61	(15)			239	
0.75	28	58	80	125	175		70	(9)			267	
0.80	32	66	92	143	201		78	(3)			295	
0.85	36	75	104	162	227		86	2			323	
0.90	40	83	116	180	253		95	8			350	
0.95	44	92	127	198	278		103	14			378	
1.00	48	100	139	217	304		112	20			406	
LCC**	0.20	0.25	0.25	0.25	0.25		0.20	0.45			0.20	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (biennial treatment) (Pic.5-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $19/AUM

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(26)	(57)	(80)	(125)	(177)		(41)	(104)			(124)	
0.25	(22)	(48)	(68)	(107)	(151)		(33)	(98)			(85)	
0.30	(18)	(40)	(56)	(89)	(125)		(24)	(92)			(46)	
0.35	(14)	(31)	(44)	(70)	(99)		(16)	(86)			(7)	
0.40	(10)	(23)	(33)	(52)	(74)		(8)	(80)			32	
0.45	(6)	(15)	(21)	(34)	(48)		1	(75)			71	
0.50	(2)	(6)	(9)	(15)	(22)		9	(69)			110	
0.55	2	2	3	3	4		18	(63)			149	
0.60	6	11	14	22	30		26	(57)			188	
0.65	10	19	26	40	56		35	(52)			227	
0.70	14	28	38	58	81		43	(46)			266	
0.75	18	36	50	77	107		51	(40)			305	
0.80	22	44	61	95	133		60	(34)			344	
0.85	26	53	73	113	159		68	(28)			383	
0.90	30	61	85	132	185		77	(23)			422	
0.95	34	70	97	150	211		85	(17)			461	
1.00	38	78	108	169	236		94	(11)			500	
LCC**	0.30	0.30	0.30	0.30	0.30		0.25	0.55			0.20	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (biennial treatment) (Pic.25+24D-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $19/AUM

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(13)	(29)	(41)	(65)	(92)		(19)	(65)			(39)	
0.25	(9)	(21)	(29)	(47)	(66)		(10)	(59)			(0)	
0.30	(5)	(12)	(18)	(28)	(40)		(2)	(54)			39	
0.35	(1)	(4)	(6)	(10)	(14)		7	(48)			78	
0.40	3	4	6	8	11		15	(42)			117	
0.45	7	13	18	27	37		24	(36)			156	
0.50	11	21	29	45	63		32	(30)			195	
0.55	15	30	41	64	89		40	(25)			234	
0.60	19	38	53	82	115		49	(19)			273	
0.65	23	47	65	100	141		57	(13)			312	
0.70	27	55	76	119	166		66	(7)			351	
0.75	30	63	88	137	192		74	(1)			390	
0.80	34	72	100	155	218		83	4			429	
0.85	38	80	112	174	244		91	10			468	
0.90	42	89	123	192	270		99	16			507	
0.95	46	97	135	211	296		108	22			546	
1.00	50	106	147	229	321		116	27			585	
LCC**	0.20	0.20	0.20	0.20	0.20		0.20	0.40			0.20	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (biennial treatment) (Glph.75-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $19/AUM

	Base	Infestation Sizes (acres)				5-acre Patch Area of Perimeter		10 acres Spread at	Rate of Spread 5 acres		Rate of Spread 50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(9)	(19)	(27)	(43)	(60)		(10)	(51)			(5)	
0.25	(5)	(11)	(15)	(24)	(35)		(2)	(45)			23	
0.30	(1)	(2)	(3)	(6)	(9)		7	(39)			51	
0.35	3	6	8	12	17		15	(34)			79	
0.40	7	15	20	31	43		24	(28)			107	
0.45	11	23	32	49	69		32	(22)			134	
0.50	15	31	44	68	95		40	(16)			162	
0.55	19	40	55	86	120		49	(10)			190	
0.60	23	48	67	104	146		57	(5)			218	
0.65	27	57	79	123	172		66	1			246	
0.70	31	65	91	141	198		74	7			274	
0.75	35	74	102	159	224		83	13			301	
0.80	39	82	114	178	250		91	19			329	
0.85	43	90	126	196	275		99	24			357	
0.90	47	99	138	215	301		108	30			385	
0.95	51	107	149	233	327		116	36			413	
1.00	55	116	161	251	353		125	42			441	
LCC**	0.20	0.20	0.20	0.20	0.20		0.20	0.35			0.20	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.4 lb/acre plus 2,4-D at 0.6 lb/acre (biennial treatment) (GlPic+24D-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated $19/AUM

						5-acre Patch		10 acres	Rate of Spread	
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres	50 acres
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(6)	(13)	(18)	(29)	(41)		(5)	(42)				12
0.25	(2)	(4)	(6)	(10)	(15)		4	(36)				51
0.30	2	4	6	8	11		12	(30)				90
0.35	6	13	17	27	37		21	(25)				129
0.40	10	21	29	45	63		29	(19)				168
0.45	14	29	41	63	89		37	(13)				207
0.50	18	38	53	82	114		46	(7)				246
0.55	22	46	64	100	140		54	(1)				285
0.60	26	55	76	118	166		63	4				325
0.65	30	63	88	137	192		71	10				364
0.70	34	72	100	155	218		79	16				403
0.75	38	80	111	174	244		88	22				442
0.80	42	88	123	192	269		96	28				481
0.85	46	97	135	210	295		105	33				520
0.90	50	105	147	229	321		113	39				559
0.95	54	114	158	247	347		122	45				598
1.00	58	122	170	265	373		130	51				637
LCC**	0.20	0.20	0.20	0.20	0.20		0.20	0.35				0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario $19/AUM

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program 2,4-D at 1.0 lb/acre (24D1-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Reduced Herbicide costs (20%)

						5-acre Patch		10 acres	Rate of Spread	
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres	50 acres
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr	3.0 rad ft/yr 4.0 rad ft/yr
AUMs/ac	total $									
0.20	(5)	(11)	(16)	(25)	(36)		(5)	(35)		8
0.25	(2)	(4)	(6)	(10)	(14)		2	(31)		39
0.30	2	3	3	5	7		9	(26)		71
0.35	5	9	13	20	28		16	(21)		103
0.40	8	16	23	35	49		23	(16)		135
0.45	11	23	32	50	70		30	(12)		167
0.50	15	30	42	65	91		37	(7)		199
0.55	18	37	51	80	112		44	(2)		230
0.60	21	44	61	95	133		50	2		262
0.65	24	51	71	110	154		57	7		294
0.70	28	58	80	125	175		64	12		326
0.75	31	64	90	140	196		71	17		358
0.80	34	71	99	155	217		78	21		390
0.85	37	78	109	170	238		85	26		421
0.90	40	85	118	185	260		92	31		453
0.95	44	92	128	200	281		99	36		485
1.00	47	99	138	215	302		105	40		517
LCC**	0.20	0.20	0.20	0.20	0.20		0.20	0.30		0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario Herbicide costs reduced 20 percent

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre (applied 2 out of 3 years) (Pic.25-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Reduced Herbicide costs (20%)

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(14)	(30)	(42)	(66)	(93)		(20)	(61)			(50)	
0.25	(10)	(23)	(32)	(51)	(72)		(13)	(57)			(18)	
0.30	(7)	(16)	(23)	(36)	(51)		(6)	(52)			13	
0.35	(4)	(9)	(13)	(21)	(30)		1	(47)			45	
0.40	(1)	(2)	(4)	(6)	(9)		7	(43)			77	
0.45	3	5	6	9	12		14	(38)			109	
0.50	6	11	16	24	33		21	(33)			141	
0.55	9	18	25	39	54		28	(28)			173	
0.60	12	25	35	54	75		35	(24)			204	
0.65	16	32	44	69	96		42	(19)			236	
0.70	19	39	54	84	117		49	(14)			268	
0.75	22	46	64	99	138		56	(10)			300	
0.80	25	53	73	114	160		62	(5)			332	
0.85	29	60	83	129	181		69	(0)			364	
0.90	32	66	92	144	202		76	5			395	
0.95	35	73	102	159	223		83	9			427	
1.00	38	80	112	174	244		90	14			459	
LCC**	0.25	0.25	0.25	0.25	0.25		0.20	0.45			0.20	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario Herbicide costs reduced 20 percent

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.5 lb/acre (biennial treatment) (Pic.5-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Reduced Herbicide costs (20%)

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(21)	(47)	(66)	(103)	(146)		(34)	(85)			(103)	
0.25	(18)	(40)	(56)	(88)	(125)		(27)	(80)			(71)	
0.30	(15)	(33)	(46)	(73)	(103)		(20)	(76)			(39)	
0.35	(12)	(26)	(37)	(58)	(82)		(13)	(71)			(7)	
0.40	(8)	(19)	(27)	(43)	(61)		(6)	(66)			25	
0.45	(5)	(12)	(18)	(28)	(40)		0	(61)			57	
0.50	(2)	(5)	(8)	(13)	(19)		7	(57)			89	
0.55	1.4	1.5	1.6	1.7	1.9		14	(52)			120	
0.60	5	8	11	17	23		21	(47)			152	
0.65	8	15	21	32	44		28	(43)			184	
0.70	11	22	30	47	65		35	(38)			216	
0.75	14	29	40	62	86		42	(33)			248	
0.80	18	36	50	77	107		48	(28)			280	
0.85	21	43	59	92	128		55	(24)			311	
0.90	24	50	69	107	149		62	(19)			343	
0.95	27	56	78	122	171		69	(14)			375	
1.00	31	63	88	137	192		76	(10)			407	
LCC**	0.30	0.30	0.30	0.30	0.30		0.25	0.60			0.20	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario Herbicide costs reduced 20 percent

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Picloram at 0.25 lb/acre plus 2,4-D at 1.0 lb/acre (biennial treatment) (Pic.25+24D-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Reduced Herbicide costs (20%)

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(11)	(25)	(35)	(55)	(78)		(16)	(54)			(35)	
0.25	(8)	(18)	(25)	(40)	(56)		(9)	(50)			(3)	
0.30	(5)	(11)	(16)	(25)	(35)		(2)	(45)			29	
0.35	(1)	(4)	(6)	(10)	(14)		5	(40)			61	
0.40	2	3	4	5	7		12	(35)			93	
0.45	5	10	13	20	28		19	(31)			125	
0.50	8	17	23	35	49		25	(26)			157	
0.55	12	23	32	50	70		32	(21)			188	
0.60	15	30	42	65	91		39	(17)			220	
0.65	18	37	52	80	112		46	(12)			252	
0.70	21	44	61	95	133		53	(7)			284	
0.75	24	51	71	110	154		60	(2)			316	
0.80	28	58	80	125	175		67	2			348	
0.85	31	65	90	140	196		74	7			379	
0.90	34	72	99	155	217		80	12			411	
0.95	37	78	109	170	239		87	17			443	
1.00	41	85	119	185	260		94	21			475	
LCC**	0.20	0.20	0.20	0.20	0.20		0.20	0.40			0.20	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario Herbicide costs reduced 20 percent

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.75 lb/acre (biennial treatment) (Glph.75-pc)
Control Strategy Perimeter Treatments
Scenario Evaluated Reduced Herbicide costs (20%)

						5-acre Patch		10 acres	Rate of Spread			
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres		50 acres	
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	total $											
0.20	(7)	(17)	(23)	(37)	(52)		(9)	(43)			(9)	
0.25	(4)	(10)	(14)	(22)	(31)		(2)	(38)			23	
0.30	(1)	(3)	(4)	(7)	(10)		5	(33)			54	
0.35	2	4	5	8	11		12	(29)			86	
0.40	6	11	15	23	32		18	(24)			118	
0.45	9	18	25	38	53		25	(19)			150	
0.50	12	25	34	53	74		32	(15)			182	
0.55	15	32	44	68	95		39	(10)			214	
0.60	19	38	53	83	116		46	(5)			245	
0.65	22	45	63	98	137		53	(0)			277	
0.70	25	52	73	113	158		60	4			309	
0.75	28	59	82	128	179		67	9			341	
0.80	31	66	92	143	201		73	14			373	
0.85	35	73	101	158	222		80	18			405	
0.90	38	80	111	173	243		87	23			436	
0.95	41	87	120	188	264		94	28			468	
1.00	44	93	130	203	285		101	33			500	
LCC**	0.20	0.20	0.20	0.20	0.20		0.20	0.35			0.20	

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario Herbicide costs reduced 20 percent

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years

Treatment Program Glyphosate at 0.4 lb/acre plus 2,4-D at 0.6 lb/acre (biennial treatment) (GlPic+24D-pc)

Control Strategy Perimeter Treatments

Scenario Evaluated Reduced Herbicide costs (20%)

						5-acre Patch		10 acres	Rate of Spread	
	Base	Infestation Sizes (acres)				Area of Perimeter		Spread at	5 acres	50 acres
	Scenario*	5	10	25	50	10 ft	12.5 ft	1.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr	3.0 rad ft/yr	4.0 rad ft/yr
AUMs/ac	----------	----------	----------	----------	----------	----------	total $	----------	----------	----------	----------	----------
0.20	(5)	(11)	(16)	(26)	(36)		(5)	(36)				7
0.25	(2)	(5)	(7)	(11)	(15)		2	(31)				38
0.30	1	2	3	4	6		9	(26)				70
0.35	5	9	13	19	27		16	(22)				102
0.40	8	16	22	34	48		23	(17)				134
0.45	11	23	32	49	69		30	(12)				166
0.50	14	30	41	64	90		36	(7)				198
0.55	18	37	51	79	111		43	(3)				229
0.60	21	44	61	94	132		50	2				261
0.65	24	50	70	109	153		57	7				293
0.70	27	57	80	124	174		64	11				325
0.75	31	64	89	139	195		71	16				357
0.80	34	71	99	154	216		78	21				389
0.85	37	78	108	169	238		85	26				421
0.90	40	85	118	184	259		91	30				452
0.95	44	92	128	199	280		98	35				484
1.00	47	99	137	214	301		105	40				516
LCC**	0.20	0.20	0.20	0.20	0.20		0.20	0.30				0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $15.50/AUM, 15 feet of periphery treated.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

Base scenario Herbicide costs reduced 20 percent

APPENDIX C

Case Study: Slope and Ransom Counties

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program Picloram at 0.25 lb/acre (Pic.25)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(61)	(45)	(54)	(70)	(71)	(72)	(60)	(53)	(45)
0.25	(49)	(29)	(41)	(61)	(63)	(64)	(48)	(39)	(29)
0.30	(38)	(12)	(28)	(52)	(55)	(56)	(37)	(26)	(12)
0.35	(26)	4	(14)	(44)	(46)	(48)	(25)	(12)	4
0.40	(15)	20	(1)	(35)	(38)	(39)	(13)	2	20
0.45	(3)	36	12	(26)	(30)	(31)	(2)	16	36
0.50	8	52	26	(17)	(21)	(23)	10	29	52
0.55	20	68	39	(8)	(13)	(15)	22	43	68
0.60	31	85	52	0	(5)	(7)	33	57	85
0.65	43	101	66	9	4	1	45	71	101
0.70	55	117	79	18	12	9	57	84	117
0.75	66	133	93	27	20	17	68	98	133
0.80	78	149	106	35	29	25	80	112	149
0.85	89	166	119	44	37	33	92	126	166
0.90	101	182	133	53	45	42	103	140	182
0.95	112	198	146	62	54	50	115	153	198
1.00	124	214	159	70	62	58	127	167	214
LCC**	0.25	0.20	0.20	0.30	0.35	0.35	0.25	0.20	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program Picloram at 0.5 lb/acre (Pic.5)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(116)	(100)	(110)					(108)	(100)
0.25	(105)	(84)	(96)					(95)	(84)
0.30	(93)	(68)	(83)					(81)	(68)
0.35	(82)	(52)	(70)					(68)	(52)
0.40	(71)	(36)	(57)					(54)	(36)
0.45	(60)	(20)	(44)					(41)	(20)
0.50	(49)	(4)	(31)					(27)	(4)
0.55	(37)	12	(18)					(14)	12
0.60	(26)	28	(5)					(0)	28
0.65	(15)	44	8					13	44
0.70	(4)	60	21					27	60
0.75	7	76	34					40	76
0.80	19	92	47					54	92
0.85	30	108	60					67	108
0.90	41	123	74					81	123
0.95	52	139	87					94	139
1.00	63	155	100					108	155
LCC**	0.40	0.30	0.35	0.50	0.50	0.55		0.35	0.30

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program Picloram at 0.25 lb/acre+2,4-D at 1.0 lb/acre (Pic.25+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(82)	(65)	(75)	(91)	(93)	(93)		(74)	(65)
0.25	(70)	(49)	(61)	(82)	(84)	(85)		(60)	(49)
0.30	(58)	(32)	(47)	(73)	(75)	(76)		(45)	(32)
0.35	(45)	(15)	(33)	(63)	(66)	(67)		(31)	(15)
0.40	(33)	2	(20)	(54)	(57)	(59)		(17)	2
0.45	(21)	19	(6)	(45)	(48)	(50)		(2)	19
0.50	(9)	35	8	(35)	(40)	(42)		12	35
0.55	3	52	22	(26)	(31)	(33)		27	52
0.60	15	69	36	(17)	(22)	(24)		41	69
0.65	27	86	50	(8)	(13)	(16)		55	86
0.70	39	103	64	2	(4)	(7)		70	103
0.75	51	120	78	11	5	1		84	120
0.80	63	136	92	20	13	10		98	136
0.85	75	153	106	29	22	19		113	153
0.90	87	170	120	39	31	27		127	170
0.95	99	187	134	48	40	36		141	187
1.00	112	204	148	57	49	45		156	204
LCC**	0.30	0.20	0.25	0.35	0.40	0.40		0.25	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program Picloram at 0.5 lb/acre+2,4-D at 1.0 lb/acre (Pic.5+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(165)	(151)	(160)					(158)	(151)
0.25	(153)	(134)	(146)					(144)	(134)
0.30	(141)	(117)	(132)					(130)	(117)
0.35	(129)	(100)	(118)					(115)	(100)
0.40	(117)	(83)	(104)					(101)	(83)
0.45	(105)	(66)	(90)					(86)	(66)
0.50	(92)	(49)	(76)					(72)	(49)
0.55	(80)	(33)	(62)					(57)	(33)
0.60	(68)	(16)	(47)					(43)	(16)
0.65	(56)	1	(33)					(29)	1
0.70	(44)	18	(19)					(14)	18
0.75	(32)	35	(5)					0	35
0.80	(20)	52	9					15	52
0.85	(7)	69	23					29	69
0.90	5	86	37					44	86
0.95	17	102	51					58	102
1.00	29	119	65					72	119
LCC**	0.45	0.35	0.40	0.60	0.60	0.65		0.40	0.35

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program Picloram at 0.5 lb/acre+2,4-D at 1.0 lb/acre (3 year application) (Pic.5+24Ds)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(126)	(110)	(120)					(118)	(110)
0.25	(115)	(95)	(107)					(105)	(95)
0.30	(104)	(79)	(94)					(92)	(79)
0.35	(93)	(64)	(81)					(79)	(64)
0.40	(82)	(48)	(69)					(66)	(48)
0.45	(71)	(33)	(56)					(53)	(33)
0.50	(60)	(17)	(43)					(40)	(17)
0.55	(50)	(2)	(31)					(27)	(2)
0.60	(39)	14	(18)					(14)	14
0.65	(28)	29	(5)					(0)	29
0.70	(17)	45	7					13	45
0.75	(6)	60	20					26	60
0.80	5	76	33					39	76
0.85	15	92	45					52	92
0.90	26	107	58					65	107
0.95	37	123	71					78	123
1.00	48	138	84					91	138
LCC**	0.40	0.30	0.35	0.55	0.55	0.60		0.35	0.30

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program 2,4-D at 1.0 lb/acre (24D1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(41)	(22)	(34)	(53)	(54)	(55)		(32)	(22)
0.25	(33)	(9)	(23)	(47)	(49)	(50)		(21)	(9)
0.30	(25)	4	(13)	(41)	(44)	(46)		(11)	4
0.35	(16)	17	(3)	(36)	(39)	(41)		(0)	17
0.40	(8)	30	7	(30)	(34)	(36)		11	30
0.45	1	44	18	(25)	(29)	(31)		21	44
0.50	9	57	28	(19)	(24)	(26)		32	57
0.55	17	70	38	(14)	(19)	(21)		43	70
0.60	26	83	48	(8)	(14)	(16)		53	83
0.65	34	96	59	(3)	(9)	(11)		64	96
0.70	42	109	69	3	(3)	(7)		75	109
0.75	51	122	79	8	2	(2)		85	122
0.80	59	136	89	14	7	3		96	136
0.85	68	149	100	19	12	8		107	149
0.90	76	162	110	25	17	13		117	162
0.95	84	175	120	31	22	18		128	175
1.00	93	188	130	36	27	23		139	188
LCC**	0.25	0.20	0.20	0.35	0.40	0.40		0.20	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program 2,4-D at 2.0 lb/acre (24D2)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(77)	(58)	(69)	(88)	(90)	(91)		(68)	(58)
0.25	(66)	(42)	(57)	(80)	(83)	(84)		(55)	(42)
0.30	(56)	(27)	(44)	(73)	(75)	(77)		(42)	(27)
0.35	(45)	(12)	(32)	(65)	(68)	(70)		(29)	(12)
0.40	(34)	4	(19)	(57)	(61)	(62)		(16)	4
0.45	(24)	19	(7)	(49)	(53)	(55)		(3)	19
0.50	(13)	34	5	(42)	(46)	(48)		10	34
0.55	(3)	50	18	(34)	(39)	(41)		22	50
0.60	8	65	30	(26)	(32)	(34)		35	65
0.65	18	80	43	(19)	(24)	(27)		48	80
0.70	29	96	55	(11)	(17)	(20)		61	96
0.75	39	111	68	(3)	(10)	(13)		74	111
0.80	50	126	80	5	(2)	(6)		87	126
0.85	61	142	93	12	5	1		99	142
0.90	71	157	105	20	12	8		112	157
0.95	82	172	117	28	19	15		125	172
1.00	92	188	130	36	27	22		138	188
LCC**	0.30	0.20	0.25	0.40	0.45	0.45		0.25	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program Glyphosate at 0.75 lb/acre (Glph.75)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	----------	----------	----------	----------	$/acre	----------	----------	----------	----------
0.20	(32)	(20)	(28)	(39)	(40)	(41)	(32)	(27)	(20)
0.25	(23)	(7)	(17)	(33)	(34)	(35)	(23)	(16)	(7)
0.30	(14)	6	(6)	(26)	(28)	(29)	(13)	(4)	6
0.35	(5)	20	4	(20)	(22)	(23)	(4)	7	20
0.40	4	33	15	(13)	(16)	(17)	5	18	33
0.45	13	46	26	(7)	(10)	(11)	14	29	46
0.50	22	60	37	(0)	(4)	(6)	23	40	60
0.55	31	73	47	6	2	0	32	51	73
0.60	40	86	58	12	8	6	41	62	86
0.65	49	100	69	19	14	12	50	73	100
0.70	58	113	79	25	20	18	60	84	113
0.75	67	126	90	32	26	24	69	95	126
0.80	75	140	101	38	32	29	78	106	140
0.85	84	153	111	44	38	35	87	117	153
0.90	93	166	122	51	44	41	96	128	166
0.95	102	180	133	57	50	47	105	139	180
1.00	111	193	144	64	56	53	114	151	193
LCC**	0.20	0.20	0.20	0.30	0.30	0.30	0.20	0.20	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (GlPic+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(71)	(54)	(65)	(82)	(83)	(84)	(71)	(63)	(54)
0.25	(59)	(37)	(50)	(72)	(74)	(75)	(58)	(49)	(37)
0.30	(47)	(20)	(36)	(63)	(65)	(66)	(46)	(34)	(20)
0.35	(35)	(3)	(22)	(53)	(56)	(58)	(34)	(20)	(3)
0.40	(23)	14	(8)	(44)	(47)	(49)	(21)	(5)	14
0.45	(10)	31	6	(35)	(38)	(40)	(9)	9	31
0.50	2	48	20	(25)	(29)	(32)	3	24	48
0.55	14	65	34	(16)	(21)	(23)	16	38	65
0.60	26	82	48	(6)	(12)	(14)	28	53	82
0.65	38	98	62	3	(3)	(5)	40	67	98
0.70	51	115	76	12	6	3	53	82	115
0.75	63	132	90	22	15	12	65	96	132
0.80	75	149	104	31	24	21	77	111	149
0.85	87	166	118	40	33	29	90	125	166
0.90	99	183	132	50	42	38	102	140	183
0.95	112	200	147	59	51	47	114	154	200
1.00	124	217	161	69	60	56	127	169	217
LCC**	0.25	0.20	0.25	0.35	0.35	0.35	0.25	0.25	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Slope County

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (2 year application) (GlPic+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(39)	(23)	(32)	(48)	(49)	(50)	(38)	(31)	(23)
0.25	(29)	(9)	(21)	(41)	(43)	(44)	(28)	(19)	(9)
0.30	(20)	5	(10)	(34)	(37)	(38)	(19)	(8)	5
0.35	(10)	19	1	(28)	(30)	(32)	(9)	4	19
0.40	(1)	33	13	(21)	(24)	(26)	0	15	33
0.45	9	47	24	(14)	(18)	(20)	10	27	47
0.50	18	61	35	(8)	(12)	(14)	19	39	61
0.55	27	75	46	(1)	(5)	(7)	29	50	75
0.60	37	89	58	6	1	(1)	38	62	89
0.65	46	104	69	13	7	5	48	74	104
0.70	56	118	80	19	13	11	58	85	118
0.75	65	132	91	26	20	17	67	97	132
0.80	74	146	102	33	26	23	77	109	146
0.85	84	160	114	39	32	29	86	120	160
0.90	93	174	125	46	39	35	96	132	174
0.95	103	188	136	53	45	41	105	143	188
1.00	112	202	147	59	51	47	115	155	202
LCC**	0.25	0.20	0.20	0.30	0.30	0.35	0.25	0.20	0.23

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $19.23/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program Picloram at 0.25 lb/acre (Pic.25)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

							Infestation Density	1-Acre Infestation	
	Base	Infestation Sizes (acres)							
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(73)	(63)	(69)	(79)	(80)	(81)	(73)	(68)	(63)
0.25	(65)	(51)	(60)	(73)	(74)	(75)	(64)	(58)	(51)
0.30	(57)	(39)	(50)	(67)	(68)	(69)	(56)	(48)	(39)
0.35	(48)	(27)	(40)	(60)	(62)	(63)	(48)	(38)	(27)
0.40	(40)	(16)	(30)	(54)	(56)	(57)	(39)	(28)	(16)
0.45	(32)	(4)	(21)	(48)	(50)	(51)	(31)	(18)	(4)
0.50	(23)	8	(11)	(41)	(44)	(46)	(22)	(8)	8
0.55	(15)	19	(1)	(35)	(38)	(40)	(14)	1	19
0.60	(7)	31	8	(29)	(32)	(34)	(5)	11	31
0.65	2	43	18	(22)	(26)	(28)	3	21	43
0.70	10	55	28	(16)	(20)	(22)	12	31	55
0.75	18	66	37	(10)	(14)	(16)	20	41	66
0.80	27	78	47	(3)	(8)	(10)	28	51	78
0.85	35	90	57	3	(2)	(5)	37	61	90
0.90	43	101	66	9	4	1	45	71	101
0.95	52	113	76	16	10	7	54	81	113
1.00	60	125	86	22	16	13	62	91	125
LCC**	0.35	0.25	0.30	0.45	0.45	0.45	0.35	0.30	0.25

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program Picloram at 0.5 lb/acre (Pic.5)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(128)	(117)	(124)	(135)	(136)	(136)	(128)	(123)	(117)
0.25	(120)	(106)	(114)	(129)	(130)	(130)	(120)	(113)	(106)
0.30	(112)	(94)	(105)	(122)	(124)	(125)	(111)	(103)	(94)
0.35	(104)	(83)	(96)	(116)	(118)	(119)	(103)	(94)	(83)
0.40	(96)	(71)	(86)	(110)	(113)	(114)	(95)	(84)	(71)
0.45	(88)	(59)	(77)	(104)	(107)	(108)	(87)	(74)	(59)
0.50	(80)	(48)	(67)	(98)	(101)	(102)	(78)	(64)	(48)
0.55	(71)	(36)	(58)	(92)	(95)	(97)	(70)	(55)	(36)
0.60	(63)	(25)	(48)	(86)	(89)	(91)	(62)	(45)	(25)
0.65	(55)	(13)	(39)	(80)	(84)	(86)	(54)	(35)	(13)
0.70	(47)	(2)	(29)	(74)	(78)	(80)	(46)	(25)	(2)
0.75	(39)	10	(20)	(68)	(72)	(74)	(37)	(16)	10
0.80	(31)	21	(10)	(62)	(66)	(69)	(29)	(6)	21
0.85	(23)	33	(1)	(55)	(61)	(63)	(21)	4	33
0.90	(15)	44	9	(49)	(55)	(57)	(13)	14	44
0.95	(6)	56	18	(43)	(49)	(52)	(4)	23	56
1.00	2	68	28	(37)	(43)	(46)	4	33	68
LCC**	0.50	0.40	0.45	0.70	0.70	0.75	0.50	0.45	0.40

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program Picloram at 1.0 lb/acre (Pic1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

	Base	Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	----------	----------	----------	----------	$/acre	----------	----------	----------	----------
0.20	(194)	(195)	(195)					(195)	(195)
0.25	(187)	(186)	(187)					(187)	(186)
0.30	(181)	(176)	(179)					(179)	(176)
0.35	(175)	(167)	(172)					(171)	(167)
0.40	(168)	(157)	(164)					(163)	(157)
0.45	(162)	(148)	(157)					(155)	(148)
0.50	(156)	(138)	(149)					(148)	(138)
0.55	(149)	(129)	(141)					(140)	(129)
0.60	(143)	(119)	(134)					(132)	(119)
0.65	(137)	(110)	(126)					(124)	(110)
0.70	(130)	(100)	(119)					(116)	(100)
0.75	(124)	(91)	(111)					(108)	(91)
0.80	(118)	(81)	(104)					(100)	(81)
0.85	(112)	(72)	(96)					(93)	(72)
0.90	(105)	(62)	(88)					(85)	(62)
0.95	(99)	(52)	(81)					(77)	(52)
1.00	(93)	(43)	(73)					(69)	(43)
LCC**	0.90	0.65	0.75	na	na	na	0.90	0.75	0.65

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program Picloram at 0.25 lb/acre+2,4-D at 1.0 lb/acre (Pic.25+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(95)	(84)	(91)	(101)	(102)	(103)	(95)	(90)	(84)
0.25	(86)	(72)	(81)	(95)	(96)	(97)	(86)	(79)	(72)
0.30	(78)	(60)	(70)	(88)	(90)	(90)	(77)	(69)	(60)
0.35	(69)	(47)	(60)	(81)	(83)	(84)	(68)	(59)	(47)
0.40	(60)	(35)	(50)	(74)	(77)	(78)	(59)	(48)	(35)
0.45	(51)	(23)	(40)	(68)	(70)	(72)	(50)	(38)	(23)
0.50	(43)	(11)	(30)	(61)	(64)	(65)	(41)	(27)	(11)
0.55	(34)	1	(20)	(54)	(58)	(59)	(33)	(17)	1
0.60	(25)	13	(10)	(48)	(51)	(53)	(24)	(7)	13
0.65	(16)	26	0	(41)	(45)	(47)	(15)	4	26
0.70	(8)	38	10	(34)	(38)	(40)	(6)	14	38
0.75	1	50	20	(27)	(32)	(34)	3	25	50
0.80	10	62	31	(21)	(26)	(28)	12	35	62
0.85	19	74	41	(14)	(19)	(22)	21	45	74
0.90	27	87	51	(7)	(13)	(15)	29	56	87
0.95	36	99	61	(1)	(6)	(9)	38	66	99
1.00	45	111	71	6	0	(3)	47	77	111
LCC**	0.40	0.30	0.35	0.50	0.50	0.55	0.40	0.35	0.30

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

[ ] County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program Picloram at 0.5 lb/acre+2,4-D at 1.0 lb/acre (Pic.5+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(179)	(169)	(175)	(184)	(185)	(185)	(178)	(174)	(169)
0.25	(170)	(157)	(165)	(177)	(178)	(179)	(169)	(164)	(157)
0.30	(161)	(145)	(155)	(170)	(172)	(172)	(160)	(153)	(145)
0.35	(152)	(133)	(145)	(164)	(165)	(166)	(152)	(143)	(133)
0.40	(144)	(120)	(134)	(157)	(159)	(160)	(143)	(133)	(120)
0.45	(135)	(108)	(124)	(150)	(152)	(154)	(134)	(122)	(108)
0.50	(126)	(96)	(114)	(143)	(146)	(147)	(125)	(112)	(96)
0.55	(117)	(84)	(104)	(137)	(140)	(141)	(116)	(101)	(84)
0.60	(108)	(72)	(94)	(130)	(133)	(135)	(107)	(91)	(72)
0.65	(100)	(59)	(84)	(123)	(127)	(128)	(98)	(80)	(59)
0.70	(91)	(47)	(74)	(116)	(120)	(122)	(89)	(70)	(47)
0.75	(82)	(35)	(63)	(109)	(114)	(116)	(80)	(59)	(35)
0.80	(73)	(23)	(53)	(103)	(107)	(110)	(71)	(49)	(23)
0.85	(64)	(10)	(43)	(96)	(101)	(103)	(63)	(38)	(10)
0.90	(56)	2	(33)	(89)	(94)	(97)	(54)	(28)	2
0.95	(47)	14	(23)	(82)	(88)	(91)	(45)	(18)	14
1.00	(38)	26	(13)	(76)	(81)	(84)	(36)	(7)	26
LCC**	0.65	0.45	0.55	0.80	0.85	0.85	0.65	0.55	0.45

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program Picloram at 0.5 lb/acre+2,4-D at 1.0 lb/acre (Pic.5+24Ds)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

							Infestation		
	Base	Infestation Sizes (acres)					Density	1-Acre Infestation	
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(137)	(127)	(134)	(143)	(144)	(144)	(137)	(133)	(127)
0.25	(130)	(116)	(124)	(137)	(138)	(139)	(129)	(123)	(116)
0.30	(122)	(105)	(115)	(131)	(133)	(134)	(121)	(114)	(105)
0.35	(114)	(94)	(106)	(126)	(127)	(128)	(113)	(104)	(94)
0.40	(106)	(82)	(97)	(120)	(122)	(123)	(105)	(95)	(82)
0.45	(98)	(71)	(88)	(114)	(116)	(117)	(97)	(85)	(71)
0.50	(90)	(60)	(78)	(108)	(111)	(112)	(89)	(76)	(60)
0.55	(82)	(49)	(69)	(102)	(105)	(107)	(81)	(66)	(49)
0.60	(75)	(37)	(60)	(96)	(100)	(101)	(73)	(57)	(37)
0.65	(67)	(26)	(51)	(90)	(94)	(96)	(65)	(47)	(26)
0.70	(59)	(15)	(42)	(85)	(89)	(91)	(57)	(38)	(15)
0.75	(51)	(4)	(32)	(79)	(83)	(85)	(49)	(28)	(4)
0.80	(43)	8	(23)	(73)	(78)	(80)	(42)	(19)	8
0.85	(35)	19	(14)	(67)	(72)	(74)	(34)	(9)	19
0.90	(27)	30	(5)	(61)	(66)	(69)	(26)	0	30
0.95	(20)	41	4	(55)	(61)	(64)	(18)	10	41
1.00	(12)	53	14	(49)	(55)	(58)	(10)	19	53
LCC**	0.55	0.40	0.50	0.75	0.80	0.80	0.55	0.45	0.40

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program 2,4-D at 1.0 lb/acre (24D1)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(50)	(37)	(45)	(59)	(60)	(61)		(44)	(37)
0.25	(44)	(27)	(38)	(55)	(56)	(57)		(36)	(27)
0.30	(38)	(18)	(30)	(51)	(53)	(54)		(28)	(18)
0.35	(32)	(8)	(23)	(47)	(49)	(50)		(21)	(8)
0.40	(26)	1	(15)	(43)	(45)	(46)		(13)	1
0.45	(20)	11	(8)	(39)	(42)	(43)		(5)	11
0.50	(14)	20	(0)	(35)	(38)	(39)		3	20
0.55	(8)	30	7	(31)	(34)	(36)		10	30
0.60	(2)	40	14	(27)	(30)	(32)		18	40
0.65	4	49	22	(23)	(27)	(29)		26	49
0.70	10	59	29	(19)	(23)	(25)		33	59
0.75	16	68	37	(15)	(19)	(22)		41	68
0.80	22	78	44	(11)	(16)	(18)		49	78
0.85	28	87	52	(7)	(12)	(15)		57	87
0.90	34	97	59	(2)	(8)	(11)		64	97
0.95	40	106	66	2	(5)	(8)		72	106
1.00	47	116	74	6	(1)	(4)		80	116
LCC**	0.35	0.20	0.30	0.50	0.55	0.55		0.25	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program 2,4-D at 2.0 lb/acre (24D2)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(88)	(75)	(83)	(97)	(98)	(98)	(87)	(82)	(75)
0.25	(81)	(63)	(74)	(91)	(93)	(93)	(80)	(72)	(63)
0.30	(73)	(52)	(65)	(85)	(87)	(88)	(72)	(63)	(52)
0.35	(65)	(41)	(56)	(80)	(82)	(83)	(64)	(54)	(41)
0.40	(58)	(30)	(47)	(74)	(77)	(78)	(56)	(44)	(30)
0.45	(50)	(19)	(38)	(69)	(71)	(73)	(48)	(35)	(19)
0.50	(42)	(8)	(29)	(63)	(66)	(68)	(40)	(26)	(8)
0.55	(35)	3	(20)	(57)	(61)	(63)	(32)	(17)	3
0.60	(27)	14	(11)	(52)	(56)	(58)	(25)	(7)	14
0.65	(20)	25	(2)	(46)	(50)	(52)	(17)	2	25
0.70	(12)	37	7	(41)	(45)	(47)	(9)	11	37
0.75	(4)	48	16	(35)	(40)	(42)	(1)	21	48
0.80	3	59	25	(29)	(35)	(37)	7	30	59
0.85	11	70	34	(24)	(29)	(32)	15	39	70
0.90	19	81	43	(18)	(24)	(27)	23	49	81
0.95	26	92	52	(13)	(19)	(22)	30	58	92
1.00	34	103	61	(7)	13	(17)	38	67	103
LCC**	0.40	0.30	0.35	0.55	0.60	0.60	0.40	0.35	0.30

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program Glyphosate at 0.75 lb/acre (Glph.75)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(42)	(35)	(39)	(46)	(47)	(47)	(42)	(39)	(35)
0.25	(36)	(25)	(32)	(41)	(42)	(43)	(35)	(31)	(25)
0.30	(29)	(16)	(24)	(37)	(38)	(39)	(29)	(23)	(16)
0.35	(23)	(6)	(16)	(32)	(34)	(34)	(22)	(15)	(6)
0.40	(16)	4	(8)	(28)	(29)	(30)	(15)	(7)	4
0.45	(10)	13	(1)	(23)	(25)	(26)	(9)	1	13
0.50	(3)	23	7	(18)	(21)	(22)	(2)	9	23
0.55	3	33	15	(14)	(16)	(17)	4	17	33
0.60	10	42	23	(9)	(12)	(13)	11	25	42
0.65	16	52	30	(4)	(7)	(9)	18	33	52
0.70	23	62	38	0	(3)	(5)	24	41	62
0.75	29	71	46	5	1	(1)	31	49	71
0.80	36	81	54	10	6	4	38	57	81
0.85	42	91	61	14	10	8	44	65	91
0.90	49	100	69	19	14	12	51	73	100
0.95	55	110	77	24	19	16	57	81	110
1.00	62	120	85	28	23	21	64	89	120
LCC**	0.30	0.20	0.25	0.35	0.40	0.40	0.30	0.25	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93/AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (GlPic+24D)
Control Strategy Treat the Entire Infestation
Scenario Evaluated Baseline

							Infestation Density	1-Acre Infestation	
	Base	Infestation Sizes (acres)							
	Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(85)	(73)	(80)	(92)	(93)	(93)	(84)	(79)	(73)
0.25	(76)	(60)	(70)	(85)	(86)	(87)	(75)	(69)	(60)
0.30	(67)	(48)	(60)	(78)	(80)	(81)	(67)	(58)	(48)
0.35	(58)	(36)	(49)	(71)	(74)	(75)	(58)	(48)	(36)
0.40	(49)	(24)	(39)	(65)	(67)	(68)	(49)	(37)	(24)
0.45	(41)	(11)	(29)	(58)	(61)	(62)	(40)	(27)	(11)
0.50	(32)	1	(19)	(51)	(54)	(56)	(31)	(16)	1
0.55	(23)	13	(9)	(44)	(48)	(49)	(22)	(6)	13
0.60	(14)	25	1	(37)	(41)	(43)	(13)	5	25
0.65	(5)	38	12	(31)	(35)	(37)	(4)	15	38
0.70	4	50	22	(24)	(28)	(30)	5	26	50
0.75	12	62	32	(17)	(22)	(24)	14	36	62
0.80	21	75	42	(10)	(15)	(18)	23	47	75
0.85	30	87	52	(4)	(9)	(11)	32	57	87
0.90	39	99	63	3	(2)	(5)	41	68	99
0.95	48	111	73	10	4	1	50	78	111
1.00	57	124	83	17	11	8	59	89	124
LCC**	0.35	0.25	0.30	0.45	0.50	0.50	0.35	0.30	0.25

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93 AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

Present Value of Net Returns From Herbicide Treatment Programs Over 20 Years, Ransom County

Treatment Program Glyphosate (0.4 lb/acre) plus 2,4-D (0.6 lb/acre) then Picloram (0.25 lb/acre) plus 2,4-D (1.0 lb/acre) (2 year application) (GlPic+24Ds)

Control Strategy Treat the Entire Infestation

Scenario Evaluated Baseline

		Infestation Sizes (acres)					Infestation Density	1-Acre Infestation	
	Base Scenario*	0.25	0.5	10	25	50	50 percent	3.0 rad ft	4.0 rad ft
AUMs/ac	$/acre								
0.20	(49)	(38)	(45)	(55)	(56)	(56)	(49)	(44)	(38)
0.25	(42)	(28)	(37)	(50)	(51)	(52)	(42)	(35)	(28)
0.30	(35)	(18)	(28)	(45)	(47)	(48)	(35)	(27)	(18)
0.35	(28)	(8)	(20)	(41)	(42)	(43)	(28)	(19)	(8)
0.40	(22)	2	(12)	(36)	(38)	(39)	(21)	(10)	2
0.45	(15)	13	(4)	(31)	(33)	(35)	(14)	(2)	13
0.50	(8)	23	4	(26)	(29)	(30)	(7)	7	23
0.55	(1)	33	12	(21)	(24)	(26)	(0)	15	33
0.60	6	43	20	(16)	(20)	(21)	7	24	43
0.65	12	53	28	(11)	(15)	(17)	14	32	53
0.70	19	63	37	(7)	(11)	(13)	21	40	63
0.75	26	74	45	(2)	(6)	(8)	28	49	74
0.80	33	84	53	3	(2)	(4)	35	57	84
0.85	40	94	61	8	3	0	41	66	94
0.90	47	104	69	13	7	5	48	74	104
0.95	53	114	77	18	12	9	55	83	114
1.00	60	124	85	22	17	14	62	91	124
LCC**	0.30	0.20	0.25	0.40	0.45	0.45	0.30	0.25	0.20

* Base scenario conditions: spread at 2.0 radial/feet year, maximum patch density, 1-acre infestation, $13.93 AUM.

** Least-loss carrying capacity (AUMs/acre): minimum carrying capacity needed for this treatment to result in less loss than no control.

County average carrying capacity

APPENDIX D

Grazing Productivity and Leafy Spurge Distributions, North Dakota, 1993

Appendix Table D1. Private Grazing Land by Carrying Capacity and Leafy Spurge Infestations, by County, North Dakota, 1993

County	Private Grazing Land			Leafy Spurge on Private Grazing Land
	Acres	Carrying Capacity	AUMs	
		- AUMs/acre -		- acres -
Sargent	52,692	0.980	51,638	12,774
Richland	51,534	0.980	50,504	6,172
Steele	19,417	0.980	19,028	2,604
Cass	27,799	0.980	27,243	9,926
Traill	28,973	0.980	28,394	1,595
Ransom	48,094	0.980	47,132	21,210
Barnes	58,433	0.900	52,590	10,056
Dickey	99,699	0.900	89,729	3,343
Stutsman	301,304	0.900	271,174	18,285
LaMoure	32,758	0.900	29,482	4,773
Pembina	31,167	0.853	26,585	1,234
Nelson	48,245	0.853	41,153	8,820
Walsh	25,054	0.853	21,371	1,789
Grand Forks	55,659	0.853	47,477	1,896
Griggs	38,191	0.850	32,462	1,046
Foster	42,624	0.850	36,231	19,679
Wells	43,006	0.850	36,555	4,187
McIntosh	149,104	0.820	122,265	1,439
Logan	262,463	0.820	215,220	850
Eddy	70,281	0.795	55,874	12,050
Benson	92,481	0.795	73,523	14,778
Ramsey	33,569	0.795	26,688	1,655
Cavalier	17,965	0.795	14,282	952
Rollette	66,780	0.765	51,087	13,450
Towner	7,364	0.765	5,634	895
Kidder	297,235	0.691	205,389	6,638
Pierce	76,665	0.660	50,599	17,078
McHenry	275,384	0.660	181,753	71,392
Burleigh	384,987	0.641	246,777	816
Emmons	296,567	0.641	190,100	5,760
Bottineau	47,491	0.610	28,970	7,152
Sheridan	142,293	0.591	84,095	25
McLean	244,407	0.581	142,001	5,147
Renville	21,535	0.560	12,060	567
Mountrail	389,867	0.560	218,325	3,032
Ward	199,123	0.560	111,509	9,411
Grant	535,704	0.541	289,816	13,637
Mercer	273,818	0.541	148,135	5,594
Morton	571,119	0.541	308,975	37,081

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Appendix Table D1. Continued

County	Private Grazing Land			Leafy Spurge on Private Grazing Land
	Acres	Carrying Capacity	AUMs	
		- AUMs/acre -		- acres -
Oliver	180,395	0.541	97,594	10,598
Sioux	473,067	0.541	255,929	4,656
Burke	147,715	0.510	75,335	3,501
Williams	305,336	0.506	154,457	21,587
Divide	120,641	0.506	61,027	190
Stark	238,130	0.500	119,160	63,919
Dunn	770,251	0.500	385,434	1,926
Adams	208,102	0.480	99,972	1,308
Hettinger	84,215	0.480	40,457	3,675
Billings	254,479	0.454	115,466	142
McKenzie	561,347	0.452	253,657	372
Slope	256,035	0.440	112,758	931
Golden Valley	204,121	0.400	81,730	12,240
Bowman	307,780	0.400	123,235	847
State	9,572,467		5,668,033	484,679

Source: Bangsund and Olson (1993); Leitch et al. (1995).

Land Productivity	Private Grazing Land			
	Acres	Percent	AUMs	Percent
0.60 AUMs/acre or less	6,489,482	67.8%	3,291,127	58.1%
Greater than 0.60 AUMs/acre	3,082,985	32.2%	2,376,906	41.9%

	Acres of Leafy Spurge	Percent
0.60 AUMs/acre or less	200,386	41.3%
Greater than 0.60 AUMs/acre	284,293	58.7%

APPENDIX E

Leafy Spurge Patch Expansion Relationships

Appendix Table E1. Size of Leafy Spurge Infestations in 20 Years, Various Sizes and Expansion Rates, North Dakota

Initial Size		Size of Infestation in 20 years					
		Spread at 2.0 rad ft/yr		Increase	Spread at 3.0 rad ft/yr		Increase
Area	Diameter	Area	Diameter	in Size	Area	Diameter	in Size
- acres -	- feet -	- acres -	- feet -	- % -	- acres -	- feet -	- % -
0.005	**15**	0.17	**97**	3,270	0.34	**137**	6,636
0.010	**25**	0.19	**104**	1,834	0.37	**144**	3,617
0.050	**50**	0.32	**133**	535	0.54	**173**	975
0.100	**75**	0.43	**154**	330	0.68	**194**	582
0.185	**100**	0.59	**181**	220	0.88	**221**	377
0.280	**125**	0.76	**205**	170	1.08	**245**	285
0.400	**150**	0.95	**229**	136	1.30	**269**	226
0.560	**175**	1.18	**256**	111	1.58	**296**	183
0.720	**200**	1.41	**280**	96	1.84	**320**	156
0.910	**225**	1.67	**305**	84	2.14	**345**	135
1.0	235	**1.8**	315	79	**2.3**	355	128
2.5	372	**3.7**	452	48	**4.4**	492	75
5.0	526	**6.6**	606	33	**7.5**	646	51
10.0	745	**12.3**	825	23	**13.5**	865	35
25.0	1,177	**28.5**	1,257	14	**30.4**	1,297	21
50.0	1,665	**54.9**	1,745	10	**57.5**	1,785	15

Appendix Table E2. Lost Grazing From Leafy Spurge Patches and Their Expansions Over 20 Years, North Dakota

Carrying Capacity	Spread at 2.0 Radial Feet/Year AUMs Lost			Spread at 3.0 Radial Feet/Year AUMs Lost		
	Original Patch	Expansion	Total	Original Patch	Expansion	Total
- AUMs/acre-	---------- One tenth-acre Infestation ----------					
0.20	0.40	0.55	1.0	0.40	0.93	1.3
0.25	0.50	0.69	1.2	0.50	1.17	1.7
0.30	0.60	0.83	1.4	0.60	1.40	2.0
0.35	0.70	0.96	1.7	0.70	1.63	2.3
0.40	0.80	1.10	1.9	0.80	1.87	2.7
0.45	0.90	1.24	2.1	0.90	2.10	3.0
0.50	1.00	1.38	2.4	1.00	2.33	3.3
0.55	1.10	1.51	2.6	1.10	2.57	3.7
0.60	1.20	1.65	2.9	1.20	2.80	4.0
0.65	1.30	1.79	3.1	1.30	3.03	4.3
0.70	1.40	1.93	3.3	1.40	3.27	4.7
0.75	1.50	2.07	3.6	1.50	3.50	5.0
0.80	1.60	2.20	3.8	1.60	3.73	5.3
0.85	1.70	2.34	4.0	1.70	3.97	5.7
0.90	1.80	2.48	4.3	1.80	4.20	6.0
0.95	1.90	2.62	4.5	1.90	4.43	6.3
1.00	2.00	2.75	4.8	2.00	4.67	6.7
	---------- One quarter-acre Infestation ----------					
0.20	1.00	0.79	1.8	1.00	1.29	2.3
0.25	1.25	0.99	2.2	1.25	1.61	2.9
0.30	1.50	1.18	2.7	1.50	1.93	3.4
0.35	1.75	1.38	3.1	1.75	2.26	4.0
0.40	2.00	1.58	3.6	2.00	2.58	4.6
0.45	2.25	1.77	4.0	2.25	2.90	5.2
0.50	2.50	1.97	4.5	2.50	3.22	5.7
0.55	2.75	2.17	4.9	2.75	3.55	6.3
0.60	3.00	2.36	5.4	3.00	3.87	6.9
0.65	3.25	2.56	5.8	3.25	4.19	7.4
0.70	3.50	2.76	6.3	3.50	4.51	8.0
0.75	3.75	2.96	6.7	3.75	4.83	8.6
0.80	4.00	3.15	7.2	4.00	5.16	9.2
0.85	4.25	3.35	7.6	4.25	5.48	9.7
0.90	4.50	3.55	8.0	4.50	5.80	10.3
0.95	4.75	3.74	8.5	4.75	6.12	10.9
1.00	5.00	3.94	8.9	5.00	6.45	11.4

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Appendix Table E2. Continued

Carrying Capacity	Spread at 2.0 Radial Feet/Year AUMs Lost			Spread at 3.0 Radial Feet/Year AUMs Lost		
	Original Patch	Expansion	Total	Original Patch	Expansion	Total
- AUMs/acre-	---------- One half-acre Infestation ----------					
0.20	2.00	1.06	3.1	2.00	1.69	3.7
0.25	2.50	1.32	3.8	2.50	2.11	4.6
0.30	3.00	1.58	4.6	3.00	2.54	5.5
0.35	3.50	1.85	5.3	3.50	2.96	6.5
0.40	4.00	2.11	6.1	4.00	3.38	7.4
0.45	4.50	2.37	6.9	4.50	3.80	8.3
0.50	5.00	2.64	7.6	5.00	4.23	9.2
0.55	5.50	2.90	8.4	5.50	4.65	10.1
0.60	6.00	3.17	9.2	6.00	5.07	11.1
0.65	6.50	3.43	9.9	6.50	5.49	12.0
0.70	7.00	3.69	10.7	7.00	5.92	12.9
0.75	7.50	3.96	11.5	7.50	6.34	13.8
0.80	8.00	4.22	12.2	8.00	6.76	14.8
0.85	8.50	4.49	13.0	8.50	7.18	15.7
0.90	9.00	4.75	13.7	9.00	7.61	16.6
0.95	9.50	5.01	14.5	9.50	8.03	17.5
1.00	10.00	5.28	15.3	10.00	8.45	18.5
	---------- One-acre Infestation ----------					
0.20	4.0	1.4	5.4	4.0	2.26	6.3
0.25	5.0	1.8	6.8	5.0	2.82	7.8
0.30	6.0	2.2	8.2	6.0	3.39	9.4
0.35	7.0	2.5	9.5	7.0	3.95	11.0
0.40	8.0	2.9	10.9	8.0	4.51	12.5
0.45	9.0	3.2	12.2	9.0	5.08	14.1
0.50	10.0	3.6	13.6	10.0	5.64	15.6
0.55	11.0	3.9	14.9	11.0	6.21	17.2
0.60	12.0	4.3	16.3	12.0	6.77	18.8
0.65	13.0	4.7	17.7	13.0	7.34	20.3
0.70	14.0	5.0	19.0	14.0	7.90	21.9
0.75	15.0	5.4	20.4	15.0	8.47	23.5
0.80	16.0	5.7	21.7	16.0	9.03	25.0
0.85	17.0	6.1	23.1	17.0	9.59	26.6
0.90	18.0	6.5	24.5	18.0	10.16	28.2
0.95	19.0	6.8	25.8	19.0	10.72	29.7
1.00	20.0	7.2	27.2	20.0	11.29	31.3

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Appendix Table E2. Continued

Carrying Capacity	Spread at 2.0 Radial Feet/Year AUMs Lost			Spread at 3.0 Radial Feet/Year AUMs Lost		
	Original Patch	Expansion	Total	Original Patch	Expansion	Total
- AUMs/acre-	---------- Five-acre Infestation ----------					
0.20	20.00	1.39	21.4	20.00	4.65	24.7
0.25	25.00	1.73	26.7	25.00	5.81	30.8
0.30	30.00	2.08	32.1	30.00	6.98	37.0
0.35	35.00	2.43	37.4	35.00	8.14	43.1
0.40	40.00	2.77	42.8	40.00	9.30	49.3
0.45	45.00	3.12	48.1	45.00	10.47	55.5
0.50	50.00	3.47	53.5	50.00	11.63	61.6
0.55	55.00	3.81	58.8	55.00	12.79	67.8
0.60	60.00	4.16	64.2	60.00	13.95	74.0
0.65	65.00	4.51	69.5	65.00	15.12	80.1
0.70	70.00	4.85	74.9	70.00	16.28	86.3
0.75	75.00	5.20	80.2	75.00	17.44	92.4
0.80	80.00	5.55	85.5	80.00	18.61	98.6
0.85	85.00	5.89	90.9	85.00	19.77	104.8
0.90	90.00	6.24	96.2	90.00	20.93	110.9
0.95	95.00	6.59	101.6	95.00	22.09	117.1
1.00	100.00	6.93	106.9	100.00	23.26	123.3
	---------- Ten-acre Infestation ----------					
0.20	40.00	4.23	44.2	40.00	6.45	46.4
0.25	50.00	5.28	55.3	50.00	8.06	58.1
0.30	60.00	6.34	66.3	60.00	9.67	69.7
0.35	70.00	7.39	77.4	70.00	11.28	81.3
0.40	80.00	8.45	88.5	80.00	12.89	92.9
0.45	90.00	9.51	99.5	90.00	14.50	104.5
0.50	100.00	10.56	110.6	100.00	16.11	116.1
0.55	110.00	11.62	121.6	110.00	17.72	127.7
0.60	120.00	12.68	132.7	120.00	19.34	139.3
0.65	130.00	13.73	143.7	130.00	20.95	150.9
0.70	140.00	14.79	154.8	140.00	22.56	162.6
0.75	150.00	15.85	165.8	150.00	24.17	174.2
0.80	160.00	16.90	176.9	160.00	25.78	185.8
0.85	170.00	17.96	188.0	170.00	27.39	197.4
0.90	180.00	19.01	199.0	180.00	29.00	209.0
0.95	190.00	20.07	210.1	190.00	30.61	220.6
1.00	200.00	21.13	221.1	200.00	32.23	232.2

Appendix Table E3. Present Value of Forgone Grazing Benefits over 20 Years, Discounted at Four Percent, Various-sized Leafy Spurge Infestations, North Dakota

Carrying Capacity	Total Present Value of Forgone Grazing								
	$12 per AUM			$15.50 per AUM			$19 per AUM		
	Rate of Spread (radial feet/year)			Rate of Spread (radial feet/year)			Rate of Spread (radial feet/year)		
	2.0	3.0	4.0	2.0	3.0	4.0	2.0	3.0	4.0
-AUMs/acre-	One-acre Infestations								
0.20	43	48	55	55	62	70	68	77	86
0.25	53	60	68	69	78	88	84	96	108
0.30	64	73	82	83	94	106	101	115	130
0.35	75	85	95	96	109	123	118	134	151
0.40	85	97	109	110	125	141	135	153	173
0.45	96	109	123	124	141	159	152	172	194
0.50	107	121	136	138	156	176	169	191	216
0.55	117	133	150	152	172	194	186	211	238
0.60	128	145	164	165	187	211	203	230	259
0.65	139	157	177	179	203	229	219	249	281
0.70	149	169	191	193	219	247	236	268	302
0.75	160	181	205	207	234	264	253	287	324
0.80	171	193	218	220	250	282	270	306	346
0.85	181	206	232	234	266	300	287	326	367
0.90	192	218	246	248	281	317	304	345	389
0.95	203	230	259	262	297	335	321	364	410
1.00	213	242	273	275	312	352	338	383	432
	Ten-acre Infestations								
0.20	356	371	387	460	480	500	563	588	613
0.25	445	464	484	575	600	626	704	735	767
0.30	534	557	581	690	720	751	845	882	920
0.35	623	650	678	804	840	876	986	1,029	1,074
0.40	712	743	775	919	960	1,001	1,127	1,176	1,227
0.45	801	836	872	1,034	1,079	1,126	1,268	1,323	1,380
0.50	890	929	969	1,149	1,199	1,251	1,409	1,470	1,534
0.55	979	1,021	1,066	1,264	1,319	1,376	1,550	1,617	1,687
0.60	1,068	1,114	1,162	1,379	1,439	1,501	1,690	1,764	1,840
0.65	1,157	1,207	1,259	1,494	1,559	1,627	1,831	1,911	1,994
0.70	1,246	1,300	1,356	1,609	1,679	1,752	1,972	2,058	2,147
0.75	1,335	1,393	1,453	1,724	1,799	1,877	2,113	2,205	2,301
0.80	1,423	1,486	1,550	1,839	1,919	2,002	2,254	2,352	2,454
0.85	1,512	1,579	1,647	1,954	2,039	2,127	2,395	2,499	2,607
0.90	1,601	1,671	1,744	2,069	2,159	2,252	2,536	2,646	2,761
0.95	1,690	1,764	1,840	2,183	2,279	2,377	2,676	2,793	2,914
1.00	1,779	1,857	1,937	2,298	2,399	2,502	2,817	2,940	3,067
	One tenth-acre Infestations								
0.20	7	10	13	9	13	16	11	15	20
0.25	9	12	16	11	16	21	14	19	25
0.30	11	15	19	14	19	25	17	23	30
0.35	12	17	22	16	22	29	20	27	35
0.40	14	19	26	18	25	33	22	31	40
0.45	16	22	29	21	28	37	25	35	45
0.50	18	24	32	23	31	41	28	38	51
0.55	19	27	35	25	34	45	31	42	56
0.60	21	29	38	27	38	49	34	46	61
0.65	23	31	41	30	41	54	36	50	66
0.70	25	34	45	32	44	58	39	54	71
0.75	27	36	48	34	47	62	42	58	76
0.80	28	39	51	37	50	66	45	61	81
0.85	30	41	54	39	53	70	48	65	86
0.90	32	44	57	41	56	74	50	69	91
0.95	34	46	61	43	59	78	53	73	96
1.00	35	48	64	46	63	82	56	77	101