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Economic impact of leafy spurge infestations in North Dakota

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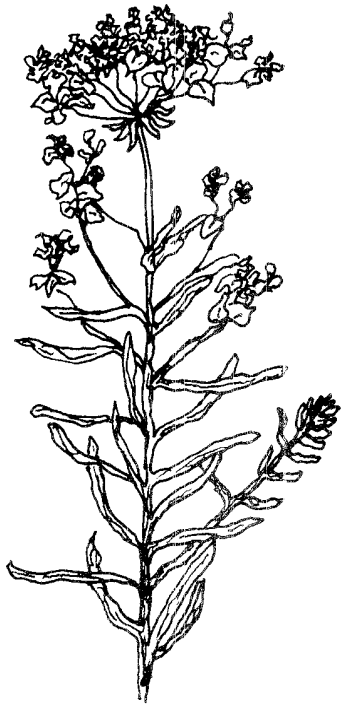

Leafy Spurge

Introduction

Leafy spurge (*Euphorbia esula*) is a widely established weed in northwestern United States and western Canada. Leafy spurge presents special problems to rangeland and pasture owners because it can reduce livestock carrying capacity by as much as 75 percent. Leafy spurge is a particularly serious problem because of the speed with which it spreads and the difficulty of controlling it given currently available technology (i.e., herbicides). The acreage of leafy spurge in North Dakota has been more than doubling every ten years (Messersmith and Lym 1983).

To evaluate the economic feasibility of either presently available chemical controls or the chemical and biocontrol technologies that may be available in the future, a better understanding of the economic effects of leafy spurge infestations is required. Such information also may be useful in making decisions regarding allocation of resources to develop and refine new control technologies. Examining the economic effects of leafy spurge dispersal requires considering not only the direct effects, such as those experienced by landowners and ranchers, but also the secondary effects on other sectors of the rural economy.

Objectives

The objectives of the study were (1) to develop a function that relates the increase in leafy spurge infestation to the decrease in livestock carrying capacity for North Dakota pasture and rangeland, (2) to estimate the economic effects of leafy spurge infestation on landowners for both reduced income derived from grazing and reduced land values, and (3) to estimate the impacts of leafy spurge infestation on the regional economy.

Procedures

The carrying capacity function was developed through extensive literature review and consultation with agronomists and range scientists who have experience in research on leafy spurge (Figure 1). Estimating the effect of reduced carrying capacity on landowners' income required establishing a value for units of lost carrying capacity. Two alternative approaches were used to estimate the value of lost carrying capacity (measured in animal unit months or AUMs).

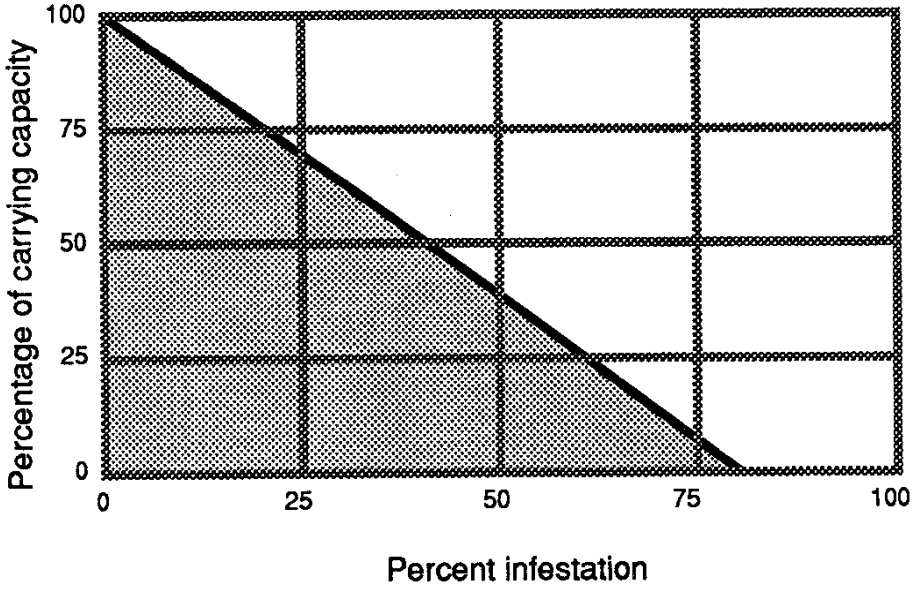

Figure 1. Estimates of reduced carrying capacity leafy spurge infestation rates (Thompson 1990).

These were (1) an analysis of historical rental rates for pasture and (2) a ranch budget analysis. The impact of leafy spurge infestation on the regional economy was estimated using the North Dakota Input-Output Model (Coon *et al*. 1985).

Carrying capacity reduction

Carrying capacity is defined as the highest stocking rate that can be achieved without inducing damage to vegetation or related resources (i.e., it is the highest sustainable stocking rate). Leafy spurge infestation reduces livestock carrying capacity in two ways: (1) herbage production is reduced due to competition from leafy spurge and (2) additional useful forage can be lost because cattle totally or partially avoid leafy spurge infested sites, especially early in the grazing season. The relationship between the percent of a pasture covered by leafy spurge and the reduction in carrying capacity may be approximated by the following linear function:

C.C. = 100 - 1.25 (P.I.)

where C.C.= carrying capacity

P.I. = percent infestation or the percent of land area covered by spurge

A leafy spurge infestation covering 80 percent of the total land area in a pasture would reduce the carrying capacity to zero from a practical range management standpoint.

Impacts on farmers and ranchers

The effect of leafy spurge infestation on carrying capacity was estimated for five regions by dividing the reported acreage of leafy spurge by the total acreage of pasture and rangeland and then applying the carrying capacity model (Figure 2). The reduced AUMs were then valued based on the cash rental rates per AUM. Statewide, the present leafy spurge infestation is estimated to cause a reduction of 577,000 AUMs, valued at $8.6 mil-

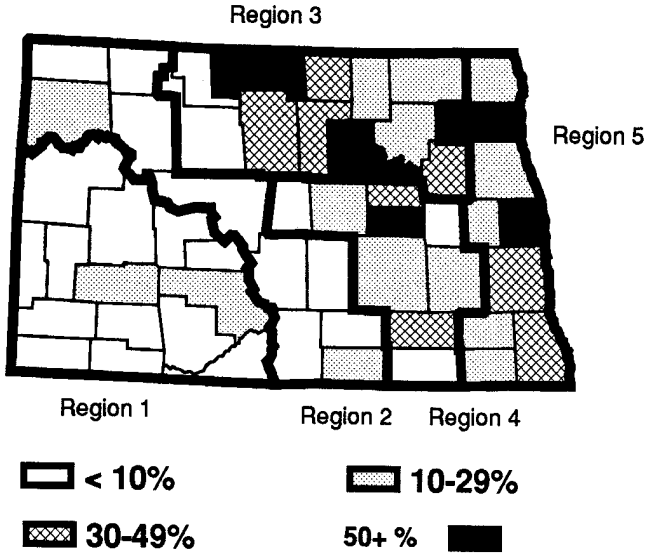

Figure 2. Percentage of pastureland and rangeland infested with leafy spurge, North Dakota regions.

lion (Figure 3). The loss in carrying capacity resulting from the present leafy spurge infestation is equivalent to that needed for a herd of about 77,000 cows (Thompson 1990).

Leafy spurge infestations reduce the productivity of grazing lands, and will lead to decreased land values. Over the period 1984-88, grazing land rental rates in North Dakota have averaged $8.36 per acre, and the sale prices of such lands have averaged $133 per acre. If this value-to-rent ratio of 15.9 is applied to the estimated $8.6 million loss of value of grazing AUMs, then the estimated reduction in grazing land value is $137 million.

Impacts on the state's economy

The secondary impacts of leafy spurge infestations on the state's economy arise from two sources: (1) the reduction in income of ranch operators and landowners represented by the loss in grazing value discussed earlier and (2) decreases in production expenditures associated with ranchers' herd reductions. The decreases in production expenditures, estimated using ranch budget analysis, were estimated to total about $14.4 million, statewide. These reductions in expenditures, which are also decreases in revenues for input suppliers, together with the estimated $8.6 million in reduced income to landowners and ranchers constitute the direct impact of present levels of spurge infestation.

The secondary and total impacts of present levels of leafy spurge infestation were estimated using the North Dakota Input-Output Model (Coon *et al*. 1985). The total impact of the present level of leafy spurge infestation includes a reduction in personal income of $25 to $26 million, or about $44.20 per lost AUM. Substantial impacts are also shown for the retail trade sector ($19.3 million) and the agriculture crops sector ($10.7 million). The total reduced business activity for all sectors was almost $75 million. Not included in this business activity reduction is the initial reduction in livestock sales of about $30 million that induced the subsequent economic changes.

Conclusions and implications

Leafy spurge is definitely a problem that warrants attention, both at the farm and regional economy levels. The high levels of foregone business activity, which also represent foregone tax revenues, further suggest public resources could effectively be used to ameliorate North Dakota's leafy spurge problem; however, attention needs to be paid to the economics of control to ensure the level of control does not exceed that which is economically optimal.

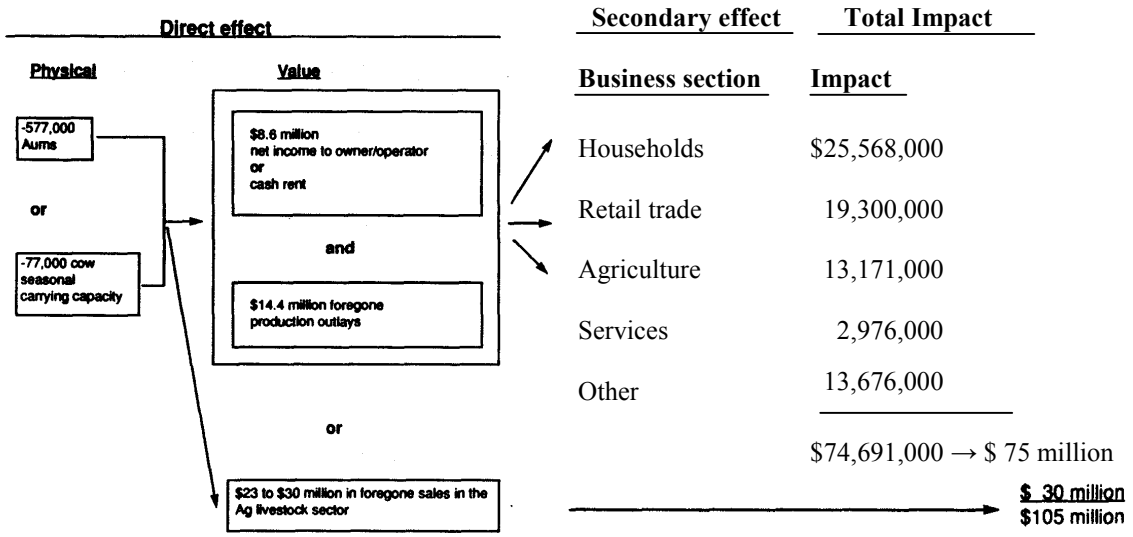

Figure 3. Economic impacts of leafy spurge infestation in North Dakota, 1989.

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For a more detailed presentation of the research results summarized here, see Thompson, Leistritz, and Leitch 1990. Economic Impact of Leafy Spurge in North Dakota. Agr. Econ. Rpt. No. 257. Fargo: North Dakota State University, Dept. of Agricultural Economics.