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# The leafy spurge problem

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### Introduction

A plant pest as complex and tenacious as leafy spurge, infesting nearly  $2\frac{1}{2}$  million acres in North America, with a conservative 1978 economic impact in the United States of \$10.5 million<sup>1</sup>, has reached a serious, if not critical level. The problem is most severe on rangelands, pastures, tree belts, parks, waterways and roadsides. Even on cultivated cropland, where leafy spurge has been controlled, it can reduce crop yields 10% to 100% (Derscheid and Wrage 1972). On rangelands, the weed displaces useful forage and if unchecked will invade and become dominant on pastures and ranges in excellent condition. Leafy spurge is a poisonous plant which produces an irritant causing dermatitis to man and animals (Kingsbury 1964). Cattle will not eat leafy spurge unless forced to by poor range conditions or when fed weedy hay. Sheep will graze small plants with no apparent ill effects but large plants are toxic (Johnston and Peake 1960).

### Distribution

The Caucasus region of the Soviet Union is the origin for leafy spurge (Croizat 1945). Its distribution in Eurasia extends across Europe from Norway, England and Portugal in the west, through Asia Minor--Turkey, Iran, Afghanistan and Pakistan. It occurs as far north as Siberia, and east into China where it is considered an introduced species (Bakke 1936, Prokhanov 1949).

<sup>&</sup>lt;sup>1</sup> Personal communication with Dr. Claude H. Schmidt, Area Director, USDA-SEA-AR, Fargo, North Dakota. December, 1978.

Leafy spurge was reported in Massachusetts in 1827 (Britton 1921). In 1933, Hansen and Budd reported the plant in 20 states, extending from New England across the northern tier of states to Washington, with a concentration center in Minnesota, North Dakota and eastern South Dakota.

Moore (1958) showed leafy spurge well distributed in western Canada, and Harris and Alex (1971) reported leafy spurge in every Canadian province except Newfoundland. Reed and Hughes (1970) described its distribution similar to Hansen and Budd (1933), with the plant in northern Missouri, Wyoming, Nevada, northeastern California and Oregon. They show the center of concentration shifting slightly mast to include eastern Montana, most of South Dakota, northern Nebraska and the northeast corner of Wyoming. Dunn (1979) reports leafy spurge in 25 states with 451 infested counties (Table 1).

		Number of Counties:		Levels of Infectation <sup>1</sup>		
		Number of Counties.		Levels of fille		
		1	А	В	C	
Arizona		l			l	
California		2			2	
Colorado		8	6	2		
Delaware		2		1	1	
Idaho		28	5	12	11	
Illinois		3			3	
Iowa		10			10	
Kansas		4			4	
Maine		1		1		
Michigan		11			11	
Minnesota		80	5	29	46	
Missouri		1			1	
Montana		54	28	19	7	
Nebraska		54	22	21	11	
Nevada					3	
New York						
North Dakota		52	41	10	1	
Oregon				5	1	
Pennsylvania,		Z7			27	
South Dakota		47	24	16	~7	
Utah		10	1	6	3	
Washington		6	1	1	4	
West Virginia		2,1			2	
Wisconsin		7	1	5	1	
Wyoming		21	8	11	2	
	Totals:	451	142	139	170	

Table 1. Distribution of leafy spurge in the 48 contiguous states. (Dunn 1979).

A >50-0 acres; B 25 to 500 acres; C <25 acres.

The leafy spurge concentration area, estimated to cover 80% to 85% of the problem in North America, now covers all or parts of nine states and five Canadian provinces. The area is defined in a 1,200-mile diameter circle centered at 106° W. Long. and 48° N. Lat., near Wolf Point, Mont. (Fig. 1).



Figure 1. A concentration area covering approximately 90% of leafy spurge in North America is defined in a 1,200-mile diameter circle centered near Wolf Point, Mont.–106° W. Long., 48° N. Lat. (Dunn 1979, Moore 1958, Moore and Frankton 1969, Selleck *et al.*, 1962).

#### Infestation

About 2 1/2 million acres in North America are estimated to be infested with leafy spurge. In the United States, Minnesota has highest infestation at 800,000 acres followed by North Dakota and Montana with 600,000 and 543,000 acres, respectively. The Canadian problem is estimated to be comparable to Nebraska.

The degree or level of infestation and infested net acres are important in defining the spurge problem. Information is seriously lacking in both areas. Dunn (1979) reported infested counties according to those with

500 acres, 25 to 500 acres, and >25 acres. By giving counties with >500 acres a factor of 20, those with 25 to 500 acres a factor of 10 and those with 25 acres a factor of 1, a simple estimate is possible for the degree of infestation for each state.

# **Diversity**

The name leafy spurge encompasses a diversity of taxonomic and biological plant types which greatly confound the problem of spurge control. Indicative of this diversity is a statement by Croizat who in 1945 wrote "Long years may elapse before it proves feasible even to begin the work of basic revision necessary to put the classification of *Euphorbia esula* and its vast alliance on a sound taxonomic and nomenclature footing." To further illustrate this point, the following list of taxa have been linked with leafy spurge:

*Euphorbia esula* L.

- E. virgata Waldst. and Kit
- *E. virgata-esula* Schur.
- E. pseudoesula Schur.
- *E. virgata* var. *orientalis* Boiss.
- E. virgata var. latifolia Schur.
- E. lucida Waldst. and Kit
- E. lucida var. androsaemifolia Koch
- E. pseudolucida Schur.
- *E. uralensis* Fisch. ex Link
- E. intercedens Podp (E. intercedens Pax)
- E. podperae Croiz.

This nomenclature headache presents serious problems for researchers and managers as they use the literature to determine what is known about leafy spurge and its control and whether the results or data from one area are applicable to their specific leafy spurge problems. The range of biotypes and phenotypes is also creating unexpected problems in the development of host-specific biological control organisms. Organisms effective on one type of spurge often will not attack "other" spurges. Also, this broad plant-ecological diversity helps to explain, in part, discrepancies in the literature as to the effectiveness of certain control measures (i.e., varieties of leafy spurge with varying anatomy, physiology, and biochemistry associated with a range of environmental factors, appear to respond differently to the same control measures).

To further complicate this diversity problem, a hybrid of leafy spurge and cypress or graveyard spurge (*E. cyparissias* L.) was collected in Ontario, Canada, in 1962 (Moore and Frankton 1969). Cypress spurge is a low growing perennial that is native to Europe and was brought to this country as an ornamental (Stucky and Pearson 1973). It has been reported across Canada from Nova Scotia to British Columbia (Moore and Lindsay 1953). Dunn (1979) lists cypress spurge in 22 states and 220 counties from New England to Washington and south to Kansas and Arkansas.

The common variety of cypress spurge is a sterile male diploid that vegetatively propagates through an efficient rhizominous root system. While difficult to eradicate, this diploid form has a slow rate of spread. However, the existence of a fertile tetraploid that propagates both sexually and asexually and hybridizes with leafy spurge compounds the problem.

In 1952 at Braeside, near Ottawa, Canada, a 9-square-mile infestation of the fertile tetraploid was reported (Harris and Alex 1971); and, at this time the infestation covers a 36-square-mile area.<sup>2</sup> This tetraploid phenotype is known to exist in New York and Massachusetts and probably occurs in several other states. (Dunn 1979).

The percentage or degree of the leafy spurge problem and number of infested acres per state is estimated at:

	Percent of Total Problem	Estimated Infestation (acres)
North Dakota	21	6000,000 <sup>a</sup>
Montana	17	543,000 <sup>b</sup>
Nebraska	15	105,000 <sup>c</sup>
South Dakota	15	$60,000^{d}$
Minnesota	10	800,000 <sup>e</sup>
Idaho	6	35,000 <sup>g</sup>
Wyoming	5	$30,000^{g}$
Other States	11	$100,000^{\rm h}$
(Utah and Colorado 5%; 22,0	000 acres)	
Tot	$\frac{100\%}{100\%}$	2,273,000
Canada <sup>i</sup>		125,000
		Total 2,398,000

Average estimates obtained from:

<sup>a</sup>Dr. Larry Mitich. *In*: "Takes Persistence to Eliminate Leafy Spurge." Bar North, June 1973, p. 26, and "Leafy Spurge – A Tough Weed but it can be Beaten", Crops and Soils, April-May 1972, p. 25-26.

<sup>b</sup>Information from the State A.S.C.S. Office, 1979.

<sup>c</sup>Personal communication with Dr. Mel McCarty, SEA-AR, University of Nebraska. May 1979.

<sup>d</sup>Publication by Lyle A. Derscheid and Leon J. Wrage. 1972. (See Literature cited.)

<sup>e</sup>Personal communication with Dr. Oliver E. Strand, Dept. Agron. and Plant Genetics, University of Minnesota. May 1979.

<sup>f</sup>Personal communication with Gene Ross, State Dept. Agric., Boise, Idaho. June 1979.

<sup>g</sup>Personal communication with George F. Hittle, State Dept. Agric., Cheyenne, Wyoming. May 1979.

<sup>h</sup>Personal communication with Dr. Eugene Heikes, Botany Dept., Colo. State University. May 1979; and Dr. Louis Jensen, Coop. Ext. Serv., Utah State University, June 1979.

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