



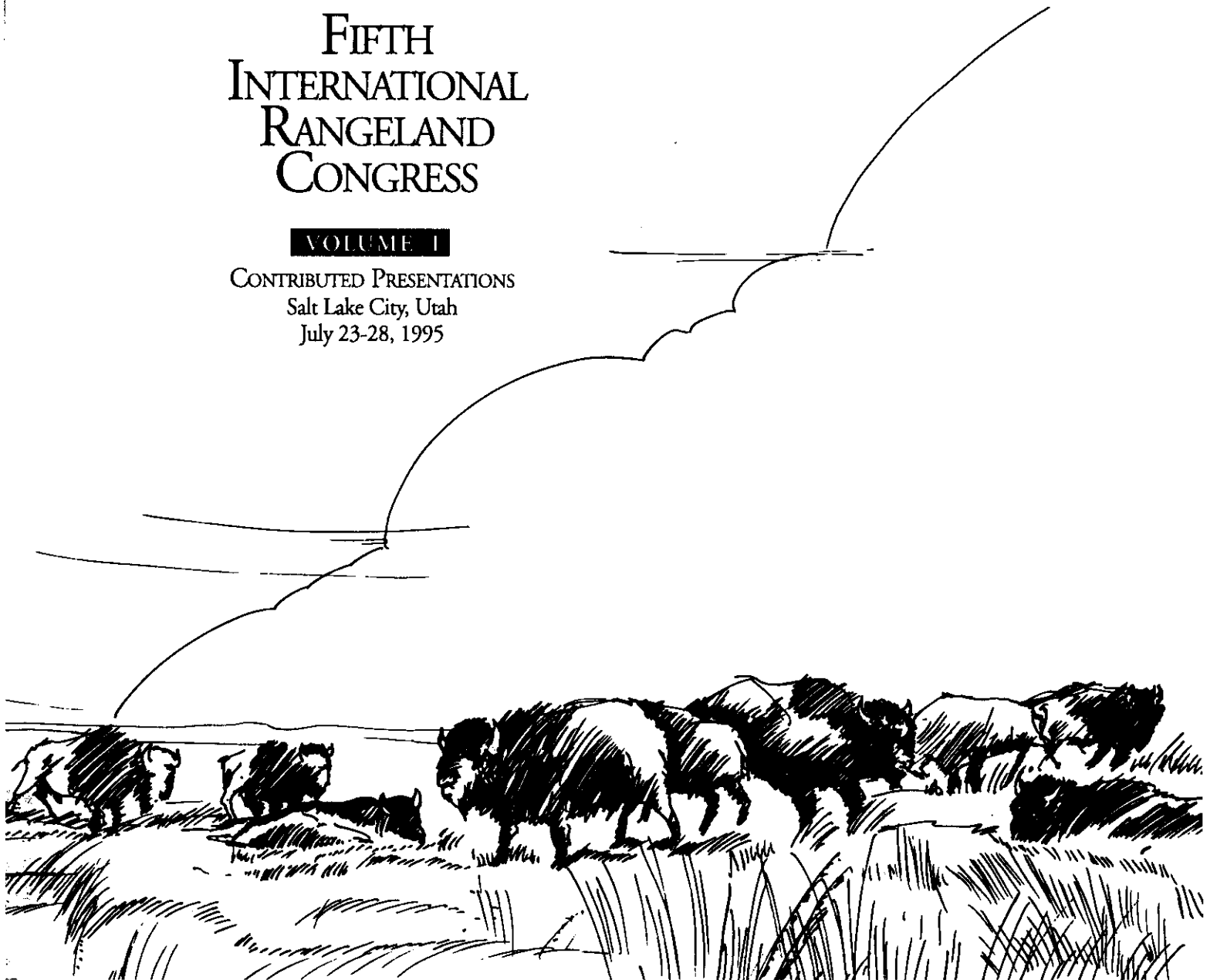
# RANGELANDS IN A SUSTAINABLE BIOSPHERE



PROCEEDINGS OF THE  
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# EFFECT OF SIMULATED DEFOLIATION AND PLANT COMPETITION ON FLOWERING AND SEED YIELD OF LEAFY SPURGE<sup>1</sup>

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## ABSTRACT

The combined influence of simulated herbivory and plant competition significantly reduced leafy spurge flowering and seed production. Defoliation had greater detrimental influence than competition on leafy spurge reproduction. Reduction in leafy spurge flowers and seed production increased with level of defoliation; however, this increase is not significant. This study indicates that the combined stresses of defoliation and competition can substantially reduce seed yield and thus probably reduce the spread of leafy spurge via seeds.

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## INTRODUCTION

Plant population dynamics are influenced by both biotic and abiotic factors and their interactions (Harper, 1977). Herbivory is one of the major biotic factors that play a central role in community dynamics. Herbivores exert both direct and indirect effects on plants which affect all aspects of plant growth, reproduction, and status in the community (Crawley, 1983; Whitham et al., 1991). The responses of plants to herbivory include slow and decreased growth and fecundity (Harper, 1977; Louda, 1984), phenological shifts (Louda, 1984; Marquis, 1985), and reduction in flowering and fruit production (Marquis, 1985, Whitham and Mopper, 1985).

Leafy spurge is a perennial weed of the spurge (*Euphorbiaceae*) family native to Europe and was introduced to North America in the early 1880s and has been rapidly spreading in rangelands of north central United States and southern Canada (Messersmith, 1990). Today, the greatest infestations of leafy spurge are found in the Northern Great Plains of the United States and the Prairie Provinces of Canada (Messersmith, 1990).

The purpose of this research was to determine the impact of simulated grazing through clipping and plant competition on leafy spurge reproduction.

## PROCEDURES

This research was conducted on a leafy spurge-infested rangeland sites 2 km east of Spencer, Idaho (112° 10'W, 44° 21'N). Elevation is about 1850 m and estimated average annual precipitation is 460 mm.

Clipping has certain shortcomings as a method of simulating grazing effects on plant growth (Heady, 1961). The major problem with clipping as a simulation of grazing is the extent to which clipping actually resembles the pattern and frequency of defoliation under grazing. However, because the researcher can better control clipping as an experimental treatment applied to individual plant, the use of clipping seems appropriate in studies which focus at that level (Dennis, 1989). In addition, clipping studies can generate useful baseline information about critical periods of defoliation in plant species (Jameson, 1963; West and Farah, 1989). It is necessary, however, to recognize the differences between grazing and clipping in order to draw appropriate conclusions and applications from experiment results (Dennis, 1989).

The response of leafy spurge to defoliation was investigated in a clipping study. The clipping regime consisted of three intensities 0% (control), 40%, and 80% removal of the aboveground leafy

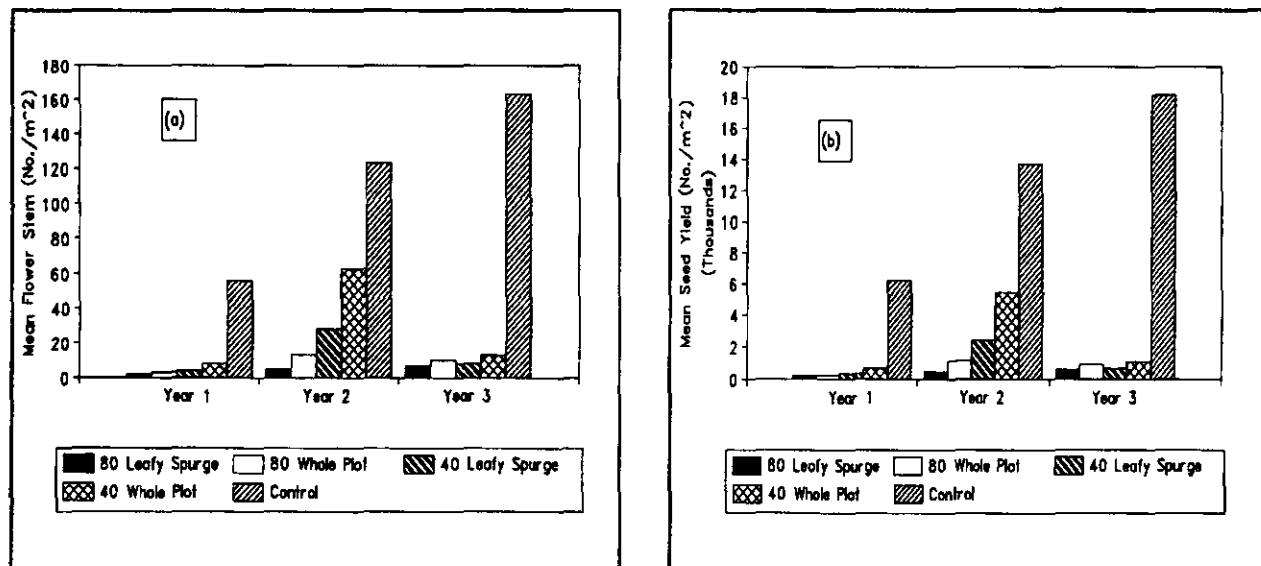


Figure 1. Effect of defoliation and competition on flowering (a) and seed yield (b) of leafy spurge.

spurge standing crop, either to leafy spurge only or to both leafy spurge and associated vegetation in order to determine leafy spurge's competitive ability. These treatments were applied to 1 m<sup>2</sup> plots that were isolated from adjacent plots by 1 m<sup>2</sup> wide tilled buffer strips. They were applied at three times: (1) when the standing leafy spurge is about 15 cm tall; (2) when the standing leafy spurge have flowers (when the inflorescence appear); (3) when the standing leafy spurge is in the seed stage. Clipping treatments were repeated on the same plots each year for 3 years.

Stem density of leafy spurge, inflorescence numbers (flower head) and seed production were measured at the time of clipping.

## RESULTS

The flowering and seed yield of leafy spurge are lower under defoliation and competition in all years (Figure 1). These differences are highly significant. Observed reduction on flowering and seed yield ranged from 90% to 50% for the 80% and the 40% treatments, respectively. However, intensity of defoliation and competition did not have significant effects on flowering or seed yield. Wet conditions that occurred in year 2 probably caused the increased of flowering on the 40% treatments

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