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## Intensive grazing of angora goats on leafy spurge infested rangeland

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Utilization and control of leafy spurge by angora goats were determined in 1991 through 1995. Project objectives were to determine 1) if intensive seasonlong grazing of angora goats will significantly reduce stem and herbage density of leafy spurge, and 2) determine if seasonlong grazing leafy spurge with angora goats will increase grass density in leafy spurge infested rangeland.

The study was conducted on a 6.1 hectare parcel located on Camp Grafton South in southeast Eddy County adjacent to the east shore line of North Twin Lake in Sec. 4, T 148 N, R 63 W. The study site was situated on a west-facing slope with the plant communities classified. These plant communities were classified as high, mid, and low prairie, and open woodland (Dix and Smeins 1967).

Angora goats were stocked at 0.14 ha/AUM in 1991, 0.34 ha/AUM in 1992 and 1993, and 0.49 ha/AUM in 1994. Leafy spurge and brush stem densities were collected in the third week of May in 1991, 1992, 1993, and 1994 and early June in 1995 to determine overall change in plant numbers using 0.1 m<sup>2</sup> plots on four replicated line transects. Overall degree of use of leafy spurge, grass and brush were determined using the paired-plot clipping technique. Leafy spurge and shrub stem counts were tested for significant ( $P < 0.05$ ) main effects using multi-response permutation procedure (MRPP) (Biondini *et al.* 1988). Each year was tested to determine number of years required to significantly ( $P < 0.05$ ) reduce leafy spurge stem counts.

Leafy spurge stem densities were reduced 12.5% ( $P > 0.05$ ) after one year, 39.9% ( $P < 0.05$ ) after two years, 53.7% ( $P < 0.05$ ) after three years, and 84.2 percent ( $P < 0.05$ ) after four years of grazing (Table 1). The shrub stem densities were significantly ( $P < 0.05$ ) reduced by 91.6% after four years of grazing (Table 1). No significant ( $P > 0.05$ ) changes in relative frequency of leafy spurge and grass herbage production occurred after two years of grazing, however, after three years of grazing leafy spurge was significantly ( $P < 0.05$ ) reduced and graminoids significantly ( $P < 0.05$ ) increased (Table 2).

The leafy spurge and shrub components were extensively grazed during all four years of the study. Degree of use by goats on leafy spurge was 64, 92, 97, and 91% in 1991, 1992, 1993, and 1994, respectively. Shrub degree of use was 94, 92, 89, and 81% in 1991, 1992, 1993, and 1994, respectively. Intensive seasonlong grazing of angora goat on leafy spurge infested rangeland significantly reduced leafy spurge stem densities after

two, years of grazing. Leafy spurge herbage production was significantly reduced and graminoid species significantly increased after three years of seasonlong angora goat grazing.

## Literature cited

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- Dix, R.L. and F.E. Smeins. 1967. The prairie, meadow, and marsh vegetation of Nelson County, North Dakota. *Canadian J. of Botany*. 45:21-58.

**Table 1. Stem density reduction of leafy spurge and shrub species at Camp Grafton South near McHenry, ND from 1991 to 1995.**

Number of stems per 0.1 m <sup>2</sup>				
Date collected	Leafy spurge <sup>1</sup>	P-value <sup>2</sup>	Shrubs	P-value
May 25, 1991	3.9 <sup>a</sup>		---	
May 19, 1992	3.4 <sup>ab</sup>	0.517	1.6 <sup>c</sup>	
May 20, 1993	2.4 <sup>bc</sup>	0.039	0.9 <sup>c</sup>	0.437
May 26, 1994	1.9 <sup>cd</sup>	0.004	0.2 <sup>d</sup>	0.001
June 5, 1995	0.7 <sup>d</sup>	0.49 <sup>-6</sup>	0.1 <sup>d</sup>	0.81 <sup>-3</sup>
Stem Density Reduction	84.7		91.6	

<sup>1</sup>Percentages with the same letter are not significantly ( $P > 0.05$ ) different.

<sup>2</sup>P-value represents comparison of 1991 and 1992, 1991 and 1993, 1991 and 1994, and 1991 and 1995.

**Table 2. Percent change in herbage production by weight from 1991 to 1994 at Camp Grafton South near McHenry, ND.**

Year	Leafy spurge	P-value	Grass species <sup>1</sup>	P-value <sup>2</sup>
1991	22.5 <sup>a</sup>		77.5 <sup>c</sup>	
1992	15.7 <sup>a</sup>	0.512	84.3 <sup>c</sup>	0.676
1993	22.1 <sup>a</sup>	0.988	77.9 <sup>c</sup>	0.967
1994	8.0 <sup>b</sup>	0.013	90.8 <sup>d</sup>	0.014
Percent change	-64.4		+17.2	

<sup>1</sup>Percentages with the same letter are not significantly ( $P > 0.05$ ) different.

<sup>2</sup>P-value represents comparison of 1991 and 1992, 1991 and 1993, and 1991 and 1994 for both leafy spurge and grass.