



NORTH DAKOTA
STATE DEPARTMENT OF
DOCUMENT

Controlling Leafy Spurge Using Goats and Sheep

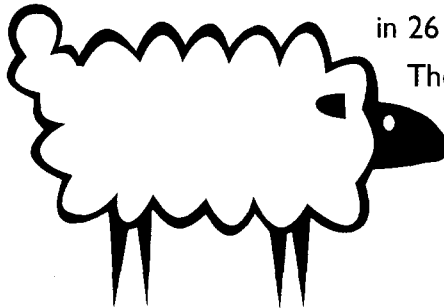
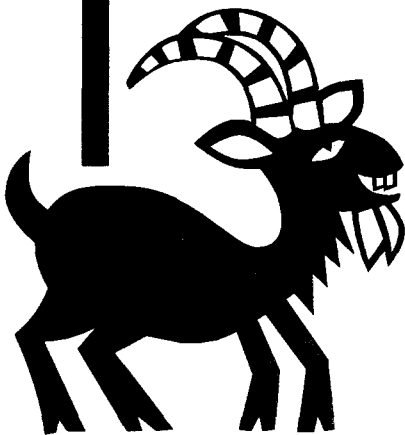
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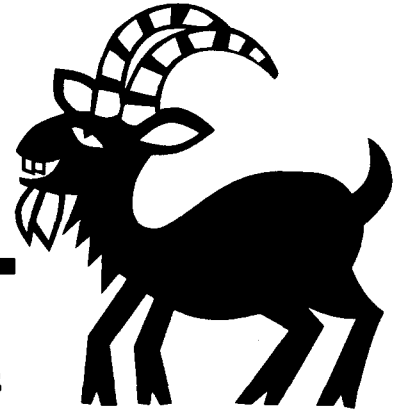
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Goats and sheep have long been used for weed control. Their use has increased in recent years because of the need for biological control agents in environmentally sensitive areas. Sheep mostly graze forbs (flowering plants) while goats generally consume shrubs. Sheep and goats became popular biological control agents to control leafy spurge in the northern Great Plains region in the mid 1980s and the 1990s. Ironically, sheep were proven to be effective for controlling leafy spurge in the 1930s while goats were first used in the 1980s.

Leafy spurge (*Euphorbia esula* L.) is a herbaceous, deep-rooted, perennial, noxious weed, introduced into North America from Eurasia and currently found in 26 states and six Canadian provinces. The weed is extremely persistent and competitive, and is primarily found on non-tilled areas.





Cattle do not utilize leafy spurge and avoid leafy spurge infested sites. Herbicides have been the primary method used for leafy spurge control and have been effective, especially when applied at recommended rates and the proper time (see NDSU Extension Circular W-765 "Leafy Spurge Identification and Control" for more information). However, herbicides have become cost prohibitive when treating widespread infestations which continue to expand. With present and future concerns over groundwater quality and environmentally sensitive areas, herbicide use may become further restricted, or even eliminated.

Feed Value of Leafy Spurge

Sheep and goats can be effective tools to complement herbicides for control of leafy spurge. In addition, their control efforts can generate an economic return from land that other livestock won't graze. The land operator can control leafy spurge by grazing sheep or goats and provide a highly nutritional diet for the livestock.

Leafy spurge is very nutritious and provides good forage for lambs, kids, lactating ewes, and/or lactating nannies. The crude protein content of leafy spurge was found to be greater than 27 percent in the early season, only declining to less than 20 percent after maturity (Table 1).

Table 1. Nutritional composition of leafy spurge at four growth stages (Fox et al. 1991. N.D. Farm Res.).

Growth stages	Crude protein	Phosphorus	In vitro dry matter digestibility
			Percent
Vegetative	27.3	0.53	80
Flowering	23.4	0.46	73
Mature	19.5	0.39	66
Regrowth	15.6	0.32	60

Recommended Stocking Rates

Proper stocking rates to control leafy spurge vary dramatically between sheep and goats. Although both classes of livestock readily consume leafy spurge, goats are more selective than sheep. Dietary overlap between sheep and cattle averages 20 to 35 percent, but with goats and cattle it is only 5 to 20 percent on leafy spurge infested lands. There is generally less overlap between the animal species as leafy spurge densities increase.

Average stocking rate of three to four goats per acre of leafy spurge over a four-month grazing season is required to maintain acceptable control, with lighter stocking rates in western and heavier rates in eastern North Dakota. For just one month, the goat stocking rate would be 12 to 16 goats per acre.

To determine stocking rates for a specific time, adjust animal numbers per acre by dividing the one month stocking rate by number of months intended to graze. Example: if goats are grazed for 2.5 months, the recommended stocking rate would be 4.8 to 6.4 goats per acre of leafy spurge (12 goats/2.5 months to 16 goats/2.5 months).

An average stocking rate of one to two sheep per acre of leafy spurge over a four-month grazing season is required for acceptable control, with lighter stocking rates in western and heavier rates in eastern North Dakota. Sheep stocking rates for one month would be four to eight sheep. To determine the stocking rate for a specific time, adjust animal numbers per acre by dividing the one-month stocking rate by the number of months intended to graze (see previous example).

Stocking rates should be based on actual infested acreage rather than pasture size. This will minimize sheep and goat grass consumption, thus allowing optimum grass production for cattle. Sheep or goat stocking rates could eventually be reduced, while cattle numbers increased as leafy spurge densities decline. A four-month grazing season is recommended because it corresponds with the growing season and is the most effective and efficient system for leafy spurge control with grazing animals.

Example # 1

Pasture — 1,000 acres in central North Dakota of which leafy spurge infests 126 acres.

Recommended goat stocking rate for four months = 3.5 goats per leafy spurge acre times 126 acres = 441 goats.

Recommended sheep stocking rate for four months = 1.5 sheep per leafy spurge acre times 126 acres = 189 sheep.

Grazing Management Plan

Sheep and goats should go to pasture earlier than cattle to keep ahead of the early growing leafy spurge plant. Once leafy spurge has reached 4 to 6 inches of growth, grazing should begin. In North Dakota, normal turn out date will be approximately mid-May.

NOTE: These recommendations are for leafy spurge infested pastures and apply only to sheep and goats. Cattle should not go to pasture until range readiness, or around late May, early June.

Goats, and especially sheep, should be forced to graze leafy spurge in the spring to improve selectivity, making leafy spurge their dominant food source. Fence off a heavily infested leafy spurge area with temporary corrals or woven fence and force the sheep or goats to graze leafy spurge. This practice allows for quick transition and adaptation to grazing leafy spurge, thus minimizing the potential use of grasses.

There are four management plans to control leafy spurge with sheep or goats. Leafy spurge control increases with increased grazing intensity.

Plan # 1 - Seed Removal

Leafy spurge should be grazed during the spring to remove the yellow bracts and flowering parts of the plant. Grazing may be required again in late summer (late August, early September) to eliminate potential flowering plants. This type of grazing will prevent seed-set but does little to reduce the root system.

Plan # 2 - Multiple Pasture Rotational System

A properly timed rotational grazing system will continuously defoliate leafy spurge throughout the growing season. Defoliation will eliminate seed production and cause limited stress on the root system. This plan is often recommended when large leafy spurge infestations occur over many acres to maximize grazing coverage.

Plan # 3 - Intensive Rotational Grazing

Leafy spurge should be grazed in the spring until the plant is completely defoliated, including all flowering parts and green foliage. The sheep or goats should then be rotated to the next pasture and process repeated. In late summer (late August, September), each pasture should be grazed a second time and leafy spurge heavily grazed again.

This method will achieve optimum stress on the plant during the critical growing periods, decreasing plant vigor and carbohydrate reserves. Grass production increases with decreased leafy spurge densities.

Plan # 4 - Continuous Grazing

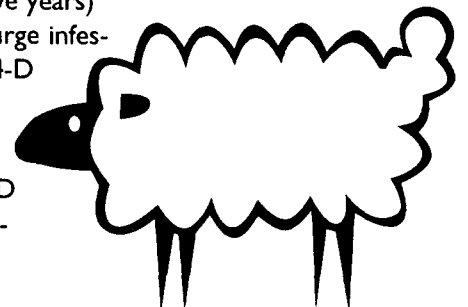
Continuous grazing (about four months) is the most intensive in terms of leafy spurge utilization; however, it involves the least amount of labor and fence. Continuous grazing allows goats or sheep to graze leafy spurge throughout the growing season, continually stressing the plant. Continuous grazing does not allow a recovery period, maximizing stress on the root system and its reserves.

Sheep and goats will graze other broadleaf forbs and shrubs, some of which are beneficial to the plant community, requiring a thorough, careful management plan. Goats and sheep can dramatically reduce the shrub component (buckbrush, chokecherry, hawthorn, etc) with a continuous, seasonlong grazing plan. A rotational grazing system may be most useful when desirable shrub and forb species are present in leafy spurge infested pastures.

Lease Value for Goats and Sheep for Leafy Spurge Control

It is difficult to determine the cost-effectiveness of sheep or goat grazing for leafy spurge control. However, one can compare similar grazing control with effective herbicides as a baseline. For this example, the cost of control with 2,4-D applied twice per year was used as a baseline. This dollar value will be a minimum value, since long-term grazing (greater than five years) should reduce leafy spurge infestations greater than 2,4-D herbicide.

The cost of applying 2 pounds (2 qt) of 2,4-D twice per year was estimated at \$18 per year,



including application costs. Since the recommended stocking rate is three to four goats per acre of leafy spurge for four months, the base lease value of one goat would be \$4.50 to \$6.00 (\$18 for 2,4-D/3 to 4 goats). If grazing sheep at the recommended stocking rate of one to two sheep per acre of leafy spurge for four months, the base lease value of one sheep would be \$9.00 to \$18.00 (\$18 for 2,4-D/1 to 2 sheep).

Chemical control of leafy spurge, when applied properly, only affects broadleaf plants and shrubs, NOT the grasses. This 2,4-D chemical control is 100 percent efficient for grass availability for cattle. Average dietary overlap of goats and cattle in leafy spurge infested pastures at the proper stocking rate is about 10 percent, or a 90 percent (0.9) efficiency coefficient (100 % efficient - 10 percent dietary overlap). Average dietary overlap of sheep and cattle is about 30 percent, or a 70 percent (0.7) efficiency coefficient (100 % efficient - 30 percent dietary overlap).

Formula for Calculating Lease Value of Goats

$$\frac{\$18.00 \text{ (cost of 2,4-D control)}}{3 \text{ to } 4 \text{ (goats/acre leafy spurge)}} \times 0.9 \text{ (efficiency coefficient)}$$

Formula for Calculating Lease Value of Sheep

$$\frac{\$18.00 \text{ (cost of 2,4-D control)}}{1.5 \text{ to } 2.0 \text{ (sheep/acre leafy spurge)}} \times 0.7 \text{ (efficiency coefficient)}$$

Example # 2

- Using Example # 1 with a pasture size of 1,000 acres and a leafy spurge infestation of 126 acres.
- Using recommended stocking rate of 441 goats at 3.5 goats per acre of leafy spurge for 4 months.
- Lease value per goat: $\$18.00/3.5 \times 0.9 = \4.63 per goat or \$1.16 per goat per month.
- Lease value for this property would be \$2,041 ($\4.63×441 goats) over the four-month grazing season. The cost of controlling one acre of leafy spurge would be \$16.20.

Example # 3

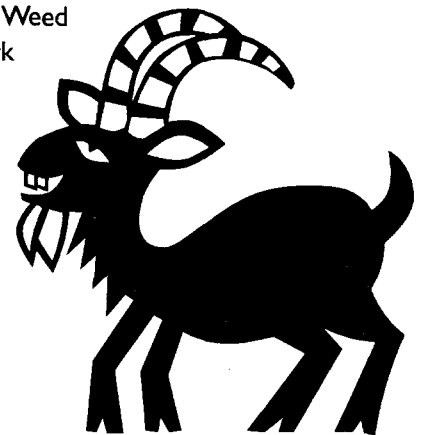
- Using Example # 1 with a pasture size of 1,000 acres and a leafy spurge infestation of 126 acres.
- Using recommended stocking rate of 189 sheep at 1.5 sheep per acre of leafy spurge for 4 months.
- Lease value per sheep: $\$18.00/1.5 \times 0.7 = \8.40 per sheep or \$2.10 per sheep per month.
- Lease value for this property would be \$1,588 ($\8.40×189 sheep) over the four-month grazing season. The cost of controlling one acre of leafy spurge would be \$12.60.

Goats can provide good control of leafy spurge while increasing grass production for cattle use. A goat grazing program should allow increased cattle carrying capacity to levels at or near those achieved before leafy spurge was present.

Sheep can also provide good leafy spurge control, but less grass will be available for cattle compared to control with goats. Cattle grazing capacity will slowly increase as fewer sheep are required to control the leafy spurge infestation.

Other sources of information on leafy spurge control:

- NDSU Extension Circular W-765 - Leafy spurge identification and control
- NDSU Extension Circular W-866 - Integrated management of leafy spurge
- North Dakota Department of Agriculture Pamphlet - Biological control of leafy spurge
- North Dakota Department of Agriculture Video - Weed Innovation Network Grant Program
- Montana State University Agricultural Experiment Station CD-ROM program - Purge Spurge



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