

Reprinted with permission from: 1999 Proceedings. Leafy Spurge Symposium, Medora, ND, June 29, 1999. pp. 16-18.

Published by: North Dakota State University Cooperative Extension Service, Fargo, ND.

Leafy spurge management with sheep and flea beetles

K. GEORGE BECK and LARRY R. RITTENHOUSE

Associate Professor and Professor, Dept. of Bioag Sciences and Pest Management, and Dept. of Rangeland Ecosystem Science, Colorado State University, Ft. Collins, CO 80523.

Abstract:

Leafy spurge (*Euphorbia esula*) is an aggressive, perennial rangeland weed that displaces native vegetation and causes millions of dollars to be lost annually in the agricultural and nonagricultural sectors. Many cultural, chemical, and biological control methods have been evaluated, but herbicides are used primarily. Leafy spurge infests a wide array of habitats and is considered difficult to impossible to control in sensitive shelterbelts and riparian areas where herbicides are very difficult to use. An experiment was initiated in 1993 (1) to determine an optimum sheep stocking rate and grazing duration that is compatible with flea beetle herbivory, and (2) to determine the impact of sheep grazing alone and sheep grazing plus flea beetles on the entire plant community within a defined leafy spurge infested habitat.

The experiment was conducted in a riparian area 25 miles east of Denver, CO. The site is characterized by low organic matter, sandy, gravelly soil, with primarily a leafy spurge-western wheatgrass (*Agropyron smithii* Rydb.)-Kentucky bluegrass (*Poa pratensis* L.) understory and a semi-open plains cottonwood (*Populus sargentii* Dode) overstory. A factorial design arranged as a split-plot was used. Main plots were four stocking rates (two, four, six, or eight sheep/A) by three grazing durations (10, 20, or 30 days). Each plot was 1 acre in size. In 1993, all main plots were split; 500 flea beetles (*Aphthona flava*) were randomized and released onto a single point into one half of each main plot. There were 12 treatments and one control plot per block. Each treatment was replicated twice and all data were subjected to regression analysis.

Data collected in June, 1998 reflect the results of treatments invoked in 1995, 1996, and 1997. These data show that 4 or 6 sheep grazing alone for 10 or 20 days were exerting biological control of leafy spurge. Leafy spurge density within these treatments was decreased 57 to 64% while

smooth brome cover increased 4- to 7-fold and Kentucky bluegrass cover increased 2- to 3-fold. The June data show that all stocking rates of sheep grazing for 30 days stimulated leafy spurge growth and 30 days of grazing was too long regardless of stocking rate. There was about 1.6 times more leafy spurge cover within all 30 day treatments compared to non-grazed plots. The greatest smooth brome cover in June 1998 occurred where 8 sheep grazed for 10 or 20 days, but Kentucky bluegrass cover was suppressed within these treatments. Data collected in fall 1998 also show that sheep were behaving as biocontrol agents when 4 or 6 sheep grazed per acre for 10 or 20 days. Leafy spurge was effectively suppressed while the cool season grasses all displayed a positive response within these treatments.

There were no functional leafy spurge equations produced from data collected on flea beetle transects in June 1998. However, fall 1998 data indicate that a synergism was apparent between grazing sheep and flea beetles relative to decreasing leafy spurge populations and increasing grass populations. Where 6 sheep grazed for 10 days concurrently with flea beetles, leafy spurge density was decreased 50% while smooth brome, western wheatgrass, and Kentucky bluegrass cover increased 36-, 26-, and 5-fold, respectively.

$$LS=54.1-7.9(\# \text{ sheep})-2.6(\# \text{ days})+0.8(\# \text{ sheep})^2+0.1(\# \text{ days})^2$$

$$SB=1-13.3(\# \text{ sheep})+5.1(\# \text{ days})+1.5(\# \text{ sheep})^2-0.14(\# \text{ days})^2$$

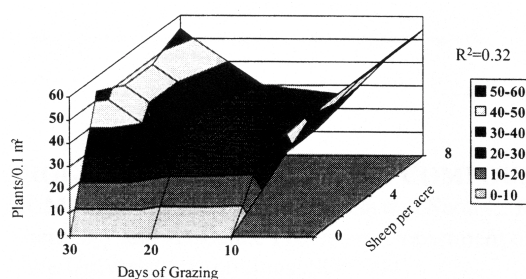


Figure 1. Leafy spurge density along flea beetle control transects June 1998

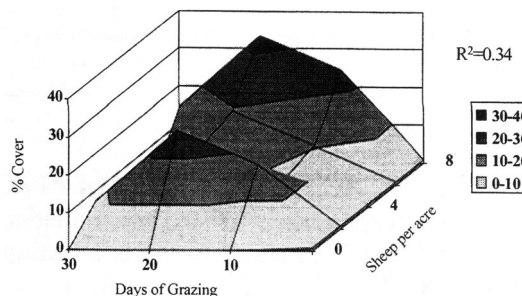


Figure 2. Smooth brome cover along flea beetle control transects June 1998

$$LS = 1.7 - 0.02(\# \text{ sheep}) - 0.08(\# \text{ days}) - 0.02(\# \text{ sheep})^2 + 0.01[(\# \text{ sheep})(\# \text{ days})] + 0.002(\# \text{ days})^2$$

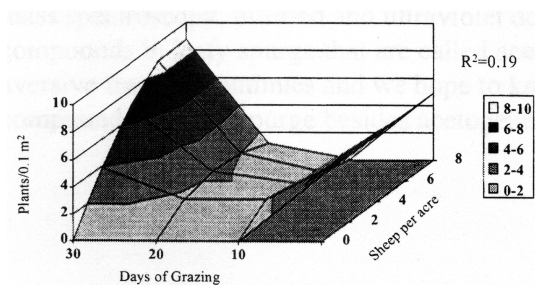


Figure 3. Leafy spurge density along flea beetle release transects Sept. 1998

$$SB = 1.9 - 8.2(\# \text{ sheep}) + 4.5(\# \text{ days}) + 2.1(\# \text{ sheep})^2 - 0.4[(\# \text{ sheep})(\# \text{ days})] - 0.01(\# \text{ days})^2$$

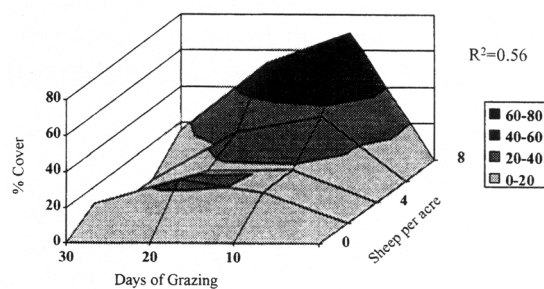


Figure 4. Smooth brome cover along flea beetle release transects Sept. 1998

$$WWG = 0.5 - 0.47(\# \text{ sheep}) + 0.08(\# \text{ days}) + 0.03(\# \text{ sheep})^2 + 0.005[(\# \text{ sheep})(\# \text{ days})]$$

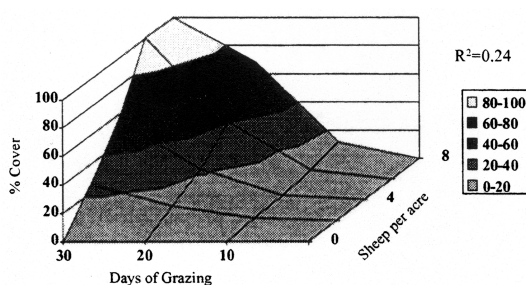


Figure 5. Western wheatgrass cover along flea beetle release transects Sept. 1998.

$$KBG = 2.0 + 9.6(\# \text{ sheep}) - 1.8(\# \text{ days}) - 1.2(\# \text{ sheep})^2 + 0.18[(\# \text{ sheep})(\# \text{ days})] + 0.03(\# \text{ days})^2$$

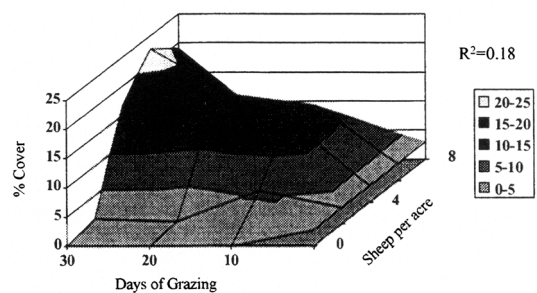


Figure 6. Kentucky bluegrass cover along flea beetle release transects Sept. 1998.