Goats to control the encroachment of undesirable brush and woody species in pastures of the Appalachian region of the United States

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Introduction

- Much of hill-land pasture in the Appalachian region of North Carolina is infested by brushy vegetation including multiflora rose (*Rosa multiflora* Thunb.) and Black locust (*Robinia pseudoacacia*).
- Multiflora rose was imported in 1886 from Japan by the USDA for use in erosion control and as a rootstock for some varieties of ornamental roses.
- In cases of heavy infestation, access to cattle (*Bos taurus*) pastures and recreational areas has been severely restricted.
- According to a 1977 survey by the North Carolina Department of Agriculture, multiflora rose had infested > 58,000 ha of pastureland and an additional 18,500 ha of non-pastureland in 53 mountain and western counties

Objectives

- To evaluate the effectiveness of grazing goats in combination with cattle as compared to goats alone (**Study 1**) and
- To evaluate the effectiveness of grazing goats in combination with cattle as compared to cattle alone (**Study 2**)

❖To control brush species and woody vegetation in hill-land pastures

Materials and Methods

- Experimental site
  - NCDA Mountain Research Station, Waynesville
    - 35.50° N lat. & 83.00° W long.

- Experimental design
  - Randomized complete block replicated three times

Materials and Methods
Study 1
Four grazing seasons (1991-1994)

- Control
  - Area fenced to keep animals out
- Goats alone
  - 30 mature does/ha
- Goats + cattle
  - 17 mature does + 3 growing steers/ha (225 kg initial BW)

Materials and Methods
Study 1
Four grazing seasons (1991-1994)

- **Grazing management**
  - **Mob grazing**
    - ✓**45 to 60 days in May-July**
    - ✓**24 to 35 days in Sep-Oct**
      - ➢**depending on forage availability**

Materials and Methods
Study 2
Four grazing seasons (1996-1999)

- Control
  - Area fenced to keep animals out
- Goats + cattle
  - 3.4 goats (36 kg) and 1.7 steer/ha (230 kg initial BW)
- Cattle alone
  - 1.7 steer/ha (230 kg initial BW)

Materials and Methods
Study 2
Four grazing seasons (1996-1999)

- Grazing management
  - Animals grazed their respective plots and were moved from plot to plot among the 3 replications throughout the grazing season
    - ✓according to forage availability

Materials and Methods

- Herbaceous plant measurements
  - Immediately before the start and after the end of each grazing season
    - ✓Botanical species
    - ✓Percent vegetative ground cover
    - ✓Percent cover from herbaceous grass species

Materials and Methods

- Browse measurements
  - Immediately before the start and after the end of each grazing season
    - ✓*Rosa multiflora* and *Robinia pseudoacacia*
      - Plant height
      - Canopy area
      - Percent live canes

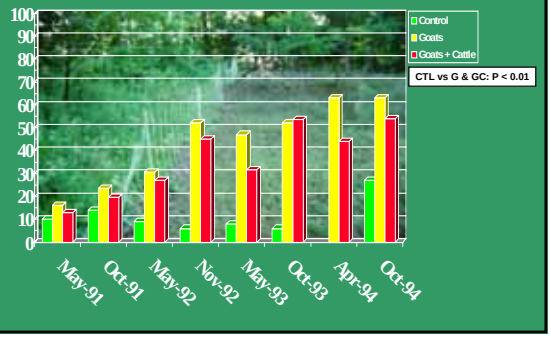
MEASUREMENTS
Transects with 30 pegs in each pasture

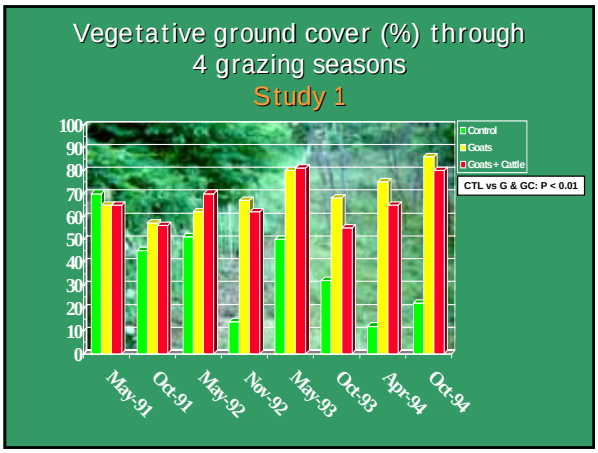
COMPASS FOR ORIENTATION

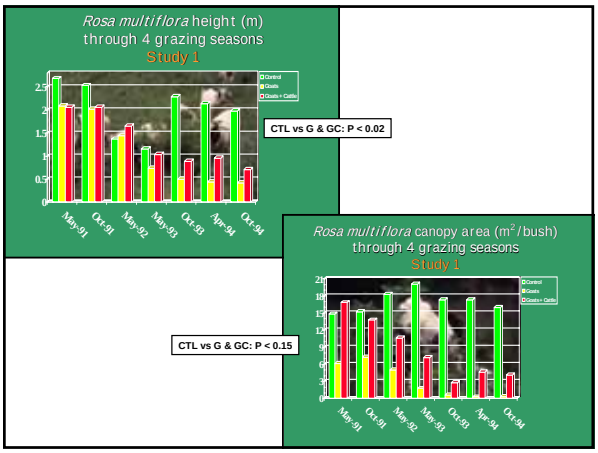
61 BOTANICAL SPECIES IDENTIFIED

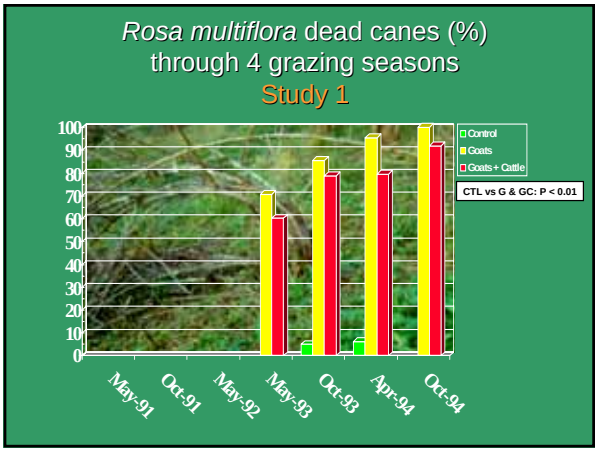
Rosa multiflora & *Robinia pseudoacacia* bushes identified by wooden pegs

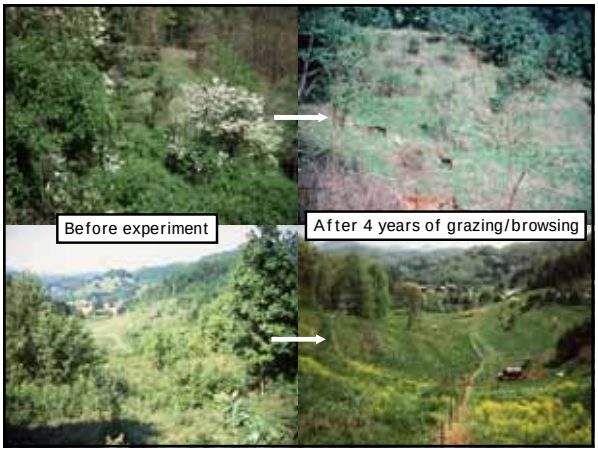
Cover from herbaceous grass species (%) through 4 grazing seasons
Study 1











Materials and Methods
Study 2
Four grazing seasons (1996-1999)

- Control
  - Area fenced to keep animals out
- Goats + cattle
  - 3.4 goats (36 kg) and 1.7 steer/ha (230 kg initial BW)
- Cattle alone
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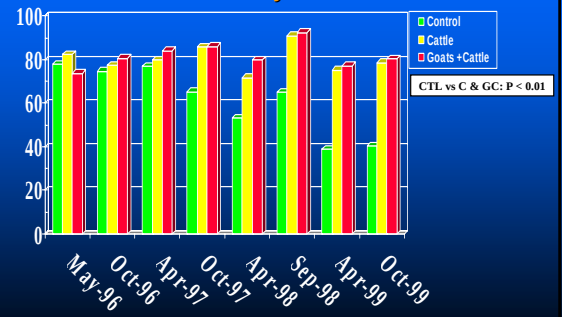
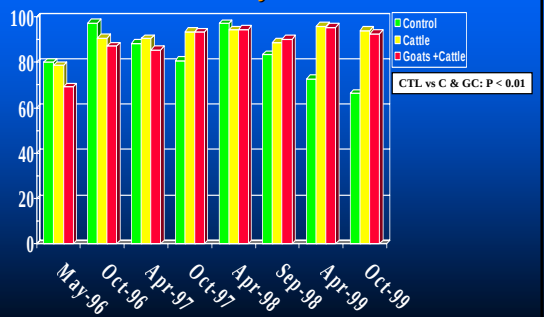
Cover from herbaceous grass species (%) through 4 grazing seasons

Study 2



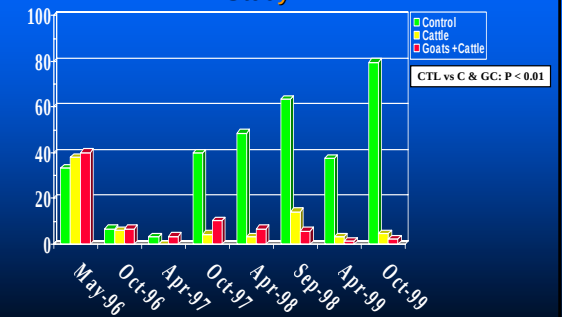
Vegetative ground cover (%) through 4 grazing seasons

Study 2



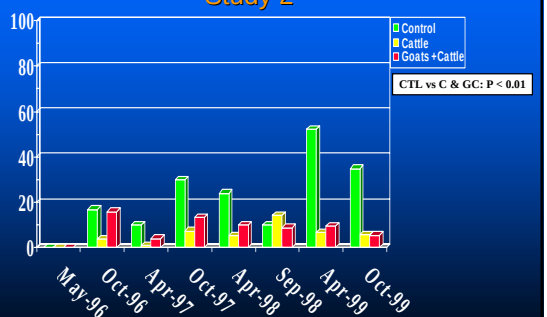
Rubus spp. frequency (%) through 4 grazing seasons

Study 2



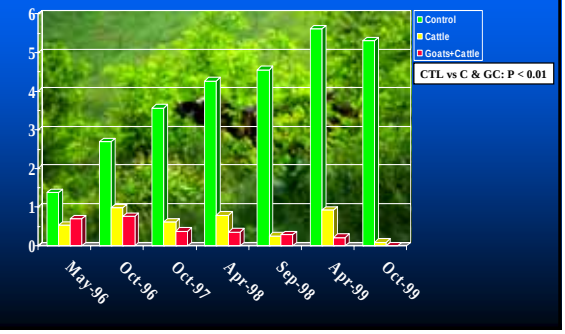
Lonicera japonica frequency (%) through 4 grazing seasons

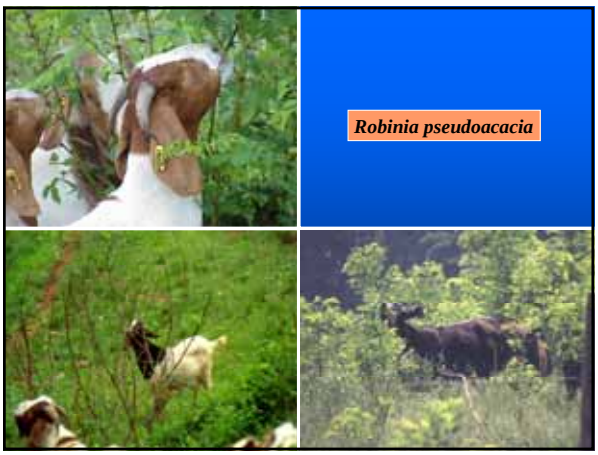
Study 2

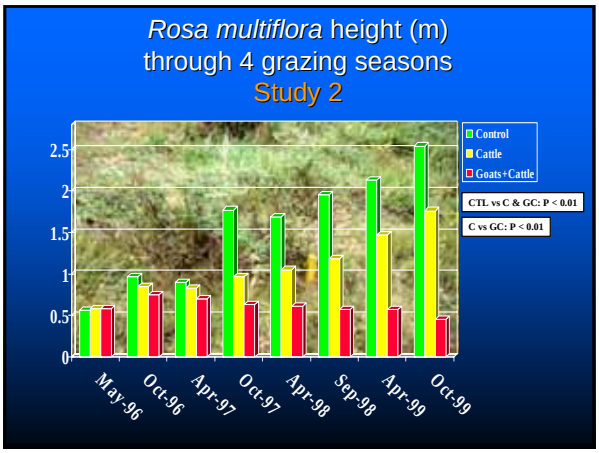


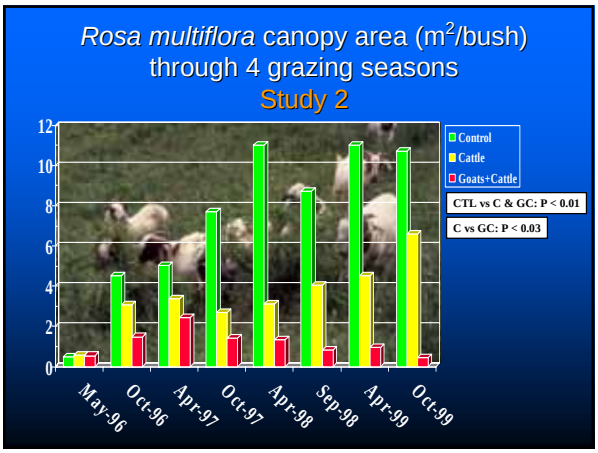
Robinia pseudoacacia height (m) through 4 grazing seasons

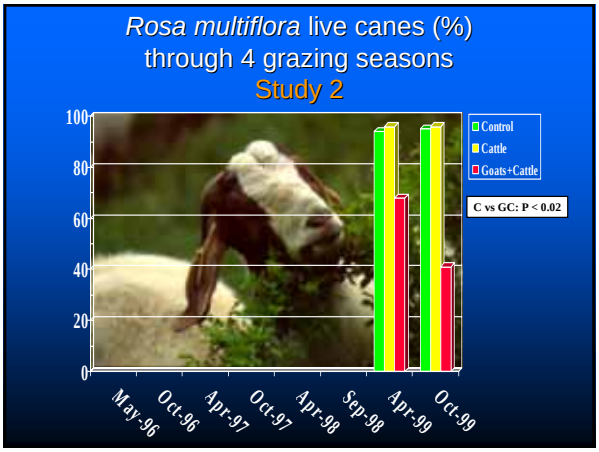
Study 2

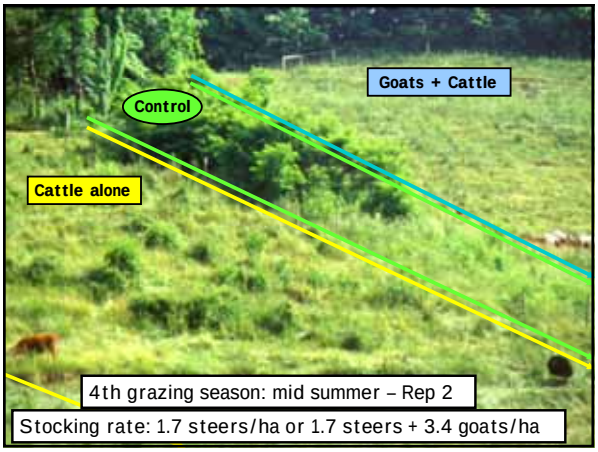


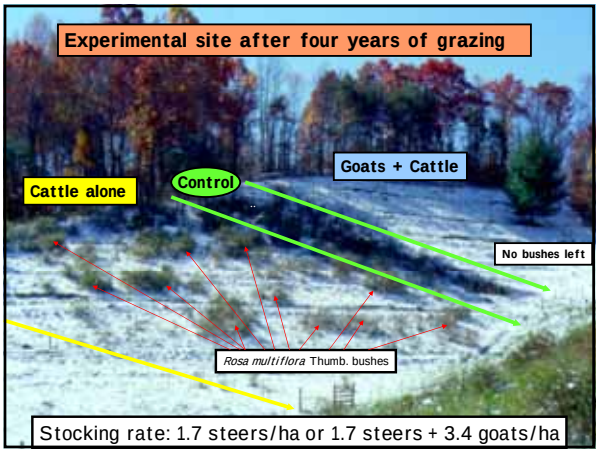












Summary

- Goats grazing alone or goats grazing with cattle were very effective in shifting botanical composition toward desirable forage species in overgrown mountain pastures
- When grazed with cattle, goats demonstrated their biocontrol potential by effectively reducing the encroachment of mountain pastures by *Rosa multiflora, Robinia pseudoacacia, Lonicera japonica and Rubus* spp.
- Cattle were as effective as goats in controlling *Robinia pseudoacacia*

Summary

- *Rosa multiflora*, however, may be difficult to eradicate permanently because of seed dispersal by rodents and birds, and the integration of goats into mountain grazing systems may prove a useful management tool to keep these pastures in production

Conclusions

- Manipulating goat numbers to strike a balance between grazing livestock and the plant community would be worthy of investigation. Woody species would provide a continuous source of palatable and nutritious browse for meat goats but could be controlled to minimize the loss of more favorable forage species preferred by other livestock species

Recommendation: 1 to 2 goats per head of cattle

Conclusions

- The foraging habits of goats also may have important environmental implications in hardwood forests and other timber land areas by potentially providing buffer zones around rural communities and newly-established development projects as viable protection against forest fires during periods of summer drought

Introduction

- Over 500,000 ha of forest in the Southeastern region of the country is invaded by kudzu (*Pueraria montana*)
- Kudzu, a native vine from Japan and China, was introduced by the USDA in early 1900s for erosion control.
- Kudzu is one of the most aggressive legume vine growing in the Southeastern United States.
- Herbicides have been used to control kudzu, but these chemicals are expensive and repeated applications are usually required. In addition, environmental concerns associated with the repeated use of chemicals cannot be over emphasized.
- Kudzu is a carrier of soybean rust in parts of the deep South.

Chemical composition of various plants browsed by goats (%)

Browse type	Crude protein	Neutral detergent fiber	Calcium	Phosphorous
Rosa multiflora	18.2	34.5	0.99	0.32
Robinia pseudoacacia	23.0	44.0	1.26	0.21
Lonicera japonica	16.0	34.5	1.21	0.30
Rubus spp.	17.1	24.5	0.23	0.84
Ligustrum vilgare	20.0	26.8	0.89	0.34
Smilax rotundifolia	16.1	39.5	0.60	0.18
Campsis radicans	16.7	43.1	0.42	0.22

QUESTIONS ?

Meat Goats & Forage Systems

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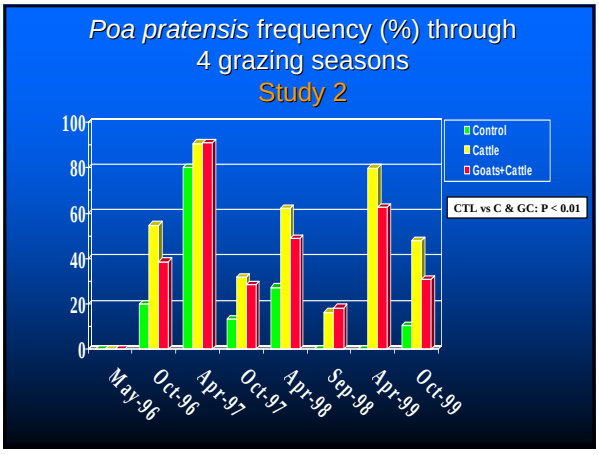
Agroforestry Systems 44: 241-252 (1999)

Sheep & Goat Research Journal 16:124-135 (2000)

Poa pratensis frequency (%) through 4 grazing seasons
Study 2



Festuca arundinacea frequency (%) through 4 grazing seasons
Study 2