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

Study 1

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

Study 1 Experimental site

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

Study 1 Experimental design

- Randomized complete-block replicated three times

Materials and Methods

Study 1

- 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 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)

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

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

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

MEASUREMENTS
Transects with 30 pegs in each pasture

100 cm
10 cm

PVC pipe
Wooden peg

COMPASS FOR ORIENTATION
61 BOTANICAL SPECIES IDENTIFIED

Rosa multiflora & Robinia pseudoacacia bushes identified by wooden pegs
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)
Rosa multiflora height (m) through 4 grazing seasons

<table>
<thead>
<tr>
<th>Month</th>
<th>Control</th>
<th>Cattle</th>
<th>Goats+Cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-96</td>
<td>0.50</td>
<td>0.55</td>
<td>0.60</td>
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<td>Oct-96</td>
<td>1.00</td>
<td>1.05</td>
<td>1.10</td>
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<td>3.10</td>
</tr>
<tr>
<td>Apr-99</td>
<td>3.50</td>
<td>3.55</td>
<td>3.60</td>
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</tbody>
</table>

Rosa multiflora canopy area (m²/bush) through 4 grazing seasons

<table>
<thead>
<tr>
<th>Month</th>
<th>Control</th>
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<th>Goats+Cattle</th>
</tr>
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<tbody>
<tr>
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<tr>
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<td>4.20</td>
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<td>Apr-97</td>
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<td>8.20</td>
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<td>10.10</td>
<td>10.20</td>
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<tr>
<td>Oct-98</td>
<td>12.00</td>
<td>12.10</td>
<td>12.20</td>
</tr>
<tr>
<td>Apr-99</td>
<td>14.00</td>
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<td>14.20</td>
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</table>

Rosa multiflora live canes (%) through 4 grazing seasons

<table>
<thead>
<tr>
<th>Month</th>
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<th>Goats+Cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-96</td>
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<tr>
<td>Oct-96</td>
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<tr>
<td>Apr-99</td>
<td>100.00</td>
<td>100.05</td>
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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.
- Experimental site after four years of grazing.

Stocking rate: 1.7 steers/ha or 1.7 steers + 3.4 goats/ha
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 vines growing in the Southeastern United States. Herbicides have been used to control kudzu, but these are cost prohibitive 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 (%)

<table>
<thead>
<tr>
<th>Browse type</th>
<th>Crude protein</th>
<th>Neutral detergent fiber</th>
<th>Calcium</th>
<th>Phosphorus</th>
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<tbody>
<tr>
<td>Rosa multiflora</td>
<td>18.2</td>
<td>34.5</td>
<td>0.99</td>
<td>0.32</td>
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<tr>
<td>Robinia pseudacacia</td>
<td>23.8</td>
<td>44.0</td>
<td>1.26</td>
<td>0.21</td>
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<tr>
<td>Lonicera japonica</td>
<td>16.8</td>
<td>34.5</td>
<td>1.21</td>
<td>0.30</td>
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<tr>
<td>Rubus spp.</td>
<td>17.1</td>
<td>24.5</td>
<td>0.23</td>
<td>0.84</td>
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<tr>
<td>Ligustrum ilicivium</td>
<td>20.6</td>
<td>26.8</td>
<td>0.89</td>
<td>0.34</td>
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<tr>
<td>Sambucus racemosa</td>
<td>16.1</td>
<td>39.5</td>
<td>0.60</td>
<td>0.18</td>
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<td>Campsis radicans</td>
<td>16.7</td>
<td>43.1</td>
<td>0.42</td>
<td>0.22</td>
</tr>
</tbody>
</table>

QUESTIONS?

Poa pratensis frequency (%) through 4 grazing seasons

Festuca arundinacea frequency (%) through 4 grazing seasons

P. pratensis frequency (%) through 4 grazing seasons

F. arundinacea frequency (%) through 4 grazing seasons

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