



Using Goats to Control Invasive Species

Staff Contact:

Meghan Filbert– (515) 232-5661
meghan@practicalfarmers.org

Web Link:

<http://bit.ly/pfilivestock>

Cooperators:

- Penny Perkins - Ogden

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In a Nutshell

- Goats are becoming a popular method of controlling unwanted vegetation and invasive species, such as honey-suckle and multiflora rose.
- Timber stands and savannahs need some sort of disturbance to keep invasive species from spreading in order for native species to flourish.
- Goats were allowed to browse a timber stand twice in 2015 and vegetation observations were conducted throughout 2015 and 2016.

Key findings

- Goats did not adversely affect the herbaceous layer (understory) of a timber stand.
- Goats did not significantly affect the desirable woody species.
- By September 2016, areas where goats browsed in 2015 had significantly less non-desirable woody species.
- Successive years of browsing goats are likely needed to successfully eradicate invasive species.

Project Timeline:
April 2015 – September 2016

Background

Goats are becoming increasingly popular for managing unwanted vegetation because they provide a 'green' alternative to pesticides while benefitting the animals and land. Not only do browsing goats control invasive species, but clearing these unwanted species allows the native plants of a timber stand to flourish (DNR, 2016). This project evaluated the use of goats to control invasive species and invigorate native savanna growth. In 2015, a research plot was established for comparing the



Timber that goats browsed is shown on the right. Goats help control invasive species.

effectiveness of goats in comparison to no management to control for invasive species in an Iowan savanna.

Some, but not enough research has been done on using goats to replace natural disturbance regimes that historically maintained Midwestern ecosystems (Perkins, 2015). Penny Perkins, an ecologist specializing in land rehabilitation, was inspired to conduct goat research while working with a landowner who desired to reestablish her property's pristine biological diversity, after becoming inundated with multiflora rose and bush honeysuckle. Penny then partnered with Ray Hansen, who works

for ISU Extension and owns property in Ogden, to set up a trial.

Prescribed burns, mechanical removal, and chemical control of invasive species require resources that not all landowners have or want to use. Landowners may also face challenges from steep terrain with limited physical abilities or limited time for managing land properly. Goats are a tool to broaden the spectrum that landowners have for keeping our native ecosystems healthy. This project begins to evaluate the practicality for private landowners to use goats as invasive species control.

Methods

The project was conducted at Prairiewood Farms; a 52 acre timber and hay farm located in the Des Moines River Valley in Boone County, which is owned and operated by Ray Hansen. A timber stand improvement was conducted four years ago on the property, and instead of just releasing the native savanna flora, released multi-flora rose and bush honeysuckle as well. An assessment of the growing vegetation was conducted over two years, and a herd of goats were rented to browse part of the timbered area.

Two treatments and designated plots were established and managed differently; no management (control) and with goats. Each treatment plot was replicated four times, for a total of eight plots. Plots were 1.5 acres in size. 40 Kiko goats browsed twice in 2015, and did not browse the next year. The first browsing period took place from May 13–27, 2015 and the second browsing period took place from June 27 to July 24, 2015.

To assess the vegetation present in the timber, counts were taken along transects. Two permanent, 100-ft transects were established in each plot with three sample stakes at 10, 50 and 75 feet, totaling six sample areas per plot. A 1m² quadrat was used to sample herbaceous vegetation and seedlings present at each sample area. Plant species found within the 1m² quadrat were recorded three different times per year, for a total of six counts. To assess how much herbaceous cover was present on the ground, Penny identified each species present, and estimated the percentage cover of each species within the quadrat. For seedlings, she counted the shoots of each species present.

The species present were then categorized into desirable and non-desirable species. The non-desirable species are those that are invasive, and are listed in **Table 1**. In both years, counts were taken in April, June and September. In 2015, counts taken in April occurred during leaf out and before goats were introduced; in June, counts occurred between the first and second goat browsing periods. No goat browsing periods occurred in 2016.

Livestock for the project were provided by Goats on the Go, a vegetation management and goat rental company operated by Aaron Steele and Chad Steenhoek, of Ames.

Data were analyzed using JMP Pro 12 (SAS Institute Inc., Cary, NC). Statistical significance is determined at $P \leq 0.10$ level. A repeated measures approach was used to examine the effects of sampling date, treatment, and their interaction on desirable and non-desirable plant species.

Table 1

List of Non-Desirable Species

Multiflora Rose (<i>Rosa multiflora</i>)
Bush Honeysuckle (<i>Lonicera macckii</i>)
Red Cedar (<i>Juniperus virginiana</i>)
Prickly Ash (<i>Zanthoxylum americana</i>)
Blackberry/Black Raspberry (<i>Rubus</i> sp.)

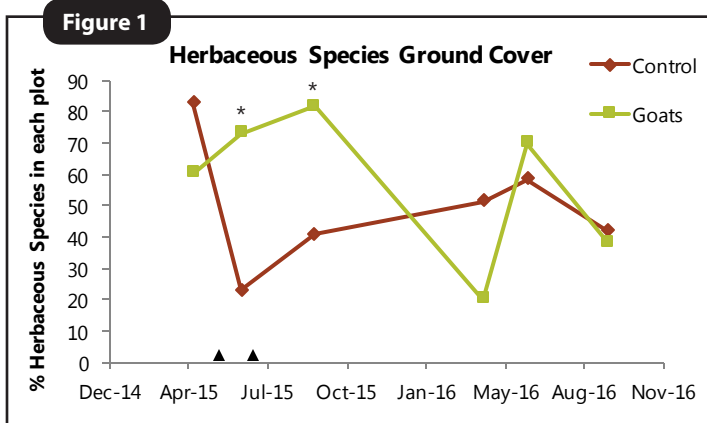


Figure 1. Herbaceous species ground cover over two growing seasons, from April 2015 to September 2016. By the end of 2016, there was no significant difference between treatments. Black triangles designate the start of the two, two-week goat browsing periods in 2015. (*) indicates sample dates when the two treatments were significantly different at the $P \leq 0.10$ level.



Penny Perkins, PFI cooperater and ecological restoration specialist.

Results and Discussion

Herbaceous Ground Cover

Penny visually estimated the herbaceous vegetation covering the ground throughout the study, in order to determine how to goats affected it. Goats predominately browse on woody species, leaving ground vegetation alone (Luginbuhl, et al., 1999). Through defoliation of the woody species by browsing goats, ground vegetation should receive more light and grow more vigorously than where the woody species were not defoliated. Ground vegetation is made up of many desirable native plant species.

Figure 1 shows the percent groundcover of herbaceous species in the control plots and browsed plots. Goats were turned into

the timber to browse on two different dates. The black triangles designate the start of those browsing periods, from May 13–27, 2015 and June 27 to July 24, 2015. In June and September of year one, significantly more herbaceous vegetation was present in the plot browsed by goats ($P \leq 0.10$).

By the end of year two, there was no significant difference in herbaceous vegetation between treatments. Penny explained, "With the presence of goats, there's less canopy, allowing more light to reach the understory. I believe that's why there were more herbaceous species present in year one, while goats browsed, than in year two, when goats weren't there."

Desirable vs. Non-Desirable Woody Species

Woody species seedlings were counted to determine if goats had an effect on the number of growing woody species. Desirable and non-desirable species were identified, specifically to assess if goats were able to control non-desirable species (listed in **Table 1**), and what effect they may have on desirable species. Goats are known to destroy small woody plants by debarking and are not deterred by thorny vegetation (Lingenfelter and Curran, 2013).

Figure 2 shows there was no significant difference in number of desirable woody species between treatments. This means, "One year of goat browsing did not prove to have a detrimental effect on our desirable woody species, such as oaks," explained Penny. This is a positive finding, as the landowner is ultimately trying to restore an oak savannah.

As shown in **Figure 3**, by the end of the study, there was a significant difference ($P \leq 0.10$) between treatments. The browsed timber plots contained significantly less non-desirable woody species. "One year of browsing seemed to keep the non-desirable species from proliferating, compared to the control where there was a spike in growth in year two," stated Penny, who went on to say, "Goats could have stunted the growth of the non-desirable species, but I think goats need to browse for successive years to really be able to effectively control non-desirable, invasive species."

Visual Observations

This two-year project taught Penny several lessons. "The plots that had been browsed were visibly clearer, more open and easier to walk through. The control plots were very, very dense with vegetation at the end of the study," said Penny. But, she observed honeysuckles coming back in the browsed plots, "To successfully use goats to control invasive woody species, you need to flash graze at a high enough stock density to completely defoliate an area." The point of flash grazing is to get livestock to eat the plants quickly, sapping the reserves within the plant.

Penny does not think that two browsing periods within the same year is enough to fully kill undesirable plants, especially well established stands of invasive woody species. "We need to do further research on the necessary stocking density, browsing times, and how many years it takes to completely eradicate certain species," clarified Penny.

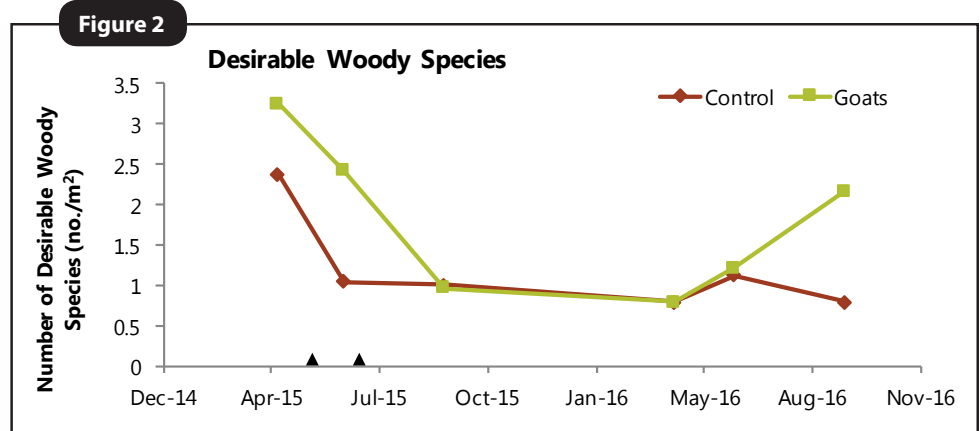


Figure 2. Number of desirable woody species from April 2015 to September 2016 in each treatment. There was no significant difference between treatments. Black triangles designate the start of the two, two-week goat browsing periods in 2015.

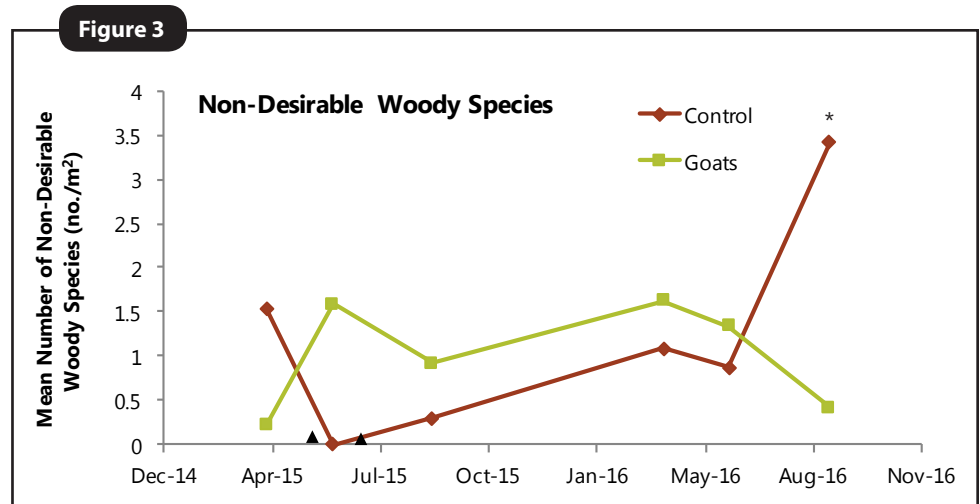


Figure 3. Number of non-desirable woody species from April 2015 to September 2016 in each treatment. By September 2016, the browsed treatment plots had significantly fewer non-desirable species than the control plots. Black triangles designate the start of the two, two-week goat browsing periods in 2015. (*) indicates sample dates when the two treatments were significantly different at the $P \leq 0.10$ level.



Goats browse on woody species in a timber stand.

Conclusion and Next Steps

Results showing that goats had a significant effect on non-desirable species is encouraging. "When I talk with landowners from now on, I will tell them they need to try successive years of browsing or grazing when trying to control certain plant species. Flash grazing provides ecological benefits over year-round grazing," Penny says.

Penny thinks there needs to be a network of landowners that share a herd of goats that can browse from one property to the next. This way, the costs of the livestock and infrastructure can be shared and the goats would be on hand for successive browsings, when the plants start to leaf out again. Penny says: "Goats can be a viable, practical, and affordable tool to maintain timber stands, providing a tool that landowners should take advantage of."



Goats on the move through a timber stand.

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PFI Cooperators' Program

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