Choose Your Weapon: Comparing Invasive Removal Methods in an Urban Watershed

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Abstract

The Hunnicutt Creek Restoration Project is an ongoing effort started in 2013 with the goal of re-establishing the natural functions and conditions of a degraded watershed located on Clemson University's campus. Monitoring and removal of invasive species, primarily Chinese Privet and Silverthorn within the upper reaches of the watershed is one of the main goals toward restoring a natural and more aesthetically pleasing system. We established thirty 5x5 meter plots, using the Carolina Vegetative Survey protocol, to measure the effectiveness of various removal techniques. We used four treatment methods to remove invasive species: chemical, mechanical, mechanical and chemical, and prescribed grazing. A variety of herbicides and mechanical removal techniques were used based on plant size. Mechanical and chemical treatments combined both techniques by removing plants and then applying herbicides to cut stems. Prescribed grazing consisted of 40 goats contained in an area for 40 days. Five plots were randomly assigned to each of these treatments in addition to five control plots. With 5 plots selected as reference sites to establish a target long-term restoration goal and for comparison with treatment plots. Preliminary results indicate that the chemical and mechanical treatment is the most effective at reducing cover and stem count of invasive species. The goats were effective in opening up the landscape but were not selective in their grazing. In addition to our efforts of analyzing one year of collected CVS from the monitored plots, we are increasing our removal efforts with a volunteer force using the mechanical and chemical treatment. Further restoration efforts are being made with the propagation of desired native species for eventual introduction into watershed.

Methods

Mechanical

Chemical

Chemical & Mechanical

Goats

The Invaders

Hunnicutt Creek has a wide range of invasive species but our main targets are:

Silverthorn
(Elaeagnus pungens)

Chinese Privet
(Ligustrum sinense)

Results

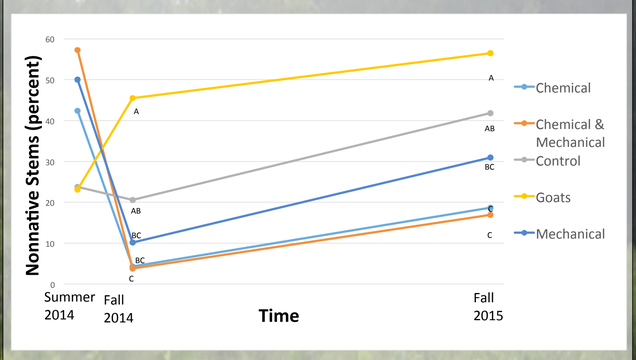

Figure 1. Four out of five treatments resulted in reductions in stems immediately after treatment, and all five methods underwent an increase in nonnative stems one year after treatment.

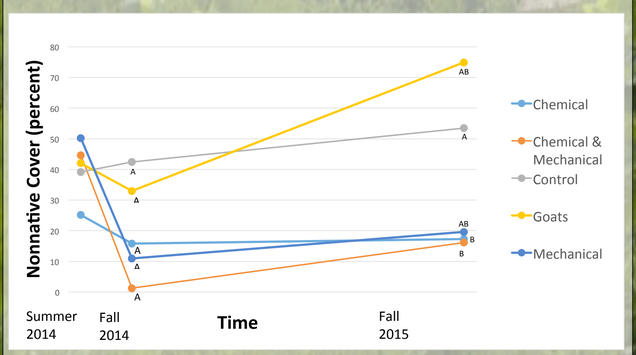

Figure 2. Immediately after treatment, four out of five treatment methods caused a reduction in nonnative cover. One year later, all five treatments increased; goat treatment increased the most, and chemical & mechanical treatment increased the least.

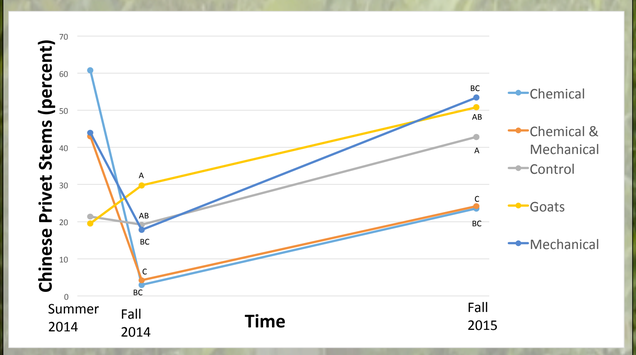

Figure 3. All treatment methods except for goats decreased directly after treatment, and all five methods increased one year after treatment. Chemical and chemical & mechanical treatments remained the lowest cover values one year after treatment.

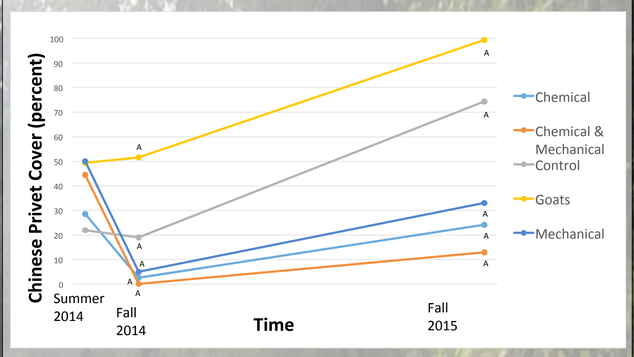

Figure 4. Four of five treatments resulted in immediate reductions in cover after treatment, with all treatments being significantly similar in the amount of reduced Chinese privet cover. One year after treatment, all 5 treatments increased in Chinese privet cover.

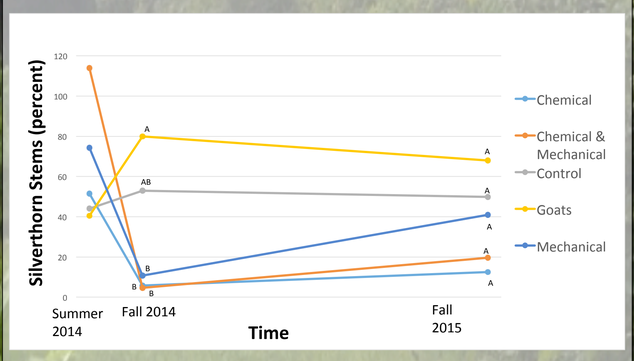

Figure 5. After treatment, three out of five methods greatly decreased stem counts, while control and goats increased. One year after treatment, goats and control decreased and the other three methods increased. The chemical treatment had the lowest silverthorn stem count one year after treatment; however, all five methods were not statistically significant from each other at that point in time.

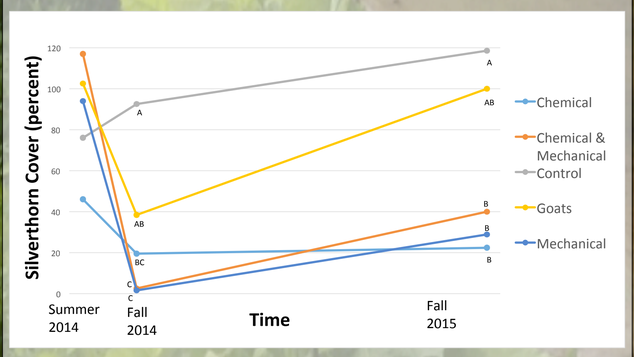

Figure 6. Four of the five treatment methods caused a reduction in silverthorn cover immediately. One year post treatment, the mechanical, chemical, and chemical & mechanical methods had significantly reduced counts of silverthorn cover, and the chemical treatment had the least amount of increase.

Conclusion

The purpose of this experiment was to evaluate the efficacy of different invasive plant removal techniques in an urban watershed.

- At time of treatment, almost every removal method was successful for reducing cover and stems
- One year post-treatment, cover and stems started to increase
- Treatments needs to be repeated in order to be effective
- Integrated management (a combination of treatment methods) is also important to be successful in invasive removal
- While goats were ineffective at treating invasive plants, they helped bring interest to the project with the community

Ongoing Research

The group is also involved with other aspects of the restoration project. Students are divided into small research groups to explore topics of:

Amphibian Monitoring

Water Quality

Drone Imagery

Citations

Michael T. Lee et al. 2008. CVS-EEP Protocol