

# GKSF Buckthorn Control Methods

**Project Subject/Title: GKSF Buckthorn Control Demo and Silviculture**

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**Abstract:** Common buckthorn is one of many invasive plants that can outcompete native vegetation include tree seedlings. Having buckthorn present in the understory requires a more integrated forest management plan and can be costly. The Governor Knowles State Forest staff recognized this problem during development of the 2012 Master plan revision. In some areas of the Governor Knowles State Forest (GKSF) property, common buckthorn dominates the understory throughout aspen and oak forests along the St. Croix river. A small group of resource professionals discussed alternatives to address buckthorn in Sunrise Ferry Terrace area of the state forest. During the master plan process, this area was designated as a demonstration area for buckthorn control treatment trials.

In 2017 a buckthorn control project was initiated. The objective of this project was to implement and assess the effectiveness of a variety of buckthorn control treatments in a timber sale. We tested 3 invasive control treatments using various combinations in sequence with a timber harvest. The treatment methods that were used are herbicide; mowing/cutting; roller chopping; goat browsing along with shelterwood or clearcut harvest methods.

## **Trial Location:**

<b>County:</b> Polk_____
<b>Township:</b> <u>36N</u> _____ <b>Range:</b> <u>20W</u> _____ <b>Section:</b> <u>29,32,33</u> _____
<b>GPS Coordinates: Lat/Long:</b> <u>45.57045</u> "N, <u>92.86201</u> "W _____
<b>Property Name:</b> <u>Governor Knowles State Forest</u> _____
<b>Site Map:</b> see appendix

## **Baseline Stand Data:**

- *Cover Type (primary, secondary, understory) – red oak, aspen*
- *Acres – 81 acres*

## **Prescription and Methods:**

In 2017, prior to the treatments, temporary mil-acre plots were established to assess buckthorn and tree seedling and saplings throughout the project area. In 2017- 2019 nine treatments were implemented in sequence with a timber harvest (completed in 2018).

The treatment sites ranged from 2 acres up to 13 acres in size. The treatment combinations include: shelterwood/herbicide; shelterwood/herbicide/mowed; shelterwood/roller chop/spray; clear cut/herbicide; clear cut; clear cut/mowed; clear cut/goats; shelterwood/goats; shelterwood/mowed/goats; shelterwood/scarified. There were no replicates of the treatments – only one treatment type at the site. Since there were no replicates for comparison, this project is considered more qualitative than quantitative in nature and used for demonstration.

-Foliar and basal bark herbicide treatments were conducted using Garlon 4 - a one-time application contracting with 4-Control, Eau Claire Wi. The treatment was done late September of 2017. The triclopyr product was used at 20% concentration with adjuvant of bark oil blue. This solution was sprayed on both seedlings (foliar) and saplings (bark).

-Facon mowing was conducted during November of 2017. Mowing cleared all understory woody stems in addition to shattering the stump. Scarification using a straight blade dozer was conducted in July of 2018 by local staff. Dozer blade scarification is implemented by running the straight blade through the stand and scraping the top layer of vegetation exposing some of the soil.

-Goat browsing was conducted during September of 2017 and June 2018 by contracting with Munch Bunch, St. Croix Falls, Wi. Approximately 60 goats were fenced (electric) one acre at a time for 1-3 days until all the understory was consumed. Then the goats and fence were strategically moved through the treatment area. The goats stayed on site for approximately one month each time until the unit was completely browsed.

-Roller chopping was conducted during the winter of 2019/20 by contracting. Roller chopping was used to knock down and chop up brush and trees up to about 3 inches in diameter.

-Both clearcut and shelterwood timber harvests were completed in the winter of 2018 throughout the treatment areas. The clearcut areas were harvested down to approximately 20% residual. The shelterwood areas (seed cut) was harvested to 40% crown closure.

### **Data collection methods**

Inventory of buckthorn and tree seedling/saplings were completed throughout the project area before treatment (2017) and two years after (2019, 2021). Seedling/sapling height of buckthorn was documented. Tree regeneration and species were documented. A second, post treatment inventory occurred in the summer of 2021. Milacre (1,000<sup>th</sup> acre plots were used to assess buckthorn stems per acre and height; and also tree regeneration species, number and height

### **Results:**

Results of buckthorn seedling/sapling were compared by calculating the percent reduction in seedling and sapling (pre-treatment versus post treatment). Each treatment is assigned a letter that corresponds to the map in the appendix. Among the different

control methods considered in the present study, none resulted in the complete elimination

Results from the 2019 inventory indicate that herbicide/clearcut treatment was the most successful at reducing the buckthorn seedling and sapling numbers followed by herbicide/shelterwood. The clearcut/goat treatments also were successful at reducing seedlings. Also, in all the clearcut harvest areas, both seedling and sapling numbers were significantly reduced.

Both goat and mowing treatments the seedling and sapling numbers remain higher (except clear cut/goat seedling). With both treatments we still observe a reduction in seedling and sapling numbers a treatment, however not as effective as herbicide.

However, when comparing tree seedling numbers in all treatments, the goat application sites had more tree seedlings. Red oak was the dominant species that increased at these sites. Within the goat browsing treatment, increased oak seedling density may be due to some scarification from hooves further prepping the seed bed.

Results shows that any one single control strategy nor one single attempt is insufficient to control buckthorn. There was a strong indication that a combined strategy employing more than one technique is likely to be the most effective approach, at least in the short term.

Table 1. Buckthorn seedling and sapling percent reduction

<b>Treatment</b>	<b>Seedling % reduction</b>	<b>Sapling % reduction</b>	<b>Tree seedling/ac</b>
Sh/Herb (H)	80	80	19,000
Sh/herb/mow (D)	60	14	10,000
Sh/RC/ (L)	*	*	20,000
Sh/mow/goat (F)	20	24	66,000
Sh/goat (A)	40	34	33,000
Sh/goat 2 (A)	22	30	42,000
Sh/scarify (E)	56	56	32,000
Clearcut (G)	75	35	50,000
Clearcut/mow (C)	70	20	18,000
Clearcut/herb (I)	99	85	23,000
Clearcut/goat (B)	78	32	38,000
Clearcut/goat 2 (B)	75	50	41,000
*inventory in 2021			

**Costs:**

Comparing each control method is difficult especially with cost comparisons. With goat browsing, approximate cost for this project \$730/acre however, additional benefits of this method are fertilization from being on site and scarification from the hooves enhancing tree seed establishment. Herbicide treatment is approximately \$220/acre. Basal bark and foliar application using a triclopyr product are effective treatments although can be

controversial regarding chemical use. Fecon mowing can be a preparatory step to herbicide treatment to weaken the plant. Mowing can be conducted in the winter to shatter the stem. Some practitioners use fecon mowing alone to control buckthorn without herbicide follow up. Mowing is estimated at \$200/acre. All contracted costs for this project were funded with state forest regeneration funds.

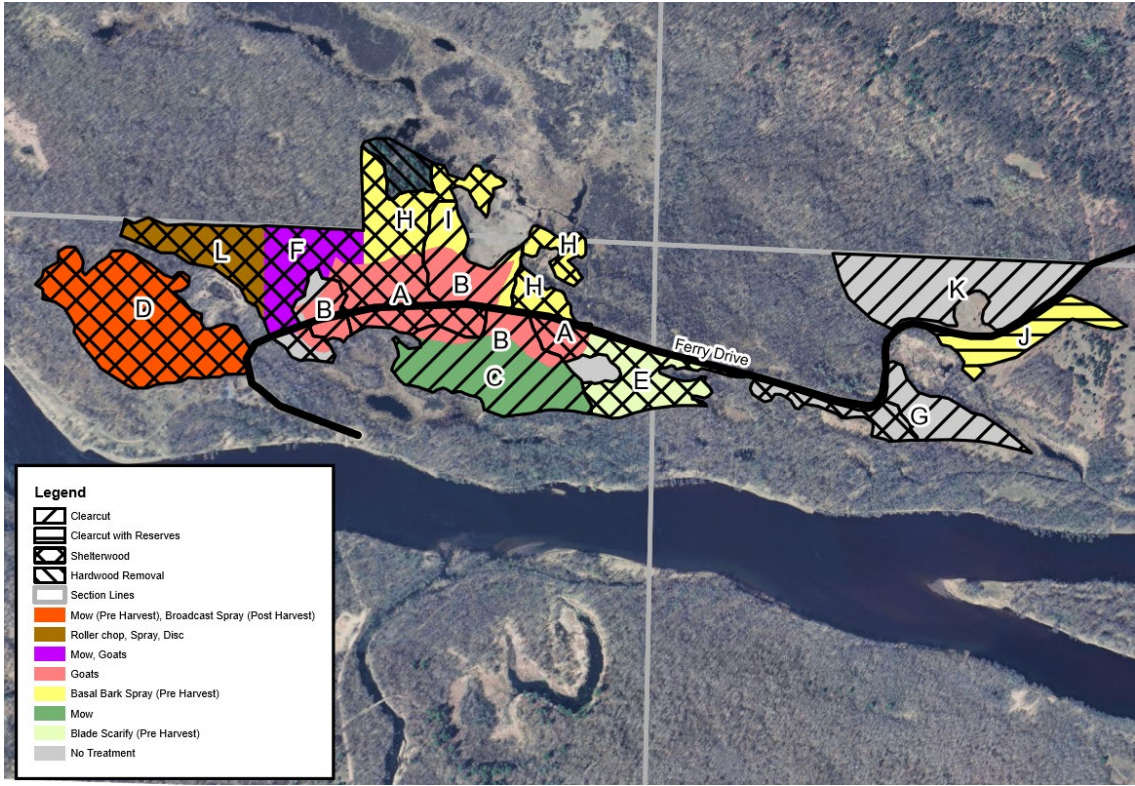
Table 2. Cost of treatment

<b>Treatment</b>	<b>Costs (\$/acre)</b>	<b>Comment</b>
Goats	\$730 per time	
Herbicide	\$160 - 220	
Fecon	\$200 - 290	
Scarification	\$120	
Roller chopping	Data not available	

**Discussion/Recommendations:**

As integrated pest management becomes more centralized in our focus to remove noxious weeds so does the need for a greater number of alternative control measures. Land managers facing buckthorn invasion should therefore see the mechanical and chemical control methods as tools to curb development and slow invasion. When designing management strategies, effective control can be achieved when considering timing, intensity and type of treatment. This project demonstrates that while herbicide may be effective at controlling buckthorn, other techniques may help achieve other stand management goals such as increasing regeneration as observed in the goat browsing treatment.

Further studies are needed to understand timing and intensity of treatment. More subsequent evaluations are required to determine the efficacy of mechanical treatment/herbicide combination.



Pictures of Munch Bunch goats and grazing



