



Managing Invasive Buckthorn

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June 2022



Minnesota Invasive Terrestrial
Plants & Pests Center

Table of contents

Introduction	3
In this toolkit:.....	3
Research overview	4
The importance of native plants.....	4
Goat grazing.....	4
Proven benefits of goat grazing	4
Potential benefits of goat grazing	4
Potential limitations of goat grazing.....	5
Identifying buckthorn	6
Glossy buckthorn.....	6
Common buckthorn.....	6
Glossy and common buckthorn differences	7
Glossy and common buckthorn similarities	7
Removing buckthorn	8
Pulling stems and preventing re-sprouting.....	8
When to remove.....	9
More information.....	9
Preventing buckthorn reinvasion	10
Using native plants	10
Considering light availability	10
Long-term management tactics	10
Additional benefits.....	11
Contributing authors	12
References	13
Photo credits	14

Introduction

There are two types of invasive buckthorn in Minnesota: Common (European) buckthorn (*Rhamnus cathartica*) and glossy buckthorn (*Frangula alnus*). Both species were introduced to Minnesota as ornamental plants and have now spread widely across the state. They outcompete native plants, suppress growth of canopy tree seedlings, and reduce habitat quality for wildlife. Both species are listed as restricted noxious weeds in Minnesota (<https://www.mda.state.mn.us/plants-insects/minnesota-noxious-weed-list>) and both are ranked high on the Minnesota Invasive Terrestrial Plants and Pests Center's (MITPPC) research priority list (<https://mitppc.umn.edu/invasive-species-prioritization>). Many landowners in Minnesota work to remove buckthorn from their property by hand-pulling, using removal tools, or treating with herbicide. But preventing buckthorn from coming back remains a challenge.

Removing buckthorn increases the availability of key resources like light and nutrients that enhance plant growth. Unfortunately, these resources are often quickly used by new buckthorn plants arising from seed or resprouting from cut stumps. As a result, buckthorn is particularly good at re-invading an area, and often rapidly returns after removal. Meanwhile, native plants are often slow to return because their seed banks have been depleted by buckthorn dominance.

In this toolkit:

- Current and ongoing buckthorn management research at MITPPC that can help
- How to identify glossy and common buckthorns
- How to remove buckthorn
- How to replant native vegetation to prevent future reinvasion

Research overview

Researchers at MITPPC have spent years pursuing effective, efficient, and accessible management tactics for common and glossy buckthorn.

The importance of native plants

Studies show that re-establishing dense native plant cover immediately after removing buckthorn causes the native plants to outcompete buckthorn for light availability, which helps suppress reinvasion. MITPPC researchers have seen that planting native grasses, wildflowers, sedges, and ferns can cut the amount of returning buckthorn in half over a few-year period.

Scientists have also seen the greatest reduction in buckthorn reinvasion with planting trees or shrubs, which can reduce the amount of returning buckthorn by up to 90%. In addition to helping keep buckthorn at bay, this method can improve and diversify the native plant community, reduce herbicide use, and result in significant cost and labor savings for large-scale property managers and individual homeowners alike.



Goat grazing

In recent years, goats have become a popular management tool for park districts, landowners, and others seeking to remove buckthorn from their properties. But researchers are still studying exactly how effective goat grazing is for removing buckthorn, as well as ways to keep goats as safe as possible in the process.

Proven benefits of goat grazing

Studies show that goat grazing increases light availability by opening up the understory. This can aid recovery of native plant diversity, but also contribute to buckthorn regrowth. So, buckthorn reduction should be treated as a “window of opportunity” to implement restoration of native plants, which provide ecological benefits and help mitigate buckthorn reinvasion.

Goats energetically browse buckthorn and are nimble enough to access tough spots on properties where steep hills make applying herbicide or cutting down buckthorn difficult. This can help reduce human labor demands and difficulties.

Potential benefits of goat grazing

Scientists at MITPPC have observed that goats can help strip the bark off of buckthorn in the winter months, when their options for grazing are more limited.

In the spring and summer months, goats trample young buckthorn plants, which could potentially help reduce buckthorn abundance over time, which could potentially help lower population growth over time, if the goats trample enough to stall reproduction.

Potential limitations of goat grazing

Goats are good at removing younger plants that are easy for goats to reach while they browse. Goats can remove the leaves from larger buckthorn plants as well. However, once buckthorn gets large enough, such as in the small tree phase, it effectively “escapes” the goats’ reach.

Plus, goats don’t eat just buckthorn when they graze. They can sometimes harm native plants in the process of grazing buckthorn. However, researchers are finding that native plants rebound a year after grazing occurs. But so is buckthorn. So, goat grazing should really only be used in conjunction with other management practices.

Lastly, different sites have different buckthorn removal needs. And goat grazing may be a better fit for, say, a large swath of land with lots of young buckthorn invading. If your property has mostly older buckthorn trees, goats may not help as much with removal.

Identifying buckthorn

Glossy and common buckthorn have many similarities. Below, find details about identifying them and telling them apart.

Glossy buckthorn



- A. Glossy buckthorn leaves
- B. Glossy buckthorn berries
- C. Glossy buckthorn flower

Common buckthorn



- D. Common buckthorn leaves
- E. Common buckthorn berries
- F. Common buckthorn flowers

Glossy and common buckthorn differences

	Glossy buckthorn	Common buckthorn
Size	Can reach heights of 15–20 feet and 10 inches in diameter	Can reach heights of 20–30 feet and 10 inches in diameter
Buds and leaves	Buds and leaves alternate along the stem with no terminal thorns	Buds and leaves are opposite along the stems, and stems terminate in small sharp thorns. The terminal thorn has a bud on either side
Leaf shape	Leaves are oval, smooth, glossy, and toothless They have 8–9 veins that radiate from a central mid-vein	Leaves are distinctly egg-shaped, smooth, glossy, finely toothed, and pointed at the tip They have 3–5 curved veins that extend from the leaf stem to the tip
Flowers	Small, greenish-white, five-petaled flowers are produced in clusters near the base of the leaf stalks along the branches	Small yellow-green, four-petaled flowers are produced in clusters near the base of the leaf stalks along the branches
Berries	Round berries that transition from green to red and then to dark purple when ripened in August and September	Round berries in the flower clusters are black and shiny when they ripen in August and September

Glossy and common buckthorn similarities

Shape	Shrubs or small trees
Stem	Multiple stems at base when young, develops into single trunk when mature, up to 10 inches in diameter
Bark color	Brown with small silvery marks
Leaf color	Leaves stay green late into the fall after most other trees have shed their leaf canopy

Removing buckthorn

The biggest thing to remember with buckthorn removal is to use various management strategies at once, and to keep with the effort year to year. Removing buckthorn is an ongoing process that requires dynamic, simultaneous strategies because of how voracious the plant is.

Cut buckthorn can resprout vigorously and repeatedly, and buckthorn seeds left in the soil can keep germinating for up to 3-5 years. Generally, the greatest germination is in the first year, with germination rapidly decreasing after that. Even after the seedbank is exhausted, birds often continue to bring buckthorn seeds into the area.

Luckily, there are several useful strategies to consider using.



Pulling stems and preventing re-sprouting

If your buckthorn infestation is small, stems that are less than 3/8th inch in diameter can be removed by hand. Bigger plants may require a tool, such as a weed wrench. Weed wrenches are good for uprooting larger stems, and can be purchased or rented from private companies. In some cases, they may even be loaned by municipalities. Because buckthorn is shallow-rooted, sandy or worm-ridden sites might be able to have much larger trees uprooted by hand. In any case, work to minimize soil disruption, as that can further spread buckthorn seeds and encourage other weeds to germinate.

If your buckthorn infestation is large, a more efficient option may be to chemically treat it with foliar herbicides. Similarly, you can cut plants that are too large to pull by hand and treat the stump with herbicides to prevent re-sprouting. Make sure that any herbicide is applied fully around the circumference of the cut stump in order for it to be most effective. Always carefully read herbicide labels and follow manufacturers' instructions. You can learn more about herbicide use from the Minnesota Department of Natural Resources, (<https://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/herbicides-control-buckthorn.html>).

For hard-to-reach areas, you can also deploy goats for grazing. Goats are more likely to graze younger buckthorn and could be a useful method to layer in for smaller plants. Different herbicides can have varying affects on goats, though. So, if you plan to use goats in conjunction with herbicides, make sure to follow the grazing restrictions associated with the specific product you use.

If you prefer not to use herbicides, non-chemical options like wrapping stumps in black plastic can be used to prevent re-sprouting. These techniques function by effectively starving the plant of light and require vigilant monitoring to ensure that no leaves escape the covering. If any part of the plant escapes the covering or the covering tears, the plant will be able to replenish itself quickly (especially in high-light environments).

When to remove

Late fall is often an ideal time to remove buckthorn and apply herbicides. Once native grasses and wildflowers have turned brown and have entered dormancy for the winter, they are less likely to be damaged by herbicides or from the physical disturbance of buckthorn removal.

Researchers have found, however, that goats are at a higher risk of contracting the parasite meningeal worm late summer and into fall. This parasite is found in slugs and snails and causes neurologic disease and death in goats, sheep, llamas, and alpacas. But MITPPC scientists have also found that co-grazing goats alongside waterfowl (like ducks and geese) may help minimize the goats' exposure to meningeal worm because the waterfowl, which are not susceptible to meningeal worm, will eat the snails and slugs that can carry the parasite.

In the spring, when the soil is moist, you may be able to remove smaller infestations of buckthorn by pulling seedlings. Early spring-controlled burns may also be the best option for controlling dense populations of small buckthorn on extremely large natural properties. However, many sites invaded by buckthorn may lack sufficient fuel to carry fire, making burning ineffective. Burning can be useful in more open sites where there are sufficient fuel loads.

More information

- Find **more detail about buckthorn removal** from the Minnesota Department of Natural Resources: <https://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/control.html>
- Contact your local Soil, Water, and Conservation District to see if they have **funding and/or technical assistance for buckthorn removal** available: http://www.maswcd.org/SWCDs_On_The_Web/swcds_on_the_web.htm
- Reach out to your local University of Minnesota Extension office for **additional advice and recommendations**: <https://extension.umn.edu/local>
- The Cornell Wildlife Health Lab has **more information on meningeal worm**: <https://cwhl.vet.cornell.edu/disease/p-tenuis-brainworm>

Preventing buckthorn reinvasion

After you remove buckthorn from your property, managing reinvasion is key to long-term success. Buckthorn can establish from resprouting stems that have been cut or from seeds.

Using native plants

Researchers at MITPPC have found that planting certain native plants after removing common buckthorn can greatly reduce the risk of reinvasion. They saw that common buckthorn seedlings need a certain amount of light to survive. If light availability drops below 3–4%—as we find below a dense canopy of maple trees, for example—it can be enough to prevent buckthorn growth. There are several options to achieve this:

- **Densely planting trees:** a mix of Balsam Fir (*Abies balsamea*) and Sugar Maple (*Acer saccharum*) has shown success, as have plantings of pure Sugar Maple.
- **Densely planting shrubs:** Red or Common Elderberry (*Sambucus racemosa* and *Sambucus canadensis*) have shown success. Researchers have used extremely dense experimental plantings (1-2 foot spacing between 18" bare-root plantings installed in the spring) to test these trees and shrubs; additional experiments using lower-density bare-root plantings and seeding are underway.
- **Seeding wild grasses and wildflowers:** Various wild rye grass species (*Elymus spp.*) have shown success. So far, researchers have used dense plantings of native grass and wildflower seed (more than 100 seeds per square foot, hand-broadcast in the late winter) to test these species.

Considering light availability

In densely shaded sites (closed-canopy forests), planted native trees and shrubs have grown more vigorously—and better suppressed buckthorn—than have seeded grasses and wildflowers. In less shaded sites such as oak woodlands and dense savannas, there are more options. Scientists have found that planted native trees and shrubs have again done well in these areas, but so have grasses and wildflowers.

Long-term management tactics

Maintaining low buckthorn abundance is an ongoing process, likely requiring additional approaches, such as manual removal or burning in combination with replanting. For the first few years after removing buckthorn, you will likely have many additional small buckthorn to remove. These may have been missed in the initial removal, sprouted from seed, or resprouted from cut stumps. But if you persist with follow-up removal, you will find far fewer new buckthorn appearing in later years, especially if you can establish a dense cover of native plants. Here are some steps for seeing the best long-term results:

- **After replanting, monitor the area annually** for buckthorn shoots and remove them promptly by hand, or with a tool or herbicide. Once the replanted native plants are vigorously established, they can reduce the number of new buckthorn that establish and how quickly they grow, so that you have fewer new buckthorn to remove and more time to do it.

- **Revegetating native grasses create more fuel for effective controlled spring burns** at sites with relatively open tree canopies (savannas and open oak woodlands), which may be another way to control buckthorn seedlings on some large properties. Wild ryes, for example, work well.
- **Replanting works best in combination with other approaches.** Replanting alone will not totally prevent buckthorn reinvasion, but when layered in with other approaches, such as ongoing removal and burning, it can help reduce the cost of maintaining buckthorn at low abundance.
- **Taking notes about which plants survived** in the replanted area and which didn't can also help plan for future restoration efforts.

Additional benefits

There are many other benefits of planting native plants on your property, including providing food and habitat for pollinators and birds. Always make sure you buy plants or seeds that are native to the region, through a reputable vendor. Consult the Midwest Invasive Plant Network's Site Revegetation Resources for recommendations, <https://www.mipn.org/cwma-resources/site-revegetation/>.

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Photo credits

COVER

- Upper left, Grazing goats: Katie Marchetto
- Bottom left, Glossy buckthorn: Brian M., Flickr.com, USDA
- Right, Native plants used to prevent buckthorn reinvasion: MITPPC

PAGE 4

- Grazing goat: Brian M., Flickr.com, USDA

PAGE 6

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PAGE 8

- Buckthorn thicket: MITPPC