

Buckthorn: A threat to our Native Woodland Ecosystem

(Updated Feb. 2016)

(Older versions of this article were published in *Northern Gardener* magazine & the *Minnesota Plant Press*, 2002. Friends of Birch Island Woods website www.fbiw.org has 2007 version.)

By now, most people know that buckthorn is not a welcome plant in Minnesota woodlands. After the primary loss of native plant habitat to agriculture and development, our remaining native plants of the forest under-story have become difficult to find in most developed areas. Invasive, non-native species have infiltrated natural and not-so-natural areas all across the United States. Throughout Minnesota and 27 other states, buckthorn had been quietly invading for decades. The under-story species of our remnant woodlands and savannas, parks and wood lots, wetlands and low maintenance areas, are in danger not only from the invasive competition of buckthorn, but the overzealous under-story clear-cutting by well-meaning buckthorn busters. Our native species--both woody and herbaceous--have all but disappeared from the lower canopies of the most severely infested areas. This is a serious problem.

The Buckthorn Conference: The Buck Stops Here!--held October 3rd, 2001 at the University of Minnesota Landscape Arboretum--was the first of its kind in Minnesota. Participants learned about two species of buckthorn invaders: Common Buckthorn *Rhamnus cathartica* and Glossy Buckthorn *Frangula alnus* (formerly *Rhamnus frangula*). Information on buckthorn's, biology, history, range, and control was covered. Many articles have been published in Twin Cities newspapers about buckthorn, but none go into great detail on control methods. Following is a summary of the threats of buckthorn, and details on effective methods for its control.

HISTORY, RANGE, & IDENTIFICATION

Buckthorns are shrubs that grow into small trees. Near urban centers and towns, you will find buckthorn to be the predominant shrub in the understory of what remains of our native, Minnesota woodlands.

Common buckthorn, also called **European buckthorn**, is native to Sweden, Russia, Siberia, Xinjiang China, and the northern Caucasus mountains. It was first imported from Europe to the US in the mid 1800s and about 1890 in Canada. The species was used primarily in hedge plantings because it shears nicely. It was formerly used in shelter belts and wildlife plantings.

Flowers of common buckthorn appear with the leaves in May; they are tiny, inconspicuous, and light green. Male and female flowers are born on *separate* plants. Shearing can reduce flowering and fruiting but *does not eliminate it*. Shrubs that have been allowed to "grow naturally," come to be multi-stemmed, small trees. Female plants produce vast quantities of black fruit that are transported through bird droppings. This invader now thrives "wild" in upland woods, parks, fence-rows, yards, gardens, waste places, and farm shelterbelts.

Currently, 86 of Minnesota's 87 counties have common buckthorn on the loose. Nation-wide it thrives in 34 states, including California. Buckthorn's current continental range is bound by Nova Scotia, Saskatchewan, Mississippi and North Carolina.

Glossy buckthorn, a second buckthorn invader, was formerly sold under several cultivar names: Tallhedge, Columnar, or Fernleaf buckthorn. It is native to most parts of Europe except the extreme north, and part of the Mediterranean region. Its range extends into European Russia, Siberia, the northern Caucasus Mountains, China, and western North Africa. It was introduced to North America in the 1900s and has been used as an upland landscape shrub; it thrives primarily in moist and wet soils.

BUCKTHORN BANNED FROM THE NURSERY TRADE

The MN Dept. of Agriculture (MDA) placed *common* buckthorn on the "Restricted Noxious Weed List" in 1999. Common buckthorn hasn't been sold since the 1930's when research proved it was the alternate host of oat crown rust; however, the birds continued to transport and plant it through their droppings. 2001 was the first year that *glossy* buckthorn and its cultivars could no longer be sold in Minnesota. Unfortunately, *glossy* buckthorn was sold in numbers as high as 60,000 per year from wholesale nurseries in Minnesota and Wisconsin for 30 years. People are generally shocked to learn that these two species have been promoted for over 100 years.

Glossy Buckthorn *Frangula alnus*

Leaves:

- Alternate arrangement
- *Margin w/ NO teeth
- Wider at end than base
- *Yellow fall color

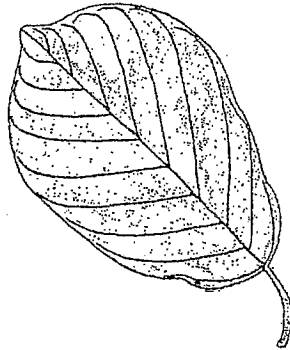
Buds:

- *Naked (NO scales)
- *Small, brown, fuzzy
- Alternate arrangement

Thorns: None

Bark:

- Very similar to choke cherry
- DO NOT ID by bark!



Glossy Buckthorn
Frangula alnus
(formerly *Rhamnus frangula*)

This invader blooms continuously from May through September when it is growing on a moist, sunny site. Flowers are small, pink and white, and perfect. Fruit is less than 1 cm. in diameter; it turns red, then nearly black. Since it blooms for four months, it is producing fruit for three months; a long flowering and fruiting period is a characteristic of many invasive plants.

This species has spread through wetland areas and adjacent woods wherever there is a nearby seed source. In some areas, both common and glossy buckthorn will grow together in upland and lowland habitats. More than ninety years ago, Minneapolis school teacher and botanist Eloise Butler wrote about the invasiveness of glossy buckthorn in her wildflower preserve. Now it exists in 29 states--especially near urban areas.

Common Buckthorn *Rhamnus cathartica*

Leaves:

- Opposite or sub-opposite arrangement
(*sometimes* alternate)
- Margin- wavy w/ small rounded serrate teeth
- Shape- oval
- Size- can be much larger than normal on stump sprout re-growth

Buds:

- Sub-opposite or opposite arrangement
(*sometimes* alternate)
- *Paired terminal buds look like a buck hoof print
- Dark brown to black with multiple scales
- Approx. ¼ in. long

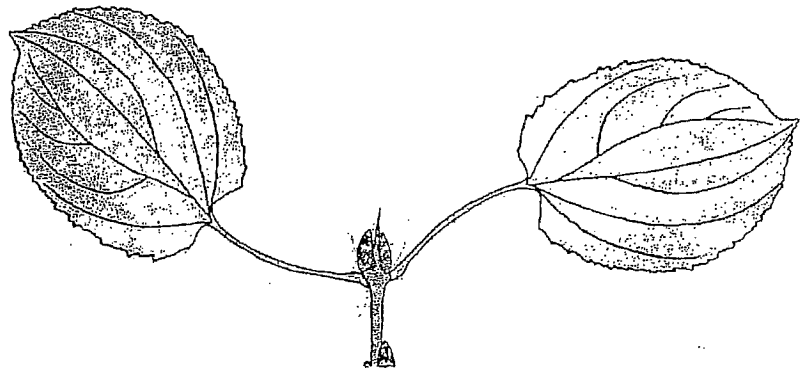
Thorns:

- Small; approx. ¼ in. long
- *Wedged between the *terminal* buds on twig ends.

Bark:

- Very similar to choke cherry, American plum & other natives.
- DO NOT ID by bark!

- *Key ID feature



Common (European) Buckthorn
Rhamnus cathartica

WHY BUCKTHORN IS SO *SUCCESSFUL*

- Leaves, twigs, and seedlings are rarely eaten by animals or insects
- Seeds are spread through bird droppings (but the berries have little food value; they are cathartic)
- Longer growing season than our natives, up to 58 days longer; this means it stores more energy
- Rapid growth
- Vigorous re-sprouting after being cut-up to 8 feet in one season
- Copious fruit and seed producer
- Seeds are viable about 6 years in the soil
- High seed germination rate
- Grows in many habitats due to its tolerance of a wide range of soil and light conditions
- Glossy buckthorn produces flowers and fruit from June through September on good sites (4 months)
- Fibrous root system with mycorrhizae benefits

WHY BUCKTHORN IS *BAD*:

- It out-competes our native plants for light, moisture, and nutrients; native species are in serious decline
- It disrupts natural forest structure by creating a dark, dense understory thicket with no herb-layer
- Its presence dramatically reduces species diversity of native plants and song birds in the forest
- It is not a nutritional food source for birds; rather, it is taken when other beneficial foods have diminished
- It is a mild toxin, a laxative for birds and humans
- Its fruits are messy; they stain cars, decks, houses, drives and walks
- Nesting birds are more prone to predation in the lower canopy of buckthorns
- It is an alternate host for crop pests: soybean aphid and oat crown rust pathogen
- It can cause a safety concern for park users in urban woodlands, because visibility is severely reduced (however, some property owners like the privacy buckthorn provides)
- Left uncontrolled, it is turning native woodland understories into near-monocultures (few native species remain in heavily-infested woods)
- It is expensive and time consuming to remove once it becomes established
- After removal of mature plants, a ground cover of seedlings can emerge from the seed bank in the soil. Therefore, control efforts require a long-term commitment
- Its hard, dense wood dulls saw blades and is tiring to haul
- Thorns on twig ends make handling dangerous (buck "thorns" are small, about ¼ in. long)

BUCKTHORN'S REDEEMING QUALITY: THE WOOD.

Beautiful burnt red-orange, dense heartwood with a lovely grain can be found when you cut this species. Wood workers make beautiful carvings and turnings from this undesirable plant. Crafters can re-use buckthorn to build trellises, arbors & walking sticks. Its dense wood makes good slow-burning firewood. Read more about buckthorns' wood value in Barry Gordon's article in *Woodworking* magazine, Feb. 2001.

WAIT, WAIT, THAT'S NOT BUCKTHORN!

Before you begin killing buckthorn *be absolutely certain that you have identified buckthorn correctly.*

You may feel that the whole woodland under-story is invaded with buckthorn, but there are many native species that are routinely being mistaken for buckthorn and removed. Too often workers are "throwing the baby out with the bathwater." Valuable remnant woody plants that are regularly confused with buckthorn are: American plum, choke cherry, black cherry, hawthorn, nannyberry, gray dogwood, and others. "Brushing" is not an acceptable control method for buckthorn, because areas with severe disturbance are susceptible to erosion and further invasion by noxious weeds. "Nature abhors a vacuum," so native plants are needed to occupy space that would otherwise be re-infested. *Before starting an invasive species removal project it is important to identify the native plants to be protected.* Depending on the level of infestation, the remnant native plants may be difficult to find, but they can be found, in all but the most degraded woods. Ask for help with plant identification. Use vinyl flagging tape to mark plants to save. Even the smallest native plants can bounce back once "released" from buckthorn competition if properly protected. Use caging material to protect the native plants from damage during removal and from browsing by deer and rabbits after removal.

MANUAL/ MECHANICAL CONTROL

Mechanical control is not realistic with large infestations of buckthorn; it is extremely labor-intensive. The following methods are recommended for those who wish to avoid chemicals and have small areas to clear.

Hand Pulling

When you pull common buckthorn, you will discover buckthorn's dense, black, fibrous, root system. Pulling plants out of the ground by hand works well for stems about 1/2 in. dia. or less. *The soil must be moist*; if the soil is dry, the plants won't budge. If they do budge, they break off, leaving the root system intact. Hand-pulling disturbs the soil, brings up more buckthorn seed, and can bring up native wildflowers and sedges. Be very careful on hillsides, because the soil disruption can lead to erosion problems. ***Be sure to knock the soil from the pulled roots back into the hole, replace the wildflowers & sedges, and tamp the soil and duff layer where the plant was pulled.*** Leave some of the pulled plants on the ground, perpendicular to the slope; these plants will trap silt and leaf debris. Hand pulling is recommended for several years after the larger buckthorn are removed, until the invasive seed bank is diminished.

Digging

With a sharp shovel blade and a sturdy pair of boots, it is possible to cut the roots around small diameter stems (about 1 1/2 inches in dia. or less). Stomp your shovel blade into the ground about eight inches away from the stem, and pull the shovel handle back; this will sever roots, but may need to be repeated. Do this all around the stem until all lateral roots are severed. There will likely be a couple central roots to cut, too. This method works well with single-stemmed plants, but is quite difficult with shrubby plants that have re-sprouted after a previous cut.

Wrenching

A few tools are available on the market to facilitate the manual leveraging of a woody stem out of the ground. Wrenching is *not* recommended on hillsides, because the soil disruption can lead to erosion problems.

The **Weed Wrench™** Woody Plant Puller is an all-steel, manually-operated tool that clamps onto a stem and operates as a lever to uproot woody plants. There are four sizes that wrench out buckthorn from 1/4 to 2 1/2 inches in dia. Some communities have purchased the tools and make them available for free-loan through the city; check with your city forester. The largest tools are heavy and need to be welded by large, strong individuals. I do not recommend the large size (for an alternative approach, see p. 5, the "cut-stump with herbicide" method).

Following is a warning sticker I've placed on each of my weed wrenches:

WARNING

- This tool is great for removing exotic, invasive, woody plants
- It also creates much soil disturbance
- Shake ALL soil from the uprooted plant back into its hole and tamp with your foot. Then replace the leaf-litter.
- Be careful not to uproot woodland sedges and wildflowers. Re-plant them if you do.

Disrupted soil not replaced leads to erosion & further invasion of exotics. Thank You

Continuous Cutting

Cutting buckthorn without chemically treating the stump is not recommended unless there are only a few plants to remove and you are willing to regularly re-cut new sprout-growth for the entire growing season and beyond. Continuous cutting will exhaust the plant of its extensive energy reserve. It may exhaust you, too!

Tin Can Method. This old approach, developed by Steve Glass, University of Wisconsin Arboretum, is only recommended for very small removal projects and for stump sizes small enough to fit under a metal can. Find a can large enough to fit over the stump *and root flare*. Instead of cutting the trunk close to the ground, leave a stump about 1 inch shorter than the height of your can. Since buckthorn re-sprouts from latent buds under the bark, it is important that the inverted can cover all exposed bark including the root flare. Drive long nails through the can into the stump to secure it in place. Sprouts that grow into the can will not have enough light and will die. Leave the can in place for one to two complete growing seasons.

HERBICIDE TREATMENTS

Time to Apply

For larger buckthorn reduction projects, chemical treatment can be efficient and safe. A single stem of buckthorn cut down to the ground and *not* herbicide-treated will re-sprout from the stump and grow many new stems up to 8 feet tall in a single season. “If you cut it, you just anger it,” says Norm Erickson, a buckthorn-busting volunteer from Rochester. This aggressive re-growth must be stopped or the plant will soon reach its former size, take up more space and continue to out-compete the native plants. It is important NOT to apply herbicide during the spring-flush growth period, usually May to July in MN. This is a time when the plant is using its stored energy reserves to grow (until the plant is fully leafed-out). During the spring-flush, the plant generally does not store energy, it spends energy. Herbicide treatments work best when the plant is transporting sugars to its root system or is dormant (late July through March). Summer, autumn, and winter are the three seasons when herbicide treatment is effective. Late September through November is an especially good time, because this is when buckthorn is easiest to identify: leaves remain green and attached while leaves of our native plants are turning color and falling.

When using herbicides, always follow label instructions and take recommended safety precautions. Be certain that your herbicide is labeled for your site. See page 6 for herbicide suggestions.

Cut-stump Treatment

Cut stems low (stumps no taller than 2”), because taller stumps are more likely to re-sprout after herbicide is applied. While cutting and brush-hauling, stumps are easily lost under leaves, debris or snow. Marking stump locations with wire flags (similar to those used by utilities) is helpful in small areas when it comes time to locate the stump for treatment. Secure the flags well, so they will not be dragged away with the brush. *Apply herbicide to the full circumference of the outermost growth rings of the fresh-cut stump surface* soon after the cut for best absorption.

Stumps can be safely treated with a **wick applicator**. Two examples are:

- 1). 7-inch hand-held dauber www.landscape-restoration.com
 - 2). 4.5-foot PVC applicator (email Janet at jvansloun@eminnetonk.com for a materials list for building one)
- See herbicide recommendations on next page.*

Two Methods that leave the buckthorn standing in place: Both methods involve less labor and stop female trees from producing fruit (that contain seeds). Standing dead buckthorn can provide habitat and be a structural frame for native vines to climb, such as, woodbine (Virginia creeper), American bittersweet, moonseed, or virgin’s bower. Once dry, standing dead trees can be cut and used for wood-working, firewood or left to break down on site.

Frill Cuts with Chemical Spray. Frill cuts can be made on larger stems and are made by wounding the bark *at the base of the trunk* with a hatchet (a butcher knife will work on small stems). Just above the soil line, make shallow cuts downward through the bark and cambium with a series of *light* chops around the circumference of the tree. These cuts create a frill (bark & wood flap). Apply herbicide with a paint brush or spray inside exposed cut areas. Chemical contact with the cambium (the layer just under the bark) is very important.

Basal Bark Treatment. When mixed with a diluent (a solvent sometimes containing dye that can be mixed with some herbicides), ester formulations of Triclopyr can be applied directly to the bark and provide effective control. This is a fast, effective way of controlling larger trees from 1 to 6 inches in diameter on large sites. Spray or wick-apply herbicide to 1.5 vertical feet of bark around the entire circumference of the tree. For diameters 2 inches or less, only one side of the stem needs to be treated. Consider a wick applicator to reduce over-spray when targeting smaller diameter plants. An ultra-low volume spray wand can cut chemical use by 75%. As of Feb. 2016, find one here: <http://www.arborchem.com/products/1095.html>.

Herbicides that work well on buckthorn:

Do NOT use more chemical than you need! If a little is effective, a lot is not better. See specifics below.

1. Glyphosate is a good choice since there is no residual or soil leaching of this herbicide. It is the active ingredient in several popular herbicide brands and other generic-type brands. Many different concentrations are available. Check the fine print in the lower label corner.
 - **18 to 25% active ingredient is needed for cut-stump and frill treatments.**
 - Apply to a fresh cut when temperatures are above freezing.
 - About 6% active ingredient is necessary for **foliar** spray control (best for seedlings in mid-October in MN, after the native plants have dropped their leaves).
 - There is NO NEED to drill holes in the stump and pour chemical as some labels suggest—this over-exposes you and the environment to herbicide.
2. Tryclop yr ester is the active ingredient in Garlon 4, Crossbow & Pathfinder II (ready to use).
 - Mix with diluent or Kerosene for **basal bark** treatments
 - Can be used when the temperature is below freezing
 - Can be used long after the cut, because it will penetrate the stump and bark.

Herbicide for wet sites:

For areas within ten feet of the shoreline of ponds, creeks, lakes or wetlands, you must use an herbicide labeled for aquatic use. Products such as Aqua Neat or Rodeo contain glyphosate and ingredients approved for aquatic use. Use the same glyphosate active ingredient rates as above.

Tips for spraying:

1. In densely infested areas, consider a hand-held tank sprayer, because backpack sprayers can be difficult to negotiate through the woods.
2. An ultra-low-volume spray wand can cut chemical use by 75%.
As of Mar. 2014, find one here: <http://www.arborchem.com/products/1095.html>
3. Wear appropriate personal protective equipment (PPE) when using herbicides, especially when mixing concentrate. Use neoprene or chemical resistant gloves (not latex, cloth or leather). Wear goggles or safety glasses. Read and follow label instructions.

Where to buy herbicides:

- Glyphosate herbicides are readily available at hardware stores, Menards, Home Depot, etc. Be certain to look for an active ingredient concentration between 18 & 25% for cut-stump and frill treatment uses.
- Tryclop yr ester can be purchased through local agriculture, turf and horticulture co-op suppliers or wholesalers.

BRUSH DISPOSAL OPTIONS

1. Utilize: salvage buckthorn for firewood &/or wood-working (trellises, arbors, fences, walking sticks, etc.)
2. Chip: chip brush and spread on trails 6" deep or in the woods 1-2" deep. Preferred chipper and vehicle access when ground is frozen. *Not recommended for branches with fruit.*
3. Cut-slash is to cut up and leave the wood on the ground. Wood/soil contact can reduce erosion and create habitat for amphibians, small mammals, and insects; aesthetics is a consideration.
4. Cut & haul: check with your garbage hauler or tree service. Minnetonka's resident brush drop at Public Works is open April through mid November.
4. Burn: recommended for branch ends with fruit containing viable seed. A burn permit is required; contact your local fire marshal.
5. Brush piles provide wildlife habitat & cover for songbirds, amphibians, and small mammals.
Note: Minnetonka Public Nuisance ordinance does not allow brush piles (neatly stacked wood is okay).
6. Energy conversion: District Energy in St. Paul burns wood waste to generate heat & electricity. Some cities have their brush ground and transported there.

LOST HOPE FOR BIOLOGICAL CONTROL

“Good news came this month,” wrote Cynthia Boyd in the St. Paul Pioneer Press, Sept. 26, 2001, “in a report commissioned by the Minnesota Department of Natural Resources from the Center for Applied Bioscience International in Delmont, Switzerland.” The 100 page research paper included a list of 14 insects that are natural predators (of buckthorn) in Europe, and were hopeful control agents for the U.S. The initial study was completed in 2001, but the entire study took many years to complete. Tests of the 14 species determined that none harm the European buckthorn exclusively or were significantly damaging. Therefore no buckthorn biocontrol insects have been released in the United States.

It is up to us to make an effort to control buckthorn in an ecologically-friendly way. With some effort we can facilitate the return of our native plants.

OVERWHELMED BY IT ALL?

If you’ve worked in a heavily buckthorn-infested area, it is easy to feel overwhelmed. Don’t give up. Buckthorn has had decades to get a root-hold ahead of those of us who would like to eliminate it. With the control methods described here, total elimination of buckthorn on a residential lot is possible. In larger wooded areas the volume of buckthorn biomass can be staggering. There, it will be a multi-year battle: first against the large plants, later against the seedlings that will emerge from the seed bank in the soil. The cost in terms of human-power, time, equipment and dollars is high. Reduction of the critical mass is possible; so *prioritization* is essential. Knowing what to do and doing *something* is far better than leaving the invasion unchecked. See priorities below for a good place to start.

BUCKTHORN REDUCTION PRIORITIES FOR THOSE OVERWHELMED OR WITH A LIMITED BUDGET

1. Survey your site to **find pockets of remaining native plants**. Clear around these plants first. By doing this you “**release**” these plants from their buckthorn competition. Protect them from being harmed during cutting and removal. Sometimes these natives are very small, the size of sticks; but they are worth protecting, because when freed, they bounce back with new growth. Find a local native plant expert to help you with identification. Use colored ribbon flagging to mark the special plants to protect. These remnants are the very important local gene pool (plants that are indigenous to your area).
2. **Remove or kill female buckthorn first**. This stops annual seed production in the area. Mark the female plants when ever fruit is visible, late summer through winter, for priority removal.
3. **Protect quality wooded areas** that are only partially infested first.

FOR NEIGHBORHOOD REMOVAL PROJECTS

4. **Partner** with conservation groups, your city, garden clubs, other neighborhood volunteers.
5. Search locally for potential grant funding, then **write grant proposals**. Watershed districts are a good place to start. Ask local businesses and foundations for assistance.
6. **Prioritize buckthorn removals to be in high-profile areas**; for example, along bike paths, parkways and in parks.
7. **Publicize what you’re doing**: put up informational signs in the project area; distribute flyers to nearby residents; write an article for your local paper or association.
8. **Stop to answer questions** of those who inquire while you are working.

These methods sound like a lot of work, and frankly it is. The benefits of organizing a project are many. When I began to organize projects in my neighborhood, I met neighbors for the first time after living only a few doors away for many years. You will be proud of your work when you see how the natives respond to release. Helping to preserve a small piece of our diminishing native woodlands, savannas and wetlands is noble indeed. Good luck.

See page 8 for references and where to go for more information.

Control method information in the first versions of this article (2002-2007) comes from case study reports given at the U of MN Landscape Arboretum Buckthorn Conference, October 2001

1. Janet Van Sloun, B.S. Urban & Community Forestry, ISA Certified Arborist
2. Mary Maguire Lerman, Mpls. Park and Rec. Board, MN
3. John Moriarty, Ramsey Co. Parks & Rec., MN
4. Norm Erickson, Buckthorn Buster volunteer, Rochester, MN

Article revisions come from subsequent field experience by:

Janet Van Sloun, Restoration Specialist, City of Minnetonka. B.S. Urban & Community Forestry, ISA Certified Arborist

To learn how extensive the invasive species problem is, read more:

MN DNR web site of invasive terrestrial plants

<http://www.dnr.state.mn.us/invasives/terrestrialplants/index.html>

Midwest Invasive Plant Network - Invasive Plant List

<http://www.mipn.org/plantlist/>

Czarapata, Elizabeth J. 2005. Invasive Plants of the Upper Midwest: an illustrated guide to their identification and control. University of Wisconsin Press. 215 pp. ISBN0-299-21054-5.