

Buckthorn: A threat to our Native Woodland Ecosystem

(Updated March 2009)

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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 intruded 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 fence-rows, 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 has also been used in shelter belts and wildlife plantings.

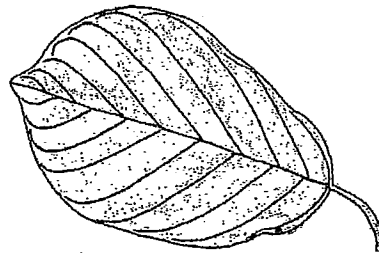
Flowers of common buckthorn appear with the leaves in May; they are tiny, inconspicuous, and light green. Male and female flowers are born on *separate* plants. Shearing can reduce flowering and fruiting but *does not eliminate it*. Shrubs that have been allowed to "grow naturally," come to be multi-stemmed, 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, 68 of Minnesota's 87 counties have buckthorn on the loose. Nation-wide it thrives in 27 states, including California. Buckthorn's current continental range is bound by Nova Scotia, Saskatchewan, NE Kansas, 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.

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
 DON'T ID by bark!

Glossy Buckthorn
Frangula alnus
 (formerly *Rhamnus frangula*)

Glossy Buckthorn *Frangula alnus* (tape leaf in space above)

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 heavily infested areas, both common and glossy buckthorn will grow together in upland and lowland habitats. More than eighty years ago, Minneapolis school teacher and botanist Eloise Butler wrote about the invasiveness of glossy buckthorn in her wildflower preserve. Now it exists in 22 Minnesota counties and 23 central and north eastern states--especially near urban areas.

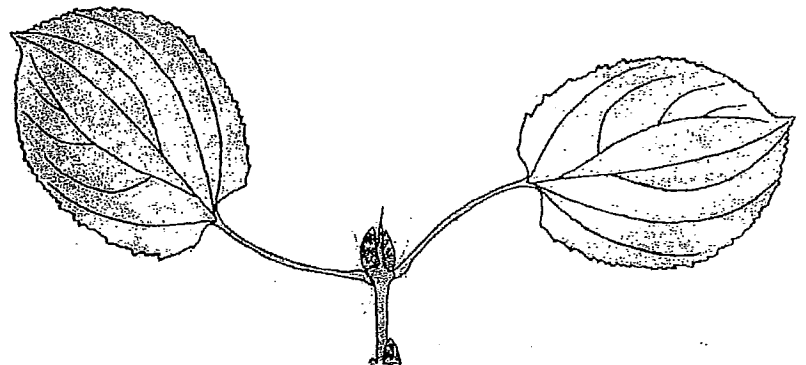
BUCKTHORN NOW BANNED FROM THE NURSERY TRADE

2001 was the first year that *glossy* buckthorn and its cultivars could no longer be sold in Minnesota. 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. (But the birds continued to transport and plant it through their droppings.) Surprisingly, *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.

Common Buckthorn *Rhamnus cathartica*

Leaves:

- Opposite or sub-opposite arrangement
 (sometimes alternate)
- Margin- wavy w/ small rounded serrate teeth
- Shape- oval; leaf
- 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.
 DON'T ID by bark!

Common (European) Buckthorn
Rhamnus cathartica

*Key ID feature

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 no 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 causes a **safety concern for park users** in urban woodlands, because visibility is severely reduced (however, some property owners like the privacy buckthorn provides)
- If left uncontrolled, it will turn native woodlands into **near-monocultures** (many heavily-infested areas exhibit this in the understory already)
- It is **expensive and time consuming to remove** once it reaches a critical mass
- After removal of mature plants, a ground cover of seedlings can emerge from the **large 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 BEST FEATURE: 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. **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 critically 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, no matter how small. 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 people 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 significant 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. It comes in four sizes and wrenches out buckthorn from 1/4 to 2 1/2 inches in dia. Some communities have purchased wrenches and made them available for free-loan through the city or local hardware store; check with your city forester. Example prices are \$82 for the "mini" and \$155 for the "medium" (2008 prices). View these tools online and get ordering information at www.weedwrench.com. The largest tools are heavy and need to be wielded 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 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 or control projects, some type of chemical treatment is the best control method. 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, “Medusa-like” 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 treat during the spring-flush growth period, usually May and June. 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 (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 Method with herbicide

During cutting and brush-hauling operations, stumps are easily lost under leaves and debris, particularly in later fall. Marking stump locations with wire flags (similar to those used by utilities to mark underground wires or pipes) is very helpful when it comes time to locate the stump for treatment after an area has been cleared. Secure the flags well, so they too will not be dragged away with the brush.

Stumps can be chemically treated with a paint-brush (single-use foam brushes work well), a wick applicator, or an ultra low volume spray wand. Apply chemical to the outermost growth rings immediately under the bark. It is very important that water-based herbicides are applied soon after the cut. Be especially quick to apply herbicide if the air is warm & dry. 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. See concentration amounts next page.

Frill-Cuts with herbicide

Frill cuts can be made on any size stem and are made by wounding the bark *at the base* of the plant with an axe or hatchet (a butcher knife will work on small stems). Cut through the bark and cambium at a downward angle with a series of light, shallow chops around the basal circumference of the tree. These cuts create a frill (bark & wood flap). Next, apply herbicide (paint brush or spray) to exposed cut areas and inner bark. Chemical contact with the cambium (the layer just under the bark) is very important. This is a good method to stop female trees from producing fruit and to minimize erosion on slopes (no soil disturbance). If you physically remove all the buckthorn, you set up the site for erosion. Buckthorn can be left standing for bird habitat or as a leafless trellis for native vines. Once dry, standing dead trees can decompose in place or be cut down and used for firewood or wood working.

Basal Bark Treatment with Herbicide

When mixed with a diluent (a solvent containing dye that can be mixed with some herbicides), ester formulations of Triclopyr can be applied directly to the bark at the base of the tree to provide effective control. Spray the lowest two 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 sprayed. This is a fast, effective way of controlling larger trees up to 6 inches in diameter on large sites. Dead trees can be left standing or cut at a later time. Garlon 4, Crossbow, and Pathfinder II (ready to use), containing the active ingredient Triclopyr, are effective brand-name chemicals for basal bark treatment.

Herbicides that work well on buckthorn:

Do NOT use more chemical than you need! If a little is good, a lot is not better.

1. Glyphosate is the active ingredient in Roundup (now off patent), Ortho Basic Solutions Weed & Grass Killer Concentrate, and others. This herbicide is a good choice since it does not leach through the soil. Use it for cut-stump and frill treatments. Many different concentrations are available. Check the fine print in the lower label corner.

- **10 to 25% active ingredient is needed for cut-stump and frill treatments+.**
- Apply to a fresh cut when temperatures are above freezing.
- Only 2% active ingredient is necessary for **foliar** spray (best for seedlings in the late fall).

2. Triclopyramine is the active ingredient in Garlon 3A and Ortho Brush B-Gon.

- Mix with water for **cut stump, frill, and foliar** applications
- Use goggles when spraying, since exposure to this chemical can cause a burning sensation in eyes
- For the cut-stump and frill method, apply immediately after cutting

3. Triclopyr ester is the active ingredient in Garlon 4, Crossbow, & Pathfinder. (Pathfinder is ready-to-use.)

- Mix with diluent or Kerosene for cut-stump, frill and **basal bark** treatments
- Can be used when the temperature is below freezing

Note: **Garlon 3a** needs to be applied immediately after the cut. **Garlon 4** can be used long after the cut because it is solvent-based and will penetrate the stump and bark.

Tordon RTU is NOT RECOMMENDED because it leaches through the soil, is persistent in the soil, and can affect roots of other plants.

Wet Sites:

For areas directly adjoining wetlands, ponds, creeks, and lakes, you must use an herbicide labeled for aquatic use, like Rodeo.* This is necessary when working within ten feet of the shoreline. Use the same rates as Roundup, above. * Rodeo is now beyond its legal patent. The glyphosate product may be offered for sale under other brand names such as Aqua Neat.

Tips for spraying in a dense buckthorn thicket

1. In densely infested areas, use a hand-held tank sprayer; backpack sprayers can be difficult to negotiate through the woods.
2. An ultra low volume spray wand (available through "<http://www.arborchem.com>") can cut chemical use by 75%.
3. Be sure to wear appropriate protective clothing when using chemicals, especially when mixing concentrate. Use neoprene or chemical resistant gloves, not latex, cloth, or leather. Wear goggles or safety glasses when mixing chemicals. Be certain to read and follow label instructions.

Where to buy the herbicides

- Glyphosate herbicides are readily available at hardware stores, Menards, Home Depot, etc. Be certain to look for active ingredient concentration between 10 & 25% for cut stump and frill treatment uses.
- Garlon herbicides 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. **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 branches with fruit containing viable seed; 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.

HOPE FOR A BIOLOGICAL CONTROL

“Good news came this month,” wrote Cynthia Boyd in the St. Paul Pioneer Press, Sept. 26, 2001, “in a \$20,000 report commissioned by the Minnesota Department of Natural Resources from the Center for Applied Bioscience International in Delmont, Switzerland. The 100 page research paper includes a list of 14 insects that are possible natural predators (of buckthorn), thus potential control agents.” According to Luke Skinner and Jay Rendall, coordinators in the DNR’s exotic species program, the feasibility study was completed in 2001, but the entire study may take up to ten years to complete. The next step will be to test the 14 species and determine which ones harm buckthorn exclusively. In the mean-time it is up to us to make an effort to control buckthorn in an ecologically-friendly way. Then we will see 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 city 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. 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, very small, the size of sticks; but they are worth protecting, because when they are 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**. 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 all 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 comes from expert testimony and case study reports given at the U of MN Landscape Arboretum Buckthorn Conference, October 2001, and subsequent field experience by:

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

Additional information from:

- Doug Courneya, U of MN Extension Service Buckthorn Display, Olmstead County
- Patrick Weicherding, U of MN Extension Service, Anoka County

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

1. MNDNR Trails & Waterways Division. Revised 2002.
Minnesota invasive non-native terrestrial plants: an identification guide for resource managers. 78 pp.
2. MN DNRs web site of invasive terrestrial plants
<http://www.dnr.state.mn.us/invasives/terrestrialplants/index.html>
3. 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.
3. Randall, J.M. & J. Marinelli. 1996. Invasive Plants: Weeds of the Global Garden. Brooklyn Botanic Garden. Brooklyn, N.Y. 111 pp.