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VEGETATION MANAGEMENT GUIDELINE

Bush Honeysuckles: Tartarian, Morrow's, Belle, and Amur Honeysuckle (*Lonicera tatarica* L., *L. morrowii* Gray, *L.* x *bella* Zabel, and *L. maackii* (Rupr.) Maxim.)

SPECIES CHARACTER

DESCRIPTION

For the purposes of this guideline, the four species or cultivars of bush honeysuckle (Tartarian, Morrow's, Belle and Amur) most frequently considered as invasive in Illinois will be collectively referred to as bush honeysuckle. Bush honeysuckle is an erect, multi-stemmed, deciduous shrub that grows from 2 - 6 meters (6 - 20 feet) tall and has a shallow root system. It has opposite, simple, entire leaves, and often the older branches are hollow. Bush honeysuckle usually flowers during May and June. The fleshy berries are usually red, rarely yellow, and ripen from June through October depending upon the species or cultivar.

Differences between individual species of non-native honeysuckles are dependent on the presence of pubescence or hair on leaves, the length of flowers and petioles (leaf stalks), and flower color. Tartarian honeysuckle has leaves that are ovate to oblong, glabrous, and 3 - 6 cm (1 1/8 - 2 3/8 inches) long. Its flowers are glabrous, 1.5 – 2.0 cm (5/8 – 3/4 inch) long, white to pink, and are borne on stalks that are 1.5 – 2.5 cm (5/8 - 1 inch) long.

Morrow's honeysuckle has leaves that are elliptic in shape, gray-green in color, softly pubescent on the lower surface, and 3 – 6 cm (1 1/8 - 2 3/8 inches) long. Its flowers are pubescent, 1.5 – 2.0 cm (5/8 – 3/4 inch) long, white fading to yellow, and are borne on densely hairy stalks that are 0.5 – 1.5 cm (1/8 - 5/8 inch) long. The fruits are usually red, or rarely, yellow. Belle honeysuckle is a hybrid cross between Tartarian and Morrow's honeysuckle and has many characteristics of both plants making positive field identification difficult.

Amur honeysuckle has long pointed leaves, lightly pubescent leaves that are 3.5 - 8.5 cm (1 ¼ - 3 ¼ inches) long. Its flowers are 1.5 – 2.0 cm (5/8 – 3/4 inch) long, white to pink fading to yellow. In addition, to the aforementioned bush honeysuckles, there are several other nonnative species or hybrids of bush honeysuckle that occur in Illinois. Swink and Wilhelm (1994) and Mohlenbrock (2002) provide keys to these species.

SIMILAR SPECIES

American fly honeysuckle (*Lonicera canadensis*) is the only native honeysuckle shrub known to occur in Illinois. It is very rare and has been reported only from Cook County. It has straggling, solid branches that are up to 2 meters (6 ½ feet) tall and lack downward pointing bristles. Its yellowish flowers are up to 2 cm (3/4 inch) long and occur in pairs. The flower stalks are much longer that the leaf stalks. The fruits are red. A rule-of-thumb regarding the remainder of the State is that all honeysuckles with a

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bushy growth form are nonnative species. There are however, a few native, woody, vine-like honeysuckles known from Illinois including grape honeysuckle (*Lonicera prolifera*), yellow honeysuckle (*Lonicera flava*) and red honeysuckle (*Lonicera dioica*).

Coralberry (*Symphoricarpos orbiculatus*) may be mistaken for small bush honeysuckle shrubs. Coralberry is a branching shrub that grows to 1 m (3 feet) tall. It produces small pinkish fruits and has sessile leaves. The leaves of coralberry tend to be somewhat more rounded on the distal end than leaves on similar-sized bush honeysuckles and are usually slighter darker green. All shrubs should be accurately identified as a bush honeysuckle before attempting any control measures. If identification of the species is in doubt, the plant's identity should be confirmed by a knowledgeable individual and/or by consulting appropriate manuals or keys.

DISTRIBUTION

Bush honeysuckle is native to Asia and Western Europe. Tartarian honeysuckle, a native of eastern Europe and adjacent Asia, was introduced to North America in 1752. Morrow's, a native of Japan, and Amur, native to central and northeastern China, the Amur and Ussuri river valleys, Korea, and some parts of Japan, were introduced into the U.S. in 1875 and 1897, respectively. Bush honeysuckle's ability to spread beyond the point of initial planting was reported in the archives of the Morton Arboretum near Chicago as early as the mid-1920's. Widespread escapes were being reported from the eastern U.S. and Ontario, Canada by the 1950's. Distribution of bush honeysuckle was once closely related to horticultural outlets and larger urban areas, where it was used as an ornamental. Promotion of bush honeysuckle to improve wildlife habitat has made rural infestations much more common particularly in forest communities. It is believed that at least one hybrid of bush honeysuckle (*L.* x *bella*) is now naturalized in 30 states. Bush honeysuckle became naturalized in Illinois sometime between 1922 and 1955. The United States Department of Agriculture Soil Conservation Service sponsored a program to develop improved cultivars of Amur honeysuckle from the 1960's to 1984. Although not recorded officially from many counties, bush honeysuckle probably is found in all Illinois counties.

HABITAT

Bush honeysuckle has tolerance for a broad range of soil moisture, soil types, light regimes and habitats. Amur honeysuckle naturally thrives in frequently disturbed habitats in its original eastern Asiatic range. In the U.S., bush honeysuckle can invade forests with as much as 85% canopy cover and bush honeysuckle cover can exceed 50%. Bush honeysuckle invasion is most likely in disturbed or disturbance-dependent forest communities including savannas, barrens, glades, upland and riparian forests, and successional stands. However, most natural communities including hill, gravel, wet and mesic prairies, sedge meadows, wetlands and fens are susceptible to invasion by one or more of the bush honeysuckles, particularly when located near urban areas or existing naturalized or planted populations. Low light levels in old growth, undisturbed, closed canopy forests discourage invasion by bush honeysuckle and it rarely is abundant in permanently pastured areas.

Distribution of bush honeysuckle is strongly correlated to landscape structure. Bush honeysuckle invasion is much more likely in urban and highly fragmented forested

areas or in areas with a high degree of forest connectivity. Amur honeysuckle apparently reaches its distributional limit when forest cover is < 5% and forest connectivity is 0%.

LIFE HISTORY

Successful plant invaders are often characterized as having one or more of the following traits: high net primary productivity, phenotypic and habitat plasticity, rapid growth rate, high fecundity, long-range seed dispersal, and resistance to pathogens and pests. Bush honeysuckle possesses all of these traits. It initially invades areas with higher light levels, such as forest edges, then progresses to shadier areas including forest interiors.

Bush honeysuckle is able to outcompete most native species because of its leaf phenology. It is one of the earliest plants to leafout in the spring and one of the latest to drop its leaves in the fall. The average number of days from full leaf expansion until 50% of leaves has dropped is 169 days in southern Wisconsin and 223 days in southwestern Ohio. In the southern one-third of Illinois, bush honeysuckle will often retain its leaves until mid-November. This growing period contrasts sharply with an average of 120 - 180 days for most native shrubs.

Bush honeysuckle also exhibits a higher degree of plasticity to changing light regimes than native shrubs. When bush honeysuckle was compared with spicebush, relative stem growth under 1% full sun was similar for both species. Spicebush growth rate was greatest under 25% full sun; however, the growth for Amur honeysuckle was substantially greater than spicebush when light intensity was 25% and 100% full sun.

Once established, bush honeysuckle grows rapidly and because it is also long-lived, can form very dense, nearly impenetrable thickets. Several authors have reported shrubs that are 17 years old, a Kentucky study reported 25 year old shrubs and Wisconsin and Ohio studies reported shrubs that were 34 and 35 years old, respectively. Bush honeysuckle density of 1,136, 2,586, and 21,380 plants/ha (459, 1,047, and 8,655 plants/acre) have been reported from study areas in Ohio. Stem densities as high as 65,959 stems/ha (26,704 stems/acre) have also been reported.

During the pre-reproductive period, bush honeysuckle directs resources toward increases in stem number and height. Stems typically go upward and outward expanding the crown. This growth patterns allows bush honeysuckle to overtop most surrounding vegetation and intercept the majority of available light. During the reproductive stage (> age 3), growth in height continues, but biomass allocation shifts from increasing stem number to radial stem expansion and reproduction.

Bush honeysuckle flowers are pollinated by bees, and possibly hummingbirds, and are self incompatible. Seed production usually begins after two to five years of growth, but may be more dependent on the size of the plant than its age. An Ohio study found 5.7% of 3 year old plants were reproductive while >50% were reproductive by age 5. The same study also found that no plants < 1m (3 ½ feet) tall were reproductive, regardless of age.

Once it attains reproductive size, bush honeysuckle is a prolific seed producer. In Wisconsin, a single 2 m (6 ½ foot) tall Belle honeysuckle shrub produced 3,554 berries in 1 year. Fruits collected from the same site averaged 5-7 seeds/fruit, indicating that a "typical" plant may produce more than 20,000 seeds annually. Estimates of annual fruit production for Amur honeysuckle in southwestern Ohio ranged up to 1.2 million fruits

per plant and approximately 400 million fruits/hectare (162 million fruits/acre). Abscission of Amur honeysuckle fruits may be triggered by cold temperatures and periods of high precipitation.

Fruits of bush honeysuckle are consumed by at least 20 species of songbirds which are thought to be the primary dispersal agent. However, the fruits are low in lipids, bitter and often remain on the shrubs until midwinter, so frugivory most commonly occurs when more desirable fruits are in short supply or when there is persistent or heavy snow cover. Recent studies suggest frugivory of bush honeysuckle fruits may not be as prevalent as once thought. In fact, many fruits may simply fall to the forest floor. Fruit dispersal is also aided by small mammals, such as deer mice, and game species including wild turkey, ruffed grouse, northern bobwhite, ring-necked pheasant and white-tailed deer. As is the case for non-game birds, bush honeysuckle fruits probably are not preferred foods for most game species. Consumption of bush honeysuckle fruit by white-tailed deer is thought to be incidental to leaf consumption. Studies have shown that Tartarian, Morrow's, Belle, and Amur honeysuckle seed remain viable after passing through the gut of white-tailed deer. Consumption of seeds by long-range dispersers (birds and deer) probably aids in establishment of distant colonies.

Dormancy mechanisms appear to vary between the bush honeysuckles. Early maturing Amur honeysuckle may lack a dormancy mechanism as seeds germinate year-round especially during warm, wet periods in winter following abscission. Late-maturing seeds may require a cold stratification. Morrow's honeysuckle seeds, whose fruits mature in summer, may require a warm stratification and typically germinate prior to winter. Tartarian honeysuckle seed may require a cold stratification. Amur and Tartarian honeysuckle seeds with the pulp removed have higher germination rates than fruits with intact pulp, so consumption by fruit-eating birds may enhance germination. The germination rate for Tartarian honeysuckle seed stored in a dry, open warehouse was 31% after 12 years, but viability in the soil seedbank is probably short as it is for Amur and Morrow's honeysuckle. A Kentucky study found 80% of Amur honeysuckle seeds germinated within eight months while the remaining 20% were not viable.

What bush honeysuckle lacks in a persistent seed bank is compensated for by a persistent, slow-growing seedling bank that has a strong gap-filling potential. Bush honeysuckle plants are commonly found growing under tall shrubs or trees that act as perch areas for birds, particularly in areas where litter and herbaceous cover are sparse. Seedling density exceeding 13,402 seedling/ha (5,280 seedlings/acre) has been report from Wisconsin forests. Seedling density in forest edges can be as high as 328 seedlings/m^2.

Once established, the seedlings can tolerate moderate shade and undergo rapid pulses of growth following canopy gap formation. If stewardship activities that could increase light intensity in the shrub layer are planned for a site, bush honeysuckle control should be initiated prior to those activities. Also, since recruitment of native species is often delayed following bush honeysuckle removal, supplemental seeding or planting using locally available stock may be considered to occupy the niche vacated by bush honeysuckle. In sites that have a long history of bush honeysuckle invasion, seeding or planting of native species may be necessary to replenish a depleted seedbank.
Little information is available on vegetative reproduction of most species and hybrids of bush honeysuckle. Belle honeysuckle can apparently reproduce asexually by root

suckering and layering. In a Wisconsin study of four Belle honeysuckle populations, between four and seven percent of Belle honeysuckle shrubs sampled exhibited suckers. Suckers were usually found on smaller shrubs or within 60 - 90 cm (2-3 feet) of the root of more mature shrubs. Layering was reported in 19% of Belle honeysuckle shrubs at one site with the layering frequency being related to soil moisture and duration of contact between the branch and soil.

EFFECTS UPON NATURAL AREAS

Although individual species may have certain environmental tolerances (e.g. Tartarian in drier habitats, Morrow's in more moist areas) at least one of the four types is capable of inhabiting most natural communities. Bush honeysuckle has a competitive advantage over native plants because it leafs out before many native species and often holds its foliage until mid-November throughout most of Illinois. It can grow so densely it will shade out everything on the forest floor and the extensive, shallow root system can reduce nutrient and water availability to other plants. Bush honeysuckle can reduce tree seedling and herbaceous species density, cover, and richness. It can also reduce growth rates and fecundity in native perennial and annual herbs. Spring ephemerals are affected by the early leaf phenology while shade tolerant summer native herbs are affected by lower nutrient and moisture availability. Bush honeysuckle may also produce allelopathic chemicals that enter the soil and inhibit seed germination of some plants.

The recovery of native species is often slow following removal of bush honeysuckle. Prolonged invasion by bush honeysuckle can deplete the seed bank of native species and result in local extinction, particularly for less common species. Several studies report invasion by garlic mustard (*Allaria petiolata*) following removal of bush honeysuckle.

Bush honeysuckle can also impact animal populations. One Ohio study found that 68% of early spring northern cardinal nests were located in either bush honeysuckle or multiflora rose (*Rosa multiflora*). The early spring nests in bush honeysuckle had only an 8.7% chance of survival over a 21-day nesting cycle. Nests in native substrates accounted for only 20% of the early season nests, but had the greatest chance of survival. Similar results were reported in a study of American robin and wood thrush nest predation at the Morton Arboretum in Chicago. The early leaf phenology of bush honeysuckle may encourage birds to nest earlier and to construct their nests closer to the ground since most native species are still dormant. Lack of other suitable early season nest substrates results in a high concentration of nests within a vertically constricted zone. These factors increase predator efficiency and reduce nest success. The negative effects of early season nesting in bush honeysuckle may be greatest for resident and short-distance migrants. Morrow's honeysuckle fruit contains the carotenoid rhodoxanthin. Cedar waxwings that consumed Morrow’s honeysuckle fruits during molt developed orange-tipped tail feathers and flank feathers with an orange tint instead of the normal yellow tint. Similar changes in feather color, possibly due to consumption of honeysuckle fruit, have been reported in Kentucky warblers and white-throated sparrows.

CONTROL RECOMMENDATIONS

Control measures may enlist one or more of the following techniques: prescribed

burning and mechanical and chemical treatments.

RECOMMENDED PRACTICES IN NATURAL COMMUNITIES OF HIGH QUALITY

Prescribed burning

In fire-adapted communities, spring prescribed burning will kill seedlings and top kill mature plants. Bush honeysuckle will readily re-sprout after burning, but the regrowth is usually much less vigorous particularly in forested communities. In Missouri, a hot fire in spring followed by another hot fire that fall nearly eliminated bush honeysuckle from one site. This technique is particularly effective if conducted when honeysuckle shrubs are in the seedling stage or too small to be of reproductive size and there is a consistent fuel load. Repeated annual or biennial burning may be necessary if the shrubs are larger. If the infestation is light, prescribed burning can the used to topkill shrubs so resprouts can be treated with foliar applications of herbicide. This treatment method requires less herbicide, reduces damage to non-target species, and is less labor intensive than spraying full-sized shrubs. Areas with dense stands of large, multi-stemmed shrubs may lack sufficient fuel to carry a fire.

Mechanical treatments

Hand pulling and grubbing are effective, time efficient methods for dealing with light infestations of small plants. Hand pulling is easiest when soils are moist and the plants are less than 1 m (3 feet) tall. Grubbing can be done with a "Pulaski," "weed winch" or other similar tool. All of the root should be removed or resprouting may occur. Disturbed soil can create conditions that favor invasion by other invasive species. Physical removal may not be the best option in some sensitive habitats.

Mechanical/chemical control

Bush honeysuckle stems can be cut at the base with brushcutters, chainsaws or hand tools. The wood of bush honeysuckles is very tough and easily dulls powertool blades. A solution of glyphosate (Roundup, Glypro, Accord) applied to the cut stump either by spraying the stump with a low pressure hand-held sprayer or wiping the herbicide on the stump with a sponge applicator is an effective control that results in little re-sprouting. Glyphosate is a nonselective herbicide and care should be taken to avoid contacting non-target plants with herbicide. A 20.0% active ingredient solution of Roundup has proven effective in several studies. It is not known if this lesser concentration is effective for Rodeo. Rodeo can be used in wetlands and over open water, but Roundup is labeled only for use in non-wetlands. Herbicides should be applied to the cut stump immediately after cutting for best results. Application in late summer, early fall, or the dormant season has proven effective. Some re-sprouting may occur with a follow up treatment being necessary.

Chemical control

Stem injection with an EZ-Ject lance or similar device is effective and less labor intensive than cut surface treatments. These devices work by pushing a capsule filled with a dry formulation of glyphosate into the vascular system of woody plants using a 22-

caliber round. It is most effective on stems larger than 1.5 cm (5/8 inch) in diameter. For best results, every stem larger than 1.5 cm should be treated on each plant. Although initial startup cost (purchase of lance and capsules) is about 50% more that for cut stump treatments, there are advantages. Use of the injector lance is far less strenuous for the operator, exposure of the operator and non-target species to herbicide is reduced, it can be used under a broad range of field conditions, it is approved for use in wetland situations, and it is 43% faster than cut surface treatments.

In areas of very heavy infestation by shrubs less than 2 meters (6 feet) tall, late fall (late October or early to mid-November) foliar application of a 4.0% solution of glyphosate (Roundup, etc) may be appropriate. An Indiana study reported 70-95 % mortality using fall foliar glyphosate applications. This method has several advantages over other methods. During late October and mid-November (depending upon the location within the state) many if not all native species are dormant, but bush honeysuckle is still actively growing, so damage to non-target species is reduced. Bush honeysuckle is easily identified at this time or year because not only is it one of the few plants to retain its leaves, but the leaves are usually a distinctive yellow-green color that is visible for a long distance. **Do not spray so heavily that herbicide drips off the target species.** When using a hand-held or backpack sprayer, herbicides should be applied while backing away from the treated area to avoid walking through the wet herbicide. By law, herbicides may only be applied as per label directions and by licensed herbicide applicators or operators when working on public properties.

RECOMMENDED PRACTICES ON BUFFER AND SEVERELY DISTURBED SITES

Methods given above for high-quality natural communities are also effective and preferred on buffer and disturbed sites. In addition, the following methods may be employed.

For severely disturbed sites with a high density of large shrubs, machinery such as hydroax or tractor-mounted brush cutter may be the most efficient removal option. The hydroax will leave a considerable amount of debris on the ground which can make locating and treating the stump with herbicide difficult. If the affected area is small, resprouts can be treated with herbicide while they are small. Some tractor-mounted brush removal systems are designed to apply herbicide as the brush is cut.

In areas of very heavy infestation where bush honeysuckle has severely inhibited growth of native species, foliar application of triclopyr applied during the summer may be appropriate. Triclopyr is a broadleaf specific herbicide that should not harm monocot species and is available under the trade names Garlon 3A, Tahoe 3A, and Renovate. Apply a 1.5% active ingredient solution of triclopyr and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves.

A foliar spray of 1.0% active ingredient solution of glyphosate will control seedlings and a 1-1/2% active ingredient foliar spray of glyphosate applied in summer (after the shrubs begin blooming until September) will control mature shrubs.

Basal bark application of 10.0% active ingredient solution of triclopyr (Garlon 4) mixed with basal oil is somewhat effective for bush honeysuckle. In an Indiana study, this treatment resulted in 15% mortality for shrubs over 2.5 meters (8 feet) tall and 40% mortality for shrubs 1.3 meters (4.5 feet) to 2.5 m (8 feet) tall. To be effective the herbicide should be applied from the root collar up the stem about 30 to 40 cm (12 to 15

inches) on all sides. Every stem should be treated. The spray can be applied with a backpack or handheld sprayer and a cone-jet nozzle.

Streamline application of 30% active ingredient triclopyr (Garlon 4) mixed with basal oil is somewhat effective for smaller (0.6 - 2.5 meters; 2 - 8 feet) bush honeysuckle shrubs. Herbicide is applied with a backpack or handheld sprayer with a 0.0001 inch orifice spray tip that delivers a thin stream. The herbicide should be applied in a 1.5 - 2.5 cm (3 - 6 inch) band approximately 2.5 cm from the ground on two sides of the stem. In an Indiana study, this method resulted in about 30% mortality for shrubs 0.6 to 2.5 meters tall.

RECOMMENDED WITH CAUTION

Basal bark treatments with premixed 13.6% triclopyr in an aqueous solution (Pathfinder II RTU). Basal bark treatment with isopropylamine salt of imazapyr (Stalker) applied as a 2.0% active ingredient solution of mixed with basal oil or and frilling treatments with 2.5% Arsenal with in a aqueous solution are very effective for control of bush honeysuckle. However, there a several reports of damage to non-target species. In some instances, death of overstory trees has been reported. Treatments involving these methods should be employed on only the most degraded sites and should not be used in high quality areas, particularly prairies or glades.

BIOLOGICAL CONTROL

Hyadaphis tataricae (honeysuckle aphid), a Russian aphid, was first found in the U.S. in Illinois in 1979. Within 10 years, it had colonized Southern Canada including Manitoba, Montreal, and Quebec City and the northern United States including Illinois, Indiana, Iowa, Michigan, Minnesota, New York, and Wisconsin. It feeds on a variety of bush honeysuckles and spends its entire life on the plant. *H. tataricae* feeding results in dwarfing and folding of terminal leaves, stunted terminal growth, and development of "witch's brooms" that lowers plant vigor and may prevent flowering and fruit development. The extent of injury varies depending upon the species and cultivar of honeysuckle. *Lonicera* x *xylosteoides* 'Clavey's Dwarf' and *Lonicera tatarica* 'Arnold Red' are resistant. *H. tataricae* is becoming more widespread, but is not present in sufficient numbers to provide effective control of bush honeysuckles at this time. However, its North American range is still expanding.

FAILED OR INEFFECTIVE PRACTICES

Clipping or cutting stems without application of herbicide will result in r-sprouting. Cut stems of bush honeysuckle will usually begin re-sprouting about three weeks after cutting. In forested communities sprouts may be less vigorous, but repeated clippings will be necessary to kill the shrubs. In a northern Kentucky study, annual clipping for four years resulted in 70% mortality of forest-grown Amur honeysuckle shrubs, but only 9% mortality in open-grown shrubs. In the open-grown shrubs, stem density actually increased by nearly 275% after four years of clipping.

Over-the-counter, commercially available herbicides do not contain a sufficient concentration of active ingredient to be effective when used for cut surface or basal bark

applications.

Fall (October or November) application of 4.0% triclopyr (Garlon 3A) resulted in only 2% mortality in bush honeysuckle. Triclopyr may not be adequately absorbed, translocated or metabolized by bush honeysuckle during this time period.

Burning small shrubs with a propane torch is ineffective and rarely results in the mortality.

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