

NAME OF SPECIES: <i>Lonicera maackii</i> (Rupr.) Maxim (1)	
Synonyms: <i>Lonicera maackii</i> (Rupr.) Herder f. <i>podocarpa</i> Rehder (1)	
Common Name: Amur honeysuckle, Maack's honeysuckle (1)	
A. CURRENT STATUS AND DISTRIBUTION	
I. In Wisconsin?	1. YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
	2. <u>Abundance</u> : There are 30 recorded occurrences of <i>L. maackii</i> in WI; however this species is probably under-reported. (1)
	3. <u>Geographic Range</u> :
	4. <u>Habitat Invaded</u> : Most reports are from old fields, forest edges, cultivated areas, and pastures (1). Disturbed Areas <input checked="" type="checkbox"/> Undisturbed Areas <input checked="" type="checkbox"/>
	5. <u>Historical Status and Rate of Spread in Wisconsin</u> : This species was first recorded in 1924, and is now reported as 30 occurrences in 9 counties (1).
	6. <u>Proportion of potential range occupied</u> : Probably only found in minor portions of potential range.
II. Invasive in Similar Climate Zones	1. YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
	<u>Where (include trends)</u> : Amur honeysuckle is distributed in the eastern U.S. from Massachusetts west to North Dakota and south to Texas. It also occurs in Idaho and southern Ontario. One study shows that Amur honeysuckle is climatically adapted to all but the coldest areas in this range, such as northern Maine, New Hampshire, and Vermont, the Adirondack area of New York, and southwestern portions of Michigan's Upper Peninsula. The Amur honeysuckle cultivar 'Rem-Red' is "climatically adapted" from Massachusetts to South Carolina and west to Missouri. (5) <i>L. maackii</i> was first introduced into the U.S. in 1897/98, and by 1931 was available from at least 8 commercial nurseries (5). Other reports indicate that <i>L. maackii</i> has been in the eastern U.S since 1855 or 1860 (7). It is now naturalized in twenty-four states of the eastern and central United States and in Ontario, Canada (4).
III. Invasive in Similar Habitat Types	1. Upland <input checked="" type="checkbox"/> Wetland <input type="checkbox"/> Dune <input type="checkbox"/> Prairie <input checked="" type="checkbox"/> Aquatic <input type="checkbox"/> Forest <input checked="" type="checkbox"/> Grassland <input type="checkbox"/> Bog <input type="checkbox"/> Fen <input type="checkbox"/> Swamp <input checked="" type="checkbox"/> Marsh <input type="checkbox"/> Lake <input type="checkbox"/> Stream <input type="checkbox"/> Other: In North America, including southern Wisconsin, <i>L. maackii</i> is often found in urban forests or in forests with histories of fragmentation, grazing, or woodcutting, and in semi-shaded fencerows, weedy thickets, and brushy groves (4) (5). In Michigan it is found in woods (upland and swampy), thickets, banks, fencerows, and often near a landscaped source (5). One study from Ohio suggests that Amur honeysuckle population spread is closely linked to forest cover and forest connectivity across the landscape. Large expanses of agricultural land may act as a barrier to dispersal, perhaps due to habitat constraints on frugivorous birds that disperse seeds. Amur honeysuckle can dominate habitats ranging from recently disturbed areas to mature forest, (but performs best near edges and in canopy gaps, where light levels are favorable) (5). Slightly disturbed and/or young secondary forests with less tree

	<p>canopy cover have proven more invasible than less disturbed forests. Light appears to be important in the invasibility of forests as suggested by the inverse relationships of <i>L. maackii</i> cover to canopy cover and shade tolerance index in stands in Ohio. Late successional forests are more resistant to invasion than younger forests, presumably due to less light reaching the forest floor. Overall the species has a high potential for long-term persistence in native forest areas, as evidenced by over 40 years of rapid growth in Ohio and Kentucky natural forest preserves. The ability to establish seedlings in forest edges and interiors, coupled with continuous activity of adventitious buds on the bases of parent plants, provides a potent combination for long-term site occupation despite the poor seed banking capability. (8)</p>
IV. Habitat Effected	<p>1. <u>Soil types favored (e.g. sand, silt, clay, or combinations thereof, pH):</u> <i>L. maackii</i> is especially aggressive on calcareous soils (4). IT also performs best on moist, well-drained sites, but is adaptable to "poor" soils, compacted soils, various soil pHs, restricted root zones, drought and salt spray (5). The lower pH limit for Amur honeysuckle is 5.0 (5). It grows in thin prairie soils over dolomite in southern Wisconsin (5). The Amur honeysuckle cultivar 'Rem-Red' is "adapted" to deep, well-drained, fertile, sandy loam to clay loam soils, and is not "adapted" to droughty or wet soils. 'Rem-Red' also grows in medium-fertility, acid, clayey, loamy, and sandy soils, and tolerates somewhat poorly drained soil. It is also classified as fairly drought tolerant. (5)</p> <p>2. <u>Conservation significance of threatened habitats:</u> Some of the Savanna and Barrens communities in WI under threat from this species are ranked G1- G2 and S1- S2. Some of the Upland Herbaceous communities in WI under threat from this species are ranked G2 - G3 and S1 - S3. Some of the Wetland Herbaceous communities in WI under threat from this species are ranked S1 - S3. (9).</p>
V. Native Habitat	<p>1. <u>List countries and native habitat types:</u> <i>L. maackii</i> is native to central and northeastern China, Manchuria, Mongolia, Eastern Russia, the Amur and Ussuri river valleys, Korea, and isolated parts of Japan (3) (5). In its native habitat, <i>L. maackii</i> is found in mixed forests in association with oaks, elms and other hardwoods, and with softwoods such as fir, spruce, and hemlock; in floodplain forests; and in scrub communities (4) (5). It is often found in calcareous soil (4).</p>
VI. Legal Classification	<p>1. <u>Listed by government entities?</u> Connecticut - Potentially invasive, banned; Massachusetts - Prohibited; Vermont - Class B noxious weed (2).</p> <p>2. <u>Illegal to sell?</u> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/></p> <p>Notes: Currently illegal to sell in Connecticut, Vermont; and Massachusetts in 2009 (2). However it is routinely available commercially in other states and on the internet (2) (15). (See also websites for Natural Resources Conservation Districts in SD, NS, NM, and Ohio). The issue of cultivars was addressed by the Mass. Dept. of Agricultural resources regarding the sales ban of some invasive species. Their findings: There are two significant</p>

	<p>challenges in determining what cultivars are not invasive: 1. There is currently no set of protocols by which to evaluate the lack of invasiveness of a particular cultivar. 2. The processes by which cultivars are identified and labeled in the marketplace is not managed sufficiently to ensure that plants that are labeled as a particular cultivar are indeed that cultivar. (10)</p>
<p>B. ESTABLISHMENT POTENTIAL AND LIFE HISTORY TRAITS</p>	
<p>I. Life History</p>	<p>1. <u>Type of plant</u>: Annual <input type="checkbox"/> Biennial <input type="checkbox"/> Monocarpic Perennial <input type="checkbox"/> Herbaceous Perennial <input type="checkbox"/> Vine <input type="checkbox"/> Shrub <input checked="" type="checkbox"/> Tree <input type="checkbox"/></p> <p>2. <u>Time to Maturity</u>: 3-8 years before a shrub starts flowering (4) (5).</p> <p>3. <u>Length of Seed Viability</u>: Apparently not long lived (5). In <i>Lonicera maackii</i>, there is only a short time between dispersal and germination; this results in a lack of a persistent seed bank (7).</p> <p>4. <u>Methods of Reproduction</u>: Asexual <input checked="" type="checkbox"/> Sexual <input checked="" type="checkbox"/> <u>Please note abundance of propagules and other important information</u>: This species is a prolific fruit producer. Estimates of annual fruit production for Amur honeysuckle in southwestern Ohio ranged from 0 to 1.2 million berries per plant, and approximately 400 million berries ha⁻¹. Amur honeysuckle will sprout from adventitious buds on the root crown in response to stem damage. (5)</p> <p>5. <u>Hybridization potential</u>: NA</p>
<p>II. Climate</p>	<p>1. <u>Climate restrictions</u>: USDA hardiness zones 3-8 (2), or 2-8 (5). However analysis of herbaria records indicates Amur honeysuckle "escapes" become limited in USDA zones 4-5 (5). It is likely close to potential range, given moisture and climate needs (8).</p> <p>2. <u>Effects of potential climate change</u>:</p>
<p>III. Dispersal Potential</p>	<p>1. <u>Pathways - Please check all that apply</u>: <u>Intentional</u>: Ornamental <input checked="" type="checkbox"/> Forage/Erosion control <input checked="" type="checkbox"/> Medicine/Food: <input type="checkbox"/> Other: Amur honeysuckle has been planted in the eastern U.S. for wildlife habitat "improvement.". It has also been cultivated as an ornamental in North America. It is still commercially available from both nurseries and Natural Resources Conservation Districts in Nebraska (15), SD, NS, NM, Ohio. Beginning in the 1960s, USDA Soil Conservation Service developed and distributed the Amur honeysuckle cultivar 'Rem-Red' for use as an ornamental shrub, promoted as valuable for wildlife and as useful for soil conservation and as a windbreak, border, hedge, or screen. The NRCS (old SCS) still recommends 2 cultivars of Amur honeysuckle (Rem Red and Cling-red) as shrubs for wildlife plantings. Amur honeysuckle, along with Tatarian honeysuckle and Morrow's honeysuckle, is among species recommended for use in strip mine site reclamation. Amur honeysuckle makes a very productive honey plant. (5).</p> <p><u>Unintentional</u>: Bird <input checked="" type="checkbox"/> Animal <input checked="" type="checkbox"/> Vehicles/Human <input type="checkbox"/> Wind <input type="checkbox"/> Water <input type="checkbox"/> Other: In a study of avian Amur honeysuckle seed dispersal in southwestern Ohio, researchers</p>

	<p>found that out of 17 bird species captured near fruiting Amur honeysuckle shrubs, 12 were found to have consumed fruit. American robin, cedar waxwing, European starling, hermit thrush, and northern mockingbird defecated viable Amur honeysuckle seed. American tree sparrow, Carolina chickadee, dark-eyed junco, northern cardinal, song sparrow, tufted titmouse, and white-throated sparrow displayed evidence of consuming fruit, but without evidence of passing viable seed. Species that showed no evidence of Amur honeysuckle frugivory included brown creeper, Carolina wren, downy woodpecker, golden-crowned kinglet, and white-breasted nuthatch. Eastern bluebirds were also observed eating Amur honeysuckle fruit, but were not captured in the study. Wild turkey, ruffed grouse, northern bobwhite, and ring-necked pheasant also use Amur honeysuckle for food. (5)</p>
	<p>2. <u>Distinguishing characteristics that aid in its survival and/or inhibit its control</u>: In a study of leaf phenology of Amur honeysuckle and some sympatric tree and shrub species in southwestern Ohio it was found that during all 3 years studied, Amur honeysuckle displayed fully expanded leaves for significantly ($p < 0.001$) longer than all native species (except northern red oak and slippery elm whose small sample size precluded comparison). Amur honeysuckle was always the 1st species to expand leaves and the last to lose them. During 1994, Amur honeysuckle began leaf expansion in March and retained leaves into late November. (5)</p>
IV. Ability to go Undetected	1. HIGH <input type="checkbox"/> MEDIUM <input type="checkbox"/> LOW <input checked="" type="checkbox"/>
C. DAMAGE POTENTIAL	
I. Competitive Ability	<p>1. <u>Presence of Natural Enemies</u>: A non-native aphid, <i>Hyadaphis tataricae</i>, feeds on bush honeysuckles causing lowered plant vigor and may prevent flowering and fruit development. According to the USGS this insect species is still expanding its range so it may be of some control value in the future. (4) (5)</p> <p>2. <u>Competition with native species</u>: <i>Lonicera maackii</i> appears detrimental to 98% of uncommon forest plant taxa leading to the potential to cause local extinctions of plant populations. Also, species richness and abundance below crowns of <i>L. maackii</i> was lowered in its presence. Because <i>L. maackii</i> dramatically increases in both density and cover following colonization, the effects at the scale of single shrubs should become increasingly apparent at the scale of forest stands. Where this species becomes established in the understory of forests, it has a negative impact on tree seedlings and herbs, presumably due to reduced light under <i>Lonicera maackii</i> canopies as this species is light limited. It also suppresses spring ephemerals and forest regeneration. (8)</p> <p>3. Rate of Spread: HIGH(1-3 yrs) <input type="checkbox"/> MEDIUM (4-6 yrs) <input type="checkbox"/> LOW (7-10 yrs) <input checked="" type="checkbox"/> Notes: Two studies reported separate average rates of migration of 0.5 km/year in separate areas of Ohio. One study reported that initial populations can result from a single individual shrub (the species is self-compatible) and remain small for the first several</p>

	<p>years but then begin to experience exponential growth when populations become larger from radial growth producing radical increases in basal shrub area. (8) (17).</p>
<p>II. Environmental Effects</p>	<p>1. <u>Alteration of ecosystem/community composition?</u> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> Notes: Because of their competitive dominance, bush honeysuckles could potentially displace native species. In one study the researchers compared native vegetation growing under Amur honeysuckle crowns with plants growing outside Amur honeysuckle influence in hardwood forest stands near Oxford, in southwestern Ohio. For all species combined, mean species richness was 53% lower, and mean cover 63% lower, in plots beneath Amur honeysuckle crowns. (17) In dense Amur honeysuckle thickets in forest and open sites are "associated with a near complete absence of ground cover species" (5). One study looked at the effects of Amur honeysuckle presence on growth, reproduction and survival of 3 native forest understory perennial forbs over 5 growing seasons. Species studied included narrowleaf wild leek (<i>Allium burdickii</i>), a spring ephemeral, and the full-season species rue anemone (<i>Thalictrum thalictroides</i>) and downy yellow violet (<i>Viola pubescens</i> var. <i>pubescens</i>). The results showed that Amur honeysuckle presence generally reduced growth and reproduction of target species, but not their survival.(8)</p> <hr/> <p>2. <u>Alteration of ecosystem/community structure?</u> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> Notes: Over the past three decades in Ohio and neighboring states, dense thickets have replaced relatively open understories that apparently had no abundant native shrubs indicating <i>L. maackii</i> has been an addition rather than a replacement in these forests, filling an open niche (8). Where native shrubs and invasive bush honeysuckles co-occur, bush honeysuckles may be creating different nesting habitat for birds with effects on nest production (4) (5) (12). In northern Illinois, nests built in Amur honeysuckle had significantly ($p < 0.001$) higher daily nest mortality rate compared with nests built in native species. Reasons offered for increased nest predation in Amur honeysuckle included lower nest height (compared with many native shrubs and trees), absence of sharp thorns (compared with native hawthorns (<i>Crataegus</i> spp.)), and branch architecture that may facilitate predator (e.g. raccoon) movement. Unfortunately, Amur honeysuckle may provide more attractive nest sites due to its early leaf flush and sturdy branches. In fact, American robins significantly ($r^2 = 0.912$, $p < 0.01$) increased their use of Amur honeysuckle over the 6-year study period. (5)</p> <hr/> <p>3. <u>Alteration of ecosystem/community functions and processes?</u> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> Notes: There are suggestions that bush honeysuckles could alter successional trajectories in ways that favor their persistence. Amur honeysuckle invasion may alter patterns of forest succession in southwestern Ohio. If development of a dense Amur honeysuckle shrub layer suppresses establishment of shade-tolerant tree seedlings, recruitment of mid- and late successional tree species may be inhibited. Hypothetically then, as older canopy trees die,</p>

	<p>closed-canopy forests could change to open-canopy woodlands or even Amur honeysuckle-dominated shrublands. It has been demonstrated that Amur honeysuckle dominance in the shrub layer of northern Kentucky hardwood forests can suppress advance regeneration of overstory species.</p> <p>A thick canopy of honeysuckle shrubs can alter light availability on the forest ground. One study in a northern Kentucky hardwood forest described a monospecific Amur honeysuckle shrub layer with nearly 100% canopy coverage, mean maximum subcanopy light levels of 1% of full sun, and a sparse ground layer flora composed mainly of suppressed Amur honeysuckle seedlings and saplings. (5)</p> <p>Reduction of light availability for ground flora and seedlings. In a studies of the effects of the understory dominance by bush honeysuckles could ultimately alter successional patterns in forests by limiting the richness, density and frequency of native ground flora and tree seedlings (4)(5)(7). There are also suggestions that bush honeysuckle invasion could have ecosystem level effects. Net primary production of dense open-grown Amur honeysuckle thickets (up to 1350 g m⁻² yr⁻¹ in northern Kentucky) may have large impacts on carbon and nutrient budgets of invaded sites (5)</p> <p>4. <u>Allelopathic properties?</u> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/></p> <p>Notes: Extract from leaves and tissues of <i>L. maackii</i> has been known to reduce germination in <i>Fraxinus americana</i>, (white ash) and <i>Acer saccharum</i> (sugar maple) (7).</p>
D. SOCIO-ECONOMIC Effects	
<p>I. Positive aspects of the species to the economy/society:</p>	<p>Notes: A popular landscaping plant due to the flower, fruits, smells, and low effort to grow (4). Currently available for sale by nurseries and Conservation Districts around the US. A simple Internet search for any of the bush honeysuckles brings up the websites of a number of nurseries and Conservation Districts in NE(15), SD, ND, NM, and OH that sell these species for ornamental and wildlife uses.</p>
<p>II. Potential socio-economic effects of restricting use:</p>	<p>Notes: Because of the species popularity the horticultural industry has significantly invested in developing and maintaining stocks of this plant.</p>
<p>III. Direct and indirect effects :</p>	<p>Notes: Suppression of tree seedlings and alteration of forest regeneration would have effects on the forestry industry (4) (5). In stands with an understory dominated by bush Honeysuckle, tree basal area growth has been found to be reduced 53%. This will potentially translate into a ~50% decrease in timber receipts for landowners managing their woodlots (20).</p> <p>In a 6 year study of nest predation on American robins (<i>Turdus migratorius</i>) and wood thrushes (<i>Hylocichla mustelina</i>) in a 200 ha woodland fragment near Chicago it was found that robin nests in <i>Lonicera maackii</i> and another non-native, invasive shrub, <i>Rhamnus cathartica</i>, experienced higher predation rates than nests in similar native shrubs (<i>Crataegus</i>, <i>Viburnum</i>) and in native trees. Part of this difference was due to nests in <i>L. maackii</i> being built closer to the ground. The authors speculate that absence of thorns on the exotics and a branch structure that facilitates movement of</p>

	<p>predators like raccoons may also help explain the difference. Robin use of <i>Lonicera</i> increased sharply during the 6-year study and the authors suggest this may be due to the exotic shrub's early leaf-out. If so, higher predation rates early in the season may also help explain the difference between nest success in exotic and native plants. Predation on wood thrush nests in native and exotic plants was not significantly different. High proportions of thrush nests were in <i>L. maackii</i> and as use of <i>L. maackii</i> by robins increased, predation rates on thrushes increased. The authors caution that these results are specific to a single site and to the two bird species followed and that it is not known whether they will be applicable to other sites or species. But they note that if higher nest predation rates are found in exotic shrubs elsewhere, restoring native shrubs would serve several conservation goals simultaneously. (5)</p> <p>Effects on forest understory vegetation and on bird survival could have negative effects on outdoor recreation and bird watching. A study in NY found that some birds with yellow in their coloring that had been fed <i>L. morrowii</i> berries had the yellow colored feathers change to orange. This could have effects on bird social behavior (mate selection) (12).</p>
IV. Increased cost to a sector:	<p>Notes: The costs to the horticultural industry would be that of replacing a popular ornamental with non-invasive alternatives, developing those as nursery stocks and educating the public about them.</p> <p>The forestry industry would bear the costs of honeysuckle inventory, mapping, and control. The overall effect of this invasive shrub in forests is increased mortality of native tree seedlings, suggesting that it impacts the natural regeneration of secondary forests (18). Another study found that when <i>L. maackii</i> occurs in the understory, the overstory trees show reductions in basal area growth (19). Lowered productivity would have a negative economic impact. Any \$s?????</p>
V. Effects on human health:	<p>Notes: Possibly some bush honeysuckle fruits are toxic, but this is not confirmed (13).</p>
E. CONTROL AND PREVENTION	
I. Costs of Prevention (including education; please be as specific as possible):	Notes: NA
II. Responsiveness to prevention efforts:	Notes: NA
III. Effective Control tactics:	<p>Mechanical <input checked="" type="checkbox"/> Biological <input type="checkbox"/> Chemical <input checked="" type="checkbox"/></p> <p>Times and uses: The most effective and least damaging method is the cut-stump method where honeysuckle shrubs are cut and the stumps painted with herbicide, usually in fall. This needs to be followed by monitoring and foliar spraying of seedlings. Usually for 3 or more years.</p> <p>Ripping out of plants is effective but labor intensive. Also, the resulting soil disturbance creates more habitat for invasives to return or move in too.</p> <p>Rx fire in prairies and savannas can be used, however there needs to be enough fine fuels in the understory to carry flames. In</p>

	<p>addition, fire needs to be used repeatedly to be effective in setting back the sprouting from root crowns. Quickly repeating fires may have a negative impact on native species. (4) (5).</p> <p>Generally, in regions where <i>L. maackii</i> is present, forests should be managed to minimize tree canopy disturbance, but when this is not possible, forests should be continually monitored for plants following disturbance. In forests where <i>L. maackii</i> is already established, management to reduce cover is recommended. (8)</p>
IV. Minimum Effort:	<p>Notes: Cutting and stump treating larger individuals along with foliar spraying of seedlings, followed by several follow-up years of surveying for and treating seedlings (several times a year) is the minimum effort required to control an infestation. Depending on the size of the infestation the original treatment could be a very costly and time consuming effort. (8) (4) (5)</p>
V. Costs of Control:	<p>Notes: Control cost approximately \$500-\$700 /acre in forested sites in Southern WI. (16)</p>
VI. Cost of prevention or control vs. Cost of allowing invasion to occur:	<p>Notes: NA</p>
VII. Non-Target Effects of Control:	<p>Notes: Depending on the time of year that herbicides are used there can be some non-target injury. Because of the early leaf-on and late leaf-off of the non-native bush honeysuckles this can be somewhat avoided. (4) (5)</p>
VIII. Efficacy of monitoring:	<p>Notes: Monitoring makes possible the managing of small colonizing populations, which will be largely successful during the early slow expansion phase. If control efforts are not started until after the population reproduces and exponential population growth begins, cost and effort of control will rise greatly while probability of successful removal declines. (8)</p>
IX. Legal and landowner issues:	<p>Notes: This species is a widely planted and popular ornamental(4). As it may occur on some private land, some access issues will arise and cooperation with landowners for management will be necessary (8).</p>

F. REFERENCES USED:

- UW Herbarium
- WI DNR
- TNC
- Native Plant Conservation Alliance
- IPANE
- USDA Plants

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19	Hartman, K.M. and B.C. McCarthy. 2006. A dendro-ecological study of forest overstorey productivity following the invasion of the non-indigenous shrub <i>Lonicera maackii</i> . In Press - <i>Applied Vegetation Science</i> .

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