

MN NWAC Risk Assessment Worksheet (04-2017)	Common Name	Latin Name (Full USDA Nomenclature)
	<b>Winged Burning Bush</b>	<b><i>Euonymus alatus</i> (Thunb.) Sieb.</b>
Original Reviewer: Emilie Justen	Affiliation/Organization: MN Dept. Of Ag.	Original Review: (08/13/2019)

**Species Description:**

- Woody, perennial shrub, 5-10 feet tall, can grow to 20 feet.
- Multiple stemmed, stems have distinctive, corky wings; more typically has a single stem that branches close to the ground.
- Leaves are dark green, opposite, and occur in pairs. Leaves are 1-2.5 inches long and 0.5-1.25 inches across, elliptic, and finely serrated. Leaves have very short petioles and are hairless. The leaves turn brilliant red in the fall in full sun and pink in heavy shade before abscising.
- Clusters of 3 flowers develop in leaf axils. Dark red to purple 0.5 inch long fruit capsules that open to reveal the seeds covered by a fleshy, bright orange to orange-red aril develop in the fall.
- A member of the Celastraceae (Bittersweet) Family

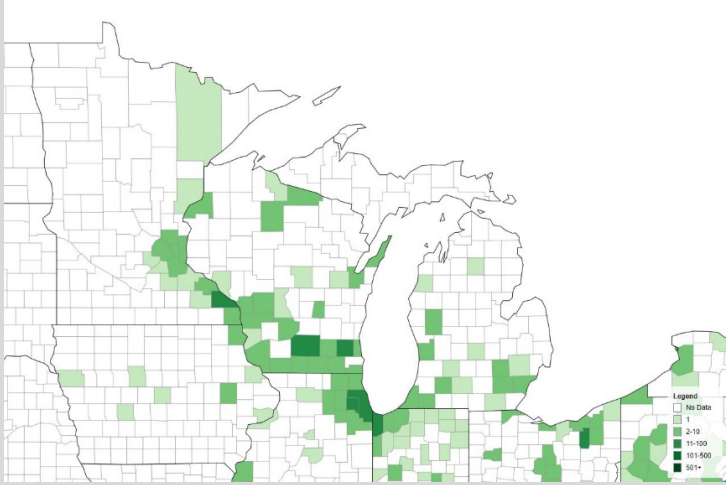


*E. alatus* was introduced into the US from Asia in the mid-1800s for use as an ornamental shrub. The bright red fall foliage makes it an attractive landscape plant, and it is commonly planted along highways, as hedges, and in foundation plantings. Shade tolerance and good form without much pruning are also important characteristics that make winged euonymus a valuable and popular plant.

**Current Regulation:** *E. alatus* is not currently regulated by MDA

Box	Question	Answer	Outcome
1	Is the plant species or genotype non-native?	Yes (USDA 2017)	Go to box 3
2	Does the plant species pose significant human or livestock concerns or has the potential to significantly harm agricultural production?		
	A. Does the plant have toxic qualities that pose a significant risk to livestock, wildlife, or people?		
	B. Does the plant cause significant financial losses associated with		

Box	Question	Answer	Outcome
	decreased yields, reduced quality, or increased production costs?		
3	Is the plant species, or a related species, documented as being a problem elsewhere?	<p>Yes (Invasive Plant Atlas 2017).</p> <p>Prohibited from sale and importation in Massachusetts, Maine, New Hampshire and Vermont. A number of states and national parks have reported it to be invasive in natural areas. The cultivar Nordine (very fruitful) is restricted in Wisconsin (Rule NR 40); all other cultivars are exempt. (Massachusetts Department of Agriculture Resources 2018; Maine Department of Agriculture, Conservation and Forestry 2018; New Hampshire Department of Agriculture, Markets and Food 2018; Vermont Agency of Agriculture, Food and Markets 2018; Wisconsin Department of Natural Resources 2018).</p> <p>In Wisconsin, it has been documented as invading open disturbed areas such as abandoned fields, pastures, forest edges, roadsides and yards (Matson 2011). In northeastern states and Illinois, it has invaded forest understories and grasslands, and known populations occur in oak upland forest, second growth lowland forest, pastures, shady hillsides, and glacial drift prairies (Ebinger 1983, The Nature Conservancy 2006).</p> <p><i>E. alatus</i> has been documented as naturalizing in urban parks. One study of 10 mid-Atlantic urban parks recorded <i>E. alatus</i> at all 10 parks (Loeb in Kohli et al 2008). Research in Indianapolis ranked <i>E. alatus</i> as one of the top 5 invasive species that pose the biggest current and emerging threats based on a survey local experts (Dolan 2016).</p>	Go to box 6
4	Is the plant species' life history & growth requirements understood?	<p>Yes; has been a horticultural landscape plant in North America since the mid-1800s and is adaptable to many growing conditions. It is hardy to USDA zones 4-9 and prefers mesic woodlands (Farrar 2001).</p> <p>Transplants easily, grows well in full shade and full sun and is adaptable to different soil types and pH levels. It has no serious</p>	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>

Box	Question	Answer	Outcome
		<p>pest problems, though deer and rabbit browsing can girdle plants (Fryer 2009). It has also shown to sprout from the crown following top-kill by herbicides and is likely that it will resprout following other types of top-killing events such as fire (Fryer 2009).</p> <p><i>E. alatus</i> reproduces prolifically by seed. However, a study in Kentucky of the cultivar ‘Compactus’ showed that seed may have limited persistence in the soil and concluded that viability was an estimated 2% after one year (Finneseth 2009, Matson 2011).</p>	
6	Does the plant species have the capacity to establish and survive in Minnesota?		
	A. Is the plant, or a close relative, currently established in Minnesota?	<p>Yes; EDDMapS distribution shows that it is established in Minnesota:</p>  <p>(EDDMapS 2019)</p> <p>While most infestations are single plants or small groups of plants in Minnesota, a densely infested 4 acre area with another 15 acres of scattered plants has been reported in southeastern Minnesota (Fritcher 2018). <i>E. elatus</i> is cold hardy to USDA Cold Hardiness Zone 4; ‘Compactus’ borderline hardy and is often injured in Zone 4 during normal winters (Dirr 2009).</p>	Go to box 7

Box	Question	Answer	Outcome
	B. Has the plant become established in areas having a climate and growing conditions similar to those found in Minnesota?	Yes; documented as naturalizing as early as 1984 in Illinois and 2001 in Iowa (Ebinger et al. 1984, Farrar 2001). There have been reports that specimens were collected as “spontaneous” in the Chicago region in 1940 (Wilhelm 2018). It has naturalized in at least six counties in Wisconsin and has been observed escaping cultivation in the Northeast and Midwest (Matson 2011). Currently reported naturalizing in 11 counties in Minnesota.	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
7	Does the plant species have the potential to reproduce and spread in Minnesota?		
	A. Does the plant reproduce by asexual/vegetative means?	No; clonal propagation is common for cultivars of <i>E. alatus</i> and it is propagated asexually by stem cuttings but does not naturally reproduce from root suckers (Dirr 2009). Plants can resprout after cutting and after fire but no evidence that plants are more vigorous after cutting (Fryer 2009).	Go to box 7C
	B. Are the asexual propagules effectively dispersed to new areas?		
	C. Does the plant produce large amounts of viable, cold-hardy seeds?	Yes, <i>E. alatus</i> is a prolific seed producer and has the ability to produce thousands of seeds per plant (Brand et al. 2012, Dirr 2009). Seeds germinate readily and are disbursed by birds and humans. A study in Connecticut concluded that of the nine cultivars that were field tested, all had the potential to produce large amounts of seed if allowed to mature and were exposed to cross pollination with different genotypes (Brand et al. 2012). Herbarium specimens show that it is reproducing in Ramsey, Scott, and Anoka Counties and Duluth in Minnesota (Cholewa 2018).	Go to box 7F
	E. Is this species self-fertile?		
	F. Are sexual propagules – viable seeds – effectively dispersed to new areas?	Yes, seeds are bird and human vectored (Dirr 2009).	Go to box 7I
	G. Can the species hybridize with native species (or other introduced species) and produce viable seed and fertile offspring in the absence of human intervention?	Unknown – <i>Euonymus atropurpureus</i> (American/eastern wahoo) is the only other species of <i>Euonymus</i> that is native to MN. Other introduced species include <i>E. fortuneii</i> , <i>E. europaeus</i> , and <i>E. hamiltonianus</i> , however none of these species are widely distributed.	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment</i>

Box	Question	Answer	Outcome
	H. If the species is a woody (trees, shrubs, and woody vines) is the juvenile period less than or equal to 5 years for tree species or 3 years for shrubs and vines?	Greater than 3 years (Calkins 2018).	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment</i>
	I. Do natural controls exist, species native to Minnesota, that are documented to effectively prevent the spread of the plant in question?	No	Go to box 8
8	Does the plant species pose significant human or livestock concerns or has the potential to significantly harm agricultural production, native ecosystems, or managed landscapes?		
	A. Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?	Yes but only if large quantities are ingested. All parts of <i>E. alatus</i> are reportedly toxic if ingested by humans. It can cause vomiting, diarrhea, weakness, chills, and convulsions (NC State Extension, The Royal Horticultural Society 2018).	Go to box 8B
	B. Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?	No.	Go to box 8C
	C. Can the plant aggressively displace native species through competition (including allelopathic effects)?	Yes; <i>E. alatus</i> forms dense thickets where “hundreds of seedlings are often found below the parent plant in what is termed a ‘seed shadow’” (Swearingen et al 2010). It adapts to a wide range of habitats, including prairies, grasslands and forests (Clements et al 2012, Robertson et al 1995).  It creates a dense shrub layer and shades species in lower layers, outcompeting native plant species by altering community structure (Fryer 2009, The Nature Conservancy 2006, NatureServe 2017, Swearingen et al 2010). It forms a mat-like root system, has a dense branching structure, and creates a dense stand of seedlings immediately below the parent plant (NatureServe 2017).	Go to box 9

Box	Question	Answer	Outcome
		No evidence of allelopathy.	
	D. Can the plant hybridize with native species resulting in a modified gene pool and potentially negative impacts on native populations?	Unknown; cultivars are known to cross-pollinate with each other and have high fruit production (Knight et al. 2011).	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment</i>
	E. Does the plant have the potential to change native ecosystems (adds a vegetative layer, affects ground or surface water levels, etc.)?	<p>Yes, it forms dense thickets, can be a prolific seed producer, produces hundreds of seedlings and a dense stand of seedlings below the parent plant (Swearingen et al 2010). It forms a broad, closed crown which shades and crowds out native herbs and shrubs, and also changes prairie vegetation to shrubland (Fryer 2009, NatureServe 2017, Swearingen et al 2010). It has also been documented invading forest understories, pasture, and coastal shrublands (Miller et al 2010).</p> <p>Infestations of this species have been documented since the late 1980s in glacial drift hill prairies in Illinois (Ebinger 1983, Ebinger et al 1984, Robertson et al 1995). A 15 acre infestation in southeastern Minnesota of winged burning bush has been documented that exhibits a high density of seedlings and very few other species of plants (Fritcher 2018).</p> <p><i>E. alatus</i> is shade tolerant and has the potential to dominate the understory of mature forests by outcompeting native shrubs and herbs (Matson 2011).</p> <p>At the University of Minnesota Landscape Arboretum, the species has been naturalizing in forested understories, where staff are documenting seedlings (McNamara 2017).</p>	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment</i>
	F. Does the plant have the potential to introduce or harbor another pest or serve as an alternate host?		
9	Does the plant species have clearly defined benefits that outweigh associated negative impacts?		

Box	Question	Answer	Outcome
	<p>A. Is the plant currently being used or produced and/or sold in Minnesota or native to Minnesota?</p>	<p>Yes, currently being sold in produced and sold in Minnesota. In 2017 the MDA sent a survey to 1,402 Minnesota nursery certificate holders. In the questions on <i>E. alatus</i>, the survey found that 41 out of 73 respondents sell <i>E. alatus</i>. 17 out of 73 respondents indicated that it was a significant source of income. Summary of the results with the percent (of the 73 respondents) that agreed with the statement:</p> <ul style="list-style-type: none"> <li>• I/we currently sell this species or one or more named cultivars of this species: 56.16%</li> <li>• This species provides significant income for my/our business: 23.29%</li> <li>• I/we consider this species invasive or problematic in native ecosystems and/or agricultural production systems in Minnesota: 17.81%</li> <li>• This species should be regulated as a noxious weed to prevent future spread and establishment in new areas in Minnesota: 12.33%</li> <li>• If this species were regulated as a noxious weed and not allowed to be sold in Minnesota, it would have a significant negative impact on my/our business: 28.77%</li> <li>• There are good alternative available with desirable traits that are similar to this species: 24.66%</li> <li>• There are no good alternatives available with desirable characteristics that are similar to this species: 34.25%</li> </ul> <p>In 2018, the Minnesota Nursery and Landscape Association reached out to wholesalers in an attempt to get an estimate of the wholesale value of <i>E. alatus</i> (the following is from James Calkins, Minnesota Nursery and Landscape Association; personal communication, August 22, 2018): It is important to note that wholesale value does not represent the full value of a particular species because retail value is not accounted for and is a significant component of the value equation. For <i>E. alatus</i>, the wholesale value is estimated at \$270,946/year (about 1.8% of total annual sales for these</p>	<p>Go to 9B</p>



Box	Question	Answer	Outcome
		<p>growers). As a wholesale value based on only the biggest wholesalers of this species, although these growers probably account for the majority of the wholesale production of <i>E. alatus</i> in Minnesota, this estimate of wholesale value is not representative of every grower and is, therefore, a rough and conservative estimate of the wholesale value. The value of <i>E. alatus</i> to these wholesale growers is also much higher when out-state sales are considered. Multiplying the wholesale value by a factor of 1.5 to 2.0 would probably provide a rough, but reasonable, estimate of the ultimate retail value of the <i>E. alatus</i> plants sold by these wholesalers. Based on this information the estimated value (wholesale plus value-added retail) of <i>E. alatus</i> plants sold in Minnesota would be in the range of \$677,365 to \$812,838/year (once again, this would be a conservative estimate because the data set is not complete). These estimated monetary values also do not account for the unique landscape value of <i>E. alatus</i> in designed landscapes.</p>	
	<p>B. Is the plant an introduced species and can its spread be effectively and easily prevented or controlled, or its negative impacts minimized through carefully designed and executed management practices?</p>	<p>Yes. NatureServe (2017) ranked its management difficulty as “Medium/Low”. Seedlings can be hand-pulled, larger plants can be dug. If plants are cut, re-sprouts must be controlled by repeated cutting or application of a systemic herbicide. Cut stump treatment is generally effective. For large populations, a foliar treatment in early summer may be employed (NatureServe 2017).</p> <p>Cut stump treatments result in little negative impact to non-target species. However, foliar treatments may result in non-target impacts and digging out large plants may cause soil disturbance.</p>	<p>Go to box 9C</p>
	<p>C. Is the plant native to Minnesota?</p>	<p>No</p>	<p>Go to 9D</p>
	<p>D. Is a non-invasive, alternative plant material commercially available that could serve the same purpose as the plant of concern?</p>	<p>Research on sterility continues with this species and it is unlikely existing cultivars of winged burning bush could be promoted as sterile or non-invasive. Though research at the University of Wisconsin showed the cultivar ‘Rudy Haag’ to produce little to no fruit, further study at the University of Connecticut suggests that “all cultivars have the potential to produce large amounts of seed if the plants are allowed to mature and are exposed to cross-pollination with different genotypes” (Renz 2018, Brand et al</p>	<p>Go to box 9E</p>



Box	Question	Answer	Outcome
		<p>2012). Additionally, ‘Rudy Haag’, when grown with other cultivars, can cross-pollinate and have high fruit production (Knight et al. 2011).</p> <p>Research conducted in Connecticut (USDA Zone Hardiness 6a) revealed few alternatives to <i>E. alatus</i> (Shrestha and Lubell 2015). A similar study needs to be conducted in Minnesota for native and non-invasive alternatives to woody invasive plants for USDA Zone Hardiness 3 and 4. If cultivars are developed that are low fecund, NWAC will consider reviewing and issuing an exemption if backed up with data.</p> <p>The Midwest Invasive Plant Network lists the following non-invasive alternatives to burning bush:  <i>Aronia arbutifolia</i> (Red chokeberry), <i>Aronia melanocarpa</i> (Black chokeberry), <i>Fothergilla major</i> (Large fothergilla), <i>Fothergilla</i> ‘Mt. Airy’ and ‘Blue Shadow’ (Fothergilla cultivars), <i>Itea virginica</i> (Virginia sweetpire), <i>Viburnum prunifolium</i> (Blackhaw), <i>Rhus copallinum</i> (Shining sumac), <i>Euonymus americanus</i> (Strawberry bush), <i>Euonymus atropurpureus</i> (Eastern wahoo), <i>Acer palmatum</i> ‘Osakazuki’ (Japanese maple)</p>	
	E. Does the plant benefit Minnesota to a greater extent than the negative impacts identified at Box #8?	No.	Go to box 10
10	Should the plant species be enforced as a noxious weed to prevent introduction &/or dispersal; designate as prohibited or restricted?		
	A. Is the plant currently established in Minnesota?	Yes	Go to box 10B
	B. Does the plant pose a serious human health threat?	No	Go to box 10C
	C. Can the plant be reliably eradicated (entire plant) or controlled (top growth only to prevent pollen dispersal and seed production as	No. Because it is widely planted as a landscape plant, it cannot be reliably controlled to prevent dispersal without a phase out and management plan enacted.	List as Restricted in 2023 after a 3 year production phase-out.

Box	Question	Answer	Outcome
	appropriate) on a statewide basis using existing practices and available resources?		
11	Should the plant species be allowed in Minnesota via a species-specific management plan; designate as specially regulated?		
<b>Final Results of Risk Assessment</b>			
	Review Entity	Comments	Outcome
	NWAC Listing Subcommittee	<p>There were many challenges to writing this risk assessment. It is a widely planted landscape plant and grows in many yards and commercial landscapes. We debated the feasibility of homeowners being able to control their plantings, the impact to the public and how much of a benefit the species is in people’s yards. Additional field studies of low fecund cultivars are needed to determine if cultivars are capable of reverting back to “wild types”. Finally, nursery sales data could be incomplete and NWAC is sensitive to listing as a Prohibited species without support from the nursery industry.</p> <p>Comments from 7/18/19: the listing subcommittee discussed the possibility of developing a communication/education plan for homeowners. The MDA does not have the capacity at this time to develop a communication plan. The group also discussed helping municipalities develop a burning bush replacement plan for homeowners. Limitations at this time are funding and staff capacity to develop these plans.</p> <p>9/23/2019: List as Specially Regulated Plant with a 3 year nursery production phase-out. After phase-out period, sale of this species would be prohibited and the species will move to the Restricted list.</p>	List as Specially Regulated with 3-year production phase-out, then list as Restricted in 2023.
	NWAC Full-Committee	Vote was 14:1 on 12/03/19.	Specially Regulated with 3-year production phase out then Restricted in 2023.

Box	Question	Answer	Outcome
	MDA Commissioner	Commissioner order was signed on 01/15/20 and effective 01/17/20.	Specially Regulated with 3-year production phase out then Restricted in 2023.

### Risk Assessment Summary:

After much discussion, the listing subcommittee arrived at listing this species as Specially Regulated in 2020 with a 3 year production phase-out, then list as Restricted in 2023. The phase out would help production nurseries diminish their inventory and give the NWAC group time to develop a communication plan for homeowners. Naturalized populations at this time are still limited but potentially underreported. The challenges of both homeowner compliance and sensitivity to the nursery industry's support of listing as Prohibited-Eradicate were acknowledged in listing subcommittee discussions and outcomes.

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