Maryland Department of Agriculture

May 15, 2019

Version 1

Weed Risk Assessment for *Aralia elata* (Miq.) Seem. (Araliaceae) – Japanese angelica tree

Left: *Aralia elata* trunk showing spines (T. Davis Sydnor, The Ohio State University, Bugwood.org). Center and right: *Aralia elata* with inflorescence and *A. elata* leaf (John M. Randall, The Nature Conservancy, Bugwood.org).

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Introduction

The Maryland Department of Agriculture regulates terrestrial ornamental invasive plants under the authority of Md. AGRICULTURE Code Ann. § 9.5-101 et seq. Invasive Plant Prevention and Control. An invasive plant is defined as "a terrestrial plant species that a) did not evolve in the State, and b) if introduced within the State, will cause or is likely to cause, as determined by the Secretary: economic harm; ecological harm; environmental harm; or harm to human health."

Maryland's Invasive Plant Advisory Committee (IPAC) was established by legislative mandate in October 2011. The IPAC's primary responsibility is to advise the Secretary of Agriculture on regulating the sale of invasive plants, and on preventing them from entering Maryland or from spreading further in the state. The IPAC evaluates the risk potential of plants already present in Maryland, newly detected in Maryland or the United States, those proposed for import, and those emerging as weeds elsewhere in the world.

The IPAC evaluates the potential invasiveness of plants using the weed risk assessment (WRA) process developed by the Plant Protection and Quarantine (PPQ) Program of the US Department of Agriculture's Animal and Plant Health Inspection Service (Koop et al. 2012). PPQ's risk model uses information about a species' biological traits and behavior to evaluate its risk potential (Koop et al. 2012).

Because the PPQ WRA model is geographically and climatically neutral, it can be used to evaluate the baseline invasive/weed potential of any plant species for the entire United States, or for any specific region in the United States. In the PPQ process, the geographic potential of the species is evaluated separately so that risk managers can make decisions appropriate for their regions. With respect to Maryland's evaluation process, we use PPQ's Geographic Information System overlays of climate to evaluate the potential for a plant to establish and grow in Maryland. The PPQ weed risk assessment also uses a stochastic simulation to evaluate how the uncertainty associated with the assessments affects the model's predictions. Detailed information on the PPQ WRA process is available in the document, Guidelines for the USDA-APHIS-PPQ Weed Risk Assessment Process (APHIS PPQ 2015), which is available upon request.

The IPAC uses a second tool, the Maryland Filter, to assign plant species that score as highly invasive either Tier 1 or Tier 2 status. Maryland regulations define Tier 1 plants as "invasive plant species that cause or are likely to cause severe harm within the State" and Tier 2 plants as "invasive plant species that cause or are likely to cause substantial negative impact within the State." The Maryland Filter considers the actual and potential distribution of a species in Maryland, its threat to threatened and endangered ecosystems and species in the state, the difficulty of control of the species, and whether added propagule pressure would be likely to increase its persistence and spread significantly. The IPAC then recommends regulations to reduce the risk of the Tiered invasive plants in Maryland.

1. Plant Information and Background

SPECIES: *Aralia elata* (Miq.) Seem. (ARS 2019).

FAMILY: Araliaceae (ARS 2019)

SYNONYMS: *Aralia mandschurica* Rupr. & Maxim. (Tropicos 2019), *Aralia canescens* Siebold & Zucc., *Aralia emeiensis* Z.Y.Zhu, *Aralia hupehensis* G.Hoo, *Aralia japonica* Seem., *Aralia subcapitata* G.Hoo, *Dimorphanthus elatus* Miq. (ThePlantList 2019).

COMMON NAMES: Japanese angelica tree, angelica tree, Japanese angelica (OSU 2019). Japanese aralia (Dirr 2009).

BOTANICAL DESCRIPTION: Japanese angelica tree usually grows as a small tree or tall shrub to 10 m tall. Trunks and stems are ringed with spines and leaf petioles and stems may also be spiny. Very large leaves are divided 2 to 3 times into smaller ovate leaflets with long points. A large inflorescence of small, white flowers has a short or non-existent central axis and 3 – 8 spreading secondary branches. Many small black fruits ripen in late summer. It tends to grow in disturbed woodlands and along road and field edges (Rhoads and Block 2007, eFloras 2019).

INITIATION: This plant is listed on the MD Department of Natural Resources Do Not Plant List, a policy document available from MD DNR. The list is a policy document which lists approximately 90 plant species that may not be planted on DNR land or used in DNR projects (MD DNR 2010).

WRA AREA[1]: Entire United States, including territories.

FOREIGN DISTRIBUTION: *Aralia elata* is native to China, Japan, Korea and Russia (Moore et al. 2009). It has naturalized in Lithuania (Gudžinskas et al. 2017), Poland (Tumilowicz and Baszczak 2006), England and Northern Europe (HEAR 2016).

U.S. DISTRIBUTION AND STATUS: Naturalized in the northeastern and Mid-Atlantic US, Missouri and Washington.

[1] "WRA area" is the area in relation to which the weed risk assessment is conducted [definition modified from that for "PRA area"] (IPPC, 2012).

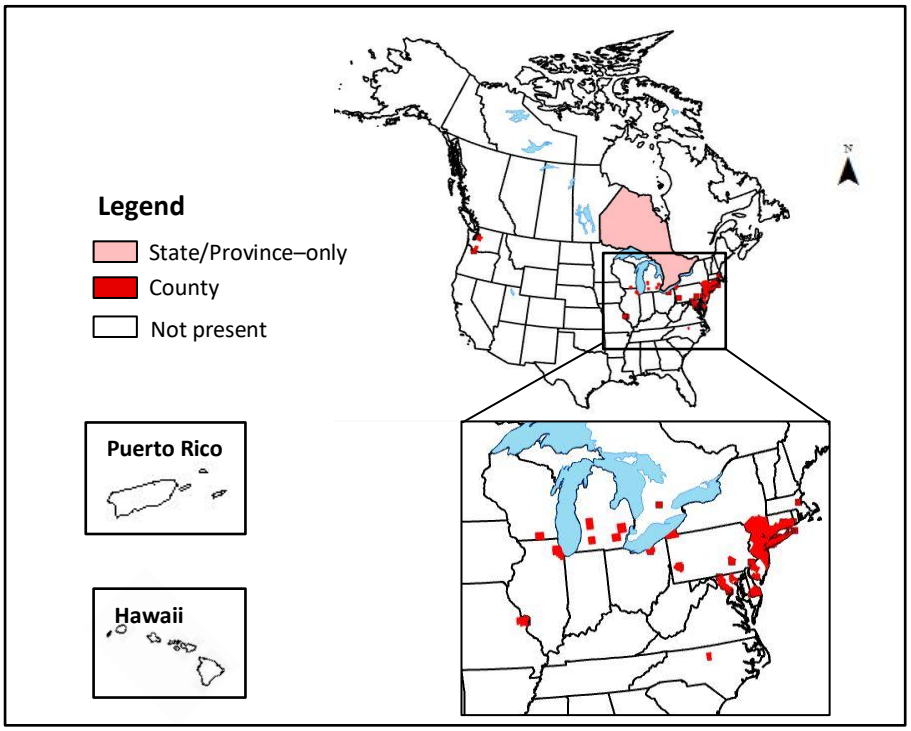

Figure 1. Known naturalized distribution of *Aralia elata* in the United States and Canada. The records shown here were obtained primarily from other species distribution databases (EDDMapS 2019 and GRIN 2019) and were not independently verified by IPAC.

3. Analysis

ESTABLISHMENT/SPREAD POTENTIAL

Japanese angelica trees spreads by seeds and runners (Moore et al. 2009; Jordan et al. 2008). It produces hundreds of fruits that are principally dispersed by birds (Moore et al., 2009, The Sanguine Root 2012). If cut or injured it resprouts with multiple stems (Moore et al. 2009, Echols 2016, DCNR 2016). We had High uncertainty with regard to whether the taxon reaches the status of a prolific seed disperser due to a lack of information on number of seeds per tree, but Moderate uncertainty for our answers overall.

Risk score = 10 Uncertainty index = 0.17

IMPACT POTENTIAL

Aralia elata forms large, dense thickets that hinder the growth of other plants and that may hinder succession (CJISST 2016; The Sanguine Root 2012). We used this as evidence for a Yes answer to question ImpN3, changing species diversity, with Moderate uncertainty since no direct measures of species diversity were found. Other native species such as sumacs can form thickets in similar habitat, and we therefore answered question Imp N2, changes to habitat structure, as No with Moderate uncertainty. *Aralia elata* is used as an ornamental plant

but one report mentioned suckers spreading into nearby plantings (WorldPlants 2016). We found no evidence for impact to production systems.

Risk score = 2 Uncertainty index = 0.15

GEOGRAPHIC POTENTIAL

Based on three climatic variables, we estimate that about 58 percent of the United States is suitable for the establishment of *Aralia elata* (Fig. 2). This predicted distribution is based on the species' known distribution elsewhere in the world and includes point-referenced localities and areas of occurrence. The map for *Aralia elata* represents the joint distribution of Plant Hardiness Zones 3-10, areas with 10-100+ inches of annual precipitation, and the following Köppen-Geiger climate classes: Mediterranean, Humid subtropical, Marine west coast, Humid continental warm summers, Humid continental cool summers.

The area estimated likely represents a conservative estimate as it uses only three climatic variables. Other environmental variables, such as soil and habitat type, may further limit the areas in which this species is likely to establish. *Aralia elata* tends to occur in disturbed and early successional habitats and along stream banks (NEWFS 2019).

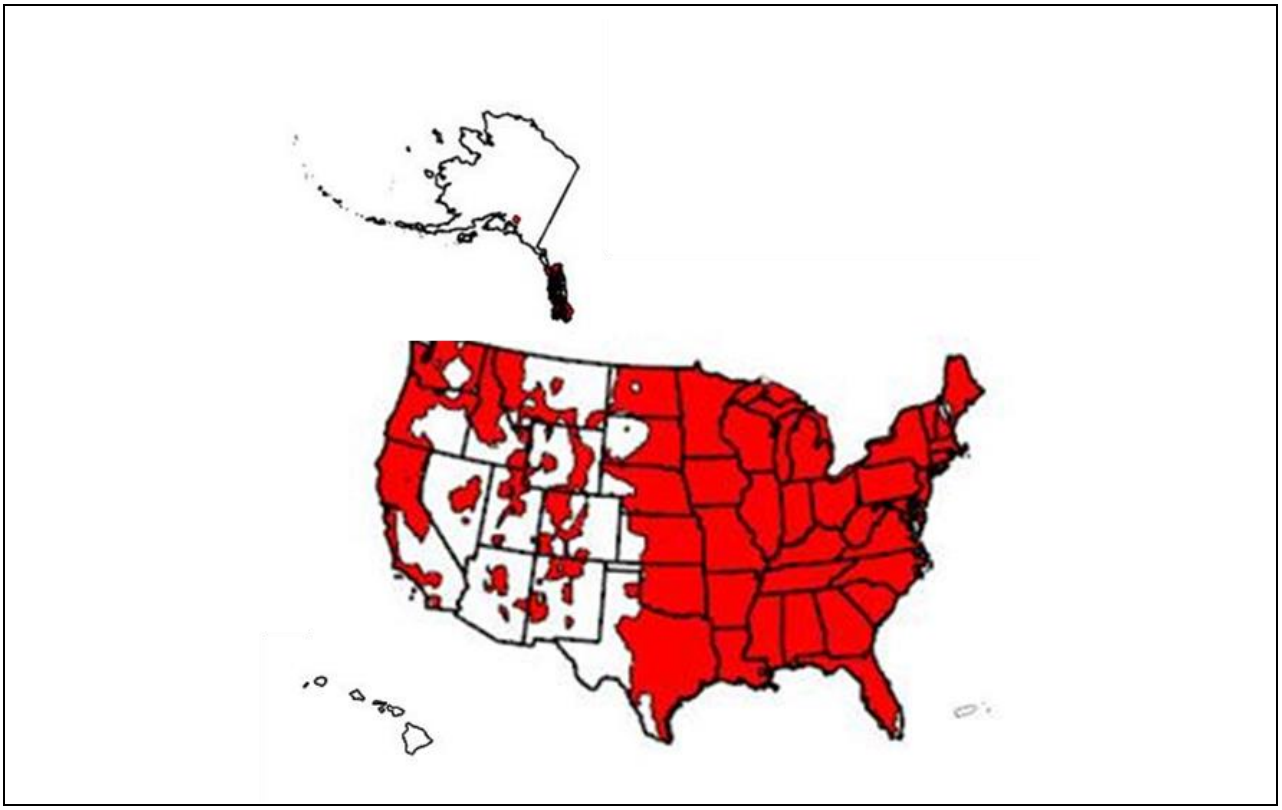

Figure 2. Potential geographic distribution of *Aralia elata* in the United States. Map insets for Hawaii and Puerto Rico are not to scale.

ENTRY POTENTIAL

We did not assess the entry potential of *Aralia elata* because it is already present in the United States (Kartesz 2016, GBIF 2019).

4. Predictive Risk Model Results

Model Probabilities: P(Major Invader) = 41.7%
P(Minor Invader) = 54.2%
P(Non-Invader) = 4.1%
Risk Result = Evaluate Further
Secondary Screening = High Risk

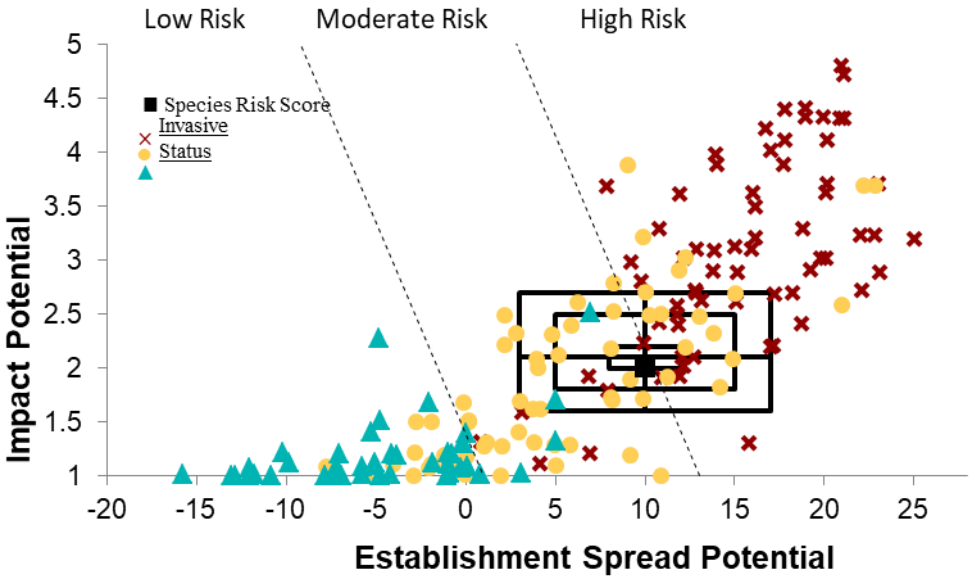

Figure 3. Risk and uncertainty results for *Aralia elata*. The species' risk score (solid black symbol) is plotted relative to the risk scores of the species used to develop and validate the PPQ WRA model (Koop et al., 2012). The results from the uncertainty analysis are plotted around the risk score for Japanese angelica tree. The smallest, black box contains 50 percent of the simulated risk scores, the second 95 percent, and the largest 99 percent. The black vertical and horizontal lines in the middle of the boxes represent the medians of the simulated risk scores (N=5000). For additional information on the uncertainty analysis used, see Caton et al., (2018).

5. Discussion

The result of the weed risk assessment for *Aralia elata* is High Risk. Although not much information is available on direct impacts of *Aralia elata* on natural areas, it is a species that

spreads by both seeds and aggressive runners. High uncertainty related to several seed production questions led to higher uncertainty overall for Establishment/Spread. The species can be difficult to control because it resprouts. It forms dense stands that clearly exclude other species but there is uncertainty about other impacts on natural areas. The species has the potential to occur in 58% of the US (Figure 2), although it does tend to occur mainly in disturbed habitats. The species falls between Moderate and High risk (Figure 3), but Further Evaluation puts the species at High Risk.

This species is ranked as a Tier 2 plant because it has the potential to occur throughout the state, has been present in the state for more than twenty years, and does not meet the Maryland Filter criteria for added propagule pressure. The species is difficult to control because of vigorous resprouting and is documented at fewer than 20 sites in Maryland (EDDMaps 2019). Because the species tends to form discrete stands, land managers should attempt to control this species quickly and prevent it from producing seeds. See Appendix B for the details of the Maryland Filter analysis.

6. Acknowledgments

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SUGGESTED CITATION

Maryland Department of Agriculture. 2019. Weed risk assessment for *Aralia elata* (Miq.) Seem.(Araliaceae) – Japanese angelica tree. Maryland Department of Agriculture, Annapolis, MD 23 pp.

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Appendix A. Weed risk assessment for *Aralia elata* (Miq.) Seem. (Araliaceae)

Weed risk assessment for *Aralia elata* (Miq.) Seem. (Araliaceae). The following information came from the original risk assessment, which is available upon request (full responses and all guidance). We modified the information to fit on the page.

Question ID	Answer - Uncertainty	Score	Notes (and references)
ESTABLISHMENT/SPREAD POTENTIAL			
ES-1 [What is the taxon's establishment and spread status outside its native range? (a) Introduced elsewhere =>75 years ago but not escaped; (b) Introduced <75 years ago but not escaped; (c) Never moved beyond its native range; (d) Escaped/Casual; (e) Naturalized; (f) Invasive; (?) Unknown]	f - negl	5	*Aralia elata* is native to China, Japan, Korea and Russia and was introduced to the United States in the 1830s (Moore et al. 2009). It is "..naturalizing across northern sections of the United States" (Moore et al. 2009; Dirr 2009). Numerous populations were found in southwestern CT, northern NJ, and around New York City and plants are spreading in the region (Moore et al. 2009). One tree was found naturalized in Burlington, VT (Gilman 2016). *Aralia elata* is naturalized in Lithuania along a river bank and spread from three stems in 2004 to more than 80 plants covering 300 m2 (Gudžinskas et al. 2017). It self-seeds at a botanic garden in Poland where plants were introduced in the 1970s and root suckers sprout 10m from the base of the parent plant (Tumilowicz and Baszczak 2006). Aralia is cultivated and occasionally naturalized in England and some other parts of northern Europe (HEAR, 2016). Randall (2012) lists it as escaped from cultivation and as a weed. Alternative answers are "e" and "d."
ES-2 (Is the species highly domesticated)	n - low	0	There are several variegated cultivars grafted on the species' rootstock (University of Connecticut 2016; Dirr 2009) but these still produce fruits (Broken Arrow Nursery 2016).
ES-3 (Significant weedy congeners)	n - low	0	A few other Aralia species have naturalized, but are not considered significant weeds (HEAR 2016; Randall 2012).

Question ID	Answer - Uncertainty	Score	Notes (and references)
ES-4 (Shade tolerant at some stage of its life cycle)	n - low	0	*A. elata* is considered a pioneer species (Naka and Yoda 1984). It was found growing in a stand of gray alder along a riverbank in Lithuania but this could be in part shade and the plants were not flowering as they did in open areas in Lithuania (Gudžinskas et al. 2017).
ES-5 (Plant a vine or scrambling plant, or forms tightly appressed basal rosettes)	n - negl	0	This plant is a small tree or large shrub (Dirr 2009) and is not a vine, nor does it form rosettes.
ES-6 (Forms dense thickets, patches, or populations)	y - high	2	Plants form thickets from root sprouts but these thickets are not always considered dense (Moore et al. 2009; Jordan et al. 2008). 80 plants were counted in a 300m^2 area in Lithuania with stems ranging from less than 1 to over 5 m in height (Gudžinskas et al. 2017); depending on how branched the individuals were, this could be a fairly dense thicket. Individual plants can have a wide spread, so we are answering yes with high uncertainty.
ES-7 (Aquatic)	n - negl	0	*A. elata* is a terrestrial plant and is not aquatic (Moore et al. 2009).
ES-8 (Grass)	n - negl	0	*A. elata* is in the Araliaceae and therefore not a grass (ThePlantList 2016).
ES-9 (Nitrogen-fixing woody plant)	n - low	0	We found no evidence that the plant fixes nitrogen. Furthermore, plants in the Araliaceae are not known to fix nitrogen (Martin and Dowd 1990; Santi et al. 2013).
ES-10 (Does it produce viable seeds or spores)	y - low	1	Plants produce viable seeds (Naka and Yoda 1984). Hundreds of seedlings established in a small area in one park (The Sanguine Root 2012).
ES-11 (Self-compatible or apomictic)	? - max	0	We found no information on self-compatibility in this species.
ES-12 (Requires specialist pollinators)	n - low	0	Bees, wasps and many other pollinators have been observed on *A. elata* flowers (Raymond

Question ID	Answer - Uncertainty	Score	Notes (and references)
			2011). The species is an important fall pollen source for *Apis cerana japonica* in Japan (Fujiwara and Washitani 2017).
ES-13 [What is the taxon's minimum generation time? (a) less than a year with multiple generations per year; (b) 1 year, usually annuals; (c) 2 or 3 years; (d) more than 3 years; or (?) unknown]	d - mod	-1	*A. elata* is described as a fast-growing and pioneer species that generally begins producing seeds after only a few years. One and two year-old plants did not flower or reproduce clonally, but three year-old plants did produce clonal ramets in a field study in NJ by Echols (2016). Plants were four to five years old before they produced flowers and fruits (Echols 2016). We are answering "d" with moderate uncertainty and alternative answers of "c" and "d."
ES-14 (Prolific seed producer)	n - high	-1	Trees produce hundreds of seeds (The Sanguine Root 2012). All information on numbers of seeds is observational - a single plant can produce several large inflorescences with possibly hundreds of fruits per inflorescence. One mature tree occupies more than $1m^2$ however, so plants are unlikely to produce more than 1000 seeds/$m^{2.}$. We are answering "no" with high uncertainty.
ES-15 (Propagules likely to be dispersed unintentionally by people)	? - max	0	Fruits are small fleshy drupes unlikely to attach to clothing. The small seeds do accumulate in the soil (Naka and Yoda 1984) and since plants often grow in disturbed areas, there is a chance seeds could be dispersed in the movement of soil by human activity. The New York--New Jersey Trail Conference (2015) trail crew thought the seeds were spreading along a trail because of foot traffic. We are answering "unknown" with maximum uncertainty.
ES-16 (Propagules likely to disperse in trade as contaminants or hitchhikers)	n - mod	-1	We found no evidence for dispersal as contaminants or hitchhikers and it seems unlikely this species would disperse as a contaminant or hitchhiker in products. The plant could occur along field edges or forest edges, but as a tree with bird-dispersed rather

Question ID	Answer - Uncertainty	Score	Notes (and references)
			than wind-dispersed seeds it seems unlikely to end up as a contaminant of agricultural or forestry products. It is grown in the horticultural industry as an ornamental plant but unless it were being grown close to the pots of other plants into which seeds could fall it is unlikely to be dispersed through the sale of horticultural products.
ES-17 (Number of natural dispersal vectors)	2	0	Fruits are small, round black drupes (Arcila 2012)
ES-17a (Wind dispersal)	n - low		Fleshy drupes are unlikely to be wind-dispersed.
ES-17b (Water dispersal)	n - mod		We found no evidence for water dispersal and seeds have no special adaptations for water dispersal. Plants sometimes grow along waterways (K. Kyde, pers. obs.) and fruits could float.
ES-17c (Bird dispersal)	y - low		Fruits are eaten by more than 30 species of birds (Moore et al., 2009).
ES-17d (Animal external dispersal)	n - low		No, fruits are small drupes with no means of external dispersal by animals.
ES-17e (Animal internal dispersal)	y - high		In Japan, fruits are consumed by Sika deer (Takatsuki 1988). Deer are known to disperse other fruits and so we assume they could disperse *A. elata*.
ES-18 (Evidence that a persistent (>1yr) propagule bank (seed bank) is formed)	y - mod	1	Naka and Yoda (1984) found viable *A. elata* seeds but no plants in a 16 year-old oak stand in Japan so it is very likely that *A. elata* has a persistent seed bank. The plants are unlikely to have grown under the shade of an oak stand for a significant period of time.
ES-19 (Tolerates/benefits from mutilation, cultivation or fire)	y - low	1	Plants will resprout prolifically following after cutting main stems (DCNR 2016). If the main meristem is damaged plants produce many closely spaced shoots (Moore et al. 2009; Echols 2016).

Question ID	Answer - Uncertainty	Score	Notes (and references)
ES-20 (Is resistant to some herbicides or has the potential to become resistant)	n - low	0	We found no evidence of herbicide resistance. It is not listed by Heap (2016).
ES-21 (Number of cold hardiness zones suitable for its survival)	8	0	
ES-22 (Number of climate types suitable for its survival)	5	2	
ES-23 (Number of precipitation bands suitable for its survival)	10	1	
IMPACT POTENTIAL			
General Impacts			
Imp-G1 (Allelopathic)	n - high	0	One study showed possible evidence for allelopathy in a greenhouse experiment (Jordan et al. 2008).
Imp-G2 (Parasitic)	n - low	0	There is no evidence that *A elata* is parasitic from botanical descriptions (Nickrent 2016; Walker 2016).
Impacts to Natural Systems			
Imp-N1 (Changes ecosystem processes and parameters that affect other species)	n - low	0	We found no evidence that *A. elata* changes ecosystem processes or parameters.
Imp-N2 (Changes habitat structure)	n - mod	0	*A. elata* forms thickets and creates dense shade (The Sanguine Root 2012; Echols 2016), but we found no reports that it changes habitat structure differently than similar native species would.
Imp-N3 (Changes species diversity)	y - mod	0.2	Evidence for changing species diversity is based on observations of land managers. "Can easily form large thickets that displace native plants and prevent successional growth of native trees and shrubs" (NJISST 2016). "This tree creates a canopy of shade so dense and a root system so interconnected that native trees, shrubs and herbaceous plants are left to die in the wake of this

Question ID	Answer - Uncertainty	Score	Notes (and references)
			aggressive alien species" (The Sanguine Root 2012).
Imp-N4 (Is it likely to affect federal Threatened and Endangered species?)	n - mod	0	We found no evidence that *A. elata* is likely to affect threatened and endangered species. The species tends to occur in disturbed habitats although it can form dense stands in that habitat type.
Imp-N5 (Is it likely to affect any globally outstanding ecoregions?)	n - high	0	*A. elata* occurs in the Appalachian Mixed Mesophytic Forest (Kartesz 2016), however currently documented impacts are local and do not affect habitat structure or ecosystem processes.
Imp-N6 [What is the taxon's weed status in natural systems? (a) Taxon not a weed; (b) taxon a weed but no evidence of control; (c) taxon a weed and evidence of control efforts]	c - low	0.6	*A. elata* is treated with herbicide in Morris Park, Philadelphia, PA (The Sanguine Root 2012). Plants are controlled by the National Park Service in MD and DC (Arcila 2012) and is considered a high threat species to natural areas in New Jersey (NJISST 2016). Alternative answers "b."
Impact to Anthropogenic Systems (e.g., cities, suburbs, roadways)			
Imp-A1 (Negatively impacts personal property, human safety, or public infrastructure)	n - low	0	Fruits can temporarily discolor sidewalks (WorldPlants 2016) but otherwise no negative impacts were found.
Imp-A2 (Changes or limits recreational use of an area)	n - mod	0	Plants have thorny stems and stems can grow densely, but we found no direct evidence for limiting recreational use of an area.
Imp-A3 (Affects desirable and ornamental plants, and vegetation)	y - mod	0.1	Suckers can spread into nearby plantings (WorldPlants 2016).
Imp-A4 [What is the taxon's weed status in anthropogenic systems? (a) Taxon not a weed; (b) Taxon a weed but no evidence of control; (c) Taxon a weed and evidence of control efforts]	c - high	0	Gardening sites recommend leaving considerable space for *A. elata* because of the extensive rhizomes and some gardeners report difficulty in controlling *A. elata* plants (Dave's Garden 2019). Answering "c" with high uncertainty and alternative answers of "b" and "a."

Question ID	Answer - Uncertainty	Score	Notes (and references)
Impact to Production Systems (agriculture, nurseries, forest plantations, orchards, etc.)			
Imp-P1 (Reduces crop/product yield)	n - low	0	We found no evidence for reducing crop or commodity yield. *A. elata* is a host plant for spotted lanternfly (*Lycorma delicatula*), a pest of many commercially cultivated fruits, in its home range of South Korea, but it is unclear if it is a preferred host (Dara et al. 2015).
Imp-P2 (Lowers commodity value)	n - low	0	We found no evidence that this species lowers commodity value.
Imp-P3 (Is it likely to impact trade?)	n - low	0	The species is not likely to impact trade. It is not regulated by other countries nor are the mainly bird-dispersed seeds likely to end up in a trade pathway.
Imp-P4 (Reduces the quality or availability of irrigation, or strongly competes with plants for water)	n - low	0	We found no evidence for this species affecting irrigation or strongly competing with other plants for water.
Imp-P5 (Toxic to animals, including livestock/range animals and poultry)	y - low	0.1	Plants are toxic to dogs, cats and horses (ASPCA 2016).
Imp-P6 [What is the taxon's weed status in production systems? (a) Taxon not a weed; (b) Taxon a weed but no evidence of control; (c) Taxon a weed and evidence of control efforts]	a - mod	0	We found no evidence that this species is considered a weed in production systems, although ingested parts of plant are toxic to animals. Alternative answers both "b."
GEOGRAPHIC POTENTIAL			Unless otherwise indicated, the following evidence represents geographically referenced points obtained from the Global Biodiversity Information Facility (GBIF).
Plant hardiness zones			
Geo-Z1 (Zone 1)	n - negl	N/A	We found no evidence that this species occurs in this hardiness zone.
Geo-Z2 (Zone 2)	n - negl	N/A	We found no evidence that this species occurs in this hardiness zone.

Question ID	Answer - Uncertainty	Score	Notes (and references)
Geo-Z3 (Zone 3)	y - mod	N/A	One point in China and one in Russia. Most gardening sources list this plant as hardy in Zones 4-9 but as possible to grow it in a sheltered place in Zone 3 (Dave's Garden 2019, MOBOT 2019, Dirr 2009).
Geo-Z4 (Zone 4)	y - low	N/A	One point in Austria. One point in China and one in Japan.
Geo-Z5 (Zone 5)	y - negl	N/A	One point in China and several points in Japan.
Geo-Z6 (Zone 6)	y - negl	N/A	Naturalized in Vilnius, Lithuania (Gudžinskas et al. 2017) and Piscataway, NJ (Echols, 2016). Numerous points in MA, MD, MO, NY, OH, PA, and southern Canada. Several points in Europe. Many points in China and Japan.
Geo-Z7 (Zone 7)	y - negl	N/A	Numerous points in MD, NJ, and NY. Many points in western Europe, a few in Sweden and Norway. Many points in China and Japan. Two points in South Korea.
Geo-Z8 (Zone 8)	y - negl	N/A	One point in DE and two on Long Island, NY. Two points in WA. Several points in China and many points in Japan.
Geo-Z9 (Zone 9)	y - negl	N/A	Many points in China and Japan.
Geo-Z10 (Zone 10)	y - low	N/A	One point in China. Several points in Japan.
Geo-Z11 (Zone 11)	n - negl	N/A	We found no evidence that this species occurs in this hardiness zone.
Geo-Z12 (Zone 12)	n - negl	N/A	We found no evidence that this species occurs in this hardiness zone.
Geo-Z13 (Zone 13)	n - negl	N/A	We found no evidence that this species occurs in this hardiness zone.
Köppen -Geiger climate classes			
Geo-C1 (Tropical rainforest)	n - negl	N/A	We found no evidence that this species occurs in this climate class.

Question ID	Answer - Uncertainty	Score	Notes (and references)
Geo-C2 (Tropical savanna)	n - negl	N/A	We found no evidence that this species occurs in this climate class.
Geo-C3 (Steppe)	n - negl	N/A	We found no evidence that this species occurs in this climate class.
Geo-C4 (Desert)	n - negl	N/A	We found no evidence that this species occurs in this climate class.
Geo-C5 (Mediterranean)	y - high	N/A	Growing as an ornamental in Varanasi, Uttar Pradesh, India (Singh 2014). Two points in WA in the US.
Geo-C6 (Humid subtropical)	y - negl	N/A	A few points in mid-Atlantic states of the US. Many points in China and Japan.
Geo-C7 (Marine west coast)	y - negl	N/A	Numerous points in Great Britain, Belgium and the Netherlands as well as points in several other European countries. Numerous points in China.
Geo-C8 (Humid cont. warm sum.)	y - negl	N/A	Naturalized in Piscataway, NJ (Echols 2016). Several points in northeastern US States. Many points in Korea, China and Japan.
Geo-C9 (Humid cont. cool sum.)	y - negl	N/A	Naturalized in Vilnius, Lithuania (Gudžinskas et al. 2017). A few points in northeastern US and Canada. Several points in Central Europe and many points in Sweden. Many points in northern Japan, a few in China.
Geo-C10 (Subarctic)	n - negl	N/A	We found no evidence that this species occurs in this climate class.
Geo-C11 (Tundra)	n - negl	N/A	We found no evidence that this species occurs in this climate class.
Geo-C12 (Icecap)	n - negl	N/A	We found no evidence that this species occurs in this climate class.
10-inch precipitation bands			
Geo-R1 (0-10 inches; 0-25 cm)	n - high	N/A	Two points in China near or on the border of the next precipitation zone. Answering "unknown" with max uncertainty since this

Question ID	Answer - Uncertainty	Score	Notes (and references)
			species does not grow in desert or steppe climates.
Geo-R2 (10-20 inches; 25-51 cm)	y - high	N/A	A few points in China, which are close to higher precipitation bands.
Geo-R3 (20-30 inches; 51-76 cm)	y - mod	N/A	A few points in Belgium, one in Spain. A few points in China and Japan.
Geo-R4 (30-40 inches; 76-102 cm)	y - negl	N/A	Two points in Missouri, one in WA. Many points in Europe. A few points in China and Japan.
Geo-R5 (40-50 inches; 102-127 cm)	y - negl	N/A	Many points in eastern US, a few points in Europe. A few points in China and Japan.
Geo-R6 (50-60 inches; 127-152 cm)	y - negl	N/A	Many points in eastern US. A few points in Europe.
Geo-R7 (60-70 inches; 152-178 cm)	y - negl	N/A	One point in WA. Several points in Japan. One point in China.
Geo-R8 (70-80 inches; 178-203 cm)	y - negl	N/A	A few points each in China and Japan.
Geo-R9 (80-90 inches; 203-229 cm)	y - negl	N/A	A few points in Japan, one point in China. Although there were relatively few points in this precipitation band, there were many in the 100+ band.
Geo-R10 (90-100 inches; 229-254 cm)	y - negl	N/A	A few points in Japan. Although there were relatively few points in this precipitation band, there were many in the 100+ band.
Geo-R11 (100+ inches; 254+ cm)	y - negl	N/A	A few points in China and numerous points in Japan. This species is widely distributed across Japan with precipitation bands ranging from 20-30 to 100+ inches.
ENTRY POTENTIAL			
Ent-1 (Plant already here)	y - negl	1	*Aralia elata* is present throughout much of the northeastern United States. (Kartesz 2016). A specimen was collected growing on the grounds of the US Capitol in 1886 (GBIF 2018).

Question ID	Answer - Uncertainty	Score	Notes (and references)
Ent-2 (Plant proposed for entry, or entry is imminent)	-	N/A	
Ent-3 [Human value & cultivation/trade status: (a) Neither cultivated or positively valued; (b) Not cultivated, but positively valued or potentially beneficial; (c) Cultivated, but no evidence of trade or resale; (d) Commercially cultivated or other evidence of trade or resale]	-	N/A	
Ent-4 (Entry as a contaminant)			
Ent-4a (Plant present in Canada, Mexico, Central America, the Caribbean or China)	-	N/A	
Ent-4b (Contaminant of plant propagative material (except seeds))	-	N/A	
Ent-4c (Contaminant of seeds for planting)	-	N/A	
Ent-4d (Contaminant of ballast water)	-	N/A	
Ent-4e (Contaminant of aquarium plants or other aquarium products)	-	N/A	
Ent-4f (Contaminant of landscape products)	-	N/A	
Ent-4g (Contaminant of containers, packing materials, trade goods, equipment or conveyances)	-	N/A	
Ent-4h (Contaminants of fruit, vegetables, or other products for consumption or processing)	-	N/A	
Ent-4i (Contaminant of some other pathway)	-	N/A	
Ent-5 (Likely to enter through natural dispersal)	-	N/A	

Appendix B. Maryland Filter Ranking for *Aralia elata* (Miq.) Seem. (Araliaceae)

1a There are reports of occurrences of this plant outside cultivation within Maryland and it does, or can potentially……..

2a. occupy part of two or fewer Maryland physiographic provinces……

3a. The species is documented as occurring in a state listed S1 or S2 community, OR it occurs within a population or habitat of a Threatened or Endangered species, or a CITES-listed species, OR it is documented as harming a Threatened or Endangered species in Maryland, then species is ranked Tier 1.

3b. Species is not documented as above…..Species is ranked Tier 2.

2b. occupy part of three or more Maryland physiographic provinces OR 50% or more of any one province……..

4a Species displays resistance to any herbicide OR has a seedbank of two or more years OR reproduces vegetatively…….

5a. Species has been present in Maryland for less than 50 years AND is present in fewer than 20 natural area sites AND

6a. the answers to ANY of WRA questions ES14, ES15 or ES16 are Yes, OR

6b. the answer to WRA question ES17 is equal to or greater than 2 ……..Species is ranked Tier 1

5b. Species is not as above…….Species is ranked **Tier 2**

4b. Species has none of these characters…….go to **3**

1b. There are NOT reports of occurrences of this plant outside cultivation within Maryland but it can potentially…….

7a. occupy LESS THAN part of two Maryland physiographic provinces……..go to **3**

7b. occupy part of three or more Maryland physiographic provinces, OR 50% or more of any one province….. Species is ranked Tier 1

Notes: 1a and 2b -- Plants are known to occur in at least two Maryland counties (Kartesz 2019, EDDMapS 2019), and could grow in any of Maryland's physiographic provinces (WRA Geopotential analysis). 4a -- Naka and Yoda (1984) found viable seeds in a 16 year-old oak stand in Japan so it is very likely that *A. elata* has a persistent seed bank. Plants will resprout prolifically following after cutting main stems (DCNR 2016), making the plant difficult to control. 5b --This species is recorded as growing in Washington, DC in 1830 (GBIF 2019) and so was likely planted somewhere in Maryland as well more than 20 years ago, but there is no definitive evidence for time of introduction to Maryland. None

of the answers to WRA questions ES 14 through 16 is “yes.” It is dispersed by birds and animals, but there are no other documented dispersal methods so the answer to WRA Question ES17 is 2. This combination of characters warrants a ranking of Tier 2 for *Aralia elata*.