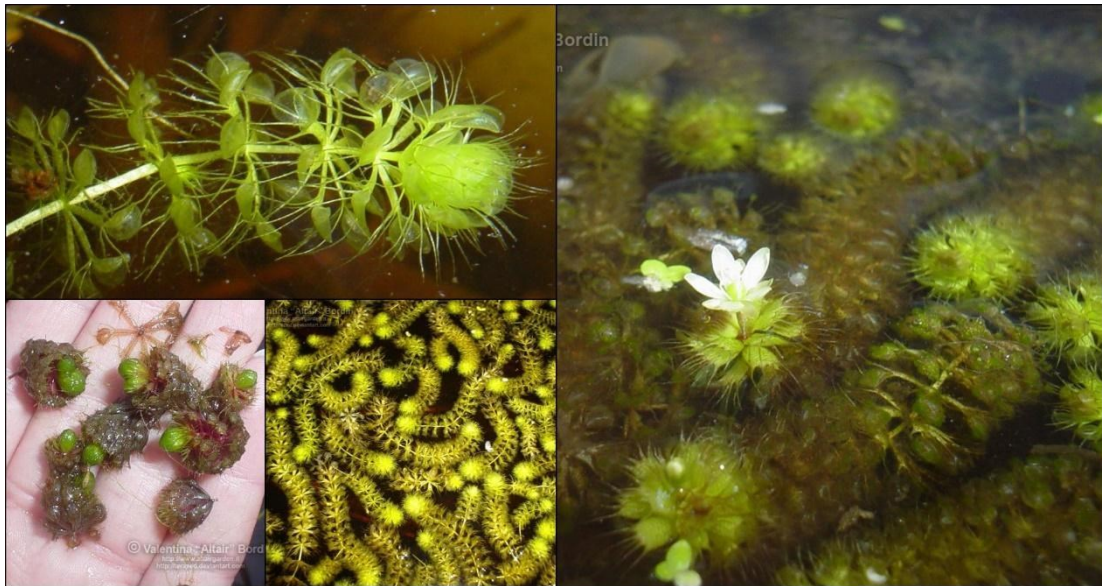


Weed Risk Assessment for *Aldrovanda vesiculosa* Linnaeus (Droseraceae) – Waterwheel



November 2025

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Resource Assessment Service



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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: *Aldrovanda vesiculosa* Linnaeus (Germplasm Resources Information Network [Internet]. Beltsville (MD): United States Department of Agriculture, Agricultural Research Service. 16 November 2020. Available from: <http://www.ars-grin.gov/>)

FAMILY: Droseraceae

SYNONYMS: N/A

COMMON NAMES: Waterwheel

BOTANICAL DESCRIPTION: *Aldrovanda vesiculosa* is a carnivorous “perennial, free-floating, rootless aquatic herbaceous plant, with a simple or sparsely branched stem possessing successive whorls of bristled, prey-catching leaves. The leaves are arranged in whorls of 4–9, measuring up to 23 mm in diameter, and are basally fused with a swollen, dorsally flattened petiole that broadens upwards before dividing into 3–8 terminal, filiform bristles of 4–8 mm length. Stem length is dependent upon water quality, prey abundance and irradiance, but is commonly between 6–20 cm” (Cross and Adamec 2020).

INITIATION: *Aldrovanda vesiculosa* was identified as a priority species for risk assessment by the Maryland Department of Natural Resources’ Invasive Species Matrix Team (ISMT). In this assessment, DNR ISMT evaluated the risk potential of this species to Maryland, to help policy makers determine whether it should be regulated in the state.

WRA AREA¹: Entire United States, including territories.

FOREIGN DISTRIBUTION: *Aldrovanda vesiculosa* is native to Eurasia, Africa, and Australia but is imperiled throughout much of that range (Floyd et al. 2015). It “has declined from 379 populations in 43 countries to only 50 confirmed extant localities, 2/3 of which are in Poland and the Ukraine” (Cross and Adamec 2020). It has been cultivated by carnivorous plant enthusiasts since the late 1980’s (Lamont et al. 2013) and has been subject to multiple introductions and reintroduction efforts to prevent global extinction (Thayer and Pfingsten, 2020). It has been introduced in Switzerland, the Netherlands and has been reintroduced to several suitable sites in the Czech Republic (Adamec 2000).

U.S. DISTRIBUTION AND STATUS: Figure 1 shows the current U.S. distribution of *Aldrovanda vesiculosa*. It has been grown by carnivorous plant enthusiasts in outdoor ponds since the 1980’s and was introduced/reported from the wild in the U.S. as early as 1999 (Lamont et al. 2013). States with introduced populations include NY, NJ, NH, and VA (Lamont et al. 2013, Floyd et al. 2015, Thayer and Pfingsten 2020). It is spreading in ponds within the Fort A.P. Hill military installation in Virginia (Floyd et al. 2015) and is listed as an “Early Detection Species” with a “Virginia Invasiveness Rank” of “High” (Heffernan et al. 2014). It is described in Virginia

¹ “WRA area” is the area in relation to which the weed risk assessment is conducted [definition modified from that for “PRA area”] (IPPC, 2017).

as being a species that is established but not widespread, and showing “highly invasive tendencies” (Heffernan et al. 2014).



Figure 1. Known occurrences of *Aldrovanda vesiculosa* in the United States. The records shown here were obtained from the USGS Nonindigenous Aquatic Species Database (Thayer and Pfingsten 2020).

3. Analysis

ESTABLISHMENT/SPREAD POTENTIAL

Aldrovanda vesiculosa exhibits an ability to establish and spread in the United States. It has been reported in four states (Figure 1) and has established itself in three- New York, New Jersey, and Virginia (Thayer and Pfingsten 2020). It has the potential to form robust colonies with dense growth in the right conditions (Lamont et al. 2013) and has increased its coverage of ponds on the Fort A.P. Hill military installation in Virginia by 57% in one year (Floyd et al. 2015). While it does produce flowers and seeds, they’re rarely successful and are unlikely to have a significant role in *A. vesiculosa*’s reproduction and spread (Cross et al. 2015, Cross and Adamec 2020). Instead, this species’ reproduction is primarily vegetative, with individual plants growing continuously in the right conditions and doubling in mass in as little as 12 days (Adamec 2000). It forms dormant buds called “turions” that sink to the bottom of the water body

to overwinter, with new plants growing from these structures in the spring (Breckpot 1997, Cross and Adamec 2020). It has been cultivated in outdoor ponds by carnivorous plant enthusiasts since the late 1980's (Lamont et al. 2013) and has been intentionally released into the wild by these groups in instances of "managed relocation" or "assisted colonization" in attempts to save the species from global extinction (Thayer and Pfingsten 2020). *Aldrovanda vesiculosa*'s spread to new habitats is most likely a direct result of these intentional releases, or natural spread from those original release points. Whole plants, plant fragments, or turions may be transported by birds, flowing water, or boats and other contaminated recreation equipment (Adamec 2005, Breckpot 1997, Floyd et al. 2015, Lamont et al. 2013). We had very low uncertainty for this risk element.

Risk score = 12

Uncertainty index = 0.06

IMPACT POTENTIAL

As a result of this species' recent and limited presence in the United States, there is limited information on its impacts as an invasive. *Aldrovanda vesiculosa* is neither allelopathic nor parasitic, but as a carnivorous plant it is a predator of zooplankton and small aquatic invertebrates. Each mature plant may contain as many as 200 traps, and one study found as many as 40% of traps on a given plant containing captured prey (Cross et al. 2015). As such, there is concern that this species could outcompete native species for zooplankton resources in certain habitats (Floyd et al. 2015). Additionally, *A. vesiculosa* has the potential to form dense floating mats under optimal conditions, which may then shade out native aquatic macrophytes (Floyd et al. 2015, Lamont et al. 2013). Dense growth could clog waterways and irrigation channels, and it could become a pest in ornamental water gardens if it was to enter them unintentionally. We had very low uncertainty for this risk element.

Risk score = 2.3

Uncertainty index = 0.06

GEOGRAPHIC POTENTIAL

Based on three climatic variables, we estimate that about 61 percent of the United States is suitable for the establishment of *Aldrovanda vesiculosa* (Fig. 2). This predicted distribution is based on the species' known distribution elsewhere in the world, using evidence from both point-referenced localities and general areas of occurrence. The map for *Aldrovanda vesiculosa* represents the joint distribution of Plant Hardiness Zones 4-13, areas with 10-100+ inches of annual precipitation, and the following Köppen-Geiger climate classes: tropical savanna, steppe, Mediterranean, humid subtropical, marine west coast, and humid continental cool summer. 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. As an aquatic plant that is sensitive to desiccation (Breckpot 1997), *A. vesiculosa* could only survive in habitats with permanent surface water.

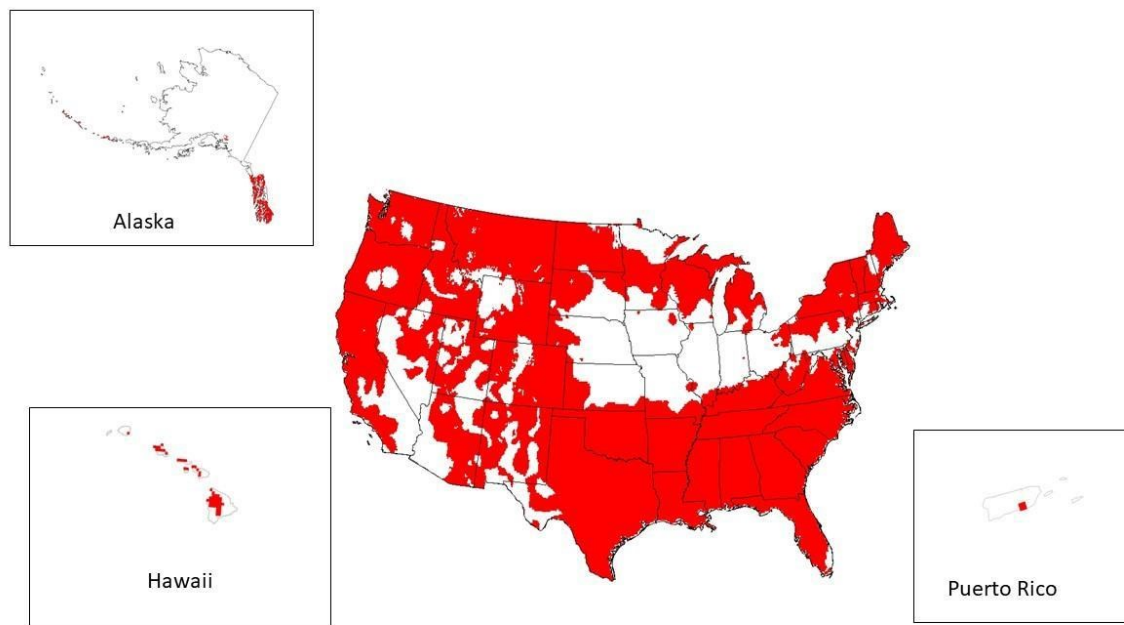


Figure 2. Potential geographic distribution of *Aldrovanda vesiculosa* in the United States and Canada. Map insets for Alaska, Hawaii, and Puerto Rico are not to scale. For additional on PPQ's climate-matching process see Magarey et al., (2017).

ENTRY POTENTIAL

We did not assess the entry potential of *Aldrovanda vesiculosa* because it is already present in the United States (Lamont et al. 2013, Floyd et al. 2015, Thayer and Pfingsten 2020) (Fig. 1).

4. Predictive Risk Model Results

Model Probabilities: P(Major Invader) = 51.9%
P(Minor Invader) = 45.4%
P(Non-Invader) = 2.7%

Risk Result = High Risk

Secondary Screening = Not applicable

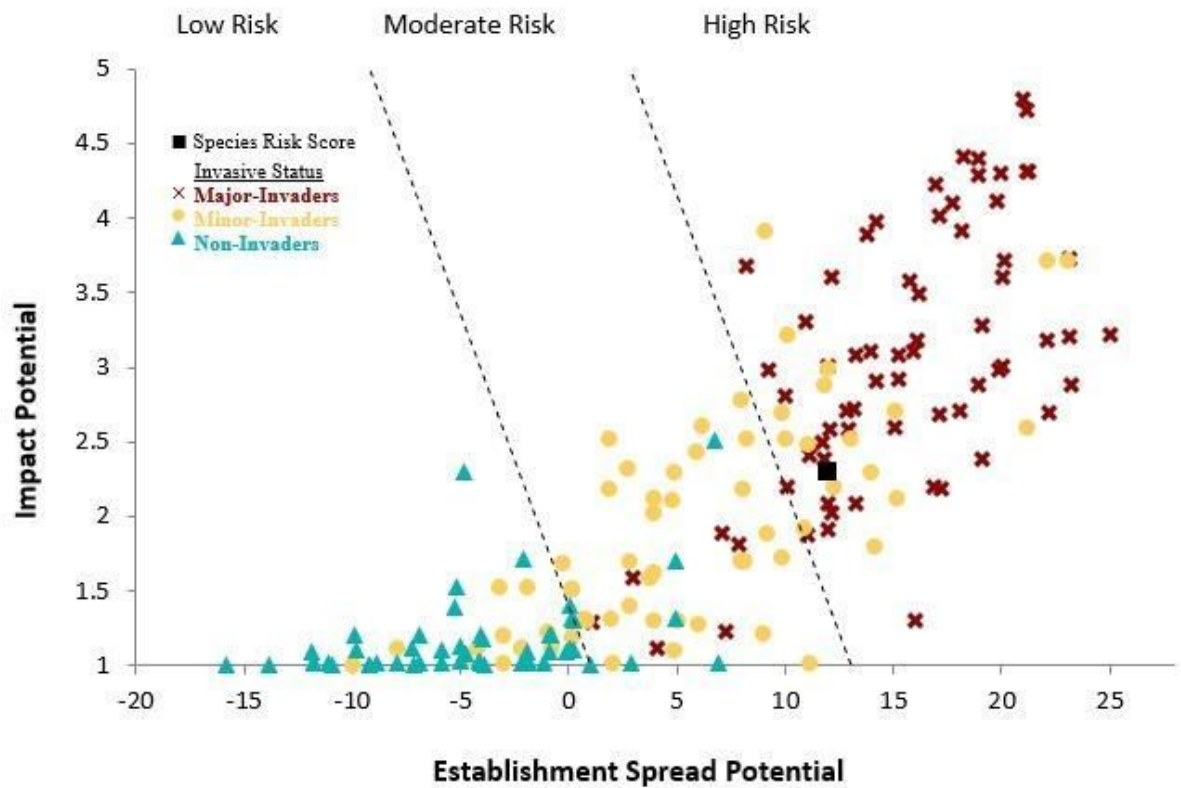


Figure 3. *Aldrovanda vesiculosa* risk score (black box) relative to the risk scores of species used to develop and validate the PPQ WRA model (other symbols). See Appendix A for the complete assessment.

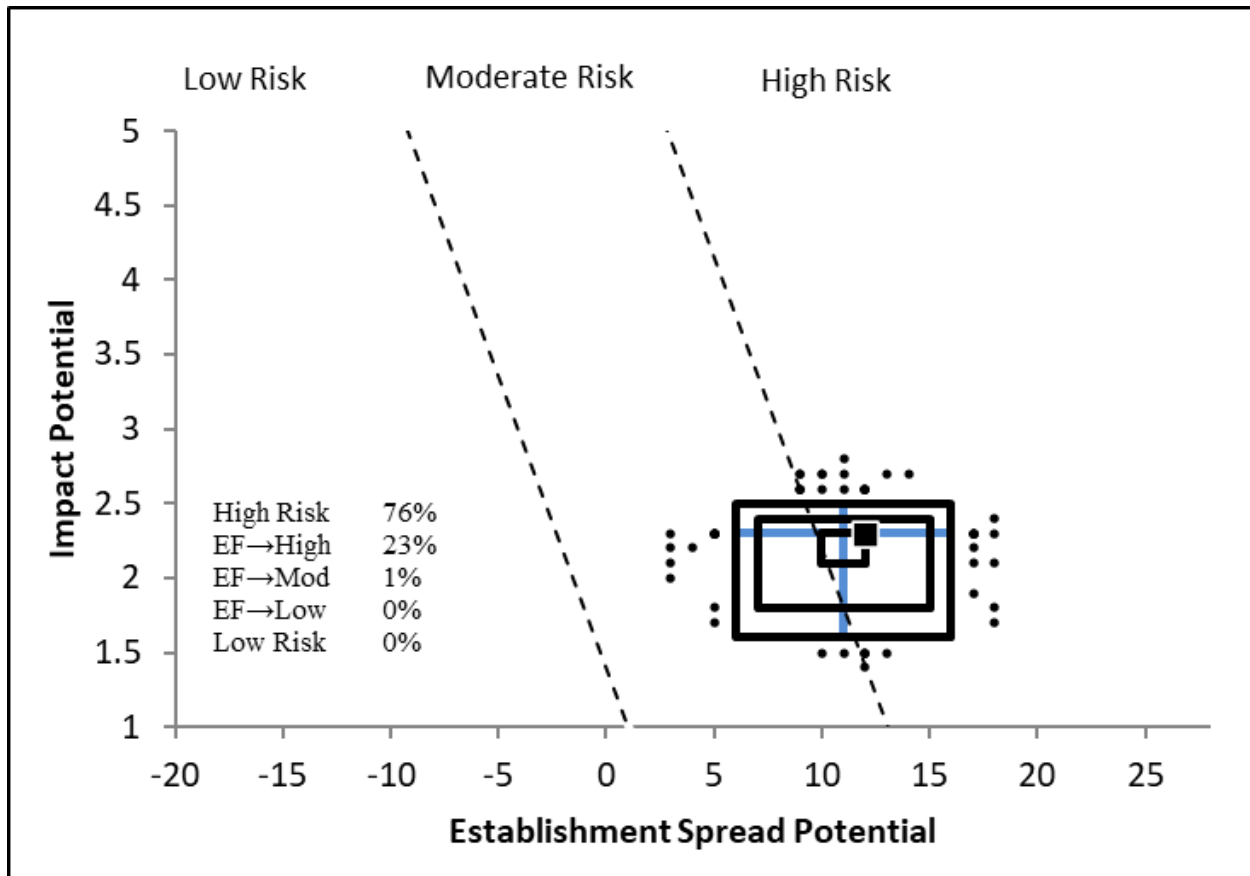


Figure 4. Model simulation results (N=5,000) for uncertainty around the risk score for *Aldrovanda vesiculosa*. The blue “+” symbol represents the medians of the simulated outcomes. The smallest box contains 50 percent of the outcomes, the second 95 percent, and the largest 99 percent.

5. Discussion

The result of the weed risk assessment for *Aldrovanda vesiculosa* is High Risk of becoming weedy or invasive in the United States. We had a generally low level of uncertainty about this species’ ability to establish and spread, but higher uncertainty regarding its potential impact. This is due largely to *A. vesiculosa*’s relatively recent arrival in the United States and limited information describing its behavior in non-native environments. While declining in its native range, *Aldrovanda vesiculosa* is seemingly successful where it has been introduced in the United States. Where native, this species is described as a poor competitor that is sensitive to habitat degradation and water quality changes (primarily eutrophication) (Cross et al. 2015, Cross and Adamec 2020). As a result, its abundance has declined by 87% throughout its native range (Cross et al. 2015) and it has been described as “critically endangered” throughout much of Europe since 1982 (Cross and Adamec 2020). Despite its imperiled status in its native range, *A. vesiculosa* seems to have found success in the few non-native habitats in the United States where it has established. Following introductions by concerned carnivorous plant enthusiasts

attempting to shore up the species against global extinction, *Aldrovanda vesiculosa* has established introduced populations in NY, NJ, and VA that may now rival those in its native range (Lamont et al. 2013, Thayer and Pfingsten 2020). It forms dense floating colonies under the right conditions (full sunlight, warm water, and pH >5.8)(Lamont et al. 2013) and is capable of rapid growth, increasing its coverage in infested ponds within the Fort A.P. Hill military installation in Virginia by 57% in one year (Floyd et al. 2015). *Aldrovanda vesiculosa*'s establishment in North American aquatic habitats may have a significant impact on invertebrate and zooplankton communities, with individual plants containing as many as 200 traps that have a capture efficiency of up to 40% (Cross et al. 2015). As such, *A. vesiculosa* may compete with native aquatic carnivorous plants (e.g., *Utricularia*), and could reduce populations of rare aquatic invertebrates through predation (Floyd et al. 2015, Thayer and Pfingsten 2020), especially in sensitive aquatic habitats. Additionally, thick growth of *Aldrovanda vesiculosa* could shade out native aquatic macrophytes (Floyd et al. 2015) and may even clog waterways used for fishing, boating, and irrigation. It is currently listed in Virginia as an "Early Detection Species" with a "Virginia Invasiveness Rank" of "High", indicating that, while not yet widespread, it has shown "highly invasive tendencies" (Heffernan et al. 2014). If this species expands beyond these initially introduced U.S. populations and continues to find the same levels of success, it could prove itself to be a damaging aquatic invader.

Results of the Maryland Filter (Appendix B) suggest that *A. vesiculosa* should be ranked a Tier 2 species. The geographic distribution analysis of this weed risk assessment suggests that at least three physiographic provinces of Maryland may be suitable for establishment.

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Appendix A. Weed risk assessment for *Aldrovanda vesiculosa* Linnaeus (Droseraceae)

Weed risk assessment for *Aldrovanda vesiculosa* Linnaeus (Droseraceae). 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]	e - negl	2	<i>Aldrovanda vesiculosa</i> is native to parts of Europe, Asia, Africa, and Australia and is in decline globally (Cross 2013). It was introduced in the U.S. as early as 1990 and has been reported as established in 4 states (NH, NJ, NY, VA) (Thayer and Pfingsten 2020). A population in VA at Fort A.P. Hill is spreading in multiple ponds on the base (Floyd et al. 2015).
ES-2 (Is the species highly domesticated)	n - negl	0	Carnivorous plant enthusiasts began growing <i>Aldrovanda vesiculosa</i> in the 1980's, but it has not been domesticated to be selected for specific traits.
ES-3 (Significant weedy congeners)	n - negl	0	<i>Aldrovanda</i> is a monotypic genus. There are no congeners (Floyd et al. 2015).
ES-4 (Shade tolerant at some stage of its life cycle)	y - mod	1	<i>Aldrovanda vesiculosa</i> is said to be a poor competitor than can be shaded out by other macrophytes. Turions can survive months under ice (Breckpot 1997). In an introduced population in NY the most robust plants grow in full sunlight (Lamont et al. 2013).
ES-5 (Plant a vine or scrambling plant, or forms tightly appressed basal rosettes)	n - mod	0	" <i>Aldrovanda vesiculosa</i> L., is a free-floating, rootless, ...submersed aquatic vascular plant [with a] ...whorled leaf arrangement along the stem [that is] ...usually less than 20 cm in total length." (Thayer and Pfingsten, 2020). An individual plant is not likely to shade out or smother other plants.

Question ID	Answer - Uncertainty	Score	Notes (and references)
ES-6 (Forms dense thickets, patches, or populations)	y - low	2	In ponds in VA, <i>Aldrovanda vesiculosa</i> has formed dense floating mats that could shade out other plants (Floyd et al. 2015). It appears to compete poorly with floating and emergent macrophytes and is limited predominantly to specific microhabitats (Cross et al. 2015). " <i>Aldrovanda</i> is a weak competitor and, presumably, cannot outcompete any plant species even in its dense stands." (Adamec 2005). <i>Aldrovanda vesiculosa</i> can form dense floating mats but apparently only in specific conditions.
ES-7 (Aquatic)	y - negl	1	Floating aquatic plant that is very susceptible to desiccation (Breckpot 1997).
ES-8 (Grass)	n - negl	0	<i>Aldrovanda vesiculosa</i> L., is a free-floating, rootless, ...submersed aquatic vascular plant" (Thayer and Pfingsten, 2020).
ES-9 (Nitrogen-fixing woody plant)	n - negl	0	<i>Aldrovanda vesiculosa</i> L., is a free-floating, rootless, ...submersed aquatic vascular plant" (Thayer and Pfingsten, 2020).
ES-10 (Does it produce viable seeds or spores)	y - negl	1	"Seeds number mostly 6-8 per capsule" (Breckpot 1997). "Seeds are unlikely to play a significant role in seasonal persistence or dispersal, with poor floral success (c. 10%), few seeds produced, low seed viability (<50%)" (Cross et al. 2015). "Seed set was low, ranging from one to nine seeds per fruit" (Cross et al. 2015). "Flowering in <i>A. vesiculosa</i> is rare and poorly successful, highly variable between season and populations, and yields exceedingly low numbers of viable seed even under optimum conditions (Cross 2012)." <i>Aldrovanda vesiculosa</i> does produce seeds, but not in abundance and not all of them are viable.
ES-11 (Self-compatible or apomictic)	y - low	1	"Even under the best conditions flowers produce very few viable seeds, with those that are produced suspected to be from self-pollination." (Cross and Adamec 2020)

Question ID	Answer - Uncertainty	Score	Notes (and references)
ES-12 (Requires specialist pollinators)	? - high	0	It is unknown if a specialist pollinator is required. <i>Aldrovanda</i> has poor (10%) floral success (Cross 2013, Cross et al. 2015). Even under the best conditions flowers produce very few viable seeds, with those that are produced suspected to be from self-pollination (Cross and Adamec 2020). Reproduction is primarily vegetative (Cross and Adamec 2020).
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]	a - low	2	Primary reproduction is vegetative. In the right conditions <i>Aldrovanda vesiculosa</i> plants can double in mass in 12 days (Adamec 2000).
ES-14 (Prolific seed producer)	n - negl	-1	Seeds number mostly 6-8 per capsule (Breckpot 1997). "Even under the best conditions flowers produce very few viable seeds" (Cross and Adamec 2020).
ES-15 (Propagules likely to be dispersed unintentionally by people)	? - mod	0	<i>Aldrovanda vesiculosa</i> has formed dense populations in ponds used for fishing and boating in VA (Floyd et al. 2015). Contamination is possible. That said, it is "very susceptible to desiccation" (Breckpot 1997), so plants may not survive the move to a new water body. Overwintering buds (turions) that would be more tolerant of drying sink to the bottom (Cross and Adamec 2020, Breckpot 1997) where they may be less likely to be picked up.
ES-16 (Propagules likely to disperse in trade as contaminants or hitchhikers)	n - mod	-1	Seeds are uncommon (Breckpot 1997, Cross and Adamec 2020) and are thus unlikely to be a contaminant. Entire plants could be included as contaminants with aquatic plants intended for the aquarium/water garden trade (speculation).
ES-17 (Number of natural dispersal vectors)	2	0	0
ES-17a (Wind dispersal)	n - negl		<i>Aldrovanda vesiculosa</i> does not have morphological adaptations to facilitate wind dispersal.
ES-17b (Water dispersal)	y - negl		<i>Aldrovanda vesiculosa</i> a floating aquatic plant. Entire plants, seeds, and turions

Question ID	Answer - Uncertainty	Score	Notes (and references)
			can disperse in flowing water (Breckpot 1997).
ES-17c (Bird dispersal)	y - mod		"A turion, seed, or less likely a whole plant may get stuck to a bird's legs or feathers and thus be carried to another place. Theoretically, a seed could, once eaten, land somewhere else via the excrements of the bird. The similarity between the worldwide distribution of <i>Aldrovanda</i> and the routes of some migratory birds is remarkable" (Breckpot 1997). One study showed that birds may not be the most reliable dispersal vector: "No intact seeds were recovered from bird feces during experimental feeding trials, and no seeds were recovered from food or water bowls to indicate regurgitation within the 24 h period" (Cross et al. 2015).
ES-17d (Animal external dispersal)	n - low		There are no obvious mechanisms for external attachment to animals.
ES-17e (Animal internal dispersal)	n - low		Seeds are uncommon and did not survive the digestive tract of a bird (Cross et al. 2015).
ES-18 (Evidence that a persistent (>1yr) propagule bank (seed bank) is formed)	n - low	-1	"Few seeds produced, low seed viability (<50%) throughout the study area and no seeds recovered from the sediment seed bank" (Cross et al. 2015). Turions only survive into the next growing season.
ES-19 (Tolerates/benefits from mutilation, cultivation or fire)	y - mod	1	This species reproduces vegetatively. Cutting/mutilating individual plants can produce multiple viable fragments (speculation).
ES-20 (Is resistant to some herbicides or has the potential to become resistant)	n - negl	0	This species is not known to be resistant to herbicides.
ES-21 (Number of cold hardiness zones suitable for its survival)	10	1	
ES-22 (Number of climate types suitable for its survival)	6	2	
ES-23 (Number of precipitation bands suitable for its survival)	10	1	
IMPACT POTENTIAL			
General Impacts			

Question ID	Answer - Uncertainty	Score	Notes (and references)
Imp-G1 (Allelopathic)	n - negl	0	There is no evidence to suggest that <i>Aldrovanda vesiculosa</i> is allelopathic.
Imp-G2 (Parasitic)	n - negl	0	There is no evidence to suggest that <i>Aldrovanda vesiculosa</i> is parasitic.
Impacts to Natural Systems			
Imp-N1 (Changes ecosystem processes and parameters that affect other species)	y - mod	0.4	May alter aquatic food webs: "Impact on native aquatic invertebrate communities may be significant. With up to c. 40% of traps containing captured prey in suitable microhabitats, and approximately 200 traps per individual in these areas, it is evident that large numbers of invertebrates are captured" (Cross et al. 2015).
Imp-N2 (Changes habitat structure)	y - mod	0.2	This species may alter aquatic plant communities and habitats:
Imp-N3 (Changes species diversity)	y - mod	0.2	This species may impact zooplankton and invertebrate diversity: "Impact on native aquatic invertebrate communities may be significant. With up to c. 40% of traps containing captured prey in suitable microhabitats, and approximately 200 traps per individual in these areas, it is evident that large numbers of invertebrates are captured" (Cross et al. 2015). "There are concerns that <i>Aldrovanda</i> could outcompete native species for zooplankton resources" (Floyd et al. 2015). It may also shade out native aquatic plants. "There are concerns that <i>Aldrovanda</i> could ... shade out native aquatic plants with dense floating mats" (Floyd et al. 2015).
Imp-N4 (Is it likely to affect federal Threatened and Endangered species?)	y - mod	0.1	This species may impact Federal T&E invertebrate and zooplankton species. "Impact on native aquatic invertebrate communities may be significant. With up to c. 40% of traps containing captured prey in suitable microhabitats, and approximately 200 traps per individual in these areas, it is evident that large numbers of invertebrates are captured" (Cross et al. 2015). "There are concerns that <i>Aldrovanda</i> could outcompete native species for zooplankton resources" (Floyd et al. 2015).

Question ID	Answer - Uncertainty	Score	Notes (and references)
Imp-N5 (Is it likely to affect any globally outstanding ecoregions?)	y - low	0.1	Based on the impacts listed in Imp-N1 through Imp-N3, this plant could alter globally outstanding wetland and riparian habitats in the United States where it does not yet occur, such as the Florida Everglades (Ricketts et al. 1999).
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]	b - negl	0.2	This species is listed in VA: " <i>Aldrovanda</i> is listed as an 'Early Detection Species' in Virginia with a 'Virginia Invasiveness Rank' of 'High'. " There is currently no evidence of management or control.
Impact to Anthropogenic Systems (e.g., cities, suburbs, roadways)			
Imp-A1 (Negatively impacts personal property, human safety, or public infrastructure)	n - negl	0	<i>Aldrovanda vesiculosa</i> is not likely to negatively impact personal property, human safety, or infrastructure.
Imp-A2 (Changes or limits recreational use of an area)	y - mod	0.1	<i>Aldrovanda vesiculosa</i> could clog waterways with thick growth under certain conditions. It grows abundantly in ponds in VA that are used for fishing and boating where it forms "dense floating mats" (Floyd et al. 2015, Lamont et al. 2013).
Imp-A3 (Affects desirable and ornamental plants, and vegetation)	n - negl	0	This species could outcompete desirable plants in water gardens when/if it is able to grow prolifically, as it can form "dense floating mats" (Floyd et al. 2015, Lamont et al. 2013) but there are no current reports. That said, it is itself a desirable plant for carnivorous plant enthusiasts and is intentionally cultured (Cross et al. 2015, Lamont et al. 2013, Thayer and Pfingsten 2020).
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]	a - negl	0	There is no evidence to suggest that this species is a weed in anthropogenic systems.
Impact to Production Systems (agriculture, nurseries, forest plantations, orchards, etc.)			
Imp-P1 (Reduces crop/product yield)	n - negl	0	There is no evidence to suggest that this species reduces crop or commodity yields.
Imp-P2 (Lowers commodity value)	n - negl	0	There is no evidence to suggest that this species lowers commodity values.

Question ID	Answer - Uncertainty	Score	Notes (and references)
Imp-P3 (Is it likely to impact trade?)	n - low	0	This species is not listed as a weed and is unlikely to impact trade.
Imp-P4 (Reduces the quality or availability of irrigation, or strongly competes with plants for water)	n - mod	0	There is no current information suggesting that this species could impact irrigation. That said, it is capable of forming dense mats under the right conditions (Floyd et al. 2015, Lamont et al. 2013) and could theoretically clog irrigation channels.
Imp-P5 (Toxic to animals, including livestock/range animals and poultry)	n - negl	0	There is no evidence suggesting that this species is toxic. Its seeds and turions are consumed by birds (Cross et al. 2015)
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 - negl	0	There is no evidence to suggest that this species is a weed in production systems.
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	There were no occurrences in this zone
Geo-Z2 (Zone 2)	n - negl	N/A	There were no occurrences in this zone
Geo-Z3 (Zone 3)	n - negl	N/A	There were no occurrences in this zone
Geo-Z4 (Zone 4)	y - mod	N/A	There were few occurrences in this zone
Geo-Z5 (Zone 5)	y - mod	N/A	There were few occurrences in this zone
Geo-Z6 (Zone 6)	y - low	N/A	There were several occurrences in this zone
Geo-Z7 (Zone 7)	y - negl	N/A	There were numerous occurrences in this zone
Geo-Z8 (Zone 8)	y - negl	N/A	There were numerous occurrences in this zone
Geo-Z9 (Zone 9)	y - negl	N/A	There were numerous occurrences in this zone
Geo-Z10 (Zone 10)	y - negl	N/A	There were numerous occurrences in this zone
Geo-Z11 (Zone 11)	y - negl	N/A	There were numerous occurrences in this zone
Geo-Z12 (Zone 12)	y - negl	N/A	There were numerous occurrences in this zone

Question ID	Answer - Uncertainty	Score	Notes (and references)
Geo-Z13 (Zone 13)	y - negl	N/A	There were numerous occurrences in this zone
Köppen -Geiger climate classes			
Geo-C1 (Tropical rainforest)	n - negl	N/A	There were no occurrences in this class
Geo-C2 (Tropical savanna)	y - negl	N/A	There were multiple occurrences in this class
Geo-C3 (Steppe)	y - negl	N/A	There were multiple occurrences in this class
Geo-C4 (Desert)	n - negl	N/A	There were no occurrences in this class
Geo-C5 (Mediterranean)	y - negl	N/A	There were multiple occurrences in this class
Geo-C6 (Humid subtropical)	y - negl	N/A	There were multiple occurrences in this class
Geo-C7 (Marine west coast)	y - negl	N/A	There were multiple occurrences in this class
Geo-C8 (Humid cont. warm sum.)	n - negl	N/A	There were no occurrences in this class
Geo-C9 (Humid cont. cool sum.)	y - negl	N/A	There were multiple occurrences in this class
Geo-C10 (Subarctic)	n - negl	N/A	There were multiple occurrences in this class
Geo-C11 (Tundra)	n - negl	N/A	There were multiple occurrences in this class
Geo-C12 (Iceland)	n - negl	N/A	There were multiple occurrences in this class
10-inch precipitation bands			
Geo-R1 (0-10 inches; 0-25 cm)	n - negl	N/A	There were no occurrences in this band
Geo-R2 (10-20 inches; 25-51 cm)	y - negl	N/A	There were multiple occurrences in this band
Geo-R3 (20-30 inches; 51-76 cm)	y - negl	N/A	There were multiple occurrences in this band
Geo-R4 (30-40 inches; 76-102 cm)	y - negl	N/A	There were multiple occurrences in this band
Geo-R5 (40-50 inches; 102-127 cm)	y - negl	N/A	There were multiple occurrences in this band
Geo-R6 (50-60 inches; 127-152 cm)	y - low	N/A	There were few occurrences in this band
Geo-R7 (60-70 inches; 152-178 cm)	y - low	N/A	There were few occurrences in this band
Geo-R8 (70-80 inches; 178-203 cm)	y - low	N/A	There were few occurrences in this band
Geo-R9 (80-90 inches; 203-229 cm)	y - high	N/A	There were no occurrences in this band, but there were multiples in surrounding bands

Question ID	Answer - Uncertainty	Score	Notes (and references)
Geo-R10 (90-100 inches; 229-254 cm)	y - high	N/A	There were no occurrences in this band, but there were multiples in surrounding bands
Geo-R11 (100+ inches; 254+ cm)	y - mod	N/A	There were few occurrences in this band
ENTRY POTENTIAL			
Ent-1 (Plant already here)	y - negl	1	Aldrovanda vesiculosa is reported from 4 US states: New Hampshire, New Jersey, New York, Virginia. Established in NJ, NY, and VA (Thayer and Pfingsten 2020).
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	

Question ID	Answer - Uncertainty	Score	Notes (and references)
Ent-5 (Likely to enter through natural dispersal)	-	N/A	

Appendix B. Maryland Filter Ranking for *Aldrovanda vesiculosa* Linnaeus (Droseraceae)

Maryland Filter Questions	Answer	Instructions/ Result	Notes/ Justification
1. Is the plant currently naturalized in Maryland? Yes OR No	No	Go to Question 2.	There are no reported occurrences of this species in Maryland based on the USGS NAS database (Thayer and Pfingsten 2020). The nearest established population is in Virginia (Thayer and Pfingsten 2020).
2. What is the species' potential distribution in Maryland? Wide OR Narrow	Wide	Go to Question 4.	The geographic potential distribution generated by this assessment (Fig. 2) indicates that this species could potentially establish in three physiographic provinces including the Coastal Plain, Piedmont, and the Allegheny Plateau.
3. Does or could the species harm threatened or endangered Maryland species or community types or CITES listed species occurring in Maryland? Yes OR No	No	Tier 2	This species has the potential to form dense mats that may impact native vegetation. As a carnivorous plant, it also has the potential to affect native macroinvertebrate species. However, to date, there have been no studies that have linked the spread of this species to declines in native, threatened or endangered species.
4. How feasible is control of the species? Easy OR Difficult	Easy	Go to Question 3.	This species is not known to be resistant to herbicides.

5. Is added propagule pressure from sales significantly increasing potential of the species to persist and spread? Yes OR No			Question 5 was not answered because Question 3 resulted in a ranking of Tier 2.
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