UF IFAS UNIVERSITY of FLORIDA

Assessment of Non-native Plants in Florida's Natural Areas

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ALL ZONES

Assessment date: 9/28/2021 Prepared by Christian Wanamaker

	Vallisneria sprialis X denseserrulata	**Answer**	**Score**
1.01	Is the species highly domesticated?	n	0
1.02	Has the species become naturalised where grown?	0	
1.03	Does the species have weedy races?	0	
2.01	Species suited to Florida's USDA climate zones (0-low; 1-intermediate; 2-high) North Zone: suited to Zones 8, 9 Central Zone: suited to Zones 9, 10 South Zone: suited to Zone 10	3	
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	3	
2.03	Broad climate suitability (environmental versatility)	y	1
2.04	Native or naturalized in habitats with periodic inundation North Zone: mean annual precipitation 50-70 inches Central Zone: mean annual precipitation 40-60 inches South Zone: mean annual precipitation 40-60 inches	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	2
3.02	Garden/amenity/disturbance weed	?	
3.03	Weed of agriculture	?	
3.04	Environmental weed	?	
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	?	
4.03	Parasitic	?	
4.04	Unpalatable to grazing animals	?	
4.05	Toxic to animals	n	0
4.06	Host for recognised pests and pathogens	?	
4.07	Causes allergies or is otherwise toxic to humans	?	
4.08	Creates a fire hazard in natural ecosystems	n	0
4.09	Is a shade tolerant plant at some stage of its life cycle	y	1
4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils). North & Central Zones: infertile soils; South Zone: shallow limerock or Histisols.	n	0
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets	y	1
5.01	Aquatic	y	5
5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte	n	0
6.01	Evidence of substantial reproductive failure in native habitat	?	
6.02	Produces viable seed	?	

6.03	Hybridizes naturally	?	
6.04	Self-compatible or apomictic	n	-1
6.05	Requires specialist pollinators	?	
6.06	Reproduction by vegetative propagation	y	1
6.07	Minimum generative time (years)	?	
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y	1
7.02	Propagules dispersed intentionally by people	y	1
7.03	Propagules likely to disperse as a produce contaminant	n	-1
7.04	Propagules adapted to wind dispersal	?	
7.05	Propagules water dispersed	?	
7.06	Propagules bird dispersed	?	
7.07	Propagules dispersed by other animals (externally)	?	
7.08	Propagules dispersed by other animals (internally)	?	
8.01	Prolific seed production	n	-1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	?	
8.03	Well controlled by herbicides	?	
8.04	Tolerates, or benefits from, mutilation or cultivation	?	
8.05	Effective natural enemies present in U.S.	?	
	Total Score	**13**	
	Implemented Pacific Second Screening	**no**	
	Risk Assessment Results	**reject**	

section	**# questions answered**	**satisfy minimum?**
A	8	yes
B	7	yes
C	10	yes
total	25	yes

	Evidence	Reference
1.01	Several species of Vallisneria (including V. spiralis and V. densuserrulata) are popular in the ornamental aquarium horticulture trade (Les et al., 2008). Believed to be a hybrid resulting from the nursery trade, whether the hybridization event was accidental or deliberate is unknown (Wasekura et al., 2016). At present there is no information to support that cultivation of Vallisneria species has resulted in modification of traits likely to reduce weed risk.	1. Les, D., Jacobs, S., Tippery, N., Chen, L., Moody, M., & Wilstermann-Hildebrand, M. (2008). Systematics of Vallisneria (Hydrocharitaceae). Systematic Botany, 33, 49–65. https://doi.org/10.1600/036364408783887483 2. Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002
1.02	Skip	0
1.03	Skip	0
2.01	There is, at this point, very little reliable occurrence data. Occurrences in southern Florida (Boynton Beach area), central Florida (Tampa Bay and Lakeland), and northern Alabama (Gorham et al., 2021; Tringali et al., 2023), indicating it is well suited to Florida's climate.	1. Gorham, S. B., Seyoum, S., Furman, B. T., Darnell, K. M., Reynolds, L. K., & Tringali, M. D. (2021). Molecular detection of a non-native hybrid eelgrass, Vallisneria spiralis Linnaeus (1753) × V. denseserrulata Makino (1921), in the southeastern United States. Aquatic Botany, 175, 103445. https://doi.org/10.1016/j.aquabot.2021.103445 2. Tringali, M. D., Gorham, S. B., Seyoum, S., Puchulutegui, C., Bass, M. S., Furman, B. T., & Mallison, C. (2023). A PCR assay for the detection of introduced Vallisneria spiralis, V. denseserrulata and their hybrids. Conservation Genetics Resources, 15(3), 125–133. https://doi.org/10.1007/s12686-023-01311-9
2.02	No computer analysis was performed.	0
2.03	Range in Japan is within Koppen Geiger zone Cwa, and the range in the southeast United States crosses Cwa, Af, and Am.	0
2.04	The current known distribution of this hybrid (in south and central Florida and southern Japan) includes regions which receive between 60 and 80 inches of rain annually. (National Weather Service, 2021).	1. National Weather Service. (retrieved October 2021). NOWData - NOAA Online Weather Data. https://www.weather.gov/wrh/Climate?wfo=mfl

2.05	Considering this difficult-to-identify hybrid can be found in both Japan and the southeastern United States, and is likely from from the aquarium trade where it may be mislabeled as Vallisneria spiralis (Gorham et al., 2021; Wasekura et al., 2016), we can infer this species has been repeatedly introduced. Gorham et al. (2021) also believe "that either it was introduced multiple times or has gone unnoticed in native populations for decades."	1. Gorham, S. B., Seyoum, S., Furman, B. T., Darnell, K. M., Reynolds, L. K., & Tringali, M. D. (2021). Molecular detection of a non-native hybrid eelgrass, Vallisneria spiralis Linnaeus (1753) × V. denseserrulata Makino (1921), in the southeastern United States. Aquatic Botany, 175, 103445. https://doi.org/10.1016/j.aquabot.2021.103445 2.Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002
3.01	Per the guidelines, taxon is a horticulturally produced hybrid with no native range, so naturalization anywhere is sufficient for a 'yes' response.	0
3.02	No evidence. This taxon is poorly studied.	0
3.03	No evidence. This taxon is poorly studied.	0
3.04	Authors speculate that this taxon "may outcompete indigenous submerged aquatic species and rapidly occupy areas in rivers or drainages." Further going on to describe how "In the lower reaches of the Nagara River (Pop3), the hybrid Vallisneria grows thickly in the kilometer ranges (S. Fujii, personal observation) and overgrows exclusively in Pop 2, 4, 5, and 8, although the inhabiting ranges are at present restricted to tens or hundreds of meters (H. Wasekura, S. Fujii, and M. Maki Maki, personal observation)." However later they acknowledge the purely observational nature of these impacts, " The actual situation of this submerged plant and its impact on water ecosystems must	Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002
3.05	V. nana and V. spiralis are both named as non-native aquatic plants of concern in Europe (Hussner, 2012).	Hussner, A. (2012). Alien aquatic plant species in European countries. Weed Research, 52(4), 297–306. https://doi.org/10.1111/j.1365-
4.01	No evidence.	0
4.02	No evidence.	0
4.03	No evidence.	0
4.04	No evidence.	0

4.05	No evidence of toxicity. Les et al., (2008) write of the genus Vallisneria: "Ecologically, the plants are an important source of food for a variety of wildlife. The buds, foliage, fruits, roots and tubers are eaten by many waterfowl (Martin and Uhler 1939; McAtee 1939; Schloesser and Manny 1990; Zhang and Lu 1999) and augment the diets of various freshwater crabs, herbivorous fish, manatees, moose, muskrats and turtles (de Vos 1958; Bengtson 1983; Zu et al. 1999; Armstrong and Booth 2005). The leaves support large populations of aquatic	1. Les, D., Jacobs, S., Tippery, N., Chen, L., Moody, M., & Wilstermann-Hildebrand, M. (2008). Systematics of Vallisneria (Hydrocharitaceae). Systematic Botany, 33, 49–65. https://doi.org/10.1600/036364408783887483
4.06	No evidence.	0
4.07	No evidence.	0
4.08	No direct evidence, but considering this is a submerged aquatic taxon (see 5.01), we answer	0
4.09	"Submerged rosulate, stoloniferous, evergreen perennial… Growing in 0.1–1.0 m (or more?) depth, (Wasekura et al., 2016). Per the guidelines, submerged aquatic species result in "yes" response.	Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002
4.10	A submerged aquatic species, it grows on the bottom of bodies of water.	0
4.11	0	0
4.12	"It usually grows densely as carpet-like population covering bottoms of rivers, and looks to become exclusive against other submerged water plants. The ligunified stem may contribute to forming dense and permanent populations," (Wasekura et al., 2016).	Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002

5.01	"Submerged … Farm courses, creeks, rivers, especially where flows are slow and water fluctuation is little or stable. Growing in 0.1–1.0 m (or more?) depth." (Wasekura et al., 2016). "Vallisneria species are… submersed, freshwater aquatics," (Les et al., 2008).	1.Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002 2. Les, D., Jacobs, S., Tippery, N., Chen, L., Moody, M., & Wilstermann-Hildebrand, M. (2008). Systematics of Vallisneria (Hydrocharitaceae). Systematic Botany, 33, 49–65. https://doi.org/10.1600/036364408783887483
5.02	Placed in family Hydrocharitaceae (Les et al., 2008).	1. Les, D., Jacobs, S., Tippery, N., Chen, L., Moody, M., & Wilstermann-Hildebrand, M. (2008). Systematics of Vallisneria (Hydrocharitaceae). Systematic Botany, 33, 49–65. https://doi.org/10.1600/036364408783887483
5.03	Herbaceous. No evidence of nitrogen fixation.	0
5.04	No evidence. Wasekura et al. (2016) note "stolons horizontally elongating, surface smooth, usually without leaves, bears no tubers."	Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002
6.01	No native habitat.	0
6.02	"Mature fruits and seeds not observed," (Wasekura et al., 2016).	Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002
6.03	No evidence.	0
6.04	The genus Vallinseria is dioeceous (Les et al., 2008).	Les, D., Jacobs, S., Tippery, N., Chen, L., Moody, M., & Wilstermann-Hildebrand, M. (2008). Systematics of Vallisneria (Hydrocharitaceae). Systematic Botany, 33, 49–65. https://doi.org/10.1600/036364408783887483

6.05	Pollination ecology is not studied. Male flowers are currently unknown, "plants examined in this study consisted only of female individuals, suggesting that the populations do not regenerate by sexual reproduction but via vegetative propagation" (Wasekura et al., 2016).	Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002
6.06	"All populations of the nonindigenous V. asiatica-like plants examined in this study consisted only of female individuals, suggesting that the populations do not regenerate by sexual reproduction but via vegetative propagation" (Wasekura et al., 2016; the "V. asiatica-like plants" later are described as Vallisneria X pseudorosulata).	Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002
6.07	Noted as a perennial species, capable of vegetative reproduction. No direct evidence of	0
7.01	Speculation that hybrid propagules, as well as propagules from the parent species V. spiralis and V. denseserrulata may have contaminated stocks of V. neotropicalis used for restoration plantings.	1. Tringali, M. D., Gorham, S. B., Seyoum, S., Puchulutegui, C., Bass, M. S., Furman, B. T., & Mallison, C. (2023). A PCR assay for the detection of introduced Vallisneria spiralis, V. denseserrulata and their hybrids. Conservation Genetics Resources, 15(3), 125–133. https://doi.org/10.1007/s12686-023-01311-9
7.02	Available in the aquatic nursery industry, likely mislabeled as V. spiralis (Wasekura et al., 2016).	Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002
7.03	No evidence.	0
7.04	No evidence.	0
7.05	No evidence.	0
7.06	No evidence.	0
7.07	No evidence.	0
7.08	No evidence.	0
8.01	"Mature fruits and seeds not observed" (Wasekura et al., 2016).	Wasekura, H., Horie, S., Fujii, S., & Maki, M. (2016). Molecular identification of alien species of Vallisneria (Hydrocharitaceae) species in Japan with a special emphasis on the commercially traded accessions and the discovery of hybrid between nonindigenous V. spiralis and native V. denseserrulata. Aquatic Botany, 128, 1–6. https://doi.org/10.1016/j.aquabot.2015.09.002

8.02	No evidence.	0
8.03	No evidence.	0
8.04	No evidence.	0
8.05	No evidence.	0