UF IFAS UNIVERSITY of FLORIDA

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

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Assessment date 16 October 2018 Prepared by Young and Lieurance

	Thinopyrum intermedium **ALL ZONES**	**Answer**	**Score**
1.01	Is the species highly domesticated?	n	0
1.02	Has the species become naturalised where grown?		
1.03	Does the species have weedy races?		
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	2	
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	2	
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	?	
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	n	0
3.03	Weed of agriculture	n	0
3.04	Environmental weed	n	0
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	n	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	n	-1
4.05	Toxic to animals	n	0
4.06	Host for recognised pests and pathogens	n	0
4.07	Causes allergies or is otherwise toxic to humans	n	0
4.08	Creates a fire hazard in natural ecosystems	unk	0
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
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	n	0
5.01	Aquatic	n	0

5.02	Grass	y	1
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte	n	0
6.01	Evidence of substantial reproductive failure in native habitat	n	0
6.02	Produces viable seed	y	1
6.03	Hybridizes naturally	y	1
6.04	Self-compatible or apomictic	n	-1
6.05	Requires specialist pollinators	unk	0
6.06	Reproduction by vegetative propagation	y	1
6.07	Minimum generative time (years)	1	1
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	unk	-1
7.05	Propagules water dispersed	unk	-1
7.06	Propagules bird dispersed	unk	-1
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	n	-1
8.01	Prolific seed production	y	1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	unk	-1
8.03	Well controlled by herbicides	unk	1
8.04	Tolerates, or benefits from, mutilation or cultivation	unk	-1
8.05	Effective natural enemies present in U.S.	?	
	Total Score	**4**	
	Implemented Pacific Second Screening	**yes**	
	Risk Assessment Results	**LOW**	

section	# questions answered	satisfy minimum?
A	10	yes
B	11	yes
C	16	yes
total	37	yes

	Reference	Source data
1.01		cultivated, but no evidence of selection for reduced weediness
1.02		Skip to question 2.01
1.03		skip to question 2.01
2.01	1. PERAL NAPPFAST Global Plant Hardiness (http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20lgnd.tif). 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?409896 (0-00-0000).	No computer analysis was performed. 1. Global hardiness zone: 4, 5, 6, 7, 8, 9, 10 ; equivalent to USDA Hardiness zones: 4, 5, 6, 7, 8, 9, 10. 2. Native to Asia-Temperate Caucasus: Armenia; Azerbaijan; Georgia; Russian Federation - Dagestan; Russian Federation-Ciscaucasia - Ciscaucasia Middle Asia: Kazakhstan; Kyrgyzstan; Tajikistan; Turkmenistan; Uzbekistan Western Asia: Iran; Iraq; Syria; Turkey Asia-Tropical Indian Subcontinent: Pakistan - Baluchistan Europe Eastern Europe: Belarus; Lithuania; Moldova; Russian Federation-European part - European part; Ukraine Middle Europe: Austria; Czech Republic; Germany; Hungary; Poland; Slovakia; Switzerland Southeastern Europe: Albania; Bulgaria; Croatia; Greece; Italy; Romania; Serbia; Slovenia Southwestern Europe: France; Portugal; Spain
2.02		
2.03	1. Köppen-Geiger climate map (http://www.hydrol-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf).	1. Distribution in the native/cultivated range occurs in Dfb, Dfa, BSk, Csb, Csa, Cfb
2.04	1. Climate Charts. World Climate Maps. http://www.climate-charts.com/World-Climate-Maps.html#rain (8-19-2015) 2. University of Purdue https://hort.purdue.edu/newcrop/CropFactSheets/triga.html (1-6-2018)3. USDA Plant Profile https://plants.usda.gov/java/charProfile?symbol=THIN6 (1-7-2018)	1. Native to regions with 9 to 58 inches of precipitation annually. 2. Differences in adaptation between pubescent and glabrous forms have been noted in the USA. The pubescent form appears to be better adapted to areas of low annual precipitation (200-400 mm), droughty soils and slightly saline soils. The glabrous form is better adapted to area with 400 mm or more annual precipitation and grows well even in relatively high rainfall areas of the eastern USA. 3. Maximum rainfall 28 inches, minimum rainfall 14 inches [conflicting information]
2.05	1. Encyclodpedia of Life http://eol.org/pages/1115772/hierarchy_entries/57190669/details (1-6-2018) 2. USDA Plant Materials Program https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/ndpmcrb10626.pdf (1-6-2018) 3. SEINet Arizona - New Mexico Chapter http://swbiodiversity.org/seinet/taxa/index.php?taxon=1288 (1-7-2018)	1. Intermediate wheatgrass is a perennial grass introduced to the USA in 1932 from Europe and Asia. 2. Intermediate wheatgrass is a cool-season perennial sod forming grass introduced from Russia in the mid 1900s. 3. It has been widely introduced in western North America for erosion control, revegetation, forage, and hay.

3.01	1. Jaikumar, N. S., Snapp, S. S., & Sharkey, T. D. (2016). Older Thinopyrum intermedium (Poaceae) plants exhibit superior photosynthetic tolerance to cold stress and greater increases in two photosynthetic enzymes under freezing stress compared with young plants. Journal of Experimental Botany, 67(15), 4743–4753.2. Nature Serve Comprehensive Report http://explorer.natureserve.org/servlet/NatureServe?searchCommunityUid=ELEMENT_GLOBAL.2.688601 (1-7-2018)	1. Currently naturalized across North America 2. In the US, a naturalized, cool-season grass species from eastern Europe.
3.02	1. Nature Serve http://explorer.natureserve.org/servlet/NatureServe?searchSpeciesUid=ELEMENT_GLOBAL.2.161012 (1-6-2018) 2. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017)	1. Thinopyrum intermedium is established in nearly all western states and also in Georgia, New York, and Massachusetts. It is widespread in several western states but apparently very rare in the few eastern states where it occurs. Thinopyrum intermedium is planted for rangeland and pastureland improvement, erosion control, forage, cover, mine spoil reclamation, hay, grain, and to compete with invasive exotics such as cheatgrass, yellow starthistle, and medusahead. It can spread into adjoining vegetative communities under ideal environmental conditions. In the Great Plains, Thinopyrum intermedium occurs sporadically in rangeland, waste ground, railroads, roadsides, and sandy flats. In California, Thinopyrum intermedium occurs in open areas and slopes in the mountains. Apparently, its impacts on biodiversity are low but more information is needed. 2. It is generally not considered a "weedy" or invasive species, but it can spread into adjoining vegetative plant communities under ideal climatic and environmental conditions. [no evidence the species is has negative impacts or is subject to control]
3.03		no evidence
3.04	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017) 2. Nature Serve http://explorer.natureserve.org/servlet/NatureServe?searchSpeciesUid=ELEMENT_GLOBAL.2.161012 (1-6-2018)	1. It is generally not considered a "weedy" or invasive species, but it can spread into adjoining vegetative plant communities under ideal climatic and environmental conditions. 2. Thinopyrum intermedium is established in nearly all western states and also in Georgia, New York, and Massachusetts. It is widespread in several western states but apparently very rare in the few eastern states where it occurs. Thinopyrum intermedium is planted for rangeland and pastureland improvement, erosion control, forage, cover, mine spoil reclamation, hay, grain, and to compete with invasive exotics such as cheatgrass, yellow starthistle, and medusahead. It can spread into adjoining vegetative communities under ideal environmental conditions. In the Great Plains, Thinopyrum intermedium occurs sporadically in rangeland, waste ground, railroads, roadsides, and sandy flats. In California, Thinopyrum intermedium occurs in open areas and slopes in the mountains. Apparently, its impacts on biodiversity are low but more information is needed.

3.05	1. Hilton, M., Harvey, N., Hart, A., James, K., & Arbuckle, C. (2006). The impact of exotic dune grass species on foredune development in Australia and New Zealand: a case study of Ammophila arenaria and Thinopyrum junceiforme. Australian Geographer, 37(3), 313-334. 2. Hanlon, L. M., Abbott, L. K., & Kennedy, D. M. (2016). Coastal Mycology and Invasive Species: Boundary Conditions for Arbuscular Mycorrhizal (AM) Fungi in Incipient Sand Dunes. Journal of Coastal Research, 75(sp1), 283-287.	1. Thinopyrum junceiforme is invasive in Australia 2. Thinopyrum junceiforme invades beach dune habitats in Australia
4.01	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017)	no evidence of these characteristics
4.02		no evidence
4.03	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017)	no evidence of these characteristics
4.04	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017) 2. Encyclodpedia of Life http://eol.org/pages/1115772/hierarchy_entries/57190669/details (1-6-2018) 3. USDA Plant Profile https://plants.usda.gov/java/charProfile?symbol=THIN6 (1-7-2018)	1. Intermediate wheatgrass is palatable to all classes of livestock and wildlife. It is a preferred feed for cattle, sheep, horses, deer, antelope, and elk in spring, early summer and fall. It is considered a desirable feed for cattle, sheep, horses, and elk in summer and winter. 2. Intermediate wheatgrass has good palatability to livestock and wildlife. Livestock and wildlife will graze it throughout the growing season, but it is most preferred as forage in spring, early summer, and fall. It will not withstand heavy continuous grazing and maintain a healthy productive stand. Stands are not as susceptible to spring and fall freezing as smooth brome, meadow brome, or orchardgrass. 3. High palatability
4.05	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017) 2. Encyclodpedia of Life http://eol.org/pages/1115772/hierarchy_entries/57190669/details (1-6-2018)	1. Intermediate wheatgrass is palatable to all classes of livestock and wildlife. It is a preferred feed for cattle, sheep, horses, deer, antelope, and elk in spring, early summer and fall. It is considered a desirable feed for cattle, sheep, horses, and elk in summer and winter. [No evidence of toxicity. Commonly grazed.)
4.06	1. USDA Plant Materials Program https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/ndpmcrb10626.pdf (1-6-2018) 2. Li, H., & Wang, X. (2009). Thinopyrum ponticum and Th. intermedium: the promising source of resistance to fungal and viral diseases of wheat. Journal of Genetics and Genomics, 36(9), 557-565.	1. Insect problems are rare although grasshoppers and other insects will consume intermediate wheatgrass herbage. Leaf spot is a common disease of intermediate wheatgrass. 2. Thinopyrum ponticum and Th. intermedium provide superior resistance against various diseases in wheat (Ttricum aestivum). Because of their readily crossing with wheat, many genes for disease resistance have been introduced from the wheatgrasses into wheat.
4.07	1. University of Purdue https://hort.purdue.edu/newcrop/CropFactSheets/triga.html (1-6-2018) 2. USDA Plant Profile https://plants.usda.gov/java/charProfile?symbol=THIN6 (1-7-2018)	1. No tests have been conducted to determine if individuals with wheat or gluten allergies can tolerate T. intermedium. 2. Not toxic to humans
4.08		no evidence
4.09	1. Useful Temperate Plants Database http://temperate.theferns.info/plant/Thinopyrum+intermedium (1-9-2018) 2. USDA Plant Profile https://plants.usda.gov/java/charProfile?symbol=THIN6 (1-7-2018)	1. "Requires a sunny position." 2. Intolerant of shade

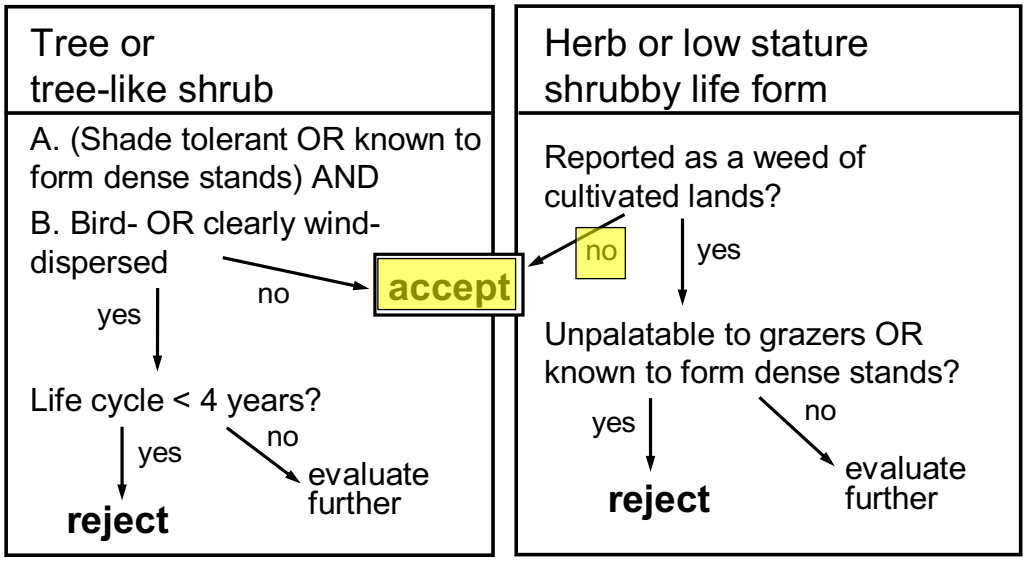
4.10	1. Utah State University Extension https://extension.usu.edu/rangeplants/grasses-and-grasslikes/intermediate-wheatgrass (1-6-2018) 2. Useful Temperate Plants Database http://temperate.theferns.info/plant/Thinopyrum+intermedium (1-9-2018) 3. USDA Plant Profile https://plants.usda.gov/java/charProfile?symbol=THIN6 (1-7-2018)	1. Adapted to well-drained, loamy to fine textured soils that are not more than mildly alkaline. 2. It prefers well drained loamy to clayey textured soils 3. Adapted to fine, coarse, and medium textured soils and requires soil with medium fertility. [no evidence supporting survival in infertile soil]
4.11	1. Wills, B. J., Douglas, G. B., McKenzie, J., Trainor, K. D., & Foote, A. G. (1998). Thinopyrum intermedium (Host) Barkw. & Dewey-a review, and evaluation of intermediate and pubescent wheatgrass for dryland agriculture in New Zealand. In PROCEEDINGS OF THE CONFERENCE-NEW ZEALAND GRASSLAND ASSOCIATION (pp. 233-242).	1. On favourable sites, wheatgrass can maintain dominance and exist as a monoculture. [no evidence of climbing or smothering growth, with the exception of agricultural monocultures)
4.12		no evidence
5.01	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017)	1. Terrestial grass
5.02	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017)	1. Intermediate wheatgrass is a perennial grass
5.03	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017)	Grass, not woody
5.04	1. Encyclodpedia of Life http://eol.org/pages/1115772/hierarchy_entries/57190669/details (1-6-2018)	[Features rhizomes, but is not a geophyte]
6.01		no evidence
6.02	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017) 2. Utah State University Extension https://extension.usu.edu/rangeplants/grasses-and-grasslikes/intermediate-wheatgrass (1-6-2018) 3. Encyclodpedia of Life http://eol.org/pages/1115772/hierarchy_entries/57190669/details (1-6-2018)	1. Intermediate wheatgrass is long-lived and vegetative spread and distribution by seed is generally very slow. 2. Reproduces from seeds, tillers, and rhizomes. 3. Intermediate is long-lived (50+ years), spreads slowly vegetatively, and very little via seed distribution.
6.03	1. Hu, L., Li, G., Zhan, H., Liu, C., & Yang, Z. (2014). New st-chromosome-specific molecular markers for identifying wheat-thinopyrum intermedium derivative lines. Journal of Genetics, 93, 69-74. doi:http://dx.doi.org/10.1007/s12041-012-0158-2 2. Zhan, H., Zhang, X., Li, G., Pan, Z., Hu, J., Li, X., ... & Yang, Z. (2015). Molecular characterization of a new wheat-Thinopyrum intermedium translocation line with resistance to powdery mildew and stripe rust. International journal of molecular sciences, 16(1), 2162-2173.	1. Hybridzes with related wheat species 2. Th. intermedium easily hybridizes with common wheat
6.04	1. Wang, Z. Y., Bell, J., & Hopkins, A. (2003). Establishment of a plant regeneration system for wheatgrasses (Thinopyrum, Agropyron and Pascopyrum). Plant cell, tissue and organ culture, 73(3), 265-273.	1. Intermediate wheatgrass is generally considered to be highly self sterile.
6.05		no evidence

6.06	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017) 2. Utah State University Extension https://extension.usu.edu/rangeplants/grasses-and-grasslikes/intermediate-wheatgrass (1-6-2018) 3. Encyclodpedia of Life http://eol.org/pages/1115772/hierarchy_entries/57190669/details (1-6-2018)	1. Intermediate wheatgrass is long-lived and vegetative spread and distribution by seed is generally very slow. 2. Reproduces from seeds, tillers, and rhizomes. 3. Intermediate is long-lived (50+ years), spreads slowly vegetatively, and very little via seed distribution. I
6.07	1. Utah State University Extension https://extension.usu.edu/rangeplants/grasses-and-grasslikes/intermediate-wheatgrass (1-6-2018) 2. University of Purdue https://hort.purdue.edu/newcrop/CropFactSheets/triga.html (1-6-2018)	1. After it is seeded, it takes one or two full growing seasons to become fully established and ready for use. 2. This perennial grain will germinate and grow during the autumn, putting much of its energy into the development of roots. During the winter it goes dormant and begins regrowing vigorously in the spring. Plants will begin sending up grain heads in June and the grain will be ready for harvest in August. Wild Triga will produce its first grain crop about 11 months after planting.
7.01	1. Useful Temperate Plants Database http://temperate.theferns.info/plant/Thinopyrum+intermedium (1-9-2018) 2. Wills, B. J., Douglas, G. B., McKenzie, J., Trainor, K. D., & Foote, A. G. (1998). Thinopyrum intermedium (Host) Barkw. & Dewey-a review, and evaluation of intermediate and pubescent wheatgrass for dryland agriculture in New Zealand. In PROCEEDINGS OF THE CONFERENCE-NEW ZEALAND GRASSLAND ASSOCIATION (pp. 233-242).	1. This species is well adapted to the stabilization of disturbed soils. It can be used in critical and urban areas where irrigation water is limited; and to stabilize ditchbanks, dykes, roadsides and airport landing strips 2. Intermediate and pubescent wheatgrasses are well adapted to stabilising disturbed soils and several cultivars have been specifically selected for this purpose. They can be used in areas where irrigation water is limited and to stabilise banks, dykes and roadsides. With its heavy root production, wheatgrass can also be used to improve soils.
7.02	1. Wills, B. J., Douglas, G. B., McKenzie, J., Trainor, K. D., & Foote, A. G. (1998). Thinopyrum intermedium (Host) Barkw. & Dewey-a review, and evaluation of intermediate and pubescent wheatgrass for dryland agriculture in New Zealand. In PROCEEDINGS OF THE CONFERENCE-NEW ZEALAND GRASSLAND ASSOCIATION (pp. 233-242). 2. Useful Temperate Plants Database http://temperate.theferns.info/plant/Thinopyrum+intermedium (1-9-2018) 3. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017)	1. Intermediate and pubescent wheatgrasses are well adapted to stabilising disturbed soils and several cultivars have been specifically selected for this purpose. They can be used in areas where irrigation water is limited and to stabilise banks, dykes and roadsides. With its heavy root production, wheatgrass can also be used to improve soils. 2. This species is well adapted to the stabilization of disturbed soils. It can be used in critical and urban areas where irrigation water is limited; and to stabilize ditchbanks, dykes, roadsides and airport landing strips 3. Widespread plantings in the USA for pastureland and erosion control.
7.03		no evidence
7.04	1. Encyclodpedia of Life http://eol.org/pages/1115772/hierarchy_entries/57190669/details (1-6-2018)	no evidence [wind dispersal may be possible with characteristics described]
7.05		no evidence
7.06		no evidence
7.07	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017)	no evidence of a mechanism for attachment
7.08		no evidence of viability after consumption

8.01	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017) 2. Useful Temperate Plants Database http://temperate.theferns.info/plant/Thinopyrum+intermedium (1-9-2018) 3. USDA Plant Profile https://plants.usda.gov/java/charProfile?symbol=THIN6 (1-7-2018)	Average production of 250 to 350 pounds per acre can be expected under dryland conditions. Average production of 450 to 550 pounds per acre can be expected under irrigated conditions. Seed yields drop significantly after about four years of production. 2. Seed production when the plant has ample moisture in the growing season can reach 500 - 600 kilos per hectare in the first year of harvest, though this diminishes in subsequent years unless the plant is fertilized and preferably also divided 3. 80080 seeds per pound
8.02		no evidence
8.03		no evidence of chemical control initiatives
8.04	1. USDA Plant Guide https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmspg10369.pdf (12-7-2017)	1. It will not withstand heavy continuous grazing and maintain a healthy productive stand. [limited evidence, but it's inability to withstand heavy grazing may support that it is unlikely to benefit from physical biomass removal intended for control purposes]
8.05		no evidence

Pacific second screening: decision rules for species with WRA scores between 1 and 6

(from Daehler *et al*. 2004)



Vines must pass both tests