Taxon: Nassella cernua **Family:** Poaceae

Common Name(s): foothill needlegrass
nodding needlegrass

Synonym(s): Stipa cernua Stebbins & Á. Löve

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 21 Sep 2015

WRA Score: 9.0 **Designation:** H(Hawai'i) **Rating:** High Risk

Keywords: Naturalized, Weedy Grass, Palatable, Perennial, Self-fertile

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Intermediate
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	n
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed		
304	Environmental weed		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle		

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	y
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 18 Sep 2015]	[Assessment is of wild type] "Cultivars, Improved, and Selected Materials (and area of origin) 'LK415f' Germplasm: Collected from San Luis Obispo County, California; Trusedale and Shells Roads. Township 27S and Range 15E Section 10. Elevation is approximately 1200 feet. Mean annual precipitation is 12-20 inches. Mean annual temperature is 60 degrees F."
	Flora of North America Editorial Committee. 1993. Flora of North America: Magnoliophyta: Commelinidae (in part): Poaceae, Part 1. Oxford University Press, New York and Oxford	[No evidence of domestication] "Nassella cernua grows in grasslands, chaparral, and juniper associations of the inner coast ranges of California and Baja California, Mexico."

102	Has the species become naturalized where grown?	
	Source(s)	**Notes**
	WRA Specialist. 2015. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	**Notes**
	WRA Specialist. 2015. Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	Intermediate
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 18 Sep 2015]	"Native: NORTHERN AMERICA (Check conservation status in U.S. & Canada in NatureServe Explorer database) Southwestern U.S.A.: United States - California Northern Mexico: Mexico - Baja California"

202	Quality of climate match data	High
	Source(s)	**Notes**
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/. [Accessed]	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Dave's Garden. 2015. Nodding Needle Grass - Nassella cernua. http://davesgarden.com/guides/pf/go/98139/. [Accessed 21 Sep 2015]	"Hardiness: USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15 °F) USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F)"
	Flora of North America Editorial Committee. 1993. Flora of North America: Magnoliophyta: Commelinidae (in part): Poaceae, Part 1. Oxford University Press, New York and Oxford	"Nassella cernua grows in grasslands, chaparral, and juniper associations of the inner coast ranges of California and Baja California, Mexico."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Elevation range <1000 m in Hawaiian Islands] "in Hawai'i naturalized in subalpine woodland and shrubland, 1,830-2,140 m,"

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Native at middle & upper elevations on Hawaii island] "in Hawai'i naturalized in sUbalpine woodland and shrubland, 1,830-2,140 m, Pohakuloa area, Hawai'i."

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to California; in Hawai'i naturalized in subalpine woodland and shrubland, 1,830-2,140 m, Pohakuloa area, Hawai'i. First collected in 1957 (Christ s.n., BISH)."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to California; in Hawai'i naturalized in subalpine woodland and shrubland, 1,830-2,140 m, Pohakuloa area, Hawai'i. First collected in 1957 (Christ s.n., BISH)."

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	[A weedy grass with potential negative impacts to ranching] "Declared noxious in Regulation 2. May be a pest in rangelands because the long, needlelike awns can injure cattle."
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 21 Sep 2015]	Disturbance adapted] "Nodding needlegrass does well in disturbed sites and is valuable for erosion control, because of its strong root system. However, it does not tolerate disturbance after planting."

Qsn #	Question	Answer
303	**Agricultural/forestry/horticultural weed**	
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	[Potential economic impacts to ranching] "Declared noxious in Regulation 2. May be a pest in rangelands because the long, needlelike awns can injure cattle."

304	**Environmental weed**	
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Impacts on native biodiversity or ecosystem function unknown] "Native to California; in Hawai'i naturalized in subalpine woodland and shrubland, 1,830-2,140 m, Pohakuloa area, Hawai'i."

305	**Congeneric weed**	**y**
	Source(s)	**Notes**
	Barker, J., Randall, R. & Grice, T. 2006. Weeds of the future? Threats to Australia's grazing industries by garden plants. Project number NBP.357. CRC for Australian Weed Management, Glen Osmond, SA	"Nassella tenuissima is unpalatable to livestock and it aggressively competes with desirable pastoral species. If livestock are forced to feed on N. tenuissima, the undigested plant matter will cause serious illness or death. Sharp seeds may also cause injury to stock – including blindness – and devalue wool and pelts." ... "It is predicted that N. tenuissima may be more invasive than N. trichotoma because of its ability to adapt to a wide range of climates. If left to spread, the economic cost to Australia over the next 60 years is estimated to be $39m annually."
	Laffan, S. W. (2006). Assessing regional scale weed distributions, with an Australian example using Nassella trichotoma. Weed Research, 46(3): 194-206	"Nassella trichotoma is native to the pampas grasslands of South America. It is an important weed in Australia, New Zealand and South Africa, with smaller infestations in France, Italy and Scotland (Campbell & Vere, 1995). Nassella trichotoma currently occurs in the southeastern parts of NSW and Victoria and parts of Tasmania (McLaren et al., 1998; Parsons & Cuthbertson, 2001), with c. 7000 km2 of infested land in NSW (Parsons & Cuthbertson, 2001). In the study region it is classified as a class W2 noxious weed under the NSW Noxious Weeds Act 1993, which means it must be fully and continuously suppressed and destroyed. It is enough of a problem overall in Australia to be designated a Weed of National Significance (Agriculture & Resource Management Council of Australia & New Zealand & Australian & New Zealand Environment Conservation Council & Forestry Ministers, 2000)."

401	**Produces spines, thorns or burrs**	**n**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Perennials; culms erect, forming large, dense clumps, usually 6-9 dm tall. Sheath glabrous, margins overlapping, membranous; ligule membranous, ca. 2 mm long, margins entire to erose, apex unevenly rounded. Blades glaucous, cauline, 1.2-2.4 mm wide, flat to involute, upper surface evenly pilose, lower surface sparsely pilose or glabrous. Panicles 30-50 cm long or longer, branches numerous, flexuous, ascending or spreading, partially or fully exserted from the subtending sheath; glumes membranous, linear to lanceolate, glabrous, apex acuminate, first glume 12-19 mm long, 3-nerved, second glume ca. 11 mm long, 3-nerved; lemma chartaceous, 5-10 mm long, papillose, pilose in lower part and on the nerves, awn 60 110 mm long, twice geniculate, the terminal segment flexuous, scabrous or basally short pubescent; palea membranous, ovate, 1-1.5 mm long, glabrous, nerveless, apex rounded. Caryopsis pale brown, cylindrical, trigonous, ca. 4 mm long"

402	Allelopathic	
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 18 Sep 2015]	[Unknown if allelopathy plays a role in this inhibition] "In dense stands, it can completely inhibit certain weeds, such as yellow starthistle."
	Ingels, C.A. 1998. Cover Cropping in Vineyards: A Grower's Handbook. University of California. Division of Agriculture and Natural Resources, Oakland, CA	Utilized as a perennial for no-till vineyards

403	Parasitic	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	No evidence. Poaceae

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 18 Sep 2015]	"It also provides good early forage for grazing animals."
	Borders, B. 2009. A synthesis of native plant seed production efforts in the San Joaquin Valley, California. California State University, Stanislaus Endangered Species Recovery Program, Fresno, CA	"Table 2. Species that were browsed heavily by wildlife during one or more growing seasons while in cultivation at the nursery" [Includes Nassella cernua]

405	Toxic to animals	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	gardenguides.com. 2010. Nodding Needlegrass (Cernua). http://www.gardenguides.com/taxonomy/nodding-needlegrass-nassella-cernua/. [Accessed 21 Sep 2015]	"Toxic to Livestock No"
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed]	[No evidence] "It also provides good early forage for grazing animals."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Fischer, G.W., Sprague, R., Johnson, H.W. & Hardison, J.R. 1942. Host and pathogen indices to the diseases observed on grasses in certain western states during 1941. Plant Disease Reporter; Suppl. 137: 87-144	"Stipa cernua Stebbins & Love Stem smut, Ustilago sp. — central Calif." [Effects on other species unknown]

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed]	[Could possibly increase fuel load] "Once established, it is generally fire tolerant, but not fire resistant. The season of a burn is the most important factor in determining the severity of the effects on the plants. It will re-sprout after spring or fall burns, but summer burns can be damaging. Smaller plants are often less damaged by fire than larger plants because they burn less intensely and don't smolder for long periods of time."
	Lorenson, L. & Callahan, K. 2010. Firewise Pants for Western Nevada County. Fire Safe Council of Nevada County, Grass Valley, CA	Recommended as a firewise plant for sun / dry conditions

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 18 Sep 2015]	"It thrives in full sun, and also grows in partial shade."

Qsn #	Question	Answer
	Lady Bird Johnson Wildflower Center. 2015. Native Plant Database - Nassella cernua. http://www.wildflower.org/plants/result.php?id_plant=NACE. [Accessed 21 Sep 2015]	"Light Requirement: Sun"
	Dave's Garden. 2015. Nodding Needle Grass - Nassella cernua. http://davesgarden.com/guides/pf/go/98139/. [Accessed 21 Sep 2015]	"Sun Exposure: Full Sun"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Ingels, C.A. 1998. Cover Cropping in Vineyards: A Grower's Handbook. University of California. Division of Agriculture and Natural Resources, Oakland, CA	"Although it is adapted to many soil types. the soil must be well drained. Commonly found on poor soils throughout the state including those in Southern California. nodding needlegrass is a belter choice for low rainfall areas than purple needlegrass."
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 18 Sep 2015]	"In California, this grass is especially adapted to sandy, well-drained, loamy soils, but will tolerate rocky soil."

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Perennials; culms erect, forming large, dense clumps, usually 6-9 dm tall."

412	Forms dense thickets	
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed]	[Possibly Yes] "In dense stands, it can completely inhibit certain weeds, such as yellow starthistle. Abundant seed production is usually what helps maintain natural stands in non-grazed or lightly grazed areas."

501	Aquatic	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 1993. Flora of North America: Magnoliophyta: Commelinidae (in part): Poaceae, Part 1. Oxford University Press, New York and Oxford	[Terrestrial] "Nassella cernua grows in grasslands, chaparral, and juniper associations of the inner coast ranges of California and Baja California, Mexico."

502	Grass	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/. [Accessed 17 Sep 2015]	"Family: Poaceae (alt. Gramineae) subfamily: Pooideae tribe: Stipeae"

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Perennials; culms erect, forming large, dense clumps, usually 6-9 dm tall" [Poaceae]

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 1993. Flora of North America: Magnoliophyta: Commelinidae (in part): Poaceae, Part 1. Oxford University Press, New York and Oxford	"Plants perennial; cespitose, not rhizomatous." [Poaceae]

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 1993. Flora of North America: Magnoliophyta: Commelinidae (in part): Poaceae, Part 1. Oxford University Press, New York and Oxford	[No evidence] "Nassella cernua grows in grasslands, chaparral, and juniper associations of the inner coast ranges of California and Baja California, Mexico."

602	Produces viable seed	y
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 21 Sep 2015]	"Abundant seed production is usually what helps maintain natural stands in non-grazed or lightly grazed areas."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Caryopsis pale brown, cylindrical, trigonous, ca. 4 mm long."
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"Stipa cernua" ... "Propagation: By seed."

603	Hybridizes naturally	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Love, R. M. (1954). Interspecific hybridization in Stipa. II. Hybrids of S. cernua, S. lepida, and S. pulchra. American Journal of Botany, 4 (2): 107-110	"Three species, Stipa cernua Stebbins and Love, S. lepida Hitchc. and S. pulchra Hitchc.,have fairly wide distributions in California(Stebbins and Love, 1941b). The ease with which these species form hybrids in natural conditions where their ranges overlap has given new impetus to the agronomic possibilities of the Stipa improvement program (Love, 1946). S. cernua and S. lepida have not yet been found growing together on the California range, but contiguous plantings of the two species at Davis, California, resulted in the establishment of F1 hybrids without artificial manipulation (Love, l.c.). Artificial hybrids involving all three species have also been made."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Hollowell, E.A., & Tysdal, H.M. .1948. The need for seed is urgent. Pages 314–347 in A. Stefferud, editor. Grass: The Yearbook of Agriculture 1948. U.S. Department of Agriculture, Washington, D.C.	"Mostly Self-Fertilized" [Includes Stipa cernua; described as Highly cleistogamous]

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Zomlefer, W.B. 1994. Guide to Flowering Plant Families. The University of North Carolina Press, Chapel Hill & London	Poaceae [anemophilous. Wind-pollinated]

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence. Non-rhizomatous & non-soloniferous] "Perennials; culms erect, forming large, dense clumps, usually 6-9 dm tall."
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	[No evidence] "A tufted perennial, 2 to 3 feet high, in rather large clumps." ... "Propagation: By seed."

607	Minimum generative time (years)	1
	Source(s)	**Notes**
	gardenguides.com. 2010. Nodding Needlegrass (Cernua). http://www.gardenguides.com/taxonomy/nodding-needlegrass-nassella-cernua/. [Accessed 21 Sep 2015]	"Growth Rate Rapid"
	Woolfolk, A. 2011. Native Species Planting Guide for the Elkhorn Slough National Estuarine Research Reserve. Elkhorn Slough Foundation, Watsonville, CA	"Its seed germinate and regrowth occurs in early spring, and the plant matures in early summer (UCDANR 1996). Seed matures mid to late spring (collection window = 2-3 weeks), and does not need any pretreatment (Emery 1987)."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Montalvo, A. M., Goode, L. & Beyers., J. 2010. Plant Profile for Nassella pulchra. Native Plant Recommendations for Southern California Ecoregions. Riverside-Corona Resource Conservation District and U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Riverside, CA. Online: http://www.rcrcd.com/index.php option=com_content&view=article&id=88&Itemid=190. [Accessed 21 Sep 2015]	[Seeds might possibly adhere to clothing] "Seeds also have sharp ends and can stick to fur. Secondary dispersal may occur by animals that use seeds for food, e.g., caching by voles (Fehmi & Bartolome 2002)."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	S&S Seeds. 2014. Stipa cernua. http://www.ssseeds.com/product/Stipa-cernua.aspx. [Accessed 21 Sep 2015]	[Seeds sold online] "Average Live Seed per Bulk Pound: 156,750"

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	[Could possibly become a contaminant of hay] "May be a pest in rangelands because the long, needlelike awns can injure cattle."
	WRA Specialist. 2015. Personal Communication	No evidence. Not grown with produce

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**
	Montalvo, A. M., Goode, L. & Beyers., J. 2010. Plant Profile for Nassella pulchra. Native Plant Recommendations for Southern California Ecoregions. Riverside-Corona Resource Conservation District and U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Riverside, CA. Online: http://www.rcrcd.com/index.php option=com_content&view=article&id=88&Itemid=190. [Accessed 18 Sep 2015]	[Presumably similar for N. cernua] "Primary dispersal by wind, May-July (Bishop 1996)."

705	Propagules water dispersed	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Seeds might be moved by overland flow of water, but generally does not occur in riparian habitats] "in Hawai'i naturalized in subalpine woodland and shrubland"

706	Propagules bird dispersed	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence. Seeds may be depredated by birds] "Caryopsis pale brown, cylindrical, trigonous, ca. 4 mm long."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	**Notes**
	Montalvo, A. M., Goode, L. & Beyers., J. 2010. Plant Profile for Nassella pulchra. Native Plant Recommendations for Southern California Ecoregions. Riverside-Corona Resource Conservation District and U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Riverside, CA. Online: http://www.rcrcd.com/index.php option=com_content&view=article&id=88&Itemid=190. [Accessed 18 Sep 2015]	"Seeds also have sharp ends and can stick to fur. Secondary dispersal may occur by animals that use seeds for food, e.g., caching by voles (Fehmi & Bartolome 2002)."
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 21 Sep 2015]	[Presumably yes] "Sharp points on the seeds are augured into the soil by the twisting action of the awns."

708	Propagules survive passage through the gut	
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 21 Sep 2015]	{unknown. Seeds may possibly be consumed & excreted by animals. Viability unknown] "It also requires some protection from grazing during the flowering period (late May-April)."

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 21 Sep 2015]	[Densities unknown] "Abundant seed production is usually what helps maintain natural stands in non-grazed or lightly grazed areas." ... "Abundant seed matures in mid to late spring, with collection possible for 2 - 3 weeks. There are between 118,000 and 250,000 seeds/lb., and if planted at a rate of 1 lb./acre, there will be approximately 4.3 seeds/square feet."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	**Notes**
	Johnston, K., Medel, I., Anderson, S., Stein, E., Whitcraft, C. & Crooks. J.. 2015. California Estuarine Wetland Monitoring Manual (Level 3). Prepared by The Bay Foundation for the United States Environmental Protection Agency	[Possibly] "Stipa cernua [Nassella c.] Long-lived (4-5 years) After drying and cleaning, seal in paper bags and store at 40 F and 40% RH."

Qsn #	Question	Answer
803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Campbell, M. H., Gilmour, A. R., & Vere, D. T. (1979). Effects of time and rate of application of herbicides on serrated tussock (Nassella trichotoma) and improved pasture species. 2. Tetrapion. Animal Production Science, 19(99): 476-480	[Presumably Yes. Herbicides provide effective control of other invasive Nassella species] "The effects of time and rate of application of tetrapion on burnt and unburnt serrated tussock, growing with and without improved species, were measured in four experiments carried out near Bathurst, New South Wales, between 1975 and 1978. Tetrapion proved effective in killing unburnt serrated tussock when applied in each season of the year. The most economical rates proved to be 1.00 kg a.i, ha-1 in spring and summer and 1.33 kg a.i. ha-1 in autumn and winter. Tetrapion was also effective in killing serrated tussock that had been burnt six and nine months before spraying. Although tetrapion had harsh phytotoxic effects on Phalaris aquatica and Trioflium repens growing in association with serrated tussock, these improved species recovered. Thus it proved possible to selectively remove serrated tussock from P. aquatica and T. repens by using tetrapion. Based on 1979 costs, tetrapion appears an economic alternative to other herbicides currently used to kill serrated tussock."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	USDA NRCS. 2005. Plant Guide - Nodding Needlegrass - Nasella cernua. USDA NRCS Plant Materials Center, Lockeford, CA. http://plants.usda.gov/plantguide/pdf/pg_nace.pdf. [Accessed 18 Sep 2015]	[Fire tolerant depending on season. Tolerant of mowing] "Once established, it is generally fire tolerant, but not fire resistant. The season of a burn is the most important factor in determining the severity of the effects on the plants. It will re-sprout after spring or fall burns, but summer burns can be damaging. Smaller plants are often less damaged by fire than larger plants because they burn less intensely and don't smolder for long periods of time." ... "Nodding needlegrass will withstand mowing, especially after seed set and some traffic. It also requires some protection from grazing during the flowering period (late May-April)."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Unknown] "In Hawaii, naturalized in subalpine woodland and shrubland, 1,830-2,140 m"

Summary of Risk Traits:

High Risk / Undesirable Traits
• Grows in higher elevation tropical climates
• Naturalized on Hawaii island
• Weedy grass, with possible detrimental impacts to ranching
• Other Nassella species are invasive
• Tolerates many soil types
• Reproduces by seed
• Hybridizes with other Nassella species
• Self-compatible (cleistogamous)
• Seeds dispersed by wind, people & externally attached to animals
• Perennial, but able to reach maturity in <1 year
• Seeds able to be stored for extended periods; May form a persistent seed bank
• Resprouts after mowing & fires
• Limited ecological information may reduce accuracy of risk prediction

Low Risk Traits
• May only be invasive at higher elevations
• Unarmed (no spines, thorns or burrs)
• Palatable to grazing animals
• Not reported to spread vegetatively
• Herbicides may provide effective control