

Taxon: <i>Agrostis stolonifera</i>	Family: Poaceae
Common Name(s): creeping bent grass marsh bent	Synonym(s): <i>Agrostis alba</i> auct. Eur.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 25 Feb 2016
WRA Score: 21.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Invasive, Palatable, Allergenic, Stoloniferous, Stoloniferous

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	y
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	y
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	n=0, y = 2*multiplier (see Appendix 2)	y
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	y=1, n=0	n
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	y
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y

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	y=1, n=0	y
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	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
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)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
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	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
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
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Europe, exact native range obscure." [No evidence. This species has not been in cultivation for at least 20 generations nor has it diverged from wild varieties.]
102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	NA
103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2016. 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
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Creeping bentgrass is native to Eurasia and North Africa [59]."

Qsn #	Question	Answer
	<p>USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 24 Feb 2016]</p>	<p>"Native: Africa Macaronesia: Portugal - Madeira Islands Northern Africa: Algeria; Libya; Morocco; Tunisia Asia-Temperate Caucasus: Armenia; Azerbaijan; Georgia; Russian Federation - Dagestan; Russian Federation-Ciscaucasia - Ciscaucasia China: China - Anhui, - Gansu, - Guizhou, - Heilongjiang, - Nei Monggol, - Ningxia, - Shaanxi, - Shandong, - Shanxi, - Xinjiang, - Xizang, - Yunnan Eastern Asia: Japan - Hokkaido Middle Asia: Kazakhstan; Tajikistan; Turkmenistan; Uzbekistan Mongolia: Mongolia Russian Far East: Russian Federation - Khabarovsk, - Primorye, - Amur Siberia: Russian Federation - Buryatia, - Chita, - Irkutsk, - Kemerovo, - Krasnoyarsk, - Kurgan, - Novosibirsk, - Omsk, - Tomsk, - Tuva, - Tyumen, - Yakutia-Sakha Western Asia: Afghanistan; Cyprus; Egypt - Sinai; Iran; Iraq; Israel; Lebanon; Syria; Turkey Asia-Tropical Indian Subcontinent: Bhutan; India; Nepal; Pakistan Europe East Europe: Belarus; Estonia; Latvia; Lithuania; Moldova; Russian Federation-European part - European part; Ukraine Middle Europe: Austria; Belgium; Czech Republic; Germany; Hungary; Netherlands; Poland; Slovakia; Switzerland Northern Europe: Denmark; Finland; Iceland; Ireland; Norway; Sweden; United Kingdom Southeastern Europe: Albania; Bulgaria; Croatia; Greece; Italy; Romania; Serbia; Slovenia Southwestern Europe: France; Portugal; Spain"</p>

202	Quality of climate match data	High
	Source(s)	Notes
	<p>Esser, L. L. 1994. <i>Agrostis stolonifera</i>. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/. [Accessed 24 Feb 2016]</p>	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes

Qsn #	Question	Answer
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Elevations for creeping bentgrass for several states and provinces are as follows: Montana 2,800-7,000 feet (854-2,134 m) [4,24] Idaho 6,600-7,920 feet (2,000-2,400 m) [10] Oregon 6,680 feet (2,036 m) [15] Nevada 6,400-8,480 feet (1,950-2,585 m) [36] Utah 3,234-10,065 feet (980-3,050 m) [41] California less than 3,300 feet (<1000 m) [26] Ontario 990 feet (300 m) [5]"
	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 exceeds 1000 m] "in Hawai'i naturalized in disturbed places, especially in moist sites, 640-1,680 m, on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i."
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 24 Feb 2016]	Widespread native & naturalized distribution in temperate to tropical climates

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Clayton, W.D., Vorontsova, M.S., Harman, K.T. and Williamson, H. 2006 onwards. GrassBase - The Online World Grass Flora. http://www.kew.org/data/grasses-db.html . [Accessed 24 Feb 2016]	"DISTRIBUTION Europe: northern, central, southwestern, southeastern, and eastern. Africa: north and Macaronesia. Asia-temperate: Siberia, Soviet far east, Soviet Middle Asia, Caucasus, western Asia, China, Mongolia, and eastern Asia. Asia-tropical: India and Indo-China. Australasia: Australia and New Zealand. Pacific: south-central and north-central. North America: Subarctic, western Canada, eastern Canada, northwest USA, north-central USA, northeast USA, southwest USA, southeast USA, and Mexico. South America: Mesoamericana, Caribbean, northern South America, western South America, and southern South America. Antarctic: Subantarctic islands. "
	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.	"in Hawai'i naturalized in disturbed places, especially in moist sites, 640-1,680 m, on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. First collected on Moloka'i in 1912 (Forbes 98.Mo, BISH)."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Creeping bentgrass is native to Eurasia and North Africa [59]. It was probably introduced to North America prior to 1750, and has become naturalized throughout the southern Canadian provinces and most of the United States [34,59]."
	Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"weed species widely naturalized elsewhere"

301	Naturalized beyond native range	y
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Qsn #	Question	Answer
	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.	"in Hawai'i naturalized in disturbed places, especially in moist sites, 640-1,680 m, on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i. First collected on Moloka'i in 1912 (Forbes 98.Mo, BISH)."
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"It was probably introduced to North America prior to 1750, and has become naturalized throughout the southern Canadian provinces and most of the United States [34,59]."
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 24 Feb 2016]	"Naturalized: Australasia Australia: Australia New Zealand: New Zealand Northern America Southeastern U.S.A.: United States - Florida Southern America Caribbean: Jamaica Southern South America: Argentina; Chile; Uruguay"

302	Garden/amenity/disturbance weed	y
	Source(s)	Notes
	Beam, J. B., Barker, W. L., & Askew, S. D. (2006). Selective Creeping Bentgrass (<i>Agrostis stolonifera</i>) Control in Cool-Season Turfgrass. <i>Weed Technology</i> , 20(2), 340-344	"Creeping bentgrass infestations in cool-season turfgrass are unsightly and difficult to control."
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Creeping bentgrass readily colonizes areas disturbed by logging, plowing, burning, or excessive grazing"
	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.	"naturalized in disturbed places, especially in moist sites, 640-1,680 m"

Qsn #	Question	Answer
303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	Banks, P. A., Branham, B., Harrison, K., Whitson, T. & Heap, I. 2004. Determination of the potential impact from the release of glyphosate-and glufosinate-resistant <i>Agrostis stolonifera</i> L. in various crop and non-crop ecosystems. Weed Science Society of America (WSSA), Lawrence, KS	[Identified as a major weed of turfgrass & a minor weed of fruit crops or pastures etc.] "Table 4. <i>Agrostis</i> or <i>Polypogon</i> species that have been reported as weeds." [A. <i>stolonifera</i> - Crop = Turfgrass. Level of Importance = Moderate to high. Comments = Major turfgrass species used in all states in US; less of a problem in southern states. Crop = Fruit crops. Level of Importance = Low. Crop = Pastures, hayfields, non-crop areas, ornamentals, grass seed fields. Level of Importance = Low to moderate.]
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	Listed as a weed of agriculture in a number of references

304	Environmental weed	y
	Source(s)	Notes
	Queensland Government. 2011. Weeds of Australia - Creeping bent - <i>Agrostis stolonifera</i> . http://keyserver.lucidcentral.org/weeds/data/080c0106-040c-4508-8300-0b0a06060e01/media/html/Agrostis_stolonifera.htm . [Accessed 24 Feb 2016]	"Creeping bent (<i>Agrostis stolonifera</i>) is regarded as an environmental weed in New South Wales, Victoria and Tasmania. This species is commonly cultivated as a lawn grass in southern Australia, and is often also used in golf and bowling greens. It has become a weed of pastures, roadsides, disturbed sites, waste areas and damp or semi-aquatic natural habitats (i.e. seasonal freshwater wetlands, riparian areas, marshes, coastal scrub and beaches). Creeping bent (<i>Agrostis stolonifera</i>) is fast growing and it can be invasive because it forms dense mat-like colonies which displace native vegetation and reduce species richness. These colonies are formed by the growth of its creeping aboveground stems (i.e. stolons), which easily take root and develop into new plants if they become separated from the rest of the colony. This species is regarded as a very serious threat to one or more vegetation formations in Victoria. For example, it is listed as a "high threat" weed species in floodplain riparian woodlands, estuarine wetlands and sedgy swamp woodlands. It is also a weed of peatlands, wetlands, swamps and spring soaks in the highland areas of this state. Creeping bent (<i>Agrostis stolonifera</i>) has been recorded in conservation areas in Victoria (e.g. Organ Pipes National Park, Phillip Island Nature Park, Finns Reserve, Lysterfield Lake Park and Churchill National Park) and is also listed as an environmental weed in the Goulburn Broken Catchment. In New South Wales, creeping bent (<i>Agrostis stolonifera</i>) is listed as an environmental weed in Blue Mountains City Council area. It has also been recorded in the Greens Beach/Kelso Coastal Reserve in Tasmania."
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Creeping bentgrass can form dense patches that outcompete native plants and prevent establishment of shrubs. In New Zealand it has been shown to change the types of insects occurring in a community."

Qsn #	Question	Answer
	Lowry, B. J., Whitesides, R. E., Dewey, S. A., Ransom, C. V. & Banner, R. E. 2011. Common Weeds of the Yard and Garden. Utah State University Cooperative Extension, Logan, UT	"Creeping bentgrass is noxious in New Jersey and Virginia, and is considered invasive in eight other—mostly western—U.S. states."
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"It is fast growing and invasive because it forms mat-like dense colonies due to vegetative growth, displacing native vegetation and reducing species richness"

305	Congeneric weed	y
	Source(s)	Notes
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	" <i>Agrostis capillaris</i> ... invades areas of poor, acid soils and forms dense swards that crowd out native vegetation and prevent shrub recruitment."
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	A number of <i>Agrostis</i> species are listed as weeds

401	Produces spines, thorns or burrs	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] "Rhizomatous or stoloniferous perennials; culms decumbent, (3-)4-10(-13) dm long. Sheaths smooth, glabrous, persistent; ligule truncate to obtuse, 1.5-5(-8.5) mm long, erose-ciliolate, often lacerate; blades flat, folded, or involute, relatively wide, 2- 5(-6) mm wide when opened, scabrous."

Qsn #	Question	Answer
402	Allelopathic	n
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	[No evidence] "Species not previously mentioned but commonly associated with creeping bentgrass include true pinyon (<i>Pinus edulis</i>), Gambel oak (<i>Quercus gambelii</i>), oneseed juniper (<i>Juniperus monosperma</i>), water birch (<i>Betula occidentalis</i>), boxelder (<i>Acer negundo</i>), bigtooth maple (<i>A. grandidentatum</i>), mountain maple (<i>A. spicatum</i>), hazel (<i>Corylus cornuta</i>), cottonwood (<i>Populus</i> spp.), red-osier dogwood (<i>Cornus sericea</i>), chokecherry (<i>Prunus virginiana</i>), Baltic rush (<i>Juncus balticus</i>), sedge, Kentucky bluegrass (<i>Poa pratense</i>), fowl bluegrass (<i>P. palustris</i>), Virginia strawberry (<i>Fragaria virginiana</i>), field horsetail (<i>Equisetum arvense</i>), Canada thistle (<i>Cirsium arvense</i>), tufted hairgrass (<i>Deschampsia cespitosa</i>), timothy (<i>Phleum pratense</i>), red clover (<i>Trifolium pratense</i>), white clover (<i>T. repens</i>), broadleaf plantain (<i>Plantago major</i>), saltgrass (<i>Distichlis spicata</i>), western aster (<i>Aster occidentalis</i>), Rocky Mountain iris (<i>Iris missouriensis</i>), longleaf phlox (<i>Phlox longifolia</i>), bush cinquefoil (<i>Potentilla fruticosa</i>), Wood's rose (<i>Rosa woodsii</i>), bearberry honeysuckle (<i>Lonicera involucrata</i>), and western yarrow (<i>Achillea millefolium</i>) [6,9,10,13,22]."

403	Parasitic	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 24 Feb 2016]	Poaceae. No evidence

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Creeping bentgrass has a high palatability rating in the spring and early summer, fair after flowering, and poor in winter [4,24]. It is rated fair to good for livestock and highly satisfactory for elk [23,24]."

405	Toxic to animals	n
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Creeping bentgrass is important forage for livestock because it stays green and palatable throughout the summer." [No evidence]

406	Host for recognized pests and pathogens	

Qsn #	Question	Answer
	Source(s)	Notes
	CABI, 2016. <i>Agrostis stolonifera</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Major host of: Anaphothrips obscurus (grass thrips); Exomala orientalis (oriental beetle); Longidorus (longidorids); Puccinia coronata (crown rust); Punctodera punctata (grass cyst nematode) Minor host of: Barley yellow dwarf viruses (barley yellow dwarf); Meloidogyne minor; Monographella nivalis (foot rot of cereals); Pratylenchus penetrans (nematode, northern root lesion); Sclerotinia homoeocarpa (dollar spot: grasses); Waitea circinata (root rot of maize) Host of (source - data mining): Phyllophaga congrua"

407	Causes allergies or is otherwise toxic to humans	y
	Source(s)	Notes
	Pollen Library. 2016. Spreading Bent (<i>Agrostis stolonifera</i>). http://www.pollenlibrary.com/Specie/Agrostis+stolonifera/ . [Accessed 24 Feb 2016]	"Allergenicity: Spreading Bent (<i>Agrostis stolonifera</i>) is a severe allergen."
	Lowry, B. J., Whitesides, R. E., Dewey, S. A., Ransom, C. V. & Banner, R. E. 2011. Common Weeds of the Yard and Garden. Utah State University Cooperative Extension, Logan, UT	"It sheds large amounts of pollen as it flowers and can be a severe allergen."

408	Creates a fire hazard in natural ecosystems	
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Creeping bentgrass has fair tolerance to fire [62]. No information was available in the literature concerning creeping bentgrass fire ecology or adaptations. "

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Caminos, T. S., & Estévez, S. J. (2007). Effects of Shade on the Persistence of Cool Season Grasses to Form Turfgrass. <i>Agricultura Técnica</i>, 67(4), 372-383</p>	<p>"Cool season turfgrass have difficulties to grow and persist with good quality under shade in the summer. The objective of this study was to evaluate the ability and persistence of three cool season species suitable for turfgrass under different levels of shade, in the Province of Cordoba, Argentina (33°07' lat. S, 64°14' long. O). Density, cover, overall quality and dry weight of live and dead biomass were evaluated in <i>Festuca rubra</i> L., <i>Poa trivialis</i> L. and <i>Agrostis stolonifera</i> L. var. <i>palustris</i> (Huds.) Farw. growing under 0, 25, 50 and 80% light reduction. The shade was produced with black plastic shading mesh. The behaviour of the turf was modified over time, with the genotype and the level of shade in which it grew ($p \leq 0.001$). In all the variables there were interactions between species \times time ($p \leq 0.001$); shade level \times time ($p \leq 0.001$) and species \times shade level ($p \leq 0.05$). None of the varieties of the studied grasses can be used as a single genotype to form turfgrass under full sunlight. Under 25% of shade, only <i>A. stolonifera</i> produced good quality turf as single species, surviving until the beginning of the second warm season. Under 50% of light reduction, <i>A. stolonifera</i> is the only species that persisted two years from its establishment, with very good quality in the first year and just acceptable in the second year. At 80% of shading, <i>A. stolonifera</i> and <i>P. trivialis</i> persisted until the second early summer with acceptable quality, but only <i>A. stolonifera</i> survived two warm seasons."</p>
	<p>Esser, L. L. 1994. <i>Agrostis stolonifera</i>. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/. [Accessed 24 Feb 2016]</p>	<p>"Creeping bentgrass is generally a pioneer or invader species [4,15,36], but is tolerant of semishaded environments [62]."</p>
	<p>Quattrocchi, U. 2006. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL</p>	<p>"tolerates cold and shade"</p>

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	<p>Esser, L. L. 1994. <i>Agrostis stolonifera</i>. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/. [Accessed 24 Feb 2016]</p>	<p>"Creeping bentgrass occurs in a wide variety of habitats including woodlands, forest openings, grasslands, shrublands, prairies, sandhills, meadows, marshes, bogs, vernal pools, and stream and lake margins [7,9,30,35,36,59]. It is most commonly found in moist places such as recently exposed sand and gravel bars, wet meadows, and along streams [4,22,23,24,34]. Creeping bentgrass grows on disturbed sites such as in ditches or along roadsides, and in pastures and hayfields [19,23,44,58]. It also grows in salt marshes [7,61]. Creeping bentgrass grows best on moist to semiwet soils, but is tolerant of poorly drained and subirrigated conditions, submergence, and frequent flooding [4,24]. It grows best on loam, clay-loam, and sandy soils, but occurs on gravelly and rocky substrates as well [4,6,15,24]. It is moderately tolerant of drought [4]."</p>

411	Climbing or smothering growth habit	n
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Qsn #	Question	Answer
	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.	"Rhizomatous or stoloniferous perennials; culms decumbent"

412	Forms dense thickets	y
	Source(s)	Notes
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Creeping bentgrass can form dense patches that outcompete native plants and prevent establishment of shrubs."
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"It is fast growing and invasive because it forms mat-like dense colonies due to vegetative growth, displacing native vegetation and reducing species richness"

501	Aquatic	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.	[Terrestrial] "in Hawai'i naturalized in disturbed places, especially in moist sites"

502	Grass	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 24 Feb 2016]	"Family: Poaceae (alt.Gramineae) Subfamily: Pooideae Tribe: Poeae Subtribe: Agrostidinae"

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 24 Feb 2016]	Poaceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Creeping bentgrass is a stoloniferous perennial, and is sometimes mat-forming or tufted"

Qsn #	Question	Answer
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. <i>Plant Protection Quarterly</i> , 25(2): 56-74	"This question is specifically to deal with plants that have specialized organs and should not include plants merely with rhizomes/ stolons"

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	[No evidence. Widespread native & introduced ranges] "Creeping bentgrass is native to Eurasia and North Africa [59]. It was probably introduced to North America prior to 1750, and has become naturalized throughout the southern Canadian provinces and most of the United States [34,59]."

602	Produces viable seed	y
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Creeping bentgrass reproduces by seed and by stolons [14,53]. It can set seed in one growing season, thus sometimes functioning as an annual. In southern Ontario, creeping bentgrass seed has a 52 percent germination rate after 30 days under approximate optimal germination conditions; seeds were cold stratified for 9 months prior to planting [53]. Grasses in the genus <i>Agrostis</i> are seed-banking species [60]. In pastures and meadows of Europe, creeping bentgrass seeds can survive in the soil for at least 1 year [48]."

603	Hybridizes naturally	y
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"Creeping bentgrass hybridizes with rabbitfoot grass (<i>Polypogon monspeliensis</i>) and colonial bentgrass (<i>A. capillaris</i>). It apparently hybridizes with ticklegrass (<i>A. scabra</i>), spike bentgrass (<i>A. exarata</i>) and water polypogon (<i>P. semiverticillatus</i>) [59]."
	Quattrocchi, U. 2006. <i>CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	"hybridizes with <i>Agrostis capillaris</i> "

604	Self-compatible or apomictic	n
	Source(s)	Notes
	Belanger, F. C., Meagher, T. R., Day, P. R., Plumley, K., & Meyer, W. A. (2003). Interspecific hybridization between and related species under field conditions. <i>Crop Science</i> , 43(1), 240-246	"Creeping bentgrass is a self-sterile, wind pollinated, outcrossing species..."

Qsn #	Question	Answer
	Kik, C., Van Andel, J., Van Delden, W., Joenje, W., & Bijlsma, R. (1990). Colonization and differentiation in the clonal perennial <i>Agrostis stolonifera</i> . <i>The Journal of Ecology</i> , 78(4): 949-961	"The breeding system is almost obligately outcrossing (Ellis Davies 1953) and vegetative propagation occurs by stolons"

605	Requires specialist pollinators	n
	Source(s)	Notes
	Belanger, F. C., Meagher, T. R., Day, P. R., Plumley, K., & Meyer, W. A. (2003). Interspecific hybridization between and related species under field conditions. <i>Crop Science</i> , 43(1), 240-246	"Creeping bentgrass is a self-sterile, wind pollinated, outcrossing species..."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. <i>Handbook of Hawaiian Weeds</i> . University of Hawaii Press, Honolulu, HI	"By vigorous creeping underground stems. Spreads rapidly and forms extensive colonies."
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 24 Feb 2016]	"In a northern subarctic community in Manitoba, Canada, creeping bentgrass is a persistent perennial that spreads vegetatively to form clumps or large patches but sometimes fails to reproduce by seed, although flowering is observed [53]."
	Weber, E. 2003. <i>Invasive Plant Species of the World. A Reference Guide to Environmental Weeds</i> . CABI Publishing, Wallingford, UK	"Plants in Australia do not fruit and spread solely by stolons. Fragments of stolons easily root and regenerate to new plants"

607	Minimum generative time (years)	1
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 25 Feb 2016]	"It can set seed in one growing season, thus sometimes functioning as an annual."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	New Zealand Plant Conservation Network. 2014. <i>Flora Details - Agrostis stolonifera</i> . http://www.nzpcn.org.nz/flora_details.aspx?ID=2467 . [Accessed 25 Feb 2016]	"Seed and stolons dispersed by water and contaminated machinery."

Qsn #	Question	Answer
	Lowry, B. J., Whitesides, R. E., Dewey, S. A., Ransom, C. V. & Banner, R. E. 2011. Common Weeds of the Yard and Garden. Utah State University Cooperative Extension, Logan, UT	"The seeds are dispersed by water, on mud stuck to feet or vehicles, and as a grass seed contaminant."
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 25 Feb 2016]	[Occurs in heavily trafficked areas] "Creeping bentgrass grows on disturbed sites such as in ditches or along roadsides, and in pastures and hayfields [19,23,44,58]."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 25 Feb 2016]	[introduced widely for the following reasons] "Creeping bentgrass is important forage for livestock because it stays green and palatable throughout the summer ... Creeping bentgrass is moderately effective in stabilizing streambanks due to its typically dense network of intertwining roots and rhizomes ... Creeping bentgrass is widely used in turf culture, especially for golf courses"

703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	Notes
	Lowry, B. J., Whitesides, R. E., Dewey, S. A., Ransom, C. V. & Banner, R. E. 2011. Common Weeds of the Yard and Garden. Utah State University Cooperative Extension, Logan, UT	"The seeds are dispersed by water, on mud stuck to feet or vehicles, and as a grass seed contaminant."

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Seeds are dispersed by wind and water, and by grazers consuming seeds as they feed on the plants."
	Lowry, B. J., Whitesides, R. E., Dewey, S. A., Ransom, C. V. & Banner, R. E. 2011. Common Weeds of the Yard and Garden. Utah State University Cooperative Extension, Logan, UT	"The seeds are dispersed by water, on mud stuck to feet or vehicles, and as a grass seed contaminant."

Qsn #	Question	Answer
705	Propagules water dispersed	y
	Source(s)	Notes
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Seeds are dispersed by wind and water, and by grazers consuming seeds as they feed on the plants."
	Lowry, B. J., Whitesides, R. E., Dewey, S. A., Ransom, C. V. & Banner, R. E. 2011. Common Weeds of the Yard and Garden. Utah State University Cooperative Extension, Logan, UT	"The seeds are dispersed by water, on mud stuck to feet or vehicles, and as a grass seed contaminant."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Seeds are dispersed by wind and water, and by grazers consuming seeds as they feed on the plants."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Couvreur, M., Christiaen, B., Verheyen, K., & Hermy, M. (2004). Large herbivores as mobile links between isolated nature reserves through adhesive seed dispersal. Applied Vegetation Science, 7(2): 229-236	"Table 1. Plant species identified in the fur of 201 large herbivores" [Agrostis stolonifera seeds collected in the fur of Galloway cattle]
	Lowry, B. J., Whitesides, R. E., Dewey, S. A., Ransom, C. V. & Banner, R. E. 2011. Common Weeds of the Yard and Garden. Utah State University Cooperative Extension, Logan, UT	[Could potentially stick to animals via mud] "The seeds are dispersed by water, on mud stuck to feet or vehicles, and as a grass seed contaminant."

Qsn #	Question	Answer
708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Seeds are dispersed by wind and water, and by grazers consuming seeds as they feed on the plants."
	Cosyns, E., Claerbout, S., Lamoot, I., & Hoffmann, M. (2005). Endozoochorous seed dispersal by cattle and horse in a spatially heterogeneous landscape. <i>Plant Ecology</i> , 178(2), 149-162	"Table 2. Alphabetic ordered list of 68 plant species, within 3 functional groups, which were recorded at least 5 times from different dung samples of large herbivores..." [<i>Agrostis stolonifera</i> seeds collected in dung]

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Plants in Australia do not fruit and spread solely by stolons. Fragments of stolons easily root and regenerate to new plants"

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 3 Mar 2016]	" <i>Agrostis</i> are seed-banking species [60]. In pastures and meadows of Europe, creeping bentgrass seeds can survive in the soil for at least 1 year [48]."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"On larger infestations, herbicides such as glyphosate are effective."
	Beam, J. B., Barker, W. L., & Askew, S. D. (2006). Selective Creeping Bentgrass (<i>Agrostis stolonifera</i>) Control in Cool-Season Turfgrass. <i>Weed Technology</i> , 20(2), 340-344	"Results indicate isoxaflutole or mesotrione could be used for selective bentgrass control in Kentucky bluegrass or perennial ryegrass."
	Hart, S. E., Yelverton, F., Nelson, E. K., Lycan, D. W., & Henry, G. M. (2005). Response of Glyphosate-Resistant and Glyphosate Susceptible Bentgrass (<i>Agrostis</i> spp.) to Postemergence Herbicides. <i>Weed Technology</i> , 19(3), 549-559	"The results of these studies demonstrate that fluzifop-P, clethodim, and sethoxydim have substantial herbicide activity on bentgrass species and may be viable alternatives to glyphosate for control of glyphosate-resistant creeping bentgrass and related bentgrass species in areas where they are not wanted. Glufosinate, atrazine, and sulfosulfuron also exhibited substantial herbicidal activity on bentgrass, and further research with these herbicides is warranted."

Qsn #	Question	Answer
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Lowry, B. J., Whitesides, R. E., Dewey, S. A., Ransom, C. V. & Banner, R. E. 2011. Common Weeds of the Yard and Garden. Utah State University Cooperative Extension, Logan, UT	"It can also withstand heavy grazing and close mowing."
	Esser, L. L. 1994. <i>Agrostis stolonifera</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 25 Feb 2016]	"Overgrazing on sites formerly dominated by native grasses produces changes in vegetational communities. Once a suitable site is disturbed, the extensive stolon system of creeping bentgrass allows it to rapidly spread and establish. It also withstands high levels of grazing, making replacement with former dominants difficult ... Creeping bentgrass is tolerant of close grazing due to its somewhat prostrate growth form, rhizomatous growth habit, and lower palatability than associated species."
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Small areas can be hand pulled, but plants will resprout from roots left in the ground."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. 2016. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Naturalized in areas with tropical or subtropical climates
- Widely naturalized, including on Kauai, Oahu, Molokai, Maui, and Hawaii island
- Disturbance-adapted weed of lawns, & turf grass
- Regarded as an environmental weed in Australia
- Other *Agrostis* species are invasive
- Pollen can be a severe allergen
- Shade-tolerant
- Tolerates many soil types
- Forms dense cover
- Reproduces by seeds & vegetatively by stolons & fragments
- Hybridizes with other *Agrostis* species
- Can reach maturity in one growing season
- Seeds dispersed by wind, water, by grazers consuming seeds as they feed on the plants & as a grass seed contaminant
- Seeds can persist in the soil for 1 year
- Tolerates mowing & grazing

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Provides fodder for livestock
- Non-toxic
- Ornamental & landscaping uses
- Self-sterile
- Herbicides can provide effective control