

Taxon: <i>Agave attenuata</i> Salm-Dyck	Family: Asparagaceae
Common Name(s): fox tail agave foxtail agave	Synonym(s):

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 7 Oct 2020
WRA Score: 9.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Naturalized, Spineless, Shade-Tolerant, Spreads Vegetatively, Wind-Dispersed Seeds

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)	High
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	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed		
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
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		
405	Toxic to animals		
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	y=1, n=0	n
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	n
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		
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	>3
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	n
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)		
708	Propagules survive passage through the gut	y=1, n=-1	n
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		
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
	Gentry, H. S. (2004). <i>Agaves of Continental North America</i> . University of Arizona Press, Tucson, AZ	[No evidence] "It has been observed in few localities and can be considered as relatively rare; see also the <i>Exsiccatae</i> . <i>A. attenuata</i> is now a wide-spread ornamental, responding particularly well to garden culture in frostless climates."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2020). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2020). 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"	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 3 Oct 2020]	"Native Northern America REGION: Mexico Naturalized Africa MACARONESIA: Portugal [Madeira Islands] NORTHERN AFRICA: Libya"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 3 Oct 2020]	

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

Qsn #	Question	Answer
	Gentry, H. S. (2004). <i>Agaves of Continental North America</i> . University of Arizona Press, Tucson, AZ	"It favors the high rocky outcrops in pine forests between 1,900 and 2,500 m. where it forms small widely scattered colonies." ... "A. attenuata is now a wide-spread ornamental, responding particularly well to garden culture in frostless climates. It is a soft voluptuous harmless plant luxuriating in patio comers. It also does well in greenhouses and will tolerate more shade than many agaves. It does not do well in the Desert Botanical Garden where summer sun is intense and shade temperatures commonly reach 115°F (46°C), and it has been frozen by temperatures of 24- 25°F (-4° to -5°C)."
	Missouri Botanical Garden. (2020). <i>Agave attenuate</i> . https://www.missouribotanicalgarden.org . [Accessed 5 Oct 2020]	"Zone: 10 to 12"

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 3 Oct 2020]	"Native Northern America REGION: Mexico Naturalized Africa MACARONESIA: Portugal [Madeira Islands] NORTHERN AFRICA: Libya"
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Verloove, F., Thiede, J., Rodríguez, Á. M., Salas-Pascual, M., Reyes-Betancort, J. A., Ojeda-Land, E., & Smith, G. F. (2019). A synopsis of feral <i>Agave</i> and <i>Furcraea</i> (Agavaceae, Asparagaceae s. lat.) in the Canary Islands (Spain). <i>Plant Ecology and Evolution</i> , 152(3), 470-498	" <i>Agave attenuata</i> is widely cultivated in warm-temperate regions of the world and increasingly reported as escaping, also in natural habitats. It is known, for instance, from the Kruger National Park in South Africa (Foxcroft et al. 2008), Italy, including Sardinia and Sicily (Podda et al. 2012; Galasso et al. 2018) and many parts of Australia (Randall 2017). In Macaronesia it is also known from Madeira (Vieira 2002; Borges et al. 2008) where it is locally naturalised."
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Ironically, although it is rare in its native habitat, <i>A. attenuata</i> is now a widespread ornamental and is the most commonly cultivated a gave in the Hawaiian Islands."
	Silva, V., Figueiredo, E., & Smith, G. F. (2015). Alien succulents naturalised and cultivated on the central west coast of Portugal. <i>Bradleya</i> , 33, 58-81	"Place recorded in central coastal Portugal: Commonly cultivated in domestic and public gardens." ... "While it is very commonly cultivated in mild-climate parts of the world, it is rarely recorded as having become naturalised. It is naturalised on the island of Madeira (Vieira, 2002)."

301	Naturalized beyond native range	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Lohr, M. T., & Keighery, G. (2016). The status and distribution of naturalised alien plants on the islands of the west coast of Western Australia. <i>Conservation Science Western Australia</i> , 10: 1	" <i>Agave attenuata</i> (fox tail agave)– Recorded as naturalised on Rottneest Island (Rippey et al. 2003) in the Swan Region. Still persists in roadside areas (Cassyanna Thomas, pers. comm.). Common in landscaping around Perth but not currently recognised by the Western Australian Herbarium as naturalised in WA."
	Verloove, F., Thiede, J., Rodríguez, Á. M., Salas-Pascual, M., Reyes-Betancort, J. A., Ojeda-Land, E., & Smith, G. F. (2019). A synopsis of feral <i>Agave</i> and <i>Furcraea</i> (Agavaceae, Asparagaceae s. lat.) in the Canary Islands (Spain). <i>Plant Ecology and Evolution</i> , 152(3), 470-498	"In the Canary Islands this ornamental from Central Mexico had previously been recorded from Fuerteventura, Gran Canaria and La Palma. In recent years it has been increasingly found on these islands and it is here reported for the first time from Tenerife as well. In most instances the occurrences consist of solitary individuals and <i>Agave attenuata</i> is definitely much less expansive than many of its congeners. In some places in Tenerife, however, small but apparently established populations were detected (including flowering individuals), for instance in a ravine in Candelaria (Barranco de Aroba) or in La Victoria de Acentejo where it grows on the cliff that is part of the Protected Natural Area of La Costa de Acentejo. A future naturalisation on a wider scale is not unlikely. Also, in Gran Canaria <i>A. attenuata</i> was detected in numerous additional localities in recent years. At least in some of these, for instance on the slopes of a ravine in Arucas (Santidad), small but apparently established populations were seen with flowering and fruiting individuals. Although very widespread in cultivation <i>A. attenuata</i> has a very limited native distribution range that remained unknown for quite a long time (Chazaro et al. 1998)."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 3 Oct 2020]	"Naturalized Africa MACARONESIA: Portugal [Madeira Islands] NORTHERN AFRICA: Libya"
	Rippey, E., Hislop, M. C., & Dodd, J. (2003). Reassessment of the vascular flora of Rottneest Island. <i>Journal of the Royal Society of Western Australia</i> , 86: 7-23	"Nine of the species that had been cultivated on the island became naturalised between the late 1950s and 1998–2001; specifically <i>Agave attenuata</i> , <i>Caesalpinia gilliesii</i> , <i>Casuarina glauca</i> , <i>Eucalyptus utilis</i> , <i>Ficus rubiginosa</i> , <i>Iris</i> sp, <i>Melia azedarach</i> , <i>Narcissus tazetta</i> and <i>Nerium oleander</i> ."
	Silva, V., Figueiredo, E., & Smith, G. F. (2015). Alien succulents naturalised and cultivated on the central west coast of Portugal. <i>Bradleya</i> , 33, 58-81	"While it is very commonly cultivated in mild-climate parts of the world, it is rarely recorded as having become naturalised. It is naturalised on the island of Madeira (Vieira, 2002)."
	Lu, P. L., & DeLay, J. K. (2016). Vegetation and fire in lowland dry forest at Wa'ahila Ridge on O'ahu, Hawai'i. <i>PhytoKeys</i> , 68: 51-64	[Established on Wa'ahila Ridge, Oahu, and called "invasive", although no evidence of impacts have been described from this site] "Year by year, the burned site became dominated this single invasive species, with scattered <i>Agave attenuata</i> , another dryland invasive species recently occurring in Hawai'i."
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

302	Garden/amenity/disturbance weed	
	Source(s)	Notes

Qsn #	Question	Answer
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Possibly weedy, although a review of the listed references did not turn up evidence of negative impacts] "References: Australia-W-93, southeast Asia-W-191, Canary Islands-N-305, Australia-W-853, Australia-N-868, Australia-N-354, Portugal-N-1006, Portugal-N-1006, Italy-N-1006, Europe-N-819, Galapagos Islands-CN-1157, South Africa-U-1247, Italy-N-251, Global-CD-1611, Libya-N-1796, Sardinia-U-1393, Australia-N-1902, Italy-N-1887, Sardinia-N-1917, South Africa-N-1991, South Africa-NR-2017, Algeria-W-1977, Australia-W-1977, Italy-W-1977, Portugal-W-1977, South Africa-W-1977, Spain-W-1977."

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Designated as a weed in a number of location] "References: Australia-W-93, southeast Asia-W-191, Canary Islands-N-305, Australia-W-853, Australia-N-868, Australia-N-354, Portugal-N-1006, Portugal-N-1006, Italy-N-1006, Europe-N- 819, Gal pagos Islands-CN-1157, South Africa-U-1247, Italy-N-251, Global-CD- 1611, Libya-N-1796, Sardinia-U-1393, Australia-N-1902, Italy-N-1887, Sardinia- N-1917, South Africa-N-1991, South Africa-NR-2017, Algeria-W-1977, Australia-W-1977, Italy-W-1977, Portugal- W-1977, South Africa-W-1977, Spain-W- 1977."
	Lu, P. L., & DeLay, J. K. (2016). Vegetation and fire in lowland dry forest at Wa'ahila Ridge on O'ahu, Hawai'i. <i>PhytoKeys</i> , 68: 51-64	[Established on Wa'ahila Ridge, Oahu, and called "invasive", although no evidence of impacts have been described from this site] "Year by year, the burned site became dominated this single invasive species, with scattered <i>Agave attenuata</i> , another dryland invasive species recently occurring in Hawai'i."
	Lucid Key Server. (2020). <i>Agave attenuata</i> . https://keys.lucidcentral.org/demo/js_player/sew2/text/agave_attenuata.htm . [Accessed 7 Oct 2020]	[Potentially] "As this species is not a declared plant, its control is not required and there are no restrictions on its sale or cultivation. However, it is a potential environmental weed and should be controlled in sensitive bushland and conservation areas."

305	Congeneric weed	y
	Source(s)	Notes
	Weber, E. 2003. <i>Invasive Plant Species of the World. A Reference Guide to Environmental Weeds</i> . CABI Publishing, Wallingford, UK	" <i>Agave americana</i> ... A single individual can form dense impenetrable stands that eliminate native vegetation."

Qsn #	Question	Answer
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Agave sisalana ... The weedy behaviour is due to vegetative growth, allowing the species to colonize large areas and replace the native vegetation with its dense growth of rosettes (Ortiz and van der Meerz, 2006). Agave sisalana persists for long periods even after abandonment of plantations. The plant easily escapes from plantations by rhizome fragments and bulbils, and becomes established in adjacent natural areas (Badano and Pugnaire, 2004; Acevedo-Rodríguez and Strong, 2005)." ... "Agave americana ... American agave is extremely drought resistant and tolerates wind, salt spray and high temperatures. It can grow in shallow soils of low fertility and in sand. The large succulent is freely suckering from the root crown and forms numerous daughter plants by vegetative growth. This dense network of rhizomatous offshoots may compete with native species for water and nutrients (Badano and Pugnaire, 2004). This property makes the plant highly invasive, despite its low growth rate and long time until flowering. The thick succulent leaves form dense and impenetrable thickets that eliminate native vegetation by shading and may hinder wildlife movement. It replaces vulnerable dune species and causes accumulation of sand in coastal areas, which substantially alters habitats (ISSG, 2014)."

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"In the wild, some <i>A. attenuata</i> populations have toothed leaf margins, but only the unarmed plants have been introduced to cultivation."
	Gentry, H. S. (2004). Agaves of Continental North America. University of Arizona Press, Tucson, AZ	"Perennial plants with 1 to several stems, usually ascending-bent, 5-15 dm long from the base, becoming naked in age, and with indeterminate number of relatively short-lived leaves. Leaves ovate-acuminate, 50- 70 x 12-16 cm, broadest in middle, soft succulent, plane to concave, light glaucous gray to pale yellowish green, the margin smooth or serrulate, apex spineless but finely tapered, soon fraying; inflorescence a dense raceme, thickly flowered, 2-3.5 m long;"

402	Allelopathic	
	Source(s)	Notes
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Unknown. <i>Agave sisalana</i> may be allelopathic] "This species may impact negatively the fertility of soils in cultivated areas. Studies have demonstrated that the fertility of soils in areas subject to continuous cultivation of <i>A. sisalana</i> has declined, while the pH of the topsoils has decreased (Hartemink et al., 1996; FAO, 2012). Finally, the effluent from the sisal fibre production process cause serious pollution when it is allowed to flow into watercourse (FAO, 2012)."

403	Parasitic	n
	Source(s)	Notes

Qsn #	Question	Answer
	Gentry, H. S. (2004). <i>Agaves of Continental North America</i> . University of Arizona Press, Tucson, AZ	"Perennial plants with 1 to several stems, usually ascending-bent, 5-15 dm long from the base, becoming naked in age, and with indeterminate number of relatively short-lived leaves." [Asparagaceae. No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	The Gardener. (2020). <i>Agave attenuata</i> . https://www.thegardener.co.za . [Accessed 5 Oct 2020]	[Other species planted for fodder] "Within the genus <i>Agave</i> , some of the species (such as <i>A. americana</i> and <i>A. sisalana</i>) that were planted in days gone by in parts of South Africa outdid themselves and now appear on the invasive vegetation list. They were imported from the arid regions of Mexico and tropical America (where the local population put agaves to a multitude of uses, from medicinal to functional to making tequila) and planted in the desert regions of the Karoo as fodder for cattle, and to prevent soil erosion, form secure hedges around cattle pens and provide nectar for honey production. "
	Thiede J. (2001) <i>Agavaceae</i> . In: Egli U., Nyffeler R. (eds) <i>Monocotyledons. Illustrated Handbook of Succulent Plants</i> . Springer, Berlin, Heidelberg	[Several <i>Agave</i> species identified as palatable] "Animal fodder: Young or also old plants and inflorescences are used as fodder mainly for cattle and goats (Delgado-Lemus & al. 2014: 7; see also under <i>A. kerchovei</i> , <i>A. quioitepecensis</i>), sometimes also the flowers (<i>A. kerchovei</i>)."

405	Toxic to animals	
	Source(s)	Notes
	Fuller, T.C. & McClintock, E.M. 1986. <i>Poisonous plants of California: Issue 53 of California natural history guides</i> . University of California Press, Berkeley and Los Angeles, CA	[Potentially Yes. May require consumption by animals for toxic effects to be manifested] "Toxic part: Sap of the leaves or inflorescence. Toxin: A hemolytic sapogenin, an acrid volatile oil, oxalic acid, and oxalates. Symptoms: Fresh juice of the plant is cathartic and diuretic. The juice of the leaf and particularly the outer layers of the leaf are highly irritant to the skin."

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Gilman, E.F., Klein, R.W., and Hansen, G. Gilman, E.F. (2018). <i>Agave attenuata: Spineless Century Plant</i> . FPS22. Revised. IFAS, University of Florida, Gainesville. https://edis.ifas.ufl.edu/fp022 . [Accessed 5 Oct 2020]	"Few problems appear to affect most specimens."
	Missouri Botanical Garden. (2020). <i>Agave attenuata</i> . https://www.missouribotanicalgarden.org . [Accessed 5 Oct 2020]	"Problems - No serious insect or disease problems. Slugs and snails may damage foliage."

407	Causes allergies or is otherwise toxic to humans	y
	Source(s)	Notes

Qsn #	Question	Answer
	Thiede J. (2001) Agavaceae. In: Eggli U., Nyffeler R. (eds) Monocotyledons. Illustrated Handbook of Succulent Plants. Springer, Berlin, Heidelberg	[Skin irritant] "Toxic part: Sap of the leaves or inflorescence. Toxin: A hemolytic sapogenin, an acrid volatile oil, oxalic acid, and oxalates. Symptoms: Fresh juice of the plant is cathartic and diuretic. The juice of the leaf and particularly the outer layers of the leaf are highly irritant to the skin."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Knutson-Pedersen, J. 2005. Fire Safe Landscaping. Tree Notes. Number 17 (revised). California Department of Forestry and Fire Protection. ceres.ca.gov/foreststeward/pdf/treenote17.pdf	[Agave attenuata included among fire safe plants] "The following is a partial list of plants that can be planted within each of the four zones around a structure. This plant list is a compilation of observations and research. More research on fire retardant vegetation needs to be conducted to produce a definitive list. Sunset's new Western Garden Book is an excellent source for specific plant descriptions. Visits to community botanical gardens and organizations such as the California Native Plant Society are also good resources for determining appropriate plant selections for your area."
	Thiede J. (2001) Agavaceae. In: Eggli U., Nyffeler R. (eds) Monocotyledons. Illustrated Handbook of Succulent Plants. Springer, Berlin, Heidelberg	[No evidence, and unlikely given succulent habit] "Stems 1 to several, usually ascending-curved, 0.5 - 1.5 m, becoming naked in age; L indeterminate in number, relatively short-lived, ovate-acuminate, softly succulent, broadest in the middle, plane to concave, 50 - 70 x 12 - 16 cm"

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Agave attenuata tolerates more shade than other agave species and in fact may burn under intense summer sunlight if not given adequate water."
	The Gardener. (2020). Agave attenuata. https://www.thegardener.co.za . [Accessed 5 Oct 2020]	"It has many other good characteristics too, including that it grows easily from cuttings that you simply stick in the ground, and that it grows in full sun, but also in relatively deep shade."
	Missouri Botanical Garden. (2020). Agave attenuata. https://www.missouribotanicalgarden.org . [Accessed 5 Oct 2020]	"Sun: Full sun to part shade"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Learn 2 Grow. (2020). Agave attenuata. http://www.learn2grow.com/plants/agave-attenuata/ . [Accessed 5 Oct 2020]	"It may be grown in most well-drained soils, even poorer ones. This is a naturally drought resistant species, but with regular water it will grow better and look nicer."
	Gilman, E.F., Klein, R.W., and Hansen, G. Gilman, E.F. (2018). Agave attenuata: Spineless Century Plant. FPS22. Revised. IFAS, University of Florida, Gainesville. https://edis.ifas.ufl.edu/fp022 . [Accessed 5 Oct 2020]	"Soil tolerances: alkaline; clay; sand; acidic; loam"

Qsn #	Question	Answer
	Missouri Botanical Garden. (2020). <i>Agave attenuata</i> . https://www.missouribotanicalgarden.org . [Accessed 5 Oct 2020]	"Winter hardy to USDA Zones 10-12 where it grows best in a sandy/gritty, medium moisture, well drained soil in full sun to part shade. Tolerates poor soils. Also tolerates dry soils and drought, but appreciates regular watering. Plant leaves will shrivel in dry conditions, but will revive when given moisture."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Gentry, H. S. (2004). <i>Agaves of Continental North America</i> . University of Arizona Press, Tucson, AZ	"Perennial plants with 1 to several stems, usually ascending-bent, 5-15 dm long from the base, becoming naked in age, and with indeterminate number of relatively short-lived leaves. Leaves ovate-acuminate, 50- 70 x 12-16 cm, broadest in middle, soft succulent, plane to concave, light glaucous gray to pale yellowish green, the margin smooth or serrulate, apex spineless but finely tapered, soon fraying; inflorescence a dense raceme, thickly flowered, 2-3.5 m long;"

412	Forms dense thickets	y
	Source(s)	Notes
	Lucid Key Server. (2020). <i>Agave attenuata</i> . https://keys.lucidcentral.org/demo/js_player/sew2/text/agave_attenuata.htm . [Accessed 7 Oct 2020]	"Foxtail agave (<i>Agave attenuata</i>) spreads laterally via suckers and can form very large and dense colonies over time."

501	Aquatic	n
	Source(s)	Notes
	Gentry, H. S. (2004). <i>Agaves of Continental North America</i> . University of Arizona Press, Tucson, AZ	[Terrestrial] "It favors the high rocky outcrops in pine forests between 1,900 and 2,500 m. where it forms small widely scattered colonies."

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 3 Oct 2020]	Family: Asparagaceae Subfamily: Agavoideae Alternate family(ies): Agavaceae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 3 Oct 2020]	Family: Asparagaceae Subfamily: Agavoideae Alternate family(ies): Agavaceae

Qsn #	Question	Answer
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Gentry, H. S. (2004). <i>Agaves of Continental North America</i> . University of Arizona Press, Tucson, AZ	"Perennial plants with 1 to several stems, usually ascending-bent, 5-15 dm long from the base, becoming naked in age, and with indeterminate number of relatively short-lived leaves."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Gentry, H. S. (2004). <i>Agaves of Continental North America</i> . University of Arizona Press, Tucson, AZ	[Rare in native range. Widespread elsewhere. No evidence of substantial reproductive failure] "It has been observed in few localities and can be considered as relatively rare; see also the <i>Exsiccatae</i> . <i>A. attenuata</i> is now a wide-spread ornamental, responding particularly well to garden culture in frostless climates."

602	Produces viable seed	y
	Source(s)	Notes
	Gentry, H. S. (2004). <i>Agaves of Continental North America</i> . University of Arizona Press, Tucson, AZ	"capsules oblong, 2-3 x 1 cm, or smaller, thin-walled, stipitate, short-beaked, freely seeding; seeds 3-3.5 x 2-2.5 1nm, lunate to deltoid with low marginal wing."
	Missouri Botanical Garden. (2020). <i>Agave attenuata</i> . https://www.missouribotanicalgarden.org . [Accessed 5 Oct 2020]	"Each rosette will flower only once, usually when the plant reaches about 10 years old. The "flower" is a huge recurving raceme to 5-10' tall with small, drooping, densely-packed, yellow-green to white flowers. Flowers are followed by seed pods."

603	Hybridizes naturally	
	Source(s)	Notes
	Thiede J. (2001) <i>Agavaceae</i> . In: Egli U., Nyffeler R. (eds) <i>Monocotyledons. Illustrated Handbook of Succulent Plants</i> . Springer, Berlin, Heidelberg	[Artificial hybrid possible. Other interspecific hybrids documented within genus] "'Blue Glow' is a hybrid with <i>A. ocahui</i> (Starr 2012: 56-58, with ill.), and 'Snow Glow' (Starr 2014: 224, with ill.) is a variegated sport selected from it."

604	Self-compatible or apomictic	n
	Source(s)	Notes
	Thiede J. (2001) <i>Agavaceae</i> . In: Egli U., Nyffeler R. (eds) <i>Monocotyledons. Illustrated Handbook of Succulent Plants</i> . Springer, Berlin, Heidelberg	"Most species are self-incompatible (outbreeding). Only few species are reported to be self-compatible (e.g. <i>A. garciaemendozae</i> , <i>A. horrida</i>), but cross-pollination is most effective for fruit set."
	Learn 2 Grow. (2020). <i>Agave attenuata</i> . http://www.learn2grow.com/plants/agave-attenuata/ . [Accessed 5 Oct 2020]	"Self-Sowing No"

605	Requires specialist pollinators	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Thiede J. (2001) Agavaceae. In: Eggl U., Nyffeler R. (eds) Monocotyledons. Illustrated Handbook of Succulent Plants. Springer, Berlin, Heidelberg	"Pollination biology: Agave has a broad variation in floral morphology, colour and size. In general, a broad spectrum of diurnal (hummingbirds and other birds, bees and other hymenopterans, other insects) as well as nocturnal flower visitors (nectar- and pollen-feeding bats, sphingids and moths) has been observed."
	Learn 2 Grow. (2020). <i>Agave attenuata</i> . http://www.learn2grow.com/plants/agave-attenuata/ . [Accessed 5 Oct 2020]	"The flowers are fragrant and attract many pollinators to include birds, bees and bats."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Gilman, E.F., Klein, R.W., and Hansen, G. Gilman, E.F. (2018). <i>Agave attenuata</i> : Spineless Century Plant. FPS22. Revised. IFAS, University of Florida, Gainesville. https://edis.ifas.ufl.edu/fp022 . [Accessed 5 Oct 2020]	"Propagation is by detaching the well-rooted suckers appearing at the base, or by uprooting germinating seedlings near the plant."
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"The plant is easily propagated by removal of the offsets produced at the base of mature plants."
	Missouri Botanical Garden. (2020). <i>Agave attenuata</i> . https://www.missouribotanicalgarden.org . [Accessed 5 Oct 2020]	"The rosette dies after flowering, but suckers/offsets at the base remain as new plants."
	The Gardener. (2020). <i>Agave attenuata</i> . https://www.thegardener.co.za . [Accessed 5 Oct 2020]	"This species is a generous monocarpic plant that produces many runners (baby plants) at the base of its stem and is able to cover a large area relatively quickly."

607	Minimum generative time (years)	>3
	Source(s)	Notes
	Gilman, E.F., Klein, R.W., and Hansen, G. Gilman, E.F. (2018). <i>Agave attenuata</i> : Spineless Century Plant. FPS22. Revised. IFAS, University of Florida, Gainesville. https://edis.ifas.ufl.edu/fp022 . [Accessed 5 Oct 2020]	"After 10 years or more (though not a century), a lofty flower spike is produced, with terminal panicles of pale yellow to white blooms. The stem producing the flower dies soon after."
	The Gardener. (2020). <i>Agave attenuata</i> . https://www.thegardener.co.za . [Accessed 5 Oct 2020]	"As each rosette of leaves matures, usually after 4 to 5 years, an amazing floral spectacle emerges in the form a flower spike 3 metres or more tall."
	Missouri Botanical Garden. (2020). <i>Agave attenuata</i> . https://www.missouribotanicalgarden.org . [Accessed 5 Oct 2020]	"Each rosette will flower only once, usually when the plant reaches about 10 years old."

Qsn #	Question	Answer
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Lucid Key Server. (2020). <i>Agave attenuata</i> . https://keys.lucidcentral.org/demo/js_player/seg2/text/agave_attenuata.htm . [Accessed 7 Oct 2020]	[Spread unintentionally as dumped garden waste] "The seeds may be spread by wind and water, while the plantlets can be dispersed during floods. Plants and plantlets are also commonly spread into bushland areas in dumped garden waste."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Ironically, although it is rare in its native habitat, <i>A. attenuata</i> is now a widespread ornamental and is the most commonly cultivated a gave in the Hawaiian Islands."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Escapee"
	Lucid Key Server. (2020). <i>Agave attenuata</i> . https://keys.lucidcentral.org/demo/js_player/seg2/text/agave_attenuata.htm . [Accessed 7 Oct 2020]	[Spread as dumped garden waste, but no evidence of spread as a produce contaminant] "The seeds may be spread by wind and water, while the plantlets can be dispersed during floods. Plants and plantlets are also commonly spread into bushland areas in dumped garden waste."

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. <i>The Families and genera of vascular plants. Volume III. Flowering plants, Monocotyledons: Liliales (except Orchidaceae)</i> . Springer-Verlag, Berlin, Heidelberg, New York	"Seed dispersal in the capsular species is primarily by wind. The flat seeds are released by waving of the flowering stem and are then collected by ground-dwelling animals."
	Lucid Key Server. (2020). <i>Agave attenuata</i> . https://keys.lucidcentral.org/demo/js_player/seg2/text/agave_attenuata.htm . [Accessed 6 Oct 2020]	"The seeds may be spread by wind and water, while the plantlets can be dispersed during floods."

705	Propagules water dispersed	y
	Source(s)	Notes
	Lucid Key Server. (2020). <i>Agave attenuata</i> . https://keys.lucidcentral.org/demo/js_player/seg2/text/agave_attenuata.htm . [Accessed 7 Oct 2020]	"Foxtail agave (<i>Agave attenuata</i>) spreads laterally via suckers and can form very large and dense colonies over time. The seeds may be spread by wind and water, while the plantlets can be dispersed during floods."

706	Propagules bird dispersed	n
	Source(s)	Notes

Qsn #	Question	Answer
	Gentry, H. S. (2004). <i>Agaves of Continental North America</i> . University of Arizona Press, Tucson, AZ	"capsules oblong, 2-3 x 1 cm, or smaller, thin-walled, stipitate, short-beaked, freely seeding; seeds 3-3.5 x 2-2.5 1nm, lunate to deltoid with low marginal wing."
	Lucid Key Server. (2020). <i>Agave attenuata</i> . https://keys.lucidcentral.org/demo/js_player/sew2/text/agave_attenuata.htm . [Accessed 7 Oct 2020]	"Foxtail agave (<i>Agave attenuata</i>) spreads laterally via suckers and can form very large and dense colonies over time. The seeds may be spread by wind and water, while the plantlets can be dispersed during floods."
	Kubitzki, K. (ed.). 1998. <i>The Families and genera of vascular plants. Volume III. Flowering plants, Monocotyledons: Liliaceae (except Orchidaceae)</i> . Springer-Verlag, Berlin, Heidelberg, New York	"Seed dispersal in the capsular species is primarily by wind. The flat seeds are released by waving of the flowering stem and are then collected by ground-dwelling animals."

707	Propagules dispersed by other animals (externally)	
	Source(s)	Notes
	Kubitzki, K. (ed.). 1998. <i>The Families and genera of vascular plants. Volume III. Flowering plants, Monocotyledons: Liliaceae (except Orchidaceae)</i> . Springer-Verlag, Berlin, Heidelberg, New York	[Possibly could be dispersed by seed-caching, non-native rodents in the Hawaiian Islands] "Seed dispersal in the capsular species is primarily by wind. The flat seeds are released by waving of the flowering stem and are then collected by ground-dwelling animals."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Lucid Key Server. (2020). <i>Agave attenuata</i> . https://keys.lucidcentral.org/demo/js_player/sew2/text/agave_attenuata.htm . [Accessed 7 Oct 2020]	[No evidence] "Foxtail agave (<i>Agave attenuata</i>) spreads laterally via suckers and can form very large and dense colonies over time. The seeds may be spread by wind and water, while the plantlets can be dispersed during floods."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Gilman, E.F., Klein, R.W., and Hansen, G. Gilman, E.F. (2018). <i>Agave attenuata: Spineless Century Plant</i> . FPS22. Revised. IFAS, University of Florida, Gainesville. https://edis.ifas.ufl.edu/fp022 . [Accessed 7 Oct 2020]	[Seed densities unknown after flowering. Until reproductive, no seeds would be present] "After 10 years or more (though not a century), a lofty flower spike is produced, with terminal panicles of pale yellow to white blooms. The stem producing the flower dies soon after."

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Royal Botanic Gardens Kew. (2020) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/ . [Accessed 7 Oct 2020]	"Storage Behaviour: No data available for species. Of 36 known taxa of genus <i>Agave</i> , 100.00% Orthodox(p/?)"

803	Well controlled by herbicides	y
	Source(s)	Notes

Qsn #	Question	Answer
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Herbicides effective on <i>Agave sisalana</i> would likely prove effective if needed to control <i>Agave attenuata</i>] "Effective herbicides are glyphosate or triclopyr plus picloram applied to cut plants"
	Tunison, J.T. & Zimmer, N.G. 1992. Success in controlling local alien plants in Hawaii Volcanoes National Park. Pp 506-524 in Stone, C.P., Smith, C.W. & Tunison, J.T. (eds.): Alien Plant Invasions in Native Ecosystems of Hawaii: Management & Research. Coop. Nat. Park Res. Studies Unit, Univ. of Hawaii, Honolulu, HI	[Herbicides effective on <i>Agave sisalana</i> would likely prove effective if needed to control <i>Agave attenuata</i>] "Table 2. Changes in target alien plant populations with treatment; most effective treatments used in Hawai'i Volcanoes National Park" ... "Agave sisalana - Most Effective Treatment Used = Foliar 5% Garlon 4. Effective treatment found 2/87; method only partially effective on small plants."
	King, M. (2020). How to Remove Agave Attenuata Roots. https://homeguides.sfgate.com/remove-agave-attenuata-roots-69403.html . [Accessed 7 Oct 2020]	[Suggests herbicides are effective] "Moisten a sponge brush with undiluted glyphosate herbicide while wearing gloves. Apply the herbicide to the roots within five minutes of wounding them. If you don't use the herbicide quickly enough, the wounds will start to heal, reducing the herbicide's effectiveness."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Gilman, E.F., Klein, R.W., and Hansen, G. Gilman, E.F. (2018). <i>Agave attenuata</i> : Spineless Century Plant. FPS22. Revised. IFAS, University of Florida, Gainesville. https://edis.ifas.ufl.edu/fp022 . [Accessed 7 Oct 2020]	"Propagation is by detaching the well-rooted suckers appearing at the base, or by uprooting germinating seedlings near the plant."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Unknown. Probably no] "Ironically, although it is rare in its native habitat, <i>A. attenuata</i> is now a widespread ornamental and is the most commonly cultivated a gave in the Hawaiian Islands."

Summary of Risk Traits:

High Risk / Undesirable Traits

- Grows in tropical climates, and potentially able to spread in regions with similar climates
- Naturalized in Africa, Australia, the Madeira Islands and possibly Oahu, Hawaiian Islands (established on Waahila Ridge)
- A potential environmental weed in Australia
- Other Agave species have become invasive
- Potentially toxic to animals, and juice and skin are highly irritant to people
- Shade tolerant
- Tolerates many soil types
- Reported to form dense stands in Australia
- Reproduces by seeds and vegetatively by suckers and offsets
- Seeds dispersed by wind, water and intentionally cultivated by people
- Vegetative fragments spread by water and dumped garden waste

Low Risk Traits

- No reports of negative impacts despite widespread cultivation in the Hawaiian Island
- Unarmed (no spines, thorns, or burrs), although spined forms do exist in native range
- Self-incompatible
- Reaches maturity in 5-10 years
- Lack of annual flowering minimizes chance of long-distance dispersal until plants reach maturity
- Herbicides may provide effective control