Taxon: Agave sisalana **Family:** Asparagaceae

Common Name(s): hemp plant
mescal
sisal

Synonym(s): Agave amaniensis Trel. & Nowell

Assessor: Chuck Chimera **Status:** Approved **End Date:** 13 Jun 2025

WRA Score: 11.0 **Designation:** H(Hawai'i) **Rating:** High Risk

Keywords: Naturalized, Environmental Weed, Succulent, Spreads Vegetatively, Rarely Seeds

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?		
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)	Low
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	y = 1*multiplier (see Appendix 2), n = 0	n
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	y = 2*multiplier (see Appendix 2), n = 0	y
305	Congeneric weed	y = 1*multiplier (see Appendix 2), n = 0	y
401	Produces spines, thorns or burrs	y = 1, n = 0	y
402	Allelopathic		
403	Parasitic	y = 1, n = 0	n
404	Unpalatable to grazing animals	y = 1, n = -1	y
405	Toxic to animals	y = 1, n = 0	y
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	n

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		
602	Produces viable seed	y = 1, n = -1	n
603	Hybridizes naturally		
604	Self-compatible or apomictic		
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	2
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	n
705	Propagules water dispersed		
706	Propagules bird dispersed	y = 1, n = -1	n
707	Propagules dispersed by other animals (externally)	y = 1, n = -1	n
708	Propagules survive passage through the gut	y = 1, n = -1	n
801	Prolific seed production (>1000/m2)	y = 1, n = -1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y = 1, n = -1	n
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?	
	Source(s)	Notes
	Nugent, J. (1999). Permaculture Plants: Agaves and Cacti. Sustainable Agriculture Research Institute, Nannup, WA	[Is the species highly domesticated? Possibly] "...this species is probably a result of selective breeding from other species over a long time frame..."
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Possibly] "The origin of this plant is uncertain and it is probably of hybrid origin." [Origin possibly faciliated by cultivation, but still able to persist and spread without human intervention]

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2025). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2025). 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
	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 Yucatan, Mexico, but widely cultivated in tropical areas..."
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The origin of this plant is uncertain and it is probably of hybrid origin" [This uncertainty does not affect its ability to spread and persist in tropical or subtropical climates]
	Weber, E. (2017). Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The plant is not known from the wild and its origin uncertain; probably it represents an anciently selected cultivar (Gentry, 1982; Flora of North America, 2014). It is an important economic plant for fibre production and is cultivated in many places as an ornamental." [This uncertainty does not affect its ability to spread and persist in tropical or subtropical climates]

202	Quality of climate match data	Low
	Source(s)	Notes
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The origin of this plant is uncertain and it is probably of hybrid origin."

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

Qsn #	Question	Answer
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"A. sisalana is a tropical succulent plant that needs full sunlight and moderate water availability to grow. It grows best in regions with an average annual rainfall of 800-1000 mm (or less). The species is drought-resistant; it is morphologically adapted to manage water scarcity by its extensive root system and the arrangement and shape of the leaves, which, like a funnel, concentrate rainwater on a small area. Moreover, it is a xerophytic plant, which means that its photosynthetic pathway is the crassulacean acid metabolism (Elzebroek and Wind, 2008). The maximum temperature should not exceed 32°C, with minimum temperatures of 5°C. A. sisalana is damaged by frost and it does not tolerate hail or waterlogging. Under dry and arid conditions or at low average temperatures it forms fewer leaves per year and has a longer life cycle."
	Oudhia, P. (2007). Agave americana L. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). Prota 11(1): Medicinal plants/Plantes médicinales 1. PROTA, Wageningen, Netherlands	"Agave americana is adapted to a wide range of conditions. In East Africa it is found from sea-level to 2500 m altitude. It is found in both low and high rainfall areas. In many countries in southern Africa, including South Africa, it is considered a noxious invasive weed."
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 3 Mar 2020]	"In tropical Africa it is grown up to 1800 m altitude." [Elevation range exceeds 1000 m]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 3 Mar 2020]	"Agave sisalana is probably of southern Mexican origin, but wild forms are not known. It has been widely introduced in the tropics and subtropics, in India between 1885 and 1892, in Tanzania in 1893, in Brazil at the end of 19th Century, and in Kenya between 1903 and 1908. Agave sisalana is now present in many tropical and subtropical countries."
	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 Hawaii originally introduced as a commercial fiber crop, now locally naturalized in dry, often rocky sites on all of the main islands except Niihau."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 3 Mar 2020]	"Agave sisalana is probably of southern Mexican origin, but wild forms are not known. It has been widely introduced in the tropics and subtropics, in India between 1885 and 1892, in Tanzania in 1893, in Brazil at the end of 19th Century, and in Kenya between 1903 and 1908. Agave sisalana is now present in many tropical and subtropical countries. Until the 1960s Tanzania was the leading producer of sisal, but since then Brazil has become by far the most important producer, followed by Tanzania, Kenya, Madagascar and China. Other countries in Africa that commercially produce sisal include Guinea, the Central African Republic, Ethiopia, Malawi, Mozambique, Angola, South Africa and Morocco. Sisal has also been grown in Uganda, Zimbabwe and Mauritius, but its exact distribution in tropical Africa is unclear "
	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 Yucatan, Mexico, but widley cultivated in tropical areas"

Qsn #	Question	Answer
301	Naturalized beyond native range	y
	Source(s)	Notes
	BioNET-EAFRINE. (2011). Agave sisalana (Sisal). https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Agave_sisalana_(Sisal).htm. [Accessed 13 Jun 2025]	"Agave sisalana is invasive in parts of Kenya (A.B.R. Witt pers. obs.) and Tanzania (Henderson 2002) and naturalised in Uganda (A.B.R. Witt Pers. obs.). Bulbils (shoots) of A. sisalana are thought to have been exported from Mexico to East Africa in the 19th Century. Large plantations of this crop were quickly established to in Kenya, Tanzania and Uganda. In Tanzania, it is cultivated in Morogoro, Tanga and Kilimanjaro regions. In Kenya, A. sisalana has been grown mainly at the coast, and parts of the Rift Valley; in Uganda, plantations are found around Butiaba Old Pier and Masindi Port."
	Morton, J.F. (1976). Pestiferous spread of many ornamental and fruit species in South Florida. Proceedings of the Florida State Horticultural Society 89: 348-353	"Agave sisalana Perrine. Sisal Agave. Introduced by Dr. Henry Perrine from Yucatan in 1836. Multiplies by bulbils and colonizes hammocks, pinelands and cultivated grounds"
	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 Hawaii originally introduced as a commercial fiber crop, now locally naturalized in dry, often rocky sites on all of the main islands except Niihau."
	Foxcroft, L. C., Richardson, D. M., & Wilson, J. R. (2008). Ornamental plants as invasive aliens: problems and solutions in Kruger National Park, South Africa. Environmental Management, 4 (1): 32-51	"Table 2 Ornamental alien plant species recorded per camp in the Kruger National Park" [Agave sisalana - Evidence of naturalization? = Yes*; * indicates that the species is invasive in the KNP (Pysek and others 2004)]

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[No. An environmental weed that can colonize disturbed sites] "A. sisalana is adapted to growth in a wide variety of habitats and often escapes from plantations into adjacent natural areas. Additionally, this species has been recorded growing in disturbed areas, roadsides, and arid ecosystems (i.e., deserts and dry forests) which suggest that it has the potential to spread much further than it has to date."

Qsn #	Question	Answer
303	**Agricultural/forestry/horticultural weed**	
	Source(s)	**Notes**
	Invasive Species South Africa. (2013). Sisal - Agave sisalana. http://www.invasives.org.za/invasive-species/item/210-sisal|agave-sisalana.html. [Accessed 4 Sep 2013]	[Possibly] "Prolific suckering can create impenetrable thickets especially where plantations have been abandoned, rendering the land useless for grazing. Leaves are poisonous to livestock."
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Primarily an environmental weed, but may impact agriculture] "A. sisalana is a perennial succulent plant and is included in lists of invasive species in Cuba, Hawaii, Puerto Rico, the Pacific Islands, and Spain. This species has been listed as a Category 2 invader in Florida (i.e., invasive exotic plant that has increased in abundance or frequency but has not yet altered Florida plant communities; Florida Exotic Pest Plant Council, 2011) and also as a Category 2 invader in South Africa's NEMBA (National Environmental Management Biodiversity Act) list (i.e., invaders with certain qualities such as commercial use, animal fodder, etc). In Australia, A. sisalana is listed as a priority environmental weed in the state of Queensland where it is ranked among the top 200 most invasive plant species. It is also listed as one of the 35 most troublesome weed species occurring on sandy beaches and dunes along Queensland's east coast (Australian Weeds Committee, 2012). It is also known to be invasive in Ethiopia, Kenya, Malawi, and Tanzania. A. sisalana is adapted to growth in a wide variety of habitats and often escapes from plantations into adjacent natural areas. Additionally, this species has been recorded growing in disturbed areas, roadsides, and arid ecosystems (i.e., deserts and dry forests) which suggest that it has the potential to spread much further than it has to date. "

304	**Environmental weed**	**y**
	Source(s)	**Notes**
	BioNET-EAFRINE. (2011). Agave sisalana (Sisal). https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Agave_sisalana_(Sisal).htm. [Accessed 13 Jun 2025]	"Agave sisalana is naturalised in a wide variety of habitats and often escapes from plantations onto neighbouring fields to develop dense infestations which can prevent the regeneration of trees and exclude understory species in indigenous bushland."
	Martin, T. G., Campbell, S., & Grounds, S. 2006. Weeds of Australian rangelands. The Rangeland Journal, 28(1): 3-26	"Appendix 1. List of 622 non-native plant species that occur in the rangelands, including 153 species, representing 94 taxa (Table 2), which pose a threat to rangeland biodiversity Species known to have an impact on rangeland biodiversity are noted (Y)." [Agave sisalana - Biodiversity threat = Y]
	Porembski, S. (2000). The invasibility of tropical granite outcrops ('inselbergs') by exotic weeds. Journal of the Royal Society of Western Australia, 83, 131-137	"In certain areas of Madagascar the neotropical Agave sisalana which is cultivated for fibre has invaded inselbergs where it has become a serious threat to the indigenous vegetation. Due to its large size and rapid propagation, it must be feared that Agave sisalana has the potential for out competing numerous native outcrop species in Madagascar."
	Castillo, S. A., & Moreno-Casasola, P. (1996). Coastal sand dune vegetation: an extreme case of species invasion. Journal of Coastal Conservation, 2(1), 13-22	"Johnson & Barbour (1990) mentioned three exotics that tend to take over habitats they invade in the coasts of Florida: Agave sisalana, Schinus terebinthifolius and Casuarina equisetifolia."
	Weber, E. (2017). Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"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)."

Qsn #	Question	Answer
	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	[Yes] "Approximately 405 nonnative plant species grow in the Park (Higashino et. al 1988). Many naturalized plant species are localized and are comprised of a few to a few hundred individuals distributed over a few to several hundred hectares, or as many as 100,000 individuals over a few hectares (e.g., wire vine (Muehlenbeckia axillaris) -- three individual vines in two locations; Formosan koa (Acacia confusa) - approximately 370 individuals scattered over 1,235 a (500 ha); and sisal (Agave sisalana) -- over 100,000 individuals concentrated in 12 a or 5 ha)."

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	"Agave americana … A single individual can form dense impenetrable stands that eliminate native vegetation."
	Weber, E. (2017). Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"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	y
	Source(s)	**Notes**
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"A large succulent perennial with thick leaves in a basal rosette of 1.5-2 m height, elongated rhizomes and suckering from the base. The bright green, linear-lanceolate leaves are 90 130 cm long, 9-12 cm wide and have dark brown terminal spines of 2-2.5 cm length. The margins are smooth or with numerous prickles."

402	Allelopathic	
	Source(s)	**Notes**
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"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 A. sisalana 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)."

Qsn #	Question	Answer
	Chowdhury, H., Saha, A. R., Sarkar, S. K., & Tripathi, M. K. (2009). Allelopathic effects of jute (Corchorus capsularis and C. olitorius) and sisal (Agave sisalana) leaf leachates on rice (Oryza sativa), wheat (Triticum aestimum) and greengram (Vigna radiata). Indian Journal of Agricultural Sciences, 79(8), 624-627	[Potentially, although effects are weaker than other plants evaluated] "A study was conducted during 2007 to screen leaf leachates of jute (Corchorus capsularis L. and C. olitorius L.) and sisal (Agave sisalana Perrine) for allelochemicals effect on germination and seedling growth of some test plants. A rice (Oryza sativa L.), wheat (Triticum aestivum L. emeond. Fiori & Paol.) and (greengram [Vigna radiata (L.) R. wilczek] allelochemicals present in the leachates inhibited differentially the germination and growth of the plants. Effect of allelochemicals on germination of the plants was less pronounced as compared to that on seedling growth. Highest inhibition on germination (paddy seeds by about 28% over control) and seedling vigour (about 48 – 62% vigour loss over the control) in the plants was recorded in case of Capsularis jute leaf extracts. Among the test plants, seedling growth of wheat was affected most by the leachates. Similar effect on germination and seedling growth of plants was also recorded when leaf samples were incorporated into soil (1: 10, w/w)." … "Sisal extract recorded less than 30% vigour loss in the test plants. Among the test plants, more vigour loss was recorded in wheat, followed by paddy and mungbean."

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.	"Subacaulescent perennials." [Asparagaceae. No evidence]

404	Unpalatable to grazing animals	y
	Source(s)	**Notes**
	Invasive Species South Africa. (2013). Sisal - Agave sisalana. http://www.invasives.org.za/invasive-species/item/210-sisal|agave-sisalana.html. [Accessed 4 Sep 2013]	"Leaves are poisonous to animals and livestock" [Method of poisoning unknown, but presumably through browsing of foliage. Low palatability may make animal poisoning rare]
	Spaan, W. P., Sikking, A. F. S., & Hoogmoed, W. B. (2005). Vegetation barrier and tillage effects on runoff and sediment in an alley crop system on a Luvisol in Burkina Faso. Soil and Tillage Research, 83(2), 194-203	[Agave identified as an unpalatable barrier species] "The effects of vegetation barriers and tillage on runoff and soil loss were evaluated in an alley crop system at a research station in central Burkina Faso. On a 2% slope of a sandy loam various local species (grasses, woody species and a succulent) were planted as conservation barriers in order to examine their influence on sediment transport. After each erosive storm, runoff and sediment yield was determined. The dense effective barriers (Andropogon gayanus and dense natural vegetation) slow down flow velocity, build up backwater and promote sedimentation uphill. The through flow in the less effective barriers with woody species and succulents (Ziziphus mauritania and Agave sisalana) was slightly hampered and flow velocity was not reduced enough, resulting in a higher soil transport. Under degraded conditions soil loss diminished 50% with less effective and 70-90% with effective barriers. During the initial cropping phase (light tillage; sowing) erosion was reduced 40-60% with effective barriers and showed an increase of 45% with less effective barriers. In the full tillage (weeding) period erosion decreased by 80- 90% for effective and 70% for less effective barriers, aided by the development of the barrier and the crop on the alley. Barriers of natural vegetation and A. gayanus are preferred for diminishing soil loss." … "This natural vegetation consisted of a mixture of annuals and perennials. The choice of crop or pasture on the alley was based on the palatability of the barrier species. The unpalatable species Agave was combined with pasture."

Qsn #	Question	Answer
405	Toxic to animals	y
	Source(s)	**Notes**
	Invasive Species South Africa. (2013). Sisal - Agave sisalana. http://www.invasives.org.za/invasive-species/item/210-sisal|agave-sisalana.html. [Accessed 4 Sep 2013]	"Leaves are poisonous to animals and livestock."
	Nellis, D.W. (1997). Poisonous plants and animals of Florida and the Caribbean. Pineapple Press Inc., Sarasota, FL	"The juice from the leaves has been lethal when fed to cattle and rabbits."

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 4 Mar 2020]	"The most serious disease of sisal is bole rot caused by the fungus Aspergillus niger entering through the leaf bases after leaves are cut. It causes a wet rot which becomes yellowish-brown and soft, with a pinkish margin, and it may lead to plant collapse and death. The incidence can be reduced through removal of infested material and harvesting under dry conditions. The fungus also causes a basal dry rot when it enters the base of the bole through an injury. Zebra disease causes striped lesions on the leaves and may also cause bole rot. It is caused by Phytophthora nicotianae and mainly occurs on poorly drained soils. Hybrid 11648 is especially vulnerable. Korogwe leaf spot is a virus disease occurring in Tanzania which gives very poor grade fibre and often renders the crop unusable. Hybrid 11648 is very susceptible to this virus disease, Agave sisalana only slightly. The only serious insect pest of sisal is the agave weevil or Mexican sisal weevil (Scyphophorus acupunctatus; synonym: Scyphophorus interstitialis), first recorded in Tanzania in 1914. The larvae damage the subterranean parts of young plants and may cause substantial losses. They also feed on leaves in the central bud, giving a shothole effect, whereas the adult weevil damages the crop by feeding on the youngest leaves before and shortly after unfurling. Planting before or in the early rains and the application of insecticides in the soil around young plants can control the pest."

407	Causes allergies or is otherwise toxic to humans	y
	Source(s)	**Notes**
	Oudhia, P. (2007). Agave americana L. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). Prota 11(1): Medicinal plants/Plantes médicinales 1. PROTA, Wageningen, Netherlands	"The leaves contain needle-like calcium oxalate crystals, called raphides, which can cause contact dermatitis and conjunctivitis."
	Nellis, D.W. (1997). Poisonous plants and animals of Florida and the Caribbean. Pineapple Press Inc., Sarasota, FL	["Toxic properties. The sap from agave leaves produces an irritant contact dermatitis. Calcium oxalate needles in the sap are thought to be the cause of irritation and swelling of the tissues of the mouth and throat when ingested. The juice and pulp from the leaves contain the steroidal sapogenins hecogenin, smilagenin and tigogenin. Symptoms. Skin contact with the sap from the cut leaves produces immediate burning, redness, itching and swelling, ,followed in several hours by blistering, which heals within 2 weeks. Irritation and temporary blindness result from sap getting into the eye. Infection and inflammation of puncture wounds caused by the sharp leaf tips near bone have resulted in a granuloma reaction resembling a neoplasm. Respiratory allergies have been provoked by the use of sisal fiber as a padding or filler in upholstery and mattresses. The juice from the leaves has been lethal when fed to cattle and rabbits."

Qsn #	Question	Answer
408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"A large succulent perennial with thick leaves in a basal rosette of 1.5-2 m height..." [No evidence, and succulent nature would likely deter the spread of fires]

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"A. sisalana is a tropical succulent plant that needs full sunlight and moderate water availability to grow."
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 4 Mar 2020]	"Sisal is a hardy tropical plant needing full sunlight and moderate relative humidity. "

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 4 Mar 2020]	"Sisal prefers sandy-loam soils but can be grown on a range of soils, provided they are rich in bases, especially Ca, and well drained, as sisal does not tolerate waterlogging. The pH should be between 5.5 and 7.5, though sisal has been grown on soils with pH 4-5."
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"This species prefers sandy-loam soils but can be grown on a range of soils with pH ranging from 4 to 6. It does not tolerate water-logging (FAO, 2012; PROTA, 2012)."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"A large succulent perennial with thick leaves in a basal rosette of 1.5-2 m height, elongated rhizomes and suckering from the base." ... "The weedy behavior is due to vegetative growth, allowing the species to colonize large areas and replace the native vegetation with its rosettes" [More of a thicket-forming habit]

412	Forms dense thickets	y
	Source(s)	Notes
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"A. sisalana can develop dense monospecific stands (due its large size and rapid propagation) which may prevent the arrival and establishment of native plant species (Badano and Pugnaire, 2004; ISSG, 2012). Porembski (2000) reports that in Madagascar A. sisalana has invaded inselbergs where it has become a serious threat to the indigenous vegetation as its large size and rapid propagation enable it to out-compete many native outcrop species."
	BioNET-EAFRINE. (2011). Agave sisalana (Sisal). https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Agave_sisalana_(Sisal).htm. [Accessed 13 Jun 2025]	"Agave sisalana is naturalised in a wide variety of habitats and often escapes from plantations onto neighboring fields to develop dense infestations which can prevent the regeneration of trees and exclude understory species in indigenous bushland."

501	Aquatic	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Terrestrial] "Grass- and heathland, forests, rock outcrops, coastal beaches."

502	Grass	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2025). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch. [Accessed 13 Jun 2025]	"Genus: Agave Family: Asparagaceae Subfamily: Agavoideae"

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2025). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch. [Accessed 13 Jun 2025]	"Genus: Agave Family: Asparagaceae Subfamily: Agavoideae"

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"A large succulent perennial with thick leaves in a basal rosette of 1.5-2 m height, elongated rhizomes and suckering from the base." [Not a true geophyte, but spreads vegetatively & resprouts if cut back]
	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. Plant Protection Quarterly, 25(2): 56-74	"This question relates to perennial plants with tubers, corms or bulbs. This question is specifically to dealwith plants that have specialized organs and should not include plants merely with rhizomes/ stolons"

601	Evidence of substantial reproductive failure in native habitat	
	Source(s)	**Notes**
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[NA] "The origin of this plant is uncertain and it is probably of hybrid origin."

Qsn #	Question	Answer
602	Produces viable seed	n
	Source(s)	**Notes**
	Hanelt, P. (ed.). (2001). Mansfeld's Encyclopedia of Agricultural and Horticultural Crops (except Ornamentals), Volume 1. Springer-Verlag, Berlin, Heidelberg, New York	"Apomictic pentaploid species which is seed-sterile and, therefore, clonally propagated."
	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.	"Capsules rarely developing, when present, ca 6 cm long, apex beaked"

603	Hybridizes naturally	
	Source(s)	**Notes**
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 13 Jun 2025]	[Unknown] "Crosses between Agave sisalana and these species resulted in progenies with spiny margins, but crosses between Agave amaniensis and Agave angustifolia are fertile and combine a high number of leaves with a good leaf size, some of them having smooth margins. Backcrossing of these hybrids with Agave amaniensis gave very good results, in particular Hybrid 11648, which may produce more than 600 leaves and give annual fibre yields twice as high as sisal, with a longer life cycle. "
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Unknown] "The origin of this plant is uncertain and it is probably of hybrid origin."

604	Self-compatible or apomictic	
	Source(s)	**Notes**
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Not Applicable] "…bulbils are usually formed in the axils of the bracteoles after flowering. Fruits are rarely formed."
	Hanelt, P. (ed.). (2001). Mansfeld's Encyclopedia of Agricultural and Horticultural Crops (except Ornamentals), Volume 1. Springer-Verlag, Berlin, Heidelberg, New York	[Yes, but seeds are sterile] "Apomictic pentaploid species which is seed-sterile and, therefore, clonally propagated."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 4 Mar 2020]	"Pollination is mostly by insects, mainly bees, but wind-pollination can also occur." [Irrlevant in Hawaii, where seed set apparently does not occur]

606	Reproduction by vegetative fragmentation	y
	Source(s)	**Notes**
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	["It forms suckers abundantly from the base, enabling the species to spread wthout reproduction by seed." … "The weedy behavior is due to vegetative growth, allowing the species to colonize large areas and replace the native vegetation with its rosettes"

607	Minimum generative time (years)	2

Qsn #	Question	Answer
	Source(s)	Notes
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 4 Mar 2020]	"Suckers are formed at the end of rhizomes. They normally start to form when plants are about 1 year old, are most prolific in the 2nd and 3rd year and become fewer as the plants age."
	Brown, K. (2002). Agave sisalana Perrine. Wildland Weeds 5(3): 18-21	[7+ but vegetative reproduction occurs earlier] "Under plantation conditions, A. sisalana produces about 220 leaves per plant before the emergence (referred to as “bolting”) of the 5-6 meter high inflorescence at about seven years of age (Nobel 1994). Leaves can be harvested after two years of age, which will postpone the “bolting” for 15-20 years. After “bolting”, the plant dies." [Vegetative reproduction can occur at an earlier age]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"The risk of introduction of A. sisalana is high. The international trade of this species is not prohibited. The species is dispersed vegetatively by bulbils and rhizomes and the risk of introduction of vegetative material as a contaminant of soil remains high in those countries where the plant is well established. Additionally, this species may escape from active or abandoned plantations into natural areas where it often persists indefinitely (Acevedo-Rodríguez, 2005)."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"A. sisalana is native to Mexico. It has been introduced into tropical and subtropical areas in North America, South America, Caribbean Islands, Africa, Australia and Asia. It has been used as an ornamental, vegetable and cultivated plant. Currently, A. sisalana is widely cultivated in tropical areas in Brazil, Tanzania, Uganda, and Kenya to produce fibres."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Potentially] "The risk of introduction of A. sisalana is high. The international trade of this species is not prohibited. The species is dispersed vegetatively by bulbils and rhizomes and the risk of introduction of vegetative material as a contaminant of soil remains high in those countries where the plant is well established. Additionally, this species may escape from active or abandoned plantations into natural areas where it often persists indefinitely (Acevedo-Rodríguez, 2005)."

704	Propagules adapted to wind dispersal	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	[No. Yes if seeds produced] "Because the plants do not set seed, propagation is solely by vegetative means, either by removal of the suckers from the base of mature plants or by setting out the small plantlets formed in the inflorescence." [Not wind-dispersed in Hawaiian Islands. Bulbils probably dispersed short distances by gravity]

Qsn #	Question	Answer
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 4 Mar 2020]	[Yes, but seeds rarely or never produced] "Seeds rounded-triangular, thin, flat, papery, black."

705	Propagules water dispersed	
	Source(s)	Notes
	Rogers, G. K. (2000). A taxonomic revision of the genus Agave (Agavaceae) in the Lesser Antilles, with an ethnobotanical hypothesis. Brittonia, 52(3): 218-233	[Possibly] "Flotation of bulbils or fruits is possible." [Description for A. americana may be applicable to A. sisalana]

706	Propagules bird dispersed	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	"Because the plants do not set seed, propagation is solely by vegetative means, either by removal of the suckers from the base of mature plants or by setting out the small plantlets formed in the inflorescence."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Oyen, L.P.A. (2011). Agave sisalana Perrine. [Internet] Record from PROTA4U. Brink, M. & Achigan-Dako, E.G. (Editors). PROTA (Plant Resources of Tropical Africa. Wageningen, Netherlands. https://prota.prota4u.org/. [Accessed 4 Mar 2020]	"Seeds have been obtained in the Kenyan highlands, Indonesia and Brazil by cutting back the inflorescence in an early stage of its development, but this technique was not successful at lower altitudes in East Africa. Bulbils are normally formed on the panicle after the flowers are shed and usually appear in the bottom branches of the pole before the upper flowers have finished flowering. The bulbils grow to a length of 6-10 cm in about 3 months, after which they are shed. One plant can produce up to 4000 bulbils. After the production of flowers and bulbils the entire plant dies." [Seeds, if produced, and bulbils lack means of external attachment]

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	WRA Specialist. (2025). Personal Communication	Unlikely that seeds, if produced, or bulbils, would be consumed, or internally dispersed

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"...bulbils are usually formed in the axils of the bracteoles after flowering. Fruits are rarely formed."
	Wickens, G.E. (1979). The propagules of the terrestrial flora of the Aldabra Archipelago, Western Indian Ocean. Atoll Research Bulletin 29: 1-39	"Agave sisalana Perr. Sisal. Capsules and seeds rarely formed due to formation of abscission layer, bulbils formed after flowers absciss (Purseglove, 1972); seeds rounded- triangular, 10 x 8 mm., thin, f l a t , papery. Cultivated and naturalised; Aldabra, Cosmoledo, Astove."
	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.	"Capsules rarely developing, when present, ca 6 cm long, apex beaked"

Qsn #	Question	Answer
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Propagation of A. sisalana can be by dividing rhizomes, tubers, corms or bulbs. This species also developed bulbils from sterile meristems (Arizaga and Ezcurra, 1995; Arizaga and Ezcurra, 2002). The species may produce up to 4000 bulbils/plant."

802	Evidence that a persistent propagule bank is formed (>1 yr)	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	"Because the plants do not set seed, propagation is solely by vegetative means, either by removal of the suckers from the base of mature plants or by setting out the small plantlets formed in the inflorescence."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Effective herbicides are glyphosate or triclopyr plus picloram applied to cut plants"
	Brown, K. (2002). Agave sisalana Perrine. Wildland Weeds 5(3): 18-21	"Tony Pernas reports that good results were obtained by breaking the “heart” from the main plant and spraying with 20% Garlon 4 herbicide. Smaller plants were removed by hand. (personal communication, Feb. 11, 2002)"
	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	[Effective on smaller sized plants] "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."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Weber, E. (2003). Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Small plants and smaller patches may be dug out, but all roots and rhizomes must be removed" [Will resprout if only aboveground vegetative material is removed]

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Unknown] "Scyphophorus interstitialis [S, acupunctatus] is the major pest of Agave species worldwide. This insect (Coleoptera) is native to Mexico where it has devastated plantations and natural populations of different Agave species. The international trade of ornamental Agave plants worldwide has facilitated S. interstitialis to establish in many parts of the world, particularly in Central and South America, the Caribbean, Africa, and Asia. On its host species, S. interstitialis causes rot and sometimes mortality due to its larvae boring holes which then facilitates microorganism and fungi entering and colonizing the host agave. The list of symptoms/signs described for Agave plants infected includes: necrotic areas and external feeding on leaves and internal red necrosis, internal discoloration, internal feeding on stems and rhizomes (ISSG, 2012)."

Summary of Risk Traits:

Agave sisalana (mescal, sisal) is an evergreen succulent plant native to southern Mexico. It is commonly cultivated for edible uses, and folk medicine. The roots are used in the making of an alcoholic beverage. This plant is widely naturalized and is reported as naturalized on every Hawaiian island except Niʻihau. This plant can adapt to many environments in Hawaiʻi as it thrives in tropical climates and can live in high elevation environments. It is problematic as it has prickles, is toxic to cattle, may cause skin irritation if handled and is poisonous to ingest. It spreads easily as it grows in dense stands, is unattractive to browsing herbivores, and can spread underground by suckers even if the upper part is removed. For all these reason this plant is a high risk plant.

High Risk / Undesirable Traits
• Thrives in tropical climates
• Elevation range exceeds 1000 m
• Widely naturalized, including all main Hawaiian Islands except Niihau
• An environmental weed
• Related Agave species have become invasive
• Leaves may have terminal spines and prickles along the margins
• Unpalatable
• Toxic to cattle and other animals
• Sap can cause dermatitis and may be poisonous if ingested
• Tolerates many soil types
• Can from dense monocultures that exclude other vegetation
• Spreads vegetatively by suckering and formation of bulbils
• Starts to spread vegetatively after 1 year
• Can resprout if only aboveground vegetative material is removed

Low Risk Traits
• Rarely produces seeds, and not reported to produce seeds in the Hawaiian Islands
• Requires full sun
• Fiber plant
• Lack of seed production makes long distance and inadvertent dispersal unlikely
• Herbicides may provide effective control