

Taxon: Hoodia gordonii	Family: Apocynaceae
Common Name(s): ghaap hoodia	Synonym(s): Hoodia barklyi Dyer Hoodia burkei N. E. Br. Hoodia longispina Plowes Stapelia gordonii Masson

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 15 Apr 2015
WRA Score: 0.0	Designation: L	Rating: Low Risk

Keywords: Succulent, Spiny, Medicinal, Fly-Pollinated, Wind-Dispersed

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	?
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	n
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n
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		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n

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

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	No evidence

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

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

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	Court, D. 2000. <i>Succulent Flora of Southern Africa</i> . Revised Edition. A.A. Balkema, Rotterdam, Netherlands	"Widely distributed from the Brandberg in Namibia to the southwestern Cape and across to Prince Albert; also in the Northern Cape to Kimberley." [Latitudinal range extends into the tropics]

202	Quality of climate match data	High
	Source(s)	Notes
	Court, D. 2000. <i>Succulent Flora of Southern Africa</i> . Revised Edition. A.A. Balkema, Rotterdam, Netherlands	

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Swart E. 2008. <i>Hoodia gordonii</i> in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – <i>Hoodia gordonii</i> . Mexico, NDF Workshop Case Studies	"H. gordonii occurs in a wide variety of arid habitats characterised by sparse vegetation, ranging from coastal to mountainous habitats. Generally the species do, however, prefer arid gravel or shale plains, slopes and ridges, ranging in altitudes from 250m to 1200m."
	South African National Biodiversity Institute. 2005. <i>PlantzAfrica.com - Hoodia gordonii</i> . http://www.plantzafrika.com/planthij/hoodgord.htm . [Accessed 15 Apr 2015]	" <i>Hoodia gordonii</i> has a very wide distribution. It occurs in the northeastern part of the Western Cape, the north and northwestern regions of the Northern Cape and southern Namibia . It is used to extreme heat (above 40°C), but it can survive in relatively low temperatures (-3°C)."

Qsn #	Question	Answer
	Rau, E. 2015. President, Sustainable Bioresources, LLC. Personal Communication. 14 April	"Most of these species grow in areas of Africa where winters are dry, periods of rainfall are short and the plants adapt by becoming dormant and losing roots. Here in Hawaii winters are the most rainy season, rain occurs frequently throughout the year and periods of prolonged wet soil conditions are encountered. Last summer here was also very wet and wet soil conditions persisted for months. When these plants are dormant they become highly susceptible to bacterial and fungal rot, mites and mite transmitted diseases."
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	[Restricted to arid climates] " <i>Hoodia gordonii</i> occurs in a wide range of arid habitats in desert, semi-desert and savanna vegetation, from coastal to mountainous, on gentle to steep shale ridges, in dry rocky places to sandy spots in riverbeds. It is most common in summer-rainfall areas and is of only scattered occurrence in drier winter-rainfall areas where some summer rainfall occurs."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Court, D. 2000. <i>Succulent Flora of Southern Africa</i> . Revised Edition. A.A. Balkema, Rotterdam, Netherlands	"Widely distributed from the Brandberg in Namibia to the southwestern Cape and across to Prince Albert; also in the Northern Cape to Kimberley." [Latitudinal range extends into the tropics]

205	Does the species have a history of repeated introductions outside its natural range?	?
	Source(s)	Notes
	Holt, S., & Taylor, T. V. (2006). <i>Hoodia gordonii</i> . An overview of biological and botanical characteristics <i>Townsend Letter</i> , 280: 104-113	"Attempts to farm the species <i>Hoodia gordonii</i> outside its normal habitat have been generally unsuccessful, with notable exceptions. 1,3 <i>Hoodia</i> plants are extremely difficult to grow, and they need a lot of care and attention, with obligatory requirements of watering, sunlight exposure, and specific seasonal temperatures."
	Tibe, O., Modise, D. M., & Mogotsi, K. K. (2008). Potential for domestication and commercialization of <i>Hoodia</i> and <i>Opuntia</i> species in Botswana. <i>African Journal of Biotechnology</i> , 7(9): 1199-1203	"The plant is cultivated in South Africa but it has not been harvested. It is reported that it has been cultivated in Chile."
	Bishop Museum. 2015. Online Natural Sciences Collections. http://nsdb.bishopmuseum.org/ . [Accessed 15 Apr 2015]	No specimens present in the Online Natural Sciences Collections database

Qsn #	Question	Answer
301	Naturalized beyond native range	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence
	Wagner, W.L., Herbst, D.R. & Lorence, D.H. 2015. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/index.htm . [Accessed 15 Apr 2015]	No evidence

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

305	Congeneric weed	n
	Source(s)	Notes
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. 1997. World weeds: natural histories and distribution. John Wiley and Sons, Inc., New York, NY	No evidence
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence

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

Qsn #	Question	Answer
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). Prota 11(2): Medicinal plants/Plantes médicinales 2. PROTA, Wageningen, Netherlands	"Many-stemmed, spiny, succulent shrub up to 100 cm tall and 60 cm broad. Stems 10–100 cm long, 2.5–5 cm thick, erect, obtusely angular, fleshy and fairly hard, glabrous, grey-green to grey-brown. Leaves reduced to spiny tubercles; stipules absent; tubercles prominent, 5–15(–20) mm long, deltoid, laterally flattened, fused in lower half of stem into 11–17 obtuse, vertical ridges, each tipped with a sharp spine 6–12 mm long. Inflorescence mainly at apex of stem, 1–4-flowered, glabrous, with many deltoid bracts."

402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	Unknown

403	Parasitic	n
	Source(s)	Notes
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). Prota 11(2): Medicinal plants/Plantes médicinales 2. PROTA, Wageningen, Netherlands	"Many-stemmed, spiny, succulent shrub up to 100 cm tall and 60 cm broad." [No evidence. Apocynaceae]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Swart E. 2008. <i>Hoodia gordonii</i> in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – <i>Hoodia gordonii</i> . Mexico, NDF Workshop Case Studies	" <i>H. gordonii</i> is a minor source of food and moisture to wildlife in arid ecosystems."
	Mithöfer, A., & Boland, W. (2012). Plant defense against herbivores: chemical aspects. Annual Review of Plant Biology, 63: 431-450	[Insect herbivory deterred] "Many studies have focused on latex as a trait reducing herbivory or the preference or performance of insect herbivores. For instance, as shown for the milkweed, <i>Hoodia gordonii</i> , both larval feeding and adult oviposition by <i>T. ni</i> was deterred when latex was added to an artificial diet or painted on the leaves of the host plant (26). However, aside from stickiness, the active compound targeting the herbivore is often unknown because latex is such a rich mixture of many compounds."
	Tibe, O., Modise, D. M., & Mogotsi, K. K. (2008). Potential for domestication and commercialization of <i>Hoodia</i> and <i>Opuntia</i> species in Botswana. African Journal of Biotechnology, 7(9): 1199-1203	[Possibly unpalatable] "There is no evidence that the <i>Hoodia</i> species has ever been used as livestock forage and fodder. Its spiny appearance may act as a deterrent to being eaten by animals."

405	Toxic to animals	n
	Source(s)	Notes
	Horizon Herbs. 2015. <i>Hoodia</i> * (<i>Hoodia gordonii</i>), potted plant, organic. https://www.horizonherbs.com/product.asp?specific=2181 . [Accessed 14 Apr 2015]	"Toxicity to pests or young children: none, the plant is spiny and self-protective, and its chemistry is nontoxic."

Qsn #	Question	Answer
	Dent, M. P., Wolterbeek, A. P. M., Russell, P. J., & Bradford R. (2012). Safety profile of <i>Hoodia gordonii</i> extract: rabbit prenatal developmental toxicity study. <i>Food and Chemical Toxicology</i> , 50, S26-S33	[No evidence] " <i>Hoodia gordonii</i> extract was orally administered by gavage to groups of 22 female New Zealand white rabbits from day 3–28 after mating at doses of 0 (control), 3, 6 or 12 mg/kg bodyweight/day. These doses were reached by a dose escalation phase between days 3 and 7 after mating. As well as a vehicle control group, a control group pair-fed to the high dose was also included. On day 29 after mating the females were euthanized and examined. Treatment at 6 or 12 mg/kg/day was associated with a dose related reduction in feed intake and bodyweight gain. Feed consumption and bodyweight gain was unaffected at 3 mg/kg/day. In spite of marked maternal effects at 12 mg/kg/day, reproductive indices were unaffected at all doses and there were no effects on fetal or placental weights and no morphological changes in the fetuses. The no-observed-effect level (NOEL) for developmental effects was therefore 12 mg/kg/ day, and the maternal NOEL was 3 mg/kg/day. At doses that caused marked maternal effects, <i>H. gordonii</i> extract did not affect embryonic or fetal development in a species that is considered predictive of developmental toxicity in man."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Tibe, O., Modise, D. M., & Mogotsi, K. K. (2008). Potential for domestication and commercialization of <i>Hoodia</i> and <i>Opuntia</i> species in Botswana. <i>African Journal of Biotechnology</i> , 7(9): 1199-1203	" <i>H. gordonii</i> and <i>H. currorri</i> are usually attacked by mealy-bug on the roots."
	Swart E. 2008. <i>Hoodia gordonii</i> in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – <i>Hoodia gordonii</i> . Mexico, NDF Workshop Case Studies	"Long term population trends are unknown, but drastic population declines have been observed in nature, mostly due to die-back of established plants. The reasons for these drastic die-back events are unknown, but they appear to coincide with prolonged high rainfall events when <i>Fusarium</i> (a fungus) and other pests attack the species." ... "Some of the preliminary natural threats that have been identified include fungus infections (Figure 8, <i>Fausaria</i> sp. infestation), snout beetles (<i>Paramecops stapeliae</i>), mite infestations and fruit flies (Figure 9, <i>Dacus bistrigulatus</i>). The milkweed bug (Figure 10, <i>Spilostethus pandurus</i>) and the African Monarch butterfly caterpillar (Figure 11, <i>Nymphalidae</i> , <i>Danaus chrysippus</i>) impacts negatively on seed production."
	Directorate: Plant Production Division. 2013. <i>Hoodia</i> (Asclepiadaceae). Department of Agriculture, Forestry and Fisheries, Pretoria, South Africa	"The major insects identified in the plant include mealybugs, snails, slugs, scale, red spider mites and nematodes (eelworm)." ... "The major diseases identified include rot."

Qsn #	Question	Answer
	<p>Rau, E. 2015. President, Sustainable Bioresources, LLC. Personal Communication. 14 April</p>	<p>[Affected by widespread pests & diseases in the Hawaiian Islands] "When these plants are dormant they become highly susceptible to bacterial and fungal rot, mites and mite transmitted diseases." ... "Approximately 1000 seedlings and cuttings of various Hoodia species (H. juttae, H. gordonii, H. macrantha, H. parviflora and H. pilifera) and Hoodiopsis triebneri have been grown in containers outdoors or planted directly in the ground for field trials at our site in Naalehu over the past three years. Virtually all of these have contracted black spot disease, a syndrome that apparently results from infestations with the false spider mite Brevipalpus phoenicis during wet weather conditions. The mite is present throughout Hawaii and has many host species. The permanent black lesions and scarring characteristic of the disease may result from the bite of the mite or a self limiting anthraconose fungus infection transmitted by the mites. This is still under investigation. Black spot disease weakens the plants and severely stunts growth of the affected shoots. If mite infestations are untreated the disease usually kills the plants. All species in this group except Caralluma and some Orbea spp. and Huernia spp. are susceptible to black spot disease. Bacterial soft rot is a devastating disease of this entire group, and also most prevalent during wet weather conditions. It is apparently caused by Erwinia bacteria (taxonomy unsettled) beginning as a root infection and spreading rapidly throughout the vascular system of the plant. Particularly in the swarming phase of growth the bacteria release enzymes that degrade the cell walls and result in the complete liquefaction of the internal tissues and collapse of the plant in 1- 2 days after the infection is first noticed. In Hoodia species the infections usually spread very rapidly and kill the entire plant. In Hoodiopsis infections tend to be walled off in the affected shoots, which may drop off and reroot as new plants."</p>

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	<p>South African National Biodiversity Institute. 2005. PlantzAfrica.com - Hoodia gordonii. http://www.plantzafrika.com/planthij/hoodgord.htm. [Accessed 14 Apr 2015]</p>	<p>"Several species of Hoodia are eaten raw. Obviously the spines must first be removed. Hoodia has been known for many years as an appetite suppressant. These appetite suppressant properties have now been developed and Hoodia derivative products are now marketed in many western countries where obesity is becoming a problem."</p>
	<p>Horizon Herbs. 2015. Hoodia* (Hoodia gordonii), potted plant, organic. https://www.horizonherbs.com/product.asp?specific=2181. [Accessed 14 Apr 2015]</p>	<p>"Toxicity to pests or young children: none, the plant is spiny and self-protective, and its chemistry is nontoxic."</p>
	<p>Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL</p>	<p>No evidence</p>

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes

Qsn #	Question	Answer
	Cowling, R. M., & Roux, P. W. eds. (1987). The karoo biome: a preliminary synthesis. Part 2-vegetation and history. South African National Scientific Programmes Report No. 142. Foundation for Research Development CSIR, Pretoria, SA	[No evidence. Fire infrequent in native range, & Hoodia species unlikely to contribute to fire risk due to succulent habit] "Dwarf and low succulent shrubs. This growth form includes leaf succulents (eg many Mesembryanthemaceae, Senecio acutifolius). stem succulents (eg Euphorbia, Stapelia, Hoodia) and stem and leaf succulents (eg Crassula, Cotyledon)." ... "Fire has probably never been a significant factor i n the Karoo (Edwards 1984). However, it is possible that a f t e r a series of high rainfall years. sufficient fuel would accumulate to support extensive fires. particularly in Stipagrostis species dominated veld and the grassy Karoo of the eastern mountains. Limited local fires caused by lightning may occur from time to time (Roux and Smart unpublished). Such fires , despite their infrequency, probably have a great influence on the structure of karoo communities (Huntley 1984)."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	Notes
	Tibe, O., Modise, D. M., & Mogotsi, K. K. (2008). Potential for domestication and commercialization of Hoodia and Opuntia species in Botswana. African Journal of Biotechnology, 7(9): 1199-1203	"Hoodia can be propagated by seeds, tissue culture and cuttings. It survives well in hot areas and light shade."
	Directorate: Plant Production Division. 2013. Hoodia (Asclepiadaceae). Department of Agriculture, Forestry and Fisheries, Pretoria, South Africa	"The plant thrives in extremely high temperatures of up to 50 °C and it prefers light shade."
	Swart E. 2008. Hoodia gordonii in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – Hoodia gordonii. Mexico, NDF Workshop Case Studies	[May tolerate shade at seedling stage] "Follicles can get up to 250mm long, containing several seeds that are wind dispersed. The follicles split open along the sides, releasing the seeds which are then blown under nurse plants or other protective sites where they germinate and establish themselves."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	Notes
	Swart E. 2008. Hoodia gordonii in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – Hoodia gordonii. Mexico, NDF Workshop Case Studies	"H. gordonii occurs in a wide variety of arid habitats characterised by sparse vegetation, ranging from coastal to mountainous habitats. Generally the species do, however, prefer arid gravel or shale plains, slopes and ridges, ranging in altitudes from 250m to 1200m. However, the specific habitat requirements (niche habitat) remain unknown."
	Directorate: Plant Production Division. 2013. Hoodia (Asclepiadaceae). Department of Agriculture, Forestry and Fisheries, Pretoria, South Africa	"It prefers a well- drained red, sandy loam soil with a pH of 6, 2."
	South African National Biodiversity Institute. 2005. PlantzAfrica.com - Hoodia gordonii. http://www.plantzafrika.com/planthij/hoodgord.htm . [Accessed 14 Apr 2015]	"The plant appears to have a wide tolerance of growing habitats, found in deep Kalahari sands, on dry stony slopes or flats and under the protection of xerophytic bushes. "

411	Climbing or smothering growth habit	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	"Many-stemmed, spiny, succulent shrub up to 100 cm tall and 60 cm broad. Stems 10–100 cm long, 2.5–5 cm thick, erect, obtusely angular, fleshy and fairly hard, glabrous, grey-green to grey-brown."

412	Forms dense thickets	
	Source(s)	Notes
	Swart E. 2008. <i>Hoodia gordonii</i> in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – <i>Hoodia gordonii</i> . Mexico, NDF Workshop Case Studies	" <i>H. gordonii</i> has a fairly wide distribution (between 290 and 330 S), occurring predominantly in South Africa and Namibia, and to a lesser extent in Botswana and Angola. The species has a patchy spatial distribution pattern, meaning that its density varies a lot throughout its distribution range. Although its distribution is not continuous, nor uniform, it is uncertain whether it is fragmented as it has not been investigated." ... "Population size and density is uncertain. <i>H. gordonii</i> clusters vary a lot in density and demography. Cluster densities range between only a few plants per hectare to over 130 plants per hectare (exceptional cases reflected a few hundred plants per hectare)."
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	"Populations tend to originate in scrub vegetation and may grow to become dominant."
	Van Wyk, B. 2000. <i>A Photographic Guide to Wild Flowers of South Africa</i> . Struik Publishers, Cape Town, South Africa	[Possibly. Unknown if colonies exclude all other vegetation] "occurring in semidesert vegetation, often in extensive colonies."

501	Aquatic	n
	Source(s)	Notes
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	[Terrestrial] " <i>Hoodia gordonii</i> occurs in a wide range of arid habitats in desert, semi-desert and savanna vegetation, from coastal to mountainous, on gentle to steep shale ridges, in dry rocky places to sandy spots in riverbeds."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 13 Apr 2015]	"Family: Apocynaceae subfamily: Asclepiadoideae tribe: Ceropegieae subtribe: Stapeliinae. Also placed in: Asclepiadaceae "

Qsn #	Question	Answer
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 13 Apr 2015]	[No evidence] "Family: Apocynaceae subfamily: Asclepiadoideae tribe: Ceropegieae subtribe: Stapeliinae. Also placed in: Asclepiadaceae "

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	"Many-stemmed, spiny, succulent shrub up to 100 cm tall and 60 cm broad. Stems 10–100 cm long, 2.5–5 cm thick, erect, obtusely angular, fleshy and fairly hard, glabrous, grey-green to grey-brown. Leaves reduced to spiny tubercles; stipules absent; tubercles prominent, 5–15(–20) mm long, deltoid, laterally flattened, fused in lower half of stem into 11–17 obtuse, vertical ridges, each tipped with a sharp spine 6–12 mm long."

601	Evidence of substantial reproductive failure in native habitat	
	Source(s)	Notes
	Swart E. 2008. <i>Hoodia gordonii</i> in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – <i>Hoodia gordonii</i> . Mexico, NDF Workshop Case Studies	"Long term population trends are unknown, but drastic population declines have been observed in nature, mostly due to die-back of established plants. The reasons for these drastic die-back events are unknown, but they appear to coincide with prolonged high rainfall events when <i>Fusarium</i> (a fungus) and other pests attack the species. No studies have been undertaken to assess the survival rate and recruitment of seedlings."
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	[No evidence. Overharvesting has led to decline] "Although <i>Hoodia gordonii</i> is widespread, occurring over an estimated 850,000 km ² , it has undergone significant decline as a result of indiscriminate harvesting. As a result of the high economic value of this species even remote areas of its distribution range are likely to have been harvested. However, no data exist to quantify the degree of decline. The conservation situation is complicated by the similarity of many <i>Hoodia</i> and related species, which makes it likely that they are all affected by illicit harvesting."

602	Produces viable seed	y
	Source(s)	Notes
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	" <i>Hoodia gordonii</i> is propagated by seed. Methods of micropropagation have been developed and patented. When seedlings are 6–8 months old and about 5 cm tall they are transplanted into the field."

Qsn #	Question	Answer
	South African National Biodiversity Institute. 2005. PlantzAfrica.com - Hoodia gordonii. http://www.plantzafrika.com/planthij/hoodgord.htm . [Accessed 14 Apr 2015]	"Propagation is done mainly from seed. Cuttings are not really an option, as the severed ends very rarely form a callus from where roots will eventually form. Seeds are produced in October and November of each year (southern hemisphere). The seed horns must be semi-dry and starting to split down the middle before seed can be collected."

603	Hybridizes naturally	y
	Source(s)	Notes
	Oyen, L.P.A., 2013. Hoodia gordonii (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). Prota 11(2): Medicinal plants/Plantes médicinales 2. PROTA, Wageningen, Netherlands	"Natural hybrids have been recorded between Hoodia gordonii and Hoodia flava (N.E.Br.) Plowes. The plants were fertile and backcrosses with the parents successful. Natural intergeneric crosses include: Hoodia gordonii × Orbeopsis lutea (N.E.Br.) L.C.Leach subsp. vaga (N.E.Br.) L.C.Leach and Hoodia gordonii × Stapelia arenosa Luckhoff."

604	Self-compatible or apomictic	
	Source(s)	Notes
	Rau, E. 2015. President, Sustainable Bioresources, LLC. Personal Communication. 14 April	"Observations suggest that these Hoodias are self-sterile and that pollination by the same or related species is required."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Swart E. 2008. Hoodia gordonii in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – Hoodia gordonii. Mexico, NDF Workshop Case Studies	"Flowers are generally dish-shaped (50-110mm in diameter), with a fleshy colour (colour does vary from red to purple to brown to mottled dark yellow). Flowers are also referred to as carrion-flowers or stapeliads and smell like decaying meat to attract pollinators, namely flies and blowflies. Pollination occurs when the flies lay their eggs inside the flower."
	Tibe, O., Modise, D. M., & Mogotsi, K. K. (2008). Potential for domestication and commercialization of Hoodia and Opuntia species in Botswana. African Journal of Biotechnology, 7(9): 1199-1203	"Its flowers are saucer-shaped with a diameter of 70 - 100 mm. They are pale purple in colour with small dark red papillae in the centre. The flowers are foul-smelling and smell like a stinking feet. They are insect pollinated and flies are attracted to the foul smelling flowers."
	Philippou, O.A. 2014. Characterisation of both Hoodia gordonii and the associating wilt causing pathogen Fusarium oxysporum. PhD Dissertation. University of the Free State, Bloemfontein, South Africa	"The flowers are pollinated by various types of flies, blowflies (Musca domestica and Calliphora species), which are attracted to the colour and an unpleasant carrion-like smell (Bruyns, 1993; Meve and Liede, 1994; Vermaak et al., 2011)."
	Van Wyk, B. 2000. A Photographic Guide to Wild Flowers of South Africa. Struik Publishers, Cape Town, South Africa	"unpleasantly scented; pollinated by flies."

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Oyen, L.P.A., 2013. Hoodia gordonii (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). Prota 11(2): Medicinal plants/Plantes médicinales 2. PROTA, Wageningen, Netherlands	[No evidence] "Hoodia gordonii is propagated by seed. Methods of micropropagation have been developed and patented. When seedlings are 6–8 months old and about 5 cm tall they are transplanted into the field."

Qsn #	Question	Answer
	South African National Biodiversity Institute. 2005. PlantzAfrica.com - Hoodia gordonii. http://www.plantzafrica.com/planthij/hoodgord.htm . [Accessed 14 Apr 2015]	[No evidence] "Propagation is done mainly from seed. Cuttings are not really an option, as the severed ends very rarely form a callus from where roots will eventually form."

607	Minimum generative time (years)	3
	Source(s)	Notes
	South African National Biodiversity Institute. 2005. PlantzAfrica.com - Hoodia gordonii. http://www.plantzafrica.com/planthij/hoodgord.htm . [Accessed 14 Apr 2015]	"Hoodia gordonii once established will grow quickly. These plants respond well to organic foodstuffs. In a three years plants can attain a height of at least 250 mm and have up to 10 branches. "
	Swart E. 2008. Hoodia gordonii in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – Hoodia gordonii. Mexico, NDF Workshop Case Studies	"The life-span and age at maturity of H. gordonii is unknown, but anecdotal data indicated it to be 15-20 years, with the first flowering event only occurring after three to six years. Coincidentally, this is also the time (three years) it takes cultivated material to produce sufficient active ingredients to be accepted for trade."
	Smith, A.S. 2008. A Hoodia Review Can Help You Get the Real Hoodia Gordonii. http://EzineArticles.com/1650785 . [Accessed 14 Apr 2015]	"The plant takes around five long years to flower and becoming ready for harvesting."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Oyen, L.P.A., 2013. Hoodia gordonii (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). Prota 11(2): Medicinal plants/Plantes médicinales 2. PROTA, Wageningen, Netherlands	[Unlikely, but possibly if hairs on seeds aid in adherence to clothing, or mud on shoes or equipment] "Fruit composed of 2 follicles, these erect, slender, horn-like, 9–11.5 cm long, diverging at 30–60°, greenish, glabrous, smooth, 180–190- seeded. Seeds with tuft of hairs at one side."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Horizon Herbs. 2015. Hoodia* (Hoodia gordonii), potted plant, organic. https://www.horizonherbs.com/product.asp?specific=2181 . [Accessed 15 Apr 2015]	"Hoodia gordonii, packet of 5 seeds" [Seeds available for commercial sale]

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	Oyen, L.P.A., 2013. Hoodia gordonii (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). Prota 11(2): Medicinal plants/Plantes médicinales 2. PROTA, Wageningen, Netherlands	[Possibly, but no evidence. Seeds could potentially be blown into other crops, or containers with other plants & be dispersed unintentionally] "Fruit composed of 2 follicles, these erect, slender, horn-like, 9–11.5 cm long, diverging at 30–60°, greenish, glabrous, smooth, 180–190- seeded. Seeds with tuft of hairs at one side."

704	Propagules adapted to wind dispersal	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	"Fruit composed of 2 follicles, these erect, slender, horn-like, 9–11.5 cm long, diverging at 30–60°, greenish, glabrous, smooth, 180–190-seeded. Seeds with tuft of hairs at one side."
	South African National Biodiversity Institute. 2005. <i>PlantzAfrica.com - Hoodia gordonii</i> . http://www.plantzafrika.com/planthij/hoodgord.htm . [Accessed 13 Apr 2015]	"The seeds are light brown in colour, are flat and have a pappus of fluffy hair attached to their one end. This pappus acts as a parachute when the seed pod splits open. The seeds are blown some distance from the parent plant where they will establish themselves."

705	Propagules water dispersed	n
	Source(s)	Notes
	Swart E. 2008. <i>Hoodia gordonii</i> in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – <i>Hoodia gordonii</i> . Mexico, NDF Workshop Case Studies	[Unlikely. Although some secondary dispersal by water may be possible, this is a wind-dispersed species of arid habitats] "Follicles can get up to 250mm long, containing several seeds that are wind dispersed." ... "H. gordonii occurs in a wide variety of arid habitats characterised by sparse vegetation, ranging from coastal to mountainous habitats. Generally the species do, however, prefer arid gravel or shale plains, slopes and ridges,"

706	Propagules bird dispersed	n
	Source(s)	Notes
	Vermaak, I., Hamman, J. H., & Viljoen, A. M. (2011). <i>Hoodia gordonii</i> : an up-to-date review of a commercially important anti obesity plant. <i>Planta Medica-Natural Products and Medicinal Plant Research</i> , 77(11), 1149–1160	[Not fleshy-fruited] "The seed capsules, produced in October and November, resemble antelope or goat horns and contain numerous flat, light brown seeds with silky seed hairs attached to one end."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Oyen, L.P.A., 2013. <i>Hoodia gordonii</i> (Masson) Sweet ex Decne. In: Schmelzer, G.H. & Gurib-Fakim, A. (Editors). <i>Prota 11(2): Medicinal plants/Plantes médicinales 2</i> . PROTA, Wageningen, Netherlands	[Unknown. Adapted for wind dispersal, but hairs could possibly allow seeds to adhere to fur or mud] "Fruit composed of 2 follicles, these erect, slender, horn-like, 9–11.5 cm long, diverging at 30–60°, greenish, glabrous, smooth, 180–190- seeded. Seeds with tuft of hairs at one side."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	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	"Answer 'no' where the taxon is unlikely to be eaten by animals or if seeds are not viable following passage through the gut." [Seeds possess adaptations for wind dispersal]

801	Prolific seed production (>1000/m2)	n

Qsn #	Question	Answer
	Source(s)	Notes
	Swart E. 2008. <i>Hoodia gordonii</i> in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – <i>Hoodia gordonii</i> . Mexico, NDF Workshop Case Studies	"Flowering is protracted (based on herbarium records, PRECIS records) and unsynchronised, reacting to rainfall events irrespective of the season. During good rainfall events, the plants are covered by flowers, producing masses of seed follicles after one month. Seeds ripen about two to three months after flowering." ... "Follicles can get up to 250mm long, containing several seeds that are wind dispersed. The follicles split open along the sides, releasing the seeds which are then blown under nurse plants or other protective sites where they germinate and establish themselves. However, the potential seed production (average number of seeds per follicle) and its longevity in the veldt are unknown."
	Dreber, N., Oldeland, J., & van Rooyen, G. M. (2011). Species, functional groups and community structure in seed banks of the arid Nama Karoo: grazing impacts and implications for rangeland restoration. <i>Agriculture, Ecosystems & Environment</i> , 141(3), 399-409	[Low densities reported for unidentified <i>Hoodia</i> spp. at a degraded site] "Table 1 Species recorded in the soil seed bank and in the standing vegetation at the reference (REF) and degraded (DEG) site." [Hoodia sp. - Seed density (seeds m ⁻²) = 0.7 ± 0.7]

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Swart E. 2008. <i>Hoodia gordonii</i> in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – <i>Hoodia gordonii</i> . Mexico, NDF Workshop Case Studies	"However, the potential seed production (average number of seeds per follicle) and its longevity in the veldt are unknown."
	Royal Botanic Gardens Kew. 2008. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/ . [Accessed 15 Apr 2015]	"Storage Behaviour: Orthodox"

803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	Unknown. No information on herbicide efficacy or control of this species

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Swart E. 2008. <i>Hoodia gordonii</i> in Southern Africa. WG 3 – Succulents and Cycads, Case Study 6 – <i>Hoodia gordonii</i> . Mexico, NDF Workshop Case Studies	[Probably will not tolerate mutilation, cultivation or fire. Tolerant of some harvesting] "Some of the preliminary anthropogenic threats include commercial wild crafted harvesting (illegal harvesting) and habitat destruction (over grazing, trampling, cultivations, road construction, off road driving, urban development, mining)." ... "Harvesting regime ... Only ten of the stems may be harvested or 25% of a plant that is larger than 40 cm in diameter, only on the southern side (down wind), near ground level. Only trained harvesters may harvest <i>Hoodia</i> material, i.e. trained in the prescribed methods provided by the department."

Qsn #	Question	Answer
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y
	<p style="text-align: center;">Source(s)</p> <p>Rau, E. 2015. President, Sustainable Bioresources, LLC. Personal Communication. 14 April</p>	<p style="text-align: center;">Notes</p> <p>[Affected by widespread pests & diseases] "Approximately 1000 seedlings and cuttings of various Hoodia species (<i>H. juttae</i>, <i>H. gordonii</i>, <i>H. macrantha</i>, <i>H. parviflora</i> and <i>H. pilifera</i>) and <i>Hoodiopsis triebneri</i> have been grown in containers outdoors or planted directly in the ground for field trials at our site in Naalehu over the past three years. Virtually all of these have contracted black spot disease, a syndrome that apparently results from infestations with the false spider mite <i>Brevipalpus phoenicis</i> during wet weather conditions. The mite is present throughout Hawaii and has many host species. The permanent black lesions and scarring characteristic of the disease may result from the bite of the mite or a self limiting anthraconose fungus infection transmitted by the mites."</p>

Summary of Risk Traits:

High Risk / Undesirable Traits

- Able to grow in regions with tropical climates
- Spiny
- Possibly unpalatable to animals
- Reproduces by wind-dispersed seeds
- Produces interspecific & intergeneric hybrids
- Limited ecological information may reduce accuracy of risk prediction

Low Risk Traits

- No reports of invasiveness or naturalization, but introduction outside native range may be limited
- Valuable medicinal plant
- Susceptibility to bacterial and fungal rot, mites and mite transmitted diseases may limit ability to escape & spread in the Hawaiian Islands
- Possibly self-incompatible
- Not reported to spread vegetatively