Taxon: Euphorbia antisyphilitica Zucc. **Family:** Euphorbiaceae

Common Name(s): candelilla
wax plant
wax plant candelilla

Synonym(s): Euphorbia cerifera Alcocer

Assessor: Chuck Chimera **Status:** Approved **End Date:** 26 Sep 2024

WRA Score: 5.0 **Designation:** L **Rating:** Low Risk

Keywords: Succulent Shrub, Naturalized Elsewhere, Waxy Coating, Ballistic Dispersal

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	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	n
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	y = 2*multiplier (see Appendix 2), n = 0	n
304	Environmental weed	y = 2*multiplier (see Appendix 2), n = 0	n
305	Congeneric weed	y = 1*multiplier (see Appendix 2), n = 0	y
401	Produces spines, thorns or burrs	y = 1, n = 0	n
402	Allelopathic		
403	Parasitic	y = 1, n = 0	n
404	Unpalatable to grazing animals	y = 1, n = -1	n
405	Toxic to animals	y = 1, n = 0	n
406	Host for recognized pests and pathogens	y = 1, n = 0	n
407	Causes allergies or is otherwise toxic to humans		
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		

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		
605	Requires specialist pollinators	y = -1, n = 0	n
606	Reproduction by vegetative fragmentation		
607	Minimum generative time (years)		
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y = 1, n = -1	n
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		
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)		
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	y = 1, n = -1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	[No evidence of domestication] " Flowering and fruiting year-round in response to sufficient rainfall. Desert scrub, frequently on limestone substrates; 100–1200 m; N.Mex., Tex.; Mexico. Euphorbia antisyphilitica is the only pencil-stemmed species of Euphorbia occurring in the flora area. The species is characteristic of the Chihuahuan Desert scrub of Mexico from Chihuahua and Coahuila south to Hidalgo and Querétaro, and barely enters into the United States in southern New Mexico (Doña Ana and Lincoln counties) and southwest (Brewster, Hudspeth, Presidio, and Terrell counties) and south (Starr and Webb counties) Texas. The stems are covered in a conspicuous coat of exfoliating wax, and the plants historically have been harvested for this product, although the practice is much less prevalent now. The specific epithet refers to its traditional medicinal use in treating sexually transmitted infections."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2024). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2024). 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
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Desert scrub, frequently on limestone substrates; 100–1200 m; N.Mex., Tex.; Mexico."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2024). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch. [Accessed 20 Sep 2024]	"Native Northern America SOUTH-CENTRAL U.S.A.: United States [New Mexico (s.), Texas] NORTHERN MEXICO: Mexico [Chihuahua, Coahuila de Zaragoza] SOUTHERN MEXICO: Mexico [Hidalgo, Querétaro]"

202	Quality of climate match data	High
	Source(s)	Notes
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Desert scrub, frequently on limestone substrates; 100–1200 m; N.Mex., Tex.; Mexico."

Qsn #	Question	Answer
203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Flowering and fruiting year-round in response to sufficient rainfall. Desert scrub, frequently on limestone substrates; 100–1200 m; N.Mex., Tex.; Mexico." [Broad elevation range]
	Martin, C.A. (2024). Virtual Library of Phoenix Landscape Plants - Euphorbia antisyphilitica. https://www.public.asu.edu/~camartin/plants/Plant%20html%20files/euphorbiaantisyphilitica.html. [Accessed 23 Sep 2024]	"Hardiness zones Sunset 11-13 USDA 8-11"

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Flowering and fruiting year-round in response to sufficient rainfall. Desert scrub, frequently on limestone substrates; 100–1200 m; N.Mex., Tex.; Mexico. Euphorbia antisyphilitica is the only pencil-stemmed species of Euphorbia occurring in the flora area. The species is characteristic of the Chihuahuan Desert scrub of Mexico from Chihuahua and Coahuila south to Hidalgo and Querétaro, and barely enters into the United States in southern New Mexico (Doña Ana and Lincoln counties) and southwest (Brewster, Hudspeth, Presidio, and Terrell counties) and south (Starr and Webb counties) Texas."
	Gallaher, T.J., Brock, K., Kennedy, B.H., Imada, C.T., Imada, K., & Walvoord, N. (2024). Plants of Hawai'i. http://www.plantsofhawaii.org. [Accessed 23 Sep 2024]	No evidence in the Hawaiian Islands to date

205	**Does the species have a history of repeated introductions outside its natural range?**	**n**
	Source(s)	**Notes**
	Barsch, F. (2004). Candelilla (Euphorbia antisyphilitica): utilization in Mexico and international trade. Medicinal Plant Conservation, 9(10), 46-50	"Candelilla is exclusively collected from wild populations. There is no cultivation of Euphorbia antisyphilitica, and cultivation trials apparently do not exist (HERNANDEZ MACÍAS, pers. comm.)."

301	**Naturalized beyond native range**	**y**
	Source(s)	**Notes**
	Barsch, F. (2004). Candelilla (Euphorbia antisyphilitica): utilization in Mexico and international trade. Medicinal Plant Conservation, 9(10), 46-50	"The species is naturalised as a neophyte in India and other subtropical regions."
	Gallaher, T.J., Brock, K., Kennedy, B.H., Imada, C.T., Imada, K., & Walvoord, N. (2024). Plants of Hawai'i. http://www.plantsofhawaii.org. [Accessed 23 Sep 2024]	No evidence in the Hawaiian Islands to date

302	**Garden/amenity/disturbance weed**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

303	**Agricultural/forestry/horticultural weed**	**n**

Qsn #	Question	Answer
	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	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	y
	Source(s)	Notes
	Weber, E. (2017). Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Euphorbia esula] "Leafy spurge has become one of the worst invaders in northern America causing both ecological and economic damage."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Numerous Euphorbia species have become invasive weeds

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	[No evidence] "Shrubs, with much-branched, fleshy rootstock. Stems erect, few branched, 25–50(–100) cm, glabrous or puberulent, pencil-like, in age covered with flaky, exfoliating layer of wax. Leaves alternate usually caducous, sometimes persisting; stipules 0.4–0.5 mm; petiole absent; blade ovate to deltate-subulate, 2.5–4 × 1 mm, thick, fleshy, base usually rounded and swollen, rarely cuneate, margins entire, apex acute, surfaces puberulent, adaxial sometimes canescent; venation inconspicuous. Cyathia in axillary congested cymes, near branch tips or solitary at distal nodes; peduncle 0–1 mm, lanulose. Involucre campanulate, 1.6–2.2 × 1.6–1.9 mm, puberulent to canescent; glands 5, pinkish, narrowly oblong to reniform, 0.3–0.4 × 0.8–1 mm; appendages white to pink, ovate, oblong, or transversely oblong, 1.3–2.5 × 1.4–2.5 mm, usually erose, rarely entire. Staminate flowers 50–70. Pistillate flowers: ovary glabrous; styles 0.9–1.1 mm, 2-fid nearly entire length. Capsules oblong to ovoid, 3.9–4.2 × 3.6–3.9 mm, glabrous; columella 3.1–3.3 mm. Seeds whitish gray, narrowly ovoid, 2.4–3.1 × 1.4–1.6 mm, irregularly rugose-tuberculate; caruncle crescent-shaped, 0.3–0.6 × 0.6–0.8 mm."

402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. (2024). Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	Notes
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Shrubs, with much-branched, fleshy rootstock." [Euphorbiaceae. No evidence]

Qsn #	Question	Answer
404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Gastelum Mendoza, F. I., Cantú Ayala, C. M., Uvalle Sauceda, J. I., Lozano Cavazos, E. A., Serna Lagunes, R., & González Saldívar, F. N. (2020). Importance of the desert microphilous scrubland for the white-tailed deer (Odocoileus virginianus Mearns, 1898) in the state of Coahuila. Revista Mexicana de Ciencias Forestales, 11 (62), 136-156	"En cambio, evitan consumir Euphorbia antisyphilitica, debido a su alto contenido de cera que dificulta su digestión (Ramírez, 2004)." [On the other hand, they avoid consuming Euphorbia antisyphilitica, due to its high content of wax that makes digestion difficult (Ramírez, 2004).]
	Pérez-Solano, L. A., García-Feria, L. M., & Gallina-Tessaro, S. (2017). Factors affecting the selection of and displacement within core areas by female mule deer (Odocoileus hemionus) in the Chihuahuan Desert, Mexico. Mammalian Biology, 87, 152-159	"It has been suggested that the shrub Euphorbia antisyphilitica makes up the most important part of the annual diet of this deer at the study site, representing 14% of its forage (Guth, 1987; Esparza-Carlos et al.,2011, 2016)."
	Rodríguez García, A., González Saldívar, F. N., Cantú Ayala, C. M., & Uvalle Sauceda, J. I. (2023). Food competition between Barbary sheep (Ammotragus lervia Pallas, 1777) and Bighorn sheep (Ovis canadensis Shaw, 1804) in Coahuila State. Revista Mexicana de Ciencias Forestale, 14(79), 294-316	"Los taxones con mayor similitud en la dieta entre ambos borregos en las diferentes estaciones del año fueron Euphorbia antisyphilitica Zucc. para primavera, además registró el más alto porcentaje de similitud, con un valor de 88 %" [The taxa with the greatest similarity in the diet between both sheep in the different seasons of the year were Euphorbia antisyphilitica Zucc. for spring, it also registered the highest percentage of similarity, with a value of 88%]
	Harveson, L. A. (2016). Woody Plants of the Big Bend and Trans-Pecos: A Field Guide to Common Browse for Wildlife. Texas A&M University Press, College Station, TX	"Value to Wildlife: Has been reported in mule deer diets in the Black Gap Wildlife Management Area, in Brewster County."
	Gastelum-Mendoza, F. I., González-Saldívar, F. N., Cantú-Ayala, C. M., Uvalle-Sauceda, J. I., Guerrero-Cárdenas, I., & Lozano-Cavazos, E. A. (2023). Forage diversity and selection in white-tailed deer (Odocoileus virginianus Texanus MEARNS) in Coahuila, Mexico. Agro Productividad, 16(1): 97-107	[Avoided by white-tailed deer] "Moreover, we identified filler plant species that were consumed depending on their availability; this category included Acacia rigidula, Cenchrus ciliaris, and Eysenhardtia texana. Meanwhile, the most avoided species were Acacia berlandieri, Euphorbia antisyphilitica, Jatropha dioica, and Karwinskia humboldtiana. The only preferred species was Opuntia engelmannii (Table 2)."
	Cossío-Bayúgar, A., Romero, E., Gallina, S., Suzán, G., & Ibáñez-Bernal, S. (2015). Variation of gastrointestinal parasites in mule deer and cattle in Mapimí biosphere reserve, Mexico. The Southwestern Naturalist, 60(2-3), 180 -185	[Consumed by mule deer, possibly for antiparasitic properties. No evidence of consumption for forage or fodder] "Among the main plants consumed by deer in Mapimi BR are species belonging to the Euphorbiaceae family, such as candelilla (Euphorbia antisyphilitica) and leatherstem or sangre de drago (Jatropha dioica) (Guth, 1987). Plants of this family are known for their antiparasitic properties (Sharma, 2006; Ali and Ahmed, 2008)."

405	Toxic to animals	n
	Source(s)	**Notes**
	Warner, S. (2023). Wild Edible Plants of the Southwest: Locate, Identify, Store, and Prepare Your Foraged Finds. Rowan's Publishing, LLC.	"Non- Toxic : Candelilla (Euphorbia antisyphilitica) The stems are shorter and grow more closely together. It has a waxy coating on its stems."
	Harveson, L. A. (2016). Woody Plants of the Big Bend and Trans-Pecos: A Field Guide to Common Browse for Wildlife. Texas A&M University Press, College Station, TX	"Value to Wildlife: Has been reported in mule deer diets in the Black Gap Wildlife Management Area, in Brewster County."
	Gastelum Mendoza, F. I., Cantú Ayala, C. M., Uvalle Sauceda, J. I., Lozano Cavazos, E. A., Serna Lagunes, R., & González Saldívar, F. N. (2020). Importance of the desert microphilous scrubland for the white-tailed deer (Odocoileus virginianus Mearns, 1898) in the state of Coahuila. Revista Mexicana de Ciencias Forestales, 11 (62), 136-156	[No evidence, although waxes may reduce palatability] "En cambio, evitan consumir Euphorbia antisyphilitica, debido a su alto contenido de cera que dificulta su digestión (Ramírez, 2004)." [On the other hand, they avoid consuming Euphorbia antisyphilitica, due to its high content of wax that makes digestion difficult (Ramírez, 2004).]

406	Host for recognized pests and pathogens	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Martin, C.A. (2024). Virtual Library of Phoenix Landscape Plants - Euphorbia antisyphilitica. https://www.public.asu.edu/~camartin/plants/Plant%20html%20files/euphorbiaantisyphilitica.html. [Accessed 25 Sep 2024]	" Disease and Pests: None."
	Botanico Hub. (2024). Euphorbia antisyphilitica. https://www.botanicohub.com/plant-species/euphorbia-antisyphilitica. [Accessed 25 Sep 2024]	"Euphorbia antisyphilitica requires little maintenance beyond occasional pruning to keep its shape. It is not prone to pests or diseases, although it may be susceptible to root rot if grown in poorly-draining soil."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	**Notes**
	Burrows, G. E., & Tyrl, R. J. (2013). Toxic Plants of North America. Second Edition. Wiley-Blackwell, Hoboken, NJ	"The Euphorbiaceae exhibits considerable toxicologic diversity. Although most of its taxa are thought to be at least mildly toxic because of their irritating milky sap, several are infamous as toxicants and others have been used for medicinal purposes. Hippomane and Ricinus have been greatly feared as toxic plants, whereas Euphorbia antisyphilitica was once purported to have the value its name implies."
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[No evidence. Used medicinally, but incorrect application or dosage could potentially result in inadvertent poisoning] "(Latex in skin diseases. A plant decoction drunk to cure syphilis, also used for washing syphilitic sores. Roots made into a paste and used on skin diseases.)"

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**
	WRA Specialist. (2024). Personal Communication	No evidence. While the plant itself may be flammable, it's not particularly prone to catching fire under normal conditions. However, like any plant matter, it could ignite if exposed to a direct flame or high heat.

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	Botanico Hub. (2024). Euphorbia antisyphilitica. https://www.botanicohub.com/plant-species/euphorbia-antisyphilitica. [Accessed 25 Sep 2024]	"Euphorbia antisyphilitica prefers well-draining soil and full sun to partial shade. It is tolerant of hot, dry conditions and can survive extended periods of drought. In its native range, it often grows alongside other desert-adapted plants such as cacti, yuccas, and agaves."
	Martin, C.A. (2024). Virtual Library of Phoenix Landscape Plants - Euphorbia antisyphilitica. https://www.public.asu.edu/~camartin/plants/Plant%20html%20files/euphorbiaantisyphilitica.html. [Accessed 25 Sep 2024]	"Light: Full sun to partial shade."
	WRA Specialist. (2024). Personal Communication	It prefers full sun conditions to thrive. Shade can inhibit its growth and reduce the production of its valuable wax.

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Horticulture Unlimited, Inc. (2024). Euphorbia antisyphilitica. https://horticultureunlimited.com/succulents/euphorbia-antisyphilitica/. [Accessed 25 Sep 2024]	" It is hardy into the low twenties Fahrenheit and grows in most soil types."
	Johari, S., & Kumar, A. (2021). Growing Euphorbia antisyphilitica on wasteland soils of Rajasthan. Journal of Plant Science and Research, 37(2), 289-295	[Soil type affects growth, but able to grow on loamy, sandy and gravel soils] "Calcium and magnesium contents were maximum in gravel soil. When combinations of soil types were employed, Red + Sand + Gravel supported maximum biomass yield. In general, red loamy soil was found best suitable for maximum growth and productivity of Euphorbia antisyphilitica. Results found in the study clearly indicate that sandy, loamy, red and gravel soils found in Rajasthan state and other parts of India can be useful in growing energy crop E. antisyphilitica (Johari and Kumar 2020a; Johari and Kumar 2020b; Johari and Kumar 2020c; Kumar et al. 2020a; Kumar 2020b; Kumar 2020c ; Kumar et al. 2020)."

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Shrubs, with much-branched, fleshy rootstock. Stems erect, few branched, 25–50(-100) cm, glabrous or puberulent, pencil-like, in age covered with flaky, exfoliating layer of wax. Leaves alternate usually caducous, sometimes persisting; stipules 0.4–0.5 mm; petiole absent; blade ovate to deltate-subulate, 2.5–4 × 1 mm, thick, fleshy, base usually rounded and swollen, rarely cuneate, margins entire, apex acute, surfaces puberulent, adaxial sometimes canescent; venation inconspicuous."

412	Forms dense thickets	y
	Source(s)	**Notes**
	Alvarez-Pérez, O. B., Aguilar, C. N., Aguirre-Joya, J. A., & Rojas, R. (2018). Characteristics and New Applications of the Candelilla Wax. In Food Process Engineering and Quality Assurance (pp. 525-539). Apple Academic Press	"Candelilla wax may be obtained from several species of Euphorbiacea, the primary source is Euphorbia antisyphilitica. The plant grows as a bush or shrub in dense stands, principally in the Chihuahuan desert in northeastern Mexico."

501	Aquatic	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	[Terrestrial] "Desert scrub, frequently on limestone substrates; 100-1200 m; N.Mex., Tex.; Mexico."

502	Grass	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2024). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch. [Accessed 23 Sep 2024]	"Family: Euphorbiaceae Subfamily: Euphorbioideae Tribe: Euphorbieae Subtribe: Euphorbiinae"

503	Nitrogen fixing woody plant	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2024). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch. [Accessed 23 Sep 2024]	"Family: Euphorbiaceae Subfamily: Euphorbioideae Tribe: Euphorbieae Subtribe: Euphorbiinae"

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Shrubs, with much-branched, fleshy rootstock."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	[No evidence] "Euphorbia antisyphilitica is the only pencil-stemmed species of Euphorbia occurring in the flora area. The species is characteristic of the Chihuahuan Desert scrub of Mexico from Chihuahua and Coahuila south to Hidalgo and Querétaro, and barely enters into the United States in southern New Mexico (Doña Ana and Lincoln counties) and southwest (Brewster, Hudspeth, Presidio, and Terrell counties) and south (Starr and Webb counties) Texas."

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Flores-del Ángel, M. L., Foroughbakhch, R., Rocha-Estrada, A., Cárdenas-Ávila, M. L., Guzmán-Lucio, M. A., Hernández-Aguilar, Y. L., & Alvarado-Vázquez, M. A. (2013). Morfología, viabilidad y germinación de semillas de candelilla (Euphorbia antisyphilitica Zucc.). φyton 82(2), 161-167	"Abstract. Candelilla (Euphorbia antisyphilitica Zucc.) is a native plant in the desert regions of northern Mexico and the southern United States. The primary commercial use of this plant is for wax production. This study assessed the morphology, viability, and the effects of temperature in combination with chemical and mechanical scarification on the germination of candelilla seeds. Seeds were collected in four localities in northeastern Mexico. The seeds were predominantly pyriform with foveolate surfaces and brown in color; on average, the seeds measured 2.92 ± 0.26, 1.91 ± 0.22, and 1.50 ± 0.41 mm in length, width, and thickness, respectively. The average weight of 100 seeds was 0.32 ± 0.12 g. Seed viability showed a direct relationship with the color of the seed coat (thereby indicating the maturity level of the seed), with a viability of up to 86% in brown seeds, 52% in amber seeds, and 22% in gray seeds. Only brown seeds were used to assess germination after applying mechanical (sandpaper) and chemical (H2SO4) scarification, as well as two temperature (28 and 32 °C) treatments. The average germination rate was greater at 28 °C than at 32 °C for all treatments. The chemical scarification (at 28 °C) of seeds from the Lomas de Icamole locality showed the highest rate of germination (60%)."
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Capsules oblong to ovoid, 3.9–4.2 × 3.6–3.9 mm, glabrous; columella 3.1–3.3 mm. Seeds whitish gray, narrowly ovoid, 2.4–3.1 × 1.4 1.6 mm, irregularly rugose-tuberculate; caruncle crescent-shaped, 0.3–0.6 × 0.6–0.8 mm."

Qsn #	Question	Answer
	Barsch, F. (2004). Candelilla (Euphorbia antisyphilitica): utilization in Mexico and international trade. Medicinal Plant Conservation, 9(10), 46-50	"The species is an anemophilous plant spread by seeds (ANON. 2003a)."
	Hodge, W. H., & H. H. Sineath. (1956). The Mexican Candelilla Plant and Its Wax. Economic Botany, 10(2), 134-154	"Under natural conditions candelilla re- produces by means of seed, but establishment of plantings of a perennial species of this type from selected clones by vegetative propagation presumably would be more efficient."

603	Hybridizes naturally	
	Source(s)	Notes
	WRA Specialist. (2024). Personal Communication	Unknown. No evidence found

604	Self-compatible or apomictic	
	Source(s)	Notes
	Kubitzki, K. (ed.). (2014). The Families and Genera of Vascular Plants. Vol. XI. Flowering Plants. Eudicots: Malpighiales. Springer, New York	"In Euphorbiaceae, with open-pollinated strictly unisexual flowers, self-incompatibility is rare, and earlier reports of it appear to be incorrect. Self-incompatibility has been shown to be absent or incomplete in Chamaesyce (herbaceous species, Ehrenfeld 1976), Hevea (Bouharmont 1962), and Manihot (Jennings 1963; George and Shifriss 1967)."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Kubitzki, K. (ed.). (2014). The Families and Genera of Vascular Plants. Vol. XI. Flowering Plants. Eudicots: Malpighiales. Springer, New York	"In Euphorbiaceae, with open-pollinated strictly unisexual flowers, self-incompatibility is rare, and earlier reports of it appear to be incorrect. Self-incompatibility has been shown to be absent or incomplete in Chamaesyce (herbaceous species, Ehrenfeld 1976), Hevea (Bouharmont 1962), and Manihot (Jennings 1963; George and Shifriss 1967)."
	Plants for a Future. (2024). Euphorbia antisyphilitica. https://pfaf.org/User/Plant.aspx?LatinName=Euphorbia+antisyphilitica. [Accessed 26 Sep 2024]	"The species is monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and is pollinated by Insects."

606	Reproduction by vegetative fragmentation	
	Source(s)	Notes
	Martínez-Ballesté, A., & Mandujano, M. C. (2013). The consequences of harvesting on regeneration of a non-timber wax producing species (Euphorbia antisyphilitica Zucc.) of the Chihuahuan Desert. Economic Botany, 67, 121-136	"Although candelilla plants are capable of vegetative reproduction through the production of lateral roots which then develop into new stems (Jakobek et al. 1986), a decrease in flower production could reduce the recruitment of new plants through seeds, an important process that ensures genetic diversity and population sustainability (Clark et al. 2004; Reif et al. 2005)."
	Horticulture Unlimited, Inc. (2024). Euphorbia antisyphilitica. https://horticultureunlimited.com/succulents/euphorbia-antisyphilitica/. [Accessed 26 Sep 2024]	"The plant is also easy to propagate by spitting its roots apart and dividing them into separate clumps."

Qsn #	Question	Answer
607	**Minimum generative time (years)**	
	Source(s)	**Notes**
	Horticulture Unlimited, Inc. (2024). Euphorbia antisyphilitica. https://horticultureunlimited.com/succulents/euphorbia-antisyphilitica/. [Accessed 26 Sep 2024]	"Growth Rate: Moderate" [Unknown. In general, plants are slow growers, so it might take 3-5 years or more for them to reach reproductive maturity]

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Capsules oblong to ovoid, 3.9–4.2 × 3.6–3.9 mm, glabrous; columella 3.1–3.3 mm. Seeds whitish gray, narrowly ovoid, 2.4–3.1 × 1.4–1.6 mm, irregularly rugose-tuberculate; caruncle crescent-shaped, 0.3–0.6 × 0.6–0.8 mm." [No evidence. Seeds small, but otherwise lack means of attachment]

702	**Propagules dispersed intentionally by people**	y
	Source(s)	**Notes**
	Horticulture Unlimited, Inc. (2024). Euphorbia antisyphilitica. https://horticultureunlimited.com/succulents/euphorbia-antisyphilitica/. [Accessed 26 Sep 2024]	"The candelilla makes a nice focal point in a small garden or as a nice potted specimen with its pale color and columnar shape. It is native to the Trans-Pecos area of southwestern Texas and the Chihuahuan Desert in Mexico, growing in Durango, Chihuahua, and Coahuila."

703	**Propagules likely to disperse as a produce contaminant**	n
	Source(s)	**Notes**
	WRA Specialist. (2024). Personal Communication	No evidence. Euphorbia antisyphilitica is not known to be a significant seed contaminant of other crops. It primarily grows in arid and semi-arid regions, mainly in Mexico and parts of the southwestern United States, where it's harvested for its wax. Since it tends to thrive in its native habitats, it's not typically found in cultivated fields of other crops, reducing the chance of it becoming a seed contaminant.

704	**Propagules adapted to wind dispersal**	
	Source(s)	**Notes**
	Botanico Hub. (2024). Euphorbia antisyphilitica. https://www.botanicohub.com/plant-species/euphorbia-antisyphilitica. [Accessed 26 Sep 2024]	"The flowers are not showy but are followed by small seed capsules that split open when ripe, releasing numerous tiny seeds that are dispersed by wind."
	WRA Specialist. (2024). Personal Communication	The seeds of Euphorbia antisyphilitica are primarily dispersed by explosive dehiscence, a mechanism common in the Euphorbia genus. As the seed capsules mature and dry, they eventually burst open, forcefully ejecting the seeds away from the parent plant. This helps the seeds spread over a wider area, although the distance they travel is usually limited to a few meters. Beyond this mechanism, wind or occasional water runoff in its arid environment might further assist in the dispersal of the seeds, but to a much lesser extent.

705	**Propagules water dispersed**	
	Source(s)	**Notes**

Qsn #	Question	Answer
	WRA Specialist. (2024). Personal Communication	The seeds of Euphorbia antisyphilitica are primarily dispersed by explosive dehiscence, a mechanism common in the Euphorbia genus. As the seed capsules mature and dry, they eventually burst open, forcefully ejecting the seeds away from the parent plant. This helps the seeds spread over a wider area, although the distance they travel is usually limited to a few meters. Beyond this mechanism, wind or occasional water runoff in its arid environment might further assist in the dispersal of the seeds, but to a much lesser extent.

706	Propagules bird dispersed	n
	Source(s)	Notes
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Capsules oblong to ovoid, 3.9–4.2 × 3.6–3.9 mm, glabrous; columella 3.1–3.3 mm. Seeds whitish gray, narrowly ovoid, 2.4–3.1 × 1.4–1.6 mm, irregularly rugose-tuberculate; caruncle crescent-shaped, 0.3–0.6 × 0.6–0.8 mm." [Not fleshy-fruited]
	WRA Specialist. (2024). Personal Communication	The primary mode of seed dispersal for this plant is explosive dehiscence, where the seed capsules burst open and eject the seeds. Unlike some other plants, the seeds of Euphorbia antisyphilitica don't have features like fleshy fruit or coatings that would attract birds, making bird dispersal unlikely. The seeds mainly rely on their mechanical ejection and, to a lesser extent, wind or water movement for distribution.

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Capsules oblong to ovoid, 3.9–4.2 × 3.6–3.9 mm, glabrous; columella 3.1–3.3 mm. Seeds whitish gray, narrowly ovoid, 2.4–3.1 × 1.4–1.6 mm, irregularly rugose-tuberculate; caruncle crescent-shaped, 0.3–0.6 × 0.6–0.8 mm." [the seeds of Euphorbia antisyphilitica are not known to be dispersed through external attachment to animals. They lack structures like hooks, barbs, or sticky coatings that would enable them to attach to animal fur or feathers.]

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Capsules oblong to ovoid, 3.9–4.2 × 3.6–3.9 mm, glabrous; columella 3.1–3.3 mm. Seeds whitish gray, narrowly ovoid, 2.4–3.1 × 1.4–1.6 mm, irregularly rugose-tuberculate; caruncle crescent-shaped, 0.3–0.6 × 0.6–0.8 mm." [There is no documented evidence that the seeds of Euphorbia antisyphilitica survive gut passage through animals. Since this plant primarily disperses its seeds through explosive dehiscence, it's not adapted for endozoochory (dispersal via ingestion by animals).]

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes

Qsn #	Question	Answer
	Flora of North America Editorial Committee. (2016). Flora of North America North of Mexico. Volume 12. Magnoliophyta: Vitaceae to Garryaceae. Oxford University Press, New York and Oxford	"Capsules oblong to ovoid, 3.9–4.2 × 3.6–3.9 mm, glabrous; columella 3.1–3.3 mm. Seeds whitish gray, narrowly ovoid, 2.4–3.1 × 1.4–1.6 mm, irregularly rugose-tuberculate; caruncle crescent-shaped, 0.3–0.6 × 0.6–0.8 mm." [There isn't specific data available on the exact number of seeds produced per Euphorbia antisyphilitica plant each year. However, like many members of the Euphorbia genus, E. antisyphilitica produces small seed capsules, each containing up to three seeds. The actual seed output can vary greatly depending on the size, age, and health of the plant, as well as environmental conditions such as rainfall, temperature, and soil quality in its arid native habitat. Generally, since this plant grows in harsh desert conditions, its seed production may be relatively moderate compared to more prolific species.]

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	**Notes**
	Flores-del Ángel, M. L., Foroughbakhch, R., Rocha-Estrada, A., Cárdenas-Ávila, M. L., Guzmán-Lucio, M. A., Hernández-Aguilar, Y. L., & Alvarado-Vázquez, M. A. (2013). Morfología, viabilidad y germinación de semillas de candelilla (Euphorbia antisyphilitica Zucc.). φyton 82(2), 161-167	[Seeds remain viable after 5 months storage. Soil seed longevity unknown] "Three germination assays were carried out corresponding to each month of storage. Seed viability was determined by the tetrazolium test. The average weight of the candelilla seeds was 0.0029 ± 0.0010 g, with extreme average values of 0.0018 ± 0.0006 g at Las Coloradas and 0.0036 ± 0.0010 g in Icamole 2. Those seeds with heavier weight obtained from red fruits and with 1 month of storage showed the highest average percentage of viability (66.87 ± 24.19%). At the same time, seeds with around average weight, obtained from red fruits and five months of storage, showed the highest average germination percentage (50.00 ± 9.42%)."

803	Well controlled by herbicides	
	Source(s)	**Notes**
	WRA Specialist. (2024). Personal Communication	Unknown. If needed, controlling Euphorbia antisyphilitica with herbicides could be challenging due to its waxy coating and hardy nature, which help protect it from chemical absorption. The waxy layer on the stems could reduce the effectiveness of many herbicides, making it difficult for the chemicals to penetrate the plant tissues.

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	**Notes**
	Horticulture Unlimited, Inc. (2024). Euphorbia antisyphilitica. https://horticultureunlimited.com/succulents/euphorbia-antisyphilitica/. [Accessed 26 Sep 2024]	"The plant is also easy to propagate by spitting its roots apart and dividing them into separate clumps. Prune it heavily to the ground if the plant becomes scraggly and to hasten new growth."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	**Notes**
	WRA Specialist. (2024). Personal Communication	Unknown

Summary of Risk Traits:

Euphorbia antisyphilitica, commonly known as candelilla, is a succulent plant native to the arid regions of Mexico and the southwestern United States. It has tall, slender, cylindrical stems that resemble candles, which is how it gets its common name. The stems can grow up to 1 meter tall and are typically gray-green in color. The plant is usually leafless, with leaves that are small and ephemeral. The plant is primarily harvested for its wax, known as candelilla wax, which is extracted from the stems. This wax is used in various products, including cosmetics, food, and candles.
Euphorbia antisyphilitica is not currently reported to be invasive anywhere in the world, although it has been documented as naturalized in India. With its ability to form dense stands within its native range, and ability to spread through ballistic seed dispersal, it has the potential to naturalize in the Hawaiian Islands, although what impacts, if any, it would have on the natural environment are uncertain.

High Risk / Undesirable Traits
Broad elevation range
Thrives and can spread in regions with tropical climates
Naturalized in India
Other Euphorbia species are invasive
Consumed by some animals, but waxy coating may deter browsing and limit palatability
Sap contains chemical that could be toxic or allergenic
Tolerates many soil types (not limited by substrate)
Reported to form dense stands within its native range
Reproduces by seed and potentially through vegetative means
Seeds dispersed ballistically from dehiscent capsules, possibly by wind and water, and through intentional cultivation
Tolerates repeated pruning and cutting

Low Risk Traits
No reports of invasive or negative impacts where cultivated
Unarmed (no spines, thorns, or burrs)
Palatable to some animals
Grows best in high light environments (dense shade may inhibit spread)

Second Screening Results for Herbs or Low Stature Shrubby Life Forms
(A) Reported as a weed of cultivated lands? No evidence
Outcome = Accept (Low Risk)