Taxon: Washingtonia robusta H. Wendl. **Family:** Arecaceae

Common Name(s): Mexican fan palm
thread palm

Synonym(s): Neowashingtonia robusta (H. Wendl.)
Washingtonia sonorae S. Watson

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 30 Oct 2017

WRA Score: 15.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Invasive Palm, Leaves Armed, Prolific Seeder, Bird-Dispersed, Water-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?	y=1, n=-1	n
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)		
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed		
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	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	y
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	y
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)	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	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	[No evidence of domestication] "Native to desert washes where underground water is continuously available, naturalized in disturbed areas with moderate rainfall; introduced; Calif., Fla.; Mexico (native to Baja California Sur and Sonora)." ... "Washingtonia robusta is widely cultivated in warm areas in the United States and has occasionally naturalized in Florida (S. Zona 1997) and southern California (J. W. Cornett 1986)."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. 2017. Personal Communication	NA

103	**Does the species have weedy races?**	**n**
	Source(s)	**Notes**
	WRA Specialist. 2017. Personal Communication	NA

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 29 Oct 2017]	"Native: Northern America Northern Mexico: Mexico - Sonora, - Baja Sur"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 29 Oct 2017]	

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

Qsn #	Question	Answer
	Dave's Garden. 2017. Mexican Fan Palm, Skyduster - Washingtonia robusta. https://davesgarden.com/guides/pf/go/51656/. [Accessed 30 Oct 2017]	"Hardiness: USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11: above 4.5 °C (40 °F)"
	Jones. D. L. 1995. Palms Throughout the World. Smithsonian Institution Press, Washington, D.C.	"They grow very well in semi-arid climates but have also proved to be highly adaptable, growing well in coastal districts, mountainous regions and from the tropics to cool-temperate climates." [Suggests environmental versatility, in contrast to other references which list tolerance to <5 hardiness zones]
	Dirr, M.A. 2011. Dirr's encyclopedia of trees and shrubs. Timber Press, Portland, OR	"Zones 8 to 11; 20° F and below result in leaf injury. Native to the Mexican state of Sonora."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Frohlich, D. & Lau, A. 2010. New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"Mexican Washingtonia was previously collected as naturalized on Maui (Oppenheimer & Bartlett 2002) and is now known to be naturalized on O'ahu as well. Much like W. filifera, it is sometimes planted in large groupings at entrances to subdivisions or other similar landscaped areas to be featured. Also like W. filifera, it readily spreads from these plantings to home gardens, landscaped areas, roadsides, and construction areas."
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 30 Oct 2017]	"Native: Northern America Northern Mexico: Mexico - Sonora, - Baja Sur Naturalized: Northern America Southeastern U.S.A.: United States - Florida Southwestern U.S.A.: United States - California"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	"Washingtonia robusta is widely cultivated in warm areas in the United States and has occasionally naturalized in Florida (S. Zona 1997) and southern California (J. W. Cornett 1986)."

301	Naturalized beyond native range	y
	Source(s)	**Notes**
	Martin, T. 2009. Naturalisation of Mexican fan palm (Washingtonia robusta) in Auckland. Auckland Botanical Society 64: 145-148	"Mexican fan palm has been recently been collected as growing wild at three locations in Auckland City. The earliest record, by Peter de Lange in May 2007 (AK 299191), was of a single plant, c. 1 m tall, growing out of the base of a concrete wall. The plant was not immediately under adult plants, but adult Mexican fan palms were present in the local area."

Qsn #	Question	Answer
	Frohlich, D. & Lau, A. 2010. New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"Mexican Washingtonia was previously collected as naturalized on Maui (Oppenheimer & Bartlett 2002) and is now known to be naturalized on O'ahu as well. Much like W. filifera, it is sometimes planted in large groupings at entrances to subdivisions or other similar landscaped areas to be featured. Also like W. filifera, it readily spreads from these plantings to home gardens, landscaped areas, roadsides, and construction areas. Material examined. O'AHU: Hickam Air Force Base, juvenile ca 1.25 m tall, sparingly naturalized in a landscaped area, growing out of a Strelitzia, no flowers or fruit seen, 23 Jul 2008, D. Frohlich & A. Lau 2008072303."
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed]	"Naturalized: Northern America Southeastern U.S.A.: United States - Florida Southwestern U.S.A.: United States - California"
	Meyer, J. Y., Lavergne, C., & Hodel, D. R. 2008. Time bombs in gardens: invasive ornamental palms in tropical islands, with emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms, 52(2): 71-83	"The Mexican fan palm, Washingtonia robusta, is locally naturalized in Saint-Gilles, La Réunion on a roadside near a plant nursery. According to A. Hoarau (pers. comm. 2005), a palm collector in La Réunion, this species could become a serious plant invader as it produces small fruits easily dispersed by the Indian myna, Acridotheres tristis, or the red-whiskered bulbul, Pycnonotus jocosus, two widespread non-native birds in the Mascarenes."
	Oppenheimer, H. L. & Bartlett, R. T. 2002. New plant records from the main Hawaiian Islands. Bishop Museum Occasional Papers. 69: 1-14	"The Thread, Skyduster, or Mexican Fan Palm is endemic to Mexico. It frequently volunteers in sidewalk cracks, and between walls, power poles, and fences. Old petiole bases sometimes form a crisscross pattern at the base of the trunk, and the old leaves can persist as a ragged, uneven shag. The leaf blades have less divided segments with fewer filaments than W. filifera (L.H. Bailey Hortorium, 1976: 1168; Roberts, 1989: 94); it is also more salt-tolerant (Little, 1980: 326). Material examined. MAUI: West Maui, Lahaina Distr., Lahaina Town, along Honoapi'ilani Hwy. near Lahaina Aquatic Center, 11 m, 25 Jul 1998, Oppenheimer H79808."
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	"Washingtonia robusta is widely cultivated in warm areas in the United States and has occasionally naturalized in Florida (S. Zona 1997) and southern California (J. W. Cornett 1986)."

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	Morton, J. F., & Collectanea, M. (1989). The Mexican Washington palm is not an asset in Florida landscaping. Proc. Florida State Hort. Soc 102: 101-106	"Concern is expressed about the increased planting of Washingtonia robusta in S. Florida. The palm appears attractive when young but it grows rapidly, has a skirt of dead leaves in the first few years, becomes nude with age, when the slender stem, ultimately too tall for a hurricane area, looks like a telegraph pole with a small tuft of leaves at the summit; it has also become a weed. Seeds germinate readily in any nook, at the side of steps, in containers and in hedges, and plants can disrupt masonry and threaten roof overhangs. ..."

Qsn #	Question	Answer
	Dave's Garden. 2017. Mexican Fan Palm, Skyduster - Washingtonia robusta. https://davesgarden.com/guides/pf/go/51656/. [Accessed 30 Oct 2017]	"On Oct 8, 2012, GardenSox from Sacramento, CA (Zone 9a) wrote: ... Am I being harsh? You tell me - the Washingtonia robusta drops thousands of seedlings which sprout everywhere. They grow in cracks in the sidewalk, they grow in your gutters if you haven't cleaned them out recently, they grow in your flower beds, they grow in your lawn, they grow in gravel pathways . . . they grow and grow. I spend about 30 minutes each weekend, almost all year round, plucking out seedlings just to stay on top of the chore. When it gets windy out, the fronds (which have sharp spikes on them) tend to drop with a vengeance. Imagine waking up at 2:30 a.m. because a 6 foot frond fell from 60 feet above onto the roof of your house. It is unpleasant; trust me. It seems like there must be better palms out there to choose from. Do your neighbors a solid and avoid this one like the plague it is."

303	Agricultural/forestry/horticultural weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence [A weed of gardens, landscaping and natural areas]

304	Environmental weed	y
	Source(s)	**Notes**
	Starr, F., Starr, K. & Loope, L. 2003. Washingtonia spp. - Mexican fan palm and California fan palm Arecaceae. USGS Biological Resources Division, Haleakala Field Station, Maui. http://www.starrenvironmental.com/. [Accessed 30 Oct 2017]	"On both East and West Maui, these palms are commonly cultivated in urban and residential areas from sea level to 4,000 ft (1,219 m). In hot, lowland, urban areas near water sources, such as wetlands, areas close to the water table, irrigation ditches, and ponds, Washingtonia spp. are extremely prolific and well established. In these areas, numerous seedlings and saplings are observed germinating wherever possible. Seedlings have even been observed to come up through cracks in concrete sidewalks and streets. Plants spread rapidly from cultivation, invade wetland areas, and crowd out native species. At higher, dryer elevations and areas where rainfall amounts are high, Washingtonia spp. do tend to spread, but not nearly as rapidly or as much. Island wide control at this time is probably not feasible due to widespread distribution. Wetland area managers near infestations should be familiar with these palms and try to remove them as early as possible to avoid major infestations." ... "In Florida, Washingtonia robusta threatens native plant communities in coastal wetland and beach habitat in southern parts of the state." ... "In Florida, there are landscaping codes that do not allow Washingtonia spp. to be planted within 500 feet of native plant communities in coastal wetland and beach habitats where they are known to invade' 'Physical control: Small plants can be dug up. Chain-sawing the palm at the base below the growing tip will also control it."
	Plant Right. 2017. Washingtonia robusta. https://plantright.org/watch/washingtonia-robusta/. [Accessed 30 Oct 2017]	"Mexican fan palm is a single-trunked palm tree that is commonly used in landscaping. It has become invasive in riparian areas, orchards, and landscaped areas in the San Francisco Bay area, southern Sacramento Valley, and on the south coast of California. "

Qsn #	Question	Answer
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Phoenix canariensis Chabaud; Canary Island date palm Washingtonia robusta H. Wendl.; Mexican fan palm" ... "These are wildland weeds in southern California, but plants have also escaped along roadsides and urban areas in other states. Habitat: Landscaped areas, urban places, riparian streams, particularly near rural areas, and orchards." ... "Expansion of both species in riparian stream and river corridors can threaten native biodiversity. Populations are densest downstream from the sources of invasion, which are typically residential areas."
	Wong, M. 2006. Palms for Hawai'i Landscapes. Landscape Nov. 2006 L-19. College of Tropical Agriculture and Human Resources, UH Manoa, Honolulu, HI	"Recent increased awareness of the dangers invasive plants can pose to native Hawaiian ecosystems has resulted in evaluation of the invasiveness of plants used in landscaping. Based on conversations with experts on palms and invasive species, the following species should be avoided: Archontophoenix alexandrae (Alexandra) Livistona chinensis (Chinese fan) Pinanga kuhlii (ivory cane) Ptychosperma macarthurii (Macarthur) Roystonea oleracea? (Carribean royal) Roystonea regia? (Cuban royal) Roystonea venezuelana? (Venezuelan royal) Washingtonia filifera (California fan) Washingtonia robusta (Mexican fan)"

305	Congeneric weed	
	Source(s)	**Notes**
	Loope, L.L. 1992, Alien plants in Haleakala National Park Pp. 3-28 in Stone et al (eds) Alien plant invasions in native ecosystems of Hawaii. Coop. Nat. Park Resources Studies Unit, University of Hawaii, Honolulu, HI	"At Death Valley National Monument, part of the Mojave and Colorado Deserts Biosphere Reserve, the two primary problems with introduced species are feral burros (Equus asinus) and Tamarix spp. Other problems exist but in comparison to these are quite minor. The area's resources management plan (National Park Service 1981) mentions need for localized control of introduced Salsola kali, Phoenix spp. and Washingfonia filifera, and Ceratophyllum demersum, an aquatic weed which crowds out native aquatic plants in one of the area's springs." [Washingtonia filifera is considered a minor pest that needs localized control]
	Meyer, J. Y., Lavergne, C., & Hodel, D. R. 2008. Time bombs in gardens: invasive ornamental palms in tropical islands, with emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms, 52(2): 71-83	"The California fan palm (Washingtonia filifera) is considered invasive in Hawaii (Starr et al. 2003b) and Australia in the Perth area (Hussey et al. 2007, Richardson et al. 2006),"
	Spencer, W. 1995-2011. The Desert Fan Palm - Evidence Supports Relict Status. http://www.xeri.com/Moapa/relict.htm. [Accessed 29 Oct 2017]	"Upon close examination there is indeed absolutely no direct evidence supporting Cornett's late and scientifically flawed theory that Washingtonia filifera is an invasive species and not relict. In fact, all of the aspects are far more indicative of a relict status than of an invasive one."
	Queensland Government. (2017). Weeds of Australia. Washingtonia filifera. http://keyserver.lucidcentral.org. [Accessed 29 Oct 2017]	[Impacts unspecified] "Naturalised in some parts of southern and western Australia (i.e. in north-western and south western Western Australia, in south-eastern South Australia and sparingly naturalised in Victoria)." ... "American cotton palm (Washingtonia filifera) is regarded as an environmental weed in Western Australia, Victoria and the Northern Territory."

401	Produces spines, thorns or burrs	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	"Leaves: sheath fibers soft; petiole split at base, conspicuously armed with teeth along margins"

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. 2017. Personal Communication	Unknown. No documented evidence of allelopathy found

403	Parasitic	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	"Stems solitary, erect, tall, massive in one species (more than 10020 cm diam.)(100--150 cm diam.), partly or completely covered with old leaf bases and marcescent dry leaves forming conspicuous skirt around trunk." [Generic description. Arecaceae. No evidence]

404	Unpalatable to grazing animals	y
	Source(s)	**Notes**
	Urban Tree Farm Nursery. 2017. Washingtonia robusta. http://www.urbantreefarm.com/washingtonia-robusta-multi.html. [Accessed 30 Oct 2017]	"Deer resistant"
	Village Nurseries. 2017. Washingtonia robusta. https://www.villagenurseries.com/product/httpswhl3-wpengine-comproductwashingtonia-robusta-mexican-fan-palm/. [Accessed 30 Oct 2017]	"Deer Resistant"

405	Toxic to animals	n
	Source(s)	**Notes**
	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

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Atilano, R. A. (1982). Phytophthora bud rot of Washingtonia palm. Plant Diseases 66(6): 517-519	"Abs: 'A previously undescribed bud rot of 5-yr-old W. robusta trees in Fla., caused by P. palmivora, is described. Symptoms included wilt, eventual desiccation of the youngest leaves to a straw brown color, and tan-colored necrotic lesions with brown margins in interior petiole bases adjacent to putrid gray bud tissue. Mature leaves remained healthy for several weeks after death of the bud. The pathogen was isolated from diseased palms and surrounding nursery soil and pathogenicity was established on 2- to 3-yr-old palms."

Qsn #	Question	Answer
	Morton, J. F., & Collectanea, M. (1989). The Mexican Washington palm is not an asset in Florida landscaping. Proc. Florida State Hort. Soc 102: 101-106	"In Florida, W. robusta is attacked by the palm aphid (Ceratophis variabilis) which causes yellowing of foliage and sooty mold on the insect excretion; an armored black thread scale (Ischnaspis longirostris); a palm leaf skeletonizer (Homaledra sabalella); the palm tortoise beetle (Hemisphaeota cyanea); and the cabbage palm caterpillar (Litoprosopus futilis) (4)."
	Inserra, R. N., Dunn, R. A., & Vovlas, N. (1994). Host response of ornamental palms to Rotylenchulus reniformis. Journal of Nematology, 26(4S): 737-743	"The responses of 20 species of ornamental palms and one cycad (Cycas revoluta) to two populations of Rotylenchulus reniformis , from southern Florida were studied in two greenhouse experiments... Sections from Washingtonia robusta roots infected by R. reniformis females showed the nematode feeding on syncytia formed by endodermal, pericyclic, and vascular parenchyma cells in a manner similar to that reported for other monocot hosts of the reniform nematode."
	Meyer, J. Y., Lavergne, C., & Hodel, D. R. 2008. Time bombs in gardens: invasive ornamental palms in tropical islands, with emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms, 52(2): 71-83	[Potentially] "In 1999, Meyer officially advised the Department of the Environment of French Polynesia to ban introduction of Licuala grandis,Washingtonia spp. and Elaeis guineensis. All new importation of palms of the genera Adonidia, Areca, Arenga, Borassus, Dypsis, Corypha, Howea, Livistona, Ptychosperma and Roystonea, as well as Elaeis guinensis, Washingtonia robusta and Phoenix dactylifera, are officially illegal in French Polynesia (Decree N°276 CM 23 May 2005), primarily because of the risk of disease to the coconut, the most economically important plant of the islands."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	Pollen Library. 2017. Washington Fan Palm (Washingtonia robusta). http://www.pollenlibrary.com/. [Accessed 30 Oct 2017]	"Allergenicity: Washington Fan Palm (Washingtonia robusta) is a mild allergen."
	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

Qsn #	Question	Answer
408	**Creates a fire hazard in natural ecosystems**	**y**
	Source(s)	**Notes**
	Floridata. 2017. Washingtonia robusta. https://floridata.com/Plants/Arecacea/Washingtonia+robusta/261. [Accessed 30 Oct 2017]	"As the leaves die, they fall against the trunk to create the "hula skirt" effect for which this palm is famous. Unfortunately this shaggy skirt of dead dry leaves is a fire hazard and provides a home for rats and other undesirable creatures. "
	Morton, J. F., & Collectanea, M. (1989). The Mexican Washington palm is not an asset in Florida landscaping. Proc. Florida State Hort. Soc 102: 101-106	"The blanket of old, dry leaves clothing Washingtonia trunks is variously referred to as the petticoat, skirt, thatch, shag, or mane. It is highly flammable and California fan palms in the wild are frequently found scorched (but seldom killed) by accidental fires or by the Indian custom of burning off the thatch to facilitate gathering the fruits and, in their belief, to promote a more abundant crop (3, 29, 31). In cultivation, the thatch is often removed to improve the appearance of the palms in formal surroundings or to eliminate a fire hazard ..."

409	**Is a shade tolerant plant at some stage of its life cycle**	**y**
	Source(s)	**Notes**
	Floridata. 2017. Washingtonia robusta. https://floridata.com/Plants/Arecacea/Washingtonia+robusta/261. [Accessed 30 Oct 2017]	"Light: It does best in bright sunny conditions but Washington palm will tolerate some shade."
	Dirr, M.A. 2011. Dirr's encyclopedia of trees and shrubs. Timber Press, Portland, OR	"Prospers in dry, well-drained, sandy soils and full sun."
	Dave's Garden. 2017. Mexican Fan Palm, Skyduster - Washingtonia robusta. https://davesgarden.com/guides/pf/go/51656/. [Accessed 30 Oct 2017]	"Sun Exposure: Full Sun"
	Sun Palm Trees. 2017. Mexican Fan Palms - Cold Hardy Palm Trees (Washingtonia robusta). http://www.sunpalmtrees.com/Cold-Hardy-Palm-Trees-Mexican-Fan-Palms.htm. [Accessed 30 Oct 2017]	"Washington Palm needs full sun for best growth but will endure some shade while young." [Can establish in shaded conditions]

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y**
	Source(s)	**Notes**
	Sun Palm Trees. 2017. Mexican Fan Palms - Cold Hardy Palm Trees (Washingtonia robusta). http://www.sunpalmtrees.com/Cold-Hardy-Palm-Trees-Mexican-Fan-Palms.htm. [Accessed 30 Oct 2017]	"Adapted to a wide range of soil types, and climates." ... "Soil tolerances: clay; sand; loam; alkaline; acidic; occasionally wet; well-drained"
	Floridata. 2017. Washingtonia robusta. https://floridata.com/Plants/Arecacea/Washingtonia+robusta/261. [Accessed 30 Oct 2017]	"Washington palm prefers a moderately rich well drained soil but can survive on poor soils, even sand."

411	**Climbing or smothering growth habit**	**n**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	"Stems solitary, erect, tall, massive in one species (more than 10020 cm diam.)(100--150 cm diam.), partly or completely covered with old leaf bases and marcescent dry leaves forming conspicuous skirt around trunk." [Generic description]

412	Forms dense thickets	y
	Source(s)	**Notes**
	Starr, F., Starr, K. & Loope, L. 2003. Washingtonia spp. - Mexican fan palm and California fan palm Arecaceae. USGS Biological Resources Division, Haleakala Field Station, Maui. http://www.starrenvironmental.com/. [Accessed 30 Oct 2017]	"On Maui, Washingtonia spp. are widely planted in urban areas. They are well established in dry, hot coastal wetland areas, produce abundant seeds spread by fruit eating birds, and form dense thickets." ... "Washingtonia spp. are widely cultivated and naturalized on Maui. These palms seem to prefer hot, dry, coastal areas where they are prolific and often form dense stands. The distribution on Maui is too widespread for island wide control. It could be discouraged from plantings and controlled in vulnerable areas."

501	Aquatic	n
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	[Terrestrial] "Native to desert washes where underground water is continuously available, naturalized in disturbed areas with moderate rainfall"

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 27 Oct 2017]	Family: Arecaceae (alt.Palmae) Subfamily: Coryphoideae Tribe: Trachycarpeae Subtribe: Livistoninae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 27 Oct 2017]	Family: Arecaceae (alt.Palmae) Subfamily: Coryphoideae Tribe: Trachycarpeae Subtribe: Livistoninae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	"Plants tree palms. Stems solitary, erect, tall, massive in one species (more than 10020 cm diam.)(100--150 cm diam.), partly or completely covered with old leaf bases and marcescent dry leaves forming conspicuous skirt around trunk. Leaves: sheath fibers soft; petiole split at base, conspicuously armed with teeth along margins, sometimes unarmed in tall plants; abaxial hastula absent; adaxial hastula irregularly shaped, margin becoming tattered, fibrous; costa prominent; blade costapalmate; plication induplicate; segments lanceolate, basally connate, bearing fibers between segments; apices 2-cleft or irregularly tattered into fibers. Inflorescences axillary within crown of leaves, paniculate, arching well beyond leaves, with 2 orders of branching; prophyll leathery; rachis bracts very conspicuous, tubular at base, distally flattened and leathery, long; rachillae glabrous."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	Felger, R. S., & Joyal, E. (1999). The palms (Arecaceae) of Sonora, Mexico. Aliso 18(1): 1-18	[Limited distribution in native range poses risk, but no evidence of substantial reproductive failure] "In Sonora native only to canyons and oases in the Sierra El Aguaje at ca. (10-) 30-135 m. Locally dense populations occur in the upper part of Canon del Nacapule and in several very steep, seaward- facing canyons and oases in mountains along the coast northwest of Bahia San Carlos, e.g., La Huerta. Also locally abundant along canyon bottoms and oases in the canyon systems of Los Anegados and Las Barajitas. In all of these canyons and oases seedlings and small plants are abundant. These palms are limited to immediate margins of streams and at springs with permanent or near permanent water or wet soil where it locally outnumbers Brahea and Sabal. The limited distribution and extremely localized groves of W. robusta in Sonora make it vulnerable to local extirpation. Rose (1899: 255) found W. robusta at Guaymas, and reported that "most of them have been cut out and used as rafters for houses." Later reports make no mention of this species occurring naturally at Guaymas. This species is otherwise native only in Baja California Sur."

602	Produces viable seed	y
	Source(s)	**Notes**
	Hodel, D.R., Greby, K., Ohara, L. M. & Ohara, E. T. 2015. Infructescence and Fruit Characteristics of Washingtonia (Arecaceae: Coryphoideae). PalmArbor 2015-2: 1-7	"In coastal southern California seeds of Washingtonia, especially W. robusta in irrigated and even non-irrigated landscapes, germinate readily and the plants can become invasive."
	Floridata. 2017. Washingtonia robusta. https://floridata.com/Plants/Arecacea/Washingtonia+robusta/261. [Accessed 30 Oct 2017]	"Propagation: Propagate by seeds, which will germinate within 2 months."
	Meerow, A.W. 2004. Palm Seed Germination - BUL274. University of Florida IFAS Ext., Ft. Lauderdale, FL. http://edis.ifas.ufl.edu. [Accessed 30 Oct 2017]	"Seed of Mexican fan palm (Washingtonia robusta) may begin to germinate in less than 2 weeks,"

Qsn #	Question	Answer
603	**Hybridizes naturally**	**y**
	Source(s)	**Notes**
	Morton, J. F., & Collectanea, M. (1989). The Mexican Washington palm is not an asset in Florida landscaping. Proc. Florida State Hort. Soc 102: 101-106	"W. filifera and W. robusta readily hybridize without human assistance, producing palms with trunk of inter mediate girth and with a larger crown than that of the normal W. robusta, many leaf filaments like W. filifera, and with fruit and seed larger than in either parent (29). Hertrich (11) shows a photo of tall hybrids on Hilliard Street in San Marino, California."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	East, E. M. 1940. The distribution of self-sterility in the flowering plants. Proceedings of the American Philosophical Society 82: 449-518	"Palmae. Self-sterility is unknown in this family. Though mostly moncecious through abortion, with a tendency toward dichogamy, I believe that all palms are self-fertile. My observations on individual isolated fruiting specimens include the following genera; Acanthorhiza H. Wendl., Actinophloeus Becc., Areca L., Arenga Labill., Butia Becc., Caryota L., Elaeis Jacq., Guilielma Mart., Latania Comm., Livingstona R. Br., Phoenix L., Rhaphis L. f., Roystonea 0. F. Cook, Sabal Adans, Salacca Reinw., Thrinax L. f. apud Sw., and Washingtonia H. Wendl."
	Martin, T. 2009. Naturalisation of Mexican fan palm (Washingtonia robusta) in Auckland. Auckland Botanical Society 64: 145-148	"The species is monoecious, self-compatible, and does not require specialist pollinators (Brusati 2003)."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Martin, T. 2009. Naturalisation of Mexican fan palm (Washingtonia robusta) in Auckland. Auckland Botanical Society 64: 145-148	"The species is monoecious, self-compatible, and does not require specialist pollinators"
	Kubitzki, K. (ed.). 1998. The Families and genera of vascular plants. Volume IV. Flowering plants, Monocotyledons: Alismatanae and Commelinanae (except Gramineae). Springer-Verlag, Berlin, Heidelberg, New York	[Family Description] "Pollination. It is only relatively recently (Uhl and Moore 1977) that the myth (Delpino 1870) that palms are wind-pollinated has been dispelled. During the past decade, it has been shown that many palms are insect-pollinated (Henderson 1986), or, even if primarily anemophilous, that entomophily occurs, as in Aiphanes (Listabarth 1992). True anemophily does indeed occur (e.g., in Thrinax) but even the date palm, Phoenix dactylifera, may in fact be secondarily anemophilous. Large quantities of pollen, a feature of the syndrome of wind pollination, seem, at least in some palms, to be an adaptation to predation by insects. Different pollination syndromes have been observed for many insects including flies, bees, ants, and beetles (Henderson 1986 and others). The large incidence of beetle pollination is noteworthy. In some cases, exine sculpturing appears correlated with pollination syndromes. Iriartea, shown by Henderson (1985) to be bee-pollinated, has a finely reticulate exine whereas beetle-pollinated Socratea has spiny pollen grains (Harley 1996)."

Qsn #	Question	Answer
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	[Flowers unspecialized] "Flowers bisexual, borne singly along rachillae, shortpedicellate; perianth 2-seriate; calyx cupulate, 3-lobed, apices and margins irregular; petals 3, long, chaffy, basally connate into tube; stamens 6, adnate briefly to petals; pistils 3, distinct basally, glabrous; styles connate, slender, long; stigma inconspicuous."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Both palms are perennials with single woody-like trunks." ... "Both species only reproduce by seed. Birds ingest fruits and disperse the seeds with their droppings." [No evidence of vegetative spread]

607	Minimum generative time (years)	>3
	Source(s)	**Notes**
	The National Gardening Association. 2016. Photo of the bloom of Mexican Fan Palm (Washingtonia robusta). https://garden.org/plants/photo/402370/. [Accessed 30 Oct 2017]	"Caption: Twelve year old palm, first flowers"

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	[Fruit & seeds lack means of external attachment] "Mexican fan palms have black fruit that are not edible. Both species only reproduce by seed. Birds ingest fruits and disperse the seeds with their droppings. Seeds are large and readily carried by winter rains from landscaped areas down storm drains into nearby creeks and rivers."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	"Washingtonia robusta is widely cultivated in warm areas in the United States and has occasionally naturalized in Florida (S. Zona 1997) and southern California (J. W. Cornett 1986)."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	Hodel, D.R., Greby, K., Ohara, L. M. & Ohara, E. T. 2015. Infructescence and Fruit Characteristics of Washingtonia (Arecaceae: Coryphoideae). PalmArbor 2015-2: 1-7	"Table 1. Infructescence and Fruit Characteristics of Washingtonia filifera and W. robusta, California, 2014." ... "W. robusta - Fruit dimension = 8 × 6 mm; Seed dimension = 5.0 × 4.5 mm] [Fruit & seeds relatively large & unlikely to become an inadvertent produce contaminant]

Qsn #	Question	Answer
704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Mexican fan palms have black fruit that are not edible. Both species only reproduce by seed. Birds ingest fruits and disperse the seeds with their droppings. Seeds are large and readily carried by winter rains from landscaped areas down storm drains into nearby creeks and rivers."

Qsn #	Question	Answer
705	**Propagules water dispersed**	**y**
	Source(s)	**Notes**
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Expansion of both species in riparian stream and river corridors can threaten native biodiversity. Populations are densest downstream from the sources of invasion, which are typically residential areas." ... "Seeds are large and readily carried by winter rains from landscaped areas down storm drains into nearby creeks and rivers."

Qsn #	Question	Answer
706	**Propagules bird dispersed**	**y**
	Source(s)	**Notes**
	Flora of North America Editorial Committee. 2000, Flora of North America: North of Mexico, Volume 22. Oxford University Press, Oxford, UK	"Fruits drupes, blackish, ellipsoid; exocarp smooth; mesocarp thin, fleshy; endocarp thin. Seeds ellipsoid; endosperm homogeneous; embryo basal; eophyll undivided, lanceolate."
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Mexican fan palms have black fruit that are not edible. Both species only reproduce by seed. Birds ingest fruits and disperse the seeds with their droppings."
	Dave's Garden. 2017. Mexican Fan Palm, Skyduster - Washingtonia robusta. https://davesgarden.com/guides/pf/go/51656/. [Accessed 30 Oct 2017]	"On Nov 19, 2012, Melthyme from Modesto, CA wrote: I agree with GardenSox. I have a friend who has one of these palms in her yard. Last spring she planted a new lawn, and now there are hundreds of palm seedlings sprouting up all throughout the yard. I've also seen them in the neighbor's yard. The seeds are also spread by birds. "
	Meyer, J. Y., Lavergne, C., & Hodel, D. R. 2008. Time bombs in gardens: invasive ornamental palms in tropical islands, with emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean). Palms, 52(2): 71-83	"The Mexican fan palm, Washingtonia robusta, is locally naturalized in Saint-Gilles, La Réunion on a roadside near a plant nursery. According to A. Hoarau (pers. comm. 2005), a palm collector in La Réunion, this species could become a serious plant invader as it produces small fruits easily dispersed by the Indian myna, Acridotheres tristis, or the red-whiskered bulbul, Pycnonotus jocosus, two widespread non-native birds in the Mascarenes."

Qsn #	Question	Answer
707	**Propagules dispersed by other animals (externally)**	**n**
	Source(s)	**Notes**
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Mexican fan palms have black fruit that are not edible. Both species only reproduce by seed. Birds ingest fruits and disperse the seeds with their droppings. Seeds are large and readily carried by winter rains from landscaped areas down storm drains into nearby creeks and rivers." [Seeds could be cached by rodents, but otherwise lack means of external attachment]

Qsn #	Question	Answer
708	**Propagules survive passage through the gut**	**y**
	Source(s)	**Notes**
	East, E. M. 1940. The distribution of self-sterility in the flowering plants. Proceedings of the American Philosophical Society 82: 449-518	"Birds ingest fruits and disperse the seeds with their droppings."
	Felger, R. S., & Joyal, E. (1999). The palms (Arecaceae) of Sonora, Mexico. Aliso 18(1): 1-18	"The fruits are eagerly eaten by many birds and various mammals including badgers, coyotes, and raccoons. Seeds are often found germinating in decaying raccoons droppings."

801	**Prolific seed production (>1000/m2)**	**y**
	Source(s)	**Notes**
	Dave's Garden. 2017. Mexican Fan Palm, Skyduster - Washingtonia robusta. https://davesgarden.com/guides/pf/go/51656/. [Accessed 30 Oct 2017]	"On Jul 17, 2013, GardenTee from Houston, TX wrote: ... Each tree appears to have 20-40 'flower stalks', each one occupied by literally millions of seeds. It started in early June and still continues. If they do this next year we will have to cut the trees down!"
	Hodel, D.R., Greby, K., Ohara, L. M. & Ohara, E. T. 2015. Infructescence and Fruit Characteristics of Washingtonia (Arecaceae: Coryphoideae). PalmArbor 2015-2: 1-7	"Table 1. Infructescence and Fruit Characteristics of Washingtonia filifera and W. robusta, California, 2014" [W. robusta - Quantity of fruits of 1 palm based on volume = 580,580]

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Emam, M. M., & Khattab, H. E. (1997). Mechanism of dormancy in Washingtonia robusta seeds. The Desert Institute Bulletin 47(2): 379-390	"Some seeds fail to germinate when provided with the necessary environmental factors for germination such as O2, H2O, light and suitable temperature. These seeds may contain germination inhibitors in certain parts of the seed. In this study, seed dormancy in Washingtonia robusta was studied with regard to the specific site of the dormancy mechanism and the influence of certain chemicals on the germination of these seeds. Results revealed that dormancy could be broken naturally by removing the outer seed coat or chemically by applying chemicals such as thiourea or cis -cinnamic acid. Dormancy could be restored by growth inhibitors present in the outer coat. It is concluded that the outer coat may contain germination inhibitors. The bioassay and use of HPLC apparatus revealed that inhibitor levels in the outer coat were relatively high, indicating that these inhibitors were responsible for dormancy in Washingtonia robusta seeds." [In general, palm seeds are considered recalcitrant, meaning that they do not survive long in the soil]
	Royal Botanic Gardens Kew. (2017) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 30 Oct 2017]	"Storage Behaviour: Uncertain Storage Conditions: It is suggested that this species may not show recalcitrant seed storage behaviour, its true seed storage behaviour (orthodox or intermediate) therefore needs to be investigated."

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Triclopyr Rate: Spot treatment: 10% of Garlon 4 Ultra concentrate (v/v) or 50% of Garlon 3A concentrate (v/v), or Garlon 3A, Garlon 4 Ultra, Pathfinder II Pathfinder II undiluted as a ready to use herbicide Timing: Postemergence into apical buds of smaller plants. Remarks: Spot treatments should be made into the centers of smaller plants. This will reduce damage to other species adjacent to invasive palms." ... "Glyphosate Roundup, Accord XRT II, and others Rate: 50% v/v for spot treatment into drill holes. Undiluted for cut stump treatments. Timing: Apply directly into stems either in drilled holes or after cutting. Remarks: Plants can be trimmed with a chainsaw, then drilled with a 5/16-inch construction drill bit. A 50% dilution of concentrated glyphosate (about 0.5 oz) is added to the drill hole. Fan palms can usually be killed with a single drill hole. Date palms are harder to kill because they have three vascular bundles, so more holes will need to be drilled. Undiluted glyphosate can be used to treat cut stumps." ... "Imazapyr Arsenal, Habitat, Stalker, Chopper, Polaris Rate: 1% v/v solution for spot treatment Timing: Postemergence to fully developed leaves of smaller plants. Remarks: Imazapyr is fairly nonselective. When not near aquatic areas, the ester formulation (Stalker or Chopper) would be expected to be more effective."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	
	Source(s)	**Notes**
	Howard, Janet L. 1992. Washingtonia filifera. In: Fire Effects Information System, [Online]. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis//plants/tree/wasfil/all.html. [Accessed 30 Oct 2017]	"Burning increased the yield of fruit crops, removed the dead shag from trunks for easier access to crops, and removed understory phreatophytes competing for water resources." [Related species tolerates fire]
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"Young palm plants can be hand pulled. Older plants can be cut at the base with a chainsaw. This can be a very effective control strategy for taller plants, where herbicide treatment to the foliage can lead to significant drift." ... "Fire and grazing are not appropriate strategies for the control of palms."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	"There are no biological control agents available for palms."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Thrives in tropical climates
• Naturalized in Hawaiian Islands (Oahu, Maui), Florida, Southern California, Auckland New Zealand
• Regarded as a garden & landscaping weed
• An environmental weed
• Deer resistant (& probably unpalatable to other grazing animals)
• Skirt of dead fronds a fire hazard
• Shade tolerant when young (allowing for establishment in shaded environments)
• Tolerates many soil types
• Forms dense stands
• Reproduces by seeds
• Hybridizes
• Self-compatible
• Seeds dispersed by birds, other frugivorous animals, water & intentionally by people
• Prolific seed production

Low Risk Traits
• Ornamental
• Not reported to spread vegetatively
• Reaches maturity in >4 years (12 years report for first flowering in cultivation)
• Herbicides may provide effective control