

Taxon: <i>Roystonea regia</i> (Kunth) O. F. Cook	Family: Arecaceae
Common Name(s): Cuban royal palm Florida royal palm royal palm	Synonym(s): <i>Euterpe ventricosa</i> C. H. Wright <i>Oreodoxa regia</i> Kunth <i>Palma elata</i> W. Bartram <i>Roystonea elata</i> (W. Bartram) F. <i>Roystonea floridana</i> O. F. Cook

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 31 Dec 2019
WRA Score: 2.0	Designation: EVALUATE	Rating: Evaluate

Keywords: Solitary Palm, Naturalized, Weedy, Ornamental, Bird-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	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		
305	Congeneric weed		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans		

Qsn #	Question	Answer Option	Answer
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		
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		
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	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		
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)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	n
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
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[Cultivated and naturalized, but no evidence of domestication] "Abundantly distributed throughout the hillsides and valleys of Cuba and the hammocks of the Everglades in Collier, Dade, and Monroe Counties, Florida, U.S.A. (Small, 1928; Austin et al., 1980; Jones, 1983). Also present in the Yucatan Peninsula and Gulf Coastal Mexico, Belize, and Honduras. Indigenous populations also exist in the Cayman Islands. This species appears to be the palm found by Gillis et al. (1975) in the Bahamas. This taxon is very commonly cultivated throughout the tropics and subtropics and apparently naturalizes with ease."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 31 Dec 2019]	"Native Northern America SOUTHEASTERN U.S.A.: United States [Florida (s.)] SOUTHERN MEXICO: Mexico [Campeche, Tabasco, Veracruz de Ignacio de la Llave, Yucatán] Southern America CARIBBEAN: Bahamas, [Inagua] Cayman Islands, [Grand Cayman] Cuba CENTRAL AMERICA: Belize, Honduras [Cortés, Atlántida]"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 31 Dec 2019]	

Qsn #	Question	Answer
203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Gilman, E.F. & Watson, D.G. (2006). <i>Ptychosperma macarthurii</i> : Macarthur Palm. ENH-693. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu . [Accessed 31 Dec 2019]	"The royal palm is a large majestic palm that is native to south Florida and Cuba. It is considered cold hardy to about 28°F or USDA Cold Hardiness Zone 10A."
	Flora of North America Editorial Committee. 2000, <i>Flora of North America: North of Mexico</i> , Volume 22. Oxford University Press, Oxford, UK	"Tropical hardwood hammocks and mixed swamp vegetation in peat soils over limestone; 0--10 m; Fla.; se Mexico; West Indies (Cuba, Bahamas, Cayman Islands)."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	"Distribution (Fig. 8). Abundantly distributed throughout the hillsides and valleys of Cuba and the hammocks of the Everglades in Collier, Dade, and Monroe Counties, Florida, U.S.A. (Small, 1928; Austin et al., 1980; Jones, 1983). Also present in the Yucatan Peninsula and Gulf Coastal Mexico, Belize, and Honduras. Indigenous populations also exist in the Cayman Islands. This species appears to be the palm found by Gillis et al. (1975) in the Bahamas. This taxon is very commonly cultivated throughout the tropics and subtropics and apparently naturalizes with ease."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 31 Dec 2019]	"Native Northern America SOUTHEASTERN U.S.A.: United States [Florida (s.)] SOUTHERN MEXICO: Mexico [Campeche, Tabasco, Veracruz de Ignacio de la Llave, Yucatán] Southern America CARIBBEAN: Bahamas, [Inagua] Cayman Islands, [Grand Cayman] Cuba CENTRAL AMERICA: Belize, Honduras [Cortés, Atlántida]"

Qsn #	Question	Answer
205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"commonly cultivated in Honolulu."
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	"This taxon is very commonly cultivated throughout the tropics and subtropics and apparently naturalizes with ease."
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	Origin: C Am, N Am, S Am Major Pathway/s: Crop, Herbal, Ornamental Dispersed by: Humans, Escapee References: Puerto Rico-CW-261, Panama- CENI-625, United States of America-W- 179, India-N-976, Europe-N-819, Galpagos Islands-CN-1157, South Africa-U- 1247, United States of America-N-1292, Global-N-1338, Global-W-1376, Global-I- 1404, Global-CD-1611, North America-N- 1760, El Salvador-N-1796, South Africa-N- 1991, United States of America-N-2092, India-W-1977, Micronesia (Federated States of)-W-1977, Palau-W-1977, South Africa-W-1977."

301	Naturalized beyond native range	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"A second case is that of the royal palms. <i>Roystonea elata</i> (W. Bartram) F. Harper, <i>R. regia</i> (Kunth) Cook., or both, may be sparingly naturalized in mesic areas in Kalihi and Nu'uuanu valleys and in Kane'ohe, O'ahu, and likewise need further investigation."
	Frohlich, D. & Lau, A. 2007. <i>New plant records from O'ahu for 2006</i> . Bishop Museum Occasional Papers 96: 8-13	" <i>Roystonea regia</i> (Kunth) O.F. Cook New naturalized record. Only previously suspected as naturalized in Kalihi and Nu'uuanu Valleys, as well as Kāne'ohe, O'ahu (Wagner et al. 1999), <i>R. regia</i> is confirmed as naturalized, and throughout Waimānalo, where it has been described as "a serious pest" by nursery owners, who must control the seedlings. For these reasons, the continuing use of this species as an ornamental should be discouraged. Material examined. O'AHU:Waimānalo, thousands of seedlings found downslope from mature trees, 26 Aug 2006, G. Staples 1234; Waimānalo, seedlings collected from garden, 3–15 m from parent trees, 28 Aug 2006, G. Staples 1236."
	Svenning, J. C. (2002). Non-native ornamental palms invade a secondary tropical forest in Panama. <i>Palms</i> 46(2): 81-86	" <i>Roystonea regia</i> occurs in high abundance as both seedlings (Fig. 1) and juveniles throughout and appears to be more or less taking over a wet, central part of the forest. It is also quite frequent as large subadults and adults all over the forest, and is by far the most abundant palm reaching the upper canopy."
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	"This taxon is very commonly cultivated throughout the tropics and subtropics and apparently naturalizes with ease."

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

Qsn #	Question	Answer
	Frohlich, D. & Lau, A. 2007. New plant records from O'ahu for 2006. Bishop Museum Occasional Papers 96: 8-13	"R. regia is confirmed as naturalized, and throughout Waimānalo, where it has been described as "a serious pest" by nursery owners, who must control the seedlings. For these reasons, the continuing use of this species as an ornamental should be discouraged." [Suggests economic costs are being incurred by its naturalization]
	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? (Caribbean royal) Roystonea regia? (Cuban royal) Roystonea venezuelana? (Venezuelan royal) Washingtonia filifera (California fan) Washingtonia robusta (Mexican fan) The species marked with a question mark are considered possibly invasive."
	Langeland, K.A.& Stocker, R.K. 2001. Control of Non-native Plants in Natural Areas of Florida. SP 242. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL	[Controlled outside natural range in Florida] "Roystonea regia Royal palm Treatment: Hand pull seedlings; chainsaw mature trees down near the base. Comments: Commonly escapes into hammocks from landscape trees; best controlled in the seedling stage; Florida royal palm, Roystonea elata is similar and some taxonomists lump these two species together as synonyms; royal palms should only be treated as exotics if it is known that they are invading areas outside of their native Florida range; Florida royal palm still occurs as a wild plant in Everglades National park (Royal Palm Hammock), Fakahatchee Strand State Preserve, and Royal Palm Hammock in Collier Seminole State Park in Collier County."
	Henderson, A., Galeano, G. & Bernal, R. (1995). Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	[Grows in disturbed habitats] "in hammocks (Florida), woods, or open savannas, usually in wet places but now very common in disturbed areas."

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

304	Environmental weed	
	Source(s)	Notes
	Frohlich, D. & Lau, A. 2007. New plant records from O'ahu for 2006. Bishop Museum Occasional Papers 96: 8-13	"R. regia is confirmed as naturalized, and throughout Waimānalo, where it has been described as "a serious pest" by nursery owners, who must control the seedlings. For these reasons, the continuing use of this species as an ornamental should be discouraged." [Suggests economic costs are being incurred by its naturalization]

Qsn #	Question	Answer
	Svenning, J. C. (2002). Non-native ornamental palms invade a secondary tropical forest in Panama. <i>Palms</i> 46(2): 81-86	[Invading secondary forests of Panama with potential environmental impacts] "Of these eight species, at least four appear completely naturalized, all having many reproductive adults in the forest and lots of regeneration: <i>Roystonea regia</i> occurs in high abundance as both seedlings (Fig. 1) and juveniles throughout and appears to be more or less taking over a wet, central part of the forest. It is also quite frequent as large subadults and adults all over the forest, and is by far the most abundant palm reaching the upper canopy."
	Langeland, K.A.& Stocker, R.K. 2001. Control of Non-native Plants in Natural Areas of Florida. SP 242. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL	[Potentially. Controlled outside natural range in Florida] " <i>Roystonea regia</i> Royal palm Treatment: Hand pull seedlings; chainsaw mature trees down near the base. Comments: Commonly escapes into hammocks from landscape trees; best controlled in the seedling stage; Florida royal palm, <i>Roystonea elata</i> is similar and some taxonomists lump these two species together as synonyms; royal palms should only be treated as exotics if it is known that they are invading areas outside of their native Florida range; Florida royal palm still occurs as a wild plant in Everglades National park (Royal Palm Hammock), Fakahatchee Strand State Preserve, and Royal Palm Hammock in Collier Seminole State Park in Collier County."

305	Congeneric weed	
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	[Includes in some weed references] " <i>Roystonea oleracea</i> ... Origin: C Am, N Am, S Am Major Pathway/s: Crop, Ornamental Dispersed by: Humans, Escapee References: Guyana-N-32, Federated States of Micronesia-N-230, Panama-CNI-625, Global-N-85, Global-N-1059, La Reunion- N-1321, Global-N-1338, French Guiana-N- 1346, Global-W-1376, Global-I-1404, Brazil-U-1559, Global-CD-1611, Brazil-I- 984, -I-, Antigua and Barbuda-W-1977, Brazil-W-1977, Guyana-W-1977, Micronesia (Federated States of)-W-1977, Palau-W-1977, Panama-W-1977, Saint Lucia-W-1977, Suriname-W-1977, Venezuela-W-1977, Global--1324."
	Wong, M. 2006. Palms for Hawai'i Landscapes. <i>Landscape</i> Nov. 2006 L-19. College of Tropical Agriculture and Human Resources, UH Manoa, Honolulu, HI	[<i>Roystonea oleracea</i> and <i>Roystonea venezuelana</i> considered potentially invasive] "Invasive species. 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: <i>Archontophoenix alexandrae</i> (Alexandra) <i>Livistona chinensis</i> (Chinese fan) <i>Pinanga kuhlii</i> (ivory cane) <i>Ptychosperma macarthurii</i> (Macarthur) <i>Roystonea oleracea</i> ? (Caribbean royal) <i>Roystonea regia</i> ? (Cuban royal) <i>Roystonea venezuelana</i> ? (Venezuelan royal) <i>Washingtonia filifera</i> (California fan) <i>Washingtonia robusta</i> (Mexican fan)"

Qsn #	Question	Answer
401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[No evidence] "Solitary, unarmed, pleonanthic, monoecious palms."
402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown. No evidence found
403	Parasitic	n
	Source(s)	Notes
	Quattrocchi, U. (2017). <i>CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	"Solitary, tall, erect, columnar, unarmed" [Arecaceae (alt.Palmae). No evidence]
404	Unpalatable to grazing animals	
	Source(s)	Notes
	Quattrocchi, U. (2017). <i>CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	"Palm heart eaten. Staple food for livestock, infructescences for feeding pigs. Birds or bats often feed on the oily pericarp."
	Vozzo, J.A. 2002. <i>Tropical Tree Seed Manual</i> . USDA Forest Service, Washington, D.C.	" <i>Roystonea regia</i> is primarily valued as an ornamental. The seeds contain oil that is sold commercially (Moscoso 1945) or used for livestock feed (Little and others 1974). The leaves are used for thatching, and the wood can be used for construction." [Unknown. Fodder not mentioned among uses]
	Henderson, A., Galeano, G. & Bernal, R. (1995). <i>Field Guide to the Palms of the Americas</i> . Princeton University Press, Princeton, NJ	"the fruits are fed to animals and are a source of oil" [Palatability of foliage unspecified]
405	Toxic to animals	n
	Source(s)	Notes

Qsn #	Question	Answer
	Ly, J., Santana, I., & Macías, M. (2000). Studies on the digestibility of royal palm nut in Cuban creole pigs. Cuban Journal of Agricultural Science, 34(4), 315-322	"AB: Sixteen pigs of two genotypes (CC21, improved and Cuban Creole) were used to determine the nutritive value of sun-dried and ground royal palm nut meal (fruit of the royal palm, <i>Roystonea regia</i> , B.H.K. Cook). Consumption level was of 0.1 kg DM/kg metabolic weight (LW ^{0.75}) at a range of 45 to 60 kg and a basal diet of soyabean meal and wheat meal partially substituted by 20% royal palm nut (N 1.07, crude fibre 30.4, NDF 58.5, ether extract 23.1% in dry basis). No significant effect of interaction or genotype on organic matter digestibility and N were found. Creole pigs tended (P < 0.10) to retain less N than those improved. A significant effect of genotype (P < 0.01) was found in favour of Creole pigs on the digestibility of ether extract. The effect of the diet was significant (P < 0.001) on organic matter digestibility and N. The organic matter digestibility and N of the royal palm nut calculated by difference was 58.5 and 25.0%. The value of digestible energy was 14.14 KJ/g DM for royal palm nut. It is suggested that royal palm nut showed better values as an energy source than as a protein source in diets for pigs, probably through a high digestive utilization of ether extract. "
	Henderson, A., Galeano, G. & Bernal, R. (1995). Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	"the fruits are fed to animals and are a source of oil"
	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	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Dookun, A., Stead, D. E., & Autrey, L. J. C. (2000). Variation among strains of <i>Xanthomonas campestris</i> pv. <i>vasculorum</i> from Mauritius and other countries based on fatty acid analysis. <i>Systematic and Applied Microbiology</i>, 23(1), 148-155</p>	<p>"AB: Fatty acid profiling was used to study variation amongst strains of <i>Xanthomonas campestris</i> [<i>X. axonopodis</i>] pv. <i>vasculorum</i> (<i>Xcv</i>). They could be divided into five groups using cellular fatty acid profiles. Group A strains represent a new and little known taxon, and all came from plants of broom bamboo (<i>Thysanolaena maxima</i>) from Mauritius. Group B strains included the <i>Xcv</i> pathotype reference strain, and were from palms, broom bamboo and sugarcane from Mauritius, Réunion and Australia. Group C contained southern African and Malagasy strains from sugarcane and maize, together with <i>X. campestris</i> pv. <i>holcicola</i> strain. No Mascarene strains fell into this group. Group D strains isolated from sugarcane, maize and royal palm (<i>Roystonea regia</i>) were from Mauritius and Réunion, the earliest known strains coming from Réunion. These groups represented in the Mascarene Islands possibly belong to three different <i>Xanthomonas</i> species. A further Group E comprised one <i>Xcv</i> strain (NCPB 182) from Puerto Rico, one <i>X. vasicola</i> pv. <i>holcicola</i> strain plus 6 other unclassified <i>Xanthomonas</i> strains causing red stripe disease symptoms in sugarcane. Three of these groups occur on Mauritius and two occur on Réunion. Group B strains originally caused serious problems in noble canes. As resistant interspecific hybrids were introduced, group D strains appeared in Mauritius possibly being introduced from Réunion but having similar host ranges within the Gramineae and Palmae. The findings that 3 of these groups (A, B, D) can cause gumming disease in a grass species (<i>T. maxima</i>) and that 2 of them (B, D) also cause gumming disease in sugarcane (Gramineae) and palms (Palmae [Arecaceae]) is unusual. "</p>

Qsn #	Question	Answer
	<p>Quattrocchi, U. (2017). CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL</p>	<p>"<i>Roystonea regia</i> host of <i>Pseudocercospora roystoneae</i> (Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Dothideomycetidae, Capnodiales, Mycosphaerellaceae), <i>Helicosporium nematosporum</i> (<i>Helicomycetes fuscus</i>) (Fungi, Ascomycota, Pezizomycotina, Dothideomycetes, Pleosporomycetidae, Pleosporales, Tubeufiaceae), <i>Lasiosphaeria nematospora</i> (Fungi, Ascomycota, Pezizomycotina, Sordariomycetes, Sordariomycetidae, Sordariales, Lasiosphaeriaceae) on sheath of royal palm, helicosporous hyphomycete <i>Rogergoosiella roystoneicola</i> (Ascomycota) described from dead petioles (in petiolis emortuis <i>Roystoneae regiae</i>). Fungus <i>Coccodiella petrakii</i> (<i>Bagnisiopsis petrakii</i>, <i>Coccostroma petrakii</i>, <i>Oxodeora petrakii</i>, <i>Phoenicostroma petrakii</i>) (Ascomycota, Pezizomycotina, Sordariomycetes, Phyllachorales, Phyllachoraceae) reported on <i>Oreodoxa regia</i>. Host of the Neotropical whitefly <i>Aleurotrachelus atratus</i> (Hemiptera, Aleyrodidae) and of the red palm weevil <i>Rhynchophorus ferrugineus</i>. Royal palm bug, <i>Xylastodoris luteolus</i> (Insecta, Hemiptera, Thaumastocoridae), pest of royal palm in Florida and Cuba, feeds on young leaves and on the newly developing fronds, getting between folds on emerging leaf; when leaf unfolds it appears scorched and brown and usually fails to mature. Foodplants of the palmfly <i>Elymnias agondas glaucopis</i> (Lepidoptera, Nymphalidae) in Papua New Guinea. Host of the red palm mite (coconut red mite, frond crimson mite, leaflet false spider mite, red date palm mite and scarlet mite), <i>Raoiella indica</i> (Acari, Trombidiformes, Tenuipalpidae), a serious pest; eriophyoidea mite <i>Acritonotus denmarki</i> infesting <i>Roystonea elata</i>. Among the predatory insects the coccinellids <i>Stethorus keralicus</i> Kapur and <i>Telsimia ephippiger</i> Chapin reported as major predators of <i>Raoiella indica</i>. The phytoseiids, <i>Amblyseius caudatus</i> Berlese, <i>Amblyseius channabasavanni</i> Gupta and <i>Amblyseius largoensis</i>, regarded as important natural enemies of <i>Raoiella indica</i>. Host of Florida red scale <i>Chrysomphalus aonidum</i> (<i>Coccus aonidum</i>) (black scale, circular black scale, circular purple scale) (Diaspididae) in Florida. Recorded host of sugar cane weevil borer <i>Rhabdoscelus obscurus</i> (Coleoptera, Curculionidae) and of <i>Neorthopleura thoracica</i> (<i>Enoplium bimaculatum</i>, <i>Enoplium damicorne</i>, <i>Enoplium punctatissimum</i>, <i>Enoplium thoracicum</i>, <i>Orthopleura damicornis</i> var. <i>nigripennis</i>, <i>Orthopleura damicornis</i> var. <i>pennsylvanica</i>, <i>Orthopleura pennsylvanica</i>, <i>Orthopleura thoracica</i>, <i>Pelonium pensylvanicum</i>) (Coleoptera, Cleridae); the New Guinea sugarcane weevil, <i>Rhabdoscelus obscurus</i> (Boisduval), is a wellknown pest of palms <i>Hyophorbe lagenicaulis</i>, <i>Pritchardia pacifica</i>, <i>Phoenix roebelenii</i>, <i>Archontophoenix alexandrae</i>, <i>Roystonea regia</i>, <i>Phoenix canariensis</i>, <i>Areca catechu</i>, <i>Cocos nucifera</i> and ornamental nurseries throughout the world. <i>Roystonea regia</i> host palm of the pest <i>Eupalamides cyparissias</i> Fab. (Lepidoptera, Castniidae). Host palm of Coconut cadang-cadang viroid and of the palm mealybug <i>Palmicultor palmarum</i> (Homoptera, Pseudococcidae). Susceptible to <i>Phytophthora</i> sp."</p>

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

Qsn #	Question	Answer
	Prakashkumar, R., Mathew, P. M., & Ravindran, P. (1998). Studies on the allergenicity of nine tropical pollen allergens. <i>Grana</i> , 37(3): 185-188	"AB: Allergy evaluation studies using the antigens of nine commonly occurring airborne pollen grains in the state of Kerala, India were undertaken. This included the pollen grains of <i>Areca catechu</i> , <i>Casuarina equisetifolia</i> , <i>Elaeis guineensis</i> , <i>Heteropogon contortus</i> (a grass), <i>Oreodoxa regia</i> , <i>Peltophorum ferrugineum</i> , <i>Phoenix dactylifera</i> , <i>Spathodea campanulata</i> and <i>Swietenia mahagoni</i> . Five hundred patients having respiratory complaints were selected for the study using these tropical pollen grains. Results were analysed in terms of age, sex, clinical history, family history and locality of the patients. The <i>O. regia</i> antigen registered the maximum significant positivity followed by <i>H. contortus</i> , <i>C. equisetifolia</i> and <i>Peltophorum ferrugineum</i> . Age and family history of the patient had no direct influence on positivity, but nature of the allergy, sex, phenological period and locality of the patient had a direct influence on hypersensitivity reactions. Similarly, a very high positive correlation between Skin Test and Bronchial Provocation Test to these allergens among the tropical population was also proved. Thus the results established the role of these tropical allergens in eliciting Ig E mediated allergic reactions." [Insignificant allergies]
	Gilman, E.F. & Watson, D.G. (2006). <i>Ptychosperma macarthurii</i> : Macarthur Palm. ENH-693. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu . [Accessed]	[Skin irritant] "If the seed is to be planted, the fleshy fruit pulp should be removed and the seeds rinsed thoroughly in water. Always wear rubber gloves when handling fruits of royal palms, since the pulp contains calcium oxalate crystals that are highly irritating to exposed skin."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Quattrocchi, U. (2017). <i>CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	[No evidence. Unlikely given habit and habitat] "Solitary, tall, erect, columnar, unarmed" ... "open savannas, along the edges of rain forest, on moist rich hammocks, along rivers and streams, wet places and swamps, wooded savannas"

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Vozzo, J.A. 2002. <i>Tropical Tree Seed Manual</i> . USDA Forest Service, Washington, D.C.	"Growth is rapid if the tree is placed in fertile soil with adequate water and full sun"
	Gilman, E.F. & Watson, D.G. (1994). <i>Roystonea</i> spp. Royal Palm. Fact Sheet ST-574. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu . [Accessed 31 Dec 2019]	"Light requirement: tree grows in part shade/part sun; tree grows in full sun"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Dehgan, B. (1998) <i>Landscape Plants for Subtropical Climates</i> . University Press of Florida, Gainesville, FL	"Culture: Full sun, fertile organic soils."

Qsn #	Question	Answer
	LLIFLE - Encyclopedia of living forms. (2019). <i>Roystonea regia</i> . http://www.llifle.com/ . [Accessed 31 Dec 2019]	"It is relatively easy to grow and very adaptable to soil type, with a little care (water and fertilizer) this palm will reward with fast growth that is rare for a palm."
	Gilman, E.F. & Watson, D.G. (1994). <i>Roystonea</i> spp. Royal Palm. Fact Sheet ST-574. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu . [Accessed 31 Dec 2019]	"Soil tolerances: clay; loam; sand; slightly alkaline; acidic; occasionally wet; well-drained"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Quattrocchi, U. (2017). CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Solitary, tall, erect, columnar, unarmed"

412	Forms dense thickets	
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	"Abundantly distributed throughout the hillsides and valleys of Cuba and the hammocks of the Everglades in Collier, Dade, and Monroe Counties, Florida, U.S.A."
	Svenning, J. C. (2002). Non-native ornamental palms invade a secondary tropical forest in Panama. <i>Palms</i> 46(2): 81-86	[Achieving high densities in naturalized population] " <i>Roystonea regia</i> occurs in high abundance as both seedlings (Fig. 1) and juveniles throughout and appears to be more or less taking over a wet, central part of the forest. It is also quite frequent as large subadults and adults all over the forest, and is by far the most abundant palm reaching the upper canopy."
	Frohlich, D. & Lau, A. 2007. New plant records from O'ahu for 2006. <i>Bishop Museum Occasional Papers</i> 96: 8-13	[If seedlings survive, the potential exists for dense groves of trees to form, although it is unclear if they would exclude other vegetation] " <i>Waimānalo</i> , thousands of seedlings found downslope from mature trees"

501	Aquatic	n
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[Terrestrial] "Abundantly distributed throughout the hillsides and valleys of Cuba and the hammocks of the Everglades in Collier, Dade, and Monroe Counties, Florida, U.S.A."

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 31 Dec 2019]	Family: Arecaceae (alt.Palmae) Subfamily: Arecoideae Tribe: Roystoneeae

503	Nitrogen fixing woody plant	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	"Cook (1901: 528) first drew attention to the tubercles found on the roots of <i>Roystonea</i> and suggested they may be nodules formed by nitrogen-fixing bacteria. These tubercles are illustrated in Cook (1939: fig. 5). Three seedlings of <i>Roystonea regia</i> with tubercles were tested for nitrogen fixation using the acetylene reduction assay (Drevon, 1983), but all three gave negative results (Zona, unpubl. data). These tubercles have been found to be sites of vesicular-arbuscular mycorrhizae infection (Zona, unpubl. data)."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 31 Dec 2019]	Family: Arecaceae (alt.Palmae) Subfamily: Arecoideae Tribe: Roystoneeae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Quattrocchi, U. (2017). <i>CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	"Solitary, tall, erect, columnar, unarmed, pleonanthic, monoecious, stout smooth gray-white trunk with faint horizontal rings, bulging stems often lichen-covered, many short air roots are attached at the base, prominent glossy emerald green crown-shaft, dark green canopy of feathery fronds, open roundish crown of long cylindrical tousled or untidy pinnate leaves with short petioles, leaf stalk sharply ridged, pinnae grow in several planes along the rachis of each leaf, deep green leaflets mostly in four rows"

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	"Abundantly distributed throughout the hillsides and valleys of Cuba and the hammocks of the Everglades in Collier, Dade, and Monroe Counties, Florida, U.S.A. (Small, 1928; Austin et al., 1980; Jones, 1983). Also present in the Yucatan Peninsula and Gulf Coastal Mexico, Belize, and Honduras. Indigenous populations also exist in the Cayman Islands. This species appears to be the palm found by Gillis et al. (1975) in the Bahamas. This taxon is very commonly cultivated throughout the tropics and subtropics and apparently naturalizes with ease."

602	Produces viable seed	y
	Source(s)	Notes
	Frohlich, D. & Lau, A. 2007. New plant records from O'ahu for 2006. <i>Bishop Museum Occasional Papers</i> 96: 8-13	"Material examined. O'AHU:Waimānalo, thousands of seedlings found downslope from mature trees, 26 Aug 2006, G. Staples 1234; Waimānalo, seedlings collected from garden, 3–15 m from parent trees, 28 Aug 2006, G. Staples 1236."

Qsn #	Question	Answer
	Gilman, E.F. & Watson, D.G. (2006). <i>Ptychosperma macarthurii</i> : Macarthur Palm. ENH-693. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu . [Accessed 31 Dec 2019]	"Royal palm seeds appear to have immature embryos at the time that the fruit falls and thus will not germinate for 5–8 months after planting. The grass-like seedlings should be transplanted into containers after the second leaf emerges."
	Quattrocchi, U. (2017). CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"seeds germinate easily and quickly."
	Rodriguez Bozan, J. (1979) Some aspects of the phenology of the royal palm (<i>Roystonea regia</i>). [FT: Algunos datos fenologicos sobre la palma real (<i>Roystonea regia</i> O. F. Cook.).] Centro Agricola, Revista Cientifica de la Facultad de Ciencias Agricolas, 6(2): 15-20	"The royal palms studied germinated on average 75 days after seed sowing, developed 27 leaves in 5 years, and the first ring, which corresponded to the thirteenth leaf, formed 732 days after germination."

603	Hybridizes naturally	
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[Unknown] "The question of hybridization has been raised by several authors (Bailey, 1949; Allen, 1952; McCurrach, 1960; Corner, 1966) in order to account for variation among individuals in cultivation. Convincing evidence has not been forthcoming, and, in fact, it is not even known if the species lack genetic barriers to hybridization. Commenting on cultivated palms, Bailey (1949: 118) wrote, "It is easy enough to call them hybrids, but we do not know that they hybridize or what the progeny would be if they did." No molecular evidence is available to support the claim of hybridization. At present, the question of hybridization remains unresolved."

604	Self-compatible or apomictic	
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	"Virtually nothing is known about breeding systems, although anecdotal evidence of solitary cultivated individuals bearing fruits does suggest that at least some individuals are self-compatible."

605	Requires specialist pollinators	n
	Source(s)	Notes

Qsn #	Question	Answer
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[Insect pollinated] "Pollination in <i>Roystonea</i> has not been extensively studied, but field observations and anecdotal data suggest that these palms are insect pollinated. Apparently, European honey bees visit <i>R. borinquena</i> , <i>R. oleracea</i> , and <i>R. regia</i> , as these species are reported to be good nectar sources (Henderson et al. , 1990; Krochmal & Krochmal, 1992; Little & Wadsworth, 1964; Little et al., 1974; Questel, 1951; pers. obs.). Apid and Halictid bees were observed visiting <i>R. violacea</i> (Zona, 1991). The flowers of <i>R. regia</i> cultivated in Malaysia are attractive to many species of pollen-collecting bees (Lee cited in Kiew & Muid, 1989). These observations and reports suggest that pollination is mediated primarily by Hymenoptera, especially bees. <i>Roystonea</i> exhibits many specialized characteristics associated with bee pollination: open, paniculate inflorescence unobstructed by sheathing bracts, diurnal anthesis, copious nectar and pollen production, and floral parts thin in texture (Henderson, 1986; Zona, 1990). Silva (1 979) found pollen of <i>Roystonea regia</i> in the stomachs of the bats <i>Phyllonycteris poeyi</i> and <i>Monophyllus redmanii</i> (Phyllostomidae). The former is known to feed on pollen, and the latter feeds on nectar. It seems possible that some pollen transfer might occur as foraging bats inadvertently contact pistillate flowers; however, since stigmas may not be receptive during the night when bats forage, the contribution of bats to the pollination of <i>Roystonea</i> is probably meager. Likewise, several birds, including the hummingbirds <i>Chlorostilbon maugaeus</i> and <i>Anthracothorax dominicus</i> , feed on nectar and flowers of <i>Roystonea borinquena</i> (Perez-Rivera, 1 984), but they are likely not significant pollinators."

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Katende, A. B., Birnie, A. & Tengnas, B. (1995). <i>Useful Trees and Shrubs for Uganda</i> . Regional Land Management Unit, Nairobi, Kenya	"Propagation: Seedlings (sow seeds in pots), and wildings"
	Quattrocchi, U. (2017). <i>CRC World Dictionary of Palms: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	[No evidence. Solitary trunks] "Solitary, smooth, tall and slender, dark milk chocolate brown trunk, unarmed"

607	Minimum generative time (years)	>3
	Source(s)	Notes
	Rodriguez Bozan, J. (1979) Some aspects of the phenology of the royal palm (<i>Roystonea regia</i>). [FT: Algunos datos fenologicos sobre la palma real (<i>Roystonea regia</i> O. F. Cook).] <i>Centro Agricola, Revista Cientifica de la Facultad de Ciencias Agricolas</i> , 6(2): 15-20	"The royal palms studied germinated on average 75 days after seed sowing, developed 27 leaves in 5 years, and the first ring, which corresponded to the thirteenth leaf, formed 732 days after germination. Data is also included on individual leaf lifetimes, the time between the physiological death of the leaf and leaf fall, and the distances between rings formed." [Plants had not flowered after 5 years]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n

Qsn #	Question	Answer
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[No means of external attachment. Bird and bat dispersed] "In addition to these observations of animals feeding on native palms, the observations of Leck (1969) on <i>R. regia</i> cultivated in Balboa, Panama, attest to the attractiveness and importance of <i>Roystonea</i> fruits. Leck listed eight birds, including robins, tanagers, woodpeckers, flycatchers, and kingbirds, that fed on these fruits in large numbers." ... "Fruits spheroid to ellipsoid, somewhat dorsiventrally compressed, 8.9-15.1 mm long, 6.9-11.2 mm dorsiventral thickness, and 7-10.9 mm wide; epicarp purplish black, stigmatic scar plain; endocarp ellipsoid, 7.5-11.1 mm long, 6-7.7 mm dorsiventral thickness, and 5. 8-7.9 mm wide; seed ellipsoid, somewhat dorsiventrally compressed, 5.5-9. 7 mm long, 4-6.3 mm dorsiventral thickness, and 5.1-7.2 mm wide"

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"commonly cultivated in Honolulu." ... "Cuban royal palm is recommended as a street tree and makes one of the finest avenue plantings in the world. The symmetry and grace of its stately trunk and elegant green crown are ideally suited for formal garden and landscape designs. Outstanding specimens can be seen at several locations around O'ahu and Maui."
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	"This taxon is very commonly cultivated throughout the tropics and subtropics and apparently naturalizes with ease."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[Bird and bat dispersed] "In addition to these observations of animals feeding on native palms, the observations of Leck (1969) on <i>R. regia</i> cultivated in Balboa, Panama, attest to the attractiveness and importance of <i>Roystonea</i> fruits. Leck listed eight birds, including robins, tanagers, woodpeckers, flycatchers, and kingbirds, that fed on these fruits in large numbers." ... "Fruits spheroid to ellipsoid, somewhat dorsiventrally compressed, 8.9-15.1 mm long, 6.9-11.2 mm dorsiventral thickness, and 7-10.9 mm wide; epicarp purplish black, stigmatic scar plain; endocarp ellipsoid, 7.5-11.1 mm long, 6-7.7 mm dorsiventral thickness, and 5. 8-7.9 mm wide; seed ellipsoid, somewhat dorsiventrally compressed, 5.5-9. 7 mm long, 4-6.3 mm dorsiventral thickness, and 5.1-7.2 mm wide"

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes

Qsn #	Question	Answer
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[Bird and bat dispersed] "In addition to these observations of animals feeding on native palms, the observations of Leck (1969) on <i>R. regia</i> cultivated in Balboa, Panama, attest to the attractiveness and importance of <i>Roystonea</i> fruits. Leck listed eight birds, including robins, tanagers, woodpeckers, flycatchers, and kingbirds, that fed on these fruits in large numbers." ... "Fruits spheroid to ellipsoid, somewhat dorsiventrally compressed, 8.9-15.1 mm long, 6.9-11.2 mm dorsiventral thickness, and 7-10.9 mm wide; epicarp purplish black, stigmatic scar plain; endocarp ellipsoid, 7.5-11.1 mm long, 6-7.7 mm dorsiventral thickness, and 5.8-7.9 mm wide; seed ellipsoid, somewhat dorsiventrally compressed, 5.5-9.7 mm long, 4-6.3 mm dorsiventral thickness, and 5.1-7.2 mm wide"

705	Propagules water dispersed	
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[Possibly if growing near riparian or aquatic habitats] "Simpson (1932) believed that <i>Roystonea</i> established itself in Florida by means of water dispersal from Cuba. He believed that most trees in Cuba fruit in autumn-when migratory birds are flying south, not north. He described how he witnessed large quantities of <i>Roystonea</i> fruits floating along the Florida coast after a hurricane. Although seeds deposited along the coast would not likely germinate and establish, those blown inland might. That Cuban material is occasionally transported to Florida, as Simpson observed, may account for the lack of genetic differentiation in Florida (Zona, unpubl. data). Because fruits are produced throughout the year (but with a peak in late summer), animal-mediated seed dispersal between Cuban and Florida need not be unidirectional."

706	Propagules bird dispersed	y
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	"In addition to these observations of animals feeding on native palms, the observations of Leck (1969) on <i>R. regia</i> cultivated in Balboa, Panama, attest to the attractiveness and importance of <i>Roystonea</i> fruits. Leck listed eight birds, including robins, tanagers, woodpeckers, flycatchers, and kingbirds, that fed on these fruits in large numbers."
	Gilman, E.F. & Watson, D.G. (2006). <i>Ptychosperma macarthurii</i> : Macarthur Palm. ENH-693. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu . [Accessed 31 Dec 2019]	"Inflorescences consisting of hundreds of tiny cream-colored flowers are followed in late summer by dark red to black fruits that are readily consumed by birds and thus widely dispersed."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes

Qsn #	Question	Answer
	Vozzo, J.A. 2002. Tropical Tree Seed Manual. USDA Forest Service, Washington, D.C.	[Primarily adapted for frugivory. Some external transport for pulp consumption or seed predation may occur, but this is not believed to be an important dispersal vector] "The violet-purple fruits are smooth, ovate, and measure 13 mm in length. Each fruit bears a single light brown, thin seed embedded in brown fibrous flesh (Neal 1965, West and Arnold 1952). In Puerto Rico, birds or bats often feed on the oily pericarp; if seeds are shed with pericarp intact, detritis-eating animals clean the seed when rotting is well advanced, leaving only a papery shell that is easily removed (Francis 1998). Thus, large quantities of cleaned seeds can be collected from the ground under seed-bearing trees."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Zona, S. (1996). <i>Roystonea</i> (Arecaceae: Arecoideae). <i>Flora Neotropica</i> , 71, 1-35	[Presumably Yes] "Birds and bats have been observed feeding on the fruits of <i>Roystonea</i> . The colorful, oily drupes are produced in abundance and are likely a significant food resource for many species of animals. The bat <i>Artibeus lituratus palmarum</i> and the birds <i>Steatornis caripensis</i> and <i>Thraupis palmarum</i> have been observed feeding on <i>R. oleracea</i> , and <i>Myiozetetes similis</i> has been reported to feed on the fruits of <i>R. regia</i> (see Zona & Henderson, 1989). Silva (1979) also reported that the bat <i>Artibeus jamaicensis</i> feeds on the fruits of <i>R. regia</i> ."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Katende, A. B., Birnie, A. & Tengnas, B. (1995). <i>Useful Trees and Shrubs for Uganda</i> . Regional Land Management Unit, Nairobi, Kenya	"These palms produce an enormous amount of fruit which can be collected from the ground under them." [Densities unspecified]
	Frohlich, D. & Lau, A. 2007. New plant records from O'ahu for 2006. <i>Bishop Museum Occasional Papers</i> 96: 8-13	[Possibly. Thousands of seedlings observed in naturalized population] "Only previously suspected as naturalized in Kalihi and Nu'uuanu Valleys, as well as Käne'ohe, O'ahu (Wagner et al. 1999), <i>R. regia</i> is confirmed as naturalized, and throughout Waimānalo, where it has been described as "a serious pest" by nursery owners, who must control the seedlings. For these reasons, the continuing use of this species as an ornamental should be discouraged. Material examined. O'AHU:Waimānalo, thousands of seedlings found downslope from mature trees, 26 Aug 2006, G. Staples 1234; Waimānalo, seedlings collected from garden, 3–15 m from parent trees, 28 Aug 2006, G. Staples 1236."

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Seed germination takes three to five months."

Qsn #	Question	Answer
	Vozzo, J.A. 2002. Tropical Tree Seed Manual. USDA Forest Service, Washington, D.C.	"The best method for long-term seed storage involves the following steps: select clean, half-ripe to ripe seeds; air dry seeds at 80 to 90 percent relative humidity; treat with a fungicide; and seal tightly in polyethylene containers held at room temperature (23 °C). The seeds of <i>Roystonea</i> may be intermediate in their storage behavior, neither orthodox nor recalcitrant (Ellis and others 1991a). Drying the seeds to a low moisture content or storing them below 0 °C may result in damage. Under natural conditions, the first seeds may not germinate for 50 to 60 days, with others delayed for an additional 100 days (Braun 1983). Presoaking <i>R. regia</i> seeds in 1,000 ppm GA3 solution for 48 hours slightly increases the rate of germination but also results in abnormally elongated seedlings (Broschat and Donselman 1988). Clean seeds germinated at 30 to 35 °C provide the best results."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Allonsy, Amelia. (2019). How to Kill a Royal Palm Tree. Home Guides SF Gate, http://homeguides.sfgate.com/kill-royal-palm-tree-68211.html . [Accessed 31 Dec 2019]	<p>"1. Drill three 5/16- to 1/2-inch diameter holes at a slight downward angle into the center of the royal palm tree's trunk. Space the holes evenly around the trunk's circumference, positioning them between your waist and chest height. Use a drill bit long enough to reach the center of the tree. Although many trees' vascular transport system is in the cambium layer just beneath the bark, palm trees' transport system is in the trunk's center within the palm heart.</p> <p>2. Fill each hole with a 41 percent solution of glyphosate herbicide. Use a small funnel, stiff plastic tube or disposable plastic syringe to dispense the herbicide into the holes.</p> <p>3. Wait a few hours for the herbicide to drain into the tree, and, if the tree is large, fill the holes a second time with the herbicide. If you have a fully mature, 85-foot tall royal palm with a very large trunk, you may need to fill the holes with the herbicide a third time after a few days.</p> <p>4. Allow about three weeks for the palm tree to exhibit signs of dessication, usually visible as drying or browning of the palm fronds. If no noticeable change occurs, either wait longer for the herbicide to work or fill the holes with more herbicide.</p> <p>5. Leave the dead tree in place to provide habitat for wildlife, or cut it down within a few months after the herbicide application or when the tree's leaves turn dark brown. Leave the tree in place only if it is in an open space in which it can't cause damage if it falls. Cut down the dessicated tree if it is within falling distance of a house or other structure."</p>

804	Tolerates, or benefits from, mutilation, cultivation, or fire	n
	Source(s)	Notes
	Langeland, K.A.& Stocker, R.K. 2001. Control of Non-native Plants in Natural Areas of Florida. SP 242. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL	"Treatment: Hand pull seedlings; chainsaw mature trees down near the base." [Presumably kills trees]

Qsn #	Question	Answer						
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)							
	<table border="1"> <thead> <tr> <th data-bbox="175 310 818 359">Source(s)</th> <th data-bbox="818 310 1568 359">Notes</th> </tr> </thead> <tbody> <tr> <td data-bbox="175 359 818 789"> <p>Gilman, E.F. & Watson, D.G. (2006). <i>Ptychosperma macarthurii</i>: Macarthur Palm. ENH-693. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu. [Accessed 31 Dec 2019]</p> </td> <td data-bbox="818 359 1568 789"> <p>"Compared to other palm species, royal palms are relatively disease resistant, being susceptible primarily to two trunk rotting fungal diseases. Ganoderma butt rot, caused by <i>Ganoderma zonatum</i>, infects the central portion of the bottom three feet of the trunk. A cross section through the trunk will reveal discoloration of the decayed, but not soft, wood. After about 85% of the cross-sectional area of the trunk has been killed by the fungus, wilt symptoms may appear in the canopy and the palm will die shortly thereafter. The fruiting structure of the fungus, called a conk, may or may not appear on the outside of the lower trunk prior to palm death. Once a conk or wilt symptoms have been observed, the palm should be removed immediately as it could fall without warning and cause serious injury or property damage"</p> </td> </tr> <tr> <td data-bbox="175 789 818 1152"> <p>Manley, M. E. (2017). Oviposition Behavior of the Female Coconut Rhinoceros Beetle, <i>Oryctes rhinoceros</i> (Coleoptera: Scarabaeidae). MS Thesis. University of Hawai'i at Mānoa, Honolulu, HI</p> </td> <td data-bbox="818 789 1568 1152"> <p>[Potentially impacted by Coconut Rhinoceros Beetle] "Although CRB prefer to feed on coconut palm (<i>Cocos nucifera</i>), oil palm (<i>Elaeis guineensis</i>), and date palm (<i>Phoenix dactylifera</i>), they have also been found to feed on banana (<i>Musa</i>), sugarcane (<i>Saccharum officinarum</i>), papaya (<i>Carica papaya</i>), sisal (<i>Agave sisalana</i>), and pineapple (<i>Ananas comosus</i>) as well as ornamentals like the royal palm (<i>Roystonea regia</i>), the latanier palm (<i>Latania loddigesii</i>), the talipot palm (<i>Corypha umbraculifera</i>), and the <i>Raphia</i> palm (<i>Raphia</i>) (CABI, 2015). These are less preferred targets, but if attacked can result in potentially severe economic loss of crop and ornamental industries."</p> </td> </tr> </tbody> </table>	Source(s)	Notes	<p>Gilman, E.F. & Watson, D.G. (2006). <i>Ptychosperma macarthurii</i>: Macarthur Palm. ENH-693. Revised. University of Florida, IFAS, Gainesville, FL. http://edis.ifas.ufl.edu. [Accessed 31 Dec 2019]</p>	<p>"Compared to other palm species, royal palms are relatively disease resistant, being susceptible primarily to two trunk rotting fungal diseases. Ganoderma butt rot, caused by <i>Ganoderma zonatum</i>, infects the central portion of the bottom three feet of the trunk. A cross section through the trunk will reveal discoloration of the decayed, but not soft, wood. After about 85% of the cross-sectional area of the trunk has been killed by the fungus, wilt symptoms may appear in the canopy and the palm will die shortly thereafter. The fruiting structure of the fungus, called a conk, may or may not appear on the outside of the lower trunk prior to palm death. Once a conk or wilt symptoms have been observed, the palm should be removed immediately as it could fall without warning and cause serious injury or property damage"</p>	<p>Manley, M. E. (2017). Oviposition Behavior of the Female Coconut Rhinoceros Beetle, <i>Oryctes rhinoceros</i> (Coleoptera: Scarabaeidae). MS Thesis. University of Hawai'i at Mānoa, Honolulu, HI</p>	<p>[Potentially impacted by Coconut Rhinoceros Beetle] "Although CRB prefer to feed on coconut palm (<i>Cocos nucifera</i>), oil palm (<i>Elaeis guineensis</i>), and date palm (<i>Phoenix dactylifera</i>), they have also been found to feed on banana (<i>Musa</i>), sugarcane (<i>Saccharum officinarum</i>), papaya (<i>Carica papaya</i>), sisal (<i>Agave sisalana</i>), and pineapple (<i>Ananas comosus</i>) as well as ornamentals like the royal palm (<i>Roystonea regia</i>), the latanier palm (<i>Latania loddigesii</i>), the talipot palm (<i>Corypha umbraculifera</i>), and the <i>Raphia</i> palm (<i>Raphia</i>) (CABI, 2015). These are less preferred targets, but if attacked can result in potentially severe economic loss of crop and ornamental industries."</p>	
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Summary of Risk Traits:

High Risk / Undesirable Traits

- Thrives in tropical climates
- Naturalized on Oahu (Hawaiian Islands), Panama and possibly elsewhere
- Regarded as weedy and invasive by nursery growers, and potentially an environmental weed in Panama and Florida
- Host of several palm pests and pathogens, including the coconut rhinoceros beetle
- Handling fruit may irritate skin
- Tolerates many soil types
- Reproduces by seeds
- Seeds dispersed by birds, bats, potentially by water and intentionally by people
- Prolific seed production, with thousands of seedlings reported from at least one location on Oahu

Low Risk Traits

- Despite ability to naturalize, and weediness in some locations, prized as an ornamental and landscaping tree
- Unarmed (no spines, thorns, or burrs)
- Fruit and seeds fed to livestock
- Non-toxic
- Not reported to spread vegetatively
- Long time to reproductive maturity (5+ years)
- Herbicides may be effective at controlling unwanted trees
- Mechanical control effective

Second Screening Results for Tree/tree-like shrubs

(A) Shade tolerant or known to form dense stands?> Reported to grow in partial shade. Forming dense seedling cover in naturalized locations

(B) Bird or clearly wind-dispersed?> Dispersed by birds

(C) Life cycle <4 years? No. Reaches maturity in 5+ years

Outcome = Evaluate

TAXON: *Roystonea regia* (Kunth) O.
F. Cook

SCORE: 2.0

RATING: *Evaluate*