

**Family:** *Arecaceae*

**Taxon:** *Ceroxylon alpinum*

**Synonym:** *Ceroxylon andicola* Humb. & Bonpl.  
*Ceroxylon ferrugineum* André

**Common Name:** Wax palm  
palmier à cire  
palma cera  
Andean Wax Palm

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation: L
Status:	Assessor Approved	Data Entry Person:	Chuck Chimera	WRA Score -4
101	Is the species highly domesticated?		y=-3, n=0	n
102	Has the species become naturalized where grown?		y=1, n=-1	
103	Does the species have weedy races?		y=1, n=-1	
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	n
302	Garden/amenity/disturbance weed		n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed		n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed		n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed		n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs		y=1, n=0	n
402	Allelopathic		y=1, n=0	
403	Parasitic		y=1, n=0	n
404	Unpalatable to grazing animals		y=1, n=-1	
405	Toxic to animals		y=1, n=0	n
406	Host for recognized pests and pathogens		y=1, n=0	
407	Causes allergies or is otherwise toxic to humans		y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle		y=1, n=0	
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	n
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	y
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	
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	n
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	
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	
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: L

WRA Score -4

## Supporting Data:

101	1997. Henderson, A./Galeano, G./Bernal, R.. Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	[Is the species highly domesticated? No] No evidence
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	1997. Henderson, A./Galeano, G./Bernal, R.. Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	[Species suited to tropical or subtropical climate(s) 2- High] "Range and habitat. Patchily distributed on the northwestern slopes of the Cordillera de la Costa in Venezuela (Distrito Federal) and Cordillera de Merida (Tachira), western and eastern slopes of the Cordillera Occidental and Central in Colombia (Antioquia, Caldas, Quindio, Valle), and western slopes of the Central Cordillera in Ecuador (Pichincha); montane rain forest, at 1400-1800(-2000) m elevation." [High elevation tropics]
202	1997. Henderson, A./Galeano, G./Bernal, R.. Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	[Quality of climate match data 2-High]
203	1993. Duke, J.A./DuCellier, J.L.. CRC Handbook of Alternative Cash Crops. CRC Press, Boca Raton, FL	[Broad climate suitability (environmental versatility)? No] "Ranging from Montane Wet through Subtropical Wet Forest Life Zones, wax palm is reported to tolerate annual precipitation of ca 10 to 15 dm, annual temperature of 9 to 19 <sup>o</sup> C, and pH of ca 4.5. Grows at high altitudes, up to 3,300 m in Colombia, its lowest limit being 2,300 m, with a mean temperature of 16 <sup>o</sup> C. It grows between 2,600 and 3,000 m with a mean temperature of 13 to 14 <sup>o</sup> C. Thrives in cool equable moist climate."
203	2001. Ellison, D./Ellison, A.. Cultivated palms of the world. UNSW Press, Sydney.	[Broad climate suitability (environmental versatility)? No] "In cultivation, it prefers ample water in warm-temperate to subtropical climates."
203	2003. Riffle, R.L./Craft, P.. An Encyclopedia of Cultivated Palms. Timber Press, Portland, OR.	[Broad climate suitability (environmental versatility)? No] "All species are difficult to grow outside their native habitats and are impossible in hot, humid climates in which the nighttime temperatures do not drop much; they are most at home in cool, moist climates and, while the ones from high elevations are frost tolerant, they do not tolerate heat."
203	2012. Calonje, M.. Palms: <i>Ceroxylon alpinum</i> . PACSOA (Palm and Cycad Society of Australia), <a href="http://www.pacsoa.org.au/palms/Ceroxylon/alpinum.html">http://www.pacsoa.org.au/palms/Ceroxylon/alpinum.html</a>	[Broad climate suitability (environmental versatility)? No] "Cool, sheltered and moist. Prefers a mild temperate climate, and doesn't like hot weather."
204	1997. Henderson, A./Galeano, G./Bernal, R.. Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Range and habitat. Patchily distributed on the northwestern slopes of the Cordillera de la Costa in Venezuela (Distrito Federal) and Cordillera de Merida (Tachira), western and eastern slopes of the Cordillera Occidental and Central in Colombia (Antioquia, Caldas, Quindio, Valle), and western slopes of the Central Cordillera in Ecuador (Pichincha); montane rain forest, at 1400-1800(-2000) m elevation." [High elevation tropics]
204	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). Phytotaxa. 34: 1-64.	[Native or naturalized in regions with tropical or subtropical climates? Yes. Higher elevations] "Distribution and habitat:—Premontane wet forest from 1400 to 2000 m, in the Andes of Venezuela (Distrito Federal, on the northwestern slopes of the Cordillera de La Costa, Aragua, and Táchira) and Colombia (western slope of the Eastern Cordillera, and eastern and western slopes of the Central and Western Cordilleras)"
205	2012. Dave's Garden. PlantFiles: Andean Wax Palm - <i>Ceroxylon alpinum</i> . <a href="http://davesgarden.com/guides/pf/go/70130/">http://davesgarden.com/guides/pf/go/70130/</a>	[Does the species have a history of repeated introductions outside its natural range? Yes] "Slow palm in southern California unless in a climate that doesn't get too hot (doesn't like it over 85F)... but eventually grows to 50-100', at least in native Andes of Venezuela, Ecuador and Colombia. Nice silvery color of undersides of leaves. Has a narrow humidity and temperature range... can't tolerate humid, hot climates, such as south Florida. Doesn't like it inland in southern California, either. Does well at higher, wetter elevations of Hawaii."
301	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. <a href="http://www.hear.org/gcw/">http://www.hear.org/gcw/</a>	[Naturalized beyond native range? No] No evidence
301	2007. Randall, R.P.. The introduced flora of Australia & its weed status. CRC for Australian Weed Management, Glen Osmond, Australia	[Naturalized beyond native range? No] No evidence

301	2012. Wagner, W.L./Herbst, D.R./Khan, N./Flynn, T.. Hawaiian Vascular Plant Updates: A Supplement to the Manual of the Flowering Plants of Hawai'i & Hawai'i's Ferns & Fern Allies. <a href="http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/supplement.htm">http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/supplement.htm</a>	[Naturalized beyond native range? No] No evidence in Hawaii
302	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. <a href="http://www.hear.org/gcw/">http://www.hear.org/gcw/</a>	[Garden/amenity/disturbance weed? No] No evidence
302	2007. Randall, R.P.. The introduced flora of Australia & its weed status. CRC for Australian Weed Management, Glen Osmond, Australia	[Garden/amenity/disturbance weed? No] No evidence in Australia
303	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. <a href="http://www.hear.org/gcw/">http://www.hear.org/gcw/</a>	[Agricultural/forestry/horticultural weed? No] No evidence
303	2007. Randall, R.P.. The introduced flora of Australia & its weed status. CRC for Australian Weed Management, Glen Osmond, Australia	[Agricultural/forestry/horticultural weed? No] No evidence
304	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. <a href="http://www.hear.org/gcw/">http://www.hear.org/gcw/</a>	[Environmental weed? No] No evidence
304	2007. Randall, R.P.. The introduced flora of Australia & its weed status. CRC for Australian Weed Management, Glen Osmond, Australia	[Environmental weed? No] No evidence
305	2007. Randall, R.P.. Global Compendium of Weeds - Index [Online Database]. <a href="http://www.hear.org/gcw/">http://www.hear.org/gcw/</a>	[Congeneric weed? No] No evidence
401	1997. Henderson, A./Galeano, G./Bernal, R.. Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	[Produces spines, thorns or burrs? No] "Stems 8-20(-30) m tall and about 20 cm diameter, gray-brownish to whitish, covered with a thin layer of wax. Leaves 14-25, horizontally spreading, forming an almost circular crown; leaflets 94-130 per side, regularly arranged and horizontally spreading in the same plane, the apical ones sometimes joined, the lower surface with a thick yellowish to whitish tomentum."
402	2012. WRA Specialist. Personal Communication.	[Allelopathic? Unknown]
403	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl">http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl</a>	[Parasitic? No] Arecaceae
404	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Unpalatable to grazing animals? Probably palatable, but no information on use of leaves and fodder] "Ceroxylon palms have been mainly used for either ceremonial (religious) purposes, or for house and fence construction. Both activities are destructive and unsustainable. Other minor uses are fruit consumption by livestock (especially pigs), and usage of the cooked basal part of the peduncle of immature inflorescences for human consumption (Borchsenius et al. 1998);"
405	1993. Duke, J.A./DuCellier, J.L.. CRC Handbook of Alternative Cash Crops. CRC Press, Boca Raton, FL	[Toxic to animals? No] "Pulp of fruit slightly bitter, but relished by hogs." [No evidence of toxicity]
406	1993. Duke, J.A./DuCellier, J.L.. CRC Handbook of Alternative Cash Crops. CRC Press, Boca Raton, FL	[Host for recognized pests and pathogens? Possibly] "Biotic factors: Trees are attacked by the fungus <i>Phyllosticta daemonoropis</i> ."
407	1997. Henderson, A./Galeano, G./Bernal, R.. Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	[Causes allergies or is otherwise toxic to humans? No] "The young leaves are cut for use on Palm Sunday; the trunks are used for fences or house walls; and fruits are used to feed pigs." [No evidence]
408	1993. Duke, J.A./DuCellier, J.L.. CRC Handbook of Alternative Cash Crops. CRC Press, Boca Raton, FL	[Creates a fire hazard in natural ecosystems? No] "Ranging from Montane Wet through Subtropical Wet Forest Life Zones, wax palm is reported to tolerate annual precipitation of ca 10 to 15 dm, annual temperature of 9 to 19° C, and pH of ca 4.5. Grows at high altitudes, up to 3,300 m in Colombia, its lowest limit being 2,300 m, with a mean temperature of 16° C. It grows between 2,600 and 3,000 m with a mean temperature of 13 to 14° C. Thrives in cool equable moist climate." [No evidence. Habitat suggests fire is not part of this palm's ecology]

408	2012. Calonje, M.. Palms: <i>Ceroxylon alpinum</i> . PACSOA (Palm and Cycad Society of Australia), <a href="http://www.pacsoa.org.au/palms/Ceroxylon/alpinum.html">http://www.pacsoa.org.au/palms/Ceroxylon/alpinum.html</a>	[Creates a fire hazard in natural ecosystems? No] "These <i>Ceroxylons</i> were at about 2000 meters at the upper limit of their range (1500-2000 meters), right below <i>Ceroxylon quindiuense</i> in cloudforest area. The climate is cool and moist year round, with not much variation."
409	2012. Central Florida Palm & Cycad Society. <i>Ceroxylon alpinum</i> . <a href="http://50.57.99.44/ms/observations/show_all/details.html?pid=102">http://50.57.99.44/ms/observations/show_all/details.html?pid=102</a>	[Is a shade tolerant plant at some stage of its life cycle? Possibly] "Half Shade / Half Sun"
409	2012. Plants for a Future Database. <i>Ceroxylon alpinum</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Ceroxylon+alpinum">http://www.pfaf.org/user/Plant.aspx?LatinName=Ceroxylon+alpinum</a>	[Is a shade tolerant plant at some stage of its life cycle? Possibly] "It can grow in semi-shade (light woodland) or no shade."
410	2012. Plants for a Future Database. <i>Ceroxylon alpinum</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Ceroxylon+alpinum">http://www.pfaf.org/user/Plant.aspx?LatinName=Ceroxylon+alpinum</a>	[Tolerates a wide range of soil conditions? Yes] "Succeeds in most fertile moist but well drained soils in a sheltered sunny position[231]. Requires a humus-rich soil with bright filtered light and cool high humidity[200]."
411	2003. Riffle, R.L./Craft, P.. An Encyclopedia of Cultivated Palms. Timber Press, Portland, OR.	[Climbing or smothering growth habit? No] " <i>Ceroxylon</i> is a genus of 11 tall, solitary-trunked, pinnate-leaved, dioecious palms in rain forest of the Andes Mountains."
412	1997. Henderson, A./Galeano, G./Bernal, R.. Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	[Forms dense thickets? No] No evidence
412	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Forms dense thickets? No] No evidence
501	2003. Riffle, R.L./Craft, P.. An Encyclopedia of Cultivated Palms. Timber Press, Portland, OR.	[Aquatic? No] Terrestrial
502	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl">http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl</a>	[Grass? No] Arecaceae
503	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl">http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl</a>	[Nitrogen fixing woody plant? No] Arecaceae
504	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "Stem 8–21 m tall, 19–30 cm in diam., internodes covered with thin layers of wax, white at the base, grey to brown towards the apex."
601	1997. Henderson, A./Galeano, G./Bernal, R.. Field Guide to the Palms of the Americas. Princeton University Press, Princeton, NJ	[Evidence of substantial reproductive failure in native habitat? Yes] "The habitat of this species has been extensively deforested and transformed into agricultural land, mainly coffee plantations. Because of this the survival of the species is severely threatened."
601	1998. Oldfield, S./Lusty, C./MacKinven, A.. The World List of Threatened Trees. World Conservation Press, Cambridge, UK	[Evidence of substantial reproductive failure in native habitat? Yes] "A species of montane rainforest. In Colombia, the species is particularly under threat from habitat conversion to agriculture, but trees survive in deforested areas or coffee plantations. Regeneration is poor."
602	2012. Plants for a Future Database. <i>Ceroxylon alpinum</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Ceroxylon+alpinum">http://www.pfaf.org/user/Plant.aspx?LatinName=Ceroxylon+alpinum</a>	[Produces viable seed? Yes] "Seed - best sown as soon as it is ripe in a warm greenhouse at not less than 24°C[188]. Stored seed is very slow to germinate. Pre soaking the seed for 24 hours in warm water prior to sowing may shorten the germination time. Plants form a long tap-root some time before forming a shoot so the seed is best sown in groups of two or three in each deep pot, thinning if necessary to the best seedling. Germination of fresh seed usually takes place in 3 - 4 months at 25°C[138]. Grow on the plants in the greenhouse for at least their first two winters and plant out in the summer. Give the plants some protection from the cold for at least their first few winters outdoors."
603	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Hybridizes naturally? Unknown] No information on hybridization
604	1998. Svenning, J.-C./Balsey, H.. The Palm Flora of the Maquipucuna Montane Forest Reserve Ecuador. <i>Priicipes</i> . 42(4): 218-226.	[Self-compatible or apomictic? No] " <i>Ceroxylon alpinum</i> are solitary trees (Fig. 5) with male and female flowers on different individuals."

604	2012. Plants for a Future Database. <i>Ceroxylon alpinum</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Ceroxylon+alpinum">http://www.pfaf.org/user/Plant.aspx?LatinName=Ceroxylon+alpinum</a>	[Self-compatible or apomictic? No] "The flowers are dioecious (individual flowers are either male or female, but only one sex is to be found on any one plant so both male and female plants must be grown if seed is required)The plant is not self-fertile."
605	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Requires specialist pollinators? Possibly Yes. Beetle pollinated] "Floral biology:—A detailed study of the floral biology of <i>Ceroxylon</i> species has not been completed to date. Knudsen et al. (2001) found that the pistillate and staminate flowers of <i>C. echinulatum</i> (as <i>C. alpinum</i> subsp. <i>ecuadorensis</i> ) emitted high levels of unsaturated aliphatic hydrocarbons, with 80% similarity to those emitted by <i>Mauritia flexuosa</i> , and <i>Wettinia maynensis</i> , suggesting adaptations to pollinators with comparable sensory preferences. The dominance of these closely related volatile compounds in floral scent, regardless of the sex of the plant, is usually associated with beetle pollination (Knudsen et al. 2001). Kirejtshuk & Couturier (2009) presented an overview of species of the genus <i>Mystrops</i> Murray, 1864 (Nitidulidae beetles) collected on male inflorescence of <i>C. quindiuense</i> in Peru, including the description of several new species of <i>Mystrops</i> ."
606	1997. Henderson, A./Galeano, G./Bernal, R.. <i>Field Guide to the Palms of the Americas</i> . Princeton University Press, Princeton, NJ	[Reproduction by vegetative fragmentation? No] "Stems are solitary, slender or stout..." [Single trunks. No evidence of suckering or clonal vegetative spread]
607	2003. Riffle, R.L./Craft, P.. <i>An Encyclopedia of Cultivated Palms</i> . Timber Press, Portland, OR.	[Minimum generative time (years)? >3] "All species are extremely slow growing, often taking many years to develop a trunk."
607	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Minimum generative time (years)? 83+] "On average they developed an aerial stem at the approximate age of 57 years and started flowering when they were approximately 83 years old."
607	2012. Calonje, M.. <i>Palms: Ceroxylon alpinum</i> . PACSOA (Palm and Cycad Society of Australia), <a href="http://www.pacsoa.org.au/palms/Ceroxylon/alpinum.html">http://www.pacsoa.org.au/palms/Ceroxylon/alpinum.html</a>	[Minimum generative time (years)? Probably >4] "Very slow growing."
701	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No] "Fruits globose, orange-red when ripe, 1.6–2.0 cm diam., exocarp with raised lenticels appearing as scattered warts; perianth with triangular–acuminate sepals, 1.0–1.8 mm long, connate basally for 0.5–1.0 mm, lobes reaching edge of corolla tube, petals elliptical subulate, 4–9 mm long, widened at base, acumen 1–3 mm long, connate basally for 0.7–1.0 mm. Seeds ca. 1 cm diam." [Unlikely. Fruits & seeds lack means of external attachment]
702	2003. Riffle, R.L./Craft, P.. <i>An Encyclopedia of Cultivated Palms</i> . Timber Press, Portland, OR.	[Propagules dispersed intentionally by people? Yes] Ornamental and landscaping
703	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Propagules likely to disperse as a produce contaminant? No] "On average they developed an aerial stem at the approximate age of 57 years and started flowering when they were approximately 83 years old." [Unlikely. Grown as an ornamental or landscaping tree. Not grown with produce, and will not fruit for a long time]
704	1997. Henderson, A./Galeano, G./Bernal, R.. <i>Field Guide to the Palms of the Americas</i> . Princeton University Press, Princeton, NJ	[Propagules adapted to wind dispersal? No] "Fruits globose, 1.6-2 cm diameter, orange-red, conspicuously pebbled."
705	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Propagules water dispersed? No] "Fruits globose, orange-red when ripe, 1.6–2.0 cm diam., exocarp with raised lenticels appearing as scattered warts; perianth with triangular–acuminate sepals, 1.0–1.8 mm long, connate basally for 0.5–1.0 mm, lobes reaching edge of corolla tube, petals elliptical subulate, 4–9 mm long, widened at base, acumen 1–3 mm long, connate basally for 0.7–1.0 mm. Seeds ca. 1 cm diam." [Although possible that fruit may float, they are primarily adapted for bird dispersal]
706	1997. Henderson, A./Galeano, G./Bernal, R.. <i>Field Guide to the Palms of the Americas</i> . Princeton University Press, Princeton, NJ	[Propagules bird dispersed? Yes] "Fruits globose, 1.6-2 cm diameter, orange-red, conspicuously pebbled." [Fleshy-fruited]
706	2007. Muñoz, M.C./Londoño, G.A./Rios, M.M./Kattan, G.H.. Diet of the Cauca Guan: Exploitation of a Novel Food Source in Times of Scarcity. <i>The Condor</i> . 109(4): 841-851.	[Propagules bird dispersed? Yes] "We describe the diet of a large sized frugivore, the Cauca Guan { <i>Penelope perspicax</i> , Cracidae}, over a one-year cycle." ... "Table 2. Nutrient content of 14 species of fruit and one species of leaf consumed by Cauca Guans at a cloud forest site in the Central Andes of Colombia." [Includes fruit of <i>Ceroxylon alpinum</i> in diet]



706	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Propagules bird dispersed? Yes] "Mejía-Londoño (1999) reported the following bird species as fruit dispersors of <i>C. alpinum</i> : sickle-winged guan ( <i>Chamaepetes goudotii</i> ), golden-headed quetzal ( <i>Pharomachrus auriceps</i> ), blue-crowned motmot ( <i>Momotus momota</i> ), toucanetes ( <i>Aulacorhynchus haematopygus</i> , <i>A. prasinus</i> ) as well as a single species of bat: <i>Artibeus jamaicensis</i> . The following were reported by the same author as potential dispersors: tawny-breasted tinamou ( <i>Nothocercus julius</i> ), chestnut wood quail ( <i>Odonthophorus hyperythrus</i> ), masked trogon ( <i>Trogon personatus</i> ), red-ruffed fruitcrow ( <i>Pyroderus scutatus</i> ), green jay ( <i>Cyanocorax yncas</i> ), thrushes ( <i>Turdus ignobilis</i> and <i>T. fuscater</i> ). In Venezuela, the fruits are consumed by the groove-billed toucanet ( <i>Aulacorhynchus sulcatus</i> ; Brown 1976)."
707	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Propagules dispersed by other animals (externally)? No] "Fruits globose, orange red when ripe, 1.6–2.0 cm diam., exocarp with raised lenticels appearing as scattered warts; perianth with triangular–acuminate sepals, 1.0–1.8 mm long, connate basally for 0.5–1.0 mm, lobes reaching edge of corolla tube, petals elliptical-subulate, 4–9 mm long, widened at base, acumen 1–3 mm long, connate basally for 0.7–1.0 mm. Seeds ca. 1 cm diam." [Fruits & seeds lack a means of external attachment]
708	1997. Henderson, A./Galeano, G./Bernal, R.. <i>Field Guide to the Palms of the Americas</i> . Princeton University Press, Princeton, NJ	[Propagules survive passage through the gut? Yes] "Fruits globose, 1.6-2 cm diameter, orange-red, conspicuously pebbled." [Fleshy-fruited]
708	2007. Muñoz, M.C./Londoño, G.A./Rios, M.M./Kattan, G.H.. <i>Diet of the Cauca Guan: Exploitation of a Novel Food Source in Times of Scarcity</i> . <i>The Condor</i> . 109(4): 841-851.	[Propagules survive passage through the gut? Presumably Yes] "We describe the diet of a large sized frugivore, the Cauca Guan ( <i>Penelope perspicax</i> , Cracidae), over a one year cycle." ... "Table 2. Nutrient content of 14 species of fruit and one species of leaf consumed by Cauca Guans at a cloud forest site in the Central Andes of Colombia." [Includes fruit of <i>Ceroxylon alpinum</i> in diet]
801	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Prolific seed production (>1000/m <sup>2</sup> )? Unknown] "Fruits globose, orange-red when ripe, 1.6–2.0 cm diam., exocarp with raised lenticels appearing as scattered warts; perianth with triangular–acuminate sepals, 1.0–1.8 mm long, connate basally for 0.5–1.0 mm, lobes reaching edge of corolla tube, petals elliptical-subulate, 4–9 mm long, widened at base, acumen 1–3 mm long, connate basally for 0.7–1.0 mm. Seeds ca. 1 cm diam."
802	1993. Duke, J.A./DuCellier, J.L.. <i>CRC Handbook of Alternative Cash Crops</i> . CRC Press, Boca Raton, FL	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "seeds lose their viability quickly, but will germinate well under warm moist conditions."
802	2001. Ellison, D./Ellison, A.. <i>Cultivated palms of the world</i> . UNSW Press, Sydney.	[Evidence that a persistent propagule bank is formed (>1 yr)? Possibly No] "mature fruit is orange to red and fresh seed germinates in 3 to 5 months."
803	2012. WRA Specialist. Personal Communication.	[Well controlled by herbicides? Unknown] No information on herbicide efficacy or chemical control of this species
804	2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, <i>Ceroxylon</i> (Arecaceae). <i>Phytotaxa</i> . 34: 1-64.	[Tolerates, or benefits from, mutilation, cultivation, or fire? Probably No] "Conservation status:—The vast majority of the montane forest within the range of this species has been destroyed or fragmented by coffee plantations or pastures. According to the IUCN criteria (Version 3.1) this species is Endangered (EN) in Venezuela (Llamosas et al. 2003), as well as in Colombia. In the latter country it is estimated that natural populations have been reduced more than 80% in the last 210 years (Galeano & Bernal 2005). Moreover, in one of the best conserved populations genetic erosion has been detected in seedlings (Gaitán-Solís 2003)."
805	2012. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]

## **Summary of Risk Traits**

### **High Risk / Undesirable Traits**

- High elevation tropical palm
- Tolerates many soil conditions (and potentially able to exploit many different habitat types)
- Bird-dispersed seeds

### **Low Risk / Desirable Traits**

- No records of naturalization or invasiveness worldwide
- Unarmed palm (no spines)
- Landscaping and ornamental value
- Very long time to reproductive maturity (83 years or more)