**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

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Status: current 20090513</th>
<th>Assessor: Chuck Chimera</th>
<th>Data Entry Person: Chuck Chimera</th>
<th>Designation: L</th>
<th>WRA Score: -4</th>
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</thead>
<tbody>
<tr>
<td>101 Is the species highly domesticated?</td>
<td>y=3, n=0</td>
<td>n</td>
<td></td>
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<tr>
<td>102 Has the species become naturalized where grown?</td>
<td>y=1, n=-1</td>
<td></td>
<td></td>
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<tr>
<td>103 Does the species have weedy races?</td>
<td>y=1, n=-1</td>
<td></td>
<td></td>
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<tr>
<td>201 Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute &quot;wet tropical&quot; for &quot;tropical or subtropical&quot;</td>
<td>(0-low; 1-intermediate; 2-high)</td>
<td>(See Appendix 2)</td>
<td>High</td>
<td></td>
<td></td>
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<tr>
<td>202 Quality of climate match data</td>
<td>(0-low; 1-intermediate; 2-high)</td>
<td>(See Appendix 2)</td>
<td>High</td>
<td></td>
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<tr>
<td>203 Broad climate suitability (environmental versatility)</td>
<td>y=1, n=0</td>
<td>n</td>
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<td></td>
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<tr>
<td>204 Native or naturalized in regions with tropical or subtropical climates</td>
<td>y=1, n=0</td>
<td>y</td>
<td></td>
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<td></td>
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<tr>
<td>205 Does the species have a history of repeated introductions outside its natural range?</td>
<td>y=-2, ?=-1, n=0</td>
<td>y</td>
<td></td>
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<tr>
<td>301 Naturalized beyond native range</td>
<td>y = 1*multiplier (see Appendix 2), n= question 205</td>
<td>n</td>
<td></td>
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<td></td>
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<tr>
<td>302 Garden/amenity/disturbance weed</td>
<td>n=0, y = 1*multiplier (see Appendix 2)</td>
<td>n</td>
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<tr>
<td>303 Agricultural/forestry/horticultural weed</td>
<td>n=0, y = 2*multiplier (see Appendix 2)</td>
<td>n</td>
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<td>304 Environmental weed</td>
<td>n=0, y = 2*multiplier (see Appendix 2)</td>
<td>n</td>
<td></td>
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<tr>
<td>305 Congeneric weed</td>
<td>n=0, y = 1*multiplier (see Appendix 2)</td>
<td>n</td>
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<tr>
<td>401 Produces spines, thorns or burrs</td>
<td>y=1, n=0</td>
<td>n</td>
<td></td>
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<td></td>
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<tr>
<td>402 Allelopathic</td>
<td>y=1, n=0</td>
<td></td>
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<tr>
<td>403 Parasitic</td>
<td>y=1, n=0</td>
<td>n</td>
<td></td>
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<tr>
<td>404 Unpalatable to grazing animals</td>
<td>y=1, n=-1</td>
<td></td>
<td></td>
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<tr>
<td>405 Toxic to animals</td>
<td>y=1, n=0</td>
<td>n</td>
<td></td>
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<tr>
<td>406 Host for recognized pests and pathogens</td>
<td>y=1, n=0</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>407 Causes allergies or is otherwise toxic to humans</td>
<td>y=1, n=0</td>
<td>n</td>
<td></td>
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<tr>
<td>408 Creates a fire hazard in natural ecosystems</td>
<td>y=1, n=0</td>
<td>n</td>
<td></td>
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<tr>
<td>409 Is a shade tolerant plant at some stage of its life cycle</td>
<td>y=1, n=0</td>
<td></td>
<td></td>
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<tr>
<td>410 Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)</td>
<td>y=1, n=0</td>
<td>y</td>
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<tr>
<td>ID</td>
<td>Characteristic</td>
<td>Value</td>
<td>Decision</td>
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<tr>
<td>411</td>
<td>Climbing or smothering growth habit</td>
<td>y=1, n=0</td>
<td>n</td>
<td></td>
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<tr>
<td>412</td>
<td>Forms dense thickets</td>
<td>y=1, n=0</td>
<td>n</td>
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<tr>
<td>501</td>
<td>Aquatic</td>
<td>y=5, n=0</td>
<td>n</td>
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<tr>
<td>502</td>
<td>Grass</td>
<td>y=1, n=0</td>
<td>n</td>
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<tr>
<td>503</td>
<td>Nitrogen fixing woody plant</td>
<td>y=1, n=0</td>
<td>n</td>
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<tr>
<td>504</td>
<td>Geophyte (herbaceous with underground storage organs — bulbs, corms, or tubers)</td>
<td>y=1, n=0</td>
<td>n</td>
<td></td>
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<tr>
<td>601</td>
<td>Evidence of substantial reproductive failure in native habitat</td>
<td>y=1, n=0</td>
<td>y</td>
<td></td>
<td></td>
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<tr>
<td>602</td>
<td>Produces viable seed</td>
<td>y=1, n=-1</td>
<td>y</td>
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<tr>
<td>603</td>
<td>Hybridizes naturally</td>
<td>y=1, n=-1</td>
<td></td>
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<tr>
<td>604</td>
<td>Self-compatible or apomictic</td>
<td>y=1, n=-1</td>
<td>n</td>
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<tr>
<td>605</td>
<td>Requires specialist pollinators</td>
<td>y=-1, n=0</td>
<td></td>
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<tr>
<td>606</td>
<td>Reproduction by vegetative fragmentation</td>
<td>y=1, n=-1</td>
<td>n</td>
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<tr>
<td>607</td>
<td>Minimum generative time (years)</td>
<td>1 year = 1, 2 or 3 years = 0, 4+ years = -1</td>
<td>&gt;3</td>
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<tr>
<td>701</td>
<td>Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)</td>
<td>y=1, n=-1</td>
<td>n</td>
<td></td>
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<tr>
<td>702</td>
<td>Propagules dispersed intentionally by people</td>
<td>y=1, n=-1</td>
<td>y</td>
<td></td>
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<tr>
<td>703</td>
<td>Propagules likely to disperse as a produce contaminant</td>
<td>y=1, n=-1</td>
<td>n</td>
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<tr>
<td>704</td>
<td>Propagules adapted to wind dispersal</td>
<td>y=1, n=-1</td>
<td>n</td>
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<tr>
<td>705</td>
<td>Propagules water dispersed</td>
<td>y=1, n=-1</td>
<td>n</td>
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<tr>
<td>706</td>
<td>Propagules bird dispersed</td>
<td>y=1, n=-1</td>
<td>y</td>
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<tr>
<td>707</td>
<td>Propagules dispersed by other animals (externally)</td>
<td>y=1, n=-1</td>
<td>n</td>
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<tr>
<td>708</td>
<td>Propagules survive passage through the gut</td>
<td>y=1, n=-1</td>
<td>y</td>
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<tr>
<td>801</td>
<td>Prolific seed production (&gt;1000/m2)</td>
<td>y=1, n=-1</td>
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<tr>
<td>802</td>
<td>Evidence that a persistent propagule bank is formed (&gt;1 yr)</td>
<td>y=1, n=-1</td>
<td>n</td>
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<tr>
<td>803</td>
<td>Well controlled by herbicides</td>
<td>y=-1, n=1</td>
<td></td>
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<tr>
<td>804</td>
<td>Tolerates, or benefits from, mutilation, cultivation, or fire</td>
<td>y=1, n=-1</td>
<td></td>
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<tr>
<td>805</td>
<td>Effective natural enemies present locally (e.g. introduced biocontrol agents)</td>
<td>y=-1, n=1</td>
<td></td>
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</tbody>
</table>

**Designation:** L  \[WRA Score \(-4\)\]
**Ceroxylon alpinum (Arecaceae)**

**Supporting Data:**


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]


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°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."


203 2003. Riffe, 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 climes in which the nighttime temperatures do not drop much; they are most at home in cool, moist climates and, wile the ones from high elevations are frost tolerant, they do not tolerate heat."


204 2011. Sanin, M.J./Galeano, G.. A revision of the Andean wax palms, Ceroxylon (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 Gardern. PlantFiles: Andean Wax Palm - Ceroxylon alpinum. http://davesgarden.com/guides/pf/go/70130/ [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 85°F)... 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."


Ceroxylon alpinum (Arecaceae)


[Environmental weed? No] No evidence

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


[Congeneric weed? No] No evidence


[Allelopathic? Unknown]


[Parasitic? No] Arecaceae


[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);"


[Toxic to animals? No] "Pulp of fruit slightly bitter, but relished by hogs." [No evidence of toxicity]


[Host for recognized pests and pathogens? Possibly] "Biotic factors: Trees are attacked by the fungus Phyllosticta daemonoris."


[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]


[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."


[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]


[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]
**Ceroxylon alpinum (Arecaceae)**


  - Creates a fire hazard in natural ecosystems? No
  - *These Ceroxylons were at about 2000 meters at the upper limit of their range (1500-2000 meters), right below Ceroxylon quindiuense in cloudforest area. The climate is cool and moist year round, with not much variation.*


  - Is a shade tolerant plant at some stage of its life cycle? Possibly
  - *Half Shade / Half Sun*


  - 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].*


  - Climbing or smothering growth habit? No
  - *Ceroxylon is a genus of 11 tall, solitary-trunked, pinnate-leaved, dioecious palms in rain forest of the Andes Mountains.*


  - Forms dense thickets? No
  - *No evidence*


  - Forms dense thickets? No
  - *No evidence*


  - Grass? No
  - *Arecaceae*


  - Nitrogen fixing woody plant? No
  - *Arecaceae*


  - 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."


  - 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."


  - 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."


  - 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."


  - Hybrids naturally? Unknown
  - *No information on hybridization*


  - Self-compatible or apomictic? No
  - *"Ceroxylon alpinum are solitary trees (Fig. 5) with male and female flowers on different individuals."*

[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."


[Requires specialist pollinators? Possibly Yes. Beetle pollinated] "Floral biology:—A detailed study of the floral biology of Ceroxylon species has not been completed to date. Knudsen et al. (2001) found that the pistillate and staminate flowers of C. echinulatum (as C. alpinum subsp. ecuadorense) emitted high levels of unsaturated aliphatic hydrocarbons, with 80% similarity to those emitted by Mauritia flexuosa, and Wettinia maynensis, 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 Mystrops Murray, 1864 (Nitidulidae beetles) collected on male inflorescence of C. quindiuense in Peru, including the description of several new species of Mystrops."


[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."


[Minimum generative time (years)? Probably >4] "Very slow growing."


[Minimum generative time (years)? >3] "All species are extremely slow growing, often taking many years to develop a trunk."


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[Reproduction by vegetative fragmentation? No] "Stems are solitary, slender or stout... [Single trunks. No evidence of suckering or clonal vegetative spread]


[Propagules dispersed intentionally by people? Yes] Ornamental and landscaping


[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]


[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]


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[Propagules bird dispersed? Yes] "Fruits globose, 1.6-2 cm diameter, orange-red, conspicuously pebbled." [Fleshy-fruited]


[Propagules adapted to wind dispersal? No] "Fruits globose, 1.6-2 cm diameter, orange-red, conspicuously pebbled."


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Propagules bird dispersed? Yes

Mejía-Londoño (1999) reported the following bird species as fruit dispersors of C. alpinum: sickle-winged guan (Chamaepetes goudotii), golden-headed quetzal (Pharomachrus auriceps), blue-crowned motmot (Momotus momota), toucanetes (Aulacorhynchus haematopygus, A. prasinus) as well as a single species of bat: Artibes jamaicencis. The following were reported by the same author as potential dispersors: tawny-breasted tinamou (Nothocercus julius), chestnut wood quail (Odontophorus hypertyrus), masked trogon (Trogon personatus), red-ruffled fruitcrow (Pyroderus scutatus), green jay (Cyanocorax yncas), thrushes (Turdus ignobilis and T. fuscater). In Venezuela, the fruits are consumed by the groove-billed toucanet (Aulacorhynchus sulcatus; Brown 1976).

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]
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)