

Key Words: Low Risk; Tree; Edible Fruit; Seed propagated; Bird & Mammal Dispersed Seeds

**Family:** *Annonaceae*

**Taxon:** *Annona mucosa*

**Synonym:** *Rollinia deliciosa* Saff.  
*Rollinia jimenezii* Saff.  
*Rollinia mucosa* (Jacq.) Baill.  
*Rollinia orthopetala* A. DC.  
*Rollinia pulchrinervia* A. DC.  
*Rollinia sieberi* A. DC.

**Common Name:** Wild sweetsop  
Anona  
Cachimán

| Questionnaire : | current 20090513  | Assessor:          | Chuck Chimera                                      | Designation: L      |
|-----------------|---|--------------------|--|---------------------|
| Status:         | Assessor Approved   | Data Entry Person: | Chuck Chimera                                      | <b>WRA Score -3</b> |
| 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)             | y                   |
| 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                   |

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| 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                                       | n |
| 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                                      | y |
| 606 | Reproduction by vegetative fragmentation   | y=1, n=-1                                      | n |
| 607 | Minimum generative time (years)  | 1 year = 1, 2 or 3 years = 0,<br>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                                      |   |
| 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                                      | n |
| 802 | Evidence that a persistent propagule bank is formed (>1 yr)                                    | y=1, n=-1                                      |   |
| 803 | Well controlled by herbicides  | y=-1, n=1                                      | y |
| 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 -3

## Supporting Data:

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| 101 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a> | [Is the species highly domesticated? No] "The only named selection referred to in the literature is 'Regnard' reported by P.J. Wester in 1917 as the best variety introduced into the Philippines. A form in the western Amazon region has very pronounced points; weighs up to 8.8 lbs (4 kg)."   |
| 102 | 2012. WRA Specialist. Personal Communication.   | NA   |
| 103 | 2012. WRA Specialist. Personal Communication.   | NA   |
| 201 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a> | [Species suited to tropical or subtropical climate(s) 2-Yes] "This species has an extensive natural range, from Peru and northern Argentina, Paraguay and Brazil and northward to Guyana, Venezuela, Colombia and southern Mexico; Trinidad, the Lesser Antilles including Guadeloupe, Martinique and St. Vincent; and Puerto Rico and Hispaniola."  |
| 202 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a> | [Quality of climate match data 2-High]   |
| 203 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a> | [Broad climate suitability (environmental versatility)? No] "The biriba is limited to warm lowlands, from 20° north to 30° south latitudes in tropical America. In Puerto Rico, it occurs at elevations between 500 and 2,000 ft (150-600 m). It has succumbed to temperature drops to 26.5°F ( 3.10°C) in southern Florida. In Brazil, the tree grows naturally in low areas along the Amazon subject to periodic flooding and it was expected to do well in the Florida Everglades. In the Philippines it is said to flourish where the rainfall is equally distributed throughout the year. Calcareous soils do not seem to be unsuitable in Florida or Puerto Rico as long as they are moist." |
| 204 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a> | [Native or naturalized in regions with tropical or subtropical climates? Yes] "This species has an extensive natural range, from Peru and northern Argentina, Paraguay and Brazil and northward to Guyana, Venezuela, Colombia and southern Mexico; Trinidad, the Lesser Antilles including Guadeloupe, Martinique and St. Vincent; and Puerto Rico and Hispaniola."   |
| 204 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. <i>Rollinia</i> . <i>Flora Neotropica</i> . 57: 1-188.   | [Native or naturalized in regions with tropical or subtropical climates? Yes] "The most widespread species, <i>R. mucosa</i> , is found from Mexico in the North to Bolivia (Beni) and Brazil (Rio de Janeiro and Sao Paulo) in the South. It is very rare in the Guianas and in Central Brazil. It is the only species found in the Caribbean. The species has probably become dispersed by cultivation; its center of origin is now difficult to trace."   |
| 205 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a> | [Does the species have a history of repeated introductions outside its natural range? Yes] "Seeds were first introduced into the United States from Para, Brazil, by O.W. Barrett in 1908 (S.P.I. #22512); a second time from Parain 1910 (S.P.I. #27579) and again in 1912 (S.P.I. #27609). The United States Department of Agriculture received seeds from Rio de Janeiro in 1914 (S.P.I. #38171). P.J. Wester may have taken seeds to the Philippines where the species first fruited in 1915. Seedlings were distributed to pioneers in southern Florida but only a very few trees exist here today."  |
| 205 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. <i>Rollinia</i> . <i>Flora Neotropica</i> . 57: 1-188.   | [Does the species have a history of repeated introductions outside its natural range? Yes] "The most important is <i>R. mucosa</i> , cultivated all over the tropics of the world, though not so extensively as <i>Annona muricata</i> "   |
| 205 | 2011. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis       | [Does the species have a history of repeated introductions outside its natural range? Yes] "Cultivated; 100-200 m. Guangdong [native to tropical South America]. This species is grown for the fine fruit, biriba. The abundant fleshy pulp surrounding the seeds is eaten."   |
| 205 | 2012. Lim, T.K.. <i>Edible Medicinal and Non-Medicinal Plants</i> . Volume 1, Fruits. Springer, New York  | [Does the species have a history of repeated introductions outside its natural range? Yes] "The species was also introduced into Northern Australia and southeast Asia for trial purposes."  |
| 301 | 2007. Randall, R.P.. <i>Global Compendium of Weeds - Index</i> [Online Database]. <a href="http://www.hear.org/gcw/">http://www.hear.org/gcw/</a>   | [Naturalized beyond native range? No evidence]   |
| 301 | 2007. Randall, R.P.. <i>The introduced flora of Australia &amp; its weed status</i> . CRC for Australian Weed Management, Glen Osmond, Australia  | [Naturalized beyond native range? No evidence in Australia]  |

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| 301 | 2011. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis   | [Naturalized beyond native range? No evidence from China] "Cultivated; 100-200 m. Guangdong [native to tropical South America].  |
| 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 evidence from Hawaiian Islands]   |
| 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  |
| 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   |
| 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   |
| 305 | 2003. Weber, E.. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK  | [Congeneric weed? Yes] "Annona glabra is an invasive tree/shrub that forms dense thickets and shades out native shrubs and trees by preventing their establishment and growth. Species richness is reduced in stands of this tree/shrub."  |
| 401 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a>   | [Produces spines, thorns or burrs? No] "This fast-growing tree ranges from 13 to 50 ft (4-15 m) in height; has brown, hairy twigs and alternate, deciduous, oblong-elliptic or ovate oblong leaves, pointed at the apex, rounded at the base, 4 to 10 in (10-25 cm) long, thin but somewhat leathery and hairy on the underside."  |
| 402 | 2012. WRA Specialist. Personal Communication.   | [Allelopathic? Unknown]  |
| 403 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a>   | [Parasitic? No] "This fast-growing tree ranges from 13 to 50 ft (4-15 m) in height..." [Annonaceae]  |
| 404 | 2008. Janick, J./Paull, R.E.. The encyclopedia of fruit & nuts. Cabi Publishing, Wallingford, UK  | [Unpalatable to grazing animals? Unknown] "Annona senegalensis wild soursop" ... "Young plants do not compete well with weeds and need to be protected from fire and browsing animals." [Relateve Annona is palatable to animals]  |
| 405 | 2012. Specialized Information Services, U.S. National Library of Medicine. TOXNET toxicology data network [online database]. National Institutes of Health, <a href="http://toxnet.nlm.nih.gov/">http://toxnet.nlm.nih.gov/</a>   | [Toxic to animals? No] No evidence of toxicity to animals.   |
| 405 | 2012. WRA Specialist. Personal Communication.   | [Toxic to animals? No evidence] Medicinal properties are mentioned, but there is no evidence of acute animal toxicity  |
| 406 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a>   | [Host for recognized pests and pathogens? Potentially] "The most important pests in Brazil are the larvae of <i>Cerconota anonella</i> (Lepidopterae) which attack fruits in the process of maturing. The borer, <i>Cratosomus bombina</i> , penetrates the bark and trunk. A stinging caterpillar, <i>Sabine</i> sp., feeds on the leaves. A white fly, <i>Aleurodicus cocois</i> , attacks foliage of young and adult plants. <i>Pseudococcus brevipes</i> and <i>Aspidiotus destructor</i> are found on the leaves and sometimes on the fruits. Black spots on the leaves are caused by the fungus <i>Cercospora anonae</i> . <i>Glomerella cingulata</i> causes dieback and fruit rot in Florida." |
| 407 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a>   | [Causes allergies or is otherwise toxic to humans? No evidence] "Food Uses The fruit is eaten fresh and is fermented to make wine in Brazil. Other Uses The wood of the tree is yellow, hard, heavy, strong and is used for ribs for canoes, boat masts, boards and boxes. Medicinal Uses: The fruit is regarded as refrigerant, analeptic and antiscorbutic. The powdered seeds are said to be a remedy for enterocolitis."   |
| 407 | 2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL  | [Causes allergies or is otherwise toxic to humans? No evidence]  |
| 408 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. <i>Rollinia</i> . <i>Flora Neotropica</i> . 57: 1-188.   | [Creates a fire hazard in natural ecosystems? No] "All over the Neotropics. In various forest types (wet lowland, "selva alta perennifolia" [No evidence]  |

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|-----|--|---|
| 408 | 2008. Janick, J./Paull, R.E.. The encyclopedia of fruit & nuts. Cabi Publishing, Wallingford, UK   | [Creates a fire hazard in natural ecosystems? No] "In Brazil, the tree grows naturally in low areas along the Amazon subject to periodic flooding." [No evidence, and unlikely given natural habitat]   |
| 409 | 2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York   | [Is a shade tolerant plant at some stage of its life cycle? Possibly Yes] "It can grow in full sun to partial shade."   |
| 409 | 2012. Trade Winds Fruit. Biriba - Rollinia deliciosa. <a href="http://www.tradewindsfruit.com/biriba.htm">http://www.tradewindsfruit.com/biriba.htm</a>  | [Is a shade tolerant plant at some stage of its life cycle? Possibly No] "Growing Environment: Biriba's often grow in areas that are flooded for parts of the year so it will tolerate very wet soils. Grow in full sun."   |
| 410 | 2008. Janick, J./Paull, R.E.. The encyclopedia of fruit & nuts. Cabi Publishing, Wallingford, UK   | [Tolerates a wide range of soil conditions? Yes] "The tree grows better in deep soil with a high content of organic matter and good drainage, even though it tolerates poor, acid and heavy-textured soils."  |
| 411 | 1987. Morton, J.F.. Fruits of warm climates - Biriba (Rollinia mucosa). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a>                   | [Climbing or smothering growth habit? No] "This fast-growing tree ranges from 13 to 50 ft (4-15 m) in height; has brown, hairy twigs and alternate, deciduous, oblong-elliptic or ovate oblong leaves, pointed at the apex, rounded at the base, 4 to 10 in (10-25 cm) long, thin but somewhat leathery and hairy on the underside."  |
| 412 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. Rollinia. Flora Neotropica. 57: 1-188.  | [Forms dense thickets? No] "All over the Neotropics. In various forest types (wet lowland, "selva alta perennifolia"..." [No evidence]  |
| 501 | 2011. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). Flora of China. Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis                        | [Aquatic? No] "Trees to 10 m tall. Bark grayish brown, with rose-colored tissue below." [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] Annonaceae  |
| 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] Annonaceae  |
| 504 | 1987. Morton, J.F.. Fruits of warm climates - Biriba (Rollinia mucosa). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a>                   | [Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "This fast-growing tree ranges from 13 to 50 ft (4-15 m) in height; has brown, hairy twigs and alternate, deciduous, oblong-elliptic or ovate oblong leaves, pointed at the apex, rounded at the base, 4 to 10 in (10-25 cm) long, thin but somewhat leathery and hairy on the underside."   |
| 601 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. Rollinia. Flora Neotropica. 57: 1-188.  | [Evidence of substantial reproductive failure in native habitat? No evidence] "The most widespread species, R. mucosa, is found from Mexico in the North to Bolivia (Beni) and Brazil (Rio de Janeiro and Sao Paulo) in the South. It is very rare in the Guianas and in Central Brazil. It is the only species found in the Caribbean. The species has probably become dispersed by cultivation; its center of origin is now difficult to trace."  |
| 602 | 1986. FAO. Food and fruit-bearing forest species 3: Examples from Latin America. Food & Agriculture Organisation of the United Nations, Rome, Italy  | [Produces viable seed? Yes] "Germination of fresh seed is rapid (3 to 6 weeks) and relatively good (60 to 80%) when sown in sandy loam beds."   |
| 602 | 2012. Trade Winds Fruit. Biriba - Rollinia deliciosa. <a href="http://www.tradewindsfruit.com/biriba.htm">http://www.tradewindsfruit.com/biriba.htm</a>  | [Produces viable seed? Yes] "Propagation: By seeds."  |
| 603 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. Rollinia. Flora Neotropica. 57: 1-188.  | [Hybridizes naturally? Unknown] No evidence of hybridization  |
| 604 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. Rollinia. Flora Neotropica. 57: 1-188.  | [Self-compatible or apomictic? No] "Flowers were tested and found to be dichogamous, so self-pollination is not possible."  |
| 605 | 1987. Morton, J.F.. Fruits of warm climates - Biriba (Rollinia mucosa). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a>                   | [Requires specialist pollinators? Yes] "The flowers, borne 1 to 3 or occasionally more together in the leaf axils, are hermaphroditic, 3/4 to 1 3/8 in (23.5 cm) wide; triangular, with 3 hairy sepals, 3 large, fleshy outer petals with upturned or horizontal wings, and 3 rudimentary inner petals." ... "Brazilian scientists have found that 4 species of beetles of the family Chrysomelidae pollinate the flowers, but only 32% of the blooms set fruit. Fruiting begins 55 days after the onset of flowering." |

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| 605 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. <i>Rollinia</i> . <i>Flora Neotropica</i> . 57: 1-188.   | [Requires specialist pollinators? Yes] "Field studies on the phenology of <i>Rollinia mucosa</i> in the vicinity of Manaus, Amazonian Brazil, were made by Falcao et al. (1981). Flowering was recorded in the dry season of 1977, during the period of 5 September to 22 November. Four species of beetles belonging to Chrysomelidae were found visiting the flowers." ... "The other insect visitors are less likely pollinators due to their behaviour or size. Bees cannot enter receptive flowers that are only partially opened, but only enter the fully-opened pollenliberating flowers to collect pollen. The flies usually do not enter the flower but, rather, only use the outer surface of the petals as a substratum for laying their eggs." |
| 606 | 2008. Janick, J./Paull, R.E.. <i>The encyclopedia of fruit &amp; nuts</i> . Cabi Publishing, Wallingford, UK  | [Reproduction by vegetative fragmentation? No] "Trees are propagate either vegetatively or by seeds." ... "The most common vegetative method is grafting."  |
| 606 | 2012. Trade Winds Fruit. <i>Biriba - Rollinia deliciosa</i> .<br><a href="http://www.tradewindsfruit.com/biriba.htm">http://www.tradewindsfruit.com/biriba.htm</a>  | [Reproduction by vegetative fragmentation? No] "Propagation: By seeds." [No evidence]   |
| 607 | 1986. FAO. <i>Food and fruit-bearing forest species 3: Examples from Latin America</i> . Food & Agriculture Organisation of the United Nations, Rome, Italy   | [Minimum generative time (years)? <5] "A five-year-old seedling tree may produce 25 to 60 fruit that average 1 kg each." [Presumably will start bearing at least one fruit earlier than five years]   |
| 607 | 2008. Janick, J./Paull, R.E.. <i>The encyclopedia of fruit &amp; nuts</i> . Cabi Publishing, Wallingford, UK  | [Minimum generative time (years)? 3] "The juvenile period from seed in about 3 years. The biriba tree is among the most tropical species and flowers just once a year after leaf fall, which occurs in the Central Amazon during the low rainfall season, between June and September. In Coast Rica, flowers are observed between February and July."   |
| 701 | 2011. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis         | [Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No] "Fruit syncarpous, globose to ovoid. Seeds many per syncarp, usually dark brown to almost black, flat, embedded in edible pulp." ... "Syncarp dark green at first, ripening yellow to pale yellow, spherical to oblong, 10–20 × 7–20 cm, with soft protuberances ending in a brown to black fleshy point at apex of each carpel; pulp white or cream, fleshy, with a soft fibrous and mucilaginous texture, juicy and with a pleasant aroma. Seeds dark brown to almost black, ca. 10 × 5 mm." [No evidence. Fruits & seeds relatively large, and lack means of external attachment]   |
| 702 | 2011. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis         | [Propagules dispersed intentionally by people? Yes] "Cultivated; 100-200 m. Guangdong [native to tropical South America]. This species is grown for the fine fruit, biriba. The abundant fleshy pulp surrounding the seeds is eaten."   |
| 703 | 2011. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 19 (Cucurbitaceae through Valerianaceae, with Annonaceae and Berberidaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis         | [Propagules likely to disperse as a produce contaminant? No] "Fruit syncarpous, globose to ovoid. Seeds many per syncarp, usually dark brown to almost black, flat, embedded in edible pulp." ... "Syncarp dark green at first, ripening yellow to pale yellow, spherical to oblong, 10–20 × 7–20 cm, with soft protuberances ending in a brown to black fleshy point at apex of each carpel; pulp white or cream, fleshy, with a soft fibrous and mucilaginous texture, juicy and with a pleasant aroma. Seeds dark brown to almost black, ca. 10 × 5 mm." [No evidence. Fruits & seeds relatively large, and lack means of external attachment]   |
| 704 | 1987. Morton, J.F.. <i>Fruits of warm climates - Biriba (Rollinia mucosa)</i> . J.F. Morton, Miami, FL<br><a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a> | [Propagules adapted to wind dispersal? No] "The fruit is conical to heart shaped, or oblate; to 6 in (15 cm) in diameter; the rind yellow and composed of more or less hexagonal, conical segments, each tipped with a wart like protrusion; nearly 1/8 in (3 mm) thick, leathery, tough and indehiscent. The pulp is white, mucilaginous, translucent, juicy, subacid to sweet. There is a slender, opaque white core and numerous dark-brown, elliptic or obovate seeds 5/8 to 3/4 in (1.6-2 cm) long."   |
| 705 | 2008. Janick, J./Paull, R.E.. <i>The encyclopedia of fruit &amp; nuts</i> . Cabi Publishing, Wallingford, UK  | [Propagules water dispersed? Potentially] "In Brazil, the tree grows naturally in low areas along the Amazon subject to periodic flooding."   |
| 706 | 1987. Morton, J.F.. <i>Fruits of warm climates - Biriba (Rollinia mucosa)</i> . J.F. Morton, Miami, FL<br><a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a> | [Propagules bird dispersed? Potentially Yes] "The fruit is conical to heart-shaped, or oblate; to 6 in (15 cm) in diameter; the rind yellow and composed of more or less hexagonal, conical segments, each tipped with a wart like protrusion; nearly 1/8 in (3 mm) thick, leathery, tough and indehiscent. The pulp is white, mucilaginous, translucent, juicy, subacid to sweet. There is a slender, opaque white core and numerous dark-brown, elliptic or obovate seeds 5/8 to 3/4 in (1.6-2 cm) long."   |
| 706 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. <i>Rollinia</i> . <i>Flora Neotropica</i> . 57: 1-188.   | [Propagules bird dispersed? Yes] "Van Roosmalen (1985) mentions endozoochory by monkeys and birds for <i>Rollinia</i> . Both <i>R. exsucca</i> (incl. <i>R. puberula</i> ) and <i>R. mucosa</i> , the species observed by him, have juicy, edible fruit pulp."  |

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| 707 | 1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. Rollinia. Flora Neotropica. 57: 1-188.  | [Propagules dispersed by other animals (externally)? No] "Van Roosmalen (1985) mentions endozoochory by monkeys and birds for Rollinia. Both <i>R. exsucca</i> (incl. <i>R. puberula</i> ) and <i>R. mucosa</i> , the species observed by him, have juicy, edible fruit pulp." [Fruits & seeds lack means of external attachment. If dispersed by animals in Hawaii, fruits likely to be consumed, and seeds internally dispersed by birds, pigs, or other mammals]  |
| 708 | 1987. Morton, J.F.. Fruits of warm climates - Biriba ( <i>Rollinia mucosa</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/biriba.html">http://www.hort.purdue.edu/newcrop/morton/biriba.html</a>  | [Propagules survive passage through the gut? Potentially Yes] "The fruit is conical to heart shaped, or oblate; to 6 in (15 cm) in diameter; the rind yellow and composed of more or less hexagonal, conical segments, each tipped with a wart like protrusion; nearly 1/8 in (3 mm) thick, leathery, tough and indehiscent. The pulp is white, mucilaginous, translucent, juicy, subacid to sweet. There is a slender, opaque white core and numerous dark-brown, elliptic or obovate seeds 5/8 to 3/4 in (1.6-2 cm) long."   |
| 801 | 2008. Janick, J./Paull, R.E.. The encyclopedia of fruit & nuts. Cabi Publishing, Wallingford, UK   | [Prolific seed production (>1000/m <sup>2</sup> )? No] "...the average production reported was about 45 fruit/tree, with a range from 35 to 55 (Sousa, 1998)." [Fruits & seeds relatively large]   |
| 802 | 2012. Bioversity International. Species Compendium Database - <i>Rollinia mucosa</i> (Jacq.) Baill.. <a href="http://www.bioversityinternational.org/databases/species_compendium_database/detail.html?tx_wfqbe_pi1[species_id]=27067">http://www.bioversityinternational.org/databases/species_compendium_database/detail.html?tx_wfqbe_pi1[species_id]=27067</a> | [Evidence that a persistent propagule bank is formed (>1 yr)? Unknown] "Storage behaviour category: Orthodox? Storage behaviour: Seeds can be maintained in air-dry storage at 5 K†hreC (Riley, 1981) Compiled in 1996."   |
| 803 | 2003. CRC Weed Management. Weed Management Guide - Pond apple ( <i>Annona glabra</i> ). <a href="http://www.weeds.gov.au/publications/guidelines/wons/pubs/a-glabra.pdf">http://www.weeds.gov.au/publications/guidelines/wons/pubs/a-glabra.pdf</a>  | [Well controlled by herbicides? Presumably Yes] "In still, dry conditions herbicide can also be applied by basal bark spraying and foliar (ie overall) spraying of seedlings. Both of these methods can be very effective, but care must be taken to prevent spray drift and minimise herbicide runoff and impacts on non-target organisms and environmentally sensitive areas such as wetlands and mangroves. Basal bark spraying is effective on stems up to a diameter of 200 mm at ground level. Spray thoroughly around each stem up to a minimum height of 500 mm (knee height). Although basal bark spraying is generally effective year round, do not spray wet stems. Foliar spraying is most effective up until early flowering, and is less effective when plants are stressed or in fruit. All foliage must be sprayed, but not past the point of runoff. Though foliar spraying will kill mature pond apple, it is not recommended because it requires large amounts of herbicide, which increases the expense and risk of spray drift and runoff." [Annona glabra, a weed of national significance, can be effectively controlled with herbicides. These methods would presumably be effective against <i>A. mucosa</i> , if needed] |
| 804 | 2012. WRA Specialist. Personal Communication.  | [Tolerates, or benefits from, mutilation, cultivation, or fire? Unknown]   |
| 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:

- Thrives in tropical climates
- Fast-growing & reproductive in 3 years
- Bird-dispersed seeds (Possibly pigs, rats, & mongoose in Hawaii)

#### Low Risk / Desirable Traits:

- Not known to be naturalized or invasive
- May only grow in low, humid, tropical conditions
- Edible fruit
- Self-incompatible (will not self-pollinate & set seeds)
- Fruits & seeds relatively large and unlikely to be spread accidentally