

Key Words: Low Risk, Tropical Tree, Edible Fruit, Fleshy-fruited, Animal-dispersed

Family: *Annonaceae*

Taxon: *Annona macrophyllata*

Synonym: *Annona diversifolia* Saff.

Common Name: ilama
 anona blanca
 llama
 perpauce

Questionnaire Status:	current 20090513 Assessor Approved	Assessor:	Chuck Chimera	Designation: L
Data Entry Person:		Chuck Chimera		WRA Score -2
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	y	
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	n	
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	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	
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	
706	Propagules bird dispersed	y=1, n=-1	
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 -2

Supporting Data:

101	1987. Morton, J.F.. Fruits of warm climates - Ilama (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Is the species highly domesticated? No] "The ilama is native and grows wild in foothills from the southwest coast of Mexico to the Pacific coast of Guatemala and El Salvador. The earliest known record of the fruit was made by Francisco Hernandez who was sent by King Philip II of Spain in 1570 to take note of the useful products of Mexico. For many years, it was confused with either the soursop or the custard apple." ... "One named cultivar, 'Imery', introduced into Florida from El Salvador and grown at the Agricultural Research and Education Center, Homestead, is large and pinkfleshed but not as flavorful as some of the white-fleshed acquisitions from Guatemala."
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	1987. Morton, J.F.. Fruits of warm climates - Ilama (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Species suited to tropical or subtropical climate(s) 2-High] "The ilama is native and grows wild in foothills from the southwest coast of Mexico to the Pacific coast of Guatemala and El Salvador. "
202	1987. Morton, J.F.. Fruits of warm climates - Ilama (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Quality of climate match data 2-High]
203	1987. Martin, F.W./Campbell, C.W./Puberté, R.M.. Perennial Edible Fruits of the Tropics: An Inventory. Agriculture Handbook No. 642. U.S. Department of Agriculture, Washington, DC	[Broad climate suitability (environmental versatility)? Requires tropical climates] "Cultural requirements: Hot tropical lowlands with low to medium rainfall." ... "Fair potential for cultivation in tropical lowland areas."
203	1987. Morton, J.F.. Fruits of warm climates - Ilama (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Broad climate suitability (environmental versatility)? Yes. Elevation range in tropics can exceed 1000 m in cultivation] "The ilama is strictly tropical; grows naturally not higher than 2,000 ft (610 m) in Mexico; is cultivated up to 5,000 ft (1,524 m) in El Salvador; up to 5,900 ft (1,800 m) in Guatemala. It seems to do best where there is a long dry season followed by plentiful rainfall. In areas where rainfall is scant, the tree is irrigated."
203	1994. Hernando Bermejo, J.E./Leon, J. (eds.). Neglected Crops: 1492 from a Different Perspective. Plant Production and Protection Series No. 26. FAO, Rome http://www.hort.purdue.edu/newcrop/1492/annonas.html	[Broad climate suitability (environmental versatility)? Yes. Elevation range exceeds 1000 m] "The ilama grows between 0 and 1800 m on the Pacific slope from central Mexico to El Salvador, but it is sown more intensively between 200 and 600 m in southwestern Guatemala. This region has a pronounced dry season (December to March), with an annual rainfall of between 1000 and 1400 mm and very fertile volcanic soils."
204	1987. Morton, J.F.. Fruits of warm climates - Ilama (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Native or naturalized in regions with tropical or subtropical climates? Yes] "The ilama is native and grows wild in foothills from the southwest coast of Mexico to the Pacific coast of Guatemala and El Salvador. "
205	1987. Morton, J.F.. Fruits of warm climates - Ilama (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Does the species have a history of repeated introductions outside its natural range? Yes] "The United States Department of Agriculture introduced seeds from El Salvador in 1914 (P.I. No. 35567); from Guatemala in 1917 (P.I. No. 45548); and from Mexico in 1919, 1922 and 1923 (P.I. Nos. 46781, 55709, and 58030). One of the trees planted at the Plant Introduction Garden, Miami, Florida, bore its first fruits in 1923. Several thousand seedlings had been sent to Puerto Rico, St. Croix, various part of tropical America and Asia (including Ceylon), and the Philippines. Apparently few survived. Only in its homeland is the ilama commonly grown in dooryards, occasionally in orchards of 100 trees or more. Dr. Victor Patino took seeds from Mexico to Colombia for planting in the Cauca Valley in 1957. In spite of early enthusiasm for this species, it is seldom mentioned in horticultural literature. In 1942, there were no more than 50 trees in southern Florida, only 3 of bearing age. In 1965, Dr. John Popenoe, Director of Fairchild Tropical Garden, brought seeds from Guatemala and raised a number of seedlings for distribution, but the tree is still quite rare in Florida. It is too tender even for southern California."
205	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	[Does the species have a history of repeated introductions outside its natural range? China] "Cultivated; 100–200 m. Guangdong [native to Central America and S Mexico]. This species is cultivated for the fine fruit, ilama, which are eaten raw."

301	2007. Randall, R.P.. Global Compendium of Weeds - Index. http://www.hear.org/gcw/	[Naturalized beyond native range? 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. http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/supplement.htm	[Naturalized beyond native range? No evidence in the Hawaiian Islands to date]
302	2007. Randall, R.P.. Global Compendium of Weeds - Index. http://www.hear.org/gcw/	[Garden/amenity/disturbance weed? No evidence]
303	2007. Randall, R.P.. Global Compendium of Weeds - Index. http://www.hear.org/gcw/	[Agricultural/forestry/horticultural weed? No evidence]
304	2007. Randall, R.P.. Global Compendium of Weeds - Index. http://www.hear.org/gcw/	[Environmental weed? 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 - Ilama (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Produces spines, thorns or burrs? No] "The tree may be spreading or erect, to 25 ft (7.5 m), often branching from the ground. It has aromatic, pale brownish-gray, furrowed bark and glossy, thin, elliptic to obovate or oblanceolate leaves, 2 to 6 in (5-15 cm) long. There are 1 or 2 leaflike, nearly circular, glabrous bracts, 1 to 1 3/8 in (2.5 3.5 cm) long, clasping the base of the flowering branchlets. The new foliage is reddish or coppery."
401	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	[Produces spines, thorns or burrs? No] "Trees to 8 m tall, deciduous. Branchlets tomentose, glabrescent. Axillary leaf buds ovoid, brown tomentose, apex obtuse. Petiole ca. 1 cm; leaf blade broadly obovate to ovate lanceolate, 7.5–20 × 3–10 cm, papery, abaxially gray pruinose and brown tomentose, adaxially smooth and glabrous, secondary veins 11–14 on each side of midvein and adaxially flat, base rounded to obtuse, apex rounded."
402	2012. WRA Specialist. Personal Communication.	[Allelopathic? Unknown]
403	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Parasitic? No] 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." [Related Annona is palatable to animals]
405	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Toxic to animals? No evidence]
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 - Ilama (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Host for recognized pests and pathogens? No] "The Ilama is not as susceptible to the chalcid fly as are its more popular relatives in Florida."
407	1946. Standley, P.C./Steyermark, J.A.. Flora of Guatemala. Part IV. Fieldiana. 24: 1-493.	[Causes allergies or is otherwise toxic to humans? No evidence] "The flesh is cream-colored or slightly tinged with pink and of delicious flavor. In Central America, wherever known, this is usually considered the best of all anonas."
407	1987. Morton, J.F.. Fruits of warm climates - Ilama (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Causes allergies or is otherwise toxic to humans? No evidence. Used for food] "The early plant explorers of the United States Department of Agriculture and their contacts in Mexico and Central America described the ilama as resembling the cherimoya or atemoya in flavor and expected it to be well received in this country and abroad. However, as grown in Florida, it is not as appealing as the sugar apple. There is a slightly unpleasant flavor close to the rind. The flesh is always consumed raw, either in the half shell or, better still, shallowly scooped out, chilled, and served with a little cream and sugar to intensify the flavor, or with a dash of lime or lemon juice."

408	1946. Standley, P.C./Steyermark, J.A.. Flora of Guatemala. Part IV. Fieldiana. 24: 1-493.	[Creates a fire hazard in natural ecosystems? No evidence] "Cultivated occasionally in the Pacific coast region at 600 meters or less; wild in thickets in Chiquimula and probably also Jutiapa; said to be cultivated about Chimaltenango (1,800 meters). Southern Mexico; Salvador." ... "It is said to be cultivated abundantly in Chiapas about Tapachula." [Intentionally cultivated with no evidence of fire risk]
409	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Is a shade tolerant plant at some stage of its life cycle? Possibly No] "Full sun is best, with protection from strong winds and salt spray exposure."
409	2012. Top Tropicals. <i>Annona diversifolia</i> . Top Tropicals Botanical Garden, http://toptropicals.com/catalog/uid/ANNONA_DIVERSIFOLIA.htm	[Is a shade tolerant plant at some stage of its life cycle? Possibly] Full sun, semi-shade
410	1987. Morton, J.F.. Fruits of warm climates - <i>Ilama</i> (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Tolerates a wide range of soil conditions? Yes] "Dr. Wilson Popenoe observed that the tree was not particular as to soil but should prosper in rich, loose loam. In Florida, it performs better on deep sand than on oolitic limestone."
411	1987. Morton, J.F.. Fruits of warm climates - <i>Ilama</i> (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Climbing or smothering growth habit? No] "The tree may be spreading or erect, to 25 ft (7.5 m), often branching from the ground."
412	1946. Standley, P.C./Steyermark, J.A.. Flora of Guatemala. Part IV. Fieldiana. 24: 1-493.	[Forms dense thickets? Part of thicket vegetation, but no indication that this species forms monocultures] "Cultivated occasionally in the Pacific coast region at 600 meters or less; wild in thickets in Chiquimula and probably also Jutiapa; said to be cultivated about Chimaltenango (1,800 meters). Southern Mexico; Salvador."
501	1987. Morton, J.F.. Fruits of warm climates - <i>Ilama</i> (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Aquatic? No] "The tree may be spreading or erect, to 25 ft (7.5 m), often branching from the ground."
502	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Grass? No] Annonaceae
503	2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Nitrogen fixing woody plant? No] Annonaceae
504	1946. Standley, P.C./Steyermark, J.A.. Flora of Guatemala. Part IV. Fieldiana. 24: 1-493.	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "A small tree, the branchlets glaucous, quite glabrous; leaves on petioles 8-18 mm. long, membranaceous, obovate, 8-14 cm. long, 4-6 cm. wide, rounded or subacute at the apex, acute or rounded at the base, glabrous, glaucous beneath; lower leaves of the flowering shoots orbicular and cordate-clasping, 2-4 cm. long;"
504	1987. Morton, J.F.. Fruits of warm climates - <i>Ilama</i> (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "The tree may be spreading or erect, to 25 ft (7.5 m), often branching from the ground."
601	1994. Hernando Bermejo, J.E./Leon, J. (eds.). Neglected Crops: 1492 from a Different Perspective. Plant Production and Protection Series No. 26. FAO, Rome http://www.hort.purdue.edu/newcrop/1492/annonas.html	[Evidence of substantial reproductive failure in native habitat? No evidence]
602	1987. Morton, J.F.. Fruits of warm climates - <i>Ilama</i> (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Produces viable seed? Yes] "Ilama seeds, taken from ripe fruits, remain dormant for several weeks or even months and the germination rate thereafter is low. Applications of gibberellic acid at 350 ppm greatly increases germination. Higher concentrations cause malformations in the seedlings. Whip-or cleft-grafting onto custard apple (<i>A. reticulata</i>) rootstocks has been successful."

603	2005. Pinto, A.C. de Q./Cordeiro, M.C.R./Andrade, S.R.M. de/Ferreira, F.R./Filgueiras, H.A.C./Alves, R.E./Kinpara, D.I.. <i>Annona</i> species. International Centre for Underutilised Crops, University of Southampton, Southampton, UK	[Hybridizes naturally? Unknown. Hybridization possible in genus] "This slight variation in chromosome number may explain the ease or difficulty of interspecific hybridisation and grafting, and warrants further work to determine if intra specific variation also exists. Some related species, e.g., <i>A. glabra</i> , are known to be tetraploid (Kessler, 1993, cited by Scheldeman, 2002). Generally, cross-pollination between <i>annonas</i> is conducted primarily to determine compatibility for increasing fruit set (Nakasone and Paull, 1998) and occasionally for new hybrid development."
603	2008. Janick, J./Paull, R.E.. The encyclopedia of fruit & nuts. Cabi Publishing, Wallingford, UK	[Hybridizes naturally? Unknown. Hybridization possible] "In order to develop cultivars adapted to cooler environments, Australia has concentrated on self-progenies and interspecific crosses of <i>A. cherimola</i> with <i>A. reticulata</i> and <i>Annona diversifolia</i> ." ... "Interspecific crosses have also been made between four different species: <i>A. cherimola</i> (<i>cherimoya</i>), <i>A. squamosa</i> (sugar apple), <i>A. reticulata</i> (bullock's heart) and <i>Annona diversifolia</i> (<i>ilama</i>)."
604	2005. Pinto, A.C. de Q./Cordeiro, M.C.R./Andrade, S.R.M. de/Ferreira, F.R./Filgueiras, H.A.C./Alves, R.E./Kinpara, D.I.. <i>Annona</i> species. International Centre for Underutilised Crops, University of Southampton, Southampton, UK	[Self-compatible or apomictic? Possibly No] "Pollination is mainly carried out by insects or sometimes by wind. The fact that flowers are protogynous (pistils are mature before pollen is liberated from anthers) suggests that self-pollination is not the rule for <i>annonas</i> ." [Generic description]
605	1987. Morton, J.F.. Fruits of warm climates - <i>Ilama</i> (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Requires specialist pollinators? Possibly Yes] "Solitary, long-stalked, maroon flowers, which open to the base, have small rusty hairy sepals, narrow, blunt, minutely hairy outer petals, and stamen-like, pollen bearing inner petals." [See Staples and Herbst 2005]
605	1987. Roecklein, J.C./Leung, P. (eds.). A Profile of economic plants. Transaction Publishers, New Brunswick, NJ	[Requires specialist pollinators? Possibly No] "They do not need hand pollination."
605	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Requires specialist pollinators? Possibly Yes] "Because the natural pollinating insects are not present in Hawaii, hand-pollination of <i>annona</i> flowers is beneficial for all species - and mandatory for some - to assure fruit set." [Genus description]
606	1987. Martin, F.W./Campbell, C.W./Puberté, R.M.. Perennial Edible Fruits of the Tropics: An Inventory. Agriculture Handbook No. 642. U.S. Department of Agriculture, Washington, DC	[Reproduction by vegetative fragmentation? No] "Tree to 6 m. Propagation by seed, grafting."
606	1994. Hernando Bermejo, J.E./Leon, J. (eds.). Neglected Crops: 1492 from a Different Perspective. Plant Production and Protection Series No. 26. FAO, Rome http://www.hort.purdue.edu/newcrop/1492/annonas.html	[Reproduction by vegetative fragmentation? No] "It is always propagated by seed with a long dormancy period which is difficult to interrupt. The seeds should not be sown without being pretreated to interrupt dormancy, such as soaking them in a solution of gibberellic acid, exposing them to the sun, immersing them in hot water or storing them for two to three months."
607	1987. Martin, F.W./Campbell, C.W./Puberté, R.M.. Perennial Edible Fruits of the Tropics: An Inventory. Agriculture Handbook No. 642. U.S. Department of Agriculture, Washington, DC	[Minimum generative time (years)? 7+] "Fruit production in 7-8 years from seed, 3-4 years from grafts."
607	1987. Morton, J.F.. Fruits of warm climates - <i>Ilama</i> (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Minimum generative time (years)? 3+] "Seedlings begin to bear when 3 to 5 years old."
701	1987. Morton, J.F.. Fruits of warm climates - <i>Ilama</i> (<i>Annona diversifolia</i>). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No evidence] "Generally, the fruit is studded with more or less pronounced, triangular protuberances, though fruits on the same tree may vary from rough to fairly smooth. The rind, pale-green to deep-pink or purplish, is coated with a dense, velvety gray-white bloom. It is about 1/4 in (6 mm) thick, leathery, fairly soft and granular. In green types, the flesh is white and sweet; in the pink types, it is pink-tinged near the rind and around the seeds, all-pink or even deep rose, and tart in flavor. It is somewhat fibrous but smooth and custardy near the rind; varies from dryish to fairly juicy, and contains 25 to 80 hard, smooth, brown, cylindrical seeds, 3/4 in (2 cm) long, 3/8 in (1 cm) wide, each enclosed in a close-fitting membrane easily slipped off when split." [Unlikely. Large fruits & seeds lack means of external attachment]
702	1998. Riffle, R.L.. The Tropical Look - An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, OR	[Propagules dispersed intentionally by people? Yes] Cultivated for its edible fruit

703	1987. Morton, J.F.. Fruits of warm climates - Ilima (Annona diversifolia). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Propagules likely to disperse as a produce contaminant? No evidence] "Generally, the fruit is studded with more or less pronounced, triangular protuberances, though fruits on the same tree may vary from rough to fairly smooth. The rind, pale-green to deep-pink or purplish, is coated with a dense, velvety gray-white bloom. It is about 1/4 in (6 mm) thick, leathery, fairly soft and granular. In green types, the flesh is white and sweet; in the pink types, it is pink-tinged near the rind and around the seeds, all-pink or even deep rose, and tart in flavor. It is somewhat fibrous but smooth and custardy near the rind; varies from dryish to fairly juicy, and contains 25 to 80 hard, smooth, brown, cylindrical seeds, 3/4 in (2 cm) long, 3/8 in (1 cm) wide, each enclosed in a close-fitting membrane easily slipped off when split." [Unlikely. Large fruits & seeds unlikely to become an inadvertent produce contaminant]
704	1987. Morton, J.F.. Fruits of warm climates - Ilima (Annona diversifolia). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Propagules adapted to wind dispersal? No] "Generally, the fruit is studded with more or less pronounced, triangular protuberances, though fruits on the same tree may vary from rough to fairly smooth. The rind, pale-green to deep-pink or purplish, is coated with a dense, velvety gray-white bloom. It is about 1/4 in (6 mm) thick, leathery, fairly soft and granular. In green types, the flesh is white and sweet; in the pink types, it is pink-tinged near the rind and around the seeds, all-pink or even deep rose, and tart in flavor. It is somewhat fibrous but smooth and custardy near the rind; varies from dryish to fairly juicy, and contains 25 to 80 hard, smooth, brown, cylindrical seeds, 3/4 in (2 cm) long, 3/8 in (1 cm) wide, each enclosed in a close-fitting membrane easily slipped off when split."
705	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	[Propagules water dispersed? Unlikely] "Syncarp green to reddish, conic, ovoid, or spherical, ca. 20 × 15 cm, tuberculate; pulp white or brownish when ripe. Seeds blackish brown, ovoid to obovoid, ca. 1 cm." [Fruit & seeds relatively large. Buoyancy unknown]
706	1987. Morton, J.F.. Fruits of warm climates - Ilima (Annona diversifolia). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Propagules bird dispersed? Potentially, although unlikely in the Hawaiian Islands] "The fruit is conical, heart-shaped, or ovoid globose, about 6 in (15 cm) long; may weigh as much as 2 lbs (0.9 kg). Generally, the fruit is studded with more or less pronounced, triangular protuberances, though fruits on the same tree may vary from rough to fairly smooth. The rind, pale-green to deep-pink or purplish, is coated with a dense, velvety gray white bloom. It is about 1/4 in (6 mm) thick, leathery, fairly soft and granular. In green types, the flesh is white and sweet; in the pink types, it is pink-tinged near the rind and around the seeds, all-pink or even deep rose, and tart in flavor. It is somewhat fibrous but smooth and custardy near the rind; varies from dryish to fairly juicy, and contains 25 to 80 hard, smooth, brown, cylindrical seeds, 3/4 in (2 cm) long, 3/8 in (1 cm) wide, each enclosed in a close-fitting membrane easily slipped off when split." [Fruit and seeds are too large for the suite of bird dispersers currently present in the Hawaiian Islands]
707	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	[Propagules dispersed by other animals (externally)? No] "Syncarp green to reddish, conic, ovoid, or spherical, ca. 20 × 15 cm, tuberculate; pulp white or brownish when ripe. Seeds blackish brown, ovoid to obovoid, ca. 1 cm." [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 - Ilima (Annona diversifolia). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Propagules survive passage through the gut? Presumably Yes] "The fruit is conical, heart-shaped, or ovoid globose, about 6 in (15 cm) long; may weigh as much as 2 lbs (0.9 kg). Generally, the fruit is studded with more or less pronounced, triangular protuberances, though fruits on the same tree may vary from rough to fairly smooth. The rind, pale-green to deep-pink or purplish, is coated with a dense, velvety gray white bloom. It is about 1/4 in (6 mm) thick, leathery, fairly soft and granular. In green types, the flesh is white and sweet; in the pink types, it is pink-tinged near the rind and around the seeds, all-pink or even deep rose, and tart in flavor. It is somewhat fibrous but smooth and custardy near the rind; varies from dryish to fairly juicy, and contains 25 to 80 hard, smooth, brown, cylindrical seeds, 3/4 in (2 cm) long, 3/8 in (1 cm) wide, each enclosed in a close-fitting membrane easily slipped off when split." [Adapted for vertebrate consumption and dispersal. Feral pigs could probably disperse seeds in the Hawaiian Islands]
708	1992. Maas, P.J.M./Westra, L.Y.T./Brown, Jr., K.S. et al.. Rollinia. Flora Neotropica. 57: 1-188.	[Propagules survive passage through the gut? Yes] "The zoochorous seeds of Annonaceae are dispersed by a wide range of animals (Gottsberger, 1978; van der Pijl, 1982; Ridley, 1930; van Roosmalen, 1985)."
708	2009. Naranjo, E.J.. Ecology and Conservation of Baird's tapir in Mexico. Tropical Conservation Science. 2(2): 140-158.	[Propagules survive passage through the gut? Presumably Yes] "Appendix 1. Plant species and their parts consumed by Baird's tapir (Tapirus bairdii) in Mexico." [Annona diversifolia (syn. A. macrophyllata) fruit consumed]

801	1987. Martin, F.W./Campbell, C.W./Puberté, R.M.. Perennial Edible Fruits of the Tropics: An Inventory. Agriculture Handbook No. 642. U.S. Department of Agriculture, Washington, DC	[Prolific seed production (>1000/m2)? No] "Poor fruit production is problem in many areas."
801	1987. Morton, J.F.. Fruits of warm climates - Ilima (Annona diversifolia). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Prolific seed production (>1000/m2)? No] "Generally, the fruit is studded with more or less pronounced, triangular protuberances, though fruits on the same tree may vary from rough to fairly smooth. The rind, pale-green to deep-pink or purplish, is coated with a dense, velvety gray-white bloom. It is about 1/4 in (6 mm) thick, leathery, fairly soft and granular. In green types, the flesh is white and sweet; in the pink types, it is pink-tinged near the rind and around the seeds, all-pink or even deep rose, and tart in flavor. It is somewhat fibrous but smooth and custardy near the rind; varies from dryish to fairly juicy, and contains 25 to 80 hard, smooth, brown, cylindrical seeds, 3/4 in (2 cm) long, 3/8 in (1 cm) wide, each enclosed in a close-fitting membrane easily slipped off when split." ... "The yield is typically low. In Mexico, during the normal fruiting period, some trees will have no fruits, others only 3 to 10; exceptional trees may bear as many as 85 to 100 fruits in a season."
801	1994. Hernando Bermejo, J.E./Leon, J. (eds.). Neglected Crops: 1492 from a Different Perspective. Plant Production and Protection Series No. 26. FAO, Rome http://www.hort.purdue.edu/newcrop/1492/annonas.html	[Prolific seed production (>1000/m2)? No] "Other factors that add to its neglect are: the tree's low productivity; the difficulty of seed germination (although methods to encourage germination artificially are already known); and the short shelf-life of the fruit at the markets (two to three days at ambient temperature)."
802	1987. Morton, J.F.. Fruits of warm climates - Ilima (Annona diversifolia). J.F. Morton, Miami, FL http://www.hort.purdue.edu/newcrop/morton/ilama.html	[Evidence that a persistent propagule bank is formed (>1 yr)? Probably not >1 year] "Ilima seeds, taken from ripe fruits, remain dormant for several weeks or even months and the germination rate thereafter is low. "
803	2003. CRC Weed Management. Weed Management Guide - Pond apple (Annona glabra). http://www.weeds.gov.au/publications/guidelines/wons/pubs/a-glabra.pdf	[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 A. macrophyllata (syn. A. diversifolia), 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
- Potentially broad elevation range (>1000 m in cultivation)
- Tolerates many soil conditions (could potentially invade many different habitat types)
- Fleshy-fruited (Seeds potentially spread by pigs, rats, & mongoose in Hawaii)

Low Risk / Desirable Traits:

- Not known to be naturalized or invasive
- Unarmed and non-toxic
- Edible fruit
- Not known to spread vegetatively
- Fruits & seeds relatively large and unlikely to be spread accidentally
- Low fruit & seed set will minimize the chance of escape and spread