

**Family:** Sapotaceae

**Taxon:** *Manilkara zapota*

**Synonym:** *Achradelpha mammosa* O. F. Cook  
*Achras mammosa* L.  
*Achras zapota* L. (basionym)  
*Achras zapotilla* (Jacq.) Nutt.  
*Calocarpum mammosum* Pierre  
*Lucuma mammosa* C. F. Gaertn.  
*Manilkara achras* (Mill.) Fosberg  
*Manilkara zapotilla* (Jacq.) Gilly  
*Pouteria mammosa* Cronquist  
*Sapota zapotilla* (Jacq.) Coville

**Common Name:** Chicle  
Naseberry  
Sapodilla  
Sapote  
Zapotillo

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation:	H(HPWRA)
Status:	Assessor Approved	Data Entry Person:	HPWRA OrgData	WRA Score	9
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		y
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)		y
305	Congeneric weed		n=0, y = 1*multiplier (see Appendix 2)		n
401	Produces spines, thorns or burrs		y=1, n=0		n
402	Allelopathic		y=1, n=0		n
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	
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	y
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	y
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	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	
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	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: H(HPWRA)

WRA Score 9

## Supporting Data:

101	1987. Morton, J.F.. Fruits of warm climates - Sapodilla ( <i>Manilkara zapota</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/sapodilla.html">http://www.hort.purdue.edu/newcrop/morton/sapodilla.html</a>	[Is the species highly domesticated? No. Assessment is mainly for wild type plants] "The sapodilla is believed native to Yucatan and possibly other nearby parts of southern Mexico, as well as northern Belize and Northeastern Guatemala. In this region there were once 100,000,000 trees. The species is found in forests throughout Central America where it has apparently been cultivated since ancient times. It was introduced long ago throughout tropical America and the West Indies, the Bahamas, Bermuda, the Florida Keys and the southern part of the Florida mainland. Early in colonial times, it was carried to the Philippines and later was adopted everywhere in the Old World tropics. It reached Ceylon in 1802."
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. Annals of the Missouri Botanical Garden. 55(2): 145-169.	[Species suited to tropical or subtropical climate(s) 2-High] "Mexico (as far north as San Luis Potosi and Nayarit) to northern South America and from southern Florida through the West Indies; probably native only from Mexico to Costa Rica."
202	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. Annals of the Missouri Botanical Garden. 55(2): 145-169.	[Quality of climate match data 2-High] "Mexico (as far north as San Luis Potosi and Nayarit) to northern South America and from southern Florida through the West Indies; probably native only from Mexico to Costa Rica."
203	1999. Jensen, M.. Trees Commonly Cultivated in Southeast Asia: An Illustrated Field Guide. 2nd Edition. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand	[Broad climate suitability (environmental versatility)? Yes] "Ecology: Adaptable species, found up to 2,500 m altitude. Survives light frost, long drought, strong winds and salt spray. However, does best at lower altitudes on rich, well drained sandy loams."
203	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Broad climate suitability (environmental versatility)? Potentially] "- Altitude range: 0 - 600 m - Mean annual rainfall: 750 - 2700 mm - Rainfall regime: summer; bimodal - Dry season duration: 0 - 6 months - Mean annual temperature: 23 - 31°C - Mean maximum temperature of hottest month: 30 - 35°C - Mean minimum temperature of coldest month: 22 - 24°C - Absolute minimum temperature: -3 - 0°C"
203	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, ( <a href="http://www.worldagroforestry.org/af/treedb/">http://www.worldagroforestry.org/af/treedb/</a> )	[Broad climate suitability (environmental versatility)? Yes] "M. zapota is a species of the lowland rainforest. Trees grow well in a wide range of climatic conditions from wet tropics to dry cool subtropical areas. But they prefer a moist hot climate similar to that found at medium to low elevations in tropical areas, such as in coastal regions. Fruiting is not adversely affected by heavy rainfall, but high temperatures (42-43 deg. C) are harmful. Trees prefer full sunshine and are fairly hardy and resistant to wind damage when mature. Young trees are frost tender and may be killed at freezing point or below, whereas mature trees can withstand short periods of temperatures of about -3 deg. C."
204	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. Annals of the Missouri Botanical Garden. 55(2): 145-169.	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Mexico (as far north as San Luis Potosi and Nayarit) to northern South America and from southern Florida through the West Indies; probably native only from Mexico to Costa Rica."
205	1999. Jensen, M.. Trees Commonly Cultivated in Southeast Asia: An Illustrated Field Guide. 2nd Edition. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand	[Does the species have a history of repeated introductions outside its natural range? Yes] "Distribution: Originates in Central America, Mexico and West Indies. Now widespread all over Southeast Asia."
205	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Does the species have a history of repeated introductions outside its natural range? Yes] "It was originally distributed in Central America, Mexico and the West Indies, but is now widely cultivated to a greater or lesser extent in tropical lowlands world-wide." ... "It is an important fruit tree all over South-East Asia grown in home gardens, orchards and plantations." ... "Today, M. zapota is still grown for chicle in countries such as Mexico, Venezuela and Guatemala (Mickelbart, 1996). The prospects for M. zapota are good, as trees are productive enough to be grown in orchards. Research into pollen viability, nursery practices (shortening the nursery period, flowering times), and the compatibility of cultivars would all help to increase commercial prospects (Verheij and Coronel, 1991)."
205	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Does the species have a history of repeated introductions outside its natural range? Yes] "Cultivated across Southeast Asia and throughout the Old World tropics including Asia, India, Sri Lanka, the Philippines, Australia, New Zealand, and South Africa (Balerdi and Crane 2000). Restrictions exist in Monroe County."

301	2003. Wunderlin, R.P./Hansen, B.F.. Guide to the Vascular Plants of Florida. University Press of Florida, Gainesville, FL	[Naturalized beyond native range? Yes] "Hammocks and disturbed sites. Occasional; Lee and Palm Beach Cos., southern peninsula. Native to Central America. Escaped from cultivation."
301	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Naturalized beyond native range? Yes] "Introduced as a fruit crop as early as 1883 (Gordon and Thomas 1997), cultivated in Florida Keys by early 1900s (Fairchild 1938), and escaped into Florida's flora in "hammocks, old fields, Everglade Keys and Florida Keys" by 1933 (Small 1933). Found reproducing and spreading at Paradise Key and Pine Island in Everglades National Park (Whiteaker and Doren 1989), and recorded from 43 conservation areas across south Florida in rockland hammocks, coastal areas, and disturbed uplands (Gann et al. 2001, FLEPPC 2002). Expanding populations of all age classes have been found in Key Largo Hammock State Botanical Site." ... "Naturalized in Puerto Rico and the Virgin Islands (USDA NRCS 2002). Occurs throughout the Caribbean Islands and in South and Central America, where it occasionally escapes (Pennington 1990)."
302	2012. WRA Specialist. Personal Communication.	[Garden/amenity/disturbance weed? No] Environmental weed
303	2012. WRA Specialist. Personal Communication.	[Agricultural/forestry/horticultural weed? No] Environmental weed
304	2007. Kaufman, S.R./Kaufman, W.. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books, Mechanicsburg, PA	[Environmental weed? Yes] "What it Does in the Ecosystem: These trees case dense shade making it difficult for other plants to survive. Seedlings can also grow very densely, potentially inhibiting establishment of other plant species."
304	2008. Ferriter, A./Doren, B./Winston, R. et al.. The Status of Nonindigenous Species in the South Florida Environment. Ch. 9 in 2008 South Florida Environmental Report. South Florida Water Management District, West Palm Beach	[Environmental weed? Yes] "Other priority species such as sapodilla ( <i>Manilkara zapota</i> ) are problematic in localized areas, especially hardwood hammocks and old homesteads." ... "Table 9-4. Stoplight table for priority plant species in the Florida Keys Module. 2007 STATUS: Know little about spread throughout region; actively removed in coordinated manner" ... "1-2 YEAR PROGNOSIS: Localized problem; difficult to detect, may become serious pest in areas where other exotics controlled; invades natural forests; difficult to control" ... "The sapodilla tree ( <i>Manilkara zapota</i> ) is interspersed with tropical hardwood communities throughout some coastal islands, making on-the-ground control tedious as herbicide applicators are forced to canvass the forested area on foot looking for the nonindigenous tree among native tree species" ... "Table 9-5. Stoplight table for priority plant species in the Southern Estuaries Module. 2007 STATUS: Scattered throughout coastal hardwood habitats; difficult to detect remotely; not included in Indicator systematic monitoring program" ... "1-2 YEAR PROGNOSIS: Because intermixed in native tropical hardwood communities, detection and control difficult and logistically challenging; likely spread by animals; no biocontrol program under way" [Being actively controlled in natural areas of South Florida, although negative impacts have not been elucidated in this report]
304	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Environmental weed? Yes] "The dense, thick, evergreen canopy formed by these trees may interfere with native species' growth by reducing sunlight in the various vegetative layers (J. Duquesnel, Florida Department of Environmental Protection, Florida Park Service, Key Largo FL, 1996 pers. comm.). Also produces significant amounts of fleshy fruit that may alter interactions within animal communities (J. Duquesnel, Florida Department of Environmental Protection, Florida Park Service, Key Largo FL, 1996 pers. comm.)."
304	2009. Kirk, T.K.. Tropical Trees of Florida and the Virgin Islands: A Guide to Identification, Characteristics and Uses. Pineapple Press Inc., Sarasota, FL	[Environmental weed? Yes] "It is considered to be invasive in South Florida."
305	2006. Dark, J./Gantz, C.. IFAS Assessment of Non-Native Plants In Florida's Natural Areas: <i>Manilkara roxburghiana</i> . University of Florida IFAS Non-Native Plant Assessment, Gainesville, FL <a href="http://plants.ifas.ufl.edu/assessment/resp_forms_pdf/Manilkara_roxb">http://plants.ifas.ufl.edu/assessment/resp_forms_pdf/Manilkara_roxb</a>	[Congeneric weed? No] " <i>Manilkara roxburghiana</i> " ... "Not considered a problem species at this time (reassess in 10 years)"
401	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. Annals of the Missouri Botanical Garden. 55(2): 145-169.	[Produces spines, thorns or burrs? No] "Tree to 40 m. Leaves clustered toward the branch tips; petioles 0.8-3 cm long; blades elliptic or oblong-elliptic to somewhat obovate or oblanceolate, 4-15 cm long, 1.5-6 cm broad, subconcolorous, glabrate at maturity, the reticulation usually evident below."

402	2004. Bentley, J.W./Boa, E./Stonehouse, J.. Neighbor Trees: Shade, Intercropping, and Cacao in Ecuador. <i>Human Ecology</i> . 32(2): 241-270.	[Allelopathic? Probably Not] "Sapodilla ( <i>Manilkara zapota</i> ) in Grenada is a minor fruit crop, grown mainly by small farmers. Trees are scattered over wide areas as cocoa intercrops and on the edges of fields. Most of the fruit is exported to neighboring Trinidad and to destinations like Canada, Holland, and the United Kingdom (Andall, 1999)."
403	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. <i>Annals of the Missouri Botanical Garden</i> . 55(2): 145-169.	[Parasitic? No] "Tree to 40 m." [Sapotaceae]
404	2000. Wilkinson, K.M./Elevitch, C.R.. Multipurpose windbreaks: design and species for Pacific Islands. <i>Agroforestry guides for Pacific Islands #4</i> . Permanent Agriculture Resources, Holualoa, Hawaii <a href="http://www.agroforestry.net/">http://www.agroforestry.net/</a>	[Unpalatable to grazing animals? Possibly No] <i>Manilkara zapota</i> used for fodder [Table: p. 25]. Unclear if fruit or foliage is used for fodder.
405	2000. Wilkinson, K.M./Elevitch, C.R.. Multipurpose windbreaks: design and species for Pacific Islands. <i>Agroforestry guides for Pacific Islands #4</i> . Permanent Agriculture Resources, Holualoa, Hawaii <a href="http://www.agroforestry.net/">http://www.agroforestry.net/</a>	[Toxic to animals? No] <i>Manilkara zapota</i> used for fodder [Table: p. 25]
406	1987. Morton, J.F.. Fruits of warm climates - Sapodilla ( <i>Manilkara zapota</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/sapodilla.html">http://www.hort.purdue.edu/newcrop/morton/sapodilla.html</a>	[Host for recognized pests and pathogens? No] "In general, the sapodilla tree remains supremely healthy with little or no care. In India, it is sometimes attacked by a bark borer, <i>Indarbela (Arbela) tetraonis</i> . Mealybugs may infest tender shoots and deface the fruits. A galechid caterpillar ( <i>Anarsia</i> ) has caused flower buds and flowers to dry up and fall. In Indonesia, caterpillars of <i>Tarsolepis remicauda</i> may completely defoliate the tree. A caterpillar, <i>Nephoteryx engraphella</i> , feeds on the leaves, flower buds and young fruits in parts of India. The ripening and overripe fruits are favorite hosts of the Mediterranean, Caribbean, Mexican and other fruit flies. Various scales, including <i>Howardia biclavis</i> , <i>Pulvinaria</i> (or <i>Chloropulvinaria</i> ) <i>psidii</i> , <i>Rastrococcus iceryoides</i> , and pustule scale, <i>Asterolecanium pustulans</i> Ckll., may lead to black sooty mold caused by the fungus <i>Capnodium</i> sp. on stems, foliage and fruits. In some years, during winter and spring in Florida, a rust (possibly <i>Uredo sapotae</i> ) may affect the foliage of some cultivars. A leaf spot ( <i>Septoria</i> sp.) has caused defoliation in a few locations. The moth of a leaf miner ( <i>Acrocercops gemoniella</i> ) is active on young leaves. Other minor enemies have been occasionally observed."
407	1999. Jensen, M.. Trees Commonly Cultivated in Southeast Asia: An Illustrated Field Guide. 2nd Edition. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand	[Causes allergies or is otherwise toxic to humans? No] "Use: Fruit eaten fresh or used in sherbets, ice cream, butter, jam or syrup. Latex previously used as basis for chewing gum and many industrial applications. Wood excellent for furniture. Seeds, flowers and bark tannin have medicinal uses." [No evidence]
407	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Causes allergies or is otherwise toxic to humans? No] "All parts of the tree are rich in a white gummy latex, which coagulates into chicle, the principal constituent of chewing gum before synthetics (Verheij and Coronel, 1991)." [No evidence]
407	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Causes allergies or is otherwise toxic to humans? Possibly] "Ingestion of more than 6 seeds may cause abdominal pain and vomiting (Morton 1987) and bark can be poisonous (Austin 1998a)."
407	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, ( <a href="http://www.worldagroforestry.org/af/treedb/">http://www.worldagroforestry.org/af/treedb/</a> )	[Causes allergies or is otherwise toxic to humans? Possibly] "Poison: Seeds contain hydrocyanic acid and should be removed before eating the fruit."
408	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, ( <a href="http://www.worldagroforestry.org/af/treedb/">http://www.worldagroforestry.org/af/treedb/</a> )	[Creates a fire hazard in natural ecosystems? No] " <i>M. zapota</i> is a species of the lowland rainforest. Trees grow well in a wide range of climatic conditions from wet tropics to dry cool subtropical areas." [No evidence]
409	2004. Cruz-Rodríguez, J.A./López-Mata, L.. Demography of the Seedling Bank of <i>Manilkara zapota</i> (L.) Royen, in a Subtropical Rain Forest of Mexico. <i>Plant Ecology</i> . 172(2): 227-235.	[Is a shade tolerant plant at some stage of its life cycle? Yes] "The shade-tolerant seedlings of <i>M. zapota</i> belonging to different cohorts exhibit high densities beneath closed forest canopies."
409	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Trees are adapted to forest light gaps and will grow in full sun to partial shade, although shaded plants grow slower (Alcorn 1994)."

410	1987. Morton, J.F.. Fruits of warm climates - Sapodilla (Manilkara zapota). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/sapodilla.html">http://www.hort.purdue.edu/newcrop/morton/sapodilla.html</a>	[Tolerates a wide range of soil conditions? Yes] "The sapodilla grows naturally in the calcareous marl and disintegrated limestone of its homeland, therefore it should not be surprising that it is so well adapted to southern Florida and the Florida Keys. Nevertheless, it flourishes also in deep, loose, organic soil, or on light clay, diabase, sand or lateritic gravel. Good drainage is essential, the tree bearing poorly in low, wet locations. It is highly drought-resistant, can stand salt spray, and approaches the date palm in its tolerance of soil salinity, rated as ECe 14.20."
410	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Tolerates a wide range of soil conditions? Yes] "Soil descriptors - Soil texture: light; medium; heavy - Soil drainage: free; impeded; seasonally waterlogged - Soil reaction: acid; neutral; alkaline - Special soil tolerances: shallow; sodic; saline; infertile"
411	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Climbing or smothering growth habit? No] "M. zapota is an evergreen tree with a round dense crown, it is generally 5-20 m in height, although it may reach up to 40 m."
412	2004. Cruz-Rodríguez, J.A./López-Mata, L.. Demography of the Seedling Bank of Manilkara zapota (L.) Royen, in a Subtropical Rain Forest of Mexico. Plant Ecology. 172(2): 227-235.	[Forms dense thickets? Yes] "Manilkara zapota frequently has high densities and it becomes the dominant species in the north-central region of Veracruz and the Yucatan Peninsula (Gomez-Pompa 1977). The shade tolerant seedlings of M. zapota belonging to different cohorts exhibit high densities beneath closed forest canopies." [Although dominant, no evidence that monocultures have formed]
412	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Forms dense thickets? Yes] "Dense monocultures reported from Everglades National Park and scattered trees found in Biscayne National Park, Deering Estate, and Long Key State Park (FLEPPC 2002)."
501	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. Annals of the Missouri Botanical Garden. 55(2): 145-169.	[Aquatic? No] "Tree to 40 m." [Terrestrial]
502	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. Annals of the Missouri Botanical Garden. 55(2): 145-169.	[Grass? No] Sapotaceae
503	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. Annals of the Missouri Botanical Garden. 55(2): 145-169.	[Nitrogen fixing woody plant? No] Sapotaceae
504	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. Annals of the Missouri Botanical Garden. 55(2): 145-169.	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "Tree to 40 m."
601	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. Annals of the Missouri Botanical Garden. 55(2): 145-169.	[Evidence of substantial reproductive failure in native habitat? No] No evidence
601	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Evidence of substantial reproductive failure in native habitat? No] No evidence
602	2004. Cruz-Rodríguez, J.A./López-Mata, L.. Demography of the Seedling Bank of Manilkara zapota (L.) Royen, in a Subtropical Rain Forest of Mexico. Plant Ecology. 172(2): 227-235.	[Produces viable seed? Yes] "The shade-tolerant seedlings of M. zapota belonging to different cohorts exhibit high densities beneath closed forest canopies. Seed size ranges from 16-23 mm long, 8-16 mm wide, and 0.3 g wet mass."
603	2012. WRA Specialist. Personal Communication.	[Hybridizes naturally? Unknown]
604	1989. Reddi, E.U.B.. Thrips-Pollination in Sapodilla (Manilkara zapata). Proceedings of the Indian National Science Academy. B55(5 & 6): 407-410.	[Self-compatible or apomictic? Yes] "The flowers are self compatible. Auto pollination, apomixis and wind pollination are absent in the plant."
604	2007. Salinas-Peba, L./Parra-Tabla, V.. Phenology and pollination of Manilkara zapota in forest and homegardens. Forest Ecology and Management. 248: 136-142.	[Self-compatible or apomictic? Yes] "Hand pollination experiments showed that M. zapota is self-compatible, and that there is pollinator limitation for fruit production in trees that grow in homegardens."
605	1989. Reddi, E.U.B.. Thrips-Pollination in Sapodilla (Manilkara zapata). Proceedings of the Indian National Science Academy. B55(5 & 6): 407-410.	[Requires specialist pollinators? Possibly] "The thrips (Thrips hawaiiensis and Haplothrips tenuipennis) live on nectar, pollen grains and stigmatic exudations and take shelter in the flowers and in return they do the service of pollination. They do mostly geitonogamous pollinations." ... "

605	2007. Salinas-Peba, L./Parra-Tabla, V.. Phenology and pollination of <i>Manilkara zapota</i> in forest and homegardens. <i>Forest Ecology and Management</i> . 248: 136–142.	[Requires specialist pollinators? No] "Thrips act as pollinators of <i>M. zapota</i> , while bees appear to be inefficient pollinators. In our study region, bee species of <i>Euglosa</i> and <i>Trigona</i> (e.g., <i>Trigona nigra</i> ), as well as members of <i>Lepidoptera</i> and <i>Coleoptera</i> are the most common floral visitors and potential pollinators (L. Salinas, pers. observ.)."
606	1987. Morton, J.F.. Fruits of warm climates - Sapodilla ( <i>Manilkara zapota</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/sapodilla.html">http://www.hort.purdue.edu/newcrop/morton/sapodilla.html</a>	[Reproduction by vegetative fragmentation? No] "Seeds remain viable for several years if kept dry. The best seeds are large ones from large fruits. They germinate readily but growth is slow and the trees take 5 to 8 years to bear. Since there is great variation in the form, quality and yield of fruits from seedling trees, vegetative propagation has long been considered desirable but has been hampered by the gummy latex. In India, several methods are practiced: grafting, inarching, ground layering and air-layering. Grafts have been successful on several rootstocks: sapodilla, <i>Bassia latifolia</i> , <i>B. longifolia</i> , <i>Sideroxylon dulcificum</i> and <i>Mimusops hexandra</i> . The last has been particularly successful, the grafts growing vigorously and fruiting heavily."
607	1987. Morton, J.F.. Fruits of warm climates - Sapodilla ( <i>Manilkara zapota</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/sapodilla.html">http://www.hort.purdue.edu/newcrop/morton/sapodilla.html</a>	[Minimum generative time (years)? 5+] "Seeds remain viable for several years if kept dry. The best seeds are large ones from large fruits. They germinate readily but growth is slow and the trees take 5 to 8 years to bear."
607	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Minimum generative time (years)? >4] "Long-lived, medium- to slow-growing tree, although grows rapidly in its home range during plentiful rainfall (Whigham et al. 1990). May grow to 18 m (60 ft) in open areas, but can reach 30 m (100 ft) in closed forests (Morton 1987)."
607	2009. Orwa, C./Mutua, A./Kindt, R./Jamnadass, R./Simons, A.. Agroforestry Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, ( <a href="http://www.worldagroforestry.org/af/treedb/">http://www.worldagroforestry.org/af/treedb/</a> )	[Minimum generative time (years)? 5+] "The tree flowers and fruits throughout the year; fruit take about 4 months to mature. Seedlings may take 5-8 years to bear fruit, while grafted varieties take only 2-3 years from planting out."
701	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Unlikely] "Fruit a large, brown, globose to elliptic berry to 10 cm (4 in) across, scruffy until ripe and becoming smooth skinned, with yellowish, translucent, sweet, edible pulp; containing up to 10 shiny, black seeds, each with one white margin." [Large fruits & seeds lack a means of external attachment, and are probably only dispersed intentionally or by animals]
702	1987. Morton, J.F.. Fruits of warm climates - Sapodilla ( <i>Manilkara zapota</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/sapodilla.html">http://www.hort.purdue.edu/newcrop/morton/sapodilla.html</a>	[Propagules dispersed intentionally by people? Yes] "The sapodilla is believed native to Yucatan and possibly other nearby parts of southern Mexico, as well as northern Belize and Northeastern Guatemala. In this region there were once 100,000,000 trees. The species is found in forests throughout Central America where it has apparently been cultivated since ancient times. It was introduced long ago throughout tropical America and the West Indies, the Bahamas, Bermuda, the Florida Keys and the southern part of the Florida mainland. Early in colonial times, it was carried to the Philippines and later was adopted everywhere in the Old World tropics. It reached Ceylon in 1802."
703	2004. Cruz-Rodríguez, J.A./López-Mata, L.. Demography of the Seedling Bank of <i>Manilkara zapota</i> (L.) Royen, in a Subtropical Rain Forest of Mexico. <i>Plant Ecology</i> . 172(2): 227-235.	[Propagules likely to disperse as a produce contaminant? No] "Seed size ranges from 16-23 mm long, 8-16 mm wide, and 0.3 g wet mass." [Unlikely. Seeds relatively large and unlikely to inadvertently be dispersed as a produce contaminant]
704	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. <i>Annals of the Missouri Botanical Garden</i> . 55(2): 145-169.	[Propagules adapted to wind dispersal? No] "Fruit brown, mealy-roughened, ellipsoid or ovoid or subglobose, to 10 cm in diam; seeds brown, compressed, 16-24 mm long, the linear scar extending from near the base to beyond the middle."
705	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. <i>Annals of the Missouri Botanical Garden</i> . 55(2): 145-169.	[Propagules water dispersed? No] "Fruit brown, mealy-roughened, ellipsoid or ovoid or subglobose, to 10 cm in diam; seeds brown, compressed, 16-24 mm long, the linear scar extending from near the base to beyond the middle." [Although fruit may float, water does not appear to be an important dispersal vector]
706	1968. Woodson, Jr.; R.E./Schery, R.W./Blackwell, Jr., W.H.. Flora of Panama. Part VIII. Family 154. Sapotaceae. <i>Annals of the Missouri Botanical Garden</i> . 55(2): 145-169.	[Propagules bird dispersed? Yes] "Fruit brown, mealy-roughened, ellipsoid or ovoid or subglobose, to 10 cm in diam; seeds brown, compressed, 16-24 mm long, the linear scar extending from near the base to beyond the middle." [Although fruits & seeds probably limited by bird dispersal pool in Hawaiian Islands]

706	2008. Weterings, M.J.A./Weterings-Schonck, S.M./Vester, H.F.M./Calmé, S.. Senescence of Manilkara zapota trees and implications for large frugivorous birds in the Southern Yucatan Peninsula, Mexico. Forest Ecology and Management. 256: 1604–1611.	[Propagules bird dispersed? Yes] "Fruits of M. zapota are an important food source for large vertebrate species in the area (Weber, 2005; Rivera and Calme´ , 2006), including birds such as the ocellated turkey and the great curassow (S. Calme´ , unpubl. data)."
707	2001. Langeland, K.A./Stocker, R.K.. Control of Non-native Plants in Natural Areas of Florida. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL <a href="http://mrec.ifas.ufl.edu/ldspmgmt/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.pdf">http://mrec.ifas.ufl.edu/ldspmgmt/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.pdf</a>	[Propagules dispersed by other animals (externally)? Possibly carried, rather than internally dispersed] "Comments: Large, spreading tree; edible fruit; seeds dispersed by raccoons and opossums; invades hammock interiors."
708	2001. Langeland, K.A./Stocker, R.K.. Control of Non-native Plants in Natural Areas of Florida. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL <a href="http://mrec.ifas.ufl.edu/ldspmgmt/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.pdf">http://mrec.ifas.ufl.edu/ldspmgmt/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.pdf</a>	[Propagules survive passage through the gut? Probably yes] "Comments: Large, spreading tree; edible fruit; seeds dispersed by raccoons and opossums; invades hammock interiors."
708	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Propagules survive passage through the gut? Yes] "Fruits are consumed by bats, monkeys, parrots, raccoons, and other small mammals (Alcorn 1994, Duquesnel pers comm., Elangovan et al. 1999)."
708	2011. O'Farrill, G./Chapman, C.A./Gonzalez, A.. Origin and deposition sites influence seed germination and seedling survival of Manilkara zapota: implications for long-distance, animal-mediated seed dispersal. Seed Science Research. 21: 305-313.	[Propagules survive passage through the gut? Yes] "In the Greater Calakmul Region, the Baird's tapir ( <i>T. bairdii</i> ) is the largest terrestrial mammal and a potential short- and long-distance seed disperser of large-seeded plants. In April 2006, we observed a maximum number of 42 <i>M. zapota</i> seeds in a single dung pile, with a mean number ( $\pm$ SD) of seeds per dung pile of 4.07 $\pm$ 5.36 seeds. In addition, previous studies suggest that tapirs are able to disperse viable zapote seeds to favourable places for germination (O'Farrill et al., 2006) and that germination probabilities do not differ when seeds are collected directly from zapote fruits or from tapir dung (O'Farrill et al., submitted). Individuals of lowland tapir ( <i>Tapirus terrestris</i> ) are known to move up to 13km in a 24-h period in Peru (Tobler, 2008), indicating that tapirs can be effective long-distance dispersers of large seeds (Fragoso et al., 2003)." ... "The interaction between seed deposition and microenvironment variation is strongly scale dependent because the variance in important environmental variables increases with distance (Bell and Lechowicz, Morton, 1987), its dispersal likely depends on large animals, as seeds are too heavy to be dispersed by wind or ingested by small animals. In the Neotropics, tapirs ( <i>Tapirus bairdii</i> ) are the last remaining large terrestrial mammals and recent reports indicate that they are capable of dispersing large-seeded plants (Fragoso et al., 2003), such as <i>M. zapota</i> (O'Farrill et al., 2006)." [Feral pigs in Hawaii may serve a similar role]
708	2012. O'Farrill, G./Calmé, S./Sengupta, R./Gonzalez, A.. Effective dispersal of large seeds by Baird's tapir: a large-scale field experiment. Journal of Tropical Ecology. 28: 119–122.	[Propagules survive passage through the gut? Yes] "The presence of intact <i>M. zapota</i> seeds in tapir dung together with their germination demonstrates that tapirs move viable seeds throughout their habitat. The neutral effect of tapir on seed germination observed in this study is consistent with the neutral effect of non-flying mammals on germination found in 40% of the studies reported by Traveset (1998). Contrary to other studies with large terrestrial mammals, our results did not show that passage through the animal's digestive system enhanced germination (Campos et al. 2008)." ... "This result indicates that the net effect of tapir dispersal does not reduce germination probability and introduces the potential benefit of longdistance displacement, although germination success will depend upon site quality."
801	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Prolific seed production (>1000/m <sup>2</sup> )? Probably No. Large fruits & seeds] "Mature trees can produce 2,500 to 3,000 fruits annually (Morton 1987). Fruits contain 2-10 seeds (Pennington 1990) that have a hard protective coat (Zaveleta and Engleman 1994)."
802	1987. Morton, J.F.. Fruits of warm climates - Sapodilla ( <i>Manilkara zapota</i> ). J.F. Morton, Miami, FL <a href="http://www.hort.purdue.edu/newcrop/morton/sapodilla.html">http://www.hort.purdue.edu/newcrop/morton/sapodilla.html</a>	[Evidence that a persistent propagule bank is formed (>1 yr)? Yes. Potentially] "Seeds remain viable for several years if kept dry. The best seeds are large ones from large fruits."
803	2001. Langeland, K.A./Stocker, R.K.. Control of Non-native Plants in Natural Areas of Florida. Institute of Food & Agricultural Sciences, University of Florida, Gainesville, FL <a href="http://mrec.ifas.ufl.edu/ldspmgmt/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.pdf">http://mrec.ifas.ufl.edu/ldspmgmt/Ldsp%20Turf%20Mgmt/PDFfiles/WG20900.pdf</a>	[Well controlled by herbicides? Yes] "Treatment: Hand pull seedlings; basal bark application of 10% Garlon 4, larger trees may require several applications or increasing the Garlon 4 to 20%; or cut stump application with 50% Garlon 3A."



803	2007. Kaufman, S.R./Kaufman, W.. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books, Mechanicsburg, PA	[Well controlled by herbicides? Probably Yes] "Seedlings can be pulled up by hand. Triclopyr mixed with oil can be applied as a basal bark treatment."
804	2008. Langeland, K.A./Burks, K.C. (eds.). Identification and Biology of Non-Native Plants in Florida's Natural Areas. UF/IFAS Distribution, Gainesville, FL <a href="http://www.fleppc.org/ID_book.htm">http://www.fleppc.org/ID_book.htm</a>	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "Forms strong, spreading roots (Barrett 1956). Often able to withstand hurricanes, and damaged trees resprout vigorously (Vandermeer and de la Cerda 1997)."
805	2008. Ferriter, A./Doren, B./Winston, R. et al.. The Status of Nonindigenous Species in the South Florida Environment. Ch. 9 in 2008 South Florida Environmental Report. South Florida Water Management District, West Palm Beach	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown] "Because intermixed in native tropical hardwood communities, detection and control difficult and logistically challenging; likely spread by animals; no biocontrol program under way" [Probably No in Hawaiian Islands]