

**Family:** *Areaceae*

**Taxon:** *Nypa fruticans*

**Synonym:** *Nypa fruticans* Thunb.

*"Nypa arborescens* Wurmbe ex H. Wendl., non

**Common Name:** Mangrove palm

Nipa palm

palmier nipa

<b>Questionnaire :</b>	current 20090513	<b>Assessor:</b>	Chuck Chimera	<b>Designation:</b> H(HPWRA)
<b>Status:</b>	Assessor Approved	<b>Data Entry Person:</b>	Chuck Chimera	<b>WRA Score</b> 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	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	n
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)	y
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	
403	Parasitic		y=1, n=0	n
404	Unpalatable to grazing animals		y=1, n=-1	n
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	n

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	n
604	Self-compatible or apomictic	y=1, n=-1	
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
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	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	
801	Prolific seed production (>1000/m2)	y=1, n=-1	
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides	y=-1, n=1	
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: H(HPWRA)

WRA Score 9

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**Supporting Data:**

101	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Is the species highly domesticated?? No] "Nipa palm, <i>N. fruticans</i> , is one of the oldest angiosperm plants and probably the oldest palm species. Eocene and miocene fossil findings in Europe, North America and the Middle East and the Paleocene strata in Brazil suggest that nipa palm had a pantropical distribution 13-63 million years ago. "
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	1972. Uhl, N.W.. Inflorescence and Flower Structure in <i>Nypa Fruticans</i> (Palmae). American Journal of Botany. 59(7): 729-743.	[Species suited to tropical or subtropical climate(s) 2-high] " <i>Nypa fruticans</i> , the mangrove palm, occurs on tidal shores and estuaries of Ceylon, the Ganges Delta, the Malay peninsula and archipelago, and Pacific islands from northern Australia to the Solomons, Philippines and the Ryukyus"
201	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Species suited to tropical or subtropical climate(s) 2-high] "Today it is mainly found in the equatorial zone, 10°N-10°S, stretching from Sri Lanka through South-East Asia to North Australia. The largest natural nipa stands are found in Indonesia (700 000 ha), Papua New Guinea (500 000 ha) and the Philippines (8000 ha). The northernmost natural occurrence is on the Ryukyu Islands of Japan and the southernmost in North Australia. In South-East Asia, nipa palm is also cultivated."
202	1972. Uhl, N.W.. Inflorescence and Flower Structure in <i>Nypa Fruticans</i> (Palmae). American Journal of Botany. 59(7): 729-743.	[Quality of climate match data? 2-high] " <i>Nypa fruticans</i> , the mangrove palm, occurs on tidal shores and estuaries of Ceylon, the Ganges Delta, the Malay peninsula and archipelago, and Pacific islands from northern Australia to the Solomons, Philippines and the Ryukyus"
203	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Broad climate suitability (environmental versatility)? No] "Climate: Nipa palm is a tropical plant. The average minimum temperature in its growing areas is 20°C and the maximum 32-35°C. Its optimum climate is subhumid to humid with more than 100 mm rainfall per month throughout the year." ... "Climatic amplitude (estimates) - Altitude range: 0 - 200 m - Mean annual rainfall: 1000 - 4000 mm - Rainfall regime: summer; bimodal; uniform - Dry season duration: 1 - 3 months - Mean annual temperature: 24 - 35°C - Mean maximum temperature of hottest month: 33 - 35°C - Mean minimum temperature of coldest month: 24 - 27°C - Absolute minimum temperature: 20 - 0°C"
203	2008. Janick, J./Paull, R.E.. The encyclopedia of fruit & nuts. Cabi Publishing, Wallingford, UK	[Broad climate suitability (environmental versatility)? No] "Tropical conditions are required for growth."
204	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Today it is mainly found in the equatorial zone, 10°N-10°S, stretching from Sri Lanka through South-East Asia to North Australia. The largest natural nipa stands are found in Indonesia (700 000 ha), Papua New Guinea (500 000 ha) and the Philippines (8000 ha). The northernmost natural occurrence is on the Ryukyu Islands of Japan and the southernmost in North Australia. In South-East Asia, nipa palm is also cultivated."
205	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Does the species have a history of repeated introductions outside its natural range? No] "There are no internationally traded products of nipa palm. The production of thatching material, sugar, vinegar, mats and baskets has only local significance. The sugar, produced in family enterprises in Malaysia and Thailand, is used for confectionery and for small scale production of distilled spirits. Recently, a pilot scheme was established in West Kalimantan (Indonesia) to produce sugar from nipa palm on a larger scale. It is planned to exploit some 10 000 ha. The production of fuel alcohol from nipa palm was seriously studied in the 1920s in the Philippines and Malaysia, and in the early 1980s in Papua New Guinea. Because of the high input of manual labour required to produce fuel alcohol, the process was not economically feasible in Papua New Guinea, whereas vinegar and treacle showed good potential for cottage-industry development. The quality and price of vinegar produced with the method developed, compared favourably with commercially produced vinegars elsewhere."

205	2006. Lorence, D.H.. <i>Nypa fruticans</i> - Herbarium Database - LC Accession Num: 960866. National Tropical Botanical Garden, <a href="http://ntbg.org/herbarium/detail.php?tempid=36072#col">http://ntbg.org/herbarium/detail.php?tempid=36072#col</a>	[Does the species have a history of repeated introductions outside its natural range? No evidence from Hawaiian Islands] "KAUAI: Koloa District, National Tropical Botanical Garden in Lawai Valley; Allerton Garden, Micronesian area on W side of Lawai Stream, growing in brackish water at edge of stream, in muddy soil."
301	2002. Sunderland, T.C.H./Morakinyo, T.. <i>Nypa fruticans</i> , a Weed in West Africa. <i>Palms</i> . 46(3): 154-155.	[Naturalized beyond native range? Yes] "The natural range of the mangrove palm, <i>Nypa fruticans</i> Wurmb, occurs from Sri Lanka and the Ganges Delta to Australia and the Solomon and Ryukyu Islands (Uhl & Dransfield 1987). However, the ability of <i>Nypa</i> to colonize areas outside its existing natural range has been reported from Trinidad (Bacon 2001), Panama (Duke 1991) and probably most extensively, West Africa (Zeven 1973)."
301	2005. CAB International. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	[Naturalized beyond native range? Yes] " <i>N. fruticans</i> has become an invasive weed in Nigeria where it was introduced about a century ago."
301	2008. Meyer, J.-Y./Lavergne, C./Hodel, D. R.. <i>Time Bombs in Gardens: Invasive Ornamental Palms in Tropical Islands, with Emphasis on French Polynesia (Pacific Ocean) and the Mascarenes (Indian Ocean)</i> . <i>Palms</i> . 52: 71-83.	[Naturalized beyond native range? Yes] "The nipa or mangrove palm ( <i>Nypa fruticans</i> ) in Nigeria, which was introduced from Singapore in 1906, is currently displacing the native mangrove vegetation and impacting coastal plant communities ( <a href="http://www.africanconservation.org/ncftemp/nipa.html">www.africanconservation.org/ncftemp/nipa.html</a> ). This species is also reported as naturalized in the island of Trinidad (Kairo et al. 2003) and Panama." ... " <i>Nypa fruticans</i> , introduced in JBHS in 1928, is locally naturalized in the garden but will not expand its distribution as suitable estuarine habitat is scarce or lacking in French Polynesia."
301	2010. Dowe, J.L.. <i>Australian Palms: Biogeography, Ecology and Systematics</i> . Csiro Publishing, Collingwood, Australia	[Naturalized beyond native range? Yes] "...with feral populations in Central America."
301	2010. Fourqurean, J.W./Smith III, T.J./Possley, J./Collins, T. M./Lee, D./Namoff, S.. Are mangroves in the tropical Atlantic ripe for invasion? Exotic mangrove trees in the forests of South Florida. <i>Biol Invasions</i> . 12: 2509-2522.	[Naturalized beyond native range? Not in Florida] "Of the five non-native mangrove species that remain in the collections of FTBG, two apparently have not reproduced: <i>Dolichandrone spathacea</i> and <i>Nypa fruticans</i> ."
301	2012. IUCN SSC Invasive Species Specialist Group. <i>Invasive Species of the Week - Nypa fruticans</i> Wurmb.. <a href="http://www.issg.org/pdf/inv_of_week/nypfru.pdf">http://www.issg.org/pdf/inv_of_week/nypfru.pdf</a>	[Naturalized beyond native range? Yes] "The nipa palm was introduced to Nigeria from where it has spread to the Wouri estuary in Cameroon; it has been reported as naturalized in a botanic garden on Tahiti in French Polynesia; a small stand has been recorded near the port of Colon in Panama on the Atlantic side, and germinating beach stranded propagules of nipa palm have been collected in Trinidad and Tobago in 1998- most likely carried with ocean currents, originating from the West African populations."
302	2012. WRA Specialist. Personal Communication.	[Garden/amenity/disturbance weed? No] Environmental Weed. See 3.04
303	2011. CAB International. <i>Invasive species compendium [online encyclopedia] - Datasheets &gt; Nypa fruticans (nipa palm)</i> . <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144</a>	[Agricultural/forestry/horticultural weed? Yes. Impacts aquaculture practices] "Nipa impacts negatively on fish catch and shellfish collection. It also impacts negatively on rural navigation in coastal waters." ... "Local people depend, often disproportionately on biodiversity for their life support. Loss of biodiversity due to the invasion of plants such as nipa forces migrations and the search for new livelihoods thereby distorting the social structure of the communities."
303	2011. Udoidiong, O.M./Ekwu, A.O.. <i>Nipa Palm (Nypa fruticans Wurmb) and the Intertidal Epibenthic Macrofauna East of the Imo River Estuary, Nigeria</i> . <i>World Applied Sciences Journal</i> . 14 (9): 1320-1330.	[Agricultural/forestry/horticultural weed? Possibly No] "However, the occurrence of 4 significant positive relations and no significant negative relationships indicated more positive relationships than negative ones, suggesting further that <i>Nypa fruticans</i> has no deleterious effects on the intertidal epibenthic macrofauna, contrary to the widely held view that it does."
303	2012. IUCN SSC Invasive Species Specialist Group. <i>Invasive Species of the Week - Nypa fruticans</i> Wurmb.. <a href="http://www.issg.org/pdf/inv_of_week/nypfru.pdf">http://www.issg.org/pdf/inv_of_week/nypfru.pdf</a>	[Agricultural/forestry/horticultural weed? Yes] "The absence of leaf litter and stilt roots, result in reduced estuarine habitat and has had impacts on fisheries-including reduced catches."
304	2002. Sunderland, T.C.H./Morakinyo, T.. <i>Nypa fruticans</i> , a Weed in West Africa. <i>Palms</i> . 46(3): 154-155.	[Environmental weed? Yes] "It has been observed that where <i>Nypa</i> colonizes the mangroves, it completely chokes the mangrove vegetation in which fish breed. It is possible that dense <i>Nypa</i> colonization is affecting the breeding of fish in the Niger Delta thus contributing to the decline of fish populations throughout the area (Living Earth Nigeria Foundation, pers. comm.)."
304	2005. CAB International. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	[Environmental weed? Yes] " <i>N. fruticans</i> has become an invasive weed in Nigeria where it was introduced about a century ago."

304	2011. CAB International. Invasive species compendium [online encyclopedia] - Datasheets > <i>Nypa fruticans</i> (nipa palm). <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oamodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oamodule=datasheet&amp;page=481&amp;site=144</a>	[Environmental weed? Yes] "The spread of nipa in the coastal zones of Nigeria threatens the mangrove vegetation of the zone by outcompeting and displacing the native mangrove species, thereby lowering biodiversity as well as affecting people's livelihoods through reduced fish catch and reduced collection of shellfish." ... "Being prostrate and gregarious, nipa outcompetes and 'crowds out' other woody mangrove species. In alien invasive conditions, this leads to a loss in biodiversity."
304	2012. IUCN SSC Invasive Species Specialist Group. Invasive Species of the Week - <i>Nypa fruticans</i> Wurmb.. <a href="http://www.issg.org/pdf/inv_of_week/nypfru.pdf">http://www.issg.org/pdf/inv_of_week/nypfru.pdf</a>	[Environmental weed? Yes] "The competitive nipa replaces indigenous <i>Rhizophora</i> and <i>Raphia</i> palm. The nipa palm can grow as tall as 10mtrs, unlike other palms it lacks an upright stem, and instead it has thick, prostrate, rhizomatous stems that branch dichotomously underground. Monotypic stands are produced due to new plants growing out vegetatively from each branch. The absence of leaf litter and stilt roots, result in reduced estuarine habitat and has had impacts on fisheries- including reduced catches."
305	2010. Dowe, J.L.. Australian Palms: Biogeography, Ecology and Systematics. Csiro Publishing, Collingwood, Australia	[Congeneric weed? No] "The subfamily includes a single genus, <i>Nypa</i> , which has a single species, <i>N. fruticans</i> ."
401	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Produces spines, thorns or burrs? No] " <i>N. fruticans</i> is a large, creeping, unarmed, pleioanthic, monoecious palm. Stem prostrate or subterranean (rhizome), up to 45 cm in diameter, branching dichotomously at regular intervals, with curved leaf scars above, and roots along the underside. Leaves in tufts of 3-5 per plant, erect, 4.5-14.2 m long, simply pinnate; petiole very stout, up to 1.5 m long, channeled adaxially, terete distally, dilated towards the base into a short sheath; leaflets up to 163 per leaf, linear, single-fold, 1.2-1.5 m x 6.5-8.6 cm, coriaceous, midrib bearing appressed brown scales on lower surface."
402	2011. CAB International. Invasive species compendium [online encyclopedia] - Datasheets > <i>Nypa fruticans</i> (nipa palm). <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oamodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oamodule=datasheet&amp;page=481&amp;site=144</a>	[Allelopathic? Unknown] "Typically, nipa palm forms pure stands, but in some areas it grows mixed with other mangrove trees. In the understory some <i>Acanthus</i> , <i>Acrostichum</i> and <i>Crinum</i> species are found." [Thicket-formation may be due to habitat, and competitive exclusion, but allelopathy may also be a factor]
403	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Parasitic? No] <i>Arecaceae</i> [Not parasitic]
404	2003. Riffle, R.L./Craft, P.. An encyclopedia of cultivated palms. Timber Press, Portland, OR.	[Unpalatable to grazing animals? Probably no] "The young, unfolding leaves are also sometimes eaten as a salad." [Palatable to people, so presumably palatable to animals, although browsing pressure could be minimal due to habitat in which palm occurs]
404	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Unpalatable to grazing animals? Probably no] "Nipah sap is fed to pigs during the dry season and is believed to impart a sweet flavour to the pork meat."
405	2003. Riffle, R.L./Craft, P.. An encyclopedia of cultivated palms. Timber Press, Portland, OR.	[Toxic to animals? No] "The young, unfolding leaves are also sometimes eaten as a salad." [Palatable and non-toxic to people, so presumably palatable and non-toxic to animals]
405	2012. Lim, T.K.. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York	[Toxic to animals? No] "Nipah sap is fed to pigs during the dry season and is believed to impart a sweet flavour to the pork meat." [No evidence]
406	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Host for recognized pests and pathogens? No] " <i>Nypa</i> palm suffers from few diseases and pests. Rats in Papua New Guinea and pigs and monkeys in northern Borneo may damage the peduncles. In Malaysia, damage of young peduncles by weevils was avoided by removing the rubbery bracts at an early stage of fruit development when preparing the stalks for pretreatment and tapping. Grapsid crab is the main pest of young seedlings."
407	2003. Riffle, R.L./Craft, P.. An encyclopedia of cultivated palms. Timber Press, Portland, OR.	[Causes allergies or is otherwise toxic to humans? No] "This species has many uses in its native haunts. The primary one is for thatch and weaving baskets and other utensils, but the leaflets are also used for rolling cigarettes. The dried petioles, because they are filled with tiny air sacs, are used for construction of huts, for fuel, and for fishing net floats. The immature fruits and seeds are considered a delicacy in parts of the palm's range, and the peduncles of the inflorescences yield a sugary sap that is used in sugar, alcoholic beverages, and vinegar. The young, unfolding leaves are also sometimes eaten as a salad." [Multiple human uses with no evidence of toxic or allergenic properties]

407	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Causes allergies or is otherwise toxic to humans? No] "In its native range in South-East Asia, there is a long tradition of using palm sap from <i>N. fruticans</i> , obtained by tapping the inflorescence stalks, as a source of molasses like sugary liquid, amorphous sugar ('gula malacca'), alcohol or vinegar. The slightly fermented sap called 'toddy' ('nera' in Indonesia and Malaysia, 'tuba' in the Philippines) is sold and consumed as local beer. The plant is truly multipurpose, and produces a variety of other products, and even has the potential for energy production as yields per hectare far exceed those from maize or cassava for example. It is also valued as it grows where crops cannot be cultivated, on coastal, often tidal areas." [Regularly utilized plant with no evidence of toxicity or allergenic properties]
408	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Creates a fire hazard in natural ecosystems? No] "Nipa palm thrives only in a brackish water environment. It is rarely seen directly on the seashore. Optimum conditions are when the base and the rhizome of the palm are regularly inundated by brackish water." [Unlikely given habitat]
408	2011. CAB International. Invasive species compendium [online encyclopedia] - Datasheets > <i>Nypa fruticans</i> (nipa palm). <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;iadmodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;iadmodule=datasheet&amp;page=481&amp;site=144</a>	[Creates a fire hazard in natural ecosystems? No] "Impact outcomes, Damaged ecosystem services, Ecosystem change/ habitat alteration, Negatively impacts human health, Negatively impacts tourism, Reduced amenity values, Reduced native biodiversity" [No evidence of increased fire hazards reported]
409	2003. Riffle, R.L./Craft, P.. An encyclopedia of cultivated palms. Timber Press, Portland, OR.	[Is a shade tolerant plant at some stage of its life cycle? Possibly] "It needs year-round warmth, copious and constant moisture, a humus-laden acidic soil, and shade or partial shade when young. It grows in the open in full sun, but the rich color and integrity of its blades are compromised."
409	2012. Dowe, J./Tucker, R.. Palms: <i>Nypa fruticans</i> . PACSOA (Palm and Cycad Society of Australia), <a href="http://www.pacsoa.org.au/palms/Nypa/fruticans.html">http://www.pacsoa.org.au/palms/Nypa/fruticans.html</a>	[Is a shade tolerant plant at some stage of its life cycle? Possibly] "When well established it can be planted out into a prepared site where the soil has been loosened to a depth of 1 m and at least 3 x 5 m in an oval-shaped bed. Plant the palm at one end, facing the shoot towards the other. Make a small levee to hold in water. Ideally the site should be only lightly shaded, to give a more compact and sturdy growth."
410	2003. Riffle, R.L./Craft, P.. An encyclopedia of cultivated palms. Timber Press, Portland, OR.	[Tolerates a wide range of soil conditions? Possibly Yes] "The most important cultural consideration is constant water, which, contrary to popular belief, need not be saline. In fact, this palm dies in undiluted salt water, although it luxuriates in brackish to mainly fresh water. A lake or pond is not necessary for growing the palm if its soil can be kept constantly moist. It is adaptable to many soils including calcareous ones and needs full sun when past the seedling stage."
410	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Tolerates a wide range of soil conditions? No] "Soil and physiography - Nipa palm thrives only in a brackish water environment. It is rarely seen directly on the seashore. Optimum conditions are when the base and the rhizome of the palm are regularly inundated by brackish water. For this reason, nipa palm occupies estuarine tidal floodplains of rivers. Nipa palm swamp soils are muddy and rich in alluvial silt, clay and humus; they have a high content of various inorganic salts, calcium, and sulphides of iron and manganese, contributing to the typical odour and dark colour. The pH is around 5; oxygen content is low with the exception of the topmost layers."
411	2010. Dowe, J.L.. Australian Palms: Biogeography, Ecology and Systematics. Csiro Publishing, Collingwood, Australia	[Climbing or smothering growth habit? No. Thicket forming] "Occurring in dense monospecific colonial populations in estuarine locations with moderate tidal parameters in anaerobic alluvial mud, at 0-5 m asl."
412	1984. Gruezo, W.S./Harries, H.C.. Self-Sown, Wild-Type Coconuts in the Philippines. Biotropica. 16(2): 140-147.	[Forms dense thickets? Yes] "Toward the land the coconut palms are associated with thick stands of <i>Nypa fruticans</i> Wurmb. (Fig. 3b). These various plant species constitute a natural strand vegetation community that is continuously exposed to oceanic waves and salt- water sprays"
412	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Forms dense thickets? Yes] "When utilized for sap production, very dense natural nipa palm stands should be thinned and cleared of old leaf debris. These operations increase the amount of light, improve the flowering frequency, and extend the flowering period as well. Wider spacings apparently improve production."
412	2010. Dowe, J.L.. Australian Palms: Biogeography, Ecology and Systematics. Csiro Publishing, Collingwood, Australia	[Forms dense thickets? Yes] "Occurring in dense monospecific colonial populations in estuarine locations with moderate tidal parameters in anaerobic alluvial mud, at 0-5 m asl."
412	2011. CAB International. Invasive species compendium [online encyclopedia] - Datasheets > <i>Nypa fruticans</i> (nipa palm). <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;iadmodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;iadmodule=datasheet&amp;page=481&amp;site=144</a>	[Forms dense thickets? Yes] "Typically, nipa palm forms pure stands, but in some areas it grows mixed with other mangrove trees. In the understorey some <i>Acanthus</i> , <i>Acrostichum</i> and <i>Crinum</i> species are found."

501	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Aquatic? No] "Nipa palm thrives only in a brackish water environment. It is rarely seen directly on the seashore. Optimum conditions are when the base and the rhizome of the palm are regularly inundated by brackish water." [Not truly aquatic]
501	2012. Dowe, J./Tucker, R.. Palms: <i>Nypa fruticans</i> . PACSOA (Palm and Cycad Society of Australia), <a href="http://www.pacsoa.org.au/palms/Nypa/fruticans.html">http://www.pacsoa.org.au/palms/Nypa/fruticans.html</a>	[Aquatic? No] "Nypa is not a mangrove in the strict sense, as it does not exploit truly littoral environments nor can it tolerate inundation with undiluted sea-water for extended periods."
502	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Grass? No] Areaceae
503	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Nitrogen fixing woody plant? No] Areaceae
504	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "N. fruticans is a large, creeping, unarmed, pleonanthic, monoecious palm. Stem prostrate or subterranean (rhizome), up to 45 cm in diameter, branching dichotomously at regular intervals, with curved leaf scars above, and roots along the underside. Leaves in tufts of 3-5 per plant, erect, 4.5-14.2 m long, simply pinnate; petiole very stout, up to 1.5 m long, channeled adaxially, terete distally, dilated towards the base into a short sheath; leaflets up to 163 per leaf, linear, single-fold, 1.2-1.5 m x 6.5-8.6 cm, coriaceous, midrib bearing appressed brown scales on lower surface."
601	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Evidence of substantial reproductive failure in native habitat? No] "First flowering occurs 3-4 years after germination. Pollination is effected by flies. In a mature nipa palm stand, normally about one quarter to one half of the palms produce flowers or fruits. The fruits mature in 5-9 months. In young fruits the endosperm is liquid, becoming solid in older ones. Frequently, more than one infructescence develops simultaneously per plant. In Papua New Guinea, the weight of one infructescence is 6-30 kg and its circumference 1.1-1.4 m, bearing 88-133 individual fruits."
601	2010. Dowe, J.L.. Australian Palms: Biogeography, Ecology and Systematics. Csiro Publishing, Collingwood, Australia	[Evidence of substantial reproductive failure in native habitat? No] "Conservation status - No present threats."
602	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Produces viable seed? Yes] "Seed broadly ovoid, grooved adaxially, hilum basal, endosperm homogeneous. Germination is on the infructescence (viviparous), with the plumule exerted and pushing the fruit away; eophyll bifid or with several leaflets." ... "Generative propagation of <i>N. fruticans</i> is by seed (fruit) and vegetative propagation is through dichotomous branching of the rhizome. In Papua New Guinea, the 'pocket and channel' method has been used successfully to propagate nipa palm. It involves placing fruits directly into 10-20 cm deep pockets along the edge of irrigation channels. In the Philippines, seedlings are first grown in a seed-bed and then transplanted into pockets. Spacing is 1.5-2 m, eventually thinned to about 400 plants per ha. Natural stands of nipa palm are usually dense; in Papua New Guinea 2000-5000, in the Philippines up to 10 000 plants per ha occur."
602	2008. Janick, J./Paul, R.E.. The encyclopedia of fruit & nuts. Cabi Publishing, Wallingford, UK	[Produces viable seed? Yes] "Nipa palm is propagated by seed or detached stem branches."
603	2010. Dowe, J.L.. Australian Palms: Biogeography, Ecology and Systematics. Csiro Publishing, Collingwood, Australia	[Hybridizes naturally? No] "The subfamily includes a single genus, <i>Nypa</i> , which has a single species, <i>N. fruticans</i> ." [No evidence]
604	1986. Henderson, A.. A Review of Pollination Studies in the Palmae. Botanical Review. 52: 221-259.	[Self-compatible or apomictic? Unknown] "This monospecific genus is monoecious, protogynous, and has unisexual flowers. Essig (1973) reported on <i>Nypa fruticans</i> Wurm. pollination in New Guinea. Pistillate heads emerged from their bracts first, but the duration of pistillate anthesis was unknown. Staminate heads emerged from their bracts later. Staminate anthesis occurred around 0930, when the staminal column elongated and pushed the anthers beyond the perianth. Drosophilid flies were numerous on the staminate and pistillate flowers, and were found to have pollen stuck to their bodies. Dipteran and coleopteran larvae were found in flower heads. Drosophilid flies were concluded to be pollinators. Dransfield (pers. comm.) reported that drosophilid flies seemed always to be present at anthesis. Corner (1966) noted that inflorescence buds were brick red and distinctly hot to the touch, and the flowers smelled like "rubber hot water bottles." Kraus (1896) reported inflorescence temperature elevation. Uhl (1972b) described the inflorescence morphology of the genus. Uhl and Moore (1977a) considered that floral vasculature, histology, and growth patterns were directly related to the activities of pollinators."

605	1986. Henderson, A.. A Review of Pollination Studies in the Palmae. Botanical Review. 52: 221-259.	[Requires specialist pollinators? No] "This monospecific genus is monoecious, protogynous, and has unisexual flowers. Essig (1973) reported on <i>Nypa fruticans</i> Wurmb. pollination in New Guinea. Pistillate heads emerged from their bracts first, but the duration of pistillate anthesis was unknown. Staminate heads emerged from their bracts later. Staminate anthesis occurred around 0930, when the staminal column elongated and pushed the anthers beyond the perianth. Drosophilid flies were numerous on the staminate and pistillate flowers, and were found to have pollen stuck to their bodies. Dipteran and coleopteran larvae were found in flower heads. Drosophilid flies were concluded to be pollinators. Dransfield (pers. comm.) reported that drosophilid flies seemed always to be present at anthesis. Corner (1966) noted that inflorescence buds were brick red and distinctly hot to the touch, and the flowers smelled like "rubber hot water bottles." Kraus (1896) reported inflorescence temperature elevation. Uhl (1972b) described the inflorescence morphology of the genus. Uhl and Moore (1977a) considered that floral vasculature, histology, and growth patterns were directly related to the activities of pollinators."
605	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Requires specialist pollinators? No] "Pollination is effected by flies. In a mature nipa palm stand, normally about one quarter to one half of the palms produce flowers or fruits."
605	2010. Teo, S./Ang, W.F./Lok, A.F.S.L./Kurukulasuriya, B.R./Tan, H.T.W.. The Status and Distribution of the Nipah Palm, <i>Nypa fruticans</i> Wurmb (Arecaceae), in Singapore. Nature in Singapore. 3: 45-52.	[Requires specialist pollinators? No] "It is monoecious and the flowers are dimorphic. The female inflorescence is globular while the male inflorescence is catkin-like (Fig. 4b). Pollination appears to be by a variety of insects and wind (Hoppe, 2005; Fig. 5), with drosophilid flies probably playing a more dominant role (Uhl & Moore, 1997; Tomlinson, 1986)."
606	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Reproduction by vegetative fragmentation? Yes] "About 1 year after germination the rhizome starts branching dichotomously and a new plant develops vegetatively on each branch. This branching pattern gives rise to the nipa palm 'colony' structure of a mature stand, in which older rhizome parts decay simultaneously and dichotomous divisions produce new plants. There is also a constant decay of old leaves and formation of new ones throughout the life of a nipa palm, which is estimated to be about 50 years."
606	2008. Janick, J./Paull, R.E.. The encyclopedia of fruit & nuts. Cabi Publishing, Wallingford, UK	[Reproduction by vegetative fragmentation? Yes] "Nipa palm is propagated by seed or detached stem branches."
606	2012. IUCN SSC Invasive Species Specialist Group. Invasive Species of the Week - <i>Nypa fruticans</i> Wurmb.. <a href="http://www.issg.org/pdf/inv_of_week/nypfu.pdf">http://www.issg.org/pdf/inv_of_week/nypfu.pdf</a>	[Reproduction by vegetative fragmentation? Yes] "Monotypic stands are produced due to new plants growing out vegetatively from each branch."
607	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Minimum generative time (years)? 3+] "First flowering occurs 3-4 years after germination."
701	2011. CAB International. Invasive species compendium [online encyclopedia] - Datasheets > <i>Nypa fruticans</i> (nipa palm). <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144</a>	[Propagules likely to be dispersed unintentionally? No. Unintentionally spread by water. See 7.05] "There are two principal modes of spread. The first and more important is movement of water via ocean current and tide; the other is by humans carrying the fruits. Tidal movement has been largely responsible for the infestation of inland rivers and creeks in the Niger Delta, Nigeria. Tidal movements transport the fruits to the near-shore whereas the longshore current moves the fruits generally westwards."
702	1972. Uhl, N.W.. Inflorescence and Flower Structure in <i>Nypa fruticans</i> (Palmae). American Journal of Botany. 59(7): 729-743.	[Propagules dispersed intentionally by people? Yes] "Locally it is of considerable economic importance, providing a source of fiber, thatch, salt, an edible gelatinous endosperm, wine, and paper (Corner, 1966; Tomlinson, 1961, 1971b)."
702	2003. Riffle, R.L./Craft, P.. An encyclopedia of cultivated palms. Timber Press, Portland, OR.	[Propagules dispersed intentionally by people? Yes] "This is a fantastic and fantastic-looking species with a tropical but wild and primitive demeanor." [Ornamental uses]
703	2010. Dowe, J.L.. Australian Palms: Biogeography, Ecology and Systematics. Csiro Publishing, Collingwood, Australia	[Propagules likely to disperse as a produce contaminant? No] "Fruit obovoid to wedge-shaped, 80-150 mm long, 20-90 mm wide, smooth, deeply grooved; epicarp to c. 1 mm thick, dark brown; mesocarp to 20 mm thick, fibrous; endocarp to 2 mm thick, hard. Seed broadly ovoid, 40-70 mm long, 40-50 mm wide." [Highly unlikely that large fruit and seeds could be inadvertently dispersed]
704	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules adapted to wind dispersal? No] "After maturing, <i>N. fruticans</i> fruit are usually pushed off from the infructescence by the developing plumule. They float on tidal water and start growing on suitable substrate. The radicle is probably aborted and the first root that appears is likely to be the first adventitious root. The seedling is prostrate first, but after being attached to the substrate, the plumule becomes erect and additional adventitious roots arise from the lower part of the stem."

705	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules water dispersed? Yes] "After maturing, <i>N. fruticans</i> fruit are usually pushed off from the infructescence by the developing plumule. They float on tidal water and start growing on suitable substrate. The radicle is probably aborted and the first root that appears is likely to be the first adventitious root. The seedling is prostrate first, but after being attached to the substrate, the plumule becomes erect and additional adventitious roots arise from the lower part of the stem."
706	2011. CAB International. Invasive species compendium [online encyclopedia] - Datasheets > <i>Nypa fruticans</i> (nipa palm). <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144</a>	[Propagules bird dispersed? No] "There are two principal modes of spread. The first and more important is movement of water via ocean current and tide; the other is by humans carrying the fruits. Tidal movement has been largely responsible for the infestation of inland rivers and creeks in the Niger Delta, Nigeria. Tidal movements transport the fruits to the near-shore whereas the longshore current moves the fruits generally westwards."
707	2012. IUCN SSC Invasive Species Specialist Group. Invasive Species of the Week - <i>Nypa fruticans</i> Wurmb.. <a href="http://www.issg.org/pdf/inv_of_week/nypfru.pdf">http://www.issg.org/pdf/inv_of_week/nypfru.pdf</a>	[Propagules dispersed by other animals (externally)? No] "There are two principal modes of spread. The first and more important is movement of water via ocean current and tide; the other is by humans carrying the fruits. Tidal movement has been largely responsible for the infestation of inland rivers and creeks in the Niger Delta, Nigeria. Tidal movements transport the fruits to the near-shore whereas the longshore current moves the fruits generally westwards." [No evidence, and no means of external attachment]
708	2010. Dowe, J.L.. Australian Palms: Biogeography, Ecology and Systematics. Csiro Publishing, Collingwood, Australia	[Propagules survive passage through the gut? Unknown] "Fruit obovoid to wedge-shaped, 80-150 mm long, 20-90 mm wide, smooth, deeply grooved; epicarp to c. 1 mm thick, dark brown; mesocarp to 20 mm thick, fibrous; endocarp to 2 mm thick, hard. Seed broadly ovoid, 40-70 mm long, 40-50 mm wide." [No evidence that fruit or seeds are adapted for internal dispersal by animals]
801	2010. Dowe, J.L.. Australian Palms: Biogeography, Ecology and Systematics. Csiro Publishing, Collingwood, Australia	[Prolific seed production (>1000/m <sup>2</sup> )? Unknown] "Occurring in dense monospecific colonial populations in estuarine locations with moderate tidal parameters in anaerobic alluvial mud, at 0-5 m asl." ... "Fruit obovoid to wedge-shaped, 80-150 mm long, 20-90 mm wide, smooth, deeply grooved; epicarp to c. 1 mm thick, dark brown; mesocarp to 20 mm thick, fibrous; endocarp to 2 mm thick, hard. Seed broadly ovoid, 40-70 mm long, 40-50 mm wide." [Unlikely, given large fruit and seed size, but high densities of plants may produce high seed densities]
802	2003. Das, S./Ghose, M.. Seed Structure and Germination Pattern of Some Indian Mangroves with Taxonomic Relevance. <i>Taiwania</i> . 48(4): 287-298.	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "In <i>Aegialitis rotundifolia</i> , <i>Aegiceras corniculatum</i> , <i>Avicennia</i> spp. and <i>Nypa fruticans</i> propagation occurs by mature fruits and there is hardly any seed dormancy period after fertilization."
802	2008. Royal Botanic Gardens Kew. Seed Information Database (SID). Version 7.1. <a href="http://data.kew.org/sid/">http://data.kew.org/sid/</a>	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "Storage Conditions: Leon (1961) classified this genus in the short-lived seed class."
803	2011. CAB International. Invasive species compendium [online encyclopedia] - Datasheets > <i>Nypa fruticans</i> (nipa palm). <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144</a>	[Well controlled by herbicides? Unknown] "Chemical control has not been attempted in Nigeria but some local people have reported limited success when the plant is treated with used engine oil. This is hardly recommended in view of the potential polluting effects." [May be difficult to control due to proximity to water sources]
804	2011. CAB International. Invasive species compendium [online encyclopedia] - Datasheets > <i>Nypa fruticans</i> (nipa palm). <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144</a>	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes. Requires repeated cutting to control mechanically] "Mechanical Control Mechanical control involving repeated (three passes) cutting has been successful in the Niger Delta, Nigeria. Plant fronds are cut back three times. The recommended period between each cutting, to assure maximum effectiveness, is 6 weeks. In highly inaccessible locations, the cutting interval may be extended to an absolute maximum of 3 months; beyond this the plants will recover. The equipment used is a regular machete; chainsaws were also used but the increase in operational costs was not justified."
805	2011. CAB International. Invasive species compendium [online encyclopedia] - Datasheets > <i>Nypa fruticans</i> (nipa palm). <a href="http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144">http://www.cabi.org/isc/?compid=5&amp;dsid=36772&amp;oadmodule=datasheet&amp;page=481&amp;site=144</a>	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown] "There are no known natural enemies in the West African (Nigerian) population. No biological control has been attempted in West Africa." [Unknown for Hawaiian Islands. Possible that natural pests of palms may impact this species]