UF | IFAS UNIVERSITY of FLORIDA

Assessment of Non-native Plants in Florida's Natural Areas

assessment.ifas.ufl.edu

Assessment date 19 June 2017

	Jatropha gossypiifolia **ALL ZONES**	**Answer**	**Score**
1.01	Is the species highly domesticated?	n	0
1.02	Has the species become naturalised where grown?		
1.03	Does the species have weedy races?		
2.01	Species suited to Florida's USDA climate zones (0-low; 1-intermediate; 2-high) North Zone: suited to Zones 8, 9 Central Zone: suited to Zones 9, 10 South Zone: suited to Zone 10	2	
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	2	
2.03	Broad climate suitability (environmental versatility)	y	1
2.04	Native or naturalized in habitats with periodic inundation North Zone: mean annual precipitation 50-70 inches Central Zone: mean annual precipitation 40-60 inches South Zone: mean annual precipitation 40-60 inches	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	2
3.02	Garden/amenity/disturbance weed	y	2
3.03	Weed of agriculture	unk	
3.04	Environmental weed	y	4
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	unk	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	y	1
4.05	Toxic to animals	y	1
4.06	Host for recognised pests and pathogens	y	1
4.07	Causes allergies or is otherwise toxic to humans	y	1
4.08	Creates a fire hazard in natural ecosystems	n	0
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils). North & Central Zones: infertile soils; South Zone: shallow limerock or Histisols.	unk	0
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets	y	1
5.01	Aquatic	n	0
5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte	n	0

6.01	Evidence of substantial reproductive failure in native habitat	n	0
6.02	Produces viable seed	y	1
6.03	Hybridizes naturally	unk	-1
6.04	Self-compatible or apomictic	y	1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	y	1
6.07	Minimum generative time (years)	2	0
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y	1
7.02	Propagules dispersed intentionally by people	y	1
7.03	Propagules likely to disperse as a produce contaminant	unk	-1
7.04	Propagules adapted to wind dispersal	unk	-1
7.05	Propagules water dispersed	y	1
7.06	Propagules bird dispersed	y	1
7.07	Propagules dispersed by other animals (externally)	y	1
7.08	Propagules dispersed by other animals (internally)	unk	-1
8.01	Prolific seed production	y	1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	y	1
8.03	Well controlled by herbicides	unk	1
8.04	Tolerates, or benefits from, mutilation or cultivation	y	1
8.05		?	
	Total Score	**25**	
	Implemented Pacific Second Screening	**no**	
	Risk Assessment Results	**High**	

section	# questions answered	satisfy minimum?
A	10	yes
B	10	yes
C	18	yes
total	38	yes

	Reference	Source data
1.01		Cultivated, but no evidence of selection for reduced weediness
1.02		Skip to 2.01
1.03		Skip to 2.01
2.01	1. Global Plant Hardiness Zones for Phytosanitary Risk Analysis. http://naldc.nal.usda.gov/download/36586/PDF (Accessed: 12 June 2017) 2. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 3. USDA National Plant Germplasm System. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?20696 (Accessed: 12 June 2017) 4. Brisbane City Council. Weed Identification Tool. http://weeds.brisbane.qld.gov.au/weeds/bellyache-bush (Accessed: 12 June 2017) 5. Dave's Garden. http://davesgarden.com/guides/pf/go/32205/#b (Accessed: 12 June 2017)	1. Figure 3. Florida North Zone: Hardiness zones 8 and 9. Central Zone: Hardiness zones 9 and 10. South Zone: Hardiness zone 10. 2. "The species is native to Mexico, South America, Gujarat State India and the Caribbean islands." 3. Native to Mexico, Brazil, Antigua and Barbuda, Bahamas, Cuba, Dominica, Dominican Republic, Guadeloupe, Haiti, Jamaica, Puerto Rico, St. Kitts and Nevis, St. Lucia, Trinidad and Tobago, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Guyana, Venezuela, Paraguay, Bolivia, Colombia, Ecuador, and Peru. 4. "Native to Mexico, the Caribbean, Central America and tropical South America." 5. USDA Zones 8-11
2.02		Native range is well known.
2.03	1. The University of Melbourne. Köppen-Geiger Climate Map of the Wolrd. http://people.eng.unimelb.edu.au/mpeel/koppen.html (Accessed: 12 June 2017) 2. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 3. USDA National Plant Germplasm System. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?20696 (Accessed: 12 June 2017) 4. Brisbane City Council. Weed Identification Tool. http://weeds.brisbane.qld.gov.au/weeds/bellyache-bush (Accessed: 12 June 2017)	1. Native or naturalized to Köppen-Geiger Climate Zones: Af, Am, Aw, BWh, BSh, BSk, Cwa, Cwb, and Cfa. 2. "The species is native to Mexico, South America, Gujarat State India and the Caribbean islands." 3. Native to Mexico, Brazil, Antigua and Barbuda, Bahamas, Cuba, Dominica, Dominican Republic, Guadeloupe, Haiti, Jamaica, Puerto Rico, St. Kitts and Nevis, St. Lucia, Trinidad and Tobago, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Guyana, Venezuela, Paraguay, Bolivia, Colombia, Ecuador, and Peru. 4. "Native to Mexico, the Caribbean, Central America and tropical South America."
2.04	1. Climate Charts. World Climate Maps. http://www.climate-charts.com/World-Climate-Maps.html#rain (Accessed: 12 June 2017) 2. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 3. USDA National Plant Germplasm System. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?20696 (Accessed: 12 June 2017) 4. Brisbane City Council. Weed Identification Tool. http://weeds.brisbane.qld.gov.au/weeds/bellyache-bush (Accessed: 12 June 2017)	1. Native and naturalized in areas with rainfall within these ranges. 2. "The species is native to Mexico, South America, Gujarat State India and the Caribbean islands." 3. Native to Mexico, Brazil, Antigua and Barbuda, Bahamas, Cuba, Dominica, Dominican Republic, Guadeloupe, Haiti, Jamaica, Puerto Rico, St. Kitts and Nevis, St. Lucia, Trinidad and Tobago, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Guyana, Venezuela, Paraguay, Bolivia, Colombia, Ecuador, and Peru. 4. "Native to Mexico, the Caribbean, Central America and tropical South America."

2.05	1. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 2. Flora of North America. http://efloras.org/florataxon.aspx?flora_id=1&taxon_id=242427780 (Accessed:12 June 2017) 3. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "It is a declared noxious weed in Puerto Rico and is naturalised in northern Australia, including Queensland where it is listed as a Class 2 declared pest plant." 2. "introduced; Fla.; Mexico; West Indies; Central America; South America; introduced also in Asia, Africa, Pacific Islands, Australia." 3. "Bellyache bush is native to Central America. Its exact origin is uncertain, but possibly centres on the drier islands of the Caribbean and the Venezuelan coast. It has been introduced as an ornamental and medicinal plant to many other tropical countries where it has since become naturalised. The species' current range includes Australia, Africa, Asia and North and South America. Genetic studies suggest that there have been multiple introductions of bellyache bush into Australia from several different countries."
3.01	1. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 2. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 3. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "It is a declared noxious weed in Puerto Rico and is naturalised in northern Australia, including Queensland where it is listed as a Class 2 declared pest plant." 2. " It has escaped and become naturalised in various areas of north Queensland." 3. "Bellyache bush is native to Central America. Its exact origin is uncertain, but possibly centres on the drier islands of the Caribbean and the Venezuelan coast. It has been introduced as an ornamental and medicinal plant to many other tropical countries where it has since become naturalised. The species' current range includes Australia, Africa, Asia and North and South America. Genetic studies suggest that there have been multiple introductions of bellyache bush into Australia from several different countries."
3.02	1. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 2. Business Queensland. https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/bellyache-bush (Accessed: 12 June 2017) 3. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 4. Global Compendium of Weeds. http://www.hear.org/gcw/species/jatropha_gossypiifolia/ (Accessed: 12 June 2017)	1. "It is a declared noxious weed in Puerto Rico and is naturalised in northern Australia, including Queensland where it is listed as a Class 2 declared pest plant." 2. "Common along riverbanks and roadways, and in grasslands and open woodland." 3. "Although infestations often begin in riparian habitats, bellyache bush will expand onto nonalluvial soils and grow in upland areas. Bellyache bush is an opportunistic weed that thrives in disturbed areas. It will readily colonise areas of bare soil or where natural vegetation has been disturbed. It is often found in places such as mine sites, abandoned homesteads, refuse tips, roadsides and overgrazed pastures. The combined effect of drought and overgrazing can give bellyache bush an opportunity to invade." 4. Classified as a weed and noxious weed

3.03	1. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 2. Global Compendium of Weeds. http://www.hear.org/gcw/species/jatropha_gossypiifolia/ (Accessed: 12 June 2017) 3. Labradal, R., Caseley, J. C. and Parker, C. (1994). Weed Management for Developing Countries, FAO, Rome. (Accessed: 13 June 2017)	1. "The spread of bellyache bush can cause significant loss of productive grazing land, as the plant forms dense thickets where little grass can grow. As it is unpalatable to stock, it can proliferate at the expense of valuable pasture species. Productive river frontages and flats are often most at risk of invasion. Bellyache bush is also highly toxic to animals and can have a direct economic impact on the pastoral industry through poisoning of livestock. Ingesting any part of the bellyache bush plant can cause gastrointestinal irritation and is potentially fatal. Cattle, horse and goat deaths have been reported in Queensland and the Northern Territory. Livestock tend to eat bellyache bush only during times of drought, when pasture is scarce and of low quality. They may also accidentally ingest seeds and dry leaves off the ground when trying to eat sparse dry grass or leaf litter. The branched nature and sticky leaves mean that both animals and people find dense infestations difficult to penetrate. Mustering costs can be increased and fence lines obscured. Access to land for recreational activities, tourism and other uses may also be restricted." 2. Classified as an agricultural weed. 3. The leaves, seeds and stems contain growth inhibitors, which have been found to be allelopathic to crops. Phenolics, alkaloids and amino acids produced by bellyache bush are the main allelochemicals which are very toxic for crop growth.
3.04	1. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 2. Queensland Government. https://web.archive.org/web/20121112051408/http://www.daff.qld.gov.au/4790_7151.htm (Accessed: 12 June 2017) 3. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 4. Global Compendium of Weeds. http://www.hear.org/gcw/species/jatropha_gossypiifolia/ (Accessed: 12 June 2017)	1. "It is a declared noxious weed in Puerto Rico and is naturalised in northern Australia, including Queensland where it is listed as a Class 2 declared pest plant." 2. "It is generally acknowledged that the shallow root system and canopy cover of bellyache bush precludes growth of other plants, often outcompeting native vegetation and reducing pasture growth. Dense infestations may occur on river flats and other areas of good loamy soil. Bellyache bush has taken over extensive sections of river frontage in several locations, reducing biodiversity and increasing mustering costs." 3. "Bellyache bush forms monocultures—large pure stands with little other vegetation. The shallow root system and dense canopy allow very few understorey plants to grow. It is difficult for new tree seedlings to establish and grow through the bellyache bush. Consequently, once mature trees in an infested area die, they will not be replaced. This causes a loss of biodiversity and reduces habitat available for native wildlife." 4. Classified as an environmental weed.

3.05	1. Global Compendium of Weeds. http://www.hear.org/gcw/scientificnames/scinamej.htm (Accessed: 12 June 2017) 2. Queensland Government. https://keyserver.lucidcentral.org/weeds/data/media/Html/jatropha_curcas.htm (Accessed: 13 June 2017)	1. Jatropha angustifolia classified as an agricultural weed; Jatropha curcas classified as an agricultural weed, environmental weed, and noxious weed; Jatropha messinica classified as an agricultral weed; Jatropha podagrica classified as an environmental weed; and Jatropha urens classified as an environmental weed 2. "Physic nut (Jatropha curcas) is not a particularly aggressive weed, and tends to spread relatively slowly. However, it is drought resistant and will grow under a wide range of climatic and soil conditions. It is regarded as an environmental weed or potential environmental weed in many parts of northern Australia. Plants are usually found in disturbed areas, especially around abandoned homesteads and mines. Physic nut (Jatropha curcas) competes with native species or pasture plants can eventually form dense thickets or colonies. If it is allowed to establish widespread populations over time, it may threaten some of Australia's rangeland communities. For example, it is regarded as posing a threat to biodiversity in the Einasleigh and Desert Uplands bioregion in inland northern Queensland."
4.01	1. Singapore Government. Nparks Flora & Fauna Web. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2975 (Accessed: 12 June 2017) 2. Flora of North America. http://efloras.org/florataxon.aspx?flora_id=1&taxon_id=242427780 (Accessed: 12 June 2017) 3. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017)	No description of these characteristics
4.02	1. Csurhes SM, 1999. Bellyache bush (Jatropha gossypiifolia) in Queensland. Pest status review series - land protection. Bellyache bush (Jatropha gossypiifolia) in Queensland. Pest status review series - land protection. Brisbane: Queensland Department of Natural Resources, unpaginated. (Accessed: 13 June 2017) 2. Labradal, R., Caseley, J. C. and Parker, C. (1994). Weed Management for Developing Countries, FAO, Rome. (Accessed: 13 June 2017)	1. Because of its dense canopy, shallow root system and allelopathic qualities, J. gossypiifolia invasion results in a loss of biodiversity, wildlife habitat, changed fire regimes, increased soil erosion and destabilization of creek and river banks. 2. The leaves, seeds and stems contain growth inhibitors, which have been found to be allelopathic to crops. Phenolics, alkaloids and amino acids produced by bellyache bush are the main allelochemicals which are very toxic for crop growth.
4.03		No evidence
4.04	1. Dave's Garden. http://davesgarden.com/guides/pf/go/32205/#b (Accessed: 12 June 2017) 2. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 3. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Seed is poisonous if ingested, All parts of plant are poisonous if ingested" 2. "A healthy pasture consisting of large numbers of perennial grasses can effectively inhibit or increase time for an infestation to develop. Pasture management to maintain ground cover post treatment significantly reduces seedlings survival through competition." 3. "The spread of bellyache bush can cause significant loss of productive grazing land, as the plant forms dense thickets where little grass can grow. As it is unpalatable to stock, it can proliferate at the expense of valuable pasture species."

4.05	1. Dave's Garden. http://davesgarden.com/guides/pf/go/32205/#b (Accessed: 12 June 2017) 2. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 3. USDA National Plant Germplasm System. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?20696 (Accessed: 12 June 2017) 4. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 5. Business Queensland. https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/bellyache-bush (Accessed: 12 June 2017)	1. "Seed is poisonous if ingested, All parts of plant are poisonous if ingested" 2. "These are followed by cherry-sized seed pods that are poisonous." 3. "Vertabrate poisons: mammals" 4. "The fruits of bellyache bush are poisonous to humans and animals. The toxic substance is a toxalbumin which, when eaten, leads to symptoms of gastroenteritis and the eventual death of some animals. There have been many stock deaths reported due to bellyache bush poisoning, mainly in times of severe drought." 5. "Its fruit is poisonous to animals, and bellyache bush has caused many stock deaths. All parts of the bush are poisonous to humans."
4.06	1. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 2. J. Raghava ReddyA. Purnachandra Reddy. Current Microbiology. March 1980, 4:95. https://link.springer.com/article/10.1007%2FBF02602900 (Accessed: 12 June 2017)	1."Powdery mildew fungal disease was reported." 2. "A new powdery mildew species with unusual structural features, such as swollen bases of the conidiophores and fibrosin bodies in mature conidia, is proposed for inclusion in the genus Erysiphe. Erysiphe euphorbiae sp. nov. was found on the green leaves of Jatropha gossypifolia in India. The description of the new species, its novel structural features, and the symptoms it produced on the host plant are described."
4.07	1. Dave's Garden. http://davesgarden.com/guides/pf/go/32205/#b (Accessed: 12 June 2017) 2. Flora of Qatar. http://www.floraofqatar.com/jatropha_gossypiifolia.htm (Accessed: 12 June 2017) 3. USDA National Plant Germplasm System. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?20696 (Accessed: 12 June 2017) 4. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 5. Business Queensland. https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/bellyache-bush (Accessed: 12 June 2017)	1. "Seed is poisonous if ingested, All parts of plant are poisonous if ingested" 2. "These are followed by cherry-sized seed pods that are poisonous." 3. "Vertabrate poisons: mammals" 4. The fruits of bellyache bush are poisonous to humans and animals. The toxic substance is a toxalbumin which, when eaten, leads to symptoms of gastroenteritis and the eventual death of some animals. There have been many stock deaths reported due to bellyache bush poisoning, mainly in times of severe drought." 5. "Its fruit is poisonous to animals, and bellyache bush has caused many stock deaths. All parts of the bush are poisonous to humans."
4.08	1. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 2. Csurhes SM, 1999. Bellyache bush (Jatropha gossypiifolia) in Queensland. Pest status review series - land protection. Bellyache bush (Jatropha gossypiifolia) in Queensland. Pest status review series - land protection. Brisbane: Queensland Department of Natural Resources, unpaginated. (Accessed: 13 June 2017)	1. Dense infestations can significantly alter fire regimes. Bellyache bush monocultures suppress the development of a grass fuel load and consequently do not readily burn." 2. "Because of its dense canopy, shallow root system and allelopathic qualities, J. gossypiifolia invasion results in a loss of biodiversity, wildlife habitat, changed fire regimes, increased soil erosion and destabilization of creek and river banks.
4.09	1. Dave's Garden. http://davesgarden.com/guides/pf/go/32205/#b (Accessed: 12 June 2017) 2. Singapore Government. Nparks Flora & Fauna Web. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2975 (Accessed: 12 June 2017)	1. "Sun Exposure: Full Sun, Sun to Partial Shade, Light Shade" 2. "Light Preference : Full Sun"
4.10	1. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Bellyache bush appears to tolerate a broad range of soil types. It thrives on sandy loam soils associated with watercourses and also seems to tolerate saline soils, growing down to the high tide mark in some locations near Darwin (Northern Territory) and Wyndham (Western Australia). Plants have been observed growing out of rock crevices in road cuttings near the Burdekin Falls Dam (Queensland)."
4.11		

4.12	1. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 2. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 3. Savanna Explorer. http://www.savanna.org.au/nq/nq_shrub_forb.html (Accessed: 13 June 2017) 4. Singapore Government. Nparks Flora & Fauna Web. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2975 (Accessed: 12 June 2017) 5. USDA Plants Database. https://plants.usda.gov/core/profile?symbol=JAGO (Accessed: 12 June 2017) 6. Queensland Government Natural Resources and Mines. https://www.daf.qld.gov.au/__data/assets/pdf_file/0010/59338/IPA-BellyacheBush-PSA.pdf (Accessed: 13 June 2017) 7. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 13 June 2017)	1. "It is generally acknowledged that the shallow root system and canopy cover of bellyache bush precludes growth of other plants, often outcompeting native vegetation and reducing pasture growth. Dense infestations may occur on river flats and other areas of good loamy soil. Bellyache bush has taken over extensive sections of river frontage in several locations, reducing biodiversity and increasing mustering costs." 2. "Bellyache bush forms monocultures—large pure stands with little other vegetation. The shallow root system and dense canopy allow very few understorey plants to grow. It is difficult for new tree seedlings to establish and grow through the bellyache bush. Consequently, once mature trees in an infested area die, they will not be replaced. This causes a loss of biodiversity and reduces habitat available for native wildlife." 3. "Bellyache bush forms dense thickets which exclude native plants and wildlife" 4. "Growth Form: Upright growth habit, able to grow up to 1 - 4 m tall." 5. "Growth Habit: Forb/herb, Subshrub" 6. "Within riparian communities, pure stands of bellyache bush are expected to smother and replace certain native plant species and interfere with normal successional processes which follow sporadic disturbance events such as flooding." 7. "Bellyache bush forms monocultures—large pure stands with little other vegetation. The shallow root system and dense canopy allow very few understorey plants to grow. It is difficult for new tree seedlings to establish and grow through the bellyache bush. Consequently, once mature trees in an infested area die, they will not be replaced. This causes a loss of biodiversity and reduces habitat available for native wildlife."
5.01	1. Singapore Government. Nparks Flora & Fauna Web. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2975 (Accessed: 12 June 2017)	1 "Native Habitat : Terrestrial"
5.02	1. USDA Plants Database. https://plants.usda.gov/core/profile?symbol=JAGO (Accessed: 12 June 2017) 2. Business Queensland. https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/bellyache-bush (Accessed: 12 June 2017)	1. "Growth Habit: Forb/herb, Subshrub" 2. "squat, invasive shrub"
5.03	1. Singapore Government. Nparks Flora & Fauna Web. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2975 (Accessed: 12 June 2017) 2. USDA Plants Database. https://plants.usda.gov/core/profile?symbol=JAGO (Accessed: 12 June 2017)	1. "Plant Growth Form : Herbaceous Plant" 2. "Family: Euphorbiaceae"
5.04	1. Singapore Government. Nparks Flora & Fauna Web. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2975 (Accessed: 12 June 2017) 2. Flora of North America. http://efloras.org/florataxon.aspx?flora_id=1&taxon_id=242427780 (Accessed: 12 June 2017) 3. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017)	No evidence of these specialized structures
6.01		No evidence
6.02	1. Dave's Garden. http://davesgarden.com/guides/pf/go/32205/#b (Accessed: 12 June 2017) 2. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Propagation Methods: From seed" 2. "The fruit is dehiscent, ‘exploding’ when ripe and catapulting seeds up to 13 m from the plant."; reproduces by seed
6.03		No evidence

6.04	1. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 2. Dehgan B, Webster GL, 1979. Morphology and infragenic relationships of the genus Jatropha (Euphorbiaceae). Botany, 74:1-73. (Accessed: 13 June 2017) 3. Reddi, E. U. B. and Reddi, C. S. 1983. Pollination ecology of Jatropha gossypifolia (Euphorbiaceae). Proceedings, Indian Academy of Sciences (Plant Sciences) 92, 215-231. (Accessed: 13 June 2017)	1. "There are usually separate male and female flowers, although bisexual flowers are produced occasionally." 2. Pollination may occur through selfing, because the flowers are self-compatible 3. Bellyache bush is monoecious and its breeding system incorporates self and cross-pollination.
6.05	1. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 2. Reddi, E. U. B. and Reddi, C. S. 1983. Pollination ecology of Jatropha gossypifolia (Euphorbiaceae). Proceedings, Indian Academy of Sciences (Plant Sciences) 92, 215-231. (Accessed: 13 June 2017) 3. Wildlife of Saint Martin. http://www.sxmwildlife.com/24-hour-pollination/ (Accessed: 13 June 2017)	1. "The flowers produce large quantities of nectar to attract insects, which assists in pollination." 2. In India, 18 species of insects, including bees, wasps, flies and butterflies promote both self and cross pollination 3. "During the day, butterflies like the great southern white visit bellyache bush flowers for nectar, and at night, moths like the striped grass looper do the same."
6.06	1. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 2. Queensland Government. Weeds of Australia. https://keyserver.lucidcentral.org/weeds/data/media/Html/jatropha_gossypiifolia.htm (Accessed: 13 June 2017) 3. Pitt JL, Miller IL, 1991. The pest status and chemical control of Jatropha gossypiifolia L. in the Northern Territory, Australia. In: Proceedings of the 13th Asian-Pacific Weed Science Society, Jakarta. unpaginated. (Accessed: 13 June 2017)	1. "Bellyache bush has a sympodial growth habit, meaning it has multiple branches that can each continue to grrow even if the main stem has been damaged."; "Bellyache bush will also regenerate vegetatively from stem cuttings or from whole removed plants." 2. " This species reproduces mainly by seed, though suckers can also develop from its roots and crown." 3. J. gossypiifolia can readily regenerate from stem cuttings (e.g. dumped garden plant material)
6.07	1. Singapore Government. Nparks Flora & Fauna Web. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2975 (Accessed: 12 June 2017) 2. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 3. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1 "Lifespan (in Singapore) : Perennial" 2. "The plant flowers throughout the year when moisture is adequate. The seeds germinate during October to December." 3. "Plants typically begin producing seed in their second year. However, under ideal growing conditions, they can begin producing seed capsules in as little as 10 weeks from germination."
7.01	1. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 2. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Spread by fruit eating birds, water, livestock and by people on machinery and for use is an ornamental plant." 2. "Dumped garden material, plants dislodged by flooding or discarded plant parts from control activities can all regrow. Pulled or cut plants left lying on the soil surface are capable of reshooting or regrowing roots several months later. Discarded plant off-cuts have also been recorded producing viable seed up to 12 months after cutting, even without reattaching to the soil."; "Humans are deliberately or inadvertently responsible for long-distance dispersal. In the past, bellyache bush was deliberately transported as a garden plant. Dumped cuttings and garden material were probably the main source of early infestations. Seeds may also be accidentally transported as a contaminant of soil and sand or on vehicles and machinery."

7.02	1. Felix-Silva et al. Evidence-Based Complementary and Alternative Medicine Volume 2014 (2014). https://www.hindawi.com/journals/ecam/2014/369204/ (Accessed: 12 June 2017) 2. Singapore Government. Nparks Flora & Fauna Web. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2975 (Accessed: 12 June 2017) 3. Heavenly Products. https://www.heavenly-products.com/cart/product_info.php?products_id=1380 (Accessed: 12 June 2017) 4. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017)	1. "Jatropha gossypiifolia L. (Euphorbiaceae), widely known as “bellyache bush,” is a medicinal plant largely used throughout Africa and America. Several human and veterinary uses in traditional medicine are described for different parts and preparations based on this plant." 2. "Desirable Plant Features : Ornamental Flowers" 3. Available for purchase online in the US. 4. "Spread by fruit eating birds, water, livestock and by people on machinery and for use is an ornamental plant."
7.03		No evidence
7.04		No evidence
7.05	1. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 2. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Spread by fruit eating birds, water, livestock and by people on machinery and for use is an ornamental plant." 2. " Seeds and plants can be transported a considerable distance in floods. Once deposited along watercourses and floodplains they have an ideal growing environment."
7.06	1. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 2. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Spread by fruit eating birds, water, livestock and by people on machinery and for use is an ornamental plant." 2. " For example, the male great bower bird (Chlamydera nuchalis) may decorate its bower with fruits of bellyache bush and, in doing so, disperses the seeds."
7.07	1. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 2. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Spread by fruit eating birds, water, livestock and by people on machinery and for use is an ornamental plant." 2. " These growths are rich in fats and proteins and attract ants, which aid in local seed dispersal."; "Seeds may also be spread in mud, adhering to feral pigs, livestock or native animals."
7.08		No evidence, but unlikely because seeds are toxic to animals
8.01	1. Singapore Government. Nparks Flora & Fauna Web. https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2975 (Accessed: 12 June 2017) 2. Queensland Government. https://www.daf.qld.gov.au/__data/assets/pdf_file/0011/66737/IPA-Bellyache-Bush-PP45.pdf (Accessed: 12 June 2017) 3. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Fruit is a green oval capsule which contains 3 dark brown seeds." 2. "Seed pods are smooth and oval, about the size of a cherry and 12 mm across; they contain three to four seeds about 8 mm long." 3. "Bellyache bush plants are prolific seed producers. One adult plant can produce between 2000 and 12 000 seeds per year, depending on environmental conditions, plant biotype and the density of the infestation."

8.02	1. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 2. Queensland Government Natural Resources and Mines. https://www.daf.qld.gov.au/__data/assets/pdf_file/0010/59338/IPA-BellyacheBush-PSA.pdf (Accessed: 13 June 2017) 3. Bebawi FF, Vitelli JS, Campbell SD, Davis KM, 2007. Seed longevity of bellyache bush (Jatropha gossypiifolia L.) in North Queensland. In: Ecology and Management of Alien Plant Invasions, Proceedings of the 9th International Conference, 17-21 September 2007, Perth, Western Australia. 116. http://www.congresswest.com.au/emapi9 (Accessed: 13 June 2017)	1. "Seed bank studies indicate that most seed in the soil will expire within four years, although some may last six years or more under dry conditions. Mass seed germination usually occurs with the start of the wet season, but seedlings can emerge at any time of year if conditions are favourable."; See chart 2. "There is anecdotal evidence that a small proportion of seeds remain viable for 15 years." 3. In a seed burial trial comparing germination and viability of intact and ant dispersed seeds exposed to either nil (rainfall excluded) or natural rainfall, no intact seeds exhumed after four years remained viable under natural rainfall conditions, whereas some ant-discarded seeds were still viable (3%). However, both intact and ant-discarded seeds exhumed after four years were 20% viable when rain was excluded
8.03	1. Business Queensland. https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/bellyache-bush (Accessed: 12 June 2017) 2. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Herbicides are effective." 2. "Eradicating bellyache bush from an area requires commitment, as the plant can reach reproductive maturity quickly under favourable conditions and a small portion of the seed bank can persist for several years (refer to section 1.2 'Reproduction'). Nevertheless, researchers and land managers have proven that large, established infestations of bellyache bush can be controlled. Most effort is needed in the first couple of years to treat the initial infestation and subsequent seedling regrowth. Generally, the majority of seedlings will emerge during the first few wet seasons following control activities, with numbers declining rapidly thereafter."; "As with any method, follow-up control is vital. If a heavy infestation is sprayed, then ignored, it can actually worsen the problem."
8.04	1. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017) 2. Bebawi FF, Campbell SD, 2002. The response of bellyache bush (Jatropha gossypiifolia) plants cut off at different heights and seasonal times. Tropical Grasslands, 36(2):65-68. (Accessed: 13 June 2017)	1. "Bellyache bush will also regenerate vegetatively from stem cuttings or from whole removed plants. Dumped garden material, plants dislodged by flooding or discarded plant parts from control activities can all regrow. Pulled or cut plants left lying on the soil surface are capable of reshooting or regrowing roots several months later. Discarded plant off-cuts have also been recorded producing viable seed up to 12 months after cutting, even without reattaching to the soil." 2. In Australia, several landholders have found J. gossypiifolia plants reshooting several months after they were pulled and left lying on the ground. Similarly, during a simulated slashing trial most off-cuts of J. gossypiifolia (particularly those cut during the dry season) flowered and produced capsules with viable seed up to 12 months after being cut
8.05	1. Business Queensland. https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/weeds-diseases/invasive-plants/restricted/bellyache-bush (Accessed: 12 June 2017) 2. Australian Government. http://weeds.ala.org.au/WoNS/bellyachebush/docs/4620_Bellyache_bush_best_practice_manual_FINAL.pdf (Accessed: 12 June 2017)	1. "Jewel bug Agonosoma trilineatum was released as biological control but seems not to have established." 2. "Bellyache bush has been a target for biological control in Australia since 1996. The only agent so far released is the seed-feeding jewel bug Agonosoma trilineatum. Thousands of these insects were released across Queensland and the Northern Territory between 2003 and 2007. To date, the jewel bug is not known to be established in the field."