

Taxon: *Senna septemtrionalis* (Viv.) H. S. Irwin & Barneby

Family: Fabaceae

Common Name(s): arsenic bush
kolomona
smooth senna

Synonym(s): *Cassia elegans* Kunth
Cassia laevigata Willd.
Cassia septemtrionalis Viv.

Assessor: Chuck Chimera

Status: Assessor Approved

End Date: 20 Jun 2017

WRA Score: 17.0

Designation: H(HPWRA)

Rating: High Risk

Keywords: Tropical Shrub/Tree, Widely Naturalized, Environmental Weed, Light-Demanding, Seedbank

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
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		
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	y
405	Toxic to animals		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
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		
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant		
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		
604	Self-compatible or apomictic		
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	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed		
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	n

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence of domestication] "Native to Mexico, widely cultivated for ornament and medicinal use and widely naturalized"

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jun 2017]	"Native: Northern America Southern Mexico: Mexico - Chiapas, - Jalisco, - Michoacan, - Oaxaca, - Veracruz Southern America Central America: Costa Rica; Guatemala; Honduras; Nicaragua"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jun 2017]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Elevation range exceeds 1000 m, demonstrating environmental versatility] in Hawai'i cultivated and naturalized primarily at low elevations in dry, disturbed areas, but occasionally at higher elevations in pastures and even margins of wet forest, 150-1,160 m"

204	Native or naturalized in regions with tropical or subtropical climates	y
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Qsn #	Question	Answer
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jun 2017]	"Native: Northern America Southern Mexico: Mexico - Chiapas, - Jalisco, - Michoacan, - Oaxaca, - Veracruz Southern America Central America: Costa Rica; Guatemala; Honduras; Nicaragua"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2010. Flora of China. Vol. 10 (Fabaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Cultivated in Guangdong, Guangxi [native to tropical America; widely cultivated in the tropics]."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Mexico, widely cultivated for ornament and medicinal use and widely naturalized"

301	Naturalized beyond native range	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Mexico, widely cultivated for ornament and medicinal use and widely naturalized; in Hawai'i cultivated and naturalized primarily at low elevations in dry, disturbed areas, but occasionally at higher elevations in pastures and even margins of wet forest, 150-1,160 m, on Kaua'i, O'ahu, Moloka'i, and Maui. Escaped from cultivation as early as 1871 (Hillebrand, 1888)."

302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	BioNET-EAFRINE. 2011. <i>Senna septemtrionalis</i> (Smooth Senna). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Senna_septemtrionalis_(Smooth_Senna).htm . [Accessed 20 Jun 2017]	[Disturbance adapted environmental weed] "In the region, this species is naturalised at low elevations in dry, disturbed areas, but occasionally at higher elevations in pastures and even margins of wet forest. It is a common garden escape in Nairobi area. It has been recorded in Kenya in northern Kenya, Rift Valley, Nairobi, Western and Nyanza, Masai and Coast floral regions."

303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	BioNET-EAFRINE. 2011. <i>Senna septemtrionalis</i> (Smooth Senna). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Senna_septemtrionalis_(Smooth_Senna).htm . [Accessed 20 Jun 2017]	[Invades plantations] " <i>Senna septemtrionalis</i> is a common garden ornamental plant that also invades; forest margins, savanna, riverbanks, roadsides, waste ground and plantations."

304	Environmental weed	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Schmidt, E., Lötter, M. & McClelland, W. 2002. Trees and shrubs of Mpumalanga and Kruger National Park. Jacana Media, Johannesburg, South Africa	"Noxious weed native to America, but now naturalised and spreading widely along the escarpment and areas with high rainfall."
	CABI, 2017. Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"S. septemtrionalis is a leafy shrub or small tree which abundantly produces seeds that are easily dispersed by humans (machinery and vehicles), birds and animals, and by water (West, 2003). Once established in new areas, this species matures quickly, negatively impacting native flora. The species is listed in the Global Compendium of Weeds as an "agricultural weed, cultivation escape, environmental weed, garden thug, naturalized, weed" with records of occurrences in North and Central America, South America, Asia, Asia-Pacific, Africa, Australia, and Europe (Randall, 2012; DAISIE, 2014; USDA-ARS, 2014). It is considered invasive in Fiji, Australia, Ecuador, Hawaii, New Zealand, and a weed in South Africa and the United States (see Distribution Table; Randall, 2012; PIER, 2014). The species was given an Australian rating of 4, indicating it is "naturalised and known to be a major problem at 3 or fewer locations within a State or Territory" (Groves et al., 2003); according to the Global Compendium of Weeds, the species is indeed invasive in some parts of the country (Randall, 2012)." ... "Despite being widely cultivated as an ornamental as well as a shade and hedge plant and green manure for agroforestry purposes, S. septemtrionalis has been shown to have a negative impact on its local environment due to its rapid maturity rate, abundant seed production, long-lived seed bank, and multiple biotic and abiotic vectors for seed dispersal (West, 2003). The species was identified as the most widespread and difficult to remove invasive species on Raoul Island, New Zealand, and is considered an environmental and agricultural weed in the Global Compendium of Weeds (West, 2003; Randall, 2012). The seeds and other plant parts are also suspected to be mildly toxic to humans and grazing animals, but there is insufficient evidence to substantiate the claims; it is also possible that the negative health effects can be negated by cooking the pulses before eating (Sosef and Maesen, 1997; CANBR, 2014)."
	BioNET-EAFRINE. 2011. <i>Senna septemtrionalis</i> (Smooth Senna). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Senna_septemtrionalis_(Smooth_Senna).htm . [Accessed 20 Jun 2017]	" <i>Senna septemtrionalis</i> can invade forest margins, savanna, riverbanks, roadsides, waste ground and plantations where it can establish and suppress the regeneration of desirable species."
	Queensland Government. (2017). Weeds of Australia. <i>Senna septemtrionalis</i> . http://keyserver.lucidcentral.org . [Accessed 20 Jun 2017]	"Smooth senna (<i>Senna septemtrionalis</i>) is regarded as an environmental weed in Queensland and New South Wales."

305	Congeneric weed	Y
	Source(s)	Notes
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	<i>Senna alata</i> , <i>S. bicapsularis</i> , <i>S. didymobotrya</i> , <i>S. obtusifolia</i> [listed as significant weeds of natural areas]

Qsn #	Question	Answer
401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence] "Leafy shrubs or small trees 1-5(-6.5) m tall . Leaflets 3-4(5) pairs, the distal ones larger, broadly ovate to lanceolate, (3.5-) 4.5-10.5 cm long, (1.1-)1.4-3.5 cm wide, glabrous, lower surface pale, apex acuminate or caudate, base obliquely rounded or cuneate, petiolar nectaries between all pairs or all but the distal pair of leaflets, none contiguous to pulvinus, the lowest one 1-2 mm long, stipules submembranous, narrowly lanceolate, 3-7 mm long, caducous."

402	Allelopathic	
	Source(s)	Notes
	West, C. J. (1996). Assessment of the weed control programme on Raoul Island, Kermadec Group. Department of Conservation, Wellington, NZ	"However, it is possible that the parent plant may also leach chemicals into the soil which inhibit seed germination."

403	Parasitic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Leafy shrubs or small trees 1-5(-6.5) m tall." [Fabaceae. No evidence]

404	Unpalatable to grazing animals	y
	Source(s)	Notes
	Sosef, M.S.M. & van der Maesen, L.J.G., 1997. <i>Senna septemtrionalis</i> (Viv.) Irwin & Barneby[Internet] Record from Proseabase. Faridah Hanum, I & van der Maesen, L.J.G. (Editors). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia. http://www.proseanet.org . [Accessed 20 Jun 2017]	"Seed meal is used as fodder."
	CSIRO. 2010. Australian Tropical Rainforest Plants Edition 6 - <i>Senna septemtrionalis</i> . http://keys.trin.org.au/ . [Accessed 20 Jun 2017]	"This is an unpalatable species which has been suspected of toxicity but not confirmed; it is not toxic to rats in laboratory tests. Hacker (1990)."

405	Toxic to animals	
	Source(s)	Notes
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"The seeds and other plant parts are also suspected to be mildly toxic to humans and grazing animals, but there is insufficient evidence to substantiate the claims;"
	CSIRO. 2010. Australian Tropical Rainforest Plants Edition 6 - <i>Senna septemtrionalis</i> . http://keys.trin.org.au/ . [Accessed 20 Jun 2017]	"This is an unpalatable species which has been suspected of toxicity but not confirmed; it is not toxic to rats in laboratory tests. Hacker (1990)."

Qsn #	Question	Answer
406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Boa, E., & Lenne, J. M. (1994). Diseases of Nitrogen Fixing Trees in Developing Countries. Natural Resources Institute, Kent	<p><i>Senna septemtrionalis</i> (<i>Viv.</i>) Irwin & Barneby (syn. <i>Cassia floribunda</i>) <i>Cassia</i> Yellow Blotch Virus, leaf disease. Australia. Dale et al. (1984) <i>Cercosporidium cassiae</i>, leaf spot. Tanzania. Riley (1960) <i>Cladosporium asteromatoides</i>, green mould. South Africa. IMI (nd) <i>Macrophomina phaseolina</i>, black root rot. Tanzania and USA. Cibson (1975); Riley (1960) <i>Meloidogyne</i> sp., no symptom recorded. Brazil and USA. Lenne (1990b) <i>Meloidogyne javanica</i>, no symptom recorded. Brazil and USA. Lenne (1990b) <i>Oidium</i> Sp., powdery mildew. Australia; India; Pakistan. IMI (nd); Khan and Kamal (1968); Simmonds (1966) <i>Phaeoisariopsis simulata</i>, foliar disease. Africa (Tanzania); Caribbean; India; South America (Brazil, Colombia and widespread); South-East Asia; USA. Browne (1968); Cibson (1975); Lenne (1990a, 1990b) <i>Phaeoramularia occidentalis</i>, foliar disease. Africa (Tanzania); Caribbean; India; South America (Brazil, Colombia and widespread); South-East Asia; USA. Browne (1968); Gibson (1975); Lenn6 (1990a, 1990b) <i>Phanerochaete salmonicolor</i>, pink disease, with leaf and twig blight. Australia; Mauritius; Tanzania. Browne (1968); Gibson (1975); Lenn6 (1990a, 1990b); Orioux and Felix (1968); Riley (1960); Wiehe (1948) <i>Pseudocercospora nigricans</i>, foliar disease. Africa (Tanzania); Caribbean; India; South America (Brazil, Colombia and widespread); South-East Asia; USA. Browne (1968); Cibson (1975); Lenn6 (1990a, 1990b)</p>

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"(May be poisonous. A solution of fruit and roots taken as a purgative. A solution from leaves crushed and mixed with water taken after childbirth to help remove the placenta.)"

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	May add to fuel load in invaded habitat, but not reported to be highly flammable or significantly increase fire risk.
	CABI, 2017. Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	Not documented among negative impacts.

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes

Qsn #	Question	Answer
	West, C. J. (1996). Assessment of the weed control programme on Raoul Island, Kermadec Group. Department of Conservation, Wellington, NZ	"Like Mysore thorn, Brazilian buttercup is light-demanding and grows in light gaps in the forest or at the forest edge. When a mature bush is killed, hundreds of seedlings germinate in the space that the parent occupied (Crawley 1991b) (Figure 6). The greater part of this flush of germination is related to increased light levels once the parent canopy is removed."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	Soil reaction acid alkaline neutral Soil texture light medium

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Leafy shrubs or small trees 1-5(-6.5) m tall."

412	Forms dense thickets	
	Source(s)	Notes
	BioNET-EAFRINE. 2011. <i>Senna septemtrionalis</i> (Smooth Senna). http://keys.lucidcentral.org/keys/v3/eafriNET/weeds/key/weeds/Media/Html/Senna_septemtrionalis_(Smooth_Senna).htm . [Accessed 20 Jun 2017]	[Unknown. Excludes other plants] " <i>Senna septemtrionalis</i> can invade forest margins, savanna, riverbanks, roadsides, waste ground and plantations where it can establish and suppress the regeneration of desirable species."

501	Aquatic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "Leafy shrubs or small trees 1-5(-6.5) m tall. ... in Hawai'i cultivated and naturalized primarily at low elevations in dry, disturbed areas, but occasionally at higher elevations in pastures and even margins of wet forest, 150-1,160 m"

Qsn #	Question	Answer
502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jun 2017]	Family: Fabaceae (alt. Leguminosae) Subfamily: Caesalpinioideae Tribe: Cassieae Subtribe: Cassiinae

503	Nitrogen fixing woody plant	
	Source(s)	Notes
	Useful Tropical Plants Database. 2017. <i>Senna septemtrionalis</i> . http://tropical.theferns.info/viewtropical.php?id=Senna+septemtrionalis . [Accessed 20 Jun 2017]	"In addition to repeated intentional introduction and cultivation of the species across tropical and subtropical regions of the world for ornamental, agroforestry, and food purposes, <i>S. septemtrionalis</i> has also been shown to have escaped cultivation and been accidentally introduced to the wild (Sosef and Maesen, 1997; Kumar and Sane, 2003; Brummitt et al., 2007; Weeds of Australia, 2014)."

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Leafy shrubs or small trees 1-5(-6.5) m tall."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 20 Jun 2017]	[No evidence. Widespread distribution] Native: Northern America Southern Mexico: Mexico - Chiapas, - Jalisco, - Michoacan, - Oaxaca, - Veracruz Southern America Central America: Costa Rica; Guatemala; Honduras; Nicaragua Naturalized: . widely natzd. in tropics

Qsn #	Question	Answer
602	Produces viable seed	y
	Source(s)	Notes
	BioNET-EAFRINE. 2011. <i>Senna septemtrionalis</i> (Smooth Senna). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Senna_septemtrionalis_(Smooth_Senna).htm . [Accessed 20 Jun 2017]	"Reproduces by seed. This plant spreads by reseeding itself, but seeds may be contaminants of soil and in garden waste."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Seeds oriented with broad face to the septum, olive or brown, compressed-obovoid, 3.6- 4.9 mm long, constricted at the hilum, smooth or minutely pitted, without an areole."

603	Hybridizes naturally	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	Unknown

604	Self-compatible or apomictic	
	Source(s)	Notes
	Marazzi, B., & Endress, P. K. (2008). Patterns and development of floral asymmetry in <i>Senna</i> (Leguminosae, Cassiinae). <i>American Journal of Botany</i> , 95(1), 22-40	[Unknown] "In monomorphic enantiostylous taxa, such as <i>Senna</i> , the presence of both left and right floral morphs on the same plant and the observation that many of these plants are self-compatible indicate that geitonogamous self-pollination between different morphs is possible."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Flowers in racemes (1.5-)2.5-8 cm long, pedicels (12-)15-25 mm long, bracts submembranous, linear, lanceolate, or subulate, (1.5-)2-4.5 mm long, caducous as pedicels begin to elongate; calyx lobes yellowish green, yellowish brown, or completely yellow, the outer ones relatively firm, ovate-elliptic, 4-6.5 mm long, the inner ones submembranous, oblong-obovate or suborbicular, 6.5-10 mm long; petals bright yellow, the standard obovate to obovate-flabellate, deeply emarginate, the others obovate, the longest petal 12-16 mm long; staminodes 3, obovate or suborbicular, (1.7-)2-2.6 mm long; filaments of 4 median stamens 1.3-2.2 mm long, those of 2 abaxial stamens dilated, ribbon-like, 7- 10.5 mm long, that of abaxial central stamen 2-4 mm long.
	Roubik, D.W. 1995. Pollination of cultivated plants in the tropics. <i>FAO Services Bulletin</i> 118. FAO, Rome, Italy	Related taxa bee-pollinated

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes

Qsn #	Question	Answer
	BioNET-EAFRINE. 2011. <i>Senna septemtrionalis</i> (Smooth <i>Senna</i>). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Senna_septemtrionalis_(Smooth_Senna).htm . [Accessed 20 Jun 2017]	"Reproduces by seed. This plant spreads by reseeding itself, but seeds may be contaminants of soil and in garden waste."

607	Minimum generative time (years)	2
	Source(s)	Notes
	West, C. J. (1996). Assessment of the weed control programme on Raoul Island, Kermadec Group. Department of Conservation, Wellington, NZ	"The plants grow rapidly, and it is likely that plants in the forest which are two years old could flower and set seed (Sykes 1990). Flowering of plants is related to the amount of light received and can be a function of plant size. Plants do not flower in their first year, but those in high light environments could flower in the following year. In canopy gaps in the forest, plants are usually 2 m tall before they flower and set seed (Figure 7). As Uren (1995a) has observed "the life span of the Brazilian buttercup seems to be a short but fertile one"."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Queensland Government. (2017). Weeds of Australia. <i>Senna septemtrionalis</i> . http://keyserver.lucidcentral.org . [Accessed 20 Jun 2017]	"This plant reproduces mainly by seed, which are dispersed by water or in mud sticking to animals, humans, machinery and vehicles. They may also be spread as a contaminant of agricultural produce."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	CABI, 2017. Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"In addition to repeated intentional introduction and cultivation of the species across tropical and subtropical regions of the world for ornamental, agroforestry, and food purposes, <i>S. septemtrionalis</i> has also been shown to have escaped cultivation and been accidentally introduced to the wild (Sosef and Maesen, 1997; Kumar and Sane, 2003; Brummitt et al., 2007; Weeds of Australia, 2014)."

703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	Notes
	Queensland Government. (2017). Weeds of Australia. <i>Senna septemtrionalis</i> . http://keyserver.lucidcentral.org . [Accessed 20 Jun 2017]	"This plant reproduces mainly by seed, which are dispersed by water or in mud sticking to animals, humans, machinery and vehicles. They may also be spread as a contaminant of agricultural produce."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	West, C. J. (1996). Assessment of the weed control programme on Raoul Island, Kermadec Group. Department of Conservation, Wellington, NZ	"Most seed is dispersed only a short distance from the parent plant, by the explosive opening of the seed pod. "

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Pods ascending on a stiff pedicel, chartaceous, cylindrical or obtusely quadrangular, 6-10.5 cm long, 0.8-1.1 cm wide, cavity moderately pulpy, divided into 2 parallel rows of cells. Seeds oriented with broad face to the septum, olive or brown, compressed-obovoid, 3.6- 4.9 mm long, constricted at the hilum, smooth or minutely pitted, without an areole."

705	Propagules water dispersed	y
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Animals, Vehicles, Water, Escapee"
	Queensland Government. (2017). Weeds of Australia. <i>Senna septemtrionalis</i> . http://keyserver.lucidcentral.org . [Accessed 20 Jun 2017]	"This plant reproduces mainly by seed, which are dispersed by water or in mud sticking to animals, humans, machinery and vehicles. They may also be spread as a contaminant of agricultural produce."

706	Propagules bird dispersed	
	Source(s)	Notes
	West, C. J. (1996). Assessment of the weed control programme on Raoul Island, Kermadec Group. Department of Conservation, Wellington, NZ	"Most seed is dispersed only a short distance from the parent plant, by the explosive opening of the seed pod. However, some seeds are carried long distances, e.g., the isolated young plant on Mahoe ridge and the infestations on the Meyers. Sykes (1977a, 1984) has suggested that birds are responsible for the long-range dispersal which has happened." ... "Birds could have dispersed the seeds in mud attached to their feet or feathers, or possibly as ingested seed. The seed is not likely to be eaten by the major seed dispersing birds though, because it is dry and not attractive to the disperser. It is possible that seed destroyers, such as kakariki which live on the Meyers but are recorded visiting Raoul (Veitch 1994), could disperse intact seeds. However, humans as a dispersal agent of Brazilian buttercup cannot be ruled out."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Queensland Government. (2017). Weeds of Australia. <i>Senna septemtrionalis</i> . http://keyserver.lucidcentral.org . [Accessed 20 Jun 2017]	"This plant reproduces mainly by seed, which are dispersed by water or in mud sticking to animals, humans, machinery and vehicles. They may also be spread as a contaminant of agricultural produce."

Qsn #	Question	Answer
708	Propagules survive passage through the gut	
	Source(s)	Notes
	West, C. J. (1996). Assessment of the weed control programme on Raoul Island, Kermadec Group. Department of Conservation, Wellington, NZ	[Possibly] "Birds could have dispersed the seeds in mud attached to their feet or feathers, or possibly as ingested seed. The seed is not likely to be eaten by the major seed dispersing birds though, because it is dry and not attractive to the disperser. It is possible that seed destroyers, such as kakariki which live on the Meyers but are recorded visiting Raoul (Veitch 1994), could disperse intact seeds. However, humans as a dispersal agent of Brazilian buttercup cannot be ruled out."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	West, C. J. (1996). Assessment of the weed control programme on Raoul Island, Kermadec Group. Department of Conservation, Wellington, NZ	"Pods are clumped on the branches and seed production is prolific, e.g., Uren (1994) records that 2.5 kg of seed was taken from 11 mature flowering plants."
	CABI, 2017. Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Densities unknown] "S. septemtrionalis is a leafy shrub or small tree which abundantly produces seeds that are easily dispersed by humans (machinery and vehicles), birds and animals, and by water (West, 2003)."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	West, C. J. (1996). Assessment of the weed control programme on Raoul Island, Kermadec Group. Department of Conservation, Wellington, NZ	"The seeds will persist in the soil for a number of years (a characteristic of many legumes). Therefore, any light gaps formed in previously infested sites are likely to have abundant germination of Brazilian buttercup. Numbers of seed buried in the soil are likely to be greater downhill of infestations, and will decrease with increasing distance from infestations."

803	Well controlled by herbicides	y
	Source(s)	Notes
	West, C. J. (1996). Assessment of the weed control programme on Raoul Island, Kermadec Group. Department of Conservation, Wellington, NZ	"Brazilian buttercup is very susceptible to the Tordon group of sprays (Sykes 1980) and Crawley (1991b) established that Escort effectively killed Brazilian buttercup trees. In 1991–92, seedlings were hand-pulled and the larger plants were cut and the stumps sprayed with Escort from 500 ml bottles (Clark 1992). Currently, large plants are poisoned with Tordon 2G granules and adolescent and seedling plants are hand-pulled. Seed pods are removed from all fruiting trees and burnt back at the Hostel. Understorey vegetation is cleared in the vicinity of mature plants once they have been removed to encourage germination of seed in the soil."

Qsn #	Question	Answer
804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	WRA Specialist. 2017. Personal Communication	Unknown. Other Senna species resprout after cutting.

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Presumably No] "in Hawai'i cultivated and naturalized primarily at low elevations in dry, disturbed areas, but occasionally at higher elevations in pastures and even margins of wet forest, 150-1,160 m, on Kaua'i, O'ahu, Moloka'i, and Maui"

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Thrives in tropical climates
- Naturalized on main Hawaiian Islands and elsewhere
- Environmental weed in Australia & Africa, competing with desirable vegetation (impacts in Hawaii not as well documented)
- Other *Senna* species are invasive
- Reported to be unpalatable to animals (but seeds used in fodder)
- Unconfirmed reports of toxicity in seeds
- Tolerates many soil types
- Unclear whether this species is Nitrogen-fixing
- Reproduces by seeds
- Reaches maturity in 2 years
- Seeds dispersed by water, mud sticking to animals, humans, machinery, and vehicles and as a contaminant of agricultural produce
- Seeds form a persistent seed bank

Low Risk Traits

- Unarmed (no spines, thorns, or burrs)
- Seeds may provide fodder for livestock (palatable despite reports of toxicity)
- Light-demanding
- Not reported to spread vegetatively
- Herbicides provide effective control