Taxon: Asclepias tuberosa L. **Family:** Apocynaceae

Common Name(s): butterfly milkweed
butterfly weed
chieger-flower
pleurisy root

Synonym(s): Asclepias decumbens L.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 17 Jul 2017

WRA Score: 7.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Herbaceous Perennial, Monarch Butterfly Host, Unpalatable, Toxic, Wind-Dispersed

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)	Intermediate
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	n
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	?
301	Naturalized beyond native range		
302	Garden/amenity/disturbance weed		
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	y
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y
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		
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
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)		
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	y
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	No evidence of domestication

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"**	**Intermediate**
	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 17 Jul 2017]	"Native: Northern America Eastern Canada: Canada - Quebec, - Ontario North-Central U.S.A.: United States - Illinois, - Iowa, - Kansas, - Minnesota, - Missouri, - Oklahoma, - South Dakota, - Wisconsin Northeastern U.S.A.: United States - Indiana, - Maine, - Massachusetts, - Michigan, - New Hampshire, - New Jersey, - New York, - Ohio, - Pennsylvania, - Rhode Island, - Vermont, - West Virginia Northern Mexico: Mexico - Chihuahua, - Coahuila, - Nuevo Leon, - Sonora, - Tamaulipas Northwestern U.S.A.: United States - Colorado South-Central U.S.A.: United States - New Mexico, - Texas Southeastern U.S.A.: United States - Alabama, - Arkansas, - Delaware, - District of Columbia, - Florida, - Georgia, - Kentucky, - Louisiana, - Maryland, - Mississippi, - North Carolina, - South Carolina, - Virginia Southwestern U.S.A.: United States - Arizona, - California, - Utah"
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Preferred Climate/s: Dryland, Mediterranean, Subtropical"

Qsn #	Question	Answer
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 17 Jul 2017]	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Missouri Botanical Garden. 2017. Asclepias tuberosa. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b490. [Accessed 17 Jul 2017]	[Broad native range and can grow in 5+ hardiness zones] "Native Range: Eastern and southern United States Zone: 3 to 9 "

204	**Native or naturalized in regions with tropical or subtropical climates**	**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 17 Jul 2017]	"Native: Northern America Eastern Canada: Canada - Quebec, - Ontario North-Central U.S.A.: United States - Illinois, - Iowa, - Kansas, - Minnesota, - Missouri, - Oklahoma, - South Dakota, - Wisconsin Northeastern U.S.A.: United States - Indiana, - Maine, - Massachusetts, - Michigan, - New Hampshire, - New Jersey, - New York, - Ohio, - Pennsylvania, - Rhode Island, - Vermont, - West Virginia Northern Mexico: Mexico - Chihuahua, - Coahuila, - Nuevo Leon, - Sonora, - Tamaulipas Northwestern U.S.A.: United States - Colorado South-Central U.S.A.: United States - New Mexico, - Texas Southeastern U.S.A.: United States - Alabama, - Arkansas, - Delaware, - District of Columbia, - Florida, - Georgia, - Kentucky, - Louisiana, - Maryland, - Mississippi, - North Carolina, - South Carolina, - Virginia Southwestern U.S.A.: United States - Arizona, - California, - Utah"

205	**Does the species have a history of repeated introductions outside its natural range?**	**?**
	Source(s)	**Notes**
	Imada, C.T., Staples, G.W. & Herbst, D.R. 2005. Annotated Checklist of Cultivated Plants of Hawai'i. http://www2.bishopmuseum.org/HBS/botany/cultivatedplants/. [Accessed 17 Jul 2017]	Locations: Harold L. Lyon Arboretum
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Reported introduced into Chile

Qsn #	Question	Answer
301	**Naturalized beyond native range**	
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Unknown. Widespread native range. Cited as a weed or weedy, but unclear if naturalized outside native range] "References: Global-W-23, United States of America-W-161, United States of America- W-218, Canada-A-642, Canada-C-756, United States of America-W-967, United States of America-W-1104, Global-W- 1349, United States of America-A-87, Global-CD-1611, Canada-G-1855, Chile-I- 1872, New Zealand-Q-1879, New Zealand- Q-2086, Chile-W-1977."

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	"Butterfly milkweed increases by underground shoots and can be invasive." ... "At one time, milkweed was classified as a noxious weed due to reported toxic effects on livestock, and efforts were made to eradicate it. Milkweeds are thought to be poisonous to cows and sheep. Milkweed also can have invasive characteristics in disturbed areas."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Cited as a weed. Impacts unspecified] "References: Global-W-23, United States of America-W-161, United States of America- W-218, Canada-A-642, Canada-C-756, United States of America-W-967, United States of America-W-1104, Global-W- 1349, United States of America-A-87, Global-CD-1611, Canada-G-1855, Chile-I- 1872, New Zealand-Q-1879, New Zealand- Q-2086, Chile-W-1977."

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	[Potentially on livestock ranches] "Butterfly milkweed increases by underground shoots and can be invasive." ... "At one time, milkweed was classified as a noxious weed due to reported toxic effects on livestock, and efforts were made to eradicate it. Milkweeds are thought to be poisonous to cows and sheep. Milkweed also can have invasive characteristics in disturbed areas."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Holm, L.G., Doll, J., Holm, E., Pancho, J.V. & Herberger, J.P. 1997. World weeds: natural histories and distribution. John Wiley and Sons, Inc., New York, NY	"A. curassavica is a reported weed of 21 crops in nearly 50 countries ..., principally in the Americas and Asia. Its economic importance is greatest in pastures where it is reported as a serious or principal weed in Brazil, Central America, Ecuador, and Samoa; a common pasture weed in Australia, Dominican Republic, Hawaii, Jamaica, Nicaragua, and Surinam; and as an unranked weed of pastures in Colombia, Mexico, New Caledonia, New Guinea, and the Solomon Islands. It is a common weed of bananas, papaya, pineapple, sesame, sorghum, sugarcane, sweet potatoes, and vegetable in Honduras; cereals and orchards in Turkey; coconut in Trinidad; maize, rice, and sugarcane in Honduras and Mexico; and taro in Samoa."
	Wyatt, R., Stoneburner, A., Broyles, S. B., & Allison, J. R. (1993). Range extension southward in common milkweed, Asclepias syriaca L. Bulletin of the Torrey Botanical Club,120(2): 177-179	"As noted by Woodson (1954) in his monograph of the 108 North American species of Asclepias, "common milkweed" (A. syriaca L.) "is the preeminent weedy species of the northeastern United States." Primarily a plant of disturbed sites, it occurs in prairies, alluvial bottoms, pastures, fields, roadsides, and railways."
	Wyatt, R., & Broyles, S. B. (1997). The weedy tropical milkweeds Asclepias curassavica and A. fruticosa are self-compatible. Biotropica, 29(2): 232-234	"Belying their common name, most milkweeds (Asclepiadaceae) are, in fact, not weedy. Of the 105 species of Asclepias native to North America, only one, A. syriaca L., is a serious pest that aggressively invades disturbed sites (Wyatt et al. 1993)."

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	[No evidence] "Herbaceous perennials from a deep, woody rootstalk Stems usually stout and clustered from the crown, usually branching only at the inflorescence, 2-9 dm. tall, conspicuously hirsutulose or hispid generally. Leaves irregularly approximate, usually crowded, rather shortly petiolate, extremely variable, very narrowly lanceolate to very broadly oblanceolate, apex acuminate to rounded, base cuneate to broadly cordate, 3-11 cm. long, 0.3-3.0 cm. broad, firmly membranaceous and occasionally irregularly crisped-revolute, more or less conspicuously hirsutulose particularly beneath; petioles 1-5 mm. long,"

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. 2017. Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	**Notes**
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"Herbaceous perennials from a deep, woody rootstalk." [No evidence]

404	Unpalatable to grazing animals	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Wilbur, H. (1976). Life History Evolution in Seven Milkweeds of the Genus Asclepias. Journal of Ecology, 64 (1), 223-240	"Except for occasional browsing by deer, A. tuberosa is almost untouched by herbivores. It is the only species without milky sap but it does have steroidal glycosides (Punyarajun 1965)."

405	Toxic to animals	y
	Source(s)	**Notes**
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	"Caution: At one time, milkweed was classified as a noxious weed due to reported toxic effects on livestock, and efforts were made to eradicate it. Milkweeds are thought to be poisonous to cows and sheep. Milkweed also can have invasive characteristics in disturbed areas."

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Lady Bird Johnson Wildflower Center. 2017. Native Plant Database - Asclepias tuberosa. https://www.wildflower.org/plants/result.php?id_plant=astu. [Accessed 17 Jul 2017]	"Inevitably butterfly weed will get aphids; you can leave them for ladybugs to eat or spray the insects and foliage with soapy water. Aphids can also be removed by blasting the plant with a high pressure stream of water."
	Missouri Botanical Garden. 2017. Asclepias tuberosa. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b490. [Accessed 17 Jul 2017]	"No serious insect or disease problems. Crown rot can be a problem in wet, poorly drained soils. Susceptible to rust and leaf spot."

407	Causes allergies or is otherwise toxic to humans	y
	Source(s)	**Notes**
	Lady Bird Johnson Wildflower Center. 2017. Native Plant Database - Asclepias tuberosa. https://www.wildflower.org/plants/result.php?id_plant=astu. [Accessed 17 Jul 2017]	"Warning: POISONOUS PARTS: Roots, plant sap from all parts. Not edible. Toxic only if eaten in large quantities. Symptoms include vomiting, stupor, weakness, spasms. Toxic Principle: Resinoid, cardiac glycoside. (Poisonous Plants of N.C.) "
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Medicinal and toxic] "Able to produce dermatitis; caution is advised, as large doses of butterfly weed are emetic and purgative. Seeds boiled for diarrhea. Roots analgesic, vasodilator, antispasmodic, laxative, mildly cathartic, expectorant, antirheumatic, tonic, carminative, diaphoretic, for breasts, stomach and intestinal pains, for pleurisy, influenza, diarrhea, dysentery, for dog or coyote bites. Raw roots or infusion for rheumatism, heart, bronchial and pulmonary trouble, a remedy for sores, cuts and wounds; poultice of root used or decoction taken for bruises and swellings, skin ulcers. Poultice of bruised leaves bound to snakebites. Rites and ceremonies, ceremonial emetic."

Qsn #	Question	Answer
408	**Creates a fire hazard in natural ecosystems**	**n**
	Source(s)	**Notes**
	Idaho Firewise. 2013. Fire Resistance of Plants Master Database & Placement of Species Within Firewise Landscape Zones. http://idahofirewise.org/. [Accessed 17 Jul 2017]	Asclepias tuberosa rated as highly fire resistant

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	Wilbur, H. (1976). Life History Evolution in Seven Milkweeds of the Genus Asclepias. Journal of Ecology, 64 (1), 223-240	"A. tuberosa plants do not bloom in dense shade but plants in partial shade on the margins of woodlands are able to reproduce."
	Lady Bird Johnson Wildflower Center. 2017. Native Plant Database - Asclepias tuberosa. https://www.wildflower.org/plants/result.php?id_plant=astu. [Accessed 17 Jul 2017]	"Light Requirement: Sun"
	American Meadows. 2017. Butterfly Weed Seeds. http://www.americanmeadows.com/wildflower-seeds/wildflower-species/butterfly-weed-seeds. [Accessed 17 Jul 2017]	"Light Requirements: Full Sun" ... "Where to Plant: Milkweed does well in open areas with full sunlight exposure areas like fields, parks, cultivated gardens, roadsides, highway medians, and road sides."
	Missouri Botanical Garden. 2017. Asclepias tuberosa. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b490. [Accessed 17 Jul 2017]	"Sun: Full sun"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	"Butterfly milkweed grows on sandy, loamy, or rocky limestone soils of prairies, open woodlands, roadsides, and disturbed areas similar to other milkweed species."
	American Meadows. 2017. Butterfly Weed Seeds. http://www.americanmeadows.com/wildflower-seeds/wildflower-species/butterfly-weed-seeds. [Accessed 17 Jul 2017]	"Soil Type: Sandy Soil, Loamy Soil, Drought/Dry Soil"

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"Herbaceous perennials from a deep, woody rootstalk."

412	Forms dense thickets	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Wilbur, H. (1976). Life History Evolution in Seven Milkweeds of the Genus Asclepias. Journal of Ecology, 64 (1), 223-240	"A. tuberosa L. occurs as isolated individuals or colonies of up to several hundred individuals throughout the upland fields"
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"Asclepias tuberosa ssp. interior ... Prairies, glades, fields, thickets, and open woods" ... "Asclepias tuberosa ssp. terminalis ... Prairies, open oak and pine woods, canyons, stream sides and arroyos." [No evidence provided from native range]

501	Aquatic	n
	Source(s)	**Notes**
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	[Terrestrial] "Herbaceous perennials from a deep, woody rootstalk"

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 14 Jul 2017]	Family: Apocynaceae Subfamily: Asclepiadoideae Tribe: Asclepiadeae Subtribe: Asclepiadinae

503	Nitrogen fixing woody plant	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 14 Jul 2017]	Family: Apocynaceae Subfamily: Asclepiadoideae Tribe: Asclepiadeae Subtribe: Asclepiadinae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"Herbaceous perennials from a deep, woody rootstalk Stems usually stout and clustered from the crown, usually branching only at the inflorescence, 2-9 dm. tall, conspicuously hirsutulose or hispid generally."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 17 Jul 2017]	[No evidence. Widespread introduction] "Native: Northern America Eastern Canada: Canada - Quebec, - Ontario North-Central U.S.A.: United States - Illinois, - Iowa, - Kansas, - Minnesota, - Missouri, - Oklahoma, - South Dakota, - Wisconsin Northeastern U.S.A.: United States - Indiana, - Maine, - Massachusetts, - Michigan, - New Hampshire, - New Jersey, - New York, - Ohio, - Pennsylvania, - Rhode Island, - Vermont, - West Virginia Northern Mexico: Mexico - Chihuahua, - Coahuila, - Nuevo Leon, - Sonora, - Tamaulipas Northwestern U.S.A.: United States - Colorado South-Central U.S.A.: United States - New Mexico, - Texas Southeastern U.S.A.: United States - Alabama, - Arkansas, - Delaware, - District of Columbia, - Florida, - Georgia, - Kentucky, - Louisiana, - Maryland, - Mississippi, - North Carolina, - South Carolina, - Virginia Southwestern U.S.A.: United States - Arizona, - California, - Utah"
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	No evidence

602	Produces viable seed	y
	Source(s)	**Notes**
	Wyatt, R. (1976). Pollination and Fruit-Set in Asclepias: A Reappraisal. American Journal of Botany, 63(6), 845-851	"Experimental pollinations of Asclepias tuberosa L., the first for this species and second large- scale effort for the genus, reveal trends toward local population differentiation. The species possesses a low level of self-compatibility, the first documented report for the genus. Analysis of flowers visited by natural pollinators in populations across the eastern half of the United States demonstrated a linear relationship between pollinia removal and pollinia insertion. Clarifications in older literature regarding the specificity of the pollination mechanism, effective levels of pollination in natural populations, and the performance of experimental manipulations are made, and it is concluded that fruit-set in Asclepias is regulated by the interaction of both mechanical aspects of pollination and physiological aspects of fertilization and fruit development. A model incorporating these restraints is seen to predict fairly well the observed fruit to flower ratio of about 1:100 in natural populations."
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"Follicles erect on deflexed pedicels, narrowly fusiform, 8-15 cm. long, 1.0-1.5 cm. broad, smooth, pilosulose; seeds broadly oval, 5-7 mm. long, the white coma 3-4 cm. long"
	Missouri Botanical Garden. 2017. Asclepias tuberosa. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b490. [Accessed 17 Jul 2017]	"Plants are easily grown from seed, but are somewhat slow to establish and may take 2-3 years to produce flowers."

603	Hybridizes naturally	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"Interspecific hybrids, as has been discussed previously, are either unknown or of more or less sporadic occurrence. Geographically distinguished races of some definite morphological character which are connected by obvious dines of apparently heterozygous populations are classified as subspecies. The genocline is the distinguishing criterion. Here again the subspecies are of unequal morphological value. Such subspecies as those of A. incarnata and A. tuberosa, being of relatively "primitive" series, are distinguished upon chiefly vegetative characters, while others of more "advanced" series, such as A. cryptoceras and A. californica, are characterized by floral structures which might be considered as of specific value in the absence of evidence of a genocline."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Wyatt, R. (1976). Pollination and Fruit-Set in Asclepias: A Reappraisal. American Journal of Botany, 63(6), 845-851	"Experimental pollinations of Asclepias tuberosa L., the first for this species and second large- scale effort for the genus, reveal trends toward local population differentiation. The species possesses a low level of self-compatibility, the first documented report for the genus. Analysis of flowers visited by natural pollinators in populations across the eastern half of the United States demonstrated a linear relationship between pollinia removal and pollinia insertion. Clarifications in older literature regarding the specificity of the pollination mechanism, effective levels of pollination in natural populations, and the performance of experimental manipulations are made, and it is concluded that fruit-set in Asclepias is regulated by the interaction of both mechanical aspects of pollination and physiological aspects of fertilization and fruit development. A model incorporating these restraints is seen to predict fairly well the observed fruit to flower ratio of about 1:100 in natural populations." ... "The present data from experimental self-pollinations of A. tuberosa, however, indicate a low, but definite, level of self-com- patibility."
	Wyatt, R. (1981). The reproductive biology of Asclepias tuberosa. New Phytologist, 88(2), 375-385	"Individual flowers of the self-incompatible milkweed Asclepias tuberosa are available to pollinators for 7 or 8 days; however, there is a large overlap in flowering time (4 to 5 weeks) within and among inflorescences on a single plant and therefore the possibility of high levels of self-pollination." ... "The species is pollinated by large bees and wasps, less commonly by butterflies (Wyatt, 1977, 1978), and is largely self-incompatible (Wyatt, 1976)."
	Missouri Botanical Garden. 2017. Asclepias tuberosa. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b490. [Accessed 17 Jul 2017]	"Mature plants may freely self-seed in the landscape if seed pods are not removed prior to splitting open."

605	Requires specialist pollinators	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wyatt, R. (1976). Pollination and Fruit-Set in Asclepias: A Reappraisal. American Journal of Botany, 63(6), 845-851	"Field notes showed clearly that these populations were distinguished in having very large numbers of butterflies (primarily monarchs, swallowtails, and sulfurs) on the flowers and relatively few Hymenopterans (here chiefly honey- bees, bumblebees, and wasps) when compared with more eastern populations; it is possible that Hymenopterans serve as more effective pollinators of A. tuberosa than Lepidopterans."
	Wyatt, R. (1981). The reproductive biology of Asclepias tuberosa. New Phytologist, 88(2), 375-385	"The species is pollinated by large bees and wasps, less commonly by butterflies (Wyatt, 1977, 1978), and is largely self-incompatible (Wyatt, 1976)."

606	Reproduction by vegetative fragmentation	y
	Source(s)	**Notes**
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	"Butterfly milkweed increases by underground shoots and can be invasive. It is ideal in semi-dry places where it can spread without presenting problems for other ornamental species."

607	Minimum generative time (years)	2
	Source(s)	**Notes**
	Missouri Botanical Garden. 2017. Asclepias tuberosa. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b490. [Accessed 17 Jul 2017]	"Plants are easily grown from seed, but are somewhat slow to establish and may take 2-3 years to produce flowers."
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	[Cuttings may bloom in 1 year] "Butterfly milkweed is easily propagated by both seed and rhizome cuttings. Both seedlings and cuttings will usually bloom in their second year, although cuttings will occasionally bloom during their first year."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	**Notes**
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	"The numerous seeds each have a tuft of long white hairs at the tip." ... "Butterfly milkweed grows on sandy, loamy, or rocky limestone soils of prairies, open woodlands, roadsides, and disturbed areas similar to other milkweed species." [Unknown. Hairs may aid in external attachment and inadvertent dispersal]

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Missouri Botanical Garden. 2017. Asclepias tuberosa. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b490. [Accessed 17 Jul 2017]	[Cultivated for many uses] 'Butterfly gardens, meadows, prairies, or naturalized/native plant areas. Also effective in sunny borders. Whether massing plants in large drifts or sprinkling them throughout a prairie or meadow, butterfly weed is one of our showiest native wildflowers."

Qsn #	Question	Answer
	American Meadows. 2017. Butterfly Weed Seeds. http://www.americanmeadows.com/wildflower-seeds/wildflower-species/butterfly-weed-seeds. [Accessed 17 Jul 2017]	[Seeds sold online] "Butterfly Weed (Asclepias tuberosa) is one of our great North American native flowers with rich Indian and medicinal history. The brilliant orange blooms light up meadows dramatically, and of course, visits by butterflies are a bonus. This wildflower, also prized as a garden perennial, is not easy to grow, but once established, is a tough, dependable colormaker."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"Follicles erect on deflexed pedicels, narrowly fusiform, 8-15 cm. long, 1.0-1.5 cm. broad, smooth, pilosulose; seeds broadly oval, 5-7 mm. long, the white coma 3-4 cm. long" [No evidence. Seeds relatively large, & unlikely to be accidentally dispersed as a contaminant]

704	Propagules adapted to wind dispersal	y
	Source(s)	**Notes**
	Lady Bird Johnson Wildflower Center. 2017. Native Plant Database - Asclepias tuberosa. https://www.wildflower.org/plants/result.php?id_plant=astu. [Accessed 17 Jul 2017]	"A long pod is produced containing hundreds of seeds with tufts of long, silky hairs (an adaptation for wind dispersal)."
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"Follicles erect on deflexed pedicels, narrowly fusiform, 8-15 cm. long, 1.0-1.5 cm. broad, smooth, pilosulose; seeds broadly oval, 5-7 mm. long, the white coma 3-4 cm. long"

705	Propagules water dispersed	
	Source(s)	**Notes**
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"Follicles erect on deflexed pedicels, narrowly fusiform, 8-15 cm. long, 1.0-1.5 cm. broad, smooth, pilosulose; seeds broadly oval, 5-7 mm. long, the white coma 3-4 cm. long" [Buoyancy of seeds in water unknown, but related taxa may also be dispersed by water]
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	[Related taxa may be water dispersed] "Gomphocarpus fruticosus" ... "Major spread, however, is by seed, which is well adapted to dispersal by wind and water; and the fruit also floats on water."

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	"The seeds are wind dispersed, so be careful when gathering to place in a paper or burlap bag to avoid losing them."

707	Propagules dispersed by other animals (externally)	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Woodson, R. E. (1954). The North American species of Asclepias L. Annals of the Missouri Botanical Garden, 41 (1): 1-211	"seeds broadly oval, 5-7 mm. long, the white coma 3-4 cm. long." [Unknown. Coma may aid in attachment to fur]
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	[Related taxa may be dispersed externally. Unknown if A. tuberosa may be dispersed in a similar manner] "Gomphocarpus fruticosus ... "Further spread occurs when seeds, in mud, adhere to animal pelts, machinery and other vehicles."

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	Gordon, D. R., Mitterdorfer, B., Pheloung, P. C., Ansari, S., Buddenhagen, C., Chimera, C., ... & Williams, P. A. 2010). Guidance for addressing the Australian Weed Risk Assessment questions. Plant Protection Quarterly, 25(2): 56-74	"Answer 'no' where the taxon is unlikely to be eaten by animals or if seeds are not viable following passage through the gut."
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	"The seeds are wind dispersed..."

801	Prolific seed production (>1000/m2)	n
	Source(s)	**Notes**
	Wilbur, H. (1976). Life History Evolution in Seven Milkweeds of the Genus Asclepias. Journal of Ecology, 64 (1), 223-240	"A. tuberosa (widespread in old fields) is close to the preceding pair in the reproductive space (Table 4) and in the selective space (Table 7) except for its low number of seeds per pod and its extremely low annual mortality rate. This species also has a low probability of germination and seedling success, which is probably due to competition in the old- field community and the uncertainty of the physical environment. Woodson (1964) reports that seedlings suffer severe mortality during dry periods of their first year's growth. Once plants mature and establish their competitive position in the community they are virtually assured of a long reproductive life and they have a low reproductive output each year."

Qsn #	Question	Answer
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	Baskin, C.C. & Baskin, J.M. 2014. Seeds Ecology, Biogeography, and Evolution of Dormancy and Germination. Second Edition. Academic Press, San Francisco, CA	"A. tuberosa - PD" [Possesses Physiological Dormancy. Seeds with PD are water-permeable, and according to Nikolaeva (1969, 1977) they have a physiological inhibiting mechanism in the embryo that prevents radicle emergence.]
	American Meadows. 2017. Butterfly Weed Seeds. http://www.americanmeadows.com/wildflower-seeds/wildflower-species/butterfly-weed-seeds. [Accessed 17 Jul 2017]	"Is It Storable? Yes- You can store your seed in any cool (not freezing) dry place that is not subject to extreme temperature variations."
	Royal Botanic Gardens Kew. (2017) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 17 Jul 2017]	"Storage Behaviour: Orthodox Storage Conditions: Dry seeds (mc not reported) survive overnight in liquid nitrogen (Pence, 1991a)"

803	**Well controlled by herbicides**	
	Source(s)	**Notes**
	Egan, J. F., Graham, I. M., & Mortensen, D. A. (2014). A comparison of the herbicide tolerances of rare and common plants in an agricultural landscape. Environmental Toxicology and Chemistry, 33(3), 696-702	"Table 3. Effective dose (ED) values (g a.i. ha□1 for atrazine or g a.e. ha–1 for dicamba and glyphosate) for biomass 28 d after treatment calculated from dose–response curves for bioassay experiments in 2010 and 2011a" [Ascelpias tuberosa might be effectively controlled by these herbicides]

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	
	Source(s)	**Notes**
	Missouri Botanical Garden. 2017. Asclepias tuberosa. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b490. [Accessed 17 Jul 2017]	"Butterfly weed does not transplant well due to its deep taproot, and is probably best left undisturbed once established."
	USDA NRCS. 2006. Quaking Aspen - Butterfly Milkweed - Asclepias tuberosa. Plant Guide. https://plants.usda.gov/plantguide/pdf/cs_astu.pdf.. [Accessed 17 Jul 2017]	[Dead stalks burn. Unknown if live plants would tolerate fire or burning] "Both milkweed and dogbane are burned in the fall to eliminate dead stalks and stimulate new growth. Burning causes new growth to have taller, straighter stems (with longer fibers). It also stimulates flower and seed production."

Qsn #	Question	Answer
805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Schreiner, I. H., & Nafus, D. M. (1997). Butterflies of Micronesia. Agricultural Experiment Station, College of Agriculture and Life Sciences, University of Guam, Mangilao, Guam	[Possibly. Monarch butterfly also present in the Hawaiian Islands & feeds on A. tuberosa] "Danaus plexippus" ... "In Micronesia it feeds on Asclepias curassavica and crown flower, Caltropis gigantea. On Pacific islands this butterfly shows up soon after host plants arrive. In 1936, Swezey noted that the weed A. curassavica was very abundant on Guam, forming dense stands almost acres in extent, and the butterfly was also very abundant. Possibly the butterflies provided some control of the weed, as it now never forms dense stands. This butterfly is well known as a migratory species, capable of making flights of several thousand miles."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability (5+ hardiness zones, but primarily temperate)
• Possibly naturalized (unverified)
• Regarded as weedy in some circumstances
• Other Asclepias species are invasive
• Unpalatable to browsing & grazing animals
• Toxic to mammals and people
• Tolerates many soil types
• Reproduces by seeds & vegetatively by underground shoots
• Low levels of self-compatibility
• Reaches maturity in 2-3 years
• Seeds dispersed by wind & intentionally by people

Low Risk Traits
• Unarmed (no spines, thorns, or burrs)
• Provides food for monarch butterfly larvae
• Generally occurs in high light environments (might not be able to invade areas with dense shade)
• Low reproductive output reported from native range