Taxon: Wisteria sinensis (Sims) DC. **Family:** Fabaceae

Common Name(s): Chinese wisteria
Chinese-glycine
zi teng

Synonym(s): Glycine sinensis Sims
Kraunhia sinensis (Sims) Greene
Wisteria sinensis var. alba Lindl.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 17 Jan 2018

WRA Score: 9.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Liana, Environmental Weed, Toxic, Smothering, Spreads Vegetatively

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)	Low
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	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	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		
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		
409	Is a shade tolerant plant at some stage of its life cycle		

Qsn #	Question	Answer Option	Answer
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	y
412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	y
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	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	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	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	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	**Notes**
	Trusty, J. L., Lockaby, B. G., Zipperer, W. C., & Goertzen, L. R. (2008). Horticulture, hybrid cultivars and exotic plant invasion: a case study of Wisteria (Fabaceae). Botanical Journal of the Linnean Society, 158(4), 593-601	[Hybrid cultivars are naturalized and invasive. No evidence of domestication] "Exotic Wisteria species are highly favoured for their horticultural qualities and have been cultivated in North America since the early 1800s. This study determines the identity, genetic diversity and hybrid status of 25 Asian Wisteria cultivars using plastid, mitochondrial and nuclear DNA data. Fifteen (60%) hybrid cultivars were identified. All of the 'Wisteria sinensis' cultivars sampled are hybrids with W. floribunda. Although W. sinensis and W. floribunda are recognized invasive species in the southeastern USA, the relationships of horticultural cultivars to naturalized plants was previously unknown. Haplotype analysis of nuclear data identifies four haplotypes shared between cultivated stock and naturalized populations in the southeastern USA. In addition, US invasive haplotypes are present in New Zealand-derived cultivars although, to date, naturalized Wisteria has not been documented in New Zealand. Finally, these data are used to make recommendations to horticulturalists of select species cultivars which may be less likely to invade US landscapes."

102	Has the species become naturalized where grown?	
	Source(s)	**Notes**
	WRA Specialist. 2018. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	**Notes**
	WRA Specialist. 2018. 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"	Low
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 11 Jan 2018]	"Native: Asia-Temperate China: China - Henan, - Hebei, - Hubei, - Guizhou, - Shaanxi, - Yunnan, - Guangxi"

Qsn #	Question	Answer
202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 11 Jan 2018]	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Dave's Garden. 2018. Wisteria Species, Chinese Wisteria - Wisteria sinensis. https://davesgarden.com/guides/pf/go/55392/. [Accessed 16 Jan 2018]	"Hardiness: USDA Zone 5a: to -28.8 °C (-20 °F) USDA Zone 5b: to -26.1 °C (-15 °F) USDA Zone 6a: to -23.3 °C (-10 °F) USDA Zone 6b: to -20.5 °C (-5 °F) USDA Zone 7a: to -17.7 °C (0 °F) USDA Zone 7b: to -14.9 °C (5 °F) USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15 °F) USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F)"
	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	"Mountain forests; 500–1800 m" [Elevation distribution exceeds 1000 m in native range, demonstrating environmental versatility]

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Distribution in the United States. Both species are primarily in the southeastern and eastern states, from Texas east to Florida, north to Maine, and west to Michigan, Illinois, and Arkansas. Chinese wisteria is considered more invasive and is also in Hawai'i."

Qsn #	Question	Answer
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Listed as naturalized & weedy in a number of locations, including tropical regions] "Wisteria sinensis ... Preferred Climate/s: Mediterranean, Subtropical, Tropical ... References: United States of America-E- 411, Pacific-W-3, United States of America-E-77, United States of America- E-80, Global-N-108, Global-W-85, United States of America-N-101, New Zealand-N- 280, United States of America-W-112, United States of America-E-129, United States of America-E-102, United Kingdom- C-314, Australia-E-380, United States of America-E-304, New Zealand-N-15, Spain- N-405, Italy-I-470, United States of America-I-628, Switzerland-N-653, North America-E-784, United States of America- E-151, Global-W-788, Hungary-U-809, Australia-W-853, New Zealand-N-919, India-N-976, France-N-1006, Italy-N-1006, Portugal-N-1006, Spain-N-1006, Europe- N-819, New Zealand-E-328, New Zealand- E-505, United States of America-W-1103, Greece-U-1142, Spain-N-1149, United States of America-AE-1156, United States of America-E-1244, Georgia-U-1250, Italy- U-251, Hungary-U-1255, Italy-N-1265, La Reunion-W-1321, Sardinia-N-1336, India- U-1345, Australia-N-1450, Spain-U-1454, Spain-N-1455, New Caledonia-I-1507, Norway-W-1609, Global-CD-1611, United States of America-E-1736, Croatia-N-1747, United States of America-I-1773, Sardinia- N-1393, Italy-U-1887, Romania-U-1905, Bosnia and Herzegovina-U-1987, Switzerland-U-1990, Croatia-U-2004, New Zealand-N-2048, Armenia-W-1977, Australia-W-1977, Croatia-W-1977, France-W-1977, Greece-W-1977, India-W- 1977, Italy-W-1977, New Zealand-W- 1977, Norway-W-1977, Portugal-W-1977, Global--1324."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Distribution in the United States. Both species are primarily in the southeastern and eastern states, from Texas east to Florida, north to Maine, and west to Michigan, Illinois, and Arkansas. Chinese wisteria is considered more invasive and is also in Hawai'i."
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Extensively cultivated as an ornamental in the southeastern United States and sold in Florida nurseries by 1887 (Austin 1999a). Spread throughout the northern part of Florida by early 1980s (Wunderlin 1982)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Listed as introduced, naturalized and weedy in a large number of countries

301	Naturalized beyond native range	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Because naturalized plants may be hybrids of the two, their characteristics are variable." ... "Although most naturalized wisteria plants, at least in the southeastern United States, may be considered hybrids, the original two species are distinguishable by several characteristics. Chinese wisteria vines twist clockwise, from lower left to upper right, while Japanese wisteria twists counterclockwise, from lower right to upper left." ... "Although Chinese wisteria and Japanese wisteria were imported as two distinct species, recent evidence indicates that naturalized and invasive plants are hybrids between the two. It is believed that the hybrids were propagated and spread through the nursery trade."
	Hurrell, J. A., Cabanillas, P., & Delucchi, G. (2011). Wisteria sinensis (Leguminosae) adventicia en la Argentina: Primer registro y mecanismos de expansión. Revista del Museo Argentino de Ciencias Naturales, 13(2), 125-130	"This paper includes the first record of Wisteria sinensis (Leguminosae) adventitious in Argentina, observations on its mechanisms of expansion and its status in the context of the naturalization process."
	Webb, C. J. (1980). Checklist of dicotyledons naturalised in New Zealand 5. Leguminosae. New Zealand Journal of Botany, 18(4), 463-472	"Wisteria sinensis ... Gisbome; recorded as naturalized on a roadside in Waiotahi Valley, Opotiki only."
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. 2018. Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/. [Accessed 12 Jan 2018]	No evidence to date

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	[Disturbance-adapted weed with negative environmental impacts] "Exotic wisterias are common in right-of-ways, roadsides, forest edges, ditches, and in riparian zones. Plants also invade open or disturbed areas after burns or clearing."

Qsn #	Question	Answer
303	**Agricultural/forestry/horticultural weed**	**n**
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	[Disturbance and forest weed] "Exotic wisterias are common in right-of-ways, roadsides, forest edges, ditches, and in riparian zones. Plants also invade open or disturbed areas after burns or clearing." ... "The twining vines circle the host tree tightly, cutting through the bark and girdling and killing them. When trees die, the forest canopy is altered, creating sunny openings that may initially encourage growth of native species, but ultimately favor the expansion of wisteria."
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	[Environmental weed] "A problematic weed in Southeastern forests (Miller 1998) where it may overtop mature forest trees (Miller 1997). Forms dense thickets that exclude other vegetation and "constricts stems of trees, often lowering their vigor or killing them" (Thomas 1993). Impairs or overtakes native shrubs and trees by strangling or shading; may kill large trees, thus opening forest canopies to increased sunlight, which favors aggressive wisteria growth (Remaley 1998b)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Primarily cited as a generic or environmental weed

304	Environmental weed	y
	Source(s)	**Notes**
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Currently reported from over 25 conservation areas in north and central Florida (FLEPPC 2002) from a variety of habitats, including dry oak thickets, mesic woods (FTG), sandhills, pine flatwoods, hardwood hammocks, along freshwater rivers and springs, and in upland disturbed sites (FLAS, FLEPPC 2002). Dense monocultures reported from hardwood hammocks in Timucuan Ecological Preserve in Duval County and Joe Budd Wildlife Management Area in Gadsden County (FLEPPC 2002). A problematic weed in Southeastern forests (Miller 1998) where it may overtop mature forest trees (Miller 1997). Forms dense thickets that exclude other vegetation and "constricts stems of trees, often lowering their vigor or killing them" (Thomas 1993). Impairs or overtakes native shrubs and trees by strangling or shading; may kill large trees, thus opening forest canopies to increased sunlight, which favors aggressive wisteria growth (Remaley 1998b)."
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"The twining vines circle the host tree tightly, cutting through the bark and girdling and killing them. When trees die, the forest canopy is altered, creating sunny openings that may initially encourage growth of native species, but ultimately favor the expansion of wisteria."
	Miller, J. H. 2006. Non-native wisteria control with Herbicides. Wildland Weeds (Winter): 19-21	"Vine entangled patches of non-native wisterias may exceed several acres and restrict plant and animal diversity, access, and forest productivity and recreation. Tall trees can be overtopped or strangled and their downfall exacerbates entanglements by vine over-growth. These dense infestations are exceedingly difficult to treat, while herbicide foliar sprays offer one viable option if suitable application equipment is available to project sprays into patches."

Qsn #	Question	Answer
305	**Congeneric weed**	**y**
	Source(s)	**Notes**
	Kim, K. D. (2012). An exotic invasive Liana, Wisteria in Korea. International Conference on Biological and Life Sciences. IPCBEE vol.40: 67-71	"Wisteria floribunda is a tendril which is distributed on Korea and Japan. This species has been widely used as a horticultural species making shade in garden, school, park and so on in Korea. Wisteria floribunda is introduced to Korea and naturalized. But, this species aggressively invade into forests or forest edge because of adaptability to both shade and sunlight, gorgeous sprouting from underground stems, going upward characteristics of the tendril with avoiding improper environment."
401	**Produces spines, thorns or burrs**	**n**
	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	[No evidence] "Lianas, to 25 m. Stems twined leftward, white villous when young, soon glabrescent. Leaves 7–13-foliolate; rachis 15–25 cm, including petiole 3–5 cm; leaflet blades elliptic-ovate to lanceolate-ovate, 5–8 × 2–4 cm with basal pair smallest and becoming larger apically, both surfaces appressed pubescent when young but glabrescent, base rounded to cuneate and somewhat asymmetric, apex attenuate to caudate. Racemes terminal or axillary from branchlets of previous year, 15–30 × 8–10 cm, white villous. Pedicel 2–3 cm, slender. Flowers 2–2.5 cm, fragrant. Calyx with adaxial tooth longer than others. Corolla purple or occasionally white; standard orbicular, sometimes retuse, glabrous, apex truncate. Ovary tomentose, with 6–8 ovules. Legume oblanceolate, 10–15 × 1.5–2 cm, tomentose, hanging on branches persistently. Seeds 1–3 per legume, brown, thickly lenticular, ca. 1.5 cm in diam., shiny."
402	**Allelopathic**	
	Source(s)	**Notes**
	Appiah, K., Li, Z., Zeng, R. S., Luo, S., Oikawa, Y., & Fujii, Y. (2015). Determination of allelopathic potentials in plant species in Sino-Japanese floristic region by sandwich method and dish pack method. International Journal of Basic and Applied Sciences, 4(4), 381-394	[Possibly yes. Demonstrated in lab] "Table 1: ... Wisteria sinensis ... * Criteria Indicates stronger inhibitory activity of test sample on the radicle elongation of lettuce by standard deviation variance"
403	**Parasitic**	**n**
	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	"Lianas, to 25 m. Stems twined leftward, white villous when young, soon glabrescent." [Fabaceae. No evidence]
404	**Unpalatable to grazing animals**	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Stone, K. R. 2009. Wisteria floribunda, W. sinensis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 16 Jan 2018]	[Potentially toxic. Palatability unknown, but probably not browsed regularly] "Palatability and/or nutritional value: A number of reviews list wisteria flowers, leaves, fruits, and seeds as poisonous [3], and one further indicates that seed ingestion causes symptoms such as nausea, vomiting, stomach pains, and diarrhea [17]. Japanese wisteria was listed as a minor winter plant food for bobwhite quail in Alabama [31], and hummingbirds have been observed feeding on the nectar of Chinese wisteria [25]."

405	Toxic to animals	y
	Source(s)	**Notes**
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Seeds have caused poisoning in young gorillas (Wiesner and Maltzan 2002)."
	Knight, A. 2007. A Guide to Poisonous House and Garden Plants. CRC Press, Boca Raton, FL	"The seeds are hazardous to children and pets that might consume them. Clinical Signs - Gastroenteritis, hematemesis, diarrhea, headache, dizziness, and confusion are reported in people who have ingested 5 - 10 seeds [3]. Similar clinical signs can be expected in animals that eat the seeds. Since vomiting is a common effect of Wisteria poisoning, the seeds are often regurgitated, and treatment must be directed at fluid replacement where dehydration is present."

406	Host for recognized pests and pathogens	
	Source(s)	**Notes**
	Missouri Botanical Garden. 2018. Wisteria sinensis. http://www.missouribotanicalgarden.org. [Accessed 16 Jan 2018]	"Although susceptible to a number of foliage-chewing insects and fungal diseases, none are significant. It is considered to be a high maintenance plant, however, because of its need for regular pruning, its invasive tendencies and its vulnerability to late spring frost damage to flower buds. Failure of vines to produce flowers may be attributable to a number of causes including death of flower buds in winter, too much shade, plants too young (especially seed grown ones), improper pruning or overfertilization."

407	Causes allergies or is otherwise toxic to humans	y
	Source(s)	**Notes**
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Plant hairs can cause skin irritation (Southcott and Haegi 1992), and all parts of the plant are toxic (Tubaro et al. 2001, Morton 1995, Austin 1999a). Seeds have caused poisoning in young gorillas (Wiesner and Maltzan 2002)."
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Seeds and pods of Chinese wisteria are toxic, causing nausea, vomiting, stomach pain, or diarrhea if eaten."

Qsn #	Question	Answer
	Knight, A. 2007. A Guide to Poisonous House and Garden Plants. CRC Press, Boca Raton, FL	"The seeds and bark contain a toxic glycoprotein lectin which binds to N-acetyl-D-galactosamine and thereby prevents the normal replacement of the mucosal cell layer of the intestinal mucosa [1]. The loss of the mucosal cells results in hemorrhagic gastroenteritis and corresponding clinical signs. Although the flowers are reportedly edible, caution is advisable as all parts of the plants are potentially toxic [2]." ... "seeds are hazardous to children and pets that might consume them. Clinical Signs - Gastroenteritis, hematemesis, diarrhea, headache, dizziness, and confusion are reported in people who have ingested 5 - 10 seeds [3]. Similar clinical signs can be expected in animals that eat the seeds. Since vomiting is a common effect of Wisteria poisoning, the seeds are often regurgitated, and treatment must be directed at fluid replacement where dehydration is present."

408	Creates a fire hazard in natural ecosystems	
	Source(s)	**Notes**
	Stone, K. R. 2009. Wisteria floribunda, W. sinensis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 16 Jan 2018]	[Potentially. More research needed] "Fuels: As of 2009, no studies specifically addressed fuel characteristics of wisterias. One review suggests that Chinese wisteria, along with a number of other invasive vines, has the potential to alter the fuel characteristics of invaded communities. Specifically, invasive vines could increase fuel loading and continuity, and contribute to the likelihood of crown fire by acting as a ladder fuel [7]. The density, spatial extent, and climbing nature of wisteria populations suggest that they may alter fuel characteristics in invaded communities."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Although they can be found in part shade, plants grow best in full sun."
	Dave's Garden. 2018. Wisteria Species, Chinese Wisteria - Wisteria sinensis. https://davesgarden.com/guides/pf/go/55392/. [Accessed 16 Jan 2018]	"Sun Exposure: Sun to Partial Shade"
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Thrives in full sun; shade tolerant but needs partial shade to flower (Gilman 1999g)."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Dave's Garden. 2018. Wisteria Species, Chinese Wisteria - Wisteria sinensis. https://davesgarden.com/guides/pf/go/55392/. [Accessed 16 Jan 2018]	"Soil pH requirements: 6.1 to 6.5 (mildly acidic) 6.6 to 7.5 (neutral) 7.6 to 7.8 (mildly alkaline)"

Qsn #	Question	Answer
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"They tolerate a variety of soils and moisture, but prefer deep loamy soils that are well drained."
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Tolerates most any soil, including clay, sand, loam, occasionally wet, low nutrient, and alkaline to acidic soils (Gilman 1999g). Prefers alkaline, loamy, deep, and well-drained soils (Remaley 1998b). Found on low, moist, fertile alluvial soil, in moist deciduous forests, and along riverbanks in home range (Isley 1990, Stritch 1985). High drought-tolerance and poor salttolerance (Gilman 1999g)."

411	Climbing or smothering growth habit	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	"Lianas, to 25 m. Stems twined leftward, white villous when young, soon glabrescent."
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Stems climb onto and over native shrubs and trees, either shading them out or strangling them. The twining vines circle the host tree tightly, cutting through the bark and girdling and killing them. When trees die, the forest canopy is altered, creating sunny openings that may initially encourage growth of native species, but ultimately favor the expansion of wisteria."

412	Forms dense thickets	y
	Source(s)	**Notes**
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Forms dense thickets that exclude other vegetation and “constricts stems of trees, often lowering their vigor or killing them” (Thomas 1993)."
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"New vines, either from seeds or from root sprouts, that trail on the ground can form thickets that exclude all other plants."

501	Aquatic	n
	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	[Terrestrial] "Lianas, to 25 m. Stems twined leftward, white villous when young, soon glabrescent." ... "Mountain forests; 500–1800 m."

Qsn #	Question	Answer
502	**Grass**	**n**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 11 Jan 2018]	Family: Fabaceae (alt.Leguminosae) Subfamily: Faboideae Tribe: Millettieae

503	**Nitrogen fixing woody plant**	**y**
	Source(s)	**Notes**
	Liu, J., Wang, E. T., & Chen, W. X. (2005). Diverse rhizobia associated with woody legumes Wisteria sinensis, Cercis racemosa and Amorpha fruticosa grown in the temperate zone of China. Systematic and Applied Microbiology, 28 (5), 465-477	"Fifty-nine bacterial isolates from root nodules of the woody legumes Wisteria sinensis, Cercis racemosa and Amorpha fruticosa grown in the central and eastern regions of China were characterized with phenotypic analysis, PCR-based 16S and 23S rRNA gene RFLP, Box PCR and 16S rRNA gene sequencing. Seven main phena were defined in numerical taxonomy, which corresponded to distinct groups within the genera Agrobacterium, Bradyrhizobium, Mesorhizobium and Rhizobium in 16S and 23S rRNA gene PCR–RFLP. The phylogenetic relationships of the 16S rRNA genes supported the grouping results of PCR–RFLP. Most of the isolates from Amorpha fruticosa were classified into two groups closely related to Mesorhizobium amorphae. Seventeen of the 21 isolates from Wisteria sinensis were identified as two groups related to Rhizobium and Agrobacterium. Six out of 10 isolates from Cercis racemosa were identified as a group related to Bradyrhizobium. Our results indicated that each of the investigated legumes nodulated mainly with one or two rhizobial groups, although isolates from different plants intermingled in some small bacterial groups. In addition, correlation between geographic origin and grouping results was found in the isolates from Amorpha fruticosa. These results revealed that the symbiotic bacteria might have been selected by both the legume hosts and the geographic factors."

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	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	"Lianas, to 25 m. Stems twined leftward, white villous when young, soon glabrescent."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	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	[No evidence] "Mountain forests; 500–1800 m. Anhui, Fujian, NE Guangxi, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, S Shanxi, Zhejiang [Japan]."

602	**Produces viable seed**	**y**

Qsn #	Question	Answer
	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	"Legume oblanceolate, 10–15 × 1.5–2 cm, tomentose, hanging on branches persistently. Seeds 1–3 per legume, brown, thickly lenticular, ca. 1.5 cm in diam., shiny."
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Reproduction primarily vegetative, but can produce seed under favorable conditions; seeds water-dispersed (Remaley 1998b)."
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Seeds are produced under favorable conditions, and can be carried long distances downstream by water to new riparian sites."

603	Hybridizes naturally	y
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Japanese wisteria and Chinese wisteria are distinct in their native ranges but hybridize in the United States."
	Trusty, J. L., Goertzen, L. R., Zipperer, W. C., & Lockaby, B. G. (2007). Invasive Wisteria in the Southeastern United States: genetic diversity, hybridization and the role of urban centers. Urban Ecosystems, 10(4), 379-395	"The increasing numbers and negative impacts of invasive species have prompted research on the relationship between human activities and the success of invasive horticultural plants. In this study, we use population genetic relationships to model the escape of a common garden vine, exotic Wisteria, into natural habitats. Urban and naturalized Wisteria populations in Charleston, South Carolina and Tallahassee, Florida were investigated using a combination of chloroplast, mitochondrial and nuclear DNA markers. Fifty-nine of 72 (81.9%) Wisteria collections were hybrids of Wisteria sinensis and W floribunda. Chi-square analysis of the distribution of shared W floribunda haplotypes among naturalized and urban populations supports the relationship of time with invasion success. Naturalized populations were more similar to those in historic neighborhoods. The most common haplotype, F 1, was encountered 22 times but its distribution was not significantly different between urban and naturalized populations. In contrast, a significantly higher proportion of haplotype F2 found in naturalized populations suggests that selection may also be acting within these populations. Finally, due to extensive human dispersal, there is no relationship between genetic distance and geographical distance among the populations sampled. We conclude that Wisteria s long history of horticulture, rampant hybridization, and human-aided dispersal are all implicated in the successful ability of these plants to invade natural habitats throughout the USA."

604	Self-compatible or apomictic	
	Source(s)	**Notes**

Qsn #	Question	Answer
	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	[Unknown. Genus possesses perfect flowers, so self-compatibility in theoretically a possibility] "Flowers 1.5–2.5 cm. Corolla standard orbicular, large, reflexed, glabrous or outside with some trichomes at base, with 2 basal calluses; wings free from keel. Stamens diadelphous; vexillary stamen distinct from other 9 or slightly connate at middle of sheath. Ovary stipitate, with trichomes, with 5–16 ovules."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"Flowers are insect-pollinated. A study in California identified Xylocopa sp. (carpenter bees) as a pollinator (Frankie et al., 2009)."
	Frankie, G., Thorp, R., Hernandez, J., Rizzardi, M., Ertter, B., Pawelek, J., Witt, S. L., Schindler, M., Coville, R. & Wojcik, V. (2009). Native bees are a rich natural resource in urban California gardens. California Agriculture, 63(3), 113-120	"Other good examples included palo verde (Parkinsonia aculeata), wisteria (Wisteria sinensis) and autumn sage (Salvia greggii/ microphylla/cvs.), all of which consistently attracted honey bees and large carpenter bees (Xylocopa spp.)."
	Stone, K. R. 2009. Wisteria floribunda, W. sinensis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 17 Jan 2018]	"Pollination and breeding system: Hummingbirds were observed visiting Chinese wisteria [25]."

606	Reproduction by vegetative fragmentation	y
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Reproduction is primarily vegetative. Nodes on stolons, which creep along the ground surface, sprout new plants. Plants spread locally from homesites into surrounding woodlands, from neglected gardens or due to improper disposal of garden waste."
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Reproduction primarily vegetative, but can produce seed under favorable conditions; seeds water-dispersed (Remaley 1998b)."

607	Minimum generative time (years)	>3
	Source(s)	**Notes**
	Plants for a Future. 2018. Wisteria sinensis. http://pfaf.org. [Accessed 17 Jan 2018]	"Plants are very slow from seed and can take up to 20 years to come into flower"

Qsn #	Question	Answer
701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**y**
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Plants spread locally from homesites into surrounding woodlands, from neglected gardens or due to improper disposal of garden waste."

702	**Propagules dispersed intentionally by people**	**y**
	Source(s)	**Notes**
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Extensively cultivated as an ornamental in the southeastern United States and sold in Florida nurseries by 1887 (Austin 1999a). Spread throughout the northern part of Florida by early 1980s (Wunderlin 1982)."
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Long-distance dispersal is accomplished through Internet and nursery sales."

703	**Propagules likely to disperse as a produce contaminant**	**n**
	Source(s)	**Notes**
	Miller, J. H. 2006. Non-native wisteria control with Herbicides. Wildland Weeds (Winter): 19-21	[No evidence. Unlikely given large seed size and long time to maturity] "Fortunately, the legumes (pods) and seeds are large and heavy, which restricts dispersal by birds and mammals. Legumes are 2.5 to 6 inches long and about 1 inch wide, with flat seeds about the size of a dime to a nickel."

704	**Propagules adapted to wind dispersal**	**n**
	Source(s)	**Notes**
	Miller, J. H. 2006. Non-native wisteria control with Herbicides. Wildland Weeds (Winter): 19-21	"Fortunately, the legumes (pods) and seeds are large and heavy, which restricts dispersal by birds and mammals. Legumes are 2.5 to 6 inches long and about 1 inch wide, with flat seeds about the size of a dime to a nickel."

705	**Propagules water dispersed**	**y**
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Seeds are produced under favorable conditions, and can be carried long distances downstream by water to new riparian sites."

706	**Propagules bird dispersed**	**n**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Miller, J. H. 2006. Non-native wisteria control with Herbicides. Wildland Weeds (Winter): 19-21	"Fortunately, the legumes (pods) and seeds are large and heavy, which restricts dispersal by birds and mammals. Legumes are 2.5 to 6 inches long and about 1 inch wide, with flat seeds about the size of a dime to a nickel."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	**Notes**
	Miller, J. H. 2006. Non-native wisteria control with Herbicides. Wildland Weeds (Winter): 19-21	"Fortunately, the legumes (pods) and seeds are large and heavy, which restricts dispersal by birds and mammals. Legumes are 2.5 to 6 inches long and about 1 inch wide, with flat seeds about the size of a dime to a nickel." [No evidence. No means of external attachment]

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	Miller, J. H. 2006. Non-native wisteria control with Herbicides. Wildland Weeds (Winter): 19-21	[No evidence of internal dispersal] "Fortunately, the legumes (pods) and seeds are large and heavy, which restricts dispersal by birds and mammals. Legumes are 2.5 to 6 inches long and about 1 inch wide, with flat seeds about the size of a dime to a nickel."

801	Prolific seed production (>1000/m2)	n
	Source(s)	**Notes**
	Langeland, K.A., Cherry, H.M., McCormick, C.M. & Craddock Burks, K.A. 2008. Identification & Biology of Non-Native Plants in Florida's Natural Areas. Second Edition. IFAS Publications, Gainesville, FL	"Reproduction primarily vegetative, but can produce seed under favorable conditions; seeds water-dispersed (Remaley 1998b)."
	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	[Few seeds per legume] "Legume oblanceolate, 10–15 × 1.5–2 cm, tomentose, hanging on branches persistently. Seeds 1–3 per legume, brown, thickly lenticular,ca. 1.5 cm in diam., shiny."
	Miller, J. H. 2006. Non-native wisteria control with Herbicides. Wildland Weeds (Winter): 19-21	[Unlikely. Relatively large seeded] "Fortunately, the legumes (pods) and seeds are large and heavy, which restricts dispersal by birds and mammals. Legumes are 2.5 to 6 inches long and about 1 inch wide, with flat seeds about the size of a dime to a nickel."

Qsn #	Question	Answer
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	CABI, 2017. Invasive Species Compendium. Wallingford , UK: CAB International. www.cabi.org/isc	"Little information is available on seed biology of W. sinensis such as viability of seeds and seed banks."
	Stone, K. R. 2009. Wisteria floribunda, W. sinensis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 17 Jan 2018]	"Seed banking: No information is available on this topic."
	Royal Botanic Gardens Kew. (2018) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 17 Jan 2018]	"Storage Behaviour: No data available for species. Of 1 known taxa of genus Wisteria, 100.00% Orthodox(p/?)"

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"Chemical control is effective, either sprayed on foliage or applied to basal bark or cut stems. Foliar sprays work best when applied to resprouts after vines have been cut. Spraying is efficient for large stands that cover all other vegetation. Foliar application is also best where cutting the stumps or physical removal is too disruptive. Applications of herbicide to cut stumps are appropriate for large stands where thick vines are well established. If applied with care, systemics such as glyphosate or triclopyr can be used without harming nontarget plants. In order to ensure protection of native species, spraying should be done before or after the spring bloom of wildflowers, either early in spring or in the fall. Because triclopyr is selective to broadleaf plants, it is safe to apply around native grasses. Chlopyralid is a herbicide specifically targeted to the sunflower, buckwheat, and pea families, but it seeps into groundwater. Picloram can be used where no desirable vegetation remains."
	Stone, K. R. 2009. Wisteria floribunda, W. sinensis. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ . [Accessed 17 Jan 2018]	"Chemical: A range of foliar spray herbicides has been effectively used for wisteria control [22,30], though high rates and repeated applications were needed to produce near-eradication [22] and it was possible to damage non-target species with treatment. Cut-stump application of glyphosate or triclopyr 2 inches (5 cm) above ground level was also found to be effective for Japanese wisteria control, though foliar spray treatments may be needed afterward to compensate for the stimulation of wisteria seedlings after large vine removal [30]. Care must be taken when other invasive species are present; in one herbicide treatment, the reduction in Chinese wisteria cover released the invasive Chinese privet (Ligustrum sinense), which was not impacted by the herbicides [22]."

Qsn #	Question	Answer
	Miller, J. H. 2006. Non-native wisteria control with Herbicides. Wildland Weeds (Winter): 19-21	"Effective herbicides that provided greater than 90 percent control 12 months after treatment (12 MAT) were Tordon K applied in September and Garlon applied at both timings (Figure 1). Greater than 80 percent control was gained by Arsenal and Accord applied in September and Transline applied in July. Escort was not effective, averaging 15 percent control after initial treatments and was the only herbicide judged significantly different from the other treatments by an analysis of variance and mean separation (analyses not shown)."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	[Tolerates and requires repeated cutting] "Vines that grow into trees can be severed at the base, close to the root crown. Cut resprouts as they occur, every two weeks during the growing season. Cutting vines repeatedly to ground level slows growth, prevents seed production, and decreases nutrient reserves."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Woodward, S. L. & Quinn, J. A. 2011. Encyclopedia of Invasive Species: From Africanized Honey Bees to Zebra Mussels. Volume 2: Plants. ABC-CLIO, Santa Barbara, California	"No biological control for wisteria is known."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Elevation range exceeds 1000 m, demonstrating environmental versatility
• Reported to be naturalized in many locations (no documented evidence in the Hawaiian Islands to date)
• A disturbance-adapted weed with negative impacts to native species diversity and abundance
• Other Wisteria species have become invasive
• Reported to be toxic to animals and people
• Tolerates many soil types
• Smother trees and other vegetation
• Forms dense thickets
• N-fixing
• Reproduces by seeds & vegetatively
• Hybridizes with other Wisteria species
• Can be spread by disposed garden waste
• Seeds dispersed by water & intentionally by people
• Able to resprout after cutting (without treatment of herbicide)

Low Risk Traits
• Native to temperate climates. Invasiveness may be limited to higher elevation tropical ecosystems
• Unarmed (no spines, thorns, or burrs)
• Ornamental
• Long time to reproductive maturity from seed (20+ years)
• Seeds relatively large & unlikely to be spread inadvertently
• Reproduces primarily by vegetative means (seed production limited)
• Herbicides may provide effective control