Taxon: Lycium barbarum L.

Family: Solanaceae

Common Name(s): Barbary matrimony vine
Chinese boxthorn
Chinese wolfberry
Duke of Argyll's teaplant
goji berry
Himalayan goji
matrimony vine
Tibetan goji

Synonym(s): Lycium halimifolium Mill.
Lycium vulgare Dunal

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 28 Aug 2019

WRA Score: 15.0 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Thorny Shrub, Edible Fruit, Dense Stands, Spreads Vegetatively, Bird-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)	Low
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	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	y
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n

Qsn #	Question	Answer Option	Answer
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans		
408	Creates a fire hazard in natural ecosystems		
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	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
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	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		
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
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**
	Bruton-Seal, J. & Seal. M. (2009). Backyard Medicine: Harvest and Make Your Own Herbal Remedies. Skyhorse Publishing Inc., New York	"Lycium originates in China and has been part of Chinese medicine for millennia. Its undoubted health benefits have become something of a fad in the West in the last decade or so." [Long history of cultivation, but not evident if species has been altered to point where it has become less invasive]
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	[Long history of cultivation. No reports of domestication] "The original habitat of the species is obscure but probably in southeastern Europe to southwest Asia. The species has naturalized in Britain, Europe and Asia and is widely cultivated in northern and southern China, especially in Ningxia and Tianjin Shi."

102	Has the species become naturalized where grown?	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	**Notes**
	WRA Specialist. (2019). 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. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 27 Aug 2019]	"Native Asia-Temperate CHINA: China [Hebei Sheng (n.), Gansu Sheng, Shanxi Sheng (n.), Sichuan Sheng, Qinghai Sheng, Nei Mongol Zizhiqu, Ningxia Huizi Zizhiqu, Xinjiang Uygur Zizhiqu] Cultivated Asia-Temperate CHINA: China (also cult.)"
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	[Grown in high elevation tropical climates] "The original habitat of the species is obscure but probably in southeastern Europe to southwest Asia. The species has naturalized in Britain, Europe and Asia and is widely cultivated in northern and southern China, especially in Ningxia and Tianjin Shi." … "It grows well in many climatic regimes from sea level to 2,000 m elevation. It can be grown in higher elevations in the tropics."

202	Quality of climate match data	Low

Qsn #	Question	Answer
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	"The original habitat of the species is obscure but probably in southeastern Europe to southwest Asia. The species has naturalized in Britain, Europe and Asia and is widely cultivated in northern and southern China, especially in Ningxia and Tianjin Shi."

203	Broad climate suitability (environmental versatility)	y
	Source(s)	**Notes**
	Nee, M. H. (2012). Lycium barbarum, in Jepson Flora Project (eds.) Jepson eFlora, http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=32204. [Accessed 27 Aug 2019]	"Ecology: Disturbed areas, fields; Elevation: < 1500 m. Bioregional Distribution: s SN, GV, SCo, MP, expected elsewhere; Distribution Outside California: native to Eurasia. Flowering Time: Apr- Aug Note: Plants with corolla tube < lobes and +- hidden by calyx are Lycium chinense Mill., a waif or possibly naturalized in central SNF, ScV, SCo; formerly cultivated." [Elevation range exceeds 1000 m, demonstrating environmental versatility]
	PennState Extension. (2016). Goji Berry Culture. Updated: October 26, 2016. https://extension.psu.edu/goji-berry-culture. [Accessed 27 Aug 2019]	"Hardiness Zones 2 to 7" [Grows in 5+ hardiness zones]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Lycium barbarum ... Preferred Climate/s: Dryland, Mediterranean, Subtropical, Tropical"
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	"The original habitat of the species is obscure but probably in southeastern Europe to southwest Asia. The species has naturalized in Britain, Europe and Asia and is widely cultivated in northern and southern China, especially in Ningxia and Tianjin Shi." ... "It grows well in many climatic regimes from sea level to 2,000 m elevation. It can be grown in higher elevations in the tropics."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed]	"Cultivated Asia-Temperate CHINA: China (also cult.) Naturalized (natzd. elsewhere)"
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	"The original habitat of the species is obscure but probably in southeastern Europe to southwest Asia. The species has naturalized in Britain, Europe and Asia and is widely cultivated in northern and southern China, especially in Ningxia and Tianjin Shi."

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

Qsn #	Question	Answer
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 27 Aug 2019]	"Cultivated Asia-Temperate CHINA: China (also cult.) Naturalized (natzd. elsewhere)"
	Möllerová, J. (2005). Notes on invasive and expansive trees and shrubs. Journal of Forest Science, 51, 19-23	"Expansion and invasion of plants indicate successful colonization and competitive abilities of species. There are fewer invasive and expansive woody plants than herbs. Main expansive (native species) trees and shrubs are Acer platanoides, Acer pseudoplatanus, Clematis vitalba, Crataegus sp. div., Fraxinus excelsior, Prunus spinosa, Rubus sp. div., Sambucus nigra. Main invasive (alien species) are Acer negundo, Ailanthus altissima, Amorpha fruticosa, Cytisus scoparius, Fraxinus pennsylvanica, Lycium barbarum, Mahonia aquifolium, Physocarpus opulifolius, Pinus strobus, Populus × canadensis, Prunus serotina, Quercus rubra, Rhus typhina, Robinia pseudoacacia, Symphoricarpos albus, Syringa vulgaris. Dominant characteristics of expansive and invasive species are dispersibility of seeds and capacity of vegetative propagation."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	"The original habitat of the species is obscure but probably in southeastern Europe to southwest Asia. The species has naturalized in Britain, Europe and Asia and is widely cultivated in northern and southern China, especially in Ningxia and Tianjin Shi."
	Queensland Government. (2019). Weeds of Australia. Lycium barbarum. https://keyserver.lucidcentral.org. [Accessed]	"Widely naturalised in eastern Australia (i.e. in south-eastern Queensland, eastern New South Wales, Victoria, Tasmania and south-eastern South Australia)."
	Wagner, W.L., Herbst, D.R.& Lorence, D.H. (2019). Flora of the Hawaiian Islands. Smithsonian Institution, Washington, D.C. http://botany.si.edu/. [Accessed 27 Aug 2019]	No evidence to date

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	The Southern Tablelands and South Coast Noxious Plants Committee. (2019). African boxthorn (Lycium ferocissimum). http://www.southeastweeds.org.au/. [Accessed 27 Aug 2019]	"Chinese boxthorn (Lycium barbarum) is a very similar looking shrub, but it has narrower leaves and purple flowers rather than white with purple spots. It is a garden escape, and less common than African boxthorn. It is not listed as noxious in the region, but should be removed as for African boxthorn." [Being controlled, but not considered a significant pest]

Qsn #	Question	Answer
	Elisabeth C. Miller Library. (2016). Gardening Answers Knowledgebase - record #963. Date: 2016-07-06. University of Washington Botanic Garden. https://depts.washington.edu. [Accessed 27 Aug 2019]	"Lycium barbarum (goji, also called wolfberry and boxthorn) can be invasive (or at least aggressive) in some areas. An article by Vern Nelson in The Oregonian (August 17, 2008) mentions this tendency, and suggests containing them in a 4 by 5-foot square support structure. Be aware that "wolfberries take root wherever they touch the ground." This is worth bearing in mind, as is the fact that Lyle's book says "the extensive root system can help stabilize banks," which one could interpret to mean that removing unwanted plants might be a fair bit of work! Suckering roots are only one way the plant spreads; seeds are another. Goji berry (boxthorn) is the "Plant of the Month" in the Whatcom County Master Gardeners Weeder's Digest from August 2006. Author Cheryll Greenwood Kinsley notes that when the plant was first introduced in Europe, people weren't enamored of the fruit but birds were, and now "the shrub has naturalized in Britain and is listed as a noxious weed on two continents and in at least some parts of several states, including Montana and Wyoming." She recommends keeping the birds away from it to discourage its spread."
	Queensland Government. (2019). Weeds of Australia. Lycium barbarum. https://keyserver.lucidcentral.org. [Accessed 27 Aug 2019]	[Classified as an environmental weed based on potential impacts that may be similar to Lycium ferocissimum. Designated in this assessment as a general weed with the potential to be upgraded to an environmental weed, pending further evidence] "Chinese boxthorn (Lycium barbarum) is regarded as an environmental weed in Victoria and Tasmania. This garden escape has mainly become naturalised in coastal and sub-coastal districts in south-eastern Australia. It is often found growing in disturbed sites and waste areas, but also invades riverbanks and native bushland (e.g. Yarra Bend Park in Victoria). Chinese boxthorn (Lycium barbarum) is very similar to African boxthorn (Lycium ferocissimum) and its distribution and impact in Australia may be under-estimated as a result of it being confused with this species. Like African boxthorn (Lycium ferocissimum), it is dispersed into natural areas by birds and other animals that eat its fruit and may cause similar environmental impacts (e.g. form dense thickets along waterways to the detriment of native species)."
	Möllerová, J. (2005). Notes on invasive and expansive trees and shrubs. Journal of Forest Science, 51, 19-23	[General weedy, invasive plant. Potential environmental weed] "Expansion and invasion of plants indicate successful colonization and competitive abilities of species. There are fewer invasive and expansive woody plants than herbs. Main expansive (native species) trees and shrubs are Acer platanoides, Acer pseudoplatanus, Clematis vitalba, Crataegus sp. div., Fraxinus excelsior, Prunus spinosa, Rubus sp. div., Sambucus nigra. Main invasive (alien species) are Acer negundo, Ailanthus altissima, Amorpha fruticosa, Cytisus scoparius, Fraxinus pennsylvanica, Lycium barbarum, Mahonia aquifolium, Physocarpus opulifolius, Pinus strobus, Populus × canadensis, Prunus serotina, Quercus rubra, Rhus typhina, Robinia pseudoacacia, Symphoricarpos albus, Syringa vulgaris. Dominant characteristics of expansive and invasive species are dispersibility of seeds and capacity of vegetative propagation."

303	**Agricultural/forestry/horticultural weed**	**n**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Queensland Government. (2019). Weeds of Australia. Lycium barbarum. https://keyserver.lucidcentral.org. [Accessed 27 Aug 2019]	[Classified as an environmental weed based on potential impacts that may be similar to Lycium ferocissimum. Designated in this assessment as a general weed with the potential to be upgraded to an environmental weed, pending further evidence] "Chinese boxthorn (Lycium barbarum) is regarded as an environmental weed in Victoria and Tasmania. This garden escape has mainly become naturalised in coastal and sub-coastal districts in south-eastern Australia. It is often found growing in disturbed sites and waste areas, but also invades riverbanks and native bushland (e.g. Yarra Bend Park in Victoria). Chinese boxthorn (Lycium barbarum) is very similar to African boxthorn (Lycium ferocissimum) and its distribution and impact in Australia may be under-estimated as a result of it being confused with this species. Like African boxthorn (Lycium ferocissimum), it is dispersed into natural areas by birds and other animals that eat its fruit and may cause similar environmental impacts (e.g. form dense thickets along waterways to the detriment of native species)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Included in some citations of agricultural weeds, but impacts have not been verified

304	Environmental weed	
	Source(s)	**Notes**
	Queensland Government. (2019). Weeds of Australia. Lycium barbarum. https://keyserver.lucidcentral.org. [Accessed 27 Aug 2019]	[Classified as an environmental weed based on potential impacts that may be similar to Lycium ferocissimum. Designated in this assessment as a general weed with the potential to be upgraded to an environmental weed, pending further evidence] "Chinese boxthorn (Lycium barbarum) is regarded as an environmental weed in Victoria and Tasmania. This garden escape has mainly become naturalised in coastal and sub-coastal districts in south-eastern Australia. It is often found growing in disturbed sites and waste areas, but also invades riverbanks and native bushland (e.g. Yarra Bend Park in Victoria). Chinese boxthorn (Lycium barbarum) is very similar to African boxthorn (Lycium ferocissimum) and its distribution and impact in Australia may be under-estimated as a result of it being confused with this species. Like African boxthorn (Lycium ferocissimum), it is dispersed into natural areas by birds and other animals that eat its fruit and may cause similar environmental impacts (e.g. form dense thickets along waterways to the detriment of native species)."

Qsn #	Question	Answer
	Möllerová, J. (2005). Notes on invasive and expansive trees and shrubs. Journal of Forest Science, 51, 19-23	[General weedy, invasive plant. Potential environmental weed] "Expansion and invasion of plants indicate successful colonization and competitive abilities of species. There are fewer invasive and expansive woody plants than herbs. Main expansive (native species) trees and shrubs are Acer platanoides, Acer pseudoplatanus, Clematis vitalba, Crataegus sp. div., Fraxinus excelsior, Prunus spinosa, Rubus sp. div., Sambucus nigra. Main invasive (alien species) are Acer negundo, Ailanthus altissima, Amorpha fruticosa, Cytisus scoparius, Fraxinus pennsylvanica, Lycium barbarum, Mahonia aquifolium, Physocarpus opulifolius, Pinus strobus, Populus × canadensis, Prunus serotina, Quercus rubra, Rhus typhina, Robinia pseudoacacia, Symphoricarpos albus, Syringa vulgaris. Dominant characteristics of expansive and invasive species are dispersibility of seeds and capacity of vegetative propagation."
	Elisabeth C. Miller Library. (2016). Gardening Answers Knowledgebase - record #963. Date: 2016-07-06. University of Washington Botanic Garden. https://depts.washington.edu. [Accessed 27 Aug 2019]	[Weedy landscaping plant with potential environmental impacts] "Lycium barbarum (goji, also called wolfberry and boxthorn) can be invasive (or at least aggressive) in some areas. An article by Vern Nelson in The Oregonian (August 17, 2008) mentions this tendency, and suggests containing them in a 4 by 5-foot square support structure. Be aware that "wolfberries take root wherever they touch the ground." This is worth bearing in mind, as is the fact that Lyle's book says "the extensive root system can help stabilize banks," which one could interpret to mean that removing unwanted plants might be a fair bit of work! Suckering roots are only one way the plant spreads; seeds are another. Goji berry (boxthorn) is the "Plant of the Month" in the Whatcom County Master Gardeners Weeder's Digest from August 2006. Author Cheryll Greenwood Kinsley notes that when the plant was first introduced in Europe, people weren't enamored of the fruit but birds were, and now "the shrub has naturalized in Britain and is listed as a noxious weed on two continents and in at least some parts of several states, including Montana and Wyoming." She recommends keeping the birds away from it to discourage its spread."

305	Congeneric weed	y
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Lycium ferocissimum … The shrub has become invasive because it forms ex-tensive and spiny thickets over large areas, impeding wild-life and crowding out native vegetation. Thickets of African boxthorn often harbour rabbits and feral pigs, leav-ing little vegetation around the shrubs (Muyt, 2001; Noble and Rose, 2013). On grazing lands, thickets of Lycium ferocissimum restrict access to water and pastures (Noble and Rose, 2013). The shrub col-onizes coastal sand dunes, changing the habitat to the disadvantage of native fauna and flora."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	A number of Lycium species are naturalized and invasive. Notable taxa include Lycium chinense, Lycium europaeum, & Lycium ferocissimum

401	Produces spines, thorns or burrs	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	"Erect, deciduous shrub 0.8–2 m tall. Stems and branches glabrous, branches thorny (Plate 1). Leaves solitary or whorled, lanceolate or long elliptic (Plate 1 – 4), 2–3 cm by 3–6 mm, membranous."
	Mohlenbrock, R.H. 1990. The illustrated flora of Illinois: Flowering plants: Nightshades to Mistletoe. SIU Press, Carbondale, IL	"Shrub, usually without spines; stems recurved, gray, glabrous except for the sometimes slender 1 cm long spines, angled to 3 m long; leaves lanceolate to oblong, obtuse to acute at the apex, cuneate to the base, entire, gray-green, glabrous, to 6 cm long, the petioles to 1 cm long; flowers axillary in groups of 1-5, to 1.2 cm broad, on slender pedicels to 2 cm long; calyx campanulate, divided about halfway to the base into usually 3 obtuse lobes, green, glabrous; corolla funnelform, dull purple, with usually 5 ovate-oblong lobes shorter than the tube; stamens 5, the filaments pubescent at the base; berry ovoid to ellipsoid, scarlet to orange-red, 1-2 cm long." [Apparently does not always produce spines]
	Wu, Z. Y. & P. H. Raven, (eds). 1994. Flora of China. Vol. 17 (Verbenaceae through Solanaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.	"Shrubs (small tree in cultivation) 0.8–2 m tall. Stems and branches glabrous, branches thorny."

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, (eds). 1994. Flora of China. Vol. 17 (Verbenaceae through Solanaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.	"Shrubs (small tree in cultivation) 0.8–2 m tall. Stems and branches glabrous, branches thorny." [Solanaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Burrows, G. E., & Tyrl, R. J. (2013). Toxic Plants of North America. Second Edition. Wiley-Blackwell, Hoboken, NJ	[Palatable, despite potential toxicity] "Disease Problems and Genesis—Only a few instances of intoxication are reported to be caused by L. barbarum. In 2 separate cases, calves and sheep were affected when they grazed plants growing around houses. In both cases a large amount of material —1.8kg or more —was eaten by the calves (Hansen 1927). The calves developed neurologic signs, including seizures, and the sheep exhibited signs of severe irritation of the small intestine."
	Brara, R. (1992). Are Grazing Lands 'Wastelands'? Some Evidence from Rajasthan. Economic and Political Weekly, 27(8), 411-418	Table 1: Uses of Principal Plant Types on Common Lands (Villages Khedi and Banai)" [L. barnarum listed as a fodder plant]

405	Toxic to animals	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	Burrows, G. E., & Tyrl, R. J. (2013). Toxic Plants of North America. Second Edition. Wiley-Blackwell, Hoboken, NJ	"Disease Problems and Genesis—Only a few instances of intoxication are reported to be caused by L. barbarum. In 2 separate cases, calves and sheep were affected when they grazed plants growing around houses. In both cases a large amount of material —1.8kg or more —was eaten by the calves (Hansen 1927). The calves developed neurologic signs, including seizures, and the sheep exhibited signs of severe irritation of the small intestine."
	Chopra, R. N., Chopra, I. C., Handa, K. L. & Kapur, L. D.. (1994). Chopra's Indigenous Drugs of India. Second Edition. Academic Publishers, Kolkata, India	"It is reported to be poisonous to livestock."

406	Host for recognized pests and pathogens	y
	Source(s)	**Notes**
	CABI. (2019). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Minor host of: Bactrocera tryoni (Queensland fruit fly); Ceratitis capitata (Mediterranean fruit fly); Colletotrichum fioriniae; Verticillium dahliae (verticillium wilt) Wild host of: Phytophthora infestans (Phytophthora blight)"
	Barnes, A. M., Taylor, N. M., & Vereijssen, J. (2015). Non-crop host plants: prime real estate for the tomato potato psyllid in New Zealand? New Zealand Plant Protection, 68, 441	[Lycium barbarum identified as one of the hosts of TPP] "Many tree croppers, especially those of you who grow tamarillos, will be familiar with the summer scourge of solanaceous crops, the tomato potato psyllid (TPP) Bactericera cockerelli. You may also be aware that TPP is the vector of a pathogenic bacterium, Candidatus Liberibacter solanacearum (CLso). CLso is the acknowledged causal agent of Zebra Chip disease in potatoes, which results in stunted growth and reduced yields, as well as discolouration of both raw and fried potato tubers1. Together, the pathogen and the insect are collectively responsible for significant economic losses across New Zealand's horticulture industry." … "Results Non-crop weed host plants in the presence of potato and tomato crops on which all TPP life stages were commonly found in Hawke's Bay and/or Canterbury:"

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	**Notes**
	Plants for a Future. (2019). Lycium barbarum. https://pfaf.org/user/plant.aspx?latinname=Lycium+barbarum. [Accessed 28 Aug 2019]	"Although no records of toxicity have been seen, some caution should be exercised with this species, particularly with regard to its edible leaves, since it belongs to a family that often contains toxins. However, use of the leaves is well documented and fairly widespread in some areas. The unripe fruit might also be suspect though the ripe fruit is wholesome."
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	[Potentially allergenic, but cases may be limited] "Two cases of allergic reaction following Goji berry (L. barabrum) ingestion were reported by Monzón Ballarín et al. (2011) . A positive skin prick test and speci fi c immunoglobulin (Ig) E to Goji berry was detected in both cases. Lipid transfer proteins appeared to be involved in allergic sensitization to Goji berries, as evidenced by cross-reactivity with tomato."

408	Creates a fire hazard in natural ecosystems	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Pyšek, P. (1991). Sprout demography and intraclonal competition inLycium barbarum, a clonal shrub, during an early phase of revegeeation. Folia Geobotanica et Phytotaxonomica, 26(2), 141-169	[Benefits from fire, but no evidence of increased fire risk from Lycium] "Fire is an important mode of ecological disturbance (RYKIEL 1985). Clonal character of growth is typical of species of fire-disturbed habitats (COOK 1985, KooP 1987). Burning of above ground biomass stimulates vegetative growth from specialized underground organs (KOMAREK 1983, CRAWLEY 1986). There is a large body of literature on post-fire resprouting from root buds (PELTON 1963 quoted by HARPER 1977, CRAWLEY 1986, KEELEY et ZEDLER 1978 quoted by AULD 1987, BROWN et DEBYLE 1987) or lignotubers (AULD 1987, KooP 1987). This type of revegetation after burning was observed even in normally nonsprouting species (DRISCOLL 1963). In general, low seed production is typical of clonal shrubs and seedling recruitment appears to be a rare event (SILVERTOWN 1982, HUENNEKE 1987). From the point of view of life strategy, Lycium barbarum belongs rather to the "phalanx" type (CLEGG 1978 quoted by HARPER 1981, LOVETT-DOUST 1981, BELL 1984, SILANDER 1985)."

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	Plants for a Future. (2019). Lycium barbarum. https://pfaf.org/user/plant.aspx?latinname=Lycium+barbarum. [Accessed 28 Aug 2019]	"Requires a sunny position[200]. Some plants at Kew are growing well in light shade[K]."
	Edible Landscaping Online. (2019). Phoenix Tears Goji Berry - Lycium barbarum. https://ediblelandscaping.com/. [Accessed 28 Aug 2019]	"Shade Tolerance: Poor"
	Maughan, T. & Black, B. (2015). Goji in the Garden. Horticulture Extension, Utah State University. https://extension.usu.edu/. [Accessed 28 Aug 2019]	"Site Selection: Plant goji in a location with full sun (although some shade can be tolerated)." … "Spacing: In a home garden, goji can be tucked into many areas of the landscape, provided they are not too shaded."
	Dave's Garden. (2019). Chinese Box Thorn, Barbary Matrimony Vine, Goji Berry, Wolfberry, Duke of Argyll's Teatree - Lycium barbarum. https://davesgarden.com/guides/pf/go/63945/. [Accessed 28 Aug 2019]	"Sun Exposure: Full Sun"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	PennState Extension. (2016). Goji Berry Culture. Updated: October 26, 2016. https://extension.psu.edu/goji-berry-culture. [Accessed 28 Aug 2019]	"Goji plants are adaptable and grow in a range of soil types, with a preferred pH of 6.5 to 7.0. Goji won't tolerate salinity well (though information can be found indicating that some of its relatives will) and prefers high fertility soils. The best growth is made in relatively light soils that are well drained such as sandy loams or loams and in areas with plenty of sunshine."

Qsn #	Question	Answer
	Maughan, T. & Black, B. (2015). Goji in the Garden. Horticulture Extension, Utah State University. https://extension.usu.edu/. [Accessed 28 Aug 2019]	"Soil: Natively, goji grow in slightly alkaline soil (pH of 7 to 8) so many Utah soils support plant growth well. They do not grow well in acidic soils. Goji plants tolerate a wide range of soil types but prefer a light loam. Although goji can be grown in clay soil, they do not do well if roots are consistently wet, and care should be taken when irrigating on heavy soils to avoid waterlogging."
	Plants for a Future. (2019). Lycium barbarum. https://pfaf.org/user/plant.aspx?latinname=Lycium+barbarum. [Accessed 28 Aug 2019]	"Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: acid, neutral and basic (alkaline) soils. "

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	"Deciduous woody perennial shrub erect or sprawling, usually 0.5–1.2 m tall. Stems much branched; branches pale grey, slender, arching, with thorns (0.5–1.5 cm)." [Sprawling, arching shrub, able to form thickets. See 4.12]
	Wu, Z. Y. & P. H. Raven, (eds). 1994. Flora of China. Vol. 17 (Verbenaceae through Solanaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.	"Shrubs (small tree in cultivation) 0.8–2 m tall. Stems and branches glabrous, branches thorny."

412	Forms dense thickets	y
	Source(s)	**Notes**
	Pyšek, P. (1991). Sprout demography and intraclonal competition inLycium barbarum, a clonal shrub, during an early phase of revegeeation. Folia Geobotanica et Phytotaxonomica, 26(2), 141-169	"Large monospecific thickets of Lycium barbarum are formed by older leafless branches covered with horizontal and overhanging upper branches which bear leaves."

501	Aquatic	n
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, (eds). 1994. Flora of China. Vol. 17 (Verbenaceae through Solanaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.	[Terrestrial] "Shrubs (small tree in cultivation) 0.8–2 m tall. Stems and branches glabrous, branches thorny."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 28 Aug 2019]	Family: Solanaceae Subfamily: Solanoideae Tribe: Lycieae

Qsn #	Question	Answer
503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network. 2019. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 28 Aug 2019]	Family: Solanaceae Subfamily: Solanoideae Tribe: Lycieae

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, (eds). 1994. Flora of China. Vol. 17 (Verbenaceae through Solanaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.	"Shrubs (small tree in cultivation) 0.8–2 m tall. Stems and branches glabrous, branches thorny. Leaves solitary or fasciculate, lanceolate or long elliptic, 2–3 cm × 3–6 mm. Inflorescences solitary or clustered flowers. Pedicel 1–2 cm. Calyx campanulate, 4–5 mm, usually 2-lobed, lobes 2- or 3- toothed at apex. Corolla purple, funnelform; tube 8–10 mm, obviously longer than limb and lobes; lobes 5–6 mm, spreading, margin glabrescent. Stamens and style slightly exserted. Berry red or orange-yellow, oblong or ovoid,0.4–2 cm × 5–10 mm. Seeds usually –20, brown-yellow, ca. 2 mm."

601	**Evidence of substantial reproductive failure in native habitat**	**n**
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	[No evidence] "The original habitat of the species is obscure but probably in southeastern Europe to southwest Asia. The species has naturalized in Britain, Europe and Asia and is widely cultivated in northern and southern China, especially in Ningxia and Tianjin Shi."

602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Möllerová, J. (2005). Notes on invasive and expansive trees and shrubs. Journal of Forest Science, 51, 19-23	"Lycium barbarum (L. halimifolium): insect pollination; fruit – berry; germination ability 50%, seeds germinate quickly; root suckers; secondary stands, resistant to pollution, sunny sites, rich soils."
	PennState Extension. (2016). Goji Berry Culture. Updated: October 26, 2016. https://extension.psu.edu/goji-berry-culture. [Accessed 28 Aug 2019]	"plants may be grown from open-pollinated seed, but plant growth habit and productivity may be variable. Growers who intend to buy plants may wish to ask whether the plants were vegetatively propagated from superior clones or were grown from seed."

603	**Hybridizes naturally**	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown. No evidence found

604	**Self-compatible or apomictic**	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Qin, K., Wang, B., Jiao, E., Li, Y., & Wang, J. (2009). Preliminary study on the breeding system of Lycium barbarum. Guangxi Zhiwu/Guihaia, 29(5), 587-606	[Extremely low level self-compatibility] "The pollen viability, stigma receptivity and breeding system of Lycium barbarum were studied by using TTC, benzidine-hydrogen peroxide, pollen-ovule ratio, out-crossing index and bagging experiment. The results showed that: the ratio of pollen quantity and ovule of L. barbarum is more than 4 000, and hybrid index is between 3 and 4. The combination of artificial pollination and bagging experiments determined that among these 13 participants, Maye (Ningqi 1, Ningqi 2, Damaye, Xiaomaye) performanced partly as self-compatible, while other materials (Baihua, Baitiao, Ningqi 3, Jiantouyuanguo, Yuantouyuanguo, Mengqi 1, Bianguo, 0701 and 0616) showed self-incompatible, flower with different strains, different strains of different flower hardly setting, and under natural conditions only through mixing with other materials can they achieve replanting seed. Because of the extremely low level self-compatibility, the breeding system of L. barbarum should belong to obligate xenogamy (except the Department of Maye). "

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Wang, B., Jiao, E., Qin, K., & Wang, J. (2010). Pollination ecology study of Lycium barbarum L. Acta Botanica Boreali-Occidentalia Sinica, 30(1), 68-77	[17 types of insects visit flowers, including Diptera, Hymenoptera and Lepidoptera] "Abstract : This paper introduces the flowering phenology, flowering dynamics, pollen viability and stigma receptivity and breeding system of the style of the eight stains of Ningxia wolfberry (Lycium barbarum L.). It is also a preliminary study on pollen germination, pollen tube growth, as well as the types and behaviors of the flower visitor. The results show that the entire florescence of Ningxia wolfberry can lasts for 5 months, while the florescence of a single flower is only 3 to 4 days; the pollen viability can maintain about 15 days; The stigma receptivity is around 72 hours; male and female reproductive units have a longer encounter period in the duration; P/O is about 4 000; OCI lies between 3 and 4; the breeding system is xenogamy and it requires pollinators. Through the fluorescent microscope observation, it shows that the pollen of the three tested participates can germinate in the stigma, while the other two are self incompatible, which locates in the upper part of the style and ovary. We also claim that there are 17 types of insects visiting flowers, which belongs to Diptera, Hymenoptera and Lepidoptera, three major categories of insects. And the structure of flower and flowering pattern are suitable for Italian bees and Syrphid flies to pollinate."

Qsn #	Question	Answer
606	**Reproduction by vegetative fragmentation**	**y**
	Source(s)	**Notes**
	Plants for a Future. (2019). Lycium barbarum. https://pfaf.org/user/plant.aspx?latinname=Lycium+barbarum. [Accessed 28 Aug 2019]	"Plants produce suckers freely and can become invasive when in a suitable position."
	Möllerová, J. (2005). Notes on invasive and expansive trees and shrubs. Journal of Forest Science, 51, 19-23	[Root suckers] "Lycium barbarum (L. halimifolium): insect pollination; fruit – berry; germination ability 50%, seeds germinate quickly; root suckers; secondary stands, resistant to pollution, sunny sites, rich soils."

607	Minimum generative time (years)	2
	Source(s)	**Notes**
	Pyšek, P. (1991). Sprout demography and intraclonal competition inLycium barbarum, a clonal shrub, during an early phase of revegeeation. Folia Geobotanica et Phytotaxonomica, 26(2), 141-169	"Owing to the high growth rate and clonal spreading, Lycium barbarum. is capable of successful occupation of frequently disturbed sites."
	PennState Extension. (2016). Goji Berry Culture. Updated: October 26, 2016. https://extension.psu.edu/goji-berry-culture. [Accessed 28 Aug 2019]	"Plants will begin fruiting two years after seeding, or the year after planting if one-year-old transplants are used. Full yields will be reached four to five years from seeding. Maximum yields in China are reported to be about 7000 lb/acre."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	**Notes**
	Von der Lippe, M., & Kowarik, I. (2008). Do cities export biodiversity? Traffic as dispersal vector across urban–rural gradients. Diversity and Distributions, 14(1), 18-25	"Roadside plantations of nonnative species in particular may act as a seed source for plant invasions along road verges. An example of this process is the frequent deposition of seeds of Lycium barbarum, which was significantly affiliated with the outbound lanes and is frequently planted along the sides of motorways. Since it has been shown for rural areas that roadsides can act as invasion foci for the adjacent landscape (Gelbard & Belnap, 2003), it is likely that seminatural habitats in suburban areas can also be invaded starting from roadsides."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	"The original habitat of the species is obscure but probably in southeastern Europe to southwest Asia. The species has naturalized in Britain, Europe and Asia and is widely cultivated in northern and southern China, especially in Ningxia and Tianjin Shi."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	**Notes**
	Mohlenbrock, R.H. 1990. The illustrated flora of Illinois: Flowering plants: Nightshades to Mistletoe. SIU Press, Carbondale, IL	"Its bird-disseminated berries are able to germinate in waste areas to that the plant is occasionally found as an adventive in Illinois."

Qsn #	Question	Answer
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop, Forestry, Herbal, Ornamental, Pasture Dispersed by: Humans, Animals, Flyers, Vehicles, Escapee"
	Lim, T.K. 2013. Edible Medicinal And Non-Medicinal Plants. Volume 6, Fruits. Springer, Dordrecht	[Cultivation and small seeds increase probability of inadvertent contamination of other crops or agricultural commodities] "The species has naturalized in Britain, Europe and Asia and is widely cultivated in northern and southern China, especially in Ningxia and Tianjin Shi." … "Seeds usually 4–20, brownyellow, 2 mm across."

704	Propagules adapted to wind dispersal	n
	Source(s)	**Notes**
	Di Castri, F., Hansen, A. J. and Debussche, M. (eds.). (1990). Biological invasions in Europe and the Mediterranean Basin. Kluwer Academic Publishers, Dordrecht, The Netherlands	"Table 1. Introduced and cultivated fleshy-fruited plants and their bird dispersers in the Monpellier region." [includes Lycium barbarum dispersed by Sylvia atricapilla]
	Wu, Z. Y. & P. H. Raven, (eds). 1994. Flora of China. Vol. 17 (Verbenaceae through Solanaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.	[Fleshy-fruited] "Berry red or orange-yellow, oblong or ovoid,0.4–2 cm × 5–10 mm. Seeds usually 4–20, brown yellow, ca. 2 mm."

705	Propagules water dispersed	
	Source(s)	**Notes**
	Queensland Government. (2019). Weeds of Australia. Lycium barbarum. https://keyserver.lucidcentral.org. [Accessed 28 Aug 2019]	[Bird-dispersed, but presence along riverbanks suggests water may play a role in secondary dispersal] "This garden escape has mainly become naturalised in coastal and sub-coastal districts in south eastern Australia. It is often found growing in disturbed sites and waste areas, but also invades riverbanks and native bushland (e.g. Yarra Bend Park in Victoria)." … "Like African boxthorn (Lycium ferocissimum), it is dispersed into natural areas by birds and other animals that eat its fruit and may cause similar environmental impacts (e.g. form dense thickets along waterways to the detriment of native species)."

706	Propagules bird dispersed	y
	Source(s)	**Notes**
	Mohlenbrock, R.H. 1990. The illustrated flora of Illinois: Flowering plants: Nightshades to Mistletoe. SIU Press, Carbondale, IL	"Its bird-disseminated berries are able to germinate in waste areas to that the plant is occasionally found as an adventive in Illinois."
	Queensland Government. (2019). Weeds of Australia. Lycium barbarum. https://keyserver.lucidcentral.org. [Accessed 28 Aug 2019]	"Like African boxthorn (Lycium ferocissimum), it is dispersed into natural areas by birds and other animals that eat its fruit and may cause similar environmental impacts (e.g. form dense thickets along waterways to the detriment of native species)."
	Di Castri, F., Hansen, A. J. and Debussche, M. (eds.). (1990). Biological invasions in Europe and the Mediterranean Basin. Kluwer Academic Publishers, Dordrecht, The Netherlands	"Table 1. Introduced and cultivated fleshy-fruited plants and their bird dispersers in the Monpellier region." [includes Lycium barbarum dispersed by Sylvia atricapilla]

707	Propagules dispersed by other animals (externally)	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Mohlenbrock, R.H. 1990. The illustrated flora of Illinois: Flowering plants: Nightshades to Mistletoe. SIU Press, Carbondale, IL	[Internally dispersed] "Its bird-disseminated berries are able to germinate in waste areas to that the plant is occasionally found as an adventive in Illinois."

708	Propagules survive passage through the gut	y
	Source(s)	**Notes**
	Queensland Government. (2019). Weeds of Australia. Lycium barbarum. https://keyserver.lucidcentral.org. [Accessed 28 Aug 2019]	"Like African boxthorn (Lycium ferocissimum), it is dispersed into natural areas by birds and other animals that eat its fruit and may cause similar environmental impacts (e.g. form dense thickets along waterways to the detriment of native species)."
	Di Castri, F., Hansen, A. J. and Debussche, M. (eds.). (1990). Biological invasions in Europe and the Mediterranean Basin. Kluwer Academic Publishers, Dordrecht, The Netherlands	"Table 1. Introduced and cultivated fleshy-fruited plants and their bird dispersers in the Monpellier region." [includes Lycium barbarum dispersed by Sylvia atricapilla]

801	Prolific seed production (>1000/m2)	n
	Source(s)	**Notes**
	Wu, Z. Y. & P. H. Raven, (eds). 1994. Flora of China. Vol. 17 (Verbenaceae through Solanaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis.	"Shrubs (small tree in cultivation) 0.8–2 m tall." … "Seeds usually 4–20, brown-yellow, ca. 2 mm." [Small-seeded shrub but seed unlikely to reach such high densities]

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	**Notes**
	Royal Botanic Gardens Kew. (2019) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 28 Aug 2019]	"Storage Behaviour: Orthodox? Storage Conditions: Hermetic air-dry storage at 5°C recommended (Rudolf, 1974l)" [Seed longevity under natural conditions unknown]

803	Well controlled by herbicides	y
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Herbicides used to control the related L. ferocissimum assumed to be effective on L. barbarum] "Cuttings plants at ground level is followed by treating all exposed surfaces with amine, 2,4-D or triclopyr to prevent regrowth. Herbicides applied as foliar sprays include glyphosate, picloram, or a mixture of picloram and triclopyr"

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	**Notes**
	Plants for a Future. (2019). Lycium barbarum. https://pfaf.org/user/plant.aspx?latinname=Lycium+barbarum. [Accessed 28 Aug 2019]	"Plants are very tolerant of pruning and can regrow from old wood [202]. Any trimming is best carried out in the spring[188]. Plants produce suckers freely and can become invasive when in a suitable position."

Qsn #	Question	Answer
805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. (2019). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability
• Able to grow in high elevation, tropical climates
• Widely naturalized (but no evidence in Hawaiian Islands to date)
• A weed shrub, and potential environmental weed in Australia
• Other Lycium species are invasive
• Thorny branches
• Toxic to animals
• Tolerates many soil types
• Reproduces by seeds and vegetatively by suckers
• Reaches maturity in 2 years
• Seeds dispersed by birds, and both intentionally and accidentally by human activities
• Tolerates frequent pruning and able to resprout after cutting

Low Risk Traits
• May only be a threat to higher elevations of tropical Pacific islands
• Although weedy and invasive, values in many locations for its edible fruit and medicinal uses
• Provides fodder for livestock (palatable despite reports of toxicity)
• Prefers full sun, potentially limiting spread into dense, intact forests
• Primarily outcrossing (although limited self-fertilization may be possible)
• Herbicides may provide effective control