

Taxon: <i>Pyracantha crenatoserrata</i> (Hance) Rehder	Family: Rosaceae
Common Name(s): firethorn	Synonym(s): <i>Photinia crenatoserrata</i> Hance <i>Pyracantha crenulata</i> var. <i>Pyracantha fortuneana</i> auct. <i>Pyracantha gibbsii</i> var. <i>yunnanensis</i> <i>Pyracantha yunnanensis</i> (P. Vilm. ex

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 10 Oct 2019
WRA Score: 13.0	Designation:	Rating:

Keywords: Spiny Shrub, Environmental Weed, Dense Stands, Bird-Dispersed, Resprouts

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)	Intermediate
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)	n
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	y
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
408	Creates a fire hazard in natural ecosystems		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	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	n
607	Minimum generative time (years)		
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	y=1, n=-1	y
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)		
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
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	[No evidence of domestication] "P. crenatoserrata is a cultivation escape with the 2 small populations apparently spreading from seed deposited by birds. The taxonomy of this sp. and its closest allies, already confused, has been further complicated by the selection of clones of hybrids. The majority of these cvs were raised in the United States and have been introduced to N.Z. in recent times. They have now largely replaced the earlier-introduced spp. which mostly have the fewer frs produced in small clusters. P. crenatoserrata is closely related to the Chinese P. atalantioides (Hance) Stapf and P. rogersiana (A. B. Jackson) Chitt. but can be distinguished by its combination of rather densely hairy peduncles and oblanceolate to obovate lvs which are subtruncate to rounded at the apex. One specimen (CHR 243421 , Waikumete, Auckland, Sykes, 13.12.1987) resembles P. crenatoserrata but lacks the infl. hairs. In addition, the lvs of P. crenatoserrata are larger than those of P. rogersiana. The illustration of P. crenatoserrata in Bot. Mag. t. 9099 (1925 as P. yunnanensis) shows lvs with more prominent teeth than in most of those on N.Z. plants but this character can vary even on one plant. Thus, lvs on vegetative shoots are more obviously toothed than the majority of lvs towards the apex of reproductive branches, particularly when vegetative shoots are more shaded. P. crenatoserrata is sometimes known as P. fortuneana (Maxim.) L. overseas but the type of P. fortuneana does not belong to the genus Pyracantha (Sealy, J. R., Bot Mag. n.s. t. 74 (1949))."

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"	Low
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 10 Oct 2019]	"Native Asia-Temperate CHINA: China [Zhejiang Sheng, Fujian Sheng, Henan Sheng, Hunan Sheng, Hubei Sheng, Jiangsu Sheng, Guizhou Sheng, Shaanxi Sheng, Sichuan Sheng, Yunnan Sheng, Guangxi Zhuangzu Zizhiqu, Xizang Zizhiqu"

Qsn #	Question	Answer
202	Quality of climate match data	Intermediate
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 10 Oct 2019]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Sunny Gardens. (2019). <i>Pyracantha fortuneana</i> 'Graberii'. http://www.sunnYGardens.com/garden_plants/pyracantha/pyracantha_2449.php . [Accessed 10 Oct 2019]	"Climate: Zones 7, 8, 9 Notes: Thrives in Dry Climates, Hot Climates. Drought Tolerant, Low Maintenance."
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	"In central Yunnan, <i>P. crenatoserrata</i> grows in forest communities dominated by <i>Pinus yunnanensis</i> over an altitudinal range of 1500–2800 m above sea level, <i>Coriaria nepalensis</i> dominated shrubland on desolate subtropical slopes at 600–1000 m altitude and <i>Sophora viciifolia</i> shrubland that regrows following forest destruction in the very dry habitats of the plateau and river valleys (Xiwen and Walker 1986). On the north-eastern Tibetan Plateau, <i>P. crenatoserrata</i> is one of a few shrub species that dominate areas between 3300 m and 3400 m above sea level (Wang et al. 2006). In central Himalayan forests, <i>P. crenulata</i> flourishes along the open banks of streams, in wastelands, chir pine forests (1580–1800 m altitude) and banj oak forests (1800–2100 m altitude). This species prefers a fertile, well-drained, moisture retentive loamy soil and sunny position (Shah et al. 2006)."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2003. Flora of China. Vol. 9 (Pittosporaceae through Connaraceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Thickets, stream sides, roadsides; 500-2800 m." [Elevation range exceeds 2000 m, demonstrating environmental versatility]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Herbarium Pacificum Staff. 1999. New Hawaiian plant records for 1998. Bishop Museum Occasional Papers 58: 3-11	"It has been reported from cultivation in the Hawaiian Islands (Neal, 1965; St. John, 1973) and is now known to be naturalized on 2 of them. Material examined. KAUAI: Waimea Distr., Kōkēe State Park, mile 18.4 on Hwy 550, just before Pu'u o Kila Lookout on southern rim of Kalalau Valley, 1220 m, 20 May 1988, D. Lorence, T. Flynn, & J. Talbot 6002. HAWAII: Hawai'i Volcanoes National Park, Kīlauea Military Camp, established in weedy, disturbed places on pyroclastic soil, 1210 m, 25 Nov 1963, F.R. Fosberg 44463."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes

Qsn #	Question	Answer
	Herbarium Pacificum Staff. 1999. New Hawaiian plant records for 1998. Bishop Museum Occasional Papers 58: 3-11	"It has been reported from cultivation in the Hawaiian Islands (Neal, 1965; St. John, 1973) and is now known to be naturalized on 2 of them."
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	"Originally introduced and planted as garden ornamentals, seven species have naturalised in Australia: <i>Pyracantha angustifolia</i> , <i>P. coccinea</i> , <i>P. crenulata</i> , <i>P. crenatoserrata</i> , <i>P. fortuneana</i> , <i>P. rogersiana</i> and <i>P. koidzumii</i> ." ... " <i>P. crenatoserrata</i> has naturalised in New Zealand and the United States (Alabama, South Carolina, Texas, California, Florida and Hawaii) (Nesom 2010; Randall 2002)."
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	" <i>P. crenatoserrata</i> is a cultivation escape with the 2 small populations apparently spreading from seed deposited by birds."

301	Naturalized beyond native range	y
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	"Originally introduced and planted as garden ornamentals, seven species have naturalised in Australia: <i>Pyracantha angustifolia</i> , <i>P. coccinea</i> , <i>P. crenulata</i> , <i>P. crenatoserrata</i> , <i>P. fortuneana</i> , <i>P. rogersiana</i> and <i>P. koidzumii</i> ."
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	" <i>P. crenatoserrata</i> is a cultivation escape with the 2 small populations apparently spreading from seed deposited by birds."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"References: United States of America-CE- 617, Australia-E-290, New Zealand-N-280, New Zealand-N-15, United States of America-N-301, United States of America- N-839, New Zealand-N-919, United States of America-W-946, Australia-N-354, Australia-N-1049, Europe-N-819, New Zealand-E-505, United States of America- Q-1197, Australia-E-1259, Australia-E- 1261, United States of America-N-1292, Global-W-1376, Global-I-1404, Australia- E-1456, Global-ZD-1495, Global-CD-1611, Australia-N-1959, New Zealand-ED- 2023, New Zealand-N-2048, United States of America-N-2092, Australia-W-1977, New Zealand-W-1977, South Africa-W-1977."
	Herbarium Pacificum Staff. 1999. New Hawaiian plant records for 1998. Bishop Museum Occasional Papers 58: 3-11	"This species, native to China, is similar to <i>P. koidzumii</i> but is distinguished by having smaller leaves that are always distinctly crenate on the margins, and smaller, usually red fruits about 0.2 inches in diameter. It has been reported from cultivation in the Hawaiian Islands (Neal, 1965; St. John, 1973) and is now known to be naturalized on 2 of them. Material examined. KAUA'I: Waimea Distr., Kōke'e State Park, mile 18.4 on Hwy 550, just before Pu'u o Kila Lookout on southern rim of Kalalau Valley, 1220 m, 20 May 1988, D. Lorence, T. Flynn, & J. Talbot 6002. HAWAII: Hawai'i Volcanoes National Park, Kīlauea Military Camp, established in weedy, disturbed places on pyroclastic soil, 1210 m, 25 Nov 1963, F.R. Fosberg 44463."

Qsn #	Question	Answer
302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	" <i>P. angustifolia</i> , <i>P. crenulata</i> , and <i>P. crenatoserrata</i> (syn. <i>P. fortuneana</i>), are significant environmental weeds in the ACT, New South Wales and Victoria (Burnett and Roush 1999)."

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	" <i>P. angustifolia</i> , <i>P. crenulata</i> , and <i>P. crenatoserrata</i> (syn. <i>P. fortuneana</i>), are significant environmental weeds in the ACT, New South Wales and Victoria (Burnett and Roush 1999)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	y
	Source(s)	Notes
	Queensland Government. (2019). Weeds of Australia - <i>Pyracantha crenatoserrata</i> . http://keyserver.lucidcentral.org . [Accessed 10 Oct 2019]	"Broad-leaf firethorn (<i>Pyracantha crenatoserrata</i>) is regarded as an environmental weed in New South Wales, the ACT and Victoria."
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	" <i>P. angustifolia</i> , <i>P. crenulata</i> , and <i>P. crenatoserrata</i> (syn. <i>P. fortuneana</i>), are significant environmental weeds in the ACT, New South Wales and Victoria (Burnett and Roush 1999)."

305	Congeneric weed	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Giantomasi, A., Tecco, P. A., Funes, G., Gurvich, D. E., & Cabido, M. (2008). Canopy effects of the invasive shrub <i>Pyracantha angustifolia</i> on seed bank composition, richness and density in a montane shrubland (Córdoba, Argentina). <i>Austral Ecology</i>, 33(1), 68-77</p>	<p>"Abstract: Invasive woody species frequently change the composition of the established vegetation and the properties of the soil under their canopies. Accordingly, invasion may well affect regenerative phases of the community, especially at the seed bank level, likely influencing community restoration. <i>Pyracantha angustifolia</i> (Rosaceae) is an invasive shrub in central Argentina that affects woody recruitment, particularly enhancing the recruitment of other exotic woody species. There is though no information regarding its effect on the soil seed bank within the invaded community. The present study was set up to gain further insight into the canopy effects of <i>P. angustifolia</i>. We aimed to assess whether the invasive shrub affects seed bank composition, richness and seed density as compared with the dominant native shrub <i>Condalia montana</i> (Rhamnaceae), and to relate the observed seed bank patterns with those of the established vegetation. We evaluated the composition of the germinable seed bank and the established vegetation under the canopy of 16 shrubs of <i>P. angustifolia</i>, 16 shrubs of <i>C. montana</i>, and in 16 control plots (10 m²) without shrub cover. The floristic composition of the seed bank differed among canopy treatments. However, seed bank richness did not differ significantly. There was an overall high seed density of exotic species throughout the study site, though exotic forbs showed significantly lower seed densities under the invasive shrub. <i>Pyracantha angustifolia</i> would not promote the incorporation of new species into the seed bank of the invaded community but rather favour the establishment of woody species that do not depend on seed banks. The absence of dominant woody species in the seed bank, the dominance of exotic forbs, and the high similarity between established exotic species and those present in the seed bank may surely affect community restoration following the main disturbances events observed in the region."</p>
	<p>Weber, E. 2017. <i>Invasive Plant Species of the World</i>, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK</p>	<p>[<i>Pyracantha angustifolia</i>] ""The shrub is invasive because it forms dense and spiny thickets that shade out other plants and impede wildlife movement. The shrub establishes well in disturbed sites and expands into less disturbed vegetation. Regeneration of native woody species is prevented where orange firethorn is present (Muyt, 2001)." [<i>Pyracantha crenulate</i>] "Himalayan firethorn is found on slopes, in grassy places and open sites in its native range; it ascends to 2500 m altitude in China (FOC, 2014). The shrub invades high-altitude grasslands in Africa (Henderson, 2001) and similar habitats to <i>Pyracantha angustifolia</i> in Australia (Muyt, 2001). The shrub forms dense and spiny thickets crowding out native vegetation and impeding wildlife. Little is known about the ecology of this plant as an invader."</p>
	<p>Randall, R.P. (2017). <i>A Global Compendium of Weeds</i>. 3rd Edition. Perth, Western Australia. R.P. Randall</p>	<p><i>Pyracantha angustifolia</i>, <i>Pyracantha coccinea</i>, <i>Pyracantha crenulata</i>, <i>Pyracantha koidzumii</i>, & <i>Pyracantha rogersiana</i> listed as weeds of some type</p>

Qsn #	Question	Answer
401	Produces spines, thorns or burrs	y
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	"Evergreen shrub to c. 2 m high; stems generally dense and ± spreading, often spine-tipped; very young stems brownish tomentose; older stems brown and shiny."
402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. (2019). Personal Communication	Unknown. No evidence found
403	Parasitic	n
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	"Evergreen shrub to c. 2 m high; stems generally dense and ± spreading, often spine-tipped" [Rosaceae. No evidence]
404	Unpalatable to grazing animals	
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	[Unknown. Spines may deter browsing] "Evergreen shrub to c. 2 m high; stems generally dense and ± spreading, often spine-tipped"
405	Toxic to animals	n
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	No evidence
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	NIH U.S. National Library of Medicine. (2019). TOXNET Toxicology Data Network. https://toxnet.nlm.nih.gov/ . [Accessed 10 Oct 2019]	No evidence
406	Host for recognized pests and pathogens	y
	Source(s)	Notes

Qsn #	Question	Answer
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	" <i>Pyracantha</i> is a host for bacterial fireblight, a serious disease of apples and pears with no single effective treatment (Miles n.d.). If an incursion of fireblight were ever detected in Queensland, eradication could be confounded once the disease became established in wild firethorn. Queensland's apple crops are grown around Stanthorpe, in close proximity to <i>Pyracantha</i> . The expected value of Queensland's apple crop in 2009-10 was \$40 million (DEEDI 2010). The berries of firethorn may also allow fruit fly to overwinter."
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	" <i>Pyracantha</i> species are highly susceptible to fireblight, for which there is not treatment except for pruning the affected area. Scab disease is another problem that affects species in this genus."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	No evidence
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	NIH U.S. National Library of Medicine. (2019). TOXNET Toxicology Data Network. https://toxnet.nlm.nih.gov/ . [Accessed 10 Oct 2019]	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	"The effect of fire on <i>Pyracantha</i> abundance and persistence is not known. However, observations by the authors near Canberra suggest bushfires can reduce the abundance of <i>Pyracantha</i> species in forest areas (but not eliminate them)."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	MyGardenLife. (2019). Chinese Firethorn (<i>Pyracantha crenatoserrata</i>). https://www.mygardenlife.com/plant-library/2652/pyracantha/crenatoserrata . [Accessed 10 Oct 2019]	"Plant Light: Full Sun"
	PlantMaster. (2019). <i>Pyracantha crenatoserrata</i> Firethorn. http://www.plantmaster.com/share/eplant.php?plantnum=331 . [Accessed 10 Oct 2019]	"Sun Full"
	Sunny Gardens. (2019). <i>Pyracantha fortuneana</i> 'Graberii'. http://www.sunnygardens.com/garden_plants/pyracantha/pyracantha_2449.php . [Accessed 10 Oct 2019]	"Sunlight: Full Sun, Partial Sun"

Qsn #	Question	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	" <i>P. crenatoserrata</i> grows in a variety of soils, mostly red or brown earths, that are seasonally dry, infertile and with a pH of 5.5–7.0 (Xiwen and Walker 1986)."
	PlantMaster. (2019). <i>Pyracantha crenatoserrata</i> Firethorn. http://www.plantmaster.com/share/eplant.php?plantnum=331 . [Accessed 10 Oct 2019]	"Soil Type - Sandy, Clay, Loam, Rocky, Unparticular"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2003. Flora of China. Vol. 9 (Pittosporaceae through Connaraceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Shrubs to 3 m tall. Lateral branches short, thornlike; young branchlets rusty pubescent, dark brown and glabrescent when old." [Photinia crenatoserrata Hance is a synonym of <i>Pyracantha fortuneana</i> (Maxim.) H.L.Li]

412	Forms dense thickets	y
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	" <i>P. crenatoserrata</i> forms thickets along stream sides and roadsides at altitudes of 500–2800 m."

501	Aquatic	n
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	[Terrestrial] "Scrub, margin of large plantations."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2003. Flora of China. Vol. 9 (Pittosporaceae through Connaraceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	[Terrestrial] "Thickets, stream sides, roadsides; 500-2800 m."

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 10 Oct 2019]	Family: Rosaceae Subfamily: Amygdaloideae Tribe: Maleae Subtribe: Malinae

503	Nitrogen fixing woody plant	n
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Qsn #	Question	Answer
	Source(s)	Notes
	de Bruijn, F. J. (ed.). (2015). Biological Nitrogen Fixation. John Wiley & Sons, Hoboken, NJ	"...of 122 genera in the Rosaceae, only 4 genera are capable of fixing nitrogen." ... "those present in nodules of members of the Rosaceae (Cercocarpus, Chamaebatia, Dryas, Purshia)"
	USDA, Agricultural Research Service, National Plant Germplasm System. (2019). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 10 Oct 2019]	Family: Rosaceae Subfamily: Amygdaloideae Tribe: Maleae Subtribe: Malinae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	"Evergreen shrub to c. 2 m high; stems generally dense and ± spreading, often spine-tipped; very young stems brownish tomentose; older stems brown and shiny."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	[No evidence] " <i>P. crenatoserrata</i> : Chinese provinces of Fujian, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Shaanxi, Sichuan, Xizang, Yunnan and Zhejiang (eFloras.org 2003)." ... "Seven species have naturalised in Australia: <i>P. angustifolia</i> , <i>P. coccinea</i> , <i>P. crenulata</i> , <i>P. crenatoserrata</i> , <i>P. fortuneana</i> , <i>P. rogersiana</i> and <i>P. koidzumii</i> !". " <i>P. crenatoserrata</i> has naturalised in New Zealand and the United States (Alabama, South Carolina, Texas, California, Florida and Hawaii) (Nesom 2010; Randall 2002)."

602	Produces viable seed	y
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	" <i>P. crenatoserrata</i> is a cultivation escape with the 2 small populations apparently spreading from seed deposited by birds."
	Queensland Government. (2019). Weeds of Australia - <i>Pyracantha crenatoserrata</i> . http://keyserver.lucidcentral.org . [Accessed 10 Oct 2019]	"This species reproduces entirely by seed. Seeds are most commonly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water and in dumped garden waste."

603	Hybridizes naturally	
	Source(s)	Notes
	Nesom, G. L. (2010). <i>Pyracantha</i> (Rosaceae) naturalized in Texas and the southeastern United States. <i>Phytoneuron</i> , 2, 1-6	"Several cultivars are explicitly indicated by Meyer et al. (1994) to be of hybrid origin (<i>P. koidzumii</i> x <i>P. fortuneana</i> ; <i>P. koidzumii</i> x <i>P. coccinea</i>)." [Unknown. Hybridization documented in genus]

604	Self-compatible or apomictic	
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Qsn #	Question	Answer
	Source(s)	Notes
	Dickinson, T. A., Lo, E., & Talent, N. (2007). Polyploidy, reproductive biology, and Rosaceae: understanding evolution and making classifications. <i>Plant systematics and evolution</i> , 266(1-2), 59-78	"Table 2. Genera of Rosaceae subfamily Maloideae, species numbers, ploidy level variation, evidence of apomixis and the breakdown of self-incompatibility (SC) in polyploids" [Unknown. Entry for <i>Pyracantha</i> spp. In table left blank]

605	Requires specialist pollinators	n
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. <i>Flora of New Zealand Volume IV</i> . Botany Division, DSIR, Christchurch, New Zealand	"Corymbs c. 20-40 mm across; pedicels c. 5-15 mm long, shiny and with scattered hairs. Sepals rounded or very broadly ovate, c. 1 mm long, glabrous, or sometimes with a few hairs, shining, mucronulate. Petals ± suborbicular, 2.5-3.5 mm diam., rounded, white or almost so. Stamens slightly < petals." [No evidence. Flowers not specialized]
	Fussell, M., & Corbet, S. A. (1992). Flower usage by bumble-bees: a basis for forage plant management. <i>Journal of Applied Ecology</i> , 29(2): 451-465	"Table 4. Flower taxa visited on more than five walks by each colour group of bumble-bees, ranked in order of group-specific selectivity" [tables includes <i>Pyracantha</i> spp.]

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Queensland Government. (2019). Weeds of Australia - <i>Pyracantha crenatoserrata</i> . http://keyserver.lucidcentral.org . [Accessed 10 Oct 2019]	"This species reproduces entirely by seed. Seeds are most commonly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water and in dumped garden waste."

607	Minimum generative time (years)	
	Source(s)	Notes
	Benson, D. & McDougall, L. (1997). <i>Ecology of Sydney Plant Species</i> . Part 5. Dicotyledon families Flacourtiaceae to Myrsinaceae. <i>Cunninghamia</i> 5(2): 330-544	" <i>Pyracantha fortuneana</i> ... Primary juvenile period:" [Unknown. No information provided]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Queensland Government. (2019). Weeds of Australia - <i>Pyracantha crenatoserrata</i> . http://keyserver.lucidcentral.org . [Accessed]	[Spread inadvertently by dumped garden waste] "Seeds are most commonly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water and in dumped garden waste."

Qsn #	Question	Answer
702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Also native to China, <i>P. crenatoserrata</i> is another attractive ornamental that is occasionally cultivated in Hawai'i."
	Herbarium Pacificum Staff. 1999. New Hawaiian plant records for 1998. Bishop Museum Occasional Papers 58: 3-11	"It has been reported from cultivation in the Hawaiian Islands (Neal, 1965; St. John, 1973) and is now known to be naturalized on 2 of them."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop, Ornamental"
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	" <i>Pyracantha</i> species are excellent ornamentals with dense habit and foliage that sets off the vivid fruit" [Possible if seeds contaminate other potted ornamental plants sold commercially]

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	"Fr. depressed-globose, 5-6 mm wide across top, red or orange-red, glossy." ... " <i>P. crenatoserrata</i> is a cultivation escape with the 2 small populations apparently spreading from seed deposited by birds."

705	Propagules water dispersed	y
	Source(s)	Notes
	Queensland Government. (2019). Weeds of Australia - <i>Pyracantha crenatoserrata</i> . http://keyserver.lucidcentral.org . [Accessed 10 Oct 2019]	"Seeds are most commonly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water and in dumped garden waste."
	Hrusa, F., Ertter, B., Sanders, A., Leppig, G., & Dean, E. (2002). Catalogue of Nonnative Vascular Plants Occurring Spontaneously in California Beyond Those Addressed in the Jepson Manual—Part I. Madroño, 49(2): 61-98	[Found in proximity to water] "Table 3. Potentially Significant Plants. Fully naturalized species or first California appearances of well-known pest plants." ... " <i>Pyracantha crenatoserrata</i> ... Widespread; invader of mesic ditchbanks, roadside depressions, open shorelines."

706	Propagules bird dispersed	y
	Source(s)	Notes
	Webb, C. J., Sykes, W. R., & Garnock-Jones, P. J. 1988. Flora of New Zealand Volume IV. Botany Division, DSIR, Christchurch, New Zealand	" <i>P. crenatoserrata</i> is a cultivation escape with the 2 small populations apparently spreading from seed deposited by birds."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. 2003. Flora of China. Vol. 9 (Pittosporaceae through Connaraceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Pome orangish red or dark red, subglobose, ca. 5 mm; fruiting pedicel 25 mm; sepals persistent, erect."

Qsn #	Question	Answer
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	"Seeds are dispersed by animals (birds), water, gravity, soil movement and dumped vegetation (Auckland Regional Council 2008; Debussche and Isenmann 1994; Bass 1996). Birds are probably the most important dispersal vector. In New South Wales, pied currawongs are a major dispersal vector and actually prefer the fruit to those of other plant species. Bird dispersal assists escape of cultivated specimens from gardens to bushland (Bass 1996). Foxes have been suggested as a dispersal vector (Muyt 2001). In Southern California, the coyote (<i>Canis latrans</i>) disperses seeds of <i>Pyracantha</i> species (Silverstein 2005). In New Zealand, introduced black rats (<i>Rattus rattus</i>) and brushtail possums (<i>Trichosurus vulpecular</i>) have been recorded excreting whole seeds of <i>P. angustifolia</i> (Williams et al. 2000)."
	Queensland Government. (2019). Weeds of Australia - <i>Pyracantha crenatoserrata</i> . http://keyserver.lucidcentral.org . [Accessed 10 Oct 2019]	"Seeds are most commonly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water and in dumped garden waste."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	"Seeds are dispersed by animals (birds), water, gravity, soil movement and dumped vegetation (Auckland Regional Council 2008; Debussche and Isenmann 1994; Bass 1996). Birds are probably the most important dispersal vector. In New South Wales, pied currawongs are a major dispersal vector and actually prefer the fruit to those of other plant species. Bird dispersal assists escape of cultivated specimens from gardens to bushland (Bass 1996). Foxes have been suggested as a dispersal vector (Muyt 2001). In Southern California, the coyote (<i>Canis latrans</i>) disperses seeds of <i>Pyracantha</i> species (Silverstein 2005). In New Zealand, introduced black rats (<i>Rattus rattus</i>) and brushtail possums (<i>Trichosurus vulpecular</i>) have been recorded excreting whole seeds of <i>P. angustifolia</i> (Williams et al. 2000)."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	"Seeds are dispersed by animals (birds), water, gravity, soil movement and dumped vegetation (Auckland Regional Council 2008; Debussche and Isenmann 1994; Bass 1996). Birds are probably the most important dispersal vector. In New South Wales, pied currawongs are a major dispersal vector and actually prefer the fruit to those of other plant species. Bird dispersal assists escape of cultivated specimens from gardens to bushland (Bass 1996). Foxes have been suggested as a dispersal vector (Muyt 2001). In Southern California, the coyote (<i>Canis latrans</i>) disperses seeds of <i>Pyracantha</i> species (Silverstein 2005). In New Zealand, introduced black rats (<i>Rattus rattus</i>) and brushtail possums (<i>Trichosurus vulpecular</i>) have been recorded excreting whole seeds of <i>P. angustifolia</i> (Williams et al. 2000)."

801	Prolific seed production (>1000/m2)	

Qsn #	Question	Answer
	Source(s)	Notes
	Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn <i>Pyracantha</i> species. The State of Queensland, Department of Employment, Economic Development and Innovation	"Berries are produced in large numbers with up to 1000 seeds/m2 of soil surface recorded" [Possibly Yes. Species not identified]

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 10 Oct 2019]	"Storage Behaviour: Orthodox p Storage Conditions: 100% viability following drying to mc's in equilibrium with 15% RH and freezing for 1 month at -20°C at RBG Kew, WP" [<i>Pyracantha fortuneana</i> . Unknown in field settings]

803	Well controlled by herbicides	y
	Source(s)	Notes
	Motooka, P., Castro, L., Nelson, D., Nagai, G. & Ching, L. 2003. Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide. CTAHR, UH Manoa, Honolulu, HI	[Methods to control <i>Pyracantha angustifolia</i> are presumed to be effective] "Somewhat tolerant of triclopyr. May require crop oil as adjuvant to enhance herbicide uptake. Katie Cassel (Kokee Museum) reports that cut-stump treatments with glyphosate or triclopyr are effective. Application of triclopyr to frills or basal bark caused slow and erratic results. Application of glyphosate (undiluted product) to frill was somewhat more effective than triclopyr. HAVO staff reported control with foliar applications of triclopyr amine at 2% product in water (Chris Zimmer, HAVO)"
	Coulombe, E. et al. (2002). Effects of various field-tested herbicide/application treatment combinations on established and incipient weed species in Kokee State Park [poster]. 2002 Hawaii Conservation Conference, Honolulu, Hawaii	A cut stump or frill treatment followed by Garlon (20% in FCO) was used at Kōkee State Park to control <i>Pyracantha crenatoserrata</i> . The treatment generated adequate mortality.

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Benson, D. & McDougall, L. (1997). Ecology of Sydney Plant Species. Part 5. Dicotyledon families Flacourtiaceae to Myrsinaceae. <i>Cunninghamia</i> 5(2): 330-544	"Fire response: Resprouted from base after high intensity fire (1/94) at Lane Cove (P. Kubiak pers. comm.)."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes

Qsn #	Question	Answer
	Herbarium Pacificum Staff. 1999. New Hawaiian plant records for 1998. Bishop Museum Occasional Papers 58: 3-11	[Unknown. No evidence found] "This species, native to China, is similar to <i>P. koidzumii</i> but is distinguished by having smaller leaves that are always distinctly crenate on the margins, and smaller, usually red fruits about 0.2 inches in diameter. It has been reported from cultivation in the Hawaiian Islands (Neal, 1965; St. John, 1973) and is now known to be naturalized on 2 of them. Material examined. KAUAI: Waimea Distr., Kōke'e State Park, mile 18.4 on Hwy 550, just before Pu'u o Kila Lookout on southern rim of Kalalau Valley, 1220 m, 20 May 1988, D. Lorence, T. Flynn, & J. Talbot 6002. HAWAII: Hawai'i Volcanoes National Park, Kīlauea Military Camp, established in weedy, disturbed places on pyroclastic soil, 1210 m, 25 Nov 1963, F.R. Fosberg 44463."

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Can grow in higher elevations with subtropical climates
- Naturalized on Kauai and Hawaii (Hawaiian Islands), parts of the continental US, Australia, New Zealand
- Environmental weed in Australia
- Other *Pyracantha* species are invasive
- Spiny
- Host of bacterial fireblight
- Tolerates many soil types
- Forms dense stands that exclude other vegetation
- Reproduces by seeds
- Seeds dispersed by birds, water, dumped garden waste & intentionally by people
- Prolific seed production (densities unknown)
- Able to resprout after fire

Low Risk Traits

- Invasiveness may be restricted to higher elevation of islands with tropical/subtropical climates
- Ornamental
- Requires full to partial sun to grow (dense shade may impede spread)
- Herbicide may provide effective control