**Taxon:** Pyracantha angustifolia (Franch.) C. K. Schneid. **Family:** Rosaceae

**Common Name(s):** narrowleaf firethorn
orange firethorn
yellow firethorn

**Synonym(s):** Cotoneaster angustifolius Franch.

**Assessor:** Chuck Chimera **Status:** In Progress **End Date:** 18 Jan 2017

**WRA Score:** 14.0 **Designation:** H(Hawai'i) **Rating:** High Risk

**Keywords:** Thorny 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 | | |
| 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 | y=1, n=0 | n |
| 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 | 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 | 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 | 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** |
| | 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 | No evidence of domestication |

| Qsn # | Question | Answer |
|---|---|---|
| 102 | **Has the species become naturalized where grown?** | |
| | **Source(s)** | **Notes** |
| | WRA Specialist. 2017. Personal Communication | NA |

| Qsn # | Question | Answer |
|---|---|---|
| 103 | **Does the species have weedy races?** | |
| | **Source(s)** | **Notes** |
| | WRA Specialist. 2017. Personal Communication | NA |

| Qsn # | Question | Answer |
|---|---|---|
| 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. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 16 Jan 2017] | "Native:<br>Asia-Temperate<br>China: China - Guizhou, - Hubei, - Sichuan, - Xizang, - Yunnan, - Zhejiang" |

| Qsn # | Question | Answer |
|---|---|---|
| 202 | **Quality of climate match data** | **Intermediate** |
| | **Source(s)** | **Notes** |
| | USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 16 Jan 2017] | |

| Qsn # | Question | Answer |
|---|---|---|
| 203 | **Broad climate suitability (environmental versatility)** | **y** |
| | **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 | "Thickets on slopes, at roadsides; 1600-3000 m" [Elevation range exceeds 1000 m] |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "This species invades open woodlands, forests, urban bushland, waterways and grasslands in temperate and sometimes also sub-tropical regions." |

| Qsn # | Question | Answer |
|---|---|---|
| | Plants for a Future. 2017. Pyracantha angustifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Pyracantha+angustifolia. [Accessed 18 Jan 2017] | "USDA hardiness 6-10" |

| 204 | Native or naturalized in regions with tropical or subtropical climates | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "This species invades open woodlands, forests, urban bushland, waterways and grasslands in temperate and sometimes also sub-tropical regions." |
| | Pratt, L. W. & Bio, K. F. 2012. New plant records from Hawai'i Island. Bishop Museum Occasional Papers 113: 75-80 | "When Wagner et al. (1990) published the Manual of the flowering plants of Hawai'i, Pyracantha angustifolia (firethorn) was listed as naturalized on both Kaua'i and Hawai'i, where it was said to be present near the Volcano dump. Subsequently, it was realized that there were actually three species of Pyracantha present in the Hawaiian Islands, and P. angustifolia was thought to be limited to Kaua'i (Herbarium Pacificum Staff 1999). a new island record of P. angustifolia for Maui was reported by Starr et al. (2008) on East Maui, where the shrub was scattered in a pasture in Kula. Now this species of firethorn has also been collected on Hawai'i Island along Hwy 11 not far from Volcano Village. With the collection of the following specimen, there are now three species of Pyracantha known from Hawai'i Island: P. angustifolia, P. crenatoserrata, and P. koidzumii. Based on recent weed surveys (I. Pratt, pers. observ.), P. crenatoserrata appears to be the most common Pyracantha species in the Volcano area and within Hawai'i Volcanoes National Park. Pyracantha angustifolia may have invasive potential on the island; the Hawai'i Weed risk assessment rated the species as 13 H, likely to be invasive in Hawai'i (Daehler & Denslow 2011). Several Pyracantha species are frequently cultivated in Hawai'i and may become weeds because of their bird-dispersed fruit (Staples & Herbst 2005)." |

| 205 | Does the species have a history of repeated introductions outside its natural range? | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Gurvich, D., Paula A. Tecco, & Díaz, S. (2005). Plant Invasions in Undisturbed Ecosystems: The Triggering Attribute Approach. Journal of Vegetation Science, 16(6), 723-728 | "Ligustrum and Pyracantha were both introduced in central Argentina as ornamental species at the beginning of the 19th century" |
| | Schmidt, E., Lötter, M. & McCleland, W. 2002. Trees and shrubs of Mpumalanga and Kruger National Park. Jacana Media, Johannesburg, South Africa | "Native to China, now well established in many gardens in South Africa. Escaped and invading the wild in the Highveld areas of Mpumalanga." |

| Qsn # | Question | Answer |
|---|---|---|
| | USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 18 Jan 2017] | "Naturalized:<br>Africa<br>Southern Africa: South Africa<br>Australasia<br>Australia: Australia<br>New Zealand: New Zealand<br>Pacific<br>North-Central Pacific: United States - Hawaii<br>Cultivated:<br>. also cult." |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "This species is widely naturalised in south-eastern Australia, but naturalised populations are generally scattered and very localised. It is most common in the tableland regions of New South Wales, in the ACT and in Victoria. Also present in other parts of New south Wales, in the cooler parts of south-eastern Queensland, and in south-eastern South Australia. Also naturalised overseas in southern Africa, New Zealand, south-western USA (i.e. California) and Hawaii." |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "widely cultivated in warm temperate areas" |

| 301 | Naturalized beyond native range | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "in Hawai'i cultivated at higher elevation mesic sites such as Koke'e State Park, Kaua'i, and Volcano, Hawai'i, now naturalized at least in the Koke'e area and rapidly spreading at the Volcano dump and in nearby abandoned agricultural land. First naturalized collection made on Kaua'i in 1986 (Ptews s.n., BISH)." |
| | Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia | "In Victoria, the plant exists as small populations (scattered over a large area), primarily in lowland grassland/grassy woodland, dry/damp sclerophyll forests and riparian vegetation (Carr et al. 1992). It is considered to pose a very serious threat to one or more vegetation formations in Victoria (Carr et al. 1992). The plant has also naturalised in eastern and north-eastern New South Wales (Hnatiuk 1990), New South Wales (Sydney) and is widespread in the ACT ( Swarbrick and Skarratt 1994). In Queensland, it exists along creek-banks near Warwick in south-east Queensland." |
| | USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 13 Jan 2017] | "Naturalized:<br>Africa<br>Southern Africa: South Africa<br>Australasia<br>Australia: Australia<br>New Zealand: New Zealand<br>Pacific<br>North-Central Pacific: United States - Hawaii" |

| Qsn # | Question | Answer |
|---|---|---|
| | Starr, F., Starr, K.& Loope, L.L. 2008. New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 100: 44-49 | "Pyracantha angustifolia (Franch.) C.K. Schneid. New island record Pyracantha angustifolia (firethorn) was previously known from Kaua'i (Wagner et al. 1999), and is now also known from upland East Maui, where scattered plants were found in pastures above residential Kula. This collection represents a new island record for the island of Maui. Material examined: MAUI: East Maui, Kula, Keähuaiwi Gulch, scattered plants in pasture, in association with Pennisetum clandestinum (kikuyu grass), Senecio madagascariensis (fireweed), and Cotoneaster pannosus (cotoneaster), 1219 m (4000 ft), 17 Aug 2005, Starr, Starr, Chimera & Spencer 050817-01." |
| | Henderson, L. (1991). Invasive alien woody plants of the Orange Free State. Bothalia, 21(1): 73-89 | "Rosa eglanteria, Acacia dealbata, Pyracantha angustifolia and Prunus persica are the most prominent invaders of veld habitats in the eastern OFS. Rosa and Pyracantha spp. are potentially the most important invaders of hillside scrub and surrounding grasslands in this region." ... "Alien woody invasion is not expected to become a problem in the greater part of the OFS. The intensity of invasion is expected to increase the most in the moist grasslands in the eastern mountain region bordering on Lesotho and Natal. Here the spread of Acacia dealbata, Rosa eglanteria and Pyracantha angustifolia needs to be controlled. In the western drier regions fewer species are expected to become troublesome." |
| | Herbarium Pacificum Staff. 1999. New Hawaiian plant records for 1998. Bishop Museum Occasional Papers 58: 3 -11 | "Verification of BISH specimens by J.B. Phipps, specialist in the Rosaceae, Maloideae, revealed that the taxon identified in the Manual (Wagner et al., 1990) as P. angustifolia was a mixture of similar species. Genuine P. angustifolia is recognized by its narrowly oblanceolate leaves, 0.5–2 inches long, that are woolly-hairy on the underside; the inflorescences are usually 3–10-flowered, their axes appressed rusty-pubescent. Fruits are about 0.2 inches in diameter, varying from orange to red. The amended naturalized distribution is only documented for Kaua'i, although the species is cultivated on O'ahu (based on vouchers in BISH) and possibly other islands. Material examined. KAUA'I: along Hwy 550, at the 16 mile marker, crossing Kaunuohua Ridge, 15 Mar 1986, J. Plews s.n. (BISH 502793)." |

| Qsn # | Question | Answer |
|---|---|---|
| | Pratt, L. W. & Bio, K. F. 2012. New plant records from Hawai'i Island. Bishop Museum Occasional Papers 113: 75 -80 | "When Wagner et al. (1990) published the Manual of the flowering plants of Hawai'i, Pyracantha angustifolia (firethorn) was listed as naturalized on both Kaua'i and Hawai'i, where it was said to be present near the Volcano dump. Subsequently, it was realized that there were actually three species of Pyracantha present in the Hawaiian Islands, and P. angustifolia was thought to be limited to Kaua'i (Herbarium Pacificum Staff 1999). a new island record of P. angustifolia for Maui was reported by Starr et al. (2008) on East Maui, where the shrub was scattered in a pasture in Kula. Now this species of firethorn has also been collected on Hawai'i Island along Hwy 11 not far from Volcano Village. With the collection of the following specimen, there are now three species of Pyracantha known from Hawai'i Island: P. angustifolia, P. crenatoserrata, and P. koidzumii. Based on recent weed surveys (l. Pratt, pers. observ.), P. crenatoserrata appears to be the most common Pyracantha species in the Volcano area and within Hawai'i Volcanoes National Park. Pyracantha angustifolia may have invasive potential on the island; the Hawai'i Weed risk assessment rated the species as 13 H, likely to be invasive in Hawai'i (Daehler & Denslow 2011). Several Pyracantha species are frequently cultivated in Hawai'i and may become weeds because of their bird-dispersed fruit (Staples & Herbst 2005)." Material examined. HAWAI'I: Hwy 11 near Volcano Village, mile marker 27, east of Hawai'i Volcanoes National Park, Puna distr, elevation ca 1120 m, rare on side of road in disturbed vegetation, thorny shrub with orange berries, 9 Sep 2005, L.W. Pratt & K. Bio 3520." |

| 302 | Garden/amenity/disturbance weed | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Gurvich, D., Paula A. Tecco, & Díaz, S. (2005). Plant Invasions in Undisturbed Ecosystems: The Triggering Attribute Approach. Journal of Vegetation Science, 16(6), 723-728 | [Does not require disturbance for establishment] "Ligustrum and Pyracantha were both introduced in central Argentina as ornamental species at the beginning of the 19th century. At present, these species are expanding into the montane woodlands of the region (Delucchi 1991). Although they expand faster in disturbed areas, they also invade in areas with no or little disturbance." |
| | Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia | Environmental weed |

| 303 | Agricultural/forestry/horticultural weed | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia | Primarily designated as an environmental weed |

| 304 | Environmental weed | y |
|---|---|---|
| | **Source(s)** | **Notes** |

| Qsn # | Question | Answer |
|---|---|---|
| | Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK | "Grass- and heathland, rocky ridges, riparian habitats. This shrub forms dense thickets where invasive, shading out native plants and imkpeding the growth and regeneration of shrubs and trees. It invades high-altitude grasslands in Africa. Once established, the plant is fairly shade tolerant" |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "Orange firethorn (Pyracantha angustifolia) is regarded as an environmental weed in Victoria, the ACT and New South Wales, and as a potential environmental weed or "sleeper weed" in other parts of southern Australia." |
| | Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia | "Pyracantha augustifolia is a large shrub (to c. 3m tall) native to western China. It produces small, white flowers followed by masses of bright orange/red berries that can be dispersed by birds or flowing water. The plant is available from some nurseries. At some locations in Australia, P augustifolia has formed dense thickets which exclude native shrubs and other understorey plants. In Victoria, the plant exists as small populations (scattered over a large area), primarily in lowland grassland/grassy woodland, dry/damp sclerophyll forests and riparian vegetation (Carr et al. 1992). It is considered to pose a very serious threat to one or more vegetation formations in Victoria (Carr et al. 1992). The plant has also naturalised in eastern and north-eastern New South Wales (Hnatiuk 1990), New South Wales (Sydney) and is widespread in the ACT ( Swarbrick and Skarratt 1994). In Queensland, it exists along creek-banks near Warwick in south-east Queensland." |
| | Weedbusters. 2017. Orange Firethorn - Pyracantha angustifolia. http://www.weedbusters.org.nz/weed-information/pyracantha-angustifolia/59/. [Accessed 16 Jan 2017] | "Why is it weedy? Forms dense thickets and produces many, well dispersed, moderately long-lived seeds. Tolerates hot to cold temperatures, wind, salt, damage, poor soils, damp to dry conditions and light shade. " |

| 305 | Congeneric weed | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Queensland Government. 2017. Weeds of Australia - Pyracantha crenatoserrata. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_crenatoserrata.htm. [Accessed 18 Jan 2017] | "Broad-leaf firethorn (Pyracantha crenatoserrata) is regarded as an environmental weed in New South Wales, the ACT and Victoria." |
| | Queensland Government. 2017. Weeds of Australia - Pyracantha crenulata. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_crenulata.htm. [Accessed 18 Jan 2017] | "Himalayan firethorn (Pyracantha crenulata) is regarded as an environmental weed in Victoria, New South Wales and the ACT." |
| | Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia | Pyracantha coccinea, Pyracantha crenatoserrata, Pyracantha crenulata, Pyracantha fortuneana, Pyracantha koidzumii, & Pyracantha rogersiana listed as weeds of some type |

| 401 | Produces spines, thorns or burrs | y |
|---|---|---|
| | **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 or small trees, to 4 m tall, often with thorny branches." |

| Qsn # | Question | Answer |
|---|---|---|
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Shrubs, usually with thorns." |

| 402 | Allelopathic | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | WRA Specialist. 2017. Personal Communication | Unknown |

| 403 | Parasitic | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Shrubs up to 4 m tall; stems rigid, erect or sprawling, many-branched, forming a dense growth, young branches tomentose, thorns leafy. Leaves oblong to oblong-lanceolate, 1.5-5 em long, 0.5-1.6 em wide, upper surface pubescent when young, soon glabrate and dark green, lower surface grayish tomentose, margins entire or with a few small teeth near apex, apex obtuse and mucronulate, or emarginate, base cuneate-attenuate." [Rosaceae. No evidence] |

| 404 | Unpalatable to grazing animals | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Ballari, S. A., Cuevas, M. F., Ojeda, R. A., & Navarro, J. L. (2015). Diet of wild boar (Sus scrofa) in a protected area of Argentina: the importance of baiting. Mammal Research, 60(1), 81-87 | "On the other hand, invasive alien plant species present in the wild boar diet were the narrowleaf firethorn (Pyracantha angustifolia), honey locust (Gleditsia triacanthos), and peach (Prunus persica), which were recognized mainly by the presence of fruits" |
| | Wild Edibles Database. 2017. Useful plants living on the East Coast of Australia. http://www.db.weedyconnection.com/. [Accessed 18 Jan 2017] | "Pyracantha spp. ... Known Hazards: Although no specific mention has been seen for this species, it belongs to a genus where most, if not all members of the genus produce hydrogen cyanide, a poison that gives almonds their characteristic flavour. This toxin is found mainly in the leaves and seed and is readily detected by its bitter taste. It is usually present in too small a quantity to do any harm but any very bitter seed or fruit should not be eaten. In small quantities, hydrogen cyanide has been shown to stimulate respiration and improve digestion, it is also claimed to be of benefit in the treatment of cancer. In excess, however, it can cause respiratory failure and even death." |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Shrubs, usually with thorns." [Thorns & possible toxins may deter browsing] |

| 405 | Toxic to animals | |
|---|---|---|
| | **Source(s)** | **Notes** |

| Qsn # | Question | Answer |
|---|---|---|
| | Plants for a Future. 2017. Pyracantha angustifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Pyracantha+angustifolia. [Accessed 18 Jan 2017] | "Although no specific mention has been seen for this species, it belongs to a genus where most, if not all members of the genus produce hydrogen cyanide, a poison that gives almonds their characteristic flavour. This toxin is found mainly in the leaves and seed and is readily detected by its bitter taste. It is usually present in too small a quantity to do any harm but any very bitter seed or fruit should not be eaten. In small quantities, hydrogen cyanide has been shown to stimulate respiration and improve digestion, it is also claimed to be of benefit in the treatment of cancer. In excess, however, it can cause respiratory failure and even death." |
| | Maruyama, S. (1998). Mass sudden deaths of Bombycilla spp. migratory birds. Japanese Journal of Toxicology and Environmental Health, 44(1), 17-24 | [Potentially Yes] "In Nagano Prefecture, in the period of January to March, 1997, sudden deaths of Bombycilla spp. birds happened in many places, amounting to 13 places with the total death of 187 birds. Of the places, Shimosuwa Town, Komoro City, and Iida City were selected to be inquired into the cause of the sudden deaths. In the case of Shimosuwa Town, the esophagus was choked with nuts of Pyracantha, and cyanide was detected in the content from the esophagus at 10.0 mug/g (average) and in the content from the stomach at 17.0 mug/g (average), suggesting that cyanide or nitrile glycoside would be one of the causes of the deaths. In the case of Komoro City, EPN, an organophosphorus pesticide, was detected from the content in the stomach at 5960 mug/g (average) and from the liver at 11.4 mug/g (average), suggesting that EPN would be a many cause of the death. In the case of Iida City no cause of the death has been known. "[note: species name was not specified] |

| 406 | Host for recognized pests and pathogens | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn Pyracantha species. The State of Queensland, Department of Employment, Economic Development and Innovation | "Pyracantha 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 Pyracantha. 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." |
| | Plants for a Future. 2017. Pyracantha angustifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Pyracantha+angustifolia. [Accessed 18 Jan 2017] | "Susceptible to scab and fireblight[11], especially when grown on acid sandy soils[182]." |

| 407 | Causes allergies or is otherwise toxic to humans | |
|---|---|---|
| | **Source(s)** | **Notes** |

| Qsn # | Question | Answer |
|---|---|---|
| | Plants for a Future. 2017. Pyracantha angustifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Pyracantha+angustifolia. [Accessed 18 Jan 2017] | "Although no specific mention has been seen for this species, it belongs to a genus where most, if not all members of the genus produce hydrogen cyanide, a poison that gives almonds their characteristic flavour. This toxin is found mainly in the leaves and seed and is readily detected by its bitter taste. It is usually present in too small a quantity to do any harm but any very bitter seed or fruit should not be eaten. In small quantities, hydrogen cyanide has been shown to stimulate respiration and improve digestion, it is also claimed to be of benefit in the treatment of cancer. In excess, however, it can cause respiratory failure and even death." |

| 408 | Creates a fire hazard in natural ecosystems | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn Pyracantha species. The State of Queensland, Department of Employment, Economic Development and Innovation | [No evidence of increased fire risk] "The effect of fire on Pyracantha abundance and persistence is not known. However, observations by the authors near Canberra suggest bushfires can reduce the abundance of Pyracantha species in forest areas (but not eliminate them)." |
| | Idaho Firewise. 2013. Fire Resistance of Plants Master Database & Placement of Species Within Firewise Landscape Zones. http://idahofirewise.org/. [Accessed 18 Jan 2017] | On a scale of 1-10, 1 being the least fire resistant & 10 being the most fire resistant, Pyracantha angustifolia scored a 6 |

| 409 | Is a shade tolerant plant at some stage of its life cycle | |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn Pyracantha species. The State of Queensland, Department of Employment, Economic Development and Innovation | "In North America, Pyracantha species are weedy colonisers of habitats with high light intensity such as those found along streams, forest margins or areas that have suffered from recent disturbance (Dickinson and Campbell 1991)." |
| | Plants for a Future. 2017. Pyracantha angustifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Pyracantha+angustifolia. [Accessed 18 Jan 2017] | "Succeeds in sun or part shade, though it does not fruit so well in a shady position" |

| 410 | Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island) | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Plants for a Future. 2017. Pyracantha angustifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Pyracantha+angustifolia. [Accessed 18 Jan 2017] | "Prefers a good well-drained, moisture retentive loamy soil[1, 200]. Succeeds in any soil that is warm and not very heavy[11]. Another report says that it grows well in heavy clay soils. Succeeds on chalky soils[108]." |
| | Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn Pyracantha species. The State of Queensland, Department of Employment, Economic Development and Innovation | "Pyracantha species grow in a variety of soil types although most references indicate a preference for soils with high calcium content (Roche et al. 1998)." ... "In the Cape Peninsula, South Africa, P. angustifolia is invading areas of degraded native forest with deep, high clay content, slightly acidic soils (Alston and Richardson 2006)." |

| Qsn # | Question | Answer |
|---|---|---|
| 411 | **Climbing or smothering growth habit** | **n** |
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Shrubs up to 4 m tall; stems rigid, erect or sprawling, many-branched, forming a dense growth, young branches tomentose, thorns leafy." |

| 412 | Forms dense thickets | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia | "At some locations in Australia, P augustifolia has formed dense thickets which exclude native shrubs and other understorey plants." |
| | Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK | "Grass- and heathland, rocky ridges, riparian habitats. This shrub forms dense thickets where invasive, shading out native plants and impeding the growth and regeneration of shrubs and trees. It invades high-altitude grasslands in Africa." |

| 501 | Aquatic | 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 | [Terrestrial shrub] "Shrubs or small trees, to 4 m tall, often with thorny branches." ... "Thickets on slopes, at roadsides;" |

| 502 | Grass | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 13 Jan 2017] | Family: Rosaceae<br>Subfamily: Amygdaloideae<br>Tribe: Maleae<br>Subtribe: Malinae |

| 503 | Nitrogen fixing woody plant | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 18 Jan 2017] | Family: Rosaceae<br>Subfamily: Amygdaloideae<br>Tribe: Maleae<br>Subtribe: Malinae |

| Qsn # | Question | Answer |
|---|---|---|
| 504 | **Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)** | **n** |
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Shrubs up to 4 m tall; stems rigid, erect or sprawling, many-branched, forming a dense growth, young branches tomentose, thorns leafy." |

| 601 | **Evidence of substantial reproductive failure in native habitat** | **n** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | USDA, ARS, Germplasm Resources Information Network. 2017. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 18 Jan 2017] | [No evidence. widespread native & introduced distribution]<br>Native:<br>Asia-Temperate<br>China: China - Zhejiang, - Hubei, - Guizhou, - Sichuan, - Yunnan, - Xizang<br>Naturalized:<br>Africa<br>Southern Africa: South Africa<br>Australasia<br>Australia: Australia<br>New Zealand: New Zealand<br>Pacific<br>North-Central Pacific: United States - Hawaii |

| 602 | **Produces viable seed** | **y** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn Pyracantha species. The State of Queensland, Department of Employment, Economic Development and Innovation | "Pyracantha species generally reproduce from seeds" |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "This species reproduces entirely by seed. These seeds are mostly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water or in dumped garden waste" |

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

| Qsn # | Question | Answer |
|---|---|---|
| 604 | **Self-compatible or apomictic** | |
| | **Source(s)** | **Notes** |
| | Dickinson, T. A., Lo, E., & Talent, N. (2007). Polyploidy, reproductive biology, and Rosaceae: understanding evolution and making classifications. Plant systematics and evolution, 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 Pyracantha spp. In table left blank] |

| 605 | **Requires specialist pollinators** | **n** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "Flowers in dense corymbs 2-4 cm in diameter, pubescent throughout; sepals broadly deltate, 0.8-1 mm long, margins minutely denticulate; petals 8-10 mm long." |
| | Fussell, M., & Corbet, S. A. (1992). Flower usage by bumble-bees: a basis for forage plant management. Journal of Applied Ecology, 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 Pyracantha spp.] |
| | Plants for a Future. 2017. Pyracantha angustifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Pyracantha+angustifolia. [Accessed 18 Jan 2017] | "The flowers are hermaphrodite (have both male and female organs) and are pollinated by Bees." |

| 606 | **Reproduction by vegetative fragmentation** | **y** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK | "The shrub suckers from roots, enabling populations to expand rapidly" |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "This species reproduces entirely by seed. These seeds are mostly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water or in dumped garden waste." [Contradicts Weber, 2003) |

| 607 | **Minimum generative time (years)** | **2** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Kubiak, P. J. 2009. Fire responses of bushland plants after the January 1994 wildfires in northern Sydney. Cunninghamia, 11(1): 131-165 | "Appendix 1. ... Pyracantha angustifolia ... Juvenile periods = c.2–3y (ripe)" |
| | Plants for a Future. 2017. Pyracantha angustifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Pyracantha+angustifolia. [Accessed 18 Jan 2017] | "Pyracantha angustifolia is an evergreen Shrub growing to 3 m (9ft) by 3 m (9ft) at a fast rate." |

| 701 | **Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)** | **y** |
|---|---|---|
| | **Source(s)** | **Notes** |

| Qsn # | Question | Answer |
|---|---|---|
| | Henderson, L. (1991). Invasive alien woody plants of the Orange Free State. Bothalia, 21(1): 73-89 | "The most prominent species (in order of prominence) in roadside and veld habitats were: Opuntia ficus-indica, Prunus persica, Eucalyptus spp., Rosa eglanteria, Pyracantha angustifolia and Acacia dealbata." |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | [Spread accidentally by dumped garden waste] "This species reproduces entirely by seed. These seeds are mostly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water or in dumped garden waste." |

| 702 | Propagules dispersed intentionally by people | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. | "in Hawai'i cultivated at higher elevation mesic sites such as Koke'e State Park, Kaua'i, and Volcano, Hawai'i, now naturalized at least in the Koke'e area and rapidly spreading at the Volcano dump and in nearby abandoned agricultural land. First naturalized collection made on Kaua'i in 1986 (ptews s.n., BISH)." |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "Orange firethorn (Pyracantha angustifolia) has been cultivated as a garden ornamental, particularly in the temperate regions of Australia." |

| 703 | Propagules likely to disperse as a produce contaminant | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "This species reproduces entirely by seed. These seeds are mostly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water or in dumped garden waste." |

| 704 | Propagules adapted to wind dispersal | 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 | "Pome reddish, depressed-globose, 56 mm in diam.; sepals persistent, erect." [Fleshy-fruited] |

| Qsn # | Question | Answer |
|---|---|---|
| **705** | **Propagules water dispersed** | **y** |
| | **Source(s)** | **Notes** |
| | Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia | "Pyracantha augustifolia is a large shrub (to c. 3m tall) native to western China. It produces small, white flowers followed by masses of bright orange/red berries that can be dispersed by birds or flowing water." ... "In Queensland, it exists along creek-banks near Warwick in south-east Queensland." |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "This species reproduces entirely by seed. These seeds are mostly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water or in dumped garden waste." |

| 706 | **Propagules bird dispersed** | **y** |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Buchanan, R. A. (1989). Pied currawongs (Strepera graculina): their diet and role in weed dispersal in suburban Sydney, New South Wales. Proceedings of the Linnean Society of New South Wales 111(1-4): 241-255 | "Abstract : In this dietary study of an abundant population of pied currawongs (S. graculina), 1009 regurgitated pellets collected over 25 months, were analysed. The percentage of pellets containing plant parts, mostly seeds of fleshy fruit, was high throughout the year (79-98%). The fruit of introduced plants was present in 45-91% of pellets containing plant material. The seeds of 46 species, of which 36 were introduced, were identified in their pellets. Fruits of the family Oleaceae, including the 3 introduced species, Ligustrum sinense, Ligustrum lucidum and Olea africana were the most significant part of the currawong diet for 3 months of the year, when at least one of these species was present in 54-74% of the pellets analysed. Other major plant species in the diet included the introduced Pyracantha angustifolia, Morus nigra, Ochna atropurpurea, Solanum pseudocapsicum, and the native Elaeocarpus reticulatus. The proportion of pellets containing animal parts decreased from a value of 50-75% in the warmer months to 11-12% in the coldest months of the year. Few vertebrate remains were found in the pellets; the major animal components identified were bullants, beetles, and other insects." |
| | Henderson, L. (1991). Invasive alien woody plants of the Orange Free State. Bothalia, 21(1): 73-89 | "Animals, particularly birds and mammals, may be important dispersal agents for many species. Seeds destined for being swallowed by animals are mainly those in a pulpy pericarp, being either drupaceous or baccate (Ridley 1930). A large proportion (47%) of the naturalized alien woody species in the OFS have fruits that are either drupes or berries. This includes all the species belonging to the Rosaceae. Rosa eglanteria and Pyracantha angustifolia are most noticeable as invaders of rocky hillside scrub in the eastern OFS. This vegetation type provides food, nesting sites and shelter for large numbers of birds andsmall mammals (Scheepers 1975)" |
| | Gurvich, D., Paula A. Tecco, & Díaz, S. (2005). Plant Invasions in Undisturbed Ecosystems: The Triggering Attribute Approach. Journal of Vegetation Science, 16(6), 723-728 | "Only wind and ungulate dispersal are common in other seasons. In contrast, Pyracantha and Ligustrum are effectively dispersed by birds in autumn and winter (Tecco et al. in press; Aragon & Groom 2003), when other food sources are scarce and their fruits are avidly consumed>" |

| Qsn # | Question | Answer |
|---|---|---|
| | Csurhes, S. & Edwards, R. 1998. Potential environmental weeds in Australia: Candidate species for preventative control. Biodiversity Group, Environment Australia, Canberra, Australia | "Pyracantha augustifolia is a large shrub (to c. 3m tall) native to western China. It produces small, white flowers followed by masses of bright orange/red berries that can be dispersed by birds or flowing water." |

| 707 | Propagules dispersed by other animals (externally) | n |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn Pyracantha species. The State of Queensland, Department of Employment, Economic Development and Innovation | [Internally dispersed by animals] "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 (Canis latrans) disperses seeds of Pyracantha species (Silverstein 2005). In New Zealand, introduced black rats (Rattus rattus) and brushtail possums (Trichosurus vulpecular) have been recorded excreting whole seeds of P. angustifolia (Williams et al. 2000)." |

| 708 | Propagules survive passage through the gut | y |
|---|---|---|
| | **Source(s)** | **Notes** |
| | Tecco, P. A., Pais-Bosch, A. I., Funes, G., Marcora, P., Zeballos, S. R., Cabido, M., & Urcelay, C. (2015). Mountain invasions on the way: are there climatic constraints for the expansion of alien woody species along an elevation gradient in Argentina?. Journal of Plant Ecology, doi:10.1093/jpe/rtv064 | "Seed dispersal by animals (i.e. seed passage through the digestive tract of dispersers) does not increase seed germination of Gleditsia (Ferreras et al. 2015), Ligustrum (Montaldo1993) or Pyracantha (Badini 2012) but can certainly facilitate their spread in the field." |
| | Wotton, D. M., & McAlpine, K. G. (2015). Seed dispersal of fleshy-fruited environmental weeds in New Zealand. New Zealand Journal of Ecology, 39(2), 155-169 | "Some (25–34%) Leycesteria formosa seeds also survived ship rat ingestion, as did 6.3% of Cotoneaster simonsii (4.1 mm, 9.88 mg), 12.5% of Pyracantha angustifolia (2.1 mm, 3.15 mg), and 32.2% of native Solanum aviculare (2.24 mm, 0.6 mg) seeds (Williams et al. 2000)." |
| | Queensland Government. 2016. Weeds of Australia - Pyracantha angustifolia. http://keyserver.lucidcentral.org/weeds/data/media/Html/pyracantha_angustifolia.htm. [Accessed 18 Jan 2017] | "This species reproduces entirely by seed. These seeds are mostly dispersed by birds and other animals (e.g. foxes) that eat the fruit, but may also be spread by water or in dumped garden waste." |
| | LaRosa, A. M., Smith, C. W., & Gardner, D. E. (1985). Role of alien and native birds in the dissemination of firetree (Myrica-faya Ait Myricaceae) and associated plants in Hawaii. Pacific Science, 3 (4), 372-378 | Pyracantha angustifolia seeds survive gut passage through Japanese white-eyes |

| Qsn # | Question | Answer |
|---|---|---|
| **801** | **Prolific seed production (>1000/m2)** | |
| | **Source(s)** | **Notes** |
| | Csurhes, S., Weber, J. & Zhou, Y. 2016. Invasive plant risk assessment. Firethorn Pyracantha species. The State of Queensland, Department of Employment, Economic Development and Innovation | "Produces masses of orange/red berries (Figure 2), 5–8 mm in diameter, containing five seeds per berry (Weber 2003);" [Possibly. Densities unspecified] |

| | | |
|---|---|---|
| **802** | **Evidence that a persistent propagule bank is formed (>1 yr)** | |
| | **Source(s)** | **Notes** |
| | Tecco, P. A., Pais-Bosch, A. I., Funes, G., Marcora, P., Zeballos, S. R., Cabido, M., & Urcelay, C. (2015). Mountain invasions on the way: are there climatic constraints for the expansion of alien woody species along an elevation gradient in Argentina?. Journal of Plant Ecology, doi:10.1093/jpe/rtv064 | "Different germination strategies seem to be at play among these invasive species to overcome stochastic environmental constraints. These strategies range from long seed longevity that allows reliance upon a seed bank, to short seed longevity compensated by a long germination time. Both strategies allow, in a different way, a progressive input of new seedlings throughout the growing season. Gleditsia would belong to the first group (Ferreras and Galetto 2010), Ligustrum to the second one, while Pyracantha seems to be in an intermediate situation." |
| | Plants for a Future. 2017. Pyracantha angustifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Pyracantha+angustifolia. [Accessed 18 Jan 2017] | "Seed - best sown as soon as it is ripe in a cold frame[200]. Remove all the fruit flesh since this can inhibit germination[200]. Stored seed requires 3 months cold stratification, sow it as early in the year as possible in a cold frame[113]." |
| | Royal Botanic Gardens Kew. (2017) Seed Information Database (SID). Version 7.1. Available from: http://data.kew.org/sid/. [Accessed 18 Jan 2017] | "Storage Behaviour: No data available for species. Of 3 known taxa of genus Pyracantha, 66.67% Orthodox(p/?), 33.33% Recalcitrant(?)" |

| | | |
|---|---|---|
| **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 | "Somewhat tolerant of triclopyr. May require crop oil as adjuvant to enhance herbicide uptake. Katie Cassel (Kōkeʻe 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 contro with foliar applications of triclopyr amine at 2% product in water (Chris Zimmer, HAVO)" |
| | Weedbusters. 2017. Orange Firethorn - Pyracantha angustifolia. http://www.weedbusters.org.nz/weed-information/pyracantha-angustifolia/59/. [Accessed 16 Jan 2017] | "What can I do to get rid of it?<br><br>Dig out small plants (all year round). Mulch.<br>2. Stump swab (all year round): glyphosate (200ml/L) or metsulfuron-methyl 600g/kg (5g /L) or triclopyr 600 EC (200ml/L).<br>3. Stem injection (all year round): metsulfuron-methyl 600g/kg (50g/L mix, 5g per stem).<br>4. Spray (summer-autumn): metsulfuron-methyl 600g/kg (5g/10L) + penetrant." |

| Qsn # | Question | Answer |
|---|---|---|
| **804** | **Tolerates, or benefits from, mutilation, cultivation, or fire** | **y** |
| | **Source(s)** | **Notes** |
| | Kubiak, P. J. 2009. Fire responses of bushland plants after the January 1994 wildfires in northern Sydney. Cunninghamia, 11(1): 131-165 | "Appendix 1. ... Pyracantha angustifolia ... R = majority of adult plants resprouted after the fires;" |
| | Weedbusters. 2017. Orange Firethorn - Pyracantha angustifolia. http://www.weedbusters.org.nz/weed-information/pyracantha-angustifolia/59/. [Accessed 16 Jan 2017] | "Cut stems resprout and seeds germinate in bare areas. " |

| | | |
|---|---|---|
| **805** | **Effective natural enemies present locally (e.g. introduced biocontrol agents)** | |
| | **Source(s)** | **Notes** |
| | Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai‘i Press and Bishop Museum Press, Honolulu, HI. | "in Hawai'i cultivated at higher elevation mesic sites such as Koke'e State Park, Kaua'i, and Volcano, Hawai'i, now naturalized at least in the Koke'e area and rapidly spreading at the Volcano dump and in nearby abandoned agricultural land." [No evidence] |

**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 Hawaii, Maui, Australia, South Africa, New Zealand, Argentina & elsewhere
• Environmental weed in Australia, South Africa & New Zealand
• Other Pyracantha species are invasive
• Thorny
• Possibly toxic
• Host of bacterial fireblight
• Tolerates many soil types
• Forms dense stands that exclude other vegetation
• Reproduces by seeds & vegetatively by suckering
• Reaches maturity in 2-3 years
• Seeds dispersed by birds, water, dumped garden waste & intentionally by people
• Prolific seed production (densities unknown)
• Able to resprout after cutting & fire

Low Risk Traits
• Invasiveness may be restricted to higher elevation of islands with tropical/subtropical climates
• Ornamental
• Herbicide may provide effective control