Taxon: Frangula alnus **Family:** Rhamnaceae

Common Name(s): alder buckthorn
European alder buckthorn
glossy buckthorn
smooth buckthorn

Synonym(s): Rhamnus frangula L.
Rhamnus frangula L. var. angustifolia

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 27 Jan 2015

WRA Score: 7.5 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Environmental weed, Temperate shrub, Thicket-forming, Bird-dispersed, Coppices

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Low
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	n
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed		
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed		
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	n
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens	y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans		
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
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)	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	n
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		
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
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)	y=1, n=-1	y
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**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[Assessment of wild type. No indication that cultivars have been intentionally selected over several to many generations for a particular trait or suite of traits that likely reduces weediness]"Horticultural cultivars include R. frangula 'Asplenifolia' (Fernleaf Buckthorn), a narrow-leaved form with fine-textured foliage that gives it a graceful, ferny appearance, and 'Columnaris' (Tallhedge Buckthorn) a tall, narrow form that creates a dense canopy supported by numerous twisting stems which makes it ideally suited for row plantings and hedges. Both cultivars are marketed throughout most of eastern and central USA (Anon., 2001). The chromosome number is 2n=20 (Tutin et al., 1968)."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. 2015. Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. 2015. 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**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"R. frangula is found throughout Europe, except Iceland and the extreme north, with a latitudinal limit for the species ranging from 64.5°N in Norway to about 67°N in Russia. Although it is found throughout Portugal and Spain it is rare in the Mediterranean region and absent from Sicily, Corsica and the Balearics; it is present in Algeria and Morocco (Godwin, 1943)."

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Climatic amplitude (estimates) - Mean annual rainfall: 300 - 1200 mm - Rainfall regime: summer; uniform - Dry season duration: 0 - 9 months - Mean annual temperature: 2 - 14ºC - Mean maximum temperature of hottest month: 15 - 25ºC - Mean minimum temperature of coldest month: -18 - 10ºC - Absolute minimum temperature: -45 - 0ºC"
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Farrar [21] indicates that glossy buckthorn is tolerant to USDA hardiness zone 2, which may reach temperatures of -50 °F (-58 °C) or lower. While glossy buckthorn may be "most aggressive" on wet sites, it occurs on "drier" sites as well [15]."
	Plants for a Future/ 2015. Frangula alnus. http://www.pfaf.org/user/Plant.aspx?LatinName=Frangula+alnus. [Accessed 26 Jan 2015]	"USDA hardiness zone : 3-7"

204	Native or naturalized in regions with tropical or subtropical climates	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"R. frangula is a temperate species, in areas with a mean annual temperature of 2-14°C, and is tolerant of severe frosts to an absolute minumum temperature of -45°C. Where present, the rainfall ranges between 300 and 1200 mm per annum, though it may tolerate extended dry periods."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"R. frangula was probably introduced to North America before 1800, but did not become widespread and naturalized until the early 1900s." ... "In North America, R. frangula is found most extensively in the northeastern part of the continent. It is found throughout the New England states from Maine to New Jersey, as far south as Tennessee and west to Wyoming and Colorado in the USA. In Canada it is reported mainly from southern Ontario where it occurs in the southeast and southwest of the province; it is absent from most of the Canadian Shield region (Catling and Porebski, 1994). R. frangula is also common in Quebec and occurs eastwards to Nova Scotia and Prince Edward Island; some individuals are recorded from Manitoba."

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

Qsn #	Question	Answer
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"In North America, glossy buckthorn has been described as "widely naturalized", "rather local", and "locally well established" from Nova Scotia to southern Manitoba and from Minnesota to New Jersey [3,65,75,83]."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"R. frangula was probably introduced to North America before 1800, but did not become widespread and naturalized until the early 1900s. In Canada it is thought to have spread from the three urban centres where it was first introduced: London (1898), Ottawa (1899) and Guelph (1906). R. frangula was subsequently recorded in Toronto by 1953, and in the Georgian Bay area of Ontario by 1968. In southeast Ontario, it was recorded in Kingston in 1953, and east of Ottawa in 1975 (White et al., 1993; Catling and Porebski, 1994; Haber, 1997). The presence of R. frangula in Prince Edward Island is attributed to its introduction as a hedge plant at the Experimental Farm in Charlottetown; it has now become naturalized in the province along hedgerows and wood edges (Catling et al., 1985). Haber (1997) reported that the earliest and westernmost occurrence of R. frangula in southern Ontario was documented by a collection on Walpole Island in Lake St Clair in 1985, but noted that it probably arrived in that region much earlier, and perhaps had spread from Michigan where it was recorded in 1949 in Oakland County on the west side of Lake St Clair."

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	[A disturbance adapted plant with negative environmental impacts. See 3.04] "Glossy buckthorn is often associated with disturbances. In central and western Massachusetts, researchers found that previously plowed sites were more than twice as likely to have glossy buckthorn than pastures or woodlots. Areas with a greater proportion of forest cover were less likely to have glossy buckthorn (P=0.085)."

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	[Potentially impacts agricultural crops] "While most studies have focused on glossy buckthorn's impact on native vegetation, there are other potential impacts on agricultural crops, birds, insects, succession, and fire ecology. Glossy buckthorn is an alternate host for the fungus that causes oat rust disease [14] and for alfalfa mosaic virus (Marani and Giunchedi 1976 as cited in [81])."

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

Qsn #	Question	Answer
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Impacts: Many North American studies have shown that glossy buckthorn dominance can negatively affect native species richness, simplify vegetation structure, disrupt food webs, and delay succession [12]. However, in native Scots pine (Pinus sylvestris) forests of northeastern Germany, there was a significant (P<0.001) positive relationship between the occurrence of glossy buckthorn and species richness. Forests with glossy buckthorn had significantly more threatened vascular species (P<0.05), threatened bryophyte species (P<0.001), and total woody species (P<0.001), as well as nonnative species (P<0.01) [52]."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"R. frangula is a problem species in native communities because it establishes in dense stands which shade out other understorey species. Possessky et al. (2000) reported a reduction in composition and abundance of the herbaceous cover in riparian habitats in the northern Allegheny Plateau (of Pennsylvania, New York and Ohio, USA) following invasion by R. frangula. Similarly, Reinartz (1997) described how an undisturbed bog community in Wisconsin was invaded by R. frangula in 1955 with a dense tall shrub canopy dominating the site within 12 years. The species is listed as an invasive weed in Tennessee and Wisconsin, USA (Southeast Exotic Pest Plant Council, 1996; Hoffman and Kearns, 1997). R. frangula was recently rated as one of the six principal invasive aliens of wetlands in Canada, and one of four principal invasive aliens in Canadian uplands. In a national survey it was rated second to purple loosestrife (Lythrum salicaria) with respect to the extent to which it is spreading in natural habitats and its severity of impact in Canada (White et al., 1993)."

305	Congeneric weed	
	Source(s)	**Notes**
	Weber, E. 2003. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Frangula alnus was formerly classified as Rhamnus frangula] "Rhamnus alaternus" ... "The shrub forms dense thickets that shade out native plants and lead to species poor stands." ... "Rhamnus cathartica" ... "Where invasive, the shrub can form dense and impenetrable thickets that displace native vegetation."
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	Frangula californica subsp. californica, Frangula caroliniana, & Frangula purshiana listed as naturalized and/or weeds in this publication, but evidence of significant impacts has not been found at this point

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Spines are absent from R. frangula."

402	Allelopathic	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Allelopathic potential probably does not play a part in glossy buckthorn's negative impacts. In laboratory experiments, glossy buckthorn root and leaf extracts did not inhibit germination and stimulated seedling growth of the test species. Researchers cautioned, however, that field conditions could produce results different from the laboratory setting [53]."

403	Parasitic	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"R. frangula is a deciduous shrub or small tree usually 4-5 m in height (Tutin et al., 1968), but may grow to 7 m (Gleason, 1963)." [Rhamnaceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	CABI. 2015. Frangula alnus In: Invasive Species Compendium. www.cabi.org/isc	"F. alnus is also used by moose (Alces alces) for browse (Borkowska and Konopko, 1994) and this accounts for about 8% of their early winter food intake (Morow, 1976). The winter diet of male moose in Belarus is mainly conifers and F. alnus, whereas females mostly feed on willows; calves are less selective. Daily food intake was 12.5 kg for males, 7.8 kg for females and 5.7 kg for calves. For the period January-March it was estimated that moose consumed 2,670 kg of F. alnus, equivalent to about 1% of the total food eaten (Dunin, 1989)."
	Gonzalez-Hernandez, M. P., & Silva-Pando, F. J. 1999. Nutritional attributes of understory plants known as components of deer diets. Journal of Range Management 52:132-138	"Nutritional attributes showed forbs, Frangula alnus Miller, Hedera helix L. and Lonicera periclymenum L. as plants with the highest forage value." ... "Digestibility of Hedera helix, Frangula alnus and Lonicera periclymenum, ranged from 50 to 64%."
	Gill, R.M.A. 1992. A review of damage by mammals in north temperate forests: 1. Deer. Forestry, 65(2): 145-169	"Table 1: The relative susceptibility of trees to deer browsing" [Frangula alnus is listed as Most Susceptible in Sweden and moderately susceptible in Poland]

Qsn #	Question	Answer
405	Toxic to animals	y
	Source(s)	**Notes**
	Van den Dikkenberg, M. I., & Holtkamp, B. M. 1987. [Alder buckthorn poisoning in horses]. Tijdschrift voor diergeneeskunde, 112(6), 340-341	"Seven cases of poisoning in horses are reported. This was caused by ingestion of branches of the alder buckthorn (Frangula alnus (mill.) syn. Rhamnus frangula L.), which had been thrown on the pasture. The biological characteristics and the toxic action of the plant are discussed more fully."
	GoatWorld.Com. 2015. Alder Buckthorn (Rhamnus frangula). http://www.goatworld.com/health/plants/alderbuckthorn.shtml. [Accessed 26 Jan 2015]	"TOXICITY RATING: High to moderate. Severity of toxicity proportionate to amount of fruit ingested. ANIMALS AFFECTED: Documented cases pertain to cattle only. However, this plant is also poisonous to humans as well. May be toxic to goats. In one case of fatal poisoning, a cow ate large quantities of leaves, twigs, and berries of alder buckthorn. The animal quickly became ill and developed symptoms of diarrhea, vomiting, slow pulse, cramps, and slight fever before death. Postmortem examination showed leaves of the plant in the stomach, with gastrointestinal inflammation (Cooper and Johnson 1984). CLASS OF SIGNS: Diarrhea, fever, vomiting and death. Animal disease called "Limberleg": Incoordination & Ataxia. "

406	Host for recognized pests and pathogens	y
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Glossy buckthorn is an alternate host for the fungus that causes oat rust disease [14] and for alfalfa mosaic virus (Marani and Giunchedi 1976 as cited in [81])."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	**Notes**
	Plants for a Future/ 2015. Frangula alnus. http://www.pfaf.org/user/Plant.aspx?LatinName=Frangula+alnus. [Accessed 26 Jan 2015]	"The plant is poisonous unless stored for 12 months before use[4, 19, 76]. This report is probably referring to the bark. Do not use in cases of intestinal obstruction, stenosis, atony, inflammatory colon disease, appendicitis, abdominal pain of unknown origin. Avoid long-term use. Two weeks recommended under medical supervision [301]"
	Nelson, L., Shih, R.D. & Balick, M.J. 2007. Handbook of poisonous and injurious plants, The New York Botanical Garden. Springer, New York, NY	[Generic Description] "Toxic Part: Fruit and bark are poisonous." ... "Toxin: Hydroxymethylanthraquinone, a gastrointestinal irritant." ... "Clinical Findings: Nausea, vomiting, abdominal cramping, and diarrhea may occur."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	[Not unless conditions are dry and windy] "Reviews report that fire spread can be difficult without dry and/or windy conditions in glossy buckthorn thickets, which are typically too shady to support much groundlayer vegetation [13,15]. However, if fires are possible, some suggest that combinations of cutting and burning may be useful in controlling glossy buckthorn."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Most studies and observations suggest that glossy buckthorn produces abundant seedlings, and growth and survival are best in open conditions." ... "In a review, glossy buckthorn seedling establishment was considered best on exposed soil in areas where light levels were high [13]. High light levels and herbivory protection were most conducive to seedling growth and survival in the Mt Toby Demonstration Forest, Massachusetts. Growth and survival were greater for glossy buckthorn seedlings transplanted to plots where the canopy was removed than for seedlings transplanted to plots with a closed canopy of 14-year-old birch (Betula spp.) and pin cherry (Prunus pensylvanica)." ... "In its native European habitats, glossy buckthorn is described as "on the whole intolerant of shade". Glossy buckthorn is typical in the understory of open woodlands, is often abundant following logging and/or grazing, but is rare in late-seral, closed-canopy forests [31]. Based on studies and observations made in the Wicken fen of Cambridgeshire, England, glossy buckthorn was an early species in fen succession. It was one of the first to dominate the shrub stage but was later replaced by common buckthorn [30]. "
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"R. frangula is generally intolerant of shade and will survive only in the understorey of open woodland (Godwin, 1943)."

Qsn #	Question	Answer
410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	**y**
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"In its native habitats, glossy buckthorn occupies nearly any soil texture and is recommended for revegetation of waterlogged clay soils that are low in nutrients and humus [13]. However, plants likely will not survive permanently waterlogged conditions [31]."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"It grows in a wide range of soil textures, and is prevalent in alder thickets and in wetlands associated with calcareous substrates and limestones." Soil descriptors - Soil texture: light; medium; heavy - Soil drainage: free; impeded - Soil reaction: acid; neutral; alkaline - Soil types: acid soils; alkaline soils; alluvial soils; bog soils; clay soils; gleysols; grassland soils; sandy soils

411	**Climbing or smothering growth habit**	**n**
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Glossy buckthorn grows as a multistemmed shrub or single-stemmed small tree up to 23 feet (7 m) tall [21,28,60,83]. Trees produce stout, erect branches [9]. "

412	**Forms dense thickets**	**y**
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Glossy buckthorn forms thickets and occupies similar habitats in its native and nonnative ranges. Reviews report that glossy buckthorn in its native range occurs in calcareous wetlands, alder (Alnus spp.) thickets, heath-oak (Erica-Quercus ssp.) woodlands, and pine and spruce (Pinus and Picea spp.) forests [12,13]. In native European habitats, "gregariousness" is common for glossy buckthorn [31]."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"R. frangula is a problem species in native communities because it establishes in dense stands which shade out other understorey species."

Qsn #	Question	Answer
501	**Aquatic**	**n**
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Glossy buckthorn forms thickets and occupies similar habitats in its native and nonnative ranges. Reviews report that glossy buckthorn in its native range occurs in calcareous wetlands, alder (Alnus spp.) thickets, heath-oak (Erica-Quercus ssp.) woodlands, and pine and spruce (Pinus and Picea spp.) forests [12,13]. In native European habitats, "gregariousness" is common for glossy buckthorn [31]."

502	Grass	n
	Source(s)	**Notes**
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/. [Accessed 26 Jan 2015]	Rhamnaceae

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, ARS, National Genetic Resources Program. 2015. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/. [Accessed 26 Jan 2015]	Rhamnaceae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Glossy buckthorn grows as a multistemmed shrub or single-stemmed small tree up to 23 feet (7 m) tall [21,28,60,83]. Trees produce stout, erect branches [9]. Leaves are deciduous, simple, and generally arranged alternately. Blades are dark-green and shiny above, measure 2 to 3 inches (5-8 cm) long, and are about half as wide. Margins are entire to slightly wavy [9,28,83]. Studies in European habitats suggest that plant age and site conditions can affect glossy buckthorn's appearance. While common as a multistemmed shrub when young, glossy buckthorn develops into a small tree with age."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	[No evidence] "R. frangula is found throughout Europe, except Iceland and the extreme north, with a latitudinal limit for the species ranging from 64.5°N in Norway to about 67°N in Russia."

Qsn #	Question	Answer
602	**Produces viable seed**	**y**
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Most sources indicate that glossy buckthorn produces "abundant" seed each year ([34,92], Hubbard 1974 as cited in [13])."

603	**Hybridizes naturally**	
	Source(s)	**Notes**
	WRA Specialist. 2015. Personal Communication	Unknown

604	**Self-compatible or apomictic**	
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 23 Jan 2015]	"Pollination and breeding system: Glossy buckthorn produces perfect flowers [75]. Based on studies conducted in glossy buckthorn's native European habitats, flowers are insect-pollinated and self-incompatible [36,63]."
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"The majority of flowers are insect pollinated, although self pollination may occasionally occur (Godwin, 1943). Outcrossing is promoted because the anthers normally mature before the pistil is receptive."
	Medan, D. 1994. Reproductive biology of Frangula alnus (Rhamnaceae) in southern Spain. Plant Systematics and Evolution, 193(1-4), 173-186	[Almost, but not 100% self-incompatible] "Although flower morphology and individual flower phenology do not fully prevent self-pollination, and geitonogamy can easily take place, the level of autogamy was negligible. Therefore, some self incompatibility mechanism is operative in this species."

605	**Requires specialist pollinators**	**n**
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 23 Jan 2015]	"Flowers were visited by bees, wasps, flies, and beetles [31]." ... "In southern Spain, the details of glossy buckthorn's reproductive biology were evaluated. Glossy buckthorn flowers had nectaries, but nectar volume was low (0.2 µl/flower, n=8). Sugar concentration averaged 9.8% in shady sites and 26.6% in sunny sites. About 21 of the 47 insect species that visited glossy buckthorn flowers were likely pollinators."

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Numerous insects are attracted to the flowers through odour, pollen and nectar secretions. In Europe the principal pollinators include bees (Apis mellifica, Bombus agrorum, B. jonellus, and B. proteus), wasps (Vespa sylvestris [Dolichovespula sylvestris], Eumenes pomiformis), flies (Lophosia fasciata) and beetles (Corymbites sjaelandicus). Medan (1994) considered flies to be the most important pollinators of R. frangula in Spain, although 21 species of insects visited the flowers. However, reproductive success was limited with only 2.8% of open-pollinated flowers producing fruits, and in these only about 50% of the ovules developed into seeds."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Natural reproduction in R. frangula is through seed, with good seed crops produced each year. Vegetative reproduction has not been observed."

607	Minimum generative time (years)	2
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Glossy buckthorn reaches reproductive age early [30]. McClain [60] reported that plants less than 3 feet (0.9 m) tall produced fruit. Sprouts of mature top-killed plants have produced fruit in their first growing season [73]."
	NH Department of Agriculture, Markets & Food, Division of Plant Industry. 2014. Glossy buckthorn. Rhamnus frangula / Frangula alnus Fact Sheet. http://www.agriculture.nh.gov/publications forms/documents/glossy-buckthorn.pdf. [Accessed 26 Jan 2015]	"Reproductive Age 2 years"

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	[No evidence] "Many researchers indicate that birds are important dispersers of glossy buckthorn seed [31,64,92], but other potential dispersal agents include small mammals, gravity, and water [31,35]."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**

Qsn #	Question	Answer
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Cultivated stocks of F. alnus are still available from nurseries, even though it is recognized as an invasive exotic in North America. In several US states and Canadian provinces, F. alnus is listed as a restricted noxious weed and it is prohibited to import, sell and transport it or its propagating parts. Since January 2002, the USA requires seeds of all species to have phytosanitary certificates, so this has limited importation from overseas suppliers."
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"In North America, glossy buckthorn has been described as "widely naturalized", "rather local", and "locally well established" from Nova Scotia to southern Manitoba and from Minnesota to New Jersey [3,65,75,83]."
	Plants for a Future/ 2015. Frangula alnus. http://www.pfaf.org/user/Plant.aspx?LatinName=Frangula+alnus. [Accessed 26 Jan 2015]	"Plants can be grown as an informal (untrimmed) hedge, though they are also amenable to trimming[200]. The cultivar 'Tallhedge (syn 'Columnaris') is very suitable for this purpose[200]. The wood is used to make wooden nails, shoe lasts, veneer etc[46, 61]. It is the source of a high quality charcoal that is used by artists"

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	**Notes**
	CABI. 2015. Frangula alnus In: Invasive Species Compendium. www.cabi.org/isc	"Natural dispersal is minimal. Many fruits fall directly beneath the parent shrubs resulting in high seed and seedling densities (in the order of 100 seedlings/m²) under mature plants (Godwin, 1943)." ... "Dispersal is principally by birds." ... "Accidental Introduction - No documented instances"

704	Propagules adapted to wind dispersal	n
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"The 2- to 3-seeded, berrylike drupe fruits occur in small clusters [9,28,83]." ... "Many researchers indicate that birds are important dispersers of glossy buckthorn seed [31,64,92], but other potential dispersal agents include small mammals, gravity, and water [31,35]."

705	Propagules water dispersed	
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"The importance of water in the dispersal of glossy buckthorn in North America is unclear. Some researchers report that glossy buckthorn fruits may float for weeks in water (Ridley 1930 as cited in [86]), and that naked seeds may float for up to a week in water (Praeger 1913 as cited in [31]). However, ripe fruits collected in Ontario sank immediately in water [5]. Along small mountain streams in southern Spain, birds were important dispersers of glossy buckthorn seed and took an average of 53% of seeds [37], but water was an important secondary dispersal method [35]."

Qsn #	Question	Answer
	CABI. 2015. Frangula alnus In: Invasive Species Compendium. www.cabi.org/isc	[Possibly No] "The fresh fruits of F. alnus are reported to float for about 3 weeks and dry seeds for about 1 week (Ridley, 1930). However, Catling and Porebski (1994) noted that ripe fruits sank immediately. Unlike Rhamnus cathartica, the fruits do not dry out on the shrub over winter, so it is unlikely that dispersal occurs by water.'

706	Propagules bird dispersed	y
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Many researchers indicate that birds are important dispersers of glossy buckthorn seed [31,64,92], but other potential dispersal agents include small mammals, gravity, and water [31,35]." ... "Glossy buckthorn produces fruits throughout the growing season, and seeds have a laxative effect on birds, making seed dispersal continual and effective [34,39,64]. In southern Ontario, researchers observed American robins, Bohemian waxwings, cedar waxwings, rose breasted grosbeaks, and European starlings feeding on glossy buckthorn fruits (Darbyshire and others, personal communications as cited in [5]), making them likely dispersers. Since introductions of glossy buckthorn and European starlings were nearly synchronous in northeastern Ohio, researchers speculated that European starlings may have been instrumental in glossy buckthorn dispersal [42]."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	[Seed caching rodents may carry seeds externally] "In European habitats, glossy buckthorn seedlings often occurred beneath the parent tree, and clumps of seedlings germinating from abandoned mouse caches were also encountered [31]. In the Wicken fen in Cambridgeshire, England, the majority of glossy buckthorn fruits fell when ripe. Experiments and field observations suggested that mice harvested and cached seed. As many as 30 to 50 glossy buckthorn seedlings germinated from abandoned caches [30]."

708	Propagules survive passage through the gut	y
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Glossy buckthorn produces fruits throughout the growing season, and seeds have a laxative effect on birds, making seed dispersal continual and effective [34,39,64]."

801	Prolific seed production (>1000/m2)	
	Source(s)	**Notes**

Qsn #	Question	Answer
	NH Department of Agriculture, Markets & Food, Division of Plant Industry. 2014. Glossy buckthorn. Rhamnus frangula / Frangula alnus Fact Sheet. http://www.agriculture.nh.gov/publications forms/documents/glossy-buckthorn.pdf. [Accessed 26 Jan 2015]	"Seed Per Plant 15,000 -54,000"
	CAB International, 2005. Forestry Compendium. CAB International, Wallingford, UK	"Seed viability of at least 3.5 years is reported by Godwin (1943). Seedling emergence in R. frangula is usually high near the seed source, and a density of 540/m² has been reported (Converse, 1984)."
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Studies conducted in southern Spain provided estimates of glossy buckthorn's reproductive potential, which was reduced in dry conditions. Glossy buckthorn produced an estimated 10,200 to 36,600 flowers/plant. On average, fruits contained 1.5 seeds. Calculations based on the proportion of available ovules that developed into viable seeds suggested that medium- to full sized glossy buckthorn individuals could potentially produce between 430 and 1,560 offspring/year, but seedlings and juveniles were rare in the study area [63]. The end of the flowering period was triggered by summer drought, and successful fruit production was confined to times of peak pollinator abundance. The flowering period was shorter and seed production was 50% lower in 2001—when conditions were drier, warmer, and windier—than in 2000 [36]."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**y**
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Sources suggest that glossy buckthorn seed remains viable in the seed bank for at least 2 years and perhaps longer ([15], Kinzel 1926 as cited in [31]). Following removal of a glossy buckthorn canopy, glossy buckthorn seedlings are common and are likely the result of germination from the seed bank [24,26,79,87]. However, seed bank studies are generally lacking. In deciduous forests of Van Cortlandt and Pelham Bay parks in the Bronx, New York, glossy buckthorn occurred in aboveground vegetation plots but did not emerge from soils samples taken from these plots [50]."

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	CABI. 2015. Frangula alnus In: Invasive Species Compendium. www.cabi.org/isc	"Chemical control is the most common method of managing F. alnus . Because F. alnus grows in wetland environments, it is preferable to carry out treatment in the winter months when the soil is frozen and there is less risk of damage to native species from trampling and herbicide overspray (Reinartz, 1997). The preferred method is to cut and apply herbicide to stumps greater than 10 cm in diameter. Basal bark treatments can be applied on smaller shrubs or in areas where openings in the understorey are not necessary for restoration. Repeated treatment over several seasons is usually required to eliminate recruitment from the seed bank. Converse (1984) lists the following herbicides and methods that have achieved good control against F. alnus in the USA: wick-applied glyphosate in May-June; misting of cut stumps (<5 cm in diameter) with glyphosate in August; misting with fomasine (ammonium salt) in September. Foliar application of 2,4-D in March-August was not effective because new leaves developed later in the year. Similarly, resprouting occurred following misting of larger stumps (>12 cm in diameter) with glyphosate in August."
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	[Possibly in conjunction with other control methods] "Chemical: The effectiveness of herbicides to control glossy buckthorn may increase if used in conjunction with other control methods. In Massachusetts, herbicide treatment of cut stumps provided control for 2 to 3 years. Treated stumps produced sprouts after that time [12]. Herbicides considered useful in glossy buckthorn control are discussed by Solecki [82]." ... "Integrated management: Most studies reporting some level of success in the control of glossy buckthorn involved more than one control method and repeated treatments. Heidorn [39] indicated that repeated cutting or girdling of glossy buckthorn followed by herbicide treatments was often effective. Since glossy buckthorn's leaf retention made it easy to identify and associated vegetation was dormant, fall treatments minimized nontarget effects [39]. In mixed-conifer and hardwood swamps in the Cedarburg bog in Wisconsin, just 3 of 150 glossy buckthorn plants survived after cutting and stump herbicide treatments. Sprouts from the 3 survivors were small and deformed at the end of the first posttreatment growing season [73]. When sites were plowed and seeded with little bluestem (Schizachyrium scoparium) in Lincoln, Massachusetts, glossy buckthorn abundance decreased [12]."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Glossy buckthorn sprouts "prolifically" from its roots and and/or root crown after being wounded or top-killed [31,60,92]. In England, glossy buckthorn is "strikingly characteristic" of burned and grazed areas [31]." ... "Mature glossy buckthorn sprouts after fire from the root crown following top-kill by fire [6,82]. In a review, Solecki [82] reports that sprouting is generally stimulated by 1 or 2 fires, but that annual or biennial "hot fire" for 5 to 6 years may be effective in reducing glossy buckthorn abundance. Sprouting was "vigorous" after a 31 May 1951 fire in a "middle aged" glossy buckthorn-dominated fen in Cambridgeshire, England [33]."

Qsn #	Question	Answer
805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Gucker, C. L. 2008. Frangula alnus. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/. [Accessed 26 Jan 2015]	"Biological: No biological controls for glossy buckthorn have been released to date (2008), but testing is occurring, and releases may be made by 2010 [15]."
	WRA Specialist. 2015. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability (in temperate climates)
• Widely naturalized in North America
• An environmental weed that reduces native species richness
• Toxic to animals and accidental poisoning of people is possible
• Tolerates many soil types
• Forms dense stands
• Seeds dispersed by birds & other frugivorous animals
• Reaches maturity in 2 years
• Seeds may persist in soil for 2 or more years
• Able to coppice & resprout after cutting

Low Risk Traits
• Grows in temperate climates & may only be a threat to higher elevation in tropical islands
• Unarmed (no spines, thorns or burrs)
• Palatable to deer & other browsing animals (although toxic)
• Relatively shade-intolerant
• Mostly self-incompatible (but not 100%)
• Not reported to spread vegetatively (but able to sucker or coppice prolifically if cut)
• Herbicides may provide effective control