

MN NWAC Risk Assessment Worksheet (04-2011)	Common Name	Latin Name
	European Buckthorn	<i>Rhamnus cathartica</i> L.
Original Reviewer: Anthony Cortilet	Affiliation/Organization: MN Dept. Of Ag.	Original Review: 6/03/2013
Current Reviewer: Anthony B. Cortilet 	MN Dept. of Agriculture	Current Review Date 07/08/2016

Species Description: <http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/commonbuckthorn.aspx>

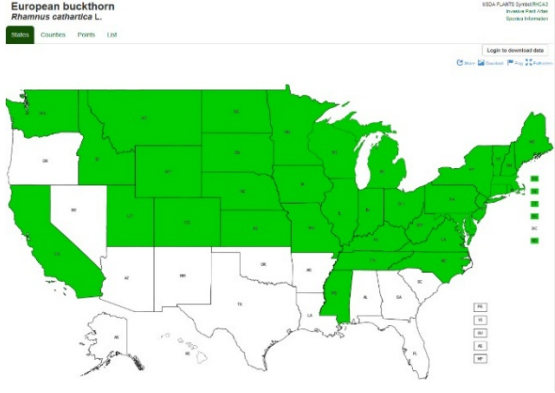
- Tall understory perennial shrub or small tree with a spreading/branched crown. Multiple stems at the base when young; eventually developing into a singular trunk/stem as it matures. Plants are either male or female.
- Main stem can be up to 10 inches in diameter with brown bark and has elongate silvery corky projections. Cut stems have orange heartwood (center/non-living) and yellow sapwood (outer/living part of stem).
- Branches contain buds and leaves that are mostly opposite or sub-opposite and terminate in small sharp thorns (up to ¼ inch in length).
- Leaves are distinctly egg-shaped, smooth, glossy, finely toothed, pointed at the tip, and have 3- 5 curved leaf veins that extend from the leaf stem to the tip. Leaves stay green late into the fall after most other trees have shed their leaf canopy, making buckthorn easy to identify at this time of the year.
- Small yellow-green, four-petaled flowers are produced in clusters near the base of the leaf stalks along the branches. Male and female flowers are borne on separate plants.
- Round berries are produced in the flower clusters of female plants following fertilization and ripen in August and September. Ripened fruit is black and shiny, highly attractive to birds, and contains 3- 4 seeds each. This adds to the ability of this species to spread quickly into new areas
- [Glossy buckthorn](#) looks similar except branches do not terminate in a thorn, leaves are alternate, toothless and oval with 8- 9 veins radiating outward from a central mid-vein. Berries tend to be a mixture of red-brown to dark-purple and black depending on maturity. Glossy buckthorn also prefers wetter habitats.
- Comparison of Common and Glossy Buckthorn: [Minnesota Department of Natural Resources Buckthorn Identification and Resources](#)

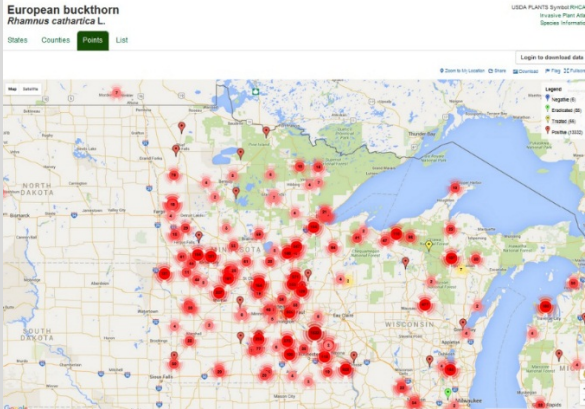
Risk Assessment Current Summary (2016): Buckthorn is an extremely challenging plant to control successfully in Minnesota and creates many challenges for successful enforcement under the Noxious Weed Law as a Prohibited Noxious Weed. Small stands of buckthorn can be

effectively controlled using multiple techniques. However, large existing stands are require a lot of time and financial resources to even attempt to control. Control success is variable and requires follow-up treatments over many years.

Although control and eradication is difficult at this stage of the buckthorn infestation statewide, this species is considered by multiple organizations, government agencies and citizens within the state too important of a threat not to list as a noxious weed in Minnesota.

Listing as a statewide Restricted Noxious Weed will prevent sale, propagation and negligent transport of this species, but will also allow regions of the state where buckthorn is not widespread, to focus on its control and eradication. Local units of government can pass resolutions or ordinances to make the statewide Restricted category Prohibited in their jurisdictions. The Minnesota Noxious Weed Advisory Committee and The Minnesota Department of Agriculture encourage all private and public landowners to control buckthorn on their properties in order to lessen the environmental degradation caused by this species.

Box	Question	Answer	Outcome
1	Is the plant species or genotype non-native?	Yes – Native to northern Europe and Asia. Native to Sweden, Russia, Siberia, China, northern Caucasus mountains, and North Africa ^{2, 6, 8, 14, 27, 30} .	Box 3
3	Is the plant species, or a related species, documented as being a problem elsewhere?	Yes – European buckthorn is known to be problematic throughout the northern half of the US and throughout Canada. It is recorded by USDA as being regulated as a noxious weed in six states: IA, CT, MA, MN, NH, and VT. It is classified as a Restricted Invasive Species in WI and is also listed as an Invasive Species (but not necessarily regulated) in many other NE and upper Midwestern states and Canadian Provinces ^{6, 7, 8, 15, 16, 17, 27, 30, 31, 32}. USDA Distribution: http://plants.usda.gov/core/profile?symbol=rhca3 EDDMapS map of European buckthorn by state: https://www.eddmaps.org/distribution/usstate.cfm?sub=3070 	Box 6
6	Does the plant species have the capacity to establish and survive in Minnesota?	Yes – Buckthorn is well established in Minnesota	

Box	Question	Answer	Outcome
	A. Is the plant, or a close relative, currently established in Minnesota?	Yes – European buckthorn has been recorded in a majority of MN counties³, 11, 12, 13, 18. EDDMaps map of Minnesota distribution: https://www.eddmaps.org/distribution/viewmap.cfm?sub=3070 	Box 7
7	Does the plant species have the potential to reproduce and spread in Minnesota?	Yes – European buckthorn has been reproducing and spreading in MN for many decades since its introduction.	
	A. Does the plant reproduce by asexual/vegetative means?	No. Reproduces by seed. ^{4, 5, 9, 10, 11, 12, 15, 19, 30}	7C
	C. Does the plant produce large amounts of viable, cold-hardy seeds?	Yes – European buckthorn produces many seeds protected by fruits attractive to birds. Seeds can also remain dormant in the seedbank for many years ^{4, 5, 9, 10, 11, 12, 15, 19, 30} .	7F
	E. Is this species self-fertile?	<i>Plants are dioecious (plants have either male or female flowers) although there have been cases when flowers have been found with both male and female parts³⁰.</i>	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>

Box	Question	Answer	Outcome
	F. Are sexual propagules – viable seeds – effectively dispersed to new areas?	Yes – Birds are known to be a huge distribution vector for European buckthorn spread. Water, snow, small mammals and human activity are also highly responsible for spread ^{4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 19, 30} .	7I
	G. Can the species hybridize with native species (or other introduced species) and produce viable seed and fertile offspring in the absence of human intervention?	<i>We found no records of European buckthorn hybridizing with other Rhamnus species in Minnesota.</i>	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
	I. Do natural controls exist, species native to Minnesota that are documented to effectively prevent the spread of the plant in question?	No – No natural controls are known to exist ^{4, 14, 27} . Researchers from CABI – Switzerland, the University of Minnesota, and the Minnesota Department of Natural Resources worked together to study the potential to find a biological control insect for glossy and common buckthorn. There were no insects found that were host-specific to European buckthorn and caused enough damage to the plant to reduce European buckthorn populations. The research project was ended ^{3, 14, 34, 35} .	Box 8
8	Does the plant species pose significant human or livestock concerns or has the potential to significantly harm agricultural production, native ecosystems, or managed landscapes?	Yes – European buckthorn is a serious threat to native ecosystems and managed landscapes. It has also been linked to agriculture as an overwintering host to the soybean aphid and as an alternate host for alfalfa mosaic virus and crown rust (<i>Puccinia coronata</i> Corda var. <i>avenae</i>), which causes oat rust disease.	
	A. Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?	No - A recent research study showed the high presence of the chemical emodin – contained in the leaves and berries of buckthorn – increased embryo mortality in western chorus frog populations ²¹ . However, the overall literature does not support the idea that European buckthorn is toxic and poses a significant direct risk to livestock, wildlife and people. It does pose a serious threat to native ecosystems and could have a significant impact on the future of native forest habitats ^{5, 7, 8, 27, 30} .	8B

Box	Question	Answer	Outcome
	B. Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?	Yes - Many research studies have described and analyzed the detrimental impact that European buckthorn causes in forested habitats, but financial losses have not been well documented at this time ^{5, 7, 8, 24, 25, 27, 30, 31, 32}. Has also been associated with the success of the soybean aphid in the upper Midwest which has significantly increased production costs for soybean producers ²⁰. The native alder-leaved buckthorn, <i>Rhamnus alnifolia</i>, has also been shown to serve as an overwintering host for soybean aphid, however its range in Minnesota is not as similar to the soybean growing region of the state ^{3, 18, 22, 23, 27, 30, 33}. European buckthorn is a known alternate host for oat crown rust (<i>Puccinia coronata</i> f. sp. <i>avenae</i>) in the U.S. and Minnesota. It is one of the most widespread and damaging diseases of oat in the country and can reduce grain yields by 10 to 40% ^{26, 27, 30}.	Box 9
	C. Can the plant aggressively displace native species through competition (including allelopathic effects)?	Yes – European buckthorn infestations are well documented in the research literature to greatly reduce forest biodiversity. European buckthorn infestations have been shown to significantly alter native forest soils, altering natural succession, and creating a more suitable environment for increased buckthorn production and spread ^{5, 6, 7, 8, 24, 25, 27, 30, 31, 32}. Buckthorn leaves are full of a toxin called emodin that discourages herbivory, increases seed transport through the digestive system, and plays a role in preventing the successful establishment of other plants in the immediate area. Research is being conducted on impacts emodin has on the environment after falling from the tree. Studies have shown emodin can impair certain amphibians such as frogs to successfully produce offspring ^{5, 7, 8, 21, 29}. Some studies have shown that buckthorn exudates from the fruits creates allelopathy toward seed germination in certain species ^{7, 28, 29}.	This text is provided as additional information not directed through the decision tree process for this particular risk assessment.

Box	Question	Answer	Outcome
9	Does the plant species have clearly defined benefits that outweigh associated negative impacts?	None –that would outweigh the negatives. European buckthorn was once thought to be beneficial as wildlife cover and food in transition areas between forest and grasslands and the berries are sought after by small mammals and birds.	
	A. Is the plant currently being used or produced and/or sold in Minnesota or native to Minnesota?	No – was sold in Minnesota until becoming a Restricted Noxious Species in 1999 (Minnesota Statutes 18.75-18.91).	Box 10
10	Should the plant species be enforced as a noxious weed to prevent introduction &/or dispersal; designate as prohibited or restricted?	Yes, common buckthorn is a major threat to forest communities in Minnesota and is one of the top forest plant species of concern by concerned citizens in the state.	
	A. Is the plant currently established in Minnesota?	Yes – see Box 6	10B
	B. Does the plant pose a serious human health threat?	The current literature does not support European buckthorn being a direct human health threat to humans.	10C
	C. Can the plant be reliably eradicated (entire plant) or controlled (top growth only to prevent pollen dispersal and seed production as appropriate) on a statewide basis using existing practices and available resources?	No - European Buckthorn is hard to reliably control or eradicate for multiple reasons. It is a forest species which makes traditional large-scale herbicide application unfeasible on large stands. Seed banks continue to produce buckthorn seedlings following treatments requiring long-term management that requires a large commitment of time and financial resources by landowners. Recruitment of seeds from neighboring sources through birds and mammals is problematic in areas being reclaimed or restored of buckthorns. Small stand control is feasible and areas of the state where buckthorn has not established in great numbers should make buckthorn control/eradication a priority.	List as a Restricted Noxious Weed.

Final Results of Risk Assessment			
	Review Entity	Comments	Outcome
	NWAC Listing Subcommittee	First review – 06/20/2013, Final Review 08/12/2013	Restricted Noxious Weed
	NWAC Full-group	Reviewed – 12/18/13	Vote 13 – 0 to remain as a Restricted Noxious Weed
	MDA Commissioner	Reviewed – 2/24/2014	Approved NWAC Recommendation
	NWAC Listing Subcommittee Review 2016	Buckthorn is too widespread in Minnesota to allow successful enforcement under the Noxious Weed Law as a Prohibited Noxious Weed. Small stands of buckthorn can be effectively controlled using multiple techniques. However, large existing stands are require a lot of time and financial resources to even attempt to control. Success is variable. Although control and eradication is difficult at this stage of the buckthorn infestation statewide, this species is considered by multiple organizations, government agencies and citizens within the state too important of a threat not to list as a noxious weed in Minnesota. Listing as a statewide Restricted Noxious Weed will prevent sale, propagation and negligent transport of this species, but will also allow regions of the state where buckthorn is not widespread, to focus on its control and eradication. Local units of government can pass resolutions or ordinances to make the statewide Restricted category Prohibited in their jurisdictions.	Restricted Noxious Weed
	NWAC Full Group 2016	NWAC voted 14 – 0 to accept the listing subcommittee recommendation.	Restricted Noxious Weed
	MDA Commissioner 2016	Accepted NWAC’s recommendation (02/06/2017).	Restricted Noxious Weed.
	FILE #: MDARA00023COMBU_2_24_2014	Restricted Noxious Weed	

References (All Website Links Listed Were Accessed June and July 2016):

- ¹ Center for Invasive Species and Ecosystem Health. 2013. European Buckthorn: <http://www.invasive.org/browse/subinfo.cfm?sub=3070>
- ² Converse, C.K. 1985. Element Stewardship Abstract, *Rhamnus cathartica*. The Nature Conservancy. http://wiki.bugwood.org/Rhamnus_cathartica
- ³ EDDMaps. European Buckthorn Distribution in Minnesota. <https://www.eddmaps.org/ipane/distribution/viewmap.cfm?sub=3070>
- ⁴ Czarapata, E. J. 2005. Invasive Plants of the Upper Midwest: an illustrated guide to their identification and control. University of Wisconsin Press. 215 pages.
- ⁵ Heneghan, L., C. Rauschenberg, F. Fatemi, and M. Workman. 2004. European Buckthorn (*Rhamnus cathartica*) and its effects on some ecosystem properties in an urban woodland. *Ecological Restoration* 22 (4): 275 - 280. ISSN 1522-4740
- ⁶ Randall, J.M. and J. Marinelli. 1996. Invasive Plants: Weeds of the Global Garden. Brooklyn Botanical Garden. Brooklyn, N.Y. 111 pages.
- ⁷ Klionsky, S.M., K.L. Amatangelo, and D.M. Waller. 2010. Above and Belowground Impacts of European Buckthorn (*Rhamnus cathartica*) on Four Native Forbs. *Restoration Ecology* 19(6): 1-10. http://www.botany.wisc.edu/waller/PDFs/KlionskyAmatWaller_2010_RestorEcol.pdf
- ⁸ Knight, K.S., J.S. Kurylo, A.G. Endress, J. R. Stewart, and P.B. Reich. 2007. Ecology and ecosystem impacts of common buckthorn (*Rhamnus cathartica*): a review. *Biological Invasions* 9: 925-937
- ⁹ Michigan Department of Natural Resources & Michigan Natural Features Inventory. 2012. Common buckthorn (*Rhamnus cathartica*). Invasive Species – Best Control Practices. 7 Pages: <http://mnfi.anr.msu.edu/invasive-species/CommonBuckthornBCP.pdf>
- ¹⁰ Missouri Department of Conservation. Common Buckthorn. http://mdc.mo.gov/sites/default/files/resources/2011/06/commonbuckthornsheet_06-30-11_0.pdf
- ¹¹ Minnesota Department of Natural Resources: Common Buckthorn (*Rhamnus cathartica*): <http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/commonbuckthorn.html>

- ¹² Minnesota Department of Transportation Minnesota Noxious Weeds. 2013: <http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>
- ¹³ USDA Natural Resources Conservation Service. Plants Database. Plants Profile – *Rhamnus cathartica* L. <http://plants.usda.gov/core/profile?symbol=rhca3>
- ¹⁴ Gassmann A., I. Tosevski, & L. Skinner. 2008. Use of native range surveys to determine the potential host range of arthropod herbivores for biological control of two related weed species, *Rhamnus cathartica* and *Frangula alnus*, Biological Control 45(1): 11-20. ISSN 1049-9644, <http://dx.doi.org/10.1016/j.biocontrol.2007.12.004> .
- ¹⁵ Forest Invasive Plants Resource Center. Common and Glossy Buckthorn. Factsheets. PDF – 7 pgs. <http://na.fs.fed.us/spfo/invasiveplants/factsheets/pdf/common-and-glossy-buckthorn.pdf>
- ¹⁶ USDA Natural Resources Conservation Service. Plants Database. Introduced, Invasive, and Noxious Plants. <http://plants.usda.gov/java/noxComposite?stateRpt=yes>
- ¹⁷ Wisconsin Department of Natural Resources. Terrestrial Invasive Species – Regulated Plants. <http://dnr.wi.gov/topic/Invasives/species.asp?filterBy=Terrestrial&filterVal=Y&catVal=PlantsReg#RegSelect>
- ¹⁸ Minnesota Wildflowers – A field Guide to the flora of Minnesota. *Rhamnus cathartica* (Common Buckthorn). <https://www.minnesotawildflowers.info/tree/common-buckthorn>
- ¹⁹ Minnesota Department of Agriculture. Restricted Noxious Weed. Common or European Buckthorn – *Rhamnus cathartica* L. <http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/commonbuckthorn.aspx>
- ²⁰ Heimpel, G., L.E. Frelich, D.A. Landis, K. R. Hopper, K.A. Hoelmer, Z. Sezen, M.K. Asplen, and K. Wu. 2010. European buckthorn and Asian soybean aphid as components of an extensive invasional meltdown in North America. Biological Invasions. Vol. 12: 2913-2931. https://www.researchgate.net/profile/Keith_Hopper/publication/225623699_European_buckthorn_and_Asian_soybean_aphid_as_components_of_an_extensive_invasional_meltdown_in_North_America/links/0912f50ec88bd55aa1000000.pdf
- ²¹ Sacerdote, A. B. and R. B. King. 2014. Direct Effects of an Invasive European Buckthorn Metabolite on Embryo Survival and Development in *Xenopus laevis* and *Pseudacris triseriata*. Journal of Herpetology 48(1): 51-58.
- ²² Minnesota Wildflowers – A field Guide to the flora of Minnesota. *Rhamnus alnifolia* (Alder-leaved Buckthorn). <https://www.minnesotawildflowers.info/shrub/alder-leaved-buckthorn>

- ²³ Voegtlin, D.J., R. J. O'neil, W. R. Graves, D. Lagos, and H. J. S. Yoo. 2005. Potential Winter Hosts of Soybean Aphid. *Annals of the Entomological Society of America* 98(5): 690-693.
- ²⁴ Webster, C.R., M.A., Jenkins, and S. Jose. 2006. Woody Invaders and the Challenges They Pose to Forest Ecosystems in the Eastern United States. *Journal of Forestry*. Volume 104(7): 366-374.
- ²⁵ Moser, K.W., E. L. Barnard, R.F. Billings, S.J. Crocker, M.E. Dix, A.N. Gray, G. G. Ice, M. Kim, R. Reid, S.U. Rodman, and W. H. McWilliams. 2009. Impacts of Nonnative Invasive Species on US Forests and Recommendations for Policy and Management. *Journal of Forestry*. Volume 107:6, pp. 320-327. http://www.fs.fed.us/rm/pubs_other/rmrs_2009_moser_w001.pdf
- ²⁶ United States Department of Agriculture, Agricultural Research Service. Cereal Disease Research. Identification of common Buckthorn and other alternate hosts for crown rust. <http://www.ars.usda.gov/Main/docs.htm?docid=10629>
- ²⁷ Centre for Agriculture Biosciences International (CABI). Invasive Species Compendium, *Rhamnus cathartica* (buckthorn). <http://www.cabi.org/isc/datasheet/46996>
- ²⁸ Seltzner, S. and T.L. Eddy. 2003. Allelopathy in *Rhamnus cathartica*, European Buckthorn. *The Michigan Botanist* 42(2): 51-61. <http://quod.lib.umich.edu/m/mbot/0497763.0042.201/1/--allelopathy-in-rhamnus-cathartica-european-buckthorn?page=root;size=100;view=image>
- ²⁹ Ishaki, I. 2002. Emodin – a secondary metabolite with multiple ecological functions in higher plants. *New Phytologist* 155(2): 205-217. <http://onlinelibrary.wiley.com/doi/10.1046/j.1469-8137.2002.00459.x/full>
- ³⁰ Qaderi, M.M., D.R. Clements, and P.B. Cavers. 2009. The Biology of Canadian Weeds. 139. *Rhamnus cathartica* L. *Canadian Journal of Plant Science* 89: 169-188. https://www.researchgate.net/profile/David_Clements/publication/240843934_The_Biology_of_Canadian_Weeds._139._Rhamnus_cathartica_L/links/554d5ea708ae12808b34ed83.pdf
- ³¹ Wisconsin Species Assessment Group. 2009. *Rhamnus cathartica*. http://dnr.wi.gov/topic/Invasives/documents/classification/GRF_Rhamnus_cathartica.pdf
- ³² New York Non-Native Plant Invasiveness Ranking Form. 2010. *Rhamnus cathartica* L. Common Buckthorn. http://www.nyis.info/user_uploads/c1b35_Rhamnus.cathartica.NYS.pdf

³³ Minnesota Wildflowers – A field Guide to the flora of Minnesota. *Rhamnus alnifolia* (Alder-leaved Buckthorn). <https://www.minnesotawildflowers.info/shrub/alder-leaved-buckthorn>

³⁴ Minnesota Department of Natural Resources. Biological control of buckthorn. <http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/biocontrol.html> [Accessed 8 July 2016].

³⁵ Gassmann, A. and I. Tosevski. 2014. [Biological control of *Rhamnus cathartica*: is it feasible? A review of work done in 2002–2012.](#) Journal of Applied Entomology 138: 1-13.