

Taxon: *Morus rubra* L.

Family: Moraceae

Common Name(s): red mulberry

Synonym(s): *Morus rubra* var. *tomentosa* Bureau

Assessor: Chuck Chimera

Status: Assessor Approved

End Date: 8 Nov 2021

WRA Score: 2.0

Designation: EVALUATE

Rating: Evaluate

Keywords: Dioecious Tree, Allergenic Pollen, Edible Fruit, Wind-Pollinated, Bird-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Intermediate
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	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	?
301	Naturalized beyond native range		
302	Garden/amenity/disturbance weed		
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)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
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	n
406	Host for recognized pests and pathogens		
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	y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
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	y=1, n=-1	y
604	Self-compatible or apomictic		
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation		
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
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	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
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		
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
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	[No evidence] "Native American tribes have been reported to use infusions of red mulberry bark medicinally to stop dysentery, as a laxative, and as a purgative; infusions of the root have been used for weakness and urinary problems; and tree sap rubbed directly on the skin as treatment for ringworm (Moerman 1998) ."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	Intermediate
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry extends from Massachusetts and southern Vermont west through the southern half of New York to extreme southern Ontario, southern Michigan, central Wisconsin and southeastern Minnesota; south to Iowa, southeastern Nebraska, central Kansas, western Oklahoma and central Texas; and east to southern Florida. It is also found in Bermuda."
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	"The red mulberry native to eastern North America, from northernmost Ontario and Vermont south to southern Florida and west to southeast South Dakota and central Texas. Although red mulberry is common in the United States, it is considered rare in Massachusetts, Ontario and Vermont. It is listed as an endangered species in Canada."

202	Quality of climate match data	High
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry extends from Massachusetts and southern Vermont west through the southern half of New York to extreme southern Ontario, southern Michigan, central Wisconsin and southeastern Minnesota; south to Iowa, southeastern Nebraska, central Kansas, western Oklahoma and central Texas; and east to southern Florida. It is also found in Bermuda."

203	Broad climate suitability (environmental versatility)	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry grows under a variety of conditions. The frost-free period ranges from 150 days in New England to 330 days in southern Florida. Total annual precipitation ranges from 1000 to 2000 mm (40 to 80 in). Best growth is in moist coves and flood plains in the southern half of its natural range. Mean annual snowfall ranges from zero in Florida to 150 cm (60 in) in New York."
	Lim, T.K. (2012). <i>Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits.</i> Springer, New York	"Red mulberry is adapted to temperate climatic requirements with total annual rainfall of 1,000– 2,000 mm. In its native range it is found in moist forests and thickets on the floodplains, river valleys, and moist hillsides at elevations below 600 m. It is rated as being moderately tolerant of brief periods of flooding. Red mulberry has a minimum requirement of 140 frost free days and can tolerate sub zero temperature down to –36 ° C. It grows in full sun but is tolerant to partial shading. It is quite drought tolerant but is intolerant of fire."

204	Native or naturalized in regions with tropical or subtropical climates	n
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry extends from Massachusetts and southern Vermont west through the southern half of New York to extreme southern Ontario, southern Michigan, central Wisconsin and southeastern Minnesota; south to Iowa, southeastern Nebraska, central Kansas, western Oklahoma and central Texas; and east to southern Florida. It is also found in Bermuda."
	Lim, T.K. (2012). <i>Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits.</i> Springer, New York	"Red mulberry is adapted to temperate climatic requirements with total annual rainfall of 1,000–2,000 mm. In its native range it is found in moist forests and thickets on the floodplains, river valleys, and moist hillsides at elevations below 600 m. It is rated as being moderately tolerant of brief periods of flooding. Red mulberry has a minimum requirement of 140 frost free days and can tolerate sub zero temperature down to –36 ° C."

205	Does the species have a history of repeated introductions outside its natural range?	?
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry has been planted in the Midwest because its fruits are a valuable food for wildlife, but because it provides very little soil stability or cover for wildlife, it has not been planted widely (8)."

301	Naturalized beyond native range	
	Source(s)	Notes

Qsn #	Question	Answer
	Protopopova, V. V., & Shevera, M. V. (2014). Ergasiophytes of the Ukrainian flora. <i>Biodiversity Research and Conservation</i> , 35(1), 31-46	"Appendix 1. Annotation list of ergasiophytes of the Ukrainian flora" " ... "Morus rubra L., Moraceae, Tree, Xero-meso, Ken. (Crimea), N.Am., Col., Erg." [In contrast to Randall (2017), this species' degree of naturalization has been categorized as a colonophyte, non-naturalized species, unstable element of flora, related to cultivation, somewhat adjusted to new conditions of survival, capable of periodic formation of seeds or reproduction in the vegetative way]
	Burda, R. I., & Koniakin, S. N. (2019). The non-native woody species of the flora of Ukraine: Introduction, naturalization and invasion. <i>Biosystems Diversity</i> , 27(3), 276-290	"Table 6 Non-native naturalizing woody species of spontaneous flora of Ukraine" [M. rubra - Degree of naturalization = colonophyte; Stage of naturalization = establishing]
	Flora of North America Editorial Committee, eds. (1997). <i>Flora of North America: Volume 3: Magnoliophyta: Magnoliidae and Hamamelidae</i> . Oxford University Press, Oxford, UK	[Possibly naturalized in New Mexico outside native range] "Morus rubra is sporadically established along fencerows in southern New Mexico (R. Spellenberg, pers. comm.)."
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	Cited as naturalized in Ukraine (Protopopova, V. V., & Shevera, M. V. (2014). <i>Ergasiophytes of the Ukrainian flora</i> . <i>Biodiversity Research and Conservation</i> , 35(1), 31.). However, a review of this publication lists <i>Morus rubra</i> as a colonophyte, or "non-naturalized species, unstable element of flora, related to cultivation, somewhat adjusted to new conditions of survival, capable of periodic formation of seeds or reproduction in the vegetative way"
	WRA Specialist. (2021). Personal Communication	May be naturalizing in Ukraine, and possibly other regions in Europe. Current references list it as a colonophyte, or possibly naturalizing due to human cultivation
	Imada, C. (2019). <i>Hawaiian Naturalized Vascular Plants Checklist</i> (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

302	Garden/amenity/disturbance weed	
	Source(s)	Notes
	Missouri Botanical Garden. (2021). <i>Morus rubra</i> . https://www.missouribotanicalgarden.org . [Accessed 8 Nov 2021]	"Weedy self-seeding and messy fruit are concerns."
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	[Cited as a weed of unspecified impacts] "References: United States of America-W-161, United States of America-W-218, Canada-C-756, North America-E-784, Europe-N-819, Global-W-1349, United States of America-A-87, Global-CD-1611, Canada-G-1855, Ukraine-N-2014."
	CABI. (2021). <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	No evidence

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	CABI. (2021). <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	No evidence

304	Environmental weed	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Unverified citation as an Environmental Weed. Unable to access original report] Randall, J.M., and Rice, B.A. (2003). 1998-1999 Survey of Invasive Species on Lands Managed by The Nature Conservancy. The Nature Conservancy. URL: http://tncweeds.ucdavis.edu/survey.html
	CABI. (2021). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	No evidence

305	Congeneric weed	y
	Source(s)	Notes
	Queensland Government. (2021). Weeds of Australia. <i>Morus alba</i> . https://keyserver.lucidcentral.org/weeds . [Accessed 4 Nov 2021]	"White mulberry (<i>Morus alba</i>) is regarded as an environmental weed in New South Wales and Queensland. This introduced species has been widely cultivated in gardens for its fruit, and its leaves are also used to feed silkworms. It has become naturalised mainly in the warmer coastal districts of eastern Australia and is a weed of watercourses (i.e. riparian areas), native bushland, forest margins and roadsides. White mulberry (<i>Morus alba</i>) is ranked among the top 200 most invasive plants in south-eastern Queensland and appears on several local environmental weed lists (e.g. in Ipswich City, Redlands Shire and Caboolture Shire). It is becoming quite common along waterways in Brisbane and other parts of southeastern Queensland (e.g. it is a priority weed in the Kedron Brook catchment in Brisbane). It is also naturalised in conservation areas and along waterways in the Sydney region (e.g. Yarramundi Reserve, Tench Reserve Riparian Corridor and Werrington Creek Riparian Corridor in the Hawkesbury River County Council area) and is of concern in north-eastern New South Wales, where it appears on some local and regional environmental weed lists (e.g. in Lismore Shire, Byron Shire and the environmental weed list for the North Coast region)."
	CABI. (2021). <i>Morus nigra</i> . In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Potentially a problem. Further research needed] "M. nigra, black mulberry, is a slow-growing, deciduous tree. The species is known to have escaped from cultivation in Denmark and Austria, is weedy in Spain, southeastern Australian bushland, and South Africa (Randall, 2012), and has been reported as invasive in southern Brazil (Gasperin and Pizo, 2009). Invasive traits include its longevity, rapid growth rate, tolerance for droughts, infertile and rocky soil, and resistance to cold, easy seed dispersal by biotic vectors attracted to its sweet, edible fruits, and repeated introductions for cultivation around the world. Considering current evidence, risk of introduction for this species is medium to high, although further research is needed."
	Master Gardeners of Northern Virginia. (2021). Invasive Plant Factsheet: White Mulberry (<i>Morus alba</i>). https://mgnv.org . [Accessed 4 Nov 2021]	[Reported to displace native species] "This native of northern China was introduced in colonial times as a food source for silkworms. Although the silk industry did not succeed, the non-native tree thrived and has since spread throughout almost the entire U. S. It aggressively colonizes open areas, displacing native species, and is considered problematic in many states. Both Alexandria and Arlington list it as invasive."

Qsn #	Question	Answer
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	<i>Morus australis</i> , <i>Morus cathayana</i> , <i>Morus macroura</i> , <i>Morus multicaulis</i> , <i>Morus nigra</i> , and <i>Morus serrata</i> listed as naturalized and/or weeds somewhere in the world. In general, negative impacts of these species have not been quantified, and further verification is needed to classify these congeners as invasive plants.

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Flora of North America Editorial Committee, eds. (1997). Flora of North America: Volume 3: Magnoliophyta: Magnoliidae and Hamamelidae. Oxford University Press, Oxford, UK	[No evidence] "Shrubs or trees , to 20 m. Bark gray-brown with orange tint, furrows shallow, ridges flat, broad. Branchlets red-brown to light greenish brown, glabrous or with a few trichomes; lenticels light colored, elliptic, prominent. Buds ovoid, slightly compressed, 3-7 mm, apex acute; outer scales dark brown, often pubescent and minutely ciliate; leaf scars oval to irregularly circular, bundle scars numerous, in circle. Leaves: stipules linear, 10-13 mm, thin, pubescent; petiole 2-2.5 cm, glabrous or pubescent. Leaf blade broadly ovate, sometimes irregularly lobed, 10-18(-36) × 8-12(-15.5) cm, base rounded to nearly cordate, sometimes oblique, margins serrate or crenate, apex abruptly acuminate; surfaces abaxially sparsely to densely pubescent or puberulent, adaxially with short, antrorsely appressed trichomes, usually scabrous. Catkins: peduncle pubescent; staminate catkins 3-5 cm; pistillate catkins 8-12 × 5-7 mm. Flowers: staminate and pistillate on different plants. Staminate flowers: sepals connate at base, green tinged with red, 2-2.5 mm, pubescent outside, ciliate toward tip; stamens 4; filaments 3-3.5 mm. Pistillate flowers: calyx tightly surrounding ovary; ovary green, broadly ellipsoid or obovoid, slightly compressed, 1.5-2 × 1 mm, glabrous; style branches divergent, whitish, sessile, ca. 1.5 mm; stigma papillose. Syncarps black or deep purple, cylindric, (1.5-)2.5-4 (-6) × 1 cm; fleshy calyx surrounding achenes; achenes yellowish, oval, flattened, ca. 2 mm, smooth."

402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Miranda, A. C. M., Batista, A. S., Gusman, G. S., & Vestena, S. (2012). Allelopathic and molluscicide effect of mulberry (<i>Morus rubra L.</i>). <i>Revista Caatinga</i> , 25(1), 28-36	[Extracts under controlled experimental conditions demonstrate allelopathic potential] "Abstract : Secondary metabolite produced in some plants can provoke alterations in the development of other plants or even other organisms. The aim of this paper was to identify possible allelopathic effects and biologic control of <i>Achatina fulica</i> Bowdich with aqueous extracts of <i>Morus rubra L.</i> leaves. For obtaining the aqueous extract, we used previously dried leaves in concentration of 1 g 10 mL . Five concentrations of each aqueous extract were tested (10, 30, 50, 70 and 100%) and compared to control (0.0%), distilled water. The aqueous extracts of <i>Morus rubra</i> showed up allelopathic potentialities on the seed germination and in the growth of the shoot and the root system of the tested species, considering that the reduction in the germination and initial growth increased with the rising of the aqueous extracts concentrations used and, in the biologic control, only in the final mass of <i>A. fulica</i> . The results indicated the existence of allelopathic effect, but not molluscicide of <i>M. rubra</i> ."

403	Parasitic	n
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry (<i>Morus rubra</i>), called moral in Spanish, is widespread in Eastern United States. It is a rapid-growing tree of valleys, flood plains, and low moist hillsides." [No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Sullivan, J. (1993). <i>Morus rubra</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed]	"The twigs and foliage are browsed by white-tailed deer. Beavers consume red mulberry bark [13]."

405	Toxic to animals	n
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"The highest use of red mulberry is for its large, sweet fruits. These are a favored food of most birds and a number of small mammals including opossum, raccoon, fox squirrels, and gray squirrels. The fruits also are used in jellies, jams, pies, and drinks. In the past, the fruits were valued for fattening hogs and as poultry food."

Qsn #	Question	Answer
	Sullivan, J. (1993). <i>Morus rubra</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 4 Nov 2021]	[No evidence] "Many species of birds and small mammals eat the fruits of red mulberry [19]. Bird consumers include wood ducks [1], bluebirds, indigo buntings, gray catbirds, eastern kingbirds, towhees, orchard orioles, brown thrashers, summer tanagers, vireos, red-cockaded woodpeckers [13], red-bellied woodpeckers, great crested flycatchers [11], and Lewis' woodpeckers [16]. Other consumers include opossums, raccoons, fox squirrels, and gray squirrels [19]. The twigs and foliage are browsed by white-tailed deer. Beavers consume red mulberry bark [13]."

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Damaging Agents- Red mulberry seems to be vanishing from at least a portion of its central range, possibly due to a bacterial disease. The effects and extent of this disease have not been investigated thoroughly, but it is known that red mulberry trees are becoming increasingly scarce (2). The only noteworthy leaf pathogens of red mulberry reported in the United States are leaf spots caused by a species of <i>Cercospora</i> , <i>Mycosphaerella mori</i> , and <i>Pseudomonas mori</i> (4). Red mulberry also is susceptible to witches' broom, <i>Microstroma juglandis</i> , but the cause is unknown. A variety of insects feed on red mulberry leaves, including the European fruit lecanium, <i>Parthenolecanium corni</i> ; Comstock mealybug, <i>Pseudococcus comstocki</i> ; and cottony maple scale, <i>Pulvinaria innumerabilis</i> . The American plum borer, <i>Euzophera semifuneralis</i> , and the mulberry borer, <i>Doraschema wildii</i> , attack twigs and stems of red mulberry (5)."
	Sullivan, J. (1993). <i>Morus rubra</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	"Leaf pathogens include <i>Cercospora</i> , <i>Mycosphaerella mori</i> , and <i>Pseudomonas mori</i> , all of which cause leaf spots. Red mulberry is also susceptible to witches broom (<i>Microstoma juglandis</i>) [19]. Insects feeding on red mulberry leaves include the European fruit lecanium, Comstock mealy bug, and cottony maple scale. Twigs and stems are attacked by the American plum borer and the mulberry borer [19]. Root-knot nematodes sometimes attack the roots of seedlings and older trees [37]."
	Missouri Botanical Garden. (2021). <i>Morus rubra</i> . https://www.missouribotanicalgarden.org . [Accessed 8 Nov 2021]	"No serious insect or disease problems. Borers may be a problem particular in the South. Whiteflies mass on some trees. Bacterial blight may kill foliage/branches. Coral spot cankers may cause twig dieback. Bacterial leaf scorch, powdery mildew, root rot and witches broom may also occur. Watch for scale, mites and mealybugs. "

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	Notes
	Pollen Library. (2021). Red Mulberry (<i>Morus rubra</i>). https://www.pollenlibrary.com/Specie/Morus+rubra/ . [Accessed 8 Nov 2021]	"Allergenicity: Red Mulberry (<i>Morus rubra</i>) is a severe allergen."
	Elias T. S. & Dykeman, P. A. (1990). <i>Edible Wild Plants: A North American Field Guide.</i> Sterling Publishing Company, New York	"Caution: Raw shoots and unripe fruits contain hallucinogens."

Qsn #	Question	Answer
	<p>Andreu, M. G., Friedman, M. H., McKenzie, M., & Quintana, H. V. (2010). <i>Morus rubra</i>, Red Mulberry. FOR 264. University of Florida, IFAS Extension, Gainesville, FL. http://edis.ifas.ufl.edu. [Accessed 8 Nov 2021]</p>	<p>"Male trees are extremely allergenic and should be avoided, while female trees cause few or no allergies. The pollen from members of the <i>Morus</i> genus can cause allergies ranging from hay fever to asthma."</p>
	<p>Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.</p>	<p>"The highest use of red mulberry is for its large, sweet fruits. These are a favored food of most birds and a number of small mammals including opossum, raccoon, fox squirrels, and gray squirrels. The fruits also are used in jellies, jams, pies, and drinks. In the past, the fruits were valued for fattening hogs and as poultry food."</p>
	<p>Lady Bird Johnson Wildflower Center. (2009). Ask Mr. Smarty Plants. Tuesday - August 18, 2009. https://www.wildflower.org/expert/show.php?id=4480. [Accessed 4 Nov 2021]</p>	<p>"The Poisonous Plants of North Carolina database lists both the North American native <i>Morus rubra</i> (red mulberry) and the introduced <i>Morus alba</i> (white mulberry) as mildly toxic. The toxic parts are the unripe berries and the white sap from any part. The symptoms are hallucinations and stomach upset. This database says that it "causes only low toxicity if eaten". This is the only toxic plant database I could find, however, that listed it. Delena Tull in <i>Edible and Useful Plants of Texas and the Southwest</i> says that the pollen of these two trees causes hay fever. She also says: "Unripe fruit and milky sap can cause gastrointestinal distress and some toxicity...The sap can cause a skin rash." L. A. Peterson in <i>A Field Guide to Edible Wild Plants of Eastern and Central North America</i> says about both species: "Unripe fruit and raw shoots contain hallucinogens."</p>
	<p>Quattrocchi, U. (2012). <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology.</i> CRC Press, Boca Raton, FL</p>	<p>[Medicinal uses] "Bark infusion for dysentery, also a laxative and purgative; root infusion for urinary problems; tree sap rubbed directly on the skin as treatment for ringworm."</p>
	<p>Burrows, G. E., & Tyrl, R. J. (2013). <i>Toxic Plants of North America. Second Edition.</i> Wiley-Blackwell, Hoboken, NJ</p>	<p>No evidence</p>
	<p>WRA Specialist. (2021). Personal Communication</p>	<p>Possible mild toxicity from unripe fruit, raw shoots, and sap</p>

Qsn #	Question	Answer
408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Sullivan, J. (1993). <i>Morus rubra</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	[No evidence. Excluded from areas that experience frequent fires] "Red mulberry is apparently excluded from certain forest communities by periodic fire [18]. In Oklahoma red mulberry is reported as a minor component of post oak-blackjack oak forests that have developed from post oak savanna in the absence of fire. Red mulberry was not listed as a member of the savanna community, which has experienced periodic fire [14]. In Florida, a pine (<i>Pinus spp.</i>)-red oak (<i>Quercus rubra</i>)-hickory (<i>Carya spp.</i>) community is maintained in open condition by periodic fire. This community succeeds to red oak, other fire-intolerant hardwoods, and red mulberry when fire is excluded. In these forests red mulberry is often found in very old, seldom-burned stands [18]. In Kansas, chinkapin oak (<i>Quercus muehlenbergii</i>)-bur oak (<i>Q. macrocarpa</i>) gallery forests are maintained by periodic fire. Shade tolerant trees including red mulberry have established where fire is suppressed. Hackberry (<i>Celtis occidentalis</i>) and elms will eventually replace the oaks if current conditions continue. Red mulberry will probably remain a minor component of the fire-free forests [27]."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"It grows best in open conditions (3) but is classed as tolerant of shade as it often grows as an understory tree."
	Sullivan, J. (1993). <i>Morus rubra</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	"Red mulberry grows best in the open, but is somewhat tolerant of shade [19]. In old-growth, mesic forests, red mulberry is found in mid-sized gaps (666 square yards [550 sq m]) more often than in small or large gaps [30]."
	Missouri Botanical Garden. (2021). <i>Morus rubra</i> . https://www.missouribotanicalgarden.org . [Accessed 8 Nov 2021]	"Sun: Full sun to part shade" ... "Best grown in rich, moist, well-drained soils in full sun to part shade. Best in full sun."

Qsn #	Question	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry grows on a variety of moist soils at elevations below 600 m (2,000 ft). Soil orders on which red mulberry is found include Alfisols, Inceptisols, Spodosols, and Ultisols. Seeds are carried great distances by birds so trees may be found on any soil that is not too dry. Best development is on well-drained, moist soils of sheltered coves along streams (7)."
	Lim, T.K. (2012). <i>Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits.</i> Springer, New York	"Red mulberry grows on a variety soils that include alfisols, inceptisols, spodosols, and ultisols. It thrives best on well-drained, moist soils with pH of 5–7."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Lim, T.K. (2012). <i>Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits.</i> Springer, New York	"A deciduous shrubs or trees, 10–15 m high sometimes to 20 m with up to 50 cm trunk diameter, gray-brown bark and red-brown to light greenish brown, lenticellate branchlets usually glabrous."

412	Forms dense thickets	
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry is usually found as scattered individuals near streams or in other moist places. Stands of any size are not mentioned in the literature."
	Sullivan, J. (1993). <i>Morus rubra.</i> In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 4 Nov 2021]	[Becomes dominant at mine sites. Co-dominates frequently flooded riverbottom forests. Ability to exclude or outcompete other vegetation not addressed] "Red mulberry is not noted as a soil stabilizer due to its shallow roots [19]. However, mine sites that have been reclaimed (usually planted to grasses and herbaceous perennials) are occasionally colonized by red mulberry. It may become dominant on these sites." ... "othenberger [29] reported that in eastern Nebraska red mulberry is codominant in frequently flooded riverbottom forests, important in the well-drained soils of the transitional forests upslope from the riverbottom, and minor in the drier upland terrace forests."
	Cobbe, T. J. (1943). <i>Variations in the Cabin Run Forest, a Climax Area in Southwestern Ohio.</i> <i>The American Midland Naturalist</i> , 29(1), 89–105	[Reported to form dense thickets. Unclear if able to exclude other vegetation] "The shrub layer is composed of <i>Hydrangea arborescens</i> , <i>Benzoin aestivale</i> and <i>Dirca palustris</i> , with young trees of <i>Fraxinus quadrangulata</i> , <i>Acer saccharum</i> , <i>Quercus borealis</i> var. <i>maxima</i> , <i>Quercus alba</i> , <i>Carya glabra</i> , <i>Carya cardiformis</i> , <i>Ostrya virginiana</i> , <i>Tilia americana</i> , <i>Morus rubra</i> and <i>Camus florida</i> . <i>Morus rubra</i> and <i>Hydrangea</i> make dense thickets."

Qsn #	Question	Answer
501	Aquatic	n
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	[Terrestrial] "In its native range it is found in moist forests and thickets on the floodplains, river valleys, and moist hillsides at elevations below 600 m."

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 4 Nov 2021]	Genus: Morus Family: Moraceae Tribe: Moreae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 4 Nov 2021]	Genus: Morus Family: Moraceae Tribe: Moreae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Flora of North America Editorial Committee, eds. (1997). Flora of North America: Volume 3: Magnoliophyta: Magnoliidae and Hamamelidae. Oxford University Press, Oxford, UK	"Shrubs or trees , to 20 m."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Lim, T.K. (2012). Edible Medicinal and Non-Medicinal Plants. Volume 3, Fruits. Springer, New York	[Endangered in part of range. Widespread distribution] "The red mulberry native to eastern North America, from northernmost Ontario and Vermont south to southern Florida and west to southeast South Dakota and central Texas. Although red mulberry is common in the United States, it is considered rare in Massachusetts, Ontario and Vermont. It is listed as an endangered species in Canada."

602	Produces viable seed	y
	Source(s)	Notes

Qsn #	Question	Answer
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Good seed crops occur every 2 to 3 years (2). The average number of red mulberry fruits per kilogram is about 8,600 (3,900/lb); the average number of cleaned seeds per kilogram is 795,000 (360,000/lb). One hundred kilograms (220 lb) of fresh fruit yield 2 to 3 kg (4 to 7 lb) of cleaned seeds (8)."

603	Hybridizes naturally	Y
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry hybridizes frequently with white mulberry (<i>Morus alba</i>), a native of China which has become naturalized throughout parts of the Eastern United States."

604	Self-compatible or apomictic	
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Flowering and Fruiting- Red mulberry is dioecious but can be monoecious, with male and female flowers on different branches of the same plants. Both male and female flowers are stalked axillary pendulous catkins and appear in April and May. The blackberry-like fruit reaches full development from June to August. Each fruit is composed of many small drupelets which develop from separate female flowers ripening together (8)."
	Nepal, M., Ferguson, C., & Mayfield, M. (2015). Breeding System and Sex Ratio Variation in Mulberries (<i>Morus</i> , Moraceae). <i>Journal of the Botanical Research Institute of Texas</i> , 9(2), 383-395	[Possibly, in monoecious, hermaphroditic trees] "Out of 408 <i>M. rubra</i> trees studied across nine populations, 42 trees (10.3%) were hermaphrodites, and out of 269 <i>M. alba</i> trees across thirteen sites, 32 trees (12.3%) were hermaphrodites (Table 1) establishing that both species exhibit a subdioecious breeding system with males, females and hemaphrodites" ... "The subdioecious breeding system in the studied species of <i>Marus</i> might represent a transition in the hermaphroditism-dioecy continuum, and could be an adaptive strategy, as previously discussed (see Case et al. 2008), for reproductive assurance by opportunistic selfing, benefitting sexual specialization and avoiding the effect of inbreeding depression."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Parks Canada Agency. (2010). <i>Recovery Strategy for the Red Mulberry (<i>Morus rubra</i>) in Canada [PROPOSED]. Species at Risk Act Recovery Strategy Series.</i> Parks Canada Agency. Ottawa, Ontario	"As a wind pollinated species, groupings of trees within the pollen dispersal range are important to ensure the production of sufficient, viable seeds for colonization of new sites."

606	Reproduction by vegetative fragmentation	
	Source(s)	Notes

Qsn #	Question	Answer
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Vegetative Reproduction- Red mulberry can be propagated from stem cuttings or by budding, but these methods are complex and require greenhouse facilities. The average rooting from stem cuttings taken in May, September, and January was only 7 percent, regardless of time of year (2). Red mulberry is a prolific root sprouter and can be reproduced by layering."
	Sullivan, J. (1993). <i>Morus rubra</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	[Possibly. Unclear if fragments will root] "Vegetative reproduction: Red mulberry sprouts from the roots, and is reported to be artificially propagated by stem cuttings, budding, or layering [19]. Baca and others [2], however, were unable to get red mulberry stem cuttings to form roots."

607	Minimum generative time (years)	>3
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Minimum seed-bearing age is usually about 10 years, but 1-year-old trees planted in an abandoned field in east Texas produced fruits at age 4 (3). Optimum seedbearing age is 30 to 85 years; the maximum is 125 years."
	Bonner, F.T. & Karrfalt, R.P. (eds.). (2008). <i>The Woody Plant Seed Manual.</i> USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	"Table 3— <i>Morus</i> , mulberry: height, seed-bearing age, seedcrop frequency, and fruit ripeness criteria" [<i>M. rubra</i> - Minimum seed-bearing age (yr) = 10]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Sullivan, J. (1993). <i>Morus rubra</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	"The seeds are dispersed by frugivores, mostly birds, after passing through their digestive tracts." [No evidence, and no means of external attachment]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Seeds and plants sold commercially online

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Escapee"
	Sullivan, J. (1993). <i>Morus rubra</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	"The seeds are dispersed by frugivores, mostly birds, after passing through their digestive tracts."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Sullivan, J. (1993). <i>Morus rubra</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	"Mature fruits fall near the tree, but most are consumed before becoming fully mature. The seeds are dispersed by frugivores, mostly birds, after passing through their digestive tracts."

705	Propagules water dispersed	
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Red mulberry is usually found as scattered individuals near streams or in other moist places." [Birds and other animals disperse seeds, but proximity to streams may result in secondary dispersal by water]
	Chick, J. H., Cosgriff, R. J., & Gittinger, L. S. (2003). Fish as potential dispersal agents for floodplain plants: first evidence in North America. <i>Canadian Journal of Fisheries and Aquatic Sciences</i> , 60(12), 1437-1439	[Fish-dispersed. Probably moved by water as well when growing in riparian habitats] "Here, we document consumption of red mulberry (<i>Morus rubra</i>) and swamp privet (<i>Forestiera acuminata</i>) fruit by channel catfish (<i>Ictalurus punctatus</i>) in the floodplain of the Mississippi River, U.S.A., and demonstrate that red mulberry and swamp privet seeds will germinate after being consumed by channel catfish. "

706	Propagules bird dispersed	y
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Fruits that mature fall to the ground near the seed tree. However, because this relatively large, sweet fruit is a favorite food of most birds and some small animals, most of the fruits are eaten and dispersed by wildlife before they fully mature (6)."

Qsn #	Question	Answer
	Bonner, F.T. & Karrfalt, R.P. (eds.). (2008). The Woody Plant Seed Manual. USDA FS Agriculture Handbook 727. Government Printing Office, Washington, D.C.	"Mulberries are valuable as food for birds and animals. Up to 18 bird species have been recorded eating the fruit in northeastern Kansas, with catbirds (<i>Dumetella carolinensis</i>) and robins (<i>Turdus migratorius</i>) consuming the most fruit (Stapanian 1982). Opossums (<i>Didelphis virginiana</i>), raccoons (<i>Procyon lotor</i>), fox squirrels (<i>Sciurus niger</i>), and eastern gray squirrels (<i>S. carolinensis</i>) eat the fruit in appreciable amounts, and cottontail rabbits (<i>Sylvilagus floridanus</i>) feed on the bark in winter (Core 1974)."
	Sullivan, J. (1993). <i>Morus rubra</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 4 Nov 2021]	"The seeds are dispersed by frugivores, mostly birds, after passing through their digestive tracts."

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Sullivan, J. (1993). <i>Morus rubra</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	"Mature fruits fall near the tree, but most are consumed before becoming fully mature. The seeds are dispersed by frugivores, mostly birds, after passing through their digestive tracts." [No means of external attachment]

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Chick, J. H., Cosgriff, R. J., & Gittinger, L. S. (2003). Fish as potential dispersal agents for floodplain plants: first evidence in North America. <i>Canadian Journal of Fisheries and Aquatic Sciences</i> , 60(12), 1437-1439	"In river–floodplain ecosystems with seasonal flood pulses, many species display adaptations to take advantage of resources in the aquatic–terrestrial transition zone. Frugivory and seed dispersal by fishes is a clear example of such adaptations, known primarily from South American river–floodplain systems. Here, we document consumption of red mulberry (<i>Morus rubra</i>) and swamp privet (<i>Forestiera acuminata</i>) fruit by channel catfish (<i>Ictalurus punctatus</i>) in the floodplain of the Mississippi River, U.S.A., and demonstrate that red mulberry and swamp privet seeds will germinate after being consumed by channel catfish. In a common-garden experiment, consumption of fruits and seeds by channel catfish improved germination success of these riparian plants relative to a treatment simulating fruit dropped during a flood without being consumed by fish. This is the first study to provide evidence of frugivory and viability of seeds ingested by fish in a North American river–floodplain ecosystem. Frugivory and seed dispersal by fishes may be more widespread than previously thought."
	Sullivan, J. (1993). <i>Morus rubra</i> . In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	"The seeds are dispersed by frugivores, mostly birds, after passing through their digestive tracts."

Qsn #	Question	Answer
801	Prolific seed production (>1000/m²)	
	Source(s)	Notes
	Burns, R.M. & Honkala, B.H. (1990). <i>Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654.</i> U.S. Department of Agriculture, Forest Service, Washington, DC.	"Good seed crops occur every 2 to 3 years (2). The average number of red mulberry fruits per kilogram is about 8,600 (3,900/ lb); the average number of cleaned seeds per kilogram is 795,000 (360,000/lb). One hundred kilograms (220 lb) of fresh fruit yield 2 to 3 kg (4 to 7 lb) of cleaned seeds (8)."
	Missouri Botanical Garden. (2021). <i>Morus rubra</i> . https://www.missouribotanicalgarden.org . [Accessed 8 Nov 2021]	"May self-seed somewhat prolifically."
802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Sullivan, J. (1993). <i>Morus rubra</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	[Longevity unknown] "The seeds are dispersed by frugivores, mostly birds, after passing through their digestive tracts. Seeds are either sown in fall without stratification or in spring after 30 to 90 days at 33 to 41 degrees Fahrenheit (1-5 deg C) in moist sand [19]."
803	Well controlled by herbicides	y
	Source(s)	Notes
	Sullivan, J. (1993). <i>Morus rubra</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	"Stem injection of red mulberry trees with 2,4-D plus picloram and with glyphosate results in 100 percent topkill [22]."
	Weber, E. (2017). <i>Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds.</i> CABI Publishing, Wallingford, UK	[Invasive <i>Morus alba</i> effectively controlled with herbicides] "Seedlings and saplings can be hand-pulled. Larger trees can be cut and the stumps ground down, or the trunks can be girdled (ISSG, 2014). Cut stumps may also be treated with a systemic herbicide such as glyphosate to prevent resprouting (Swearingen et al., 2010)."
804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Sullivan, J. (1993). <i>Morus rubra</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/tree/morrub/all.html . [Accessed 8 Nov 2021]	[Sprouts from roots, but probably killed by fire] "Vegetative reproduction: Red mulberry sprouts from the roots, and is reported to be artificially propagated by stem cuttings, budding, or layering [19]. Baca and others [2], however, were unable to get red mulberry stem cuttings to form roots." ... "Red mulberry is probably easily killed by fire due to its thin bark and shallow roots. Information on the relationship of the intensity of fire to red mulberry mortality is lacking in the available literature."

Qsn #	Question	Answer
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability and range
- Range extends into subtropical regions
- Possibly naturalizing outside native range
- Described as a weedy, self-seeder
- Other *Morus* species are invasive
- Potentially allelopathic
- Pollen from male trees reported to be a severe allergen
- Shade tolerant (although dense shade may inhibit spread)
- Tolerates many soil types
- May form dense thickets (reported from native range)
- Reproduces by seeds and root suckers
- Hybridizes with *Morus alba*
- Seeds dispersed by birds and intentionally by people
- Tolerates and resprouts after heavy pruning, but reportedly killed by fires

Low Risk Traits

- Unarmed (no spines, thorns, or burrs)
- Palatable to browsing animals
- Dioecious trees not self-compatible, but some trees reported to be monoecious
- Minimum seed-bearing age is usually about 10 years
- Herbicides may provide effective control if needed

Second Screening Results for Tree/tree-like shrubs

(A) Shade tolerant or known to form dense stands?> Yes. Shade tolerant and can form dense stands in native range.

(B) Bird or clearly wind-dispersed?> Yes. Dispersed by birds

(C) Lifecycle <4 years? No

Outcome = Evaluate

