

Taxon: <i>Morella cerifera</i> (L.) Small	Family: Myricaceae
Common Name(s): bayberry candleberry southern bayberry southern wax-myrtle waxberry wax-myrtle	Synonym(s): <i>Myrica cerifera</i> L. (basionym) <i>Myrica pumila</i> (Michx.) Small

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 11 Mar 2020
WRA Score: 21.0	Designation: H(Hawai'i)	Rating: High Risk

Keywords: Naturalized Tree, Dense Stands, Dioecious, Spreads Vegetatively, 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)	High
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	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	n
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	y
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	y
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		

Qsn #	Question	Answer Option	Answer
407	Causes allergies or is otherwise toxic to humans		
408	Creates a fire hazard in natural ecosystems	y=1, n=0	y
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
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	y
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	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)		
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)	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)	y=-1, n=1	n

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Van Dersal, W. (2007). Native Woody Plants of the United States. Read Country Books, Alcester, UK	Morella cerifera is not highly domesticated

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2020). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2020). 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"	High
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 10 Mar 2020]	"Native Northern America NORTHEASTERN U.S.A.: United States [New Jersey (s.)] NORTH-CENTRAL U.S.A.: United States [Oklahoma] SOUTHEASTERN U.S.A.: United States [Alabama, Arkansas, Delaware, Florida (http://www.plantatlas.usf.edu/main.asp?plantID=3942), Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Virginia] SOUTH-CENTRAL U.S.A.: United States [Texas] Mexico Southern America CARIBBEAN: Bahamas, Bermuda, Cuba, Hispaniola (possibly), Jamaica, United States [Puerto Rico] CENTRAL AMERICA: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama (w.)"
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	<i>M. cerifera</i> is native to coastal regions of the southeastern United States,
	Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico	On hillsides and in thickets, in moist districts, at lower to middle elevations, Puerto Rico; southeastern North America, Bermuda, Bahamas, Greater Antilles, Guadeloupe, Mexico and Central America.

202	Quality of climate match data	High
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Qsn #	Question	Answer
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 10 Mar 2020]	
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	" <i>M. cerifera</i> is native to coastal regions of the southeastern United States"

203	Broad climate suitability (environmental versatility)	n
	Source(s)	Notes
	Burrell, C. C., Marinelli, J., & Harper-Lore, B. (2006). Native alternatives to invasive plants. Brooklyn Botanic Garden, Brooklyn, NY	"Hardiness Range: Zones 7 to 10"
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 10 Mar 2020]	"Wax-myrtle is common in a variety of habitats and plant communities in the southeastern United States. It grows equally well with the subtropical vegetation of south Florida and the temperate vegetation of the Inland Coastal Plain...Wax-myrtle grows on a variety of sites but seems to be restricted to climates with mild winters and long, hot, humid summers, and elevations below 500 feet (150 m)."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	"Naturalized populations of <i>M. cerifera</i> have been confirmed on the islands of Maui and Hawai'i, however its status on Oahu and other islands is unknown."
	Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico	On hillsides and in thickets, in moist districts, at lower to middle elevations, Puerto Rico; southeastern North America, Bermuda, Bahamas, Greater Antilles, Guadeloupe, Mexico and Central America.

205	Does the species have a history of repeated introductions outside its natural range?	n
	Source(s)	Notes
	Liogier, A.H. & Martorell, L.F. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis. Second Edition Revised. La Editorial, UPR, San Juan, Puerto Rico	Broad native range [no evidence of repeated introduction outside native range]

301	Naturalized beyond native range	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i>, 10(1), 19-24</p>	<p>"Naturalized populations of <i>M. cerifera</i> have been confirmed on the islands of Maui and Hawai'i, however its status on Oahu and other islands is unknown...Recently, several events have brought the relatively benign nature of <i>M. cerifera</i> into question. In 1994, Maui Pineapple Company staff discovered a naturalized population in the Pu'u Kukui watershed on Maui (Meidell et al.1997; H. Oppenheimer, personal communication). More recently, the construction of a new road across a young, lowland lava flow on the island of Hawai'i revealed a second large, naturalized population. The location of this colonization is of particular concern. The road follows an 1881 lava flow, the youngest Mauna Loa lava flow in the windward lowlands near Hilo, Hawai'i."</p>
	<p>Frohlich, D. & Lau, A. 2012. New plant records for the Hawaiian islands. <i>Bishop Museum Occasional Papers</i> 113: 27-54</p>	<p>"This species has previously been documented as naturalized on Maui. it is documented here as established on Hawai'i island, where two populations are known in the Hilo area, along Mohouli St and along Stainback Hwy near Pana'ewa Zoo. it was known to exist on the island in the literature (Kurten et al. 2008), but apparently not citing an herbarium specimen. This species is not listed as planted on Big island Forest reserves in Skolmen (1980), although it may have been planted there at some point. The Mohouli Street population is an extensive, dense thicket, and significant control work has been performed in that area (J. Parker 2011, pers. comm.). This species is also documented here as at least adventive on Kaua'i, where it was seen in a coastal residential area spreading significantly throughout one resident's yard, perhaps only by root suckers. it is unclear whether it was originally planted in this location. Material examined. KAUA'I: Hā'ena, on Hā'ena Place. Coastal residential setting. 2-3 m tall shrub. Adventively spreading locally. only male plants noted, though only a few individuals were inspected, 9 Mar 2010, A. Lau & D. Frohlich 2010030902. HAWAII: Sunrise Ridge subdivision on Mohouli St extension between Komohana St and Kaumana Dr. Growing with <i>Melastoma septemnerium</i>, <i>Melochia</i>, other weedy species on thin soil on roadside. Distribution of the plant in the area is unknown but it is common just above Komohana St for about 1 km on Mohouli St. Appears to occupy at least 70 acres, 19 Mar 2003, s.n.; Several large trees 7-8 m tall and a few (not many) apparent seedlings along Stainback Hwy between Pana'ewa Zoo and Hawaii Belt Hwy, 26 Apr 1985, R.L. Stemmermann 6936."</p>
	<p>Meidell, J.S., Oppenheimer, H.L. & Bartlett, R.T. 1997. New plant records from Pu'u Kukui watershed and adjacent areas, Maui. <i>Bishop Museum Occasional Papers</i> 49: 17-18</p>	<p>"Wagner et al. (1990:929) document <i>Myrica faya</i> as the only naturalized member of Myricaceae in Hawai'i. <i>Myrica cerifera</i> was introduced to West Maui by David T. Fleming in December 1932 as a component of the Maunalei Arboretum project. Recent surveys indicate the proliferation of this taxon well beyond the original planting site. Current estimates put the naturalized population of <i>M. cerifera</i> at 200+ individuals in an area between Honolua and Honokahua Valleys, 395-490 m. Range and population data are likely to be revised as additional surveys are expected to reveal more plants. In light of current problems encountered with <i>M. faya</i> at Hawai'i Volcanoes National Park and elsewhere, this taxon will be monitored very closely. Aggressive eradication efforts are under way by Maui Pineapple Co. / Pu'u Kukui Watershed staff. Material examined. MAUI: Lahaina District - West Maui, 427 m, near original planting site within Maunalei Arboretum, 31 October 1996, Meidell & Oppenheimer 127 (BISH)."</p>

Qsn #	Question	Answer
302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	<p>Van Deelen, T. R. (1991). <i>Morella cerifera</i>. In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html. [Accessed]</p>	<p>"Wax-myrtle is an early successional species. It is one of the first woody plants to invade secondary dunes and beach meadows in the Southeast [9], and naturally reseeds disturbed sites from adjacent forests [31]. In the Everglades, increased human-caused disturbance, such as draining and burning, has caused wax myrtle to become more common as it invades sawgrass, marl prairie, and mixed hardwood swamp communities. Dense thickets form, known locally as "hell nests" [18,29,47]." [A disturbance weed with negative effects on forestry and the natural environment]</p>
303	Agricultural/forestry/horticultural weed	y
	Source(s)	Notes
	<p>Kalmbacher, R. S., Eger, J. E., & Rowland-Bamford, A. J. (1993). Response of southern wax myrtle (<i>Myrica cerifera</i>) to herbicides in Florida. <i>Weed Technology</i>, 7(1), 84-91</p> <p>Van Deelen, T. R. (1991). <i>Morella cerifera</i>. In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html. [Accessed 10 Mar 2020]</p>	<p>"An estimated 800 000 ha of pasture in south Florida were infested with wax myrtle (10). Seed dispersal by birds is a major method for spread of this species (2). It is the main food of tree swallows (<i>Iridoprocne bicolor</i>) when these birds winter in Florida and the Gulf area (3). Wax myrtle has become the major woody weed on Florida pasture. Southern wax myrtle can be a dominant shrub that reduced the yield of forage, which makes it a problem on range and pasture."</p> <p>"Wax-myrtle is an understory pest on southern pine plantations. It competes with pine seedlings and contribute to an accumulation of understory fuels which increases the potential for damaging wildfires [27,28]. Pearson and others [36] believe that the presence of southern bayberry on grazed longleaf pine plantations may have eased grazing pressure on the pine seedlings."</p>
304	Environmental weed	y
	Source(s)	Notes
	<p>Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i>, 10(1), 19-24</p>	<p>"Abstract Invasive plants that fix nitrogen can alter nutrient availability and thereby community dynamics and successional trajectories of native communities they colonize. <i>Morella cerifera</i> (Myricaceae) is a symbiotic nitrogen fixer originally from the southeastern U.S. that is colonizing native-dominated vegetation on a young lava flow near Hilo, Island of Hawai'i, where it increases total and biologically available soil nitrogen and increases foliar nitrogen concentrations in associated individuals of the native tree <i>Metrosideros polymorpha</i>. This invasion has the potential to alter the few remaining native-dominated lowland forest ecosystems in windward Hawai'i."</p>
305	Congeneric weed	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Vitousek, P. M., & Walker, L. R. (1989). Biological invasion by <i>Myrica faya</i> in Hawai'i: plant demography, nitrogen fixation, ecosystem effects. <i>Ecological monographs</i>, 59(3), 247-265</p>	<p>"<i>Myrica faya</i>, an introduced actinorhizal nitrogen fixer, is invading young volcanic sites in Hawaii Volcanoes National Park. We examined the population biology of the invader and ecosystem level consequences of its invasion in open-canopied forests resulting from volcanic cinder-fall. Although <i>Myrica faya</i> is nominally dioecious, both males and females produce large amounts of fruit that are utilized by a number of exotic and native birds, particularly the exotic <i>Zosterops japonica</i>. In areas of active colonization, <i>Myrica</i> seed rain under perch trees of the dominant native <i>Metrosideros polymorpha</i> ranged from 6 to 60 seeds/m²/yr; no seeds were captured in the open. Planted seeds of <i>Myrica</i> also germinated and established better under isolated individuals of <i>Metrosideros</i> than in the open. Diameter growth of <i>Myrica</i> is >15-fold greater than that of <i>Metrosideros</i>, and the <i>Myrica</i> population is increasing rapidly. Rates of nitrogen fixation were measured using the acetylene reduction assay calibrated with 15N. <i>Myrica</i> nodules reduced acetylene at between 5 and 20 μmol/g/h, a rate that extrapolated to nitrogen fixation of 18 kg/ha/yr in a densely colonized site. By comparison, all native sources of nitrogen fixation summed to 0.2 kg/ha/yr, and precipitation added <4 kg/ha/yr. Measurements of litter decomposition and nitrogen release, soil nitrogen mineralization, and plant growth in bioassays all demonstrated that nitrogen fixed by <i>Myrica</i> becomes available to other organisms as well. We concluded that biological invasion by <i>Myrica faya</i> alters ecosystem-level properties in this young volcanic area; at least in this case, the demography and physiology of one species controls characteristics of a whole ecosystem." [Myrica faya Aiton Synonym of <i>Morella faya</i> (Aiton) Wilbur]</p>

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	<p>Van Deelen, T. R. (1991). <i>Morella cerifera</i>. In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html. [Accessed]</p>	<p>[No evidence] "Wax myrtle is an erect, evergreen, small tree or shrub. It is native to low-elevation tropical, subtropical, and warm-temperate regions of the Americas. It grows to a maximum height of 40 feet (12 m), and a maximum d.b.h. of 12.5 inches (32 cm) at maturity [16,20]. Its flat leaves are toothed near the end and aromatic when crushed [3]. The diminutive flowers are unisexual, dioecious, and borne on catkinlike axillary spikes. Wax myrtle fruit are small, light green, dry drupes which are covered with a conspicuous layer of pale blue wax, giving them a "warty" appearance. Each axillary spike bears 1 to 12 berries, which may persist over winter [10,20]. The seeds have no endosperm [20]."</p>
	<p>Van Dersal, W. (2007). <i>Native Woody Plants of the United States</i>. Read Country Books, Alcester, UK</p>	<p>No spines, thorns or burrs</p>

402	Allelopathic	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Tolliver, K. S., Colley, D. M., & Young, D. R. (1995). Inhibitory effects of <i>Myrica cerifera</i> on <i>Pinus taeda</i>. <i>American Midland Naturalist</i>, 133: 256-263</p>	<p>"ABSTRACT.-<i>Pinus taeda</i> naturally invades <i>Myrica cerifera</i> thickets as the shrub community succeeds to a maritime forest on southeastern USA barrier islands. Potential mechanisms supporting the persistence of <i>M. cerifera</i> thickets on barrier islands were examined in an environmental chamber. The inhibitory effects of allelochemicals from <i>M. cerifera</i> leaf litter and the soil in which it grows, and the interaction between allelochemicals and light intensity were quantified for seed germination and seedling growth of <i>P taeda</i>. Germination of <i>P taeda</i> seeds was significantly reduced by treatment with leachate from dead <i>M. cerifera</i> leaves, but light level had no significant effect. In contrast, root, shoot and total seedling growth were significantly lower under low light (44 Rmol m⁻² sec⁻¹). Root growth under high light (300 Rmol m⁻² sec⁻¹) was significantly lower for <i>P taeda</i> seedlings grown in soil collected from beneath <i>Myrica</i> thickets. Both root and shoot growth of <i>P taeda</i> in <i>Myrica</i> soil were significantly higher in the presence of <i>Myrica</i> leaf litter in high light. Thus, litter accumulation may assist <i>P taeda</i> in invading <i>Myrica</i> thicket gaps, possibly by counteracting allelopathic effects of <i>Myrica</i> root exudate. Low light levels and allelopathic effects may interact and contribute to the persistence of <i>Myrica</i> thickets limiting root growth of invading <i>P taeda</i> seedlings, thereby reducing competition for space, soil moisture and nutrients."</p>
	<p>Dunevitz, V., & Ewel, J. (1981). Allelopathy of wax myrtle (<i>Myrica cerifera</i>) on <i>Schinus terebinthifolius</i>. <i>Florida Scientist</i>, 44(1): 13-20</p>	<p>"Nutrient solution leached through soil in which wax myrtle was rooted inhibited growth of schinus. Aqueous leaf extracts of wax myrtle leaves inhibit germination of beans, and possibly of schinus. Allelopathy by wax myrtle reduces the vigor of schinus, and may increase its susceptibility to competitors and pests. Because of the ecological similarity of wax myrtle and schinus, encouragement of myrtle growth may be an effective biological control tool."</p>
	<p>Overholt, W. A., Cuda, J. P. & Markle, L. (2012). Can novel weapons favor native plants? Allelopathic interactions between <i>Morella cerifera</i> (L.) and <i>Schinus terebinthifolia</i> Raddi. <i>The Journal of the Torrey Botanical Society</i>, 139(4), 356-366</p>	<p>"Potential allelopathic effects of wax myrtle, <i>Morella cerifera</i> (L.), to Brazilian peppertree, <i>Schinus terebinthifolia</i> Raddi, were investigated in laboratory and field studies. Aqueous leaf extracts of wax myrtle suppressed germination and reduced seedling growth and survival of Brazilian peppertree. Similarly, root washings of wax myrtle negatively affected germination, growth and biomass accumulation of Brazilian peppertree. In field plots planted with equal densities of wax myrtle and Brazilian peppertree saplings, no differences in final densities, growth or vigor between the two species were detected after 14 months, suggesting that neither species was competitively superior to the other. Based on the results of this study, wax myrtle may have value as one tool in an integrated approach to management of Brazilian peppertree, but additional research is required to demonstrate allelopathic effects in the field."</p>

Qsn #	Question	Answer
403	Parasitic	n
	Source(s)	Notes
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 11 Mar 2020]	"Wax myrtle is an erect, evergreen, small tree or shrub." [No evidence. Myricaceae]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 11 Mar 2020]	"A consistent contributor to the available browse biomass in southeastern forests, wax-myrtle is occasionally eaten by cattle...Wax-myrtle is unpalatable to white-tailed deer in eastern Texas [24,25]. Its palatability to cattle is unreported."
	Haywood, J. D., Pearson, H. A., Grelen, H. E., & Popham, T. W. (2000). Effects of date and frequency of burning on southern bayberry (<i>Myrica cerifera</i>) in central Louisiana. <i>Texas Journal of Science</i> 52(4): 33-42	"Although its abundant seeds are eaten by many songbirds, wild turkey and tree swallows, <i>Myrica cerifera</i> is considered an inferior food plant for white-tailed deer and a secondary food plant for bobwhite quail (Grelen & Duvall 1966; Landers & Johnson 1976; Halls 1977). Consequently, the negative qualities of <i>Myrica cerifera</i> outweigh its benefits for many, and land managers generally wish to control the spread of this shrub." [Inferior food, but no evidence of lack of palatability]
	USDA Natural Resources Conservation Service. (2005). Plant Fact Sheet: Dwarf Wax Myrtle- <i>Myrica pusilla</i> Raf. http://plants.usda.gov/factsheet/pdf/fs_mypu.pdf . [Accessed 11 Mar 2020]	"Stutzenbaker (1999) reports wax myrtle to be durable, able to withstand periodic burning, flooding, drought, and heavy grazing by livestock." [Apparently tolerant of grazing by livestock, indicating species is palatable to animals]
	Van Dersal, W. (2007). <i>Native Woody Plants of the United States</i> . Read Country Books, Alcester, UK	leaves refused by captive marsh rabbits

405	Toxic to animals	n
	Source(s)	Notes
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 11 Mar 2020]	"Wax-myrtle is unpalatable to white-tailed deer in eastern Texas [24,25]. Its palatability to cattle is unreported." [No evidence of toxicity to animals]
	USDA Natural Resources Conservation Service. (2005). Plant Fact Sheet: Dwarf Wax Myrtle- <i>Myrica pusilla</i> Raf. http://plants.usda.gov/factsheet/pdf/fs_mypu.pdf . [Accessed 11 Mar 2020]	[No evidence] "Stutzenbaker (1999) reports wax myrtle to be durable, able to withstand periodic burning, flooding, drought, and heavy grazing by livestock."

406	Host for recognized pests and pathogens	
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Qsn #	Question	Answer
	Source(s)	Notes
	Howard, F.W., Pemberton, R.W., Hodges, G.S., Steinberg, B., McLean, D. & Liu, H. 2006. Host Plant Range of Lobate Lac Scale, <i>Paratachardina lobata</i> , in Florida. <i>Proceedings of the Florida State Horticultural Society</i> 119: 398-408	"Abstract. A list of host plant species of lobate lac scale, <i>Paratachardina lobata</i> (Chamberlin) (Hemiptera: Coccoidea: Kerridae), in southern Florida was compiled from the authors' observations and records of the Florida State Collection of Arthropods. This scale insect was found on 307 plant species, nearly all of which are dicotyledonous trees, shrubs, or lianas. Hosts included plant species grown for fruits and as ornamentals, several weeds, and eighty three species native to southern Florida. In addition to tropical plants, which predominate in this region, it was found on many temperate zone plants whose ranges extend to southern Florida. Seventeen plant species were consistently highly infested at different sites, and are thus considered highly susceptible; of these, ten are plants native to Florida." ... "Wax-myrtle (<i>Myrica cerifera</i>) is apparently the most susceptible host of lobate lac scale in southern Florida. Lobate lac scale was found at all sites where both wax-myrtle and this scale insect were present, and the plant was consistently highly infested at many of the sites"
	Gilman, E.F. & Watson, D.G. (1994). <i>Myrica cerifera</i> - Southern Waxmyrtle. Fact Sheet ST-410. Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. http://hort.ufl.edu . [Accessed 11 Mar 2020]	"Pests: Caterpillars and mites may occasionally attack the foliage. Webworms common in some landscapes - prune to remove infestation. Diseases: Cankers may form on old branches and trunks and kill them. Also, a lethal wilt disease caused by the fungus <i>Fusarium oxysporum</i> and <i>Fusarium</i> spp. Has been recently noted attacking Waxmyrtle plants in central and south Florida. The vascular tissue is irregularly stained purple but not decayed as a result of the disease. Root injury and nitrogen fertilization encourage the disease."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	Notes
	Pollen Library. (2020). Southern Bayberry (<i>Morella cerifera</i>). http://www.pollenlibrary.com/Specie/Morella+cerifera/ . [Accessed 11 Mar 2020]	"Allergenicity: Southern Bayberry (<i>Morella cerifera</i>) is a mild allergen." [Not considered a severe allergen]
	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	[No evidence. Used medicinally] "Leaves used for a gynecological aid and an emetic; the bark, as a blood purifier and a kidney aid. Leaves and stems decoction to treat fevers; and roots, to treat inflamed tonsils and stomachaches, and as a stimulant."
	California Poison Control System. (2020). Toxic plants. https://calpoison.org/topics/plant#toxic . [Accessed 11 Mar 2020]	[Potential skin irritant] "Table 3: Toxic plants by common name" [Includes <i>Myrica cerifera</i> - Rating 1 = "Dermal - Skin contact with these plants can cause symptoms ranging from redness, itching, and rash to painful blisters like skin burns."]

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

Qsn #	Question	Answer
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 11 Mar 2020]	"It competes with pine seedlings and contribute to an accumulation of understory fuels which increases the potential for damaging wildfires"
	Haywood, J. D., Pearson, H. A., Grelen, H. E., & Popham, T. W. (2000). Effects of date and frequency of burning on southern bayberry (<i>Myrica cerifera</i>) in central Louisiana. <i>Texas Journal of Science</i> 52(4): 33-42	" <i>Myrica cerifera</i> (southern bayberry or waxmyrtle) is one of the most common shrubs in the longleaf pine/bluestem forest type in the West Gulf Coastal Plain. During controlled burns, individual plants can burn intensely because the wax coated foliage and fruits are very flammable... However, <i>Myrica cerifera</i> is adapted to survival on frequently burned longleaf pine sites by resprouting vigorously from the root collar." [Along with ability to form thickets, can increase fire risk in invaded ecosystems]

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Garrett, H. (1996). <i>Howard Garrett's Plants for Texas</i> . University of Texas Press, Austin, TX	"Location: Sun to part shade."
	Gilman, E.F. & Watson, D.G. (1994). <i>Myrica cerifera</i> - Southern Waxmyrtle. Fact Sheet ST-410. Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. http://hort.ufl.edu . [Accessed 11 Mar 2020]	[Grows in total shade, but growth is thin] "Waxmyrtle can tolerate a variety of landscape settings from full sun to partial shade, wet swamplands or high, dry and alkaline areas. Growth is thin in total shade."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Garrett, H. (1996). <i>Howard Garrett's Plants for Texas</i> . University of Texas Press, Austin, TX	"Easy to grow in any soil, drought tolerant."
	Gilman, E.F. & Watson, D.G. (1994). <i>Myrica cerifera</i> - Southern Waxmyrtle. Fact Sheet ST-410. Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. http://hort.ufl.edu . [Accessed 11 Mar 2020]	"Soil tolerances: clay; loam; sand; acidic; alkaline; extended flooding; well-drained"

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 11 Mar 2020]	"Wax-myrtle is an erect, evergreen, small tree or shrub."

412	Forms dense thickets	y
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Qsn #	Question	Answer
	Source(s)	Notes
	Tiner, R.W. (2009). Field guide to tidal wetland plants of the northeastern United States and neighboring Canada: vegetation of beaches, tidal flats, rocky shores, marshes, swamps, and coastal ponds. Univ of Massachusetts Press, Amherst, MA	"Irregularly flooded tidal marshes and swamps, occasionally forming dense thickets,"
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	" <i>M. cerifera</i> is native to coastal regions of the southeastern United States, where it is an early colonizer in areas undergoing primary and secondary succession and can form dense thickets (Duever and Riopelle 1983; Young et al. 1995)."
	Tolliver, K. S., Colley, D. M., & Young, D. R. (1995). Inhibitory effects of <i>Myrica cerifera</i> on <i>Pinus taeda</i> . <i>American Midland Naturalist</i> , 133: 256-263	" <i>Myrica cerifera</i> forms dense persistent thickets on rear dunes and swales of Atlantic coast barrier islands (Ehrenfeld, 1990; Young et al., 1992) and is an important midsuccessional species (Levy, 1990)."

501	Aquatic	n
	Source(s)	Notes
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	Terrestrial tree

502	Grass	n
	Source(s)	Notes
	Van Dersal, W. (2007). <i>Native Woody Plants of the United States</i> . Read Country Books, Alcester, UK	"Wax myrtle is an erect, evergreen, small tree or shrub." [Myricaceae]

503	Nitrogen fixing woody plant	y
	Source(s)	Notes
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	" <i>Morella cerifera</i> (Myricaceae) is a symbiotic nitrogen fixer originally from the southeastern U.S. that is colonizing native-dominated vegetation on a young lava flow near Hilo, Island of Hawai'i, where it increases total and biologically available soil nitrogen and increases foliar nitrogen concentrations in associated individuals of the native tree <i>Metrosideros polymorpha</i> ."

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 1 Jun 2010]	Not a geophyte

Qsn #	Question	Answer
601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	<p>Van Deelen, T. R. (1991). <i>Morella cerifera</i>. In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html. [Accessed 11 Mar 2020]</p>	<p>[No evidence] "Wax myrtle is most common in peninsular Florida and on the Coastal Plain of the southeastern United States. It occurs from the Florida Keys north to southern New Jersey, Maryland, and Delaware; west to eastern Texas, southeast Oklahoma, and central Arkansas. Atypical reported occurrences include Maine, Massachusetts, and New York. Outside the United States, wax myrtle grows in Bermuda, Cuba, the Bahamas, Puerto Rico, and the British West Indies. It grows in Mexico, Central America, and South America from Costa Rica to Belize [16,20,26]."</p>

602	Produces viable seed	y
	Source(s)	Notes
	<p>Garrett, H. (1996). <i>Howard Garrett's Plants for Texas</i>. University of Texas Press, Austin, TX</p>	<p>"Propagation: Seeds, cuttings, transplants."</p>
	<p>Van Deelen, T. R. (1991). <i>Morella cerifera</i>. In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html. [Accessed 11 Mar 2020]</p>	<p>"Wild wax myrtle seeds can be harvested by hand or shaken onto a canvas. Seed processing requires removal of the waxy coat by mechanical agitation or rubbing over a dry screen. Before sowing, the seeds require stratification at 34 to 40 degrees F (1-4 deg C) for 90 days. The seeds should be drilled into rows 8 to 12 inches (20-30 cm) apart and covered with 0.25 inch (0.8 cm) of firmed soil. Fall plantings should be mulched. Wax myrtle yields approximately 84,000 cleaned seeds per pound (184,000/kg) [20]."</p>

603	Hybridizes naturally	y
	Source(s)	Notes
	<p>Bornstein, A.J. (1997). <i>Myricaceae</i>. Oxford University Press, New York, NY</p>	<p>"Further complicating matters, bayberry and the wax myrtle [<i>Morella cerifera</i> (L.) Small] can hybridize when growing together"</p>

604	Self-compatible or apomictic	n
	Source(s)	Notes
	<p>Van Deelen, T. R. (1991). <i>Morella cerifera</i>. In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html. [Accessed 11 Mar 2020]</p>	<p>"The diminutive flowers are unisexual, dioecious, and borne on catkinlike axillary spikes."</p>

Qsn #	Question	Answer
605	Requires specialist pollinators	n
	Source(s)	Notes
	Erickson, D. L., Hamrick, J. L., & Kochert, G. D. (2004). Ecological determinants of genetic diversity in an expanding population of the shrub <i>Myrica cerifera</i> . <i>Molecular Ecology</i> , 13(6), 1655-1664	"It is probably wind pollinated as most members of Fagales are wind-pollinated and because no adaptations for insect pollination are apparent."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	" <i>M. cerifera</i> also has the ability to spread vegetatively via root suckers (Dirr 2002)."
	Gilman, E.F. & Watson, D.G. (1994). <i>Myrica cerifera</i> - Southern Waxmyrtle. Fact Sheet ST-410. Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. http://hort.ufl.edu . [Accessed 11 Mar 2020]	"The only drawback to the plant is its tendency to sprout from the roots. This can be a nuisance as they need to be removed several times each year to keep the tree looking sharp. However, in a naturalized garden this thick growth could be an advantage, since it would provide good nesting cover for wildlife."
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 11 Mar 2020]	"Wax-myrtle is clonal, with several stems growing from a common root collar. Underground runners extend the growth laterally"

607	Minimum generative time (years)	
	Source(s)	Notes
	Gilman, E.F. & Watson, D.G. (1994). <i>Myrica cerifera</i> - Southern Waxmyrtle. Fact Sheet ST-410. Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. http://hort.ufl.edu . [Accessed 11 Mar 2020]	"Growth rate: fast" [Uncertain. Probably <4 years]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	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.	" <i>Morella cerifera</i> drupe, 3 mm length" [Potential for unintentional dispersal, but no evidence]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Garrett, H. (1996). <i>Howard Garrett's Plants for Texas</i> . University of Texas Press, Austin, TX	"Uses: Specimen garden tree; evergreen background."

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	Bird-dispersed
	WRA Specialist. (2020). Personal Communication	No evidence of contamination of produce. Unlikely given dispersal vectors and growth habit

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	"It produces a large number of small fruits (Dirr 1998), which are bird dispersed in its native range, and almost certainly in Hawai'i as well (McClanahan and Wolfe 1993)." [Not adapted for wind dispersal]

705	Propagules water dispersed	
	Source(s)	Notes
	USDA Natural Resources Conservation Service. (2005). Plant Fact Sheet: Dwarf Wax Myrtle- <i>Myrica pusilla</i> Raf. http://plants.usda.gov/factsheet/pdf/fs_mypu.pdf . [Accessed 11 Mar 2020]	[Occurrence near riparian habitats suggests potential movement by water] "It is believed that the waxy coating may help prevent the fruit from drying out in arid climates and may help to keep water borne fruits afloat in wetter ones...A close relative of dwarf wax myrtle is common wax myrtle (<i>Myrica cerifera</i>). Common wax myrtle grows from 10-30 feet tall, is not stoloniferous, and is the only evergreen wax myrtle with wedge shaped leaves. It is usually found in clay soils near streams, lakes, and other waterways, as well as in boggy grasslands and wet wooded areas."

706	Propagules bird dispersed	y
	Source(s)	Notes
	Erickson, D. L., Hamrick, J. L., & Kochert, G. D. (2004). Ecological determinants of genetic diversity in an expanding population of the shrub <i>Myrica cerifera</i> . <i>Molecular Ecology</i> , 13(6), 1655-1664	"Fruits mature in early autumn and are eaten by migratory bird species, particularly <i>Dendroica coronata</i> , suggesting that long-distance, animal-mediated seed dispersal is possible. If not eaten, the fruits typically remain attached to the plant, facilitating seed collection, although germination rates rapidly decline after 9 months (Erickson personal observation)."
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	"Like <i>M. faya</i> , <i>M. cerifera</i> is relatively fast growing (Young et al. 1995), bird dispersed (McClanahan and Wolfe 1993, Levey et al. 2005), and fixes nitrogen via a symbiosis with actinorhizal bacteria, <i>Frankia</i> (Burleigh and Dawson 1994, Wijnholds and Young 2000)."
	Kalmbacher, R. S., Eger, J. E., & Rowland-Bamford, A. J. (1993). Response of southern wax myrtle (<i>Myrica cerifera</i>) to herbicides in Florida. <i>Weed Technology</i> , 7(1), 84-91	"Seed dispersal by birds is a major method for spread of this species (2). It is the main food of tree swallows (<i>Iridoprocne bicolor</i>) when these birds winter in Florida and the Gulf area (3)."
	Garrett, H. (1996). <i>Howard Garrett's Plants for Texas</i> . University of Texas Press, Austin, TX	"Tips/Notes: Birds like the berries."

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Borgmann, K. L., Pearson, S. F., Levey, D. J., & Greenberg, C. H. (2004). Wintering Yellow-rumped Warblers (<i>Dendroica coronata</i>) track manipulated abundance of <i>Myrica cerifera</i> fruits. <i>The Auk</i> , 121(1), 74-87	Adapted for internal bird/animal dispersal
	WRA Specialist. (2020). Personal Communication	No evidence of external dispersal or means of external attachment

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Borgmann, K. L., Pearson, S. F., Levey, D. J., & Greenberg, C. H. (2004). Wintering Yellow-rumped Warblers (<i>Dendroica coronata</i>) track manipulated abundance of <i>Myrica cerifera</i> fruits. <i>The Auk</i> , 121(1), 74-87	"We suspect that the importance of <i>M. cerifera</i> fruits to wintering birds extends beyond what we detected for Yellow-rumped Warblers. During the course of our study, we observed seven other species consuming <i>M. cerifera</i> fruits: Downy Woodpecker (<i>Picoides pubescens</i>), Red-bellied Woodpecker (<i>Melanerpes carolinus</i>), Carolina Chickadee, Northern Cardinal, Ruby-crowned Kinglet, Tufted Titmouse, and Pine Warbler (<i>D. pinus</i>). Furthermore, fecal samples from wintering Gray Catbirds (<i>Dumetella carolinensis</i>), White eyed Vireos (<i>Vireo griseus</i>), and Ruby crowned Kinglets at our study site frequently were composed of >90% <i>M. cerifera</i> fruit (S. F. Pearson unpubl. data). We emphasize that all those species were much less common than Yellow-rumped Warblers at our study site (Table 1). Hence, low sample sizes and reduced statistical power (power of treatment x time interactions for canopy, shrub, and foraging abundance were <0.68 for all species other than the Yellow-rumped Warbler) likely contributed to those species' apparent lack of response to our experimental manipulation of <i>M. cerifera</i> fruit abundance. Although those species did not respond to changes in fruit abundance, <i>M. cerifera</i> may still be an important resource for them."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 11 Mar 2020]	"Wax myrtle yields approximately 84,000 cleaned seeds per pound (184,000/kg)" [Potential seed densities of >1000/m2 unlikely given size of trees]

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes

Qsn #	Question	Answer
	<p>Van Deelen, T. R. (1991). <i>Morella cerifera</i>. In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html. [Accessed 11 Mar 2020]</p>	<p>"Seedlings will establish on disturbed sites [39], but the seeds require removal of their waxy coating before they will germinate [20]. Birds, feeding on southern bayberry fruit, probably accomplish wax removal and seed dispersal." [Suggest the potential to develop a seed bank]</p>
	<p>Haywood, J. D. (1994). Seed viability of selected tree, shrub, and vine species stored in the field. <i>New Forests</i>, 8 (2), 143-154</p>	<p>[Germinates after 4 years] "Seeds from 10 species were collected, sealed in fiberglass screen pouches, and stored under hardware-cloth cages on both a forest and cleared site for up to five years. At each site, half of the pouches were placed under leaf litter and the other half were planted in mineral soil. <i>Liquidambar styraciflua</i> and <i>Callicarpa americana</i> seeds had high germination rates under all conditions. <i>Quercus falcata</i>, <i>Sassafras albidum</i>, <i>Rhus copallina</i>, and <i>Vaccinium arboretum</i> required planting in mineral soil to ensure germination. Planted <i>Myrica cerifera</i> and <i>Vitis aestivalis</i> seeds germinated well on both sites. <i>Myrica cerifera</i> also germinated well if placed under litter on the forest floor and <i>Vitis aestivalis</i> if placed under litter on the cleared site. Germination of <i>Crataegus uniflora</i> seeds was erratic. Most <i>Lonicera japonica</i> were unsound when collected. Germination rates generally decreased over time, but some <i>Sassafras albidum</i>, <i>Myrica cerifera</i>, and <i>Vaccinium arboreum</i> seed germinated after four years, and <i>Rhus coppalina</i>, <i>Callicarpa americana</i>, <i>Crataegus uniflora</i>, and <i>Vitis aestivalis</i> seeds germinated after five years in the field."</p>

803	Well controlled by herbicides	y
	Source(s)	Notes
	<p>Van Deelen, T. R. (1991). <i>Morella cerifera</i>. In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html. [Accessed 11 Mar 2020]</p>	<p>"A 20 percent Garlon 4, 10 percent Cide-kick (a penetrant), 70 percent diesel-oil herbicide mixture can be used for wax-myrtle control. Basal applications should be made in February, using the "streamline" technique [32]."</p>

Qsn #	Question	Answer
	<p>Kalmbacher, R. S., Eger, J. E., & Rowland-Bamford, A. J. (1993). Response of southern wax myrtle (<i>Myrica cerifera</i>) to herbicides in Florida. <i>Weed Technology</i>, 7(1), 84-91</p>	<p>"Abstract. Triclopyr (0.28, 0.56, and 1.12 kg ai ha-l); triclopyr + 2,4-D (0.56 + 1.12 kg ha l); and dicamba (1.12 kg ha-1) were evaluated over 2 yr at two locations in Florida for southern wax myrtle control following spring (Mar. to Apr.) or summer (Aug. to Sept.) applications. All treatments were applied twice, 1 yr apart, except 1.12 kg ha-1 triclopyr, which was applied once in the initial year. In the first year, defoliation with triclopyr was quadratic with > 90% at 0.56 kg ha-l. In the second year, a single application of 1.12 kg ha-1 triclopyr resulted in similar (P > 0.05) defoliation compared with two applications of 0.56 kg ha-1 triclopyr. After 1 yr, increasing triclopyr rate resulted in a linear increase in mortality. After 2 yr, two applications of triclopyr at 0.56 kg ha-1 and triclopyr + 2,4 D caused lower (P < .01) mortality (45%) than a single application of 1.12 kg ha-1 triclopyr (63%). Addition of 2,4-D to triclopyr did not increase mortality. After 2 yr, two applications of 0.28 kg ha-1 triclopyr resulted in 21% mortality while two applications of dicamba were ineffective. Defoliation was often greater with spring, compared with summer applications, but often depended on treatment and location. Mortality was greater (P < 0.01) at 1 and 2 yr after summer application compared with spring application at one location, but not the other. Roots of wax myrtle were sampled on 28-d intervals in the first year and analyzed for total non structural carbohydrate (TNC). Starch composed 630 g kg-1 of TNC in myrtle roots, with highest concentration of TNC (120 g kg1) in March and lowest (30 g kg-1) in August. Nomenclature: Dicamba, 3,6 dichloro-2-methoxybenzoic acid; 2,4-D, (2,4 dichlorophenoxy)acetic acid; triclopyr, [(3,5- 6 trichloro-2-pyridinyl)oxy]acetic acid; southern wax myrtle, <i>Myrica cerifera</i> L. #3 MYRCE. Additional index words: Pasture and range brush control, triclopyr, 2,4-D, dicamba, MYRCE."</p>

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	<p>Haywood, J. D., Pearson, H. A., Grelen, H. E., & Popham, T. W. (2000). Effects of date and frequency of burning on southern bayberry (<i>Myrica cerifera</i>) in central Louisiana. <i>Texas Journal of Science</i> 52(4): 33-42</p>	<p>"Description: <i>Myrica cerifera</i> (southern bayberry or waxmyrtle) is one of the most common shrubs in the longleaf pine/bluestem forest type in the West Gulf Coastal Plain. During controlled burns, individual plants can burn intensely because the wax coated foliage and fruits are very flammable. However, <i>Myrica cerifera</i> can survive fires on frequently burned sites by resprouting vigorously from the root collar. To determine how burning influences the development of <i>Myrica cerifera</i>, this study compared several burning dates (1 March, 1 May and 1 July) and fire frequencies (one, two and three year intervals) on a site in central Louisiana. <i>Myrica cerifera</i> plants generally survived all burning treatments, with only two plants dying over eight growing seasons (1.3% mortality). Burning kept average shrub height at or below the initial preburn heights and significantly below the height of the non burned plants. Final average heights and diameters of <i>Myrica cerifera</i> decreased significantly as the burning frequency increased and the date of burning was delayed into the growing season."</p>
	<p>Burrell, C. C., Marinelli, J., & Harper-Lore, B. (2006). Native alternatives to invasive plants. Brooklyn Botanic Garden, Brooklyn, NY</p>	<p>"If necessary, cut the plant to the ground to renew growth. It tolerates fire, drought, salt and heat."</p>

Qsn #	Question	Answer
	Kalmbacher, R. S., Eger, J. E., & Rowland-Bamford, A. J. (1993). Response of southern wax myrtle (<i>Myrica cerifera</i>) to herbicides in Florida. <i>Weed Technology</i> , 7(1), 84-91	"On range, wax myrtle can be suppressed by burning (10). Southeastern range is typically burned every 2 to 3 yr, an interval which allows for a build-up in sufficient fuel to carry a fire up into the wax myrtle canopy. On pasture, notably bahiagrass (<i>Paspalum notatum</i> Flugge), there is usually not sufficient fuel to destroy a wax myrtle canopy, especially in late winter."
	Van Deelen, T. R. (1991). <i>Morella cerifera</i> . In: Fire Effects Information System, [Online]. U.S. D. A., Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. https://www.fs.fed.us/database/feis/plants/shrub/morcer/all.html . [Accessed 1 Jun 2010]	Tests of burning, chopping, and blading methods for wax-myrtle control found that wax-myrtle can return to pretreatment levels within 3 years...Wax-myrtle stems die quickly. The stems and foliage of southern bayberry contain large amounts of aromatic compounds that are quite flammable [6], making it a potential fire hazard. Presumably, severe enough fires will kill wax-myrtle rootstock, although no such instances were reported in the literature. The rootstock is apparently quite hardy. PLANT RESPONSE TO FIRE : Wax-myrtle sprouts vigorously from surviving root crowns following fire [2]. The most vigorous growth occurs in the 1st postfire year [1]. Stem density and frequency increase rapidly relative to cover. Cover increases less rapidly because the wax-myrtle clones are self-thinning [2,44].

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	n
	Source(s)	Notes
	Kurten, E. L., Snyder, C. P., Iwata, T., & Vitousek, P. M. (2008). <i>Morella cerifera</i> invasion and nitrogen cycling on a lowland Hawaiian lava flow. <i>Biological Invasions</i> , 10(1), 19-24	Apparently natural enemies not stopping spread of <i>Morella cerifera</i> in Hawaiian Islands

Summary of Risk Traits:

High Risk / Undesirable Traits

- Grows in tropical to subtropical climates
- Naturalized on Maui and Hawaii Hawaiian Islands)
- A weed of pastures and pine plantations in the southern U.S.
- An environmental weed in the Hawaiian Islands
- Other *Morella* species are invasive
- Allelopathic
- Potential skin irritant
- Increases fire risk in natural systems
- Shade tolerant
- Tolerates many soil types
- Capable of forming dense stands
- Nitrogen fixing (may alter soil nutrients)
- Reproduces by seeds and vegetatively by root suckers
- Hybridizes with other *Morella* species
- Seeds dispersed by birds, possibly water and intentionally by people
- Seeds may remain viable in soil for 4 or more years
- Able to resprout after cutting
- No natural enemies known to be present in the Hawaiian Islands

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Palatable to browsing animals (although may not be preferred)
- Valued as an ornamental
- Dioecious
- Herbicides may provide effective control