

Revised assessment date 6 Dec 2017

Melaleuca viminalis synonym Callistemon viminalis (Weeping bottlebrush) ALL ZONES		Answer	Score
1.01	Is the species highly domesticated?	n	0
1.02	Has the species become naturalised where grown?		
1.03	Does the species have weedy races?		
2.01	Species suited to Florida's USDA climate zones (0-low; 1-intermediate; 2-high) North Zone: suited to Zones 8, 9 Central Zone: suited to Zones 9, 10 South Zone: suited to Zone 10	2	
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	2	
2.03	Broad climate suitability (environmental versatility)	y	1
2.04	Native or naturalized in habitats with periodic inundation North Zone: mean annual precipitation 50-70 inches Central Zone: mean annual precipitation 40-60 inches South Zone: mean annual precipitation 40-60 inches	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	unk	
3.02	Garden/amenity/disturbance weed	y	2
3.03	Weed of agriculture	n	0
3.04	Environmental weed	n	0
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	unk	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	?	
4.05	Toxic to animals	n	0
4.06	Host for recognised pests and pathogens	unk	0
4.07	Causes allergies or is otherwise toxic to humans	y	1
4.08	Creates a fire hazard in natural ecosystems	unk	0
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils). North & Central Zones: infertile soils; South Zone: shallow limerock or Histisols.	y	1
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets	n	0
5.01	Aquatic	n	0
5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte	n	0

6.01	Evidence of substantial reproductive failure in native habitat	n	0
6.02	Produces viable seed	y	1
6.03	Hybridizes naturally	y	1
6.04	Self-compatible or apomictic	unk	-1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	unk	-1
6.07	Minimum generative time (years)	unk	-1
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y	1
7.02	Propagules dispersed intentionally by people	y	1
7.03	Propagules likely to disperse as a produce contaminant	n	-1
7.04	Propagules adapted to wind dispersal	y	1
7.05	Propagules water dispersed	y	1
7.06	Propagules bird dispersed	?	
7.07	Propagules dispersed by other animals (externally)	unk	-1
7.08	Propagules dispersed by other animals (internally)	unk	-1
8.01	Prolific seed production	y	1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	unk	-1
8.03	Well controlled by herbicides	y	-1
8.04	Tolerates, or benefits from, mutilation or cultivation	?	
8.05	Effective natural enemies present in U.S.	?	
Total Score			7
Implemented Pacific Second Screening			No
Risk Assessment Results			High

section	# questions answered	satisfy minimum?
A		10 yes
B		8 yes
C		15 yes
total		33 yes

	Reference	Source data
1.01	Cultivated, but no evidence of selection for reduced invasive traits.	
1.02	Skip to 2.01	
1.03	Skip to 2.01	
2.01	1. Koeser, A. K., Hasing, G., Friedman, M. H., Irving, R. B. (2015). Trees: North & central Florida. Gainesville, FL: University of Florida, Institute of Food and Agricultural Sciences. 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. 3. Dave's Garden (https://davesgarden.com/guides/pf/go/64223/ accessed 12/5/2017)	No computer analysis was performed. 1. Found in USDA hardiness zones 9B through 11. 2. Native to AUSTRALASIA Australia: Australia - New South Wales, - Queensland 3. USDA Zone 9a: to -6.6 °C (20 °F), USDA Zone 9b: to -3.8 °C (25 °F), USDA Zone 10a: to -1.1 °C (30 °F), USDA Zone 10b: to 1.7 °C (35 °F), USDA Zone 11: above 4.5 °C (40 °F)
2.02		No computer analysis was performed. Native range is well known; refer to 2.01 source data.
2.03	1. Köppen-Geiger climate map (http://koeppen-geiger.vu-wien.ac.at/pdf/kottek_et_al_2006_A4.pdf [accessed 14 Nov 2017]). 2. Global Biodiversity Information Facility (https://www.gbif.org/species/2928531 [assessed 14 Nov 2017]). See source data for 2.01.	1. Distribution in native and cultivated ranges occurs in > three climate zones. (Cfa, Cfb, Aw, Af, Am)...Including Cfa which is the major climate classification found in Florida
2.04	1. World Climate Maps (http://www.climate-charts.com/World-Climate-Maps.htm [assessed 14 Nov 2017]) 2. Global Biodiversity Information Facility (https://www.gbif.org/species/2928531 [assessed 14 Nov 2017])	1. The Native range includes precipitation averages from 20 inches to 60 inches.
2.05	1. California Gardens http://www.californiagardens.com/Plant_Pages/callistemon_viminalis.htm (11-22-2017) 2. CalFlora http://www.calflora.org/cgi-bin/species_query.cgi?where-taxon=Callistemon+viminalis (11-22-2017) 3. Invasive Species South Africa http://www.invasives.org.za/legislation/item/858-weeping-bottlebrush-callistemon-viminalis (11-22-2017) 4. South African Department of Agriculture, Forestry, and Fisheries http://www.nda.agric.za/docs/Brochures/Bottlebrush.pdf (11-22-2017)	1. Introduced to California 2. Introduced to California 3. Introduced to South Africa 4. Introduced to South Africa
3.01		No direct evidence found. Likely, distribution records and comments on Dave's Garden species page indicate possible naturalization in California, Arizona, Florida
3.02	1. Invasive Species South Africa http://www.invasives.org.za/legislation/item/858-weeping-bottlebrush-callistemon-viminalis (11-22-2017) 2. Jacobs, L. E. (2017). An assessment of Melaleuca (Myrtaceae) as invasive species in South Africa (Doctoral dissertation, Stellenbosch: Stellenbosch University).	1. An escaped weed in South Africa, replacing indigenous species 2. M. viminalis subsp. viminalis is invasive, surviving and reproducing a significant distance from the site of original introduction, but not over a wide extent
3.03		no evidence
3.04		no evidence

3.05	1. Burrows, D. W., & Balciunas, J. K. (1998). Biology and host range of <i>Pomponatus typicus</i> Distant (Heteroptera: Coreidae), a potential biological control agent for the paperbark tree, <i>Melaleuca quinquenervia</i> , in southern Florida. <i>Austral Entomology</i> , 37(2), 168-173. 2. UF IFAS CAIP https://plants.ifas.ufl.edu/plant-directory/melaleuca-quinquenervia/ (11-30-2017) 3. J. Masterson, Smithsonian Marine Station. September 30, 2007 https://www.sms.si.edu/irlspec/Melaleuca_quinquenervia.htm (11-29-2017)	1. The Australian broad-leaved paperbark tree, <i>Melaleuca quinquenervia</i> (Cav.) S.T. Blake (Myrtaceae) was introduced into southern Florida as an ornamental at the beginning of this century. It has since escaped cultivation and rapidly expanded its range, which now covers 200 000–600 000 ha, including the Everglades National Park 2. <i>Melaleuca quinquenervia</i> is a major invasive species in Florida 3. <i>Melaleuca quinquenervia</i> among the 100 most disruptive invasive species in the world
4.01	1. University of Florida, IFAS http://edis.ifas.ufl.edu/st111 (11-14-2017)	no evidence of these features
4.02		no evidence
4.03		no evidence of these features
4.04	1. Central QLD Landcare Network http://www.cqqlandcarenetwork.org.au/plants-database/weeping-bottlebrush (11-22-2017) 2. EcoLandscape California http://www.ecolandscapes.org/plantProfiles/Callistemon_x_viminalis_Little_John.pdf (11-22-2017)	1. In Australia, nectar is eaten by many birds, flowers are eaten by lorikeets and the seeds are eaten by pale headed rosellas. 2. Deer resistant [lack of information on this question]
4.05	1. ASPCA https://www.aspcare.org/pet-care/animal-poison-control/toxic-and-non-toxic-plants/callistemon-viminalis (11-22-2017)	1. Non-Toxic to Dogs, Non-Toxic to Cats, Non-Toxic to Horses
4.06	1. University of Florida, IFAS http://edis.ifas.ufl.edu/st111 (11-14-2017) 2. Burrows, D. W., & Balciunas, J. K. (1998). Biology and host range of <i>Pomponatus typicus</i> Distant (Heteroptera: Coreidae), a potential biological control agent for the paperbark tree, <i>Melaleuca quinquenervia</i> , in southern Florida. <i>Austral Entomology</i> , 37(2), 168-173. 3. Kolesik, P., Manners, A. G., & Hills-Hayes, B. (2017). A new species of gall midge (Diptera: Cecidomyiidae) damaging ornamental <i>Callistemon</i> (Myrtaceae) in Australia. <i>Zootaxa</i> , 4318(2), 395-400.	Susceptible to many diseases and pests, but insufficient evidence that these are crop pests or pathogens. 1. Root rot in wet soil, and canker. A twig gall, formed in response to a fungus (<i>Sphaeropsis tumefacens</i>), can disfigure the tree. The tree is often short-lived due to disease. 2. Susceptible to nymph infestation 3. Susceptible to midge infestation
4.07	1. Dave's Garden https://davesgarden.com/guides/pf/go/64223/ (11-22-2017) 2. EcoLandscape California http://www.ecolandscapes.org/plantProfiles/Callistemon_x_viminalis_Little_John.pdf (11-22-2017)	1. Parts of plant are poisonous if ingested. Pollen may cause allergic reaction 2. May cause allergic reaction
4.08	1.(https://www.fs.fed.us/database/feis/plants/tree/melqui/all.html accessed 12/6/2017)	no evidence but likely. Congener <i>Melaleuca quinquenervia</i> creates a fire hazard in its invaded range. <i>M. viminalis</i> has similar fire adaption and bark."the dry, shaggy outer layers of bark are highly flammable and provide a ladder fuel that can quickly carry fire into the canopy, destroying leaves and branches
4.09	1. Australian Native Plants Society http://anpsa.org.au/c-vim.html (11-14-2017) 2. Arizona State University http://www.public.asu.edu/~camartin/plants/Plant%20html%20files/melaleucaviminalis.html (11-14-2017) 3. Austrian National Herbarium https://www.anbg.gov.au/gnp/gnp12/callistemon-viminalis.html (11-14-2017)	1. plants flower best in a sunny location but they will tolerate considerable shade at the expense of flowering performance. 2. Full sun 3. For optimum results it should be planted in moist well-drained soil in full or partial sun.
4.10	1. Arizona State University http://www.public.asu.edu/~camartin/plants/Plant%20html%20files/melaleucaviminalis.html (11-14-2017) 2. Floridata https://floridata.com/Plants/Myrtaceae/Callistemon%20viminalis/541 (11-22-2017) 3. Singapore National Parks https://florafanaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=2772 (11-22-2017) 3. 1. Dave's Garden https://davesgarden.com/guides/pf/go/64223/ (11-22-2017)	1. Well drained, more tolerant of alkaline soils 2. Plant does well in sandy well drained soils 3. Prefers well-drained, sandy loam soils with regular watering 3. 6.1 to 6.5 (mildly acidic), 6.6 to 7.5 (neutral), 7.6 to 7.8 (mildly alkaline), 7.6 to 7.8 (mildly alkaline)
4.11	1. University of Florida, IFAS http://edis.ifas.ufl.edu/st111 (11-14-2017)	1. Growth form is a weeping shrub or tree
4.12		no evidence

5.01	1. University of Florida, IFAS http://edis.ifas.ufl.edu/st111 (11-14-2017)	Family: Myrtaceae
5.02	1. University of Florida, IFAS http://edis.ifas.ufl.edu/st111 (11-14-2017)	Family: Myrtaceae
5.03		no evidence
5.04		no evidence of these features
6.01		no evidence
6.02	1. Australian Native Plants Society http://anpsa.org.au/c-vim.html (11-14-2017) 2. Austrlian National Herbarium https://www.anbg.gov.au/gnp/gnp12/callistemon-viminalis.html (11-14-2017) 3. University of Florida, IFAS http://edis.ifas.ufl.edu/st111 (11-14-2017)	1. produces viable seed which germinates easily. 2. Callistemon can be propagated easily from seed which falls readily from mature fruit capsules when dry. 3. Propagation is by seeds or cuttings.
6.03	1. PlantNET http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvi=gn&name=Callistemon (11-22-2017) 2. Hunker: Bottlebrush Tree Facts https://www.hunker.com/12254473/bottlebrush-tree-facts (11-22-2017) 3. Singapore National Parks https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=2772 (11-22-2017)	1. Hybridizes readily 2. Bottlebrush hybridizes easily 3. Easily hybridizes with other Callistemon species, resulting in highly variable offspring from seeds, therefore quality seed source is essential for volume planting of the typical form, otherwise propagation by cutting is preferred for retaining cultivars
6.04	1. (https://www.fs.fed.us/database/feis/plants/tree/melqui/all.html accessed 12/6/2017)	no evidence Congener <i>Melaleuca quinquenervia</i> : "Field studies in southern Florida showed that pollination within the same flower resulted in significantly ($p < 0.05$) reduced fruit set compared with pollination between flowers on different trees or pollination between flowers on the same tree. These studies also indicated that male and female flower parts often develop at different rates, which tends to promote pollination between flowers
6.05	1. Latif, A., Iqbal, N., Ejaz, M., Malik, S. A., Saeed, S., Gulshan, A. B., ... & Dad, K. (2016). Pollination biology of <i>Callistemon viminalis</i> (Sol. Ex Gaertn.) G. Don (Myrtaceae), Punjab, Pakistan. <i>Journal of Asia-Pacific Entomology</i> , 19(2), 467-471. 2. Dave's Garden https://davesgarden.com/guides/pf/go/64223/ (11-22-2017)	1. The plant is pollinated by a diverse array of pollinator species. The flowers were visited by nine Hymenopteran, four Lepidopteran, one Dipteran and one bird species. Among all pollinators, bees represented the most abundant species. 2. This plant is attractive to bees, butterflies and/or birds
6.06		no evidence
6.07		no evidence
7.01	1. Invasive Species South Africa http://www.invasives.org.za/legislation/item/858-weeping-bottlebrush-callistemon-viminalis (11-22-2017) 2. Central QLD Landcare Network http://www.cqlandcarenetwork.org.au/plants-database/weeping-bottlebrush (11-22-2017) 3. Australian Tropical Rainforest Plants http://keys.trin.org.au/key-server/data/0e0f0504-0103-430d-8004-060d07080d04/media/Html/taxon/Melaleuca_viminalis.htm (11-22-2017) 4. Singapore National Park https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=2773 (11-22-2017)	Seed is very small. 1. Spread by human activity 2. Found along stream banks and beds of seasonal waterways 3. Grows as a rheophyte along creeks and rivers usually in open forest situations but sometimes on streams flowing through rain forest. 4. Applied in landscaping schemes as a roadside tree
7.02	1. Plant Net http://publish.plantnet-project.org/project/plantinvasivekruger/collection/collection/synthese/details/CLXVI (11-14-2017) 2. Invasive Species South Africa http://www.invasives.org.za/legislation/item/858-weeping-bottlebrush-callistemon-viminalis (11-22-2017) 3. Australian National Botanic Gardens and Centre for Australian National Biodiversity Research, Canberra. Last updated: 24 December, 2015. https://www.anbg.gov.au/gnp/gnp12/callistemon-viminalis.html (11-22-2017)	1. It is used as a garden ornament. 2. Spread by human activity, especially ornamental planting 3. It is a valuable species in landscaping, being useful as a screen plant, in erosion control or as a specimen or street tree, where it exhibits smog tolerance.
7.03		no evidence

7.04	1. Plant Net http://publish.plantnet-project.org/project/plantinvasivekruger/collection/collection/synthese/details/CLXVI (11-14-2017) 2. Invasive Species South Africa http://www.invasives.org.za/legislation/item/858-weeping-bottlebrush-callistemon-viminalis (11-22-2017)	1. Seeds are spread by wind. 2. Seeds spread by wind
7.05	1. Australian Native Plants Society http://anpsa.org.au/c-vim.html (11-14-2017) 2. Australian National Herbarium https://www.anbg.gov.au/gnp/gnp12/callistemon-viminalis.html (11-14-2017) 3. Australian Rainforest Plants http://keys.trin.org.au/key-server/data/0e0f0504-0103-430d-8004-060d07080d04/media/Html/taxon/Melaleuca_viminalis.htm (11-30-2017)	1. In the wild, <i>C.viminalis</i> is usually found along watercourses 2. They often grow in damp or wet conditions such as along creek beds or in areas which are prone to floods. 2. Grows as a rheophyte along creeks and rivers usually in open forest situations but sometimes on streams flowing through rain forest. [common along watercourses, water dispersal likely]
7.06	1. Invasive Species South Africa http://www.invasives.org.za/legislation/item/858-weeping-bottlebrush-callistemon-viminalis (11-22-2017)	1. Bird dispersed [but no supporting evidence. No evidence from other sources]
7.07		no evidence
7.08		no evidence
8.01	1. Latif, A., Iqbal, N., Ejaz, M., Malik, S. A., Saeed, S., Gulshan, A. B., ... & Dad, K. (2016). Pollination biology of <i>Callistemon viminalis</i> (Sol. Ex Gaertn.) G. Don (Myrtaceae), Punjab, Pakistan. <i>Journal of Asia-Pacific Entomology</i> , 19(2), 467-471.	1. In a study observing seed production following open pollination, 242 seeds were observed per flower. This study used a sample of only 40 flowers per tree. Therefore, a conservative estimate of the average number of seed per tree is nearly 10,000. Given the credibility of this source, it is enough to confirm prolific seed production.
8.02		no evidence and not likely (widely believed <i>Melaleuca</i> spp seeds do not persist in the seed bank
8.03	1. C. Mason personal communication	1. Land managers use the same methods to control <i>M. viminalis</i> in natural areas as <i>M. quinquenervia</i> . (hack and squirt and/or the "melaleuca mix" glyphosate/amazipyr.
8.04	1. Plant Net http://publish.plantnet-project.org/project/plantinvasivekruger/collection/collection/synthese/details/CLXVI (11-14-2017) 2. Jacobs, L. E. (2017). An assessment of <i>Melaleuca</i> (Myrtaceae) as invasive species in South Africa (Doctoral dissertation, Stellenbosch: Stellenbosch University). 3. Australian National Herbarium https://www.anbg.gov.au/gnp/gnp12/callistemon-viminalis.html (11-14-2017)	1. It is controlled by cutting. 2. <i>M. parvistaminea</i> establishment was enhanced by fire and cutting/felling of plants which allowed for seed release and consequent establishment into the invaded habitat. A similar pattern has been observed for establishment of <i>M. armillaris</i> subsp. <i>armillaris</i> , <i>M. linearis</i> var. <i>linearis</i> and <i>M. viminalis</i> subsp. <i>viminalis</i> in South Africa. 3. Fire also stimulates the opening of the fruits in some bottlebrushes. Cutting can lead to vigorous regrowth.

8.05	<p>1. Burrows, D. W., & Balciunas, J. K. (1998). Biology and host range of <i>Pomponatus typicus</i> Distant (Heteroptera: Coreidae), a potential biological control agent for the paperbark tree, <i>Melaleuca quinquenervia</i>, in southern Florida. <i>Austral Entomology</i>, 37(2), 168-173. 2. Kolesik, P., Manners, A. G., & Hills-Hayes, B. (2017). A new species of gall midge (Diptera: Cecidomyiidae) damaging ornamental <i>Callistemon</i> (Myrtaceae) in Australia. <i>Zootaxa</i>, 4318(2), 395-400. 3. Wheeler, G. S. (2005). Maintenance of a narrow host range by <i>Oxyops vitiosa</i>; a biological control agent of <i>Melaleuca quinquenervia</i>. <i>Biochemical Systematics and Ecology</i>, 33(4), 365-383.</p>	<p>[Several studies have indicated potential viability of bio-control agents for <i>Callistemon</i> spp. Some of these are currently present in the United States. However, none have confirmed they are effective bio-control agents outside of experimental conditions] 1. <i>Pomponatus typicus</i> (insect) was determined a partially effective biological control agent for a relative of <i>C. viminalis</i>, <i>Melaleuca quinquenervia</i>. 2. Gall midges were feeding gregariously within vegetative buds of <i>Callistemon viminalis</i> plants, cultivars "Little John" and "Captain Cook", grown in a production greenhouse at Tynong in Victoria, Australia, in September 2016. Infested buds stopped developing and, following the departure of the larvae for the soil, turned necrotic and died. Pupation took place within the soil and sometimes on the soil surface. Young potted plants were infested and severely retarded in their overall growth. 3. The host testing of the <i>Melaleuca quinquenervia</i> biological control agent <i>Oxyops vitiosa</i> indicated that larvae would accept and complete development on the Australian target weed <i>M. quinquenervia</i>, two Australian ornamental species, <i>Callistemon citrina</i>, <i>Callistemon viminalis</i> (all Myrtaceae). However, the larvae did not complete development when fed a North American species <i>Myrica cerifera</i> (Myricaceae). The study reported here confirms these results and examines the nutritional and performance differences in <i>O. vitiosa</i> larvae fed leaves of these species.</p>
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