

Assessment date 16 October 2018 Prepared by Sullivan and Lieurance

<i>Vinca major</i> NORTH ZONE		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	y	2
3.02	Garden/amenity/disturbance weed	y	2
3.03	Weed of agriculture	unk	
3.04	Environmental weed	y	4
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	n	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	y	1
4.05	Toxic to animals	unk	0
4.06	Host for recognised pests and pathogens	y	1
4.07	Causes allergies or is otherwise toxic to humans	unk	0
4.08	Creates a fire hazard in natural ecosystems	n	0
4.09	Is a shade tolerant plant at some stage of its life cycle	y	1
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	y	1
4.12	Forms dense thickets	y	1
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	unk	-1
6.04	Self-compatible or apomictic	n	-1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	y	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	n	-1
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	n	-1
8.01	Prolific seed production	n	-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	y	1
8.05	Effective natural enemies present in U.S.	?	
Total Score			15
Implemented Pacific Second Screening			NO
Risk Assessment Results			HIGH

section	# questions answered	satisfy minimum?
A		10 yes
B		10 yes
C		20 yes
total		40 yes

Assessment date 16 October 2018 Prepared by Sullivan and Lieurance

<i>Vinca major</i> CENTRAL ZONE		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	y	2
3.02	Garden/amenity/disturbance weed	y	2
3.03	Weed of agriculture	unk	
3.04	Environmental weed	y	4
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	n	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	y	1
4.05	Toxic to animals	unk	0
4.06	Host for recognised pests and pathogens	y	1
4.07	Causes allergies or is otherwise toxic to humans	unk	0
4.08	Creates a fire hazard in natural ecosystems	n	0
4.09	Is a shade tolerant plant at some stage of its life cycle	y	1
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	y	1
4.12	Forms dense thickets	y	1
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	unk	-1
6.04	Self-compatible or apomictic	n	-1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	y	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	n	-1
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	n	-1
8.01	Prolific seed production	n	-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	y	1
8.05	Effective natural enemies present in U.S.	?	
Total Score			10
Implemented Pacific Second Screening			NO
Risk Assessment Results			HIGH

section	# questions answered	satisfy minimum?
A		10 yes
B		10 yes
C		20 yes
total		40 yes

Assessment date 16 October 2018 Prepared by Sullivan and Lieurance

<i>Vinca major</i> SOUTH ZONE		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	y	2
3.02	Garden/amenity/disturbance weed	y	2
3.03	Weed of agriculture	unk	
3.04	Environmental weed	y	4
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	n	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	y	1
4.05	Toxic to animals	unk	0
4.06	Host for recognised pests and pathogens	y	1
4.07	Causes allergies or is otherwise toxic to humans	unk	0
4.08	Creates a fire hazard in natural ecosystems	n	0
4.09	Is a shade tolerant plant at some stage of its life cycle	y	1
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	y	1
4.12	Forms dense thickets	y	1
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	unk	-1
6.04	Self-compatible or apomictic	n	-1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	y	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	n	-1
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	n	-1
8.01	Prolific seed production	n	-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	y	1
8.05	Effective natural enemies present in U.S.	?	
Total Score			9
Implemented Pacific Second Screening			NO
Risk Assessment Results			HIGH

section	# questions answered	satisfy minimum?
A		10 yes
B		10 yes
C		20 yes
total		40 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	<p>1. Floridata (https://floridata.com/Plants/Apocynaceae/Vinca%20major/924 [assessed 30 Nov 2017]) 2. University of California Weed Research and Information Center (http://wric.ucdavis.edu/information/natural%20areas/wr_V/Vinca.pdf [assessed 30 Nov 2017]) 3. Stone, Katharine R. 2009. <i>Vinca major</i>, <i>V. minor</i>. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, November 30]. 4. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?41679 [assessed 4 Dec 2017]</p>	<p>No computer analysis was performed. 1. Found in USDA hardiness zones 7 to 9. "Native to France and Italy, and eastward through the Balkans to northern Asia Minor and the Western Caucasus." 2. Native to central Europe and the Mediterranean region. 3. Native to Mediterranean Europe, Asia Minor and northern Africa. 4. Native to ASIA-TEMPERATE Western Asia: Turkey, EUROPE Southeastern Europe: Albania; Italy; Serbia; Slovenia, Southwestern Europe: France; Spain</p>
2.02		No computer analysis was performed. Native range is well known; refer to 2.01 source data.
2.03	<p>1. Köppen-Geiger climate map (http://koeppen-geiger.vu-wien.ac.at/pdf/kottek_et_al_2006_A4.pdf [accessed 30 Nov 2017]). 2. Global Biodiversity Information Facility (https://www.gbif.org/species/3169708 [assessed 30 Nov 2017]). See source data for 2.01.</p>	<p>1. Distribution in native and cultivated ranges occurs in over three climate zones. (Cfa, Cfb, Csb, Csb) NOTE: zone Cfa covers most of North and Central Florida</p>
2.04	<p>1. World Climate Maps (http://www.climate-charts.com/World-Climate-Maps.htm [assessed 30 Nov 2017]) 2. Global Biodiversity Information Facility (https://www.gbif.org/species/3169708 [assessed 30 Nov 2017])</p>	<p>1. Native range includes precipitation averages from 20 inches to 60 inches.</p>
2.05	<p>1. DiTomaso, J.M., G.B. Kyser et al. 2013. <i>Weed Control in Natural Areas in the Western United States</i>. Weed Research and Information Center, University of California. 544 pp. [assessed 18 Jan 2018] 2. Wells, E. F., Brown R. L. (2000). An annotated checklist of the vascular plants in the forest at historic Mount Vernon, Virginia: A legacy from the past. <i>Castanea</i>, 65(4), 242-257. 3. Global Biodiversity Information Facility (https://www.gbif.org/species/3169708 [assessed 30 Nov 2017]). See source data for 2.01.</p>	<p>1. "Introduced to the United States in the 1700s as an ornamental and for medicinal uses." 2. <i>Vinca major</i> was brought to the United States from southern Europe in 1789. 3. widespread distribution outside native range including North America and Australia</p>

3.01	<p>1. Environmental Weeds of Australia for Biosecurity Queensland https://keyserver.lucidcentral.org/weeds/data/media/Html/vinca_major.htm [assessed 21 Nov 2017]) 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?41679 [assessed 4 Dec 2017]</p>	<p>See 2.01 for native distribution range. 1. Naturalised in southern Australia, Lord Howe Island, Norfolk Island and southeastern Queensland. Also naturalised in the mediterranean region, North America and New Zealand. 2. Naturalized in AFRICA Macaronesia: Portugal - Azores, - Madeira Islands; Spain - Canary Islands, Northeast Tropical Africa: Eritrea; Ethiopia, Northern Africa: Morocco, Southern Africa: South Africa - KwaZulu-Natal, - Eastern Cape, - Western Cape, ASIA-TEMPERATE Western Asia: Cyprus; Lebanon; Syria, ASIA-TROPICAL Indian Subcontinent: India; Pakistan, AUSTRALASIA Australia: Australia, New Zealand: New Zealand, EUROPE Eastern Europe: Ukraine, Middle Europe: Austria; Hungary, Northern Europe: Norway, Southeastern Europe: Bulgaria; Greece - Crete, Southwestern Europe: France - Corsica; Portugal, NORTHERN AMERICA North-Central U.S.A.: United States - Illinois, - Missouri, Northeastern U.S.A.: United States - Massachusetts, - Ohio, Northern Mexico: Mexico - Coahuila, - Durango, - Nuevo Leon, - San Luis Potosi, - Tamaulipas, Northwestern U.S.A.: United States - Oregon, - Washington, South-Central U.S.A.: United States - New Mexico, - Texas, Southeastern U.S.A.: United States - Alabama, - Arkansas, - Georgia, - Mississippi, - North Carolina, - South Carolina, - Tennessee, - Virginia, Southern Mexico: Mexico - Chiapas, - Guanajuato, - Hidalgo, - Mexico, - Morelos, - Oaxaca, - Puebla, - Queretaro, - Tlaxcala, - Veracruz, - Federal District, Southwestern U.S.A.: United States - California, Western Canada: Canada - British Columbia, PACIFIC North-Central Pacific: United States - Hawaii, SOUTHERN AMERICA Central America: Costa Rica, Northern South America: Venezuela - Aragua, Southern South America: Argentina: Chile: Uruguay, Western South America:</p>
3.02	<p>1. Environmental Weeds of Australia for Biosecurity Queensland https://keyserver.lucidcentral.org/weeds/data/media/Html/vinca_major.htm [assessed 21 Nov 2017]) 2. Australian Association of Bush Regenerators http://www.aabr.org.au/images/stories/resources/ManagementGuides/WeedGuides/wmg_periwinkle.pdf [assessed 21 Jan 2018])</p>	<p>1. Considered to be "a weed of urban bushland, open woodlands, watercourses, roadsides, gardens, disturbed sites, and waste areas." 2. Vinca major is commonly grown in residential gardens. It typically outgrows garden beds and the trimmings are thrown out in garden waste, which allows the species to spread to other environments.</p>
3.03		No evidence.
3.04	<p>1. Environmental Weeds of Australia for Biosecurity Queensland https://keyserver.lucidcentral.org/weeds/data/media/Html/vinca_major.htm [assessed 21 Nov 2017]) 2. Global Invasive Species Database http://issg.org/database/species/ecology.asp?si=487&fr=1&sts=&lang=EN [assessed 27 Nov 2017])</p>	<p>1. Considered to be an environmental weed in Victoria, South Australia, Western Australia, New South Wales, the Australian Capital Territory and Tasmania. 2. Forms dense thickets of plant material that smother native ground vegetation and prevent the regeneration of other plant species.</p>

3.05	<p>1. Stone, Katharine R. 2009. Vinca major, V. minor. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, December 5]. 2. Good Oak Ecological Services (http://goodoak.com/info/weeds/periwinkle.pdf [assessed 5 Dec 2017]) 3. Australian Association of Bush Regenerators (http://www.aabr.org.au/images/stories/resources/ManagementGuides/WeedGuides/wmg_periwinkle.pdf [assessed 21 Jan 2018])</p>	<p>1. Vinca minor, also known as common periwinkle, exhibits weedy characteristics similar to Vinca major. Common periwinkle is known to form dense mats along forest floors and has the ability to outcompete native species. 2. Common periwinkle is known to spread aggressively and form dense mats. Due to the weak structure of its stems it is difficult to remove the root systems without breaking the stems. This makes it especially difficult to remove the invasive plant from its environment. 3. Vinca minor (common periwinkle) and Catharanthus roseus (Madagascar periwinkle) are both relatives of Vinca major and considered to be a weed or potential weed.</p>
4.01	<p>1. Nonnative Invasive Plants of Southern Forests (https://www.srs.fs.fed.us/pubs/gtr/gtr_srs119.pdf [assessed 3 Dec 2017]) 2. Environmental Weeds of Australia for Biosecurity Queensland (https://keyserver.lucidcentral.org/weeds/data/media/html/vinca_major.htm [assessed 5 Dec 2017])</p>	<p>1. Known to have stout and woody branches that are generally hairless and smooth. 2. Known to have hairless stems filled with sap.</p>
4.02		No evidence.
4.03		No evidence.
4.04	<p>1. DiTomaso, J.M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California. 544 pp. [assessed 4 Dec 2017] 2. Stone, Katharine R. 2009. Vinca major, V. minor. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, November 27].</p>	<p>1. "Stems contain milky latex that makes the plant unpalatable to grazing and foraging animals." 2. "Periwinkles are generally unpalatable and have little nutritional value."</p>
4.05	<p>1. Dengarden (https://dengarden.com/gardening/poisonous-plants-hellebore-oleander-periwinkle [assessed 5 Dec 2017]) 2. Moudi M, Go R, Yien CYS, Nazre M. Vinca Alkaloids. International Journal of Preventive Medicine. 2013;4(11):1231-1235. [assessed 17 January]</p>	<p>1. Vinca major is considered to be moderately poisonous and is known to cause abdominal cramping and cardiac issues if consumed. 2. "Some plants in the dogbane (apocynaceae) family are extremely toxic, although poisoning due to the ingestion of big periwinkle is poorly documented."</p>
4.06	<p>1. Baumgartner, Kendra; Warren, Jeremy G. 2005. Persistence of Xylella fastidiosa in riparian hosts near northern California vineyards. Plant Disease. 89(10): 1097-1102. [73878] [assessed 21 Jan 2018] 2. Hopkins, D. L. (1989). Xylella fastidiosa: xylem-limited bacterial pathogen of plants. Annual Review Phytopathol, 27, 271-90.</p>	<p>1. Vinca major is a host to X. fastidiosa, which is known to cause Pierce's disease. Pierce's disease is detrimental to the health of vineyards in California. 2. "Riparian weeds in Napa Valley serve both as breeding hosts for leafhopper vectors and as reservoirs from which the insects can acquire the bacteria and inoculate grape plants."</p>
4.07	<p>1. Dengarden (https://dengarden.com/gardening/poisonous-plants-hellebore-oleander-periwinkle [assessed 5 Dec 2017]) 2. DiTomaso, J.M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California. 544 pp. [assessed 4 December 2017]</p>	<p>1. Vinca major is considered to be moderately poisonous and is known to cause abdominal cramping and cardiac issues if consumed. 2. "Some plants in the dogbane (apocynaceae) family are extremely toxic, although poisoning due to the ingestion of big periwinkle is poorly documented."</p>

4.08	<p>1. Stone, Katharine R. 2009. <i>Vinca major</i>, <i>V. minor</i>. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, November 20].</p>	<p>1. FROM FEIS: As of this writing (2009), there was no information available regarding the flammability of periwinkles. Some evidence suggests that periwinkles may alter local fuel characteristics by changing community structure, litter dynamics, fuel arrangement, and understory temperatures. In Michigan, understory structure in a mixed-hardwood dune successional forest was changed when mats of common periwinkle replaced canopy tree seedlings and herbaceous understory plants [17]. Common periwinkle also greatly reduced the overall accumulation of leaf litter in this area (Bultman personal observation cited in [17]). In mature oak-hickory forest in southwestern Illinois, common periwinkle in the understory led to an increase in the amount of vegetated surface area [88]. Near Sydney, Australia, areas dominated by bigleaf periwinkle had significantly cooler temperatures than sites with little bigleaf periwinkle cover ($P < 0.01$) [31]. The impact of these altered fuel characteristics likely varies based on departure from historical conditions and the dynamics of local fire regimes.</p>
4.09	<p>1. Stone, Katharine R. 2009. <i>Vinca major</i>, <i>V. minor</i>. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, November 20]. 2. Global Invasive Species Database (http://issg.org/database/species/ecology.asp?si=487&fr=1&sts=&lang=EN [assessed 27 Nov 2017])</p>	<p>1. <i>Vinca major</i> has the ability to grow in moist soils in partial sun or in poor soil in complete shade. 2. <i>Vinca major</i> grows in shady conditions. It is commonly found at the base of trees and near drainage pipes where shade is plentiful.</p>
4.10	<p>1. Stone, Katharine R. 2009. <i>Vinca major</i>, <i>V. minor</i>. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, November 20]. 2. DiTomaso, J.M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California. 544 pp. [assessed 21 Jan 2018]</p>	<p>1. Known to grow in a variety of soils derived from granite, gneiss, limestone and schist. <i>Vinca major</i> has the ability to grow in moist soils in partial sun or in poor soil in complete shade. 2. <i>Vinca major</i> prefers medium loam soils, but can tolerate clays and alkaline soils.</p>
4.11	<p>1. Weber, E. (2003). Invasive Plant Species of the World: A reference guide to environmental weeds. United Kingdom: CABI. 2. Global Invasive Species Database (http://issg.org/database/species/ecology.asp?si=487&fr=1&sts=&lang=EN [assessed 27 Nov 2017])</p>	<p>1. Forms dense thickets along the ground. 2. <i>Vinca major</i> forms dense thickets of plant material smothering native ground vegetation.</p>
4.12	<p>1. Weber, E. (2003). Invasive Plant Species of the World: A reference guide to environmental weeds. United Kingdom: CABI. 2. Global Invasive Species Database (http://issg.org/database/species/ecology.asp?si=487&fr=1&sts=&lang=EN [assessed 27 Nov 2017])</p>	<p>1. Smothers plants along the ground and crowds native species. 2. <i>Vinca major</i> forms dense thickets of plant material smothering native ground vegetation.</p>
5.01	<p>1. Weber, E. (2003). Invasive Plant Species of the World: A reference guide to environmental weeds. United Kingdom: CABI. 2. Encyclopedia of Life (http://eol.org/pages/585624/details [assessed 4 Dec 2017])</p>	<p>1. Invades "forests, grassland, riparian habitats, and coastal dunes." 2. Family: Apocynaceae</p>

5.02	Encyclopedia of Life (http://eol.org/pages/585624/details [assessed 4 Dec 2017])	Family: Apocynaceae
5.03	Encyclopedia of Life (http://eol.org/pages/585624/details [assessed 4 Dec 2017])	Family: Apocynaceae
5.04	Encyclopedia of Life (http://eol.org/pages/585624/details [assessed 4 Dec 2017])	
6.01		No evidence.
6.02	1. Australian Association of Bush Regenerators (http://www.aabr.org.au/images/stories/resources/ManagementGuides/WeedGuides/wmg_periwinkle.pdf [assessed 19 Jan 2018]) 2. New South Wales Department of Primary Industries (http://weeds.dpi.nsw.gov.au/Weeds/Details/308 [assessed 21 Jan 2018])	1. Vinca major spreads primarily through vegetative means; however, in recent years there have been documentations of the species producing viable seeds. 2. Vinca major can produce viable seeds, although this is not very common as it primarily reproduces vegetatively.
6.03		No evidence.
6.04	1. Fryxell, Paul A. 1957. Mode of reproduction of higher plants. Botanical Review. 23: 135-233. [67749] [assessed 4 Dec 2017]	1. Identified as self-incompatible.
6.05	1. Climbers: Censusing Lianas In Mesic Biomes of Eastern Regions (http://climbers.lsa.umich.edu/?p=418 [assessed 21 Jan 2018])	1. Known to attract bees, hawkmoths and a variety of other insects.
6.06	1. Weber, E. (2003). Invasive Plant Species of the World: A reference guide to environmental weeds. United Kingdom: CABI. 2. Stone, Katharine R. 2009. Vinca major, V. minor. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, November 20]. 3. Australian Association of Bush Regenerators (http://www.aabr.org.au/images/stories/resources/ManagementGuides/WeedGuides/wmg_periwinkle.pdf [assessed 19 Jan 2018])	1. Spreads primarily through vegetative growth. 2. Reproduces through vegetative spread. 3. Stems sprout from the nodes and tips of previously established stems allowing the Vinca major to spread rapidly.
6.07	1. Stone, Katharine R. 2009. Vinca major, V. minor. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, November 20].	Vinca major flowers from March to June. In north central Texas it has the potential to bloom all year around. In the Carolinas it produces fruit in June and July.
7.01	1. Global Invasive Species Database (http://issg.org/database/species/ecology.asp?si=487&fr=1&sts=&lang=EN [assessed 4 Dec 2017]) 2. DiTomaso, J.M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California. 544 pp. [assessed 4 Dec 2017] 3. Australian Association of Bush Regenerators (http://www.aabr.org.au/images/stories/resources/ManagementGuides/WeedGuides/wmg_periwinkle.pdf [assessed 19 Jan 2018])	1. Found along roadsides and in cemeteries, lawns and waste areas. 2. Considered to a common ground cover in urban areas. 3. Plant fragments have the potential to spread through garden waste and the movement of soil and water. "It spreads from gardens, roadsides, nature strips, firebreaks, fencelines, and neglected rubbish dumps into the bush along waterways."
7.02	1. Australian Association of Bush Regenerators (http://www.aabr.org.au/images/stories/resources/ManagementGuides/WeedGuides/wmg_periwinkle.pdf [assessed 19 Jan 2018]) 2. Greenwood Nursery (https://www.greenwoodnursery.com/categories/all-perennial-plants-for-sale/vinca-major-fast-growing-ground-cover [assessed 19 Jan 2018])	1. Vinca major is an ornamental plant with medicinal properties. It spreads through vegetative means, which allows it to cover large areas of lands quickly. 2. Since Vinca major is a common ornamental plant it is sold in nurseries across the United States.

7.03		No evidence.
7.04	1. Global Invasive Species Database (http://issg.org/database/species/ecology.asp?si=487&fr=1&sts=&lang=EN [assessed 27 Nov 2017])	1. Seeds are mostly likely to be transported by wind in warm climate zones.
7.05	1. DiTomaso, J.M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California. 544 pp. [assessed 4 Dec 2017] 2. Global Invasive Species Database (http://issg.org/database/species/ecology.asp?si=487&fr=1&sts=&lang=EN [assessed 27 Nov 2017]) 2. Australian Association of Bush Regenerators (http://www.aabr.org.au/images/stories/resources/Management Guides/WeedGuides/wmg_periwinkle.pdf [assessed 19 Jan 2018])	1. "In riparian areas, water currents can fragment stems and carry them downstream where they may take root if lodged in a suitable location." 2. Vinc major plant fragments have the potential to be transported by floods and water movement, as the species commonly grows along river banks.
7.06		No evidence.
7.07		No evidence.
7.08		No evidence.
8.01	1. Stone, Katharine R. 2009. Vinca major, V. minor. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, December 5] 2. Australian Association of Bush Regenerators (http://www.aabr.org.au/images/stories/resources/Management Guides/WeedGuides/wmg_periwinkle.pdf [assessed 21 Jan 2018])	1. Seedlings are occasionaly found. It has been reported that Vinca major does not reproduce by seed when grown in the wild in California. 2. Vinca major produces fruit which each contain approximately 1 to 10 seeds.
8.02	Stone, Katharine R. 2009. Vinca major, V. minor. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2018, January 18].	Little to no information is known about seed banks in periwinkles. It has been observed that Vinca major is the primary vegetation in riparian areas of the Huachuca Mountains in Arizona; however, it is a very small portion of the seed bank in that area.
8.03	1. Stone, Katharine R. 2009. Vinca major, V. minor. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, November 27]. Weber, E. (2003). 2. Invasive Plant Species of the World: A reference guide to environmental weeds. United Kingdom: CABI. 3. Global Invasive Species Database (http://issg.org/database/species/ecology.asp?si=487&fr=1&sts=&lang=EN [assessed 27 Nov 2017])	1. Small infestations can be effectivly treated with herbicides. Herbicides are not as effective in long term control of larger infestations. 2. Small plants can be easily dug ot of the grown. Large plants can be mowed over and treated with herbicides like glyphosate and triclopyr. 3. Effective chemical controls include paraquat (oxyflurfen), Goal (oxyflurfen), Fenuron, 2,4-D, and 2,3,6-TBA.
8.04	DiTomaso, J.M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California. 544 pp. [assessed 4 Dec 2017]	1. It is advised not to mow or cut Vinca major because the plant will resprout and fragments are easily reestablished in new environments.
8.05	DiTomaso, J.M., G.B. Kyser et al. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California. 544 pp. [assessed 4 Dec 2017]1	No known biological control agents.