

Taxon: <i>Vinca minor</i>	Family: Apocynaceae
Common Name(s): common periwinkle lesser periwinkle running-myrtle	Synonym(s): <i>Pervinca heterophylla</i> Raf. <i>Pervinca procumbens</i> Gilib. <i>Pervinca repens</i> Raf. <i>Vinca acutiflora</i> Bertol. ex W.D.J.Koch <i>Vinca ellipticifolia</i> Stokes <i>Vinca humilis</i> Salisb. <i>Vinca intermedia</i> Tausch

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 5 Jan 2016
WRA Score: 8.5	Designation: H(HPWRA)	Rating: High Risk

Keywords: Perennial Herb, Environmental Weed, Toxic, Smothering, Spreads Vegetatively

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)	Low
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
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)	y
303	Agricultural/forestry/horticultural weed		
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		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	y
405	Toxic to animals	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans		
408	Creates a fire hazard in natural ecosystems		
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	y
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed		
603	Hybridizes naturally		
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)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
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	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m ²)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
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)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	[Assessment for wild type, with no evidence of being highly domesticated] "Numerous periwinkle cultivars are available [30,66]."

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2015. 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"	Low
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	"Common periwinkle is native across all of continental Europe as far north as the Baltic States [86]."

202	Quality of climate match data	High
	Source(s)	Notes
	Stone, K. 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/ . [Accessed]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes

Qsn #	Question	Answer
	Stone, K. 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/ . [Accessed 4 Jan 2016]	"Elevation: Periwinkles occur at a range of elevations from sea level to 7,500 feet (2,300 m)."
	Missouri Botanical Garden. 2016. <i>Vinca minor</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=u760 . [Accessed 4 Jan 2016]	"Zone: 4 to 8" [5 hardiness zones]

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 4 Jan 2016]	[Reported to be naturalized in the following regions, including Florida, which is partially subtropical] "Southeastern U.S.A.: United States - Florida, - Georgia, - Maryland, - North Carolina, - Tennessee, - Virginia "

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	"Both bigleaf [51,55,92,107] and common [29,42,50,55,97,100,103,117] periwinkle are frequently planted in North America and escape from cultivation."
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 1 Jan 2016]	Widely introduced and naturalized

301	Naturalized beyond native range	y
	Source(s)	Notes
	Staples, G.W. & Herbst, D.R. 2005. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Common periwinkle is fairly abundant on Maui, Kauai and Hawaii in gardens above 3000' elevation."
	Stone, K. 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/ . [Accessed 31 Dec 2015]	"Common periwinkle occurs in every state in the eastern United States from Minnesota south to Louisiana. It is discontinuously distributed in the western United States, occurring in Nebraska, Kansas, Texas, Arizona, Utah, Oregon, Washington, and Montana."

Qsn #	Question	Answer
	<p>USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 1 Jan 2016]</p>	<p>"Naturalized: Asia-Temperate China: China - Jiangsu Australasia New Zealand: New Zealand Europe East Europe: Estonia Northern Europe: Ireland; Norway; Sweden; United Kingdom Southeastern Europe: Bulgaria Northern America Eastern Canada: Canada - Quebec, - Nova Scotia, - Ontario, - New Brunswick North-Central U.S.A.: United States - Illinois, - Iowa, - Kansas, - Missouri, - Nebraska, - Wisconsin Northeastern U.S.A.: United States - Connecticut, - Indiana, - Maine, - Massachusetts, - Michigan, - New Hampshire, - New Jersey, - New York, - Ohio, - Pennsylvania, - Rhode Island, - Vermont, - West Virginia South-Central U.S.A.: United States - Texas Southeastern U.S.A.: United States - Florida, - Georgia, - Maryland, - North Carolina, - Tennessee, - Virginia Western Canada: Canada - British Columbia"</p>

302	Garden/amenity/disturbance weed	y
	Source(s)	Notes
	<p>Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA</p>	<p>"It is often found around old homesites and in open forests."</p>
	<p>Eom, S. H., Senesac, A. F., Tsontakis-Bradley, I., & Weston, L. A. (2005). Evaluation of herbaceous perennials as weed suppressive groundcovers for use along roadsides or in landscapes. <i>Journal of Environmental Horticulture</i>, 23(4), 198-203</p>	<p>"<i>Vinca minor</i> (periwinkle), although slow to establish in full sun conditions, gradually spread outside of the planting area after two years, and was generally unsightly due to weed infestation. This groundcover is listed as a potentially invasive species."</p>

Qsn #	Question	Answer
	Dave's Garden. 2016. Common Periwinkle, Creeping Myrtle, Flower-of-Death - <i>Vinca minor</i> . http://davesgarden.com/guides/pf/go/174/ . [Accessed 4 Jan 2016]	[Numerous comments describe invasiveness of this plant in gardens & managed landscapes] "On Mar 9, 2013, HeidiKHandmade from Vancouver, WA wrote: Have it and can't get rid of it! My mother thought that since the flowers were so pretty, we should plant it in the front flowerbeds...huge mistake! It choked out a young hibiscus tree and my five-year-old winter daphne...and the roses are shooting for the stars to get above it!" ... "On Mar 24, 2012, glb360 from Grand Prairie, TX wrote: Pretty when blooming but annoyed by its invasive habit (mine grows in the crown of a rose bush - ouch!). After reading the other posts I'll need to "ditch" the shovel and find a backhoe!" ... "On Jun 17, 2011, seran72 from Bozeman, MT wrote: Too invasive in my garden. Although I find it lovely, I finally had to dig it all up. And I mean DIG! It does not just pull up." ... "On Jun 29, 2009, l6blue from Coon Rapids, MN (Zone 4b) wrote: This will choke out everything but thistles and dandelions. Extremely invasive in my yard."

303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	Listed as an agricultural weed. No impacts specified

304	Environmental weed	y
	Source(s)	Notes
	Invasive Plant Species Assessment Working Group. 2007. Periwinkle - <i>Vinca minor</i> . www.invasivespecies.IN.gov	"Once established, <i>Vinca minor</i> forms a dense carpet to the exclusion of other plants. This creates a problem where it is competing with native flora. In ideal growth conditions, <i>Vinca minor</i> can spread with great rapidity by means of its arching stolons, which root at the tips."
	Swearingen, J.B., Slattery, B., Reshetiloff, K. & Zwicker, S. (2010). Plant Invaders of Mid-Atlantic Natural Areas, 4th ed. National Park Service and U.S. Fish and Wildlife Service, Washington, DC.	"Periwinkle has escaped cultivation and is invading natural areas throughout the eastern U.S. It inhabits open to shady sites including forests and often escapes from old homesites. Ecological Threat Periwinkle grows vigorously and forms dense and extensive mats along the forest floor, displacing native herbaceous and woody plant species."
	Bowen, B., Johnson, K., Franklin, S., Call, G. & Webber, M. (2002). Invasive Exotic Pest Plants in Tennessee. <i>Journal of the Tennessee Academy of Science</i> 77(2):45-48	"Rank 2. Significant Threat. Exotic plant species that possess characteristics of invasive species but are not presently considered to spread as easily into native plant communities as those species listed as Rank 1." [Includes <i>Vinca minor</i>]

Qsn #	Question	Answer
	Darcy, A. J., & Burkart, M. C. (2002). Allelopathic potential of <i>Vinca minor</i> , an invasive exotic plant in west Michigan forests. <i>Bios</i> , 73(4): 127-132	[Inhibits seedling recruitment] "The presence of fewer seedlings at <i>Vinca</i> plots than at paired non- <i>Vinca</i> plots in our seedling census (Figure 1) suggests strongly that <i>Vinca</i> has a significant, negative impact on woody seedlings. These results confirm our initial observations of the problem posed by the invasive species, and they concur with the concerns of Schulz and Thelen (2000)." ... "Control measures will be necessary to curb the threats posed by <i>V. minor</i> on the tree population structure in this nature preserve. We are currently comparing physical and chemical removal in an effort to find the most efficient management of the invasive plant (data not shown)."

305	Congeneric weed	y
	Source(s)	Notes
	Weber, E. 2003. <i>Invasive Plant Species of the World. A Reference Guide to Environmental Weeds.</i> CABI Publishing, Wallingford, UK	" <i>Vinca major</i> " ... "A fast growing plant that spreads mainly by vegetative growth. It is a vigorous creeper, occurring in large infestation in semi-shady conditions. The numerous intertwined stems form dense and thick mats that cover the ground, smother small plants and crowd out native species. Establishment of shrub and tree seedlings is prevented"

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Stone, K. R. 2009. <i>Vinca major, V. minor.</i> In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ . [Accessed 31 Dec 2015]	[No evidence] "Periwinkles are vines [42,113] with scrambling or trailing stolons up to 3 feet (1 m) long and vertical stems 1 foot (30 cm) high [72]. The succulent stems become somewhat woody at the caudex [72]." ... "Common periwinkle leaves are evergreen [113], narrow, elliptic, and 0.8 to 1.8 inches (2 to 4.5 cm) long [72]. Periwinkle flowers are violet to blue-lavender, with 5 petals radiating pinwheel-like at right angles from floral a tube. Flowers are infrequently white. The flowers of bigleaf periwinkle are larger than those of common periwinkle [72]."

402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Darcy, A. J., & Burkart, M. C. (2002). Allelopathic potential of <i>Vinca minor</i> , an invasive exotic plant in west Michigan forests. <i>Bios</i> , 73(4): 127-132	[Possibly] " <i>Vinca minor</i> , a trailing, evergreen groundcover often praised for its landscaping value, has been overlooked as a forest invader that can alter forest dynamics significantly. This study demonstrates the invasive plant's pattern of inhibiting tree-seedling recruitment in a hardwood forest in western Michigan and explores allelopathy and light competition as possible mechanisms for its dominance. A census of woody seedlings showed that plots with dense <i>Vinca</i> had significantly lower tree seedling density than plots with either sparse <i>Vinca</i> cover or control plots with no <i>Vinca</i> . Laboratory bioassays with seeds grown on extracts from whole <i>Vinca</i> suggested the possibility of an allelopathic effect on root growth. Regardless of whether we removed <i>Vinca</i> leaves or both leaves and root systems, survival of <i>Acer saccharum</i> seedlings in test plots was 80% at 11 months. In contrast, none of the 60 transplants survived in adjacent plots with intact <i>Vinca</i> growth or in those with intact <i>Vinca</i> root systems and shadecloth that simulated the shading effects of dense <i>Vinca</i> cover. Overall, our results point to shading as the chief cause for tree-seedling suppression under dense <i>Vinca</i> , although allelopathic inhibition may contribute. If <i>Vinca</i> continues to spread, its effects on seedling recruitment will eventually prevent replacement of canopy trees."

403	Parasitic	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	"Periwinkles are vines [42,113] with scrambling or trailing stolons up to 3 feet (1 m) long and vertical stems 1 foot (30 cm) high [72]. The succulent stems become somewhat woody at the caudex [72]." [Apocynaceae. No evidence]

404	Unpalatable to grazing animals	y
	Source(s)	Notes
	Kaufman, S.R. & Kaufman, W. 2012. <i>Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species</i> . Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Leaves are toxic to most or all grazers," [Browsers likely deterred by toxic compounds]
	Stone, K. 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/ . [Accessed 31 Dec 2015]	[Uncommonly browsed] "Palatability and/or nutritional value: Periwinkles are generally unpalatable and have little nutritional value." ... "Common periwinkle was an infrequent food item of the volcano rabbit in Mexico [20] and white-tailed deer in Indiana [91]. Caged Canada geese would not feed on common periwinkle, even when it was the only forage available [23]."

405	Toxic to animals	y
	Source(s)	Notes

Qsn #	Question	Answer
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Leaves are toxic to most or all grazers, and seeds are too small for birds, so when it displaces native plants, it also displaces food sources for wildlife."

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Missouri Botanical Garden. 2016. <i>Vinca minor</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=u760 . [Accessed 4 Jan 2016]	"No serious insect problems but vinca stem canker (blight) can damage or kill large patches."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	Notes
	Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Contact dermatitis" [Sap may be allergenic]
	Knight, A. 2007. A Guide to Poisonous House and Garden Plants. CRC Press, Boca Raton, FL	"Numerous alkaloids including alstronine, reserpine, vinblastine, vincristine, and yohimbine are present in all parts of the plant and have hypotensive, digestive and neurotoxic effects if consumed in large doses.' .' Some alkaloids such as reserpine reduce blood pressure, while vinblastine and vincristine affect bone marrow cells and have been used effectively for the treatment of leukemias.' These alkaloids inhibit mitosis through binding of tubulin and arresting microtubule formation. They also have neurotoxic and teratogenic effects in mice."

408	Creates a fire hazard in natural ecosystems	
	Source(s)	Notes
	Kuhns, M. (1998). Firewise Plants for Utah Landscapes. Utah State University Extension. Logan, Utah	"The following table lists plants and groups of plants that can be firewise if used properly in the landscape and properly maintained." [Includes <i>Vinca minor</i> & <i>Vinca major</i>]
	Stone, K. 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/ . [Accessed 4 Jan 2016]	[Unknown] "It is unclear how the presence of periwinkles may affect fire regimes in invaded communities. In ecosystems where periwinkles replace plants with similar fuel characteristics, they may alter fire intensity or slightly modify an existing fire regime. If periwinkle spread introduces novel fuel properties to the invaded ecosystem, fire behavior, and potentially fire regime, may be altered (see these citations: [14,26]). This topic warrants additional study."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes

Qsn #	Question	Answer
	Swearingen, J.B., Slattery, B., Reshetiloff, K. & Zwicker, S. (2010). <i>Plant Invaders of Mid-Atlantic Natural Areas</i> , 4th ed. National Park Service and U.S. Fish and Wildlife Service, Washington, DC.	"It inhabits open to shady sites including forests and often escapes from old homesites."
	Staples, G.W. & Herbst, D.R. 2005. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"It requires a cool, partially shaded location and is cultivated primarily as a ground cover for erosion control."
	Stone, K. R. 2009. <i>Vinca major, V. minor</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ . [Accessed 4 Jan 2016]	"Periwinkles are not restricted to either seral or climax plant communities. They tolerate both sun [68,101] and shade ([66,68,76,99], reviews by [7,111]). They may be found in habitats created and/or maintained by long-term human disturbance (e.g., roadsides, cemeteries, old fields) [3,18,42,47,48,55,78,94,97,100,103] or in relatively undisturbed areas such as forest understories [4,9,32,37,40,70,71,88,112]."
	Missouri Botanical Garden. 2016. <i>Vinca minor</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=u760 . [Accessed 4 Jan 2016]	"Tolerates full shade. Prefers moist, humusy soils in part shade."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Stone, K. R. 2009. <i>Vinca major, V. minor</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ . [Accessed 4 Jan 2016]	"Soils: Periwinkles are found on soils with a range of characteristics." ... " In its native range, common periwinkle is associated with soils of varying textures [35,44,53]. Common periwinkle occurs on silt loams in Ohio [58] and Illinois [88], clayey, loamy, and sandy soils in the Northeast [68], and rocky, sandy soil in Missouri [99]." ... "Common periwinkle prefers moist sites [28,76,88], though it tolerates moderately well-drained soil [68]. While some sources suggest common periwinkle prefers fertile soil ([28], review by [25]), one source states that common periwinkle tolerates soils of low fertility [68]. In the oak-beech forest region of France, common periwinkle occurred on shallow soils ranging from 5.7 to 8.7 inches (14.4-22.1 cm) deep [35]. In its nonnative range, common periwinkle occurs on acid soils [18,68,88]. In France, common periwinkle occurred on soils with pH ranging from 6.7 to 7.2 [35]."

411	Climbing or smothering growth habit	y
	Source(s)	Notes
	Swearingen, J.B., Slattery, B., Reshetiloff, K. & Zwicker, S. (2010). <i>Plant Invaders of Mid-Atlantic Natural Areas</i> , 4th ed. National Park Service and U.S. Fish and Wildlife Service, Washington, DC.	"Periwinkle grows vigorously and forms dense and extensive mats along the forest floor, displacing native herbaceous and woody plant species." ... "Plant: vine-like erect or trailing groundcover; mostly evergreen; stems slender."
	Stone, K. R. 2009. <i>Vinca major, V. minor</i> . In: <i>Fire Effects Information System</i> , [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ . [Accessed 4 Jan 2016]	"Periwinkles are vines [42,113] with scrambling or trailing stolons up to 3 feet (1 m) long and vertical stems 1 foot (30 cm) high [72]. The succulent stems become somewhat woody at the caudex [72]."

Qsn #	Question	Answer
	Darcy, A. J., & Burkart, M. C. (2002). Allelopathic potential of <i>Vinca minor</i> , an invasive exotic plant in west Michigan forests. <i>Bios</i> , 73(4): 127-132	[Smothering habit]]Forms dense cover on forest floor. Habit is smothering. See 4.11] "We studied the pattern of invasion by <i>Vinca minor</i> in a West Michigan forest and its mechanisms of inhibiting native trees. In the mature beech-maple forest we studied, dense patches of <i>Vinca</i> support very few seedlings of canopy tree species, suggesting a direct inhibitory effect of <i>Vinca</i> on seedling recruitment."

412	Forms dense thickets	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	"In Tennessee, common periwinkle formed dense mats in the understory of a second-growth oak hickory (<i>Carya</i> spp.) forest that contained maples [32]."
	Darcy, A. J., & Burkart, M. C. (2002). Allelopathic potential of <i>Vinca minor</i> , an invasive exotic plant in west Michigan forests. <i>Bios</i> , 73(4): 127-132]Forms dense cover on forest floor. Habit is smothering. See 4.11] "We studied the pattern of invasion by <i>Vinca minor</i> in a West Michigan forest and its mechanisms of inhibiting native trees. In the mature beech-maple forest we studied, dense patches of <i>Vinca</i> support very few seedlings of canopy tree species, suggesting a direct inhibitory effect of <i>Vinca</i> on seedling recruitment."

501	Aquatic	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	[Terrestrial herb] "Periwinkles are vines [42,113] with scrambling or trailing stolons up to 3 feet (1 m) long and vertical stems 1 foot (30 cm) high [72]."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 4 Jan 2016]	"Family: Apocynaceae Juss., nom. cons. subfam. Rauvolfioideae tribe Vinceae"

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 4 Jan 2016]	"Family: Apocynaceae "

Qsn #	Question	Answer
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	"Common periwinkle plants in western Montana exhibited fibrous roots ranging from 1 to 3 inches (3-8 cm) long [96]."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	[No evidence. Widespread distribution] "Common periwinkle generally flowers from between March and June depending on location [4,29,42,45,50,78,97]. In Georgia, most common periwinkle flowering occurs in early March, though flowering was observed as early as 28 February [40]. Common periwinkle fruits are produced from May to July in the southeastern United States ([78], review by [72])."

602	Produces viable seed	
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	"Common periwinkle rarely produces seeds [45,113]."
	Swearingen, J.B., Slattery, B., Reshetiloff, K. & Zwicker, S. (2010). <i>Plant Invaders of Mid-Atlantic Natural Areas</i> , 4th ed. National Park Service and U.S. Fish and Wildlife Service, Washington, DC.	"no fruits or seeds typically."

603	Hybridizes naturally	
	Source(s)	Notes
	WRA Specialist. 2015. Personal Communication	Unknown

604	Self-compatible or apomictic	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	"Pollination and breeding system: Periwinkles are cross-pollinating plants [38]."

Qsn #	Question	Answer
	Hickey, M. & King, C.1988. 100 Families of Flowering Plants. Cambridge University Press, Cambridge, UK	"The reproductive organs are highly specialised to prevent self-pollination."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Willmer, P., & Finlayson, K. (2014). Big bees do a better job: intraspecific size variation influences pollination effectiveness. <i>Journal of Pollination Ecology</i> , 14: 244-254	"Laboratory studies with <i>B. terrestris</i> workers and <i>Vinca minor</i> flowers showed that pollination effectiveness PE, as measured from pollen grains deposited on stigmas in single visits (SVD), was significantly positively related to bee size; larger bees deposited more grains, while the smallest individuals, with proportionally shorter tongues, were unable to collect or deposit pollen in these flowers. Individuals did not increase their pollen deposition over time, so handling experience does not influence SVD in <i>Vinca minor</i> ." ... " <i>Vinca minor</i> (Apocynaceae) was the test flower, being native to temperate Europe (Fjell 1983) and pollinated by several insect genera, including <i>Bombus</i> spp. (Horwood 1919)."
	Hickey, M. & King, C.1988. 100 Families of Flowering Plants. Cambridge University Press, Cambridge, UK	"Long-tongued bees and bee-flies are attracted by the colour of the flowers and by the nectar secreted by the pair of nectaries situated at the base of the ovary. The reproductive organs are highly specialised to prevent self-pollination."
	Moré, M., Sérsic, A.N. & Cocucci, A.A. (2007) Restriction of pollinator assemblage through flower length and width in three longtongued hawkmoth-pollinated species of <i>Mandevilla</i> (Apocynaceae, Apocynoideae). <i>Annals of the Missouri Botanical Garden</i> 94: 485–504	"Schick (1982) centered his studies on the function of the pollination mechanism in two species, <i>Apocynum cannabinum</i> L. and <i>Vinca minor</i> L., which are visited (but not always pollinated) by a diverse array of insects."

606	Reproduction by vegetative fragmentation	y
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	"Vegetative regeneration: Vegetative regeneration is very important to the establishment and spread of both bigleaf ([74,113], reviews by [81,111]) and common ([66,88], review by [81]) periwinkles." ... "Periwinkles form mats and extensive infestations even under forest canopies ([32], review by [72]). Given their ability to spread with the dumping of yard waste ([17,37], review by [10]), it is likely that periwinkles establish from plant fragments."
	Darcy, A. J., & Burkart, M. C. (2002). Allelopathic potential of <i>Vinca minor</i> , an invasive exotic plant in west Michigan forests. <i>Bios</i> , 73(4): 127-132	" <i>Vinca</i> propagates moderately fast (MacKenzie, 1989), facilitated by vegetative reproduction, whereby the plant may root from stem nodes in all directions (Wyman, 1956)."

Qsn #	Question	Answer
607	Minimum generative time (years)	1
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	"Most periwinkle reproduction occurs through vegetative spread. Seeds are rarely produced" [Whether or not plants set seed, the ability to spread by vegetative means suggests plants will be able to reproduce within one year]

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	"Given their ability to spread with the dumping of yard waste ([17,37], review by [10]), it is likely that periwinkles establish from plant fragments."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 31 Dec 2015]	"Both bigleaf [51,55,92,107] and common [29,42,50,55,97,100,103,117] periwinkle are frequently planted in North America and escape from cultivation."

703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	[Unlikely given limited or lack of seed production] "Periwinkle spreads mainly from underground runners and from rootlets formed at leaf nodes. It seldom reproduces from seeds."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	"Some authors suggest that common periwinkle has no active dispersal mechanism [44]. One review states that common periwinkle does not spread to new areas by seed in its nonnative range [81]."

705	Propagules water dispersed	y
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Qsn #	Question	Answer
	Source(s)	Notes
	DiTomaso, J. 2007. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	"In riparian areas, water currents can fragment stems and carry them downstream where they may root if lodged in a suitable place." [Description of <i>V. major</i> . <i>V. minor</i> can also spread by vegetative fragments, & would presumably be moved by water if occurring in riparian areas]
	Harrison, M. 2006. Groundcovers for the South. Pineapple Press Inc., Sarasota, FL	"Spread is caused by floating vegetation and debris and by dumping of garden refuse. Stem fragments root wherever they land."

706	Propagules bird dispersed	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	"Some authors suggest that common periwinkle has no active dispersal mechanism [44]. One review states that common periwinkle does not spread to new areas by seed in its nonnative range [81]."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	"Common periwinkle seeds are dispersed by ants in its native range [54,56]."

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	[Unlikely. Not fleshy-fruited, & plants unpalatable & unlikely to be consumed] "Periwinkle fruits are slender, cylindrical follicles up to 2 inches (5 cm) long [72]. Follicles dry, split, and release 3 to 5 seeds (review by [72]). Periwinkle seeds are naked and without a coma [29]." ... "Periwinkles are generally unpalatable and have little nutritional value."

801	Prolific seed production (>1000/m2)	n
	Source(s)	Notes
	Stone, K. 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/ . [Accessed]	"Common periwinkle rarely produces seeds [45,113]."

802	Evidence that a persistent propagule bank is formed (>1 yr)	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	[Unlikely given limited seed production] "Common periwinkle rarely produces seeds [45,113]." ... "Seed banking: There is limited information on seed banking in periwinkles." ... "In laboratory studies, common periwinkle seeds exhibited an "extended dormancy period"; 70% germination occurred after 30 days using a combination of acid scarification and 90-day cold stratification. No germination occurred after 30-day stratification-scarification treatment or scarification treatment alone [110]."

803	Well controlled by herbicides	y
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	"Both bigleaf ([39,114], review by [7]) and common [98] periwinkle are damaged by some herbicides. The waxy leaf cuticle of bigleaf periwinkle makes herbicide penetration difficult (review by [7]). Spot treatment with herbicides may be effective on isolated periwinkle plants (review by [81])."
	Kaufman, S.R. & Kaufman, W. 2012. <i>Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species</i> . Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Herbicides with glyphosate are the most effective control. Triclopyr also works but not as effectively."
	Weber, E. 2003. <i>Invasive Plant Species of the World. A Reference Guide to Environmental Weeds</i> . CABI Publishing, Wallingford, UK	"Larger infestations can be mown or slashed and the regrowth treated with herbicide. Effective herbicides are glyphosate or triclopyr. Follow-up treatments are necessary to control seedlings and regrowth" [Control methods for <i>Vinca major</i> would presumably also be effective for <i>V. minor</i>]
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. 2013. <i>Weed Control in Natural Areas in the Western United States</i> . Weed Research and Information Center, University of California, Davis, CA	Picloram, Triclopyr, Glyphosate, & Imazapyr are listed as effective at controlling <i>Vinca major</i> . Such control measures would presumably also be effective for <i>V. minor</i>

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	"Given their ability to spread with the dumping of yard waste ([17,37], review by [10]), it is likely that periwinkles establish from plant fragments." [Cuttings will resprout & spread plant]
	Swearingen, J.B., Slattery, B., Reshetiloff, K. & Zwicker, S. (2010). <i>Plant Invaders of Mid-Atlantic Natural Areas</i> , 4th ed. National Park Service and U.S. Fish and Wildlife Service, Washington, DC.	"Periwinkle can be pulled by hand, dug up or raked up, being sure to remove underground portions. Where appropriate, mowing can be used to cut plants back but will likely have to be repeated regularly. Mowing followed soon after by application of a systemic herbicide would improve control greatly"

Qsn #	Question	Answer
	Kaufman, S.R. & Kaufman, W. 2012. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species. Second Edition, Revised and Updated. Stackpole Books, Mechanicsburg, PA	"Small populations can be pulled by hand, but often root fragments will produce new growth."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Stone, K. 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/ . [Accessed 4 Jan 2016]	[Unknown in Hawaiian Islands] "While no specific biological control programs existed for periwinkles as of 2009, common periwinkle is susceptible to fungal foliar diseases that cause leaf and stem lesions and stem death [63]."

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, demonstrating environmental versatility
- Widely naturalized (not documented in the Hawaiian Islands)
- Garden & environmental weed
- *Vinca major* is also invasive
- Relatively unpalatable to browsing & grazing animals
- Toxic to animals & potentially toxic, & allergenic to humans
- Shade tolerant
- Tolerates many soil types
- Forms thick mats that smother the ground & low-growing vegetation
- Reproduces rapidly by vegetative means
- Vegetative fragments spread in garden waste, & by water
- Able to resprout after cutting

Low Risk Traits

- Unarmed (no spines, thorns or burrs)
- Ornamental & medicinal uses
- Rarely, if ever, produces seeds in introduced range
- Lack of seed production may limit ability to disperse & spread
- Certain herbicides may provide effective control