

Taxon: <i>Nemophila menziesii</i>	Family: Boraginaceae
Common Name(s): baby blue eyes California bluebell	Synonym(s): <i>N. menziesii</i> subsp. <i>insignis</i> (Douglas) <i>Nemophila menziesii</i> var. <i>discoidalis</i>

Assessor: Assessor	Status: Assessor Approved	End Date: 17 Sep 2014
WRA Score: 8.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Annual Herb, Naturalized, Self-Compatible, Bee-Pollinated, Seed Dormancy

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Intermediate
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	n
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	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)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed		
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		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y

Qsn #	Question	Answer Option	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	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	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
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)		
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
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		
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides		
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Baldwin, B.G., Goldman, D.H., Keil, D.J., Patterson, R., & Rosatti, T.J. (eds.). 2012. The Jepson Manual. Vascular Plants of California, Second Edition, Thoroughly Revised and Expanded. University of California Press, Berkeley and Los Angeles	No evidence

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	Intermediate
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 15 Sep 2014]	"Native: NORTHERN AMERICA Northwestern U.S.A.: United States - Oregon [w.] Southwestern U.S.A.: United States - California Northern Mexico: Mexico - Baja Norte [n.]"

202	Quality of climate match data	High
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed]	

Qsn #	Question	Answer
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Missouri Botanical Garden. 2014. <i>Nemophila menziesii</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b759 . [Accessed 15 Sep 2014]	[Can be grown in 5+ hardiness zones] "Zone: 2 to 11"
	Cruden, R. W. 1974. The adaptive nature of seed germination in <i>Nemophila menziesii</i> Aggr. <i>Ecology</i> 55(6): 1295-1305	[Elevation range exceeds 1000 m. Demonstrates environmental versatility] "The plants occur in many communities from sea level to altitudes of over 5000 ft (1515 m). In general they are components of more xeric communities in southern California and more mesic communities in northern California."

204	Native or naturalized in regions with tropical or subtropical climates	n
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 16 Sep 2014]	"Native: NORTHERN AMERICA Northwestern U.S.A.: United States - Oregon [w.] Southwestern U.S.A.: United States - California Northern Mexico: Mexico - Baja Norte [n.]"
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence.

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Dave's Garden. 2014. PlantFiles: Baby Blue Eyes <i>Nemophila insignis</i> var. <i>menziesii</i> . http://davesgarden.com/guides/pf/go/54588/ . [Accessed 16 Sep 2014]	[Apparently widely cultivated outside native range within the United States] "This plant has been said to grow in the following regions: , (2 reports) Phoenix, Arizona Amesti, California Concord, California Richmond, California San Jose, California San Leandro, California San Lorenzo, California San Pedro, California Eatonton, Georgia Peabody, Massachusetts Somerville, Massachusetts Cambridge, Minnesota Ronkonkoma, New York North Augusta, South Carolina Lawrenceburg, Tennessee Austin, Texas Bulverde, Texas Richmond, Texas San Antonio, Texas Camano Island, Washington Tacoma, Washington Madison, Wisconsin"

301	Naturalized beyond native range	y
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 15 Sep 2014]	[Location unspecified] " <i>Nemophila menziesii</i> " ... "sometimes naturalized elsewhere "

Qsn #	Question	Answer
	EDDMapS Alaska. 2014. baby blue eyes. <i>Nemophila menziesii</i> Hook. & Arn. http://www.eddmaps.org/alaska/point.cfm?id=2777699 . [Accessed 16 Sep 2014]	[Naturalized in Alaska] "Project Description: A survey for A- and B-listed non-native plant species as well as those new to Alaska on primary and secondary roadsides within the Municipality of Anchorage (see Gary 2010 for A and B listed species, AKEPIC for species new to Alaska). Project Method: 4x25ft transects were read every 0.5mi on alternating sides of the roadway; A- and B-listed plant spp. were recorded. A, outlying B and spp. new to the state were recorded between transects. A, B and new species were recorded in high-priority locations. Percent Cover: 1"

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence. Listed as naturalized

303	Agricultural/forestry/horticultural weed	n
	Source(s)	Notes
	Sanguaneko, P. P., & León, R. G. 2011. Weed management practices determine plant and arthropod diversity and seed predation in vineyards. <i>Weed Research</i> , 51(4), 404-412	[<i>Nemophila menziesii</i> among species used as a cover crop to control weeds in vineyards] "Table 1 Species composition of the cover crop seeded in the berm in February of 2006 and 2007"
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence. Listed as naturalized

304	Environmental weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	No evidence. Listed as naturalized

305	Congeneric weed	n
	Source(s)	Notes
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	<i>Nemophila aphylla</i> listed as a weed of unspecified impacts. <i>Nemophila maculate</i> listed as a cultivation escape

Qsn #	Question	Answer
401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Abrams, L. & Ferris, R.S. 1923. An Illustrated Flora of the Pacific States: Geraniaceae to Scrophulariaceae, geraniums to figworts. Stanford University Press, Stanford, CA	[No evidence] "Stems succulent, diffuse, obscurely winged or angle, 1-3 dm. long, pubescent. Leaves all opposite, linear-oblong to oval, 2-5 cm. long, 0.8-2.5 cm. broad, pinnately divided into usually 9-1 oblong to orbicular, obtuse divisions, entire or 1-3-toothed, appressed-hispid;"

402	Allelopathic	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	Unknown

403	Parasitic	n
	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	[No evidence. Boraginaceae] "Annual herb, low-growing, slender, branching, pinnately lobed leaves, pale blue flowers, forage."

404	Unpalatable to grazing animals	
	Source(s)	Notes
	The Watershed Nursery. 2012. <i>Nemophila menziesii</i> . http://www.watershednursery.com/nursery/plant-finder/nemophila-menziesii/ . [Accessed 16 Sep 2014]	"Deer Resistant, Drought Resistant"
	Mullins, A. 2014. Field-edge planting to deter white-tailed deer and attract carabid beetles in soybean fields. MS Thesis. Dalhousie University, Halifax, Nova Scotia	"deer-resistant flower mix" [Includes Baby Blue-Eyes = <i>Nemophila menziesii</i>]

405	Toxic to animals	n
	Source(s)	Notes
	Crescent Bloom. 2004. <i>Nemophila menziesii</i> . http://crescentbloom.com/plants/specimen/NE/Nemophila20menziesii.htm . [Accessed 16 Sep 2014]	"Internal poison - no. Dermatologic poison - no. Livestock poison - no"
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

Qsn #	Question	Answer
406	Host for recognized pests and pathogens	n
	Source(s)	Notes
	Missouri Botanical Garden. 2014. <i>Nemophila menziesii</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b759 . [Accessed 15 Sep 2014]	"No serious insect or disease problems. Watch for aphids. Powdery and downy mildew may occur. Plants decline sharply in consistently hot and humid weather."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Global Species. 2014. <i>Nemophila menziesii</i> (baby blue eyes; baby blue-eyes). http://globalspecies.org/ntaxa/855985/L . [Accessed 16 Sep 2014]	"Allergen Potential [1] - Low"
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Riverside-Corona Resource Conservation District. 2011. Living on the Edge. www.rccrd.com/Publications/LivingontheEdge.pdf	"Annuals or summer-dormant perennials No need for water during summer. There is little, if any, plant material above ground to burn. California poppy, <i>Eschscholzia californica</i> Larkspurs, delphinium, <i>Delphinium parryi</i> , <i>D. cardinale</i> Wild Canterbury-bell, <i>Phacelia minor</i> California figwort, <i>Scrophularia californica</i> Baby blue eyes, <i>Nemophila menziesii</i> Royal penstemon, <i>Penstemon spectabilis</i> Lupine, <i>Lupinus</i> species (<i>L. bicolor</i> , <i>L. succulentus</i> , <i>L. truncatus</i> , <i>L. sparsiflorus</i>)"
	Santa Monica Mountains Fire Safe Alliance. 2010. A Road Map to Fire Safety. How to Create Defensible Space in the Santa Monica Mountains. County of Los Angeles, CA	"Appendix C: Fire-resistant Plants" ... "These California natives are good options for a fire-safe landscape." [List includes <i>Nemophila menziesii</i>]

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Wildflower Information.org. 2006. Baby Blue Eyes. <i>Nemophila menziesii</i> . http://www.wildflowerinformation.org/Wildflower.asp?ID=67 . [Accessed 16 Sep 2014]	"Sun/Shade: Prefers some shade to filtered sun "
	Missouri Botanical Garden. 2014. <i>Nemophila menziesii</i> . http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=b759 . [Accessed 15 Sep 2014]	"Sun: Full sun to part shade"
	Seedaholic. 2013. <i>Nemophila menziesii</i> 'Baby Blue Eyes'. http://www.seedaholic.com/nemophila-maculata-baby-blue-eyes.html . [Accessed 17 Sep 2014]	"They are used extensively to amazing effect at the Hitachi seaside park in Japan, the plants are also perfect for shaded areas: "nemophila" means "shade-lover"

Qsn #	Question	Answer
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Wildflower Information.org. 2006. Baby Blue Eyes. <i>Nemophila menziesii</i> . http://www.wildflowerinformation.org/Wildflower.asp?ID=67 . [Accessed 16 Sep 2014]	"Soil preference: Prefers light soils and dry conditions, but adaptable."

411	Climbing or smothering growth habit	n
	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	"Annual herb, low-growing, slender, branching, pinnately lobed leaves, pale blue flowers, forage."

412	Forms dense thickets	n
	Source(s)	Notes
	Baldwin, B.G., Goldman, D.H., Keil, D.J., Patterson, R., & Rosatti, T.J. (eds.). 2012. The Jepson Manual. Vascular Plants of California, Second Edition, Thoroughly Revised and Expanded. University of California Press, Berkeley and Los Angeles	[No evidence from native range. Annual growth habit would likely prevent formation of persistent dense stands]
	Wildflower Information.org. 2006. Baby Blue Eyes. <i>Nemophila menziesii</i> . http://www.wildflowerinformation.org/Wildflower.asp?ID=67 . [Accessed 16 Sep 2014]	[No evidence. Does not persist & exclude other vegetation] "Since this species blooms very quickly from seed, it is often a feature of early spring meadows where it adds wonderful color, and then since it is so short, it is quickly gone and covered by taller growing summer wildflowers. "

501	Aquatic	n
	Source(s)	Notes
	Cruden, R. W. 1974. The adaptive nature of seed germination in <i>Nemophila menziesii</i> Aggr. <i>Ecology</i> 55(6): 1295-1305	[Terrestrial] "The plants occur in many communities from sea level to altitudes of over 5000 ft (1515 m). In general they are components of more xeric communities in southern California and more mesic communities in northern California. Likewise, plants at higher elevations occur in more mesic habitats than those at lower elevations."

502	Grass	n
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 16 Sep 2014]	"Family: Boraginaceae subfamily: Hydrophylloideae. Also placed in: Hydrophyllaceae"

Qsn #	Question	Answer
503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: http://www.ars-grin.gov/ . [Accessed 16 Sep 2014]	"Family: Boraginaceae subfamily: Hydrophylloideae. Also placed in: Hydrophyllaceae"

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Wildflower Information.org. 2006. Baby Blue Eyes. <i>Nemophila menziesii</i> . http://www.wildflowerinformation.org/Wildflower.asp?ID=67 . [Accessed 16 Sep 2014]	"Annual. Lives just one year. Grows quickly, blooms heavily, dies with first frost. Can regrow following spring if seed falls on bare ground."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Cruden, R. W. 1972. Pollination biology of <i>Nemophila menziesii</i> (Hydrophyllaceae) with comments on the evolution of oligolectic bees. <i>Evolution</i> ,26(3): 373-389	"In this region, <i>N. menziesii</i> is relatively common from the Central Valley to elevations of over 3500 feet."
	Baldwin, B.G., Goldman, D.H., Keil, D.J., Patterson, R., & Rosatti, T.J. (eds.). 2012. <i>The Jepson Manual. Vascular Plants of California, Second Edition, Thoroughly Revised and Expanded.</i> University of California Press, Berkeley and Los Angeles	No evidence

602	Produces viable seed	y
	Source(s)	Notes
	Shaw, R. G., Byers, D. L., & Shaw, F. H. 1998. Genetic components of variation in <i>Nemophila menziesii</i> undergoing inbreeding: morphology and flowering time. <i>Genetics</i> , 150(4): 1649-1661	"...in the population we studied, unvisited flowers readily self-pollinate, and these flowers produce viable seeds (R. G. Shaw and D. L. Byers, personal observations)."
	Schmidt, M.G. 1980. <i>Growing California Native Plants.</i> University of California Press, Berkeley and Los Angeles, CA	"Baby Blue-Eyes are propagated from seed broadcast where wanted."
	Cruden, R. W. 1974. The adaptive nature of seed germination in <i>Nemophila menziesii</i> Aggr. <i>Ecology</i> 55(6): 1295-1305	"Seeds of all ages are able to germinate but germination of young seed is inhibited at temperatures that do not affect mature seed. Seed maturation is a function of high summer temperatures and aging."

603	Hybridizes naturally	
	Source(s)	Notes

Qsn #	Question	Answer
	Barr, C. M. 2004. Hybridization and regional sex ratios in <i>Nemophila menziesii</i> . <i>Journal of Evolutionary Biology</i> , 17 (4): 786-794	[No evidence of interspecific hybridization] "I tested whether a region of high female frequencies in the gynodioecious plant, <i>Nemophila menziesii</i> , may be due to hybridization between regionally distributed populations with different corolla colours. I crossed plants in the greenhouse from populations with different corolla colours and found that hybrid crosses yielded higher frequencies of females than within-colour crosses. In the field, I found that populations with high female frequencies had intermediate mean corolla colours and higher variance in corolla colour, two traits suggesting hybridization. <i>Nemophila menziesii</i> has nuclear-cytoplasmic sex inheritance, thus if populations with different corolla colours are fixed for different male-sterile cytoplasms and matching nuclear restorer alleles, hybridization between populations with different corolla colour should yield high frequencies of females. Two populations that are all hermaphroditic in the field segregated females in hybrid crosses suggesting that field populations may contain sex ratio distorters but appear undistorted, a prediction of genomic conflict theory."

604	Self-compatible or apomictic	y
	Source(s)	Notes
	Shaw, R. G., Byers, D. L., & Shaw, F. H. 1998. Genetic components of variation in <i>Nemophila menziesii</i> undergoing inbreeding: morphology and flowering time. <i>Genetics</i> , 150(4): 1649-1661	"...in the population we studied, unvisited flowers readily self-pollinate, and these flowers produce viable seeds (R. G. Shaw and D. L. Byers, personal observations)."
	Gomez, N. N., & Shaw, R. G. 2006. Inbreeding effect on male and female fertility and inheritance of male sterility in <i>Nemophila menziesii</i> (Hydrophyllaceae). <i>American Journal of Botany</i> , 93(5): 739-746	"Most <i>N. menziesii</i> flowers are hermaphroditic, with five stamens, pollen-bearing anthers, a bifurcated style, and two stigmas (Fig. 1). Flowers are protandrous, produce nectar, and are frequently pollinated by bees but can self-pollinate (Cruden, 1972; Andersson, 1994)."
	Cruden, R. W. 1972. Pollination biology of <i>Nemophila menziesii</i> (Hydrophyllaceae) with comments on the evolution of oligolectic bees. <i>Evolution</i> , 26(3): 373-389	"The flowers of <i>Nemophila</i> agg. are protandrous (Fig. 5) and self-compatible."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Cruden, R. W. 1972. Pollination biology of <i>Nemophila menziesii</i> (Hydrophyllaceae) with comments on the evolution of oligolectic bees. <i>Evolution</i> , 26(3): 373-389	"Although the flowers of <i>Nemophila</i> agg. are visited by individuals of many orders, Hymenoptera and Diptera usually compose 90% or more of the flower visitors. Throughout most of its distribution range four species of bees are the primary pollinators, viz. <i>Apis mellifera</i> , <i>Andrena macrocephala</i> , <i>Andrena torulosa</i> and <i>Andrena crudenii</i> . These bees are medium sized and have behavioral patterns which make them efficient pollinators."
	Gomez, N. N., & Shaw, R. G. 2006. Inbreeding effect on male and female fertility and inheritance of male sterility in <i>Nemophila menziesii</i> (Hydrophyllaceae). <i>American Journal of Botany</i> , 93(5): 739-746	"Most <i>N. menziesii</i> flowers are hermaphroditic, with five stamens, pollen-bearing anthers, a bifurcated style, and two stigmas (Fig. 1). Flowers are protandrous, produce nectar, and are frequently pollinated by bees but can self-pollinate (Cruden, 1972; Andersson, 1994)."

Qsn #	Question	Answer
606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Cruden, R. W. 1974. The adaptive nature of seed germination in <i>Nemophila menziesii</i> Aggr. <i>Ecology</i> 55(6): 1295-1305	[Annual. Spreads by seeds] " <i>Nemophila menziesii</i> aggr. includes three closely-related winter annual plants found in many communities in cismontane California and Oregon. The germination response is adapted to the Mediterranean climate that characterizes the region, i.e., wet winters and dry summers. The seeds germinate in late fall or early winter and are inhibited from germinating during late spring, summer, and early fall by high temperatures, long photoperiods, and low available moisture."

607	Minimum generative time (years)	1
	Source(s)	Notes
	Gomez, N. N., & Shaw, R. G. 2006. Inbreeding effect on male and female fertility and inheritance of male sterility in <i>Nemophila menziesii</i> (Hydrophyllaceae). <i>American Journal of Botany</i> , 93(5): 739-746	[Annual. Reaches maturity in one growing season] " <i>Nemophila menziesii</i> H. & A. (Hydrophyllaceae) is an annual plant native to California and Oregon, USA (Munz, 1959."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	Notes
	Shaw, R. G., Byers, D. L., & Shaw, F. H. 1998. Genetic components of variation in <i>Nemophila menziesii</i> undergoing inbreeding: morphology and flowering time. <i>Genetics</i> , 150(4): 1649-1661	"...seeds have no specialized dispersal mechanism or apparent means of long-distance dispersal."
	Abrams, L. & Ferris, R.S. 1923. <i>An Illustrated Flora of the Pacific States: Geraniaceae to Scrophulariaceae, geraniums to figworts</i> . Stanford University Press, Stanford, CA	[Unknown. No means of external attachment, but small size could allow for adherence to vehicles or footwear in mud or soil] "seeds usually 10-20, ovoid to oblong, about 2 mm. long, dark brown or black"

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	GrowOrganic.com. 2014. PV Flowering Pollinator Mix. http://www.groworganic.com/pv-flowering-pollinator-mix-lb.html . [Accessed 16 Sep 2014]	[Baby Blue Eyes = <i>Nemophila menziesii</i> . Sold in commercial seed mix] 'Annuals and Biennial Open Pollinated. Attracts a wide range of insects and pollinators. Contains: Arroyo Lupine, Golden Lupine, Chinese Houses, Five Spot, California Poppy, Lacey Phacelia, Baby Blue Eyes, Dwarf Sunflower, White Alyssum, Globe Gilia, Tidy Tips, Bird's Eyes, and Primrose. 1/4 lb covers approximately 500 sq ft if broadcast."

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	Grown as a cover crop and to attract and benefit pollinators. Seeds could possibly become mixed in with other crop material, but no evidence found to date.

Qsn #	Question	Answer
704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Shaw, R. G., Byers, D. L., & Shaw, F. H. 1998. Genetic components of variation in <i>Nemophila menziesii</i> undergoing inbreeding: morphology and flowering time. <i>Genetics</i> , 150(4): 1649-1661	"...seeds have no specialized dispersal mechanism or apparent means of long-distance dispersal."
705	Propagules water dispersed	y
	Source(s)	Notes
	Cruden, R. W. 1974. The adaptive nature of seed germination in <i>Nemophila menziesii</i> Aggr. <i>Ecology</i> 55(6): 1295-1305	[Secondary dispersal by water] "Seed dispersal has two components: (1) dehiscence of the capsules which drops the seed onto the ground and (2) movement of the seed into or below the soil surface." ... "The typical seed probably lies on the soil surface until the heavy rains of the fall wash it into a favorable germination site."
706	Propagules bird dispersed	n
	Source(s)	Notes
	Cruden, R. W. 1974. The adaptive nature of seed germination in <i>Nemophila menziesii</i> Aggr. <i>Ecology</i> 55(6): 1295-1305	[No evidence] "Seed dispersal has two components: (1) dehiscence of the capsules which drops the seed onto the ground and (2) movement of the seed into or below the soil surface. The seeds have a cucullus on the chalazal end that may serve as a food for ants. Ants take the seed into their nest, remove the cucullus and then carry the seed to the edge of the nest or beyond (Berg 1958, 1959). Lateral dispersal results from such interactions. The typical seed probably lies on the soil surface until the heavy rains of the fall wash it into a favorable germination site."
707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	Cruden, R. W. 1974. The adaptive nature of seed germination in <i>Nemophila menziesii</i> Aggr. <i>Ecology</i> 55(6): 1295-1305	[Ant-dispersed] "Seed dispersal has two components: (1) dehiscence of the capsules which drops the seed onto the ground and (2) movement of the seed into or below the soil surface. The seeds have a cucullus on the chalazal end that may serve as a food for ants. Ants take the seed into their nest, remove the cucullus and then carry the seed to the edge of the nest or beyond (Berg 1958, 1959)."
708	Propagules survive passage through the gut	
	Source(s)	Notes
	Shaw, R. G., Byers, D. L., & Shaw, F. H. 1998. Genetic components of variation in <i>Nemophila menziesii</i> undergoing inbreeding: morphology and flowering time. <i>Genetics</i> , 150(4): 1649-1661	[Unknown, but unlikely to be consumed & internally dispersed] "...seeds have no specialized dispersal mechanism or apparent means of long-distance dispersal."
801	Prolific seed production (>1000/m2)	

Qsn #	Question	Answer
	Source(s)	Notes
	Platenkamp, G. A., & Shaw, R. G. 1993. Environmental and genetic maternal effects on seed characters in <i>Nemophila menziesii</i> . <i>Evolution</i> 47(2): 540-555	[Unknown, but probably no in drought years] "In some years, almost all of the plants in our population may be prevented from flowering and setting seed due to drought (R. Shaw and L. Summers, pers. obs.)."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Probert, R. J., Daws, M. I., & Hay, F. R. 2009. Ecological correlates of ex situ seed longevity: a comparative study on 195 species. <i>Annals of Botany</i> , 104(1): 57-69.	"APPENDIX. Details of species used in the study: classification to family level (following APG, 2003), country of origin, time to 50% viability loss (p50) in the ageing conditions (458C, 60% RH), and germination conditions used. Species in bold were aged at 608C, 60% RH (p50 shown for these is an estimate based on the measured p50 at 608C multiplied by a factor of 10.9; see text for details)." [Nemophila menziesii - time to 50% viability loss = 51.8 days at 15° C]
	Platenkamp, G. A., & Shaw, R. G. 1993. Environmental and genetic maternal effects on seed characters in <i>Nemophila menziesii</i> . <i>Evolution</i> 47(2): 540-555	"Dormancy is important in this species. In some years, almost all of the plants in our population may be prevented from flowering and setting seed due to drought (R. Shaw and L. Summers, pers. obs.). Cruden (1974) found that seeds from two northern California populations may remain dormant for at least three years under favorable conditions for germination in a growth chamber."
	Baskin, C.C. & Baskin, J.M. 2014. <i>Seeds Ecology, Biogeography, and Evolution of Dormancy and Germination</i> . Second Edition. Academic Press, San Francisco, CA	"Seeds of <i>Nemophila menziesii</i> (Cruden, 1974), and apparently those of <i>Phacelia vallicola</i> , <i>P. quickii</i> and <i>P. lemmonii</i> (Quick, 1947), have PD, and they afterripened during dry storage at room temperature. However, it is unknown if seeds of these species come out of dormancy in the field during summer and germinate in autumn."

803	Well controlled by herbicides	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	Unknown. No information on herbicide efficacy or chemical control of this species, & generally not regarded as a weed where grown.

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	Unknown, but as an annual herb, probably unlikely to tolerate mutilation or cultivation practices.

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	WRA Specialist. 2014. Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits

- Elevation range exceeds 1000 m, and can grow in >5 hardiness zones demonstrating environmental versatility
- Naturalized elsewhere (specifics lacking)
- Tolerates many soil types
- Shade tolerant
- Seeds dispersed by ants, water & intentionally by people
- Self-compatible
- Able to reach maturity in <1 year (annual)
- Seeds possess dormancy and may form a persistent seed bank

Low Risk Traits

- Despite naturalization, no documented negative impacts to date
- May only pose a threat to higher elevation areas in the tropics
- Unarmed (no spines, thorns or burrs)
- No reports of toxicity or allergens
- Beneficial to bees and other pollinators
- Ornamental
- Not reported to spread vegetatively