

Family: *Boraginaceae*

Taxon: *Borago officinalis*

Synonym: *Borago hortensis* L.

Common Name: beebread
beeplant
borage
starflower
talewort
bourrache

Questionnaire :	current 20090513	Assessor:	Assessor	Designation: L
Status:	Assessor Approved	Data Entry Person:	Assessor	WRA Score 1
101	Is the species highly domesticated?		y=-3, n=0	n
102	Has the species become naturalized where grown?		y=1, n=-1	
103	Does the species have weedy races?		y=1, n=-1	
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	
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		n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed		n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed		n=0, y = 1*multiplier (see Appendix 2)	n
401	Produces spines, thorns or burrs		y=1, n=0	n
402	Allelopathic		y=1, n=0	
403	Parasitic		y=1, n=0	n
404	Unpalatable to grazing animals		y=1, n=-1	n
405	Toxic to animals		y=1, n=0	
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	
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	
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	y=1, n=-1	n
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)	y=1, n=-1	
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	n
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	
801	Prolific seed production (>1000/m2)	y=1, n=-1	
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	n
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: L

WRA Score 1

Supporting Data:

101	2008. Sales, E./Montaner, C./Muniozgueren, J.M./Carravedo, M./Alvarez, J.M.. Genetic diversity in a collection of borage (<i>Borago officinalis</i>) germplasm. <i>Botany</i> . 86(6): 603-609.	[Is the species highly domesticated? No] " <i>Borago officinalis</i> can be considered a plant species in the initial stages of domestication, especially as an oilseed crop; cultivation for this use has only recently been established. The commercial varieties analysed here (CA and VM) were not significantly different from each other and were closely related to wild accessions from northern Europe."
102	2013. WRA Specialist. Personal Communication.	NA
103	2013. WRA Specialist. Personal Communication.	NA
201	2009. Tucker, A.O./DeBaggio, T.. The encyclopedia of herbs: a comprehensive reference to herbs of flavor and fragrance. Timber Press, Portland, OR	[Species suited to tropical or subtropical climate(s) 1-Intermediate] "Borage is native to southern Europe but naturalized in the warmer parts of central, eastern, and western Europe."
202	2009. Tucker, A.O./DeBaggio, T.. The encyclopedia of herbs: a comprehensive reference to herbs of flavor and fragrance. Timber Press, Portland, OR	[Quality of climate match data 2-High]
203	2013. Missouri Botanical Gardens. <i>Borago officinalis</i> . http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/b765/borago-officinalis.aspx [Accessed 14 June 2013]	[Broad climate suitability (environmental versatility)? Yes] "Zone: 2 to 11"
204	1988. Miller, J.S.. A Revised Treatment of Boraginaceae for Panama. <i>Annals of the Missouri Botanical Garden</i> . 75(2): 456-521.	[Native or naturalized in regions with tropical or subtropical climates? Possibly] "Although <i>Borago officinalis</i> has not been collected in Panama, it seems almost certain that it is present in Panamanian gardens. It is often cultivated as a culinary or medicinal herb and is known from most neotropical countries, often as an adventive"
204	2012. Farhadi, R./Balashahri, M.S./Tilebeni, H.G./Sadeghi, M.. Pharmacology of Borage (<i>Borago officinalis</i> L.) medicinal plant. <i>International Journal of Agronomy and Plant Production</i> . 3(2): 73-77.	[Native or naturalized in regions with tropical or subtropical climates? Unknown. Temperate and Mediterranean regions] "...naturalized throughout the Mediterranean region, as well as Asia Minor, Europe, North Africa, and South America."
205	1988. Miller, J.S.. A Revised Treatment of Boraginaceae for Panama. <i>Annals of the Missouri Botanical Garden</i> . 75(2): 456-521.	[Does the species have a history of repeated introductions outside its natural range? Yes] "Two introduced species of Boraginaceae are known from Panama. <i>Borago officinalis</i> L. is widely cultivated throughout the world and occasionally is found naturalized, although these populations do not appear to persist for long."
205	2012. Farhadi, R./Balashahri, M.S./Tilebeni, H.G./Sadeghi, M.. Pharmacology of Borage (<i>Borago officinalis</i> L.) medicinal plant. <i>International Journal of Agronomy and Plant Production</i> . 3(2): 73-77.	[Does the species have a history of repeated introductions outside its natural range? Yes] "...naturalized throughout the Mediterranean region, as well as Asia Minor, Europe, North Africa, and South America."
301	1981. Sykes, W.R.. Checklist of dicotyledons naturalised in New Zealand 10. Polemoniales and Boraginaceae. <i>New Zealand Journal of Botany</i> . 19(3): 311-317.	[Naturalized beyond native range?] "Occasional escape from cultivation in North and South Is."
301	2006. Howell, C.J./Sawyer, J.W.D.. New Zealand naturalised vascular plant checklist. New Zealand Plant Conservation Network, Wellington, NZ www.nzpcn.org.nz	[Naturalized beyond native range? Yes] " <i>Borago officinalis</i> " ... "Fully naturalised"
301	2007. DiTomaso, J.. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	[Naturalized beyond native range? Yes] Borage sometimes escapes cultivation as a garden ornamental in North Coast, San Francisco Bay Region, Central Coast, South Coast, and northern and central Sierra Nevada foothills, to 300 m. It is also naturalized in Montana, Oregon, Utah, Washington, a few north-central states, and most northeastern states."
301	2007. Hussey, B.M.J./Keighery, G. J./Dodd, J./Lloyd, S.G./Cousens, R.D.. Western Weeds. A Guide to the Weeds of Western Australia. The Weed Society of Western Australia, Victoria Park, WA	[Naturalized beyond native range? Yes] "It is native to the Mediterranean and is often grown in herb gardens, escaping onto wasteland near Mukinbudin and between Donnybrook and Lake Grace."

301	2012. Farhadi, R./Balashahri, M.S./Tilebeni, H.G./Sadeghi, M.. Pharmacology of Borage (<i>Borago officinalis</i> L.) medicinal plant. International Journal of Agronomy and Plant Production. 3(2): 73-77.	[Naturalized beyond native range? Yes] "The plant Borage (<i>Borago officinalis</i> L.) family Boraginaceae, also known as "starflower" is an annual herb originating in Syria, but naturalized throughout the Mediterranean region, as well as Asia Minor, Europe, North Africa, and South America."
302	2006. WWF Australia. National list of naturalised invasive and potentially invasive garden plants. http://wwf.org.au/publications/ListInvasivePlants/	[Garden/amenity/disturbance weed? Yes] "Borago officinalis ... Australian Rating = 2" [2 - Naturalised and known to be a minor problem warranting control at 3 or fewer locations within a State or Territory]
302	2011. Richardson, F.J./Richardson, R.G./Shepherd, R.C.H.. Weeds of the South-East: An Identification Guide for Australia. Second Edition. RG and FJ Richardson, Victoria, Australia	[Garden/amenity/disturbance weed?] "An occasional garden escape"
302	2011. Weed Science Society of America. Edible Weeds: A Tasty Revenge for Homeowners!. http://wssa.net/2011/07/edible-weeds-a-tasty-revenge-for-homeowners/ [Accessed 14 June 2013]	[Garden/amenity/disturbance weed? Yes] "Borage (<i>Borago officinalis</i>). This annual weed is a prolific seeder that can quickly take over a garden. It features blue, star-shaped flowers that bloom in midsummer and bristly leaves and stems. Both the flowers and leaves have a crisp, cucumber-like flavor that make them a favored ingredient in salads or soups."
302	2013. BBC. Borage. http://www.bbc.co.uk/gardening/plants/plant_finder/plant_pages/11553.shtml [Accessed 14 June 2013]	[Garden/amenity/disturbance weed? Yes] "As with many herbs, it can be slightly invasive if left unchecked, so cut the plant back fairly hard after flowering."
302	2013. P-Patch Community Gardening Program. P-Patch Invasive Plant Guidelines. Seattle Department of Neighborhoods, http://www.seattle.gov/neighborhoods/ppatch/documents/InvasivePlantGuidelinesforweb2_21_2013_000.pdf	[Garden/amenity/disturbance weed? Yes] "Plants of concern: These are common in all gardens control and containment is recommended" [Includes <i>Borago officinalis</i>]
302	2013. What's Invasive - DNV. common borage – <i>Borago officinalis</i> . http://www.whatsinvasive.org/species.cfm?sub=17377 [Accessed 14 June 2013]	[Garden/amenity/disturbance weed? Yes] "Borago officinalis can be found in ditches, roadsides and in fields. It over takes native plants habitats." [Although this species may have some detrimental impacts on native species, this site does not provide enough details to list this plant as an environmental weed]
303	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Agricultural/forestry/horticultural weed? No]
304	2013. What's Invasive - DNV. common borage – <i>Borago officinalis</i> . http://www.whatsinvasive.org/species.cfm?sub=17377 [Accessed 14 June 2013]	[Environmental weed? No] "Borago officinalis can be found in ditches, roadsides and in fields. It over takes native plants habitats." [Although this species may have some detrimental impacts on native species, this site does not provide enough details to list this plant as an environmental weed]
305	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Congeneric weed? No] <i>Borago pygmaea</i> listed as "N - Naturalised", "C - Cultivation Escape" and "- Casual Alien" [No serious negative impacts documented]
401	2011. Richardson, F.J./Richardson, R.G./Shepherd, R.C.H.. Weeds of the South-East: An Identification Guide for Australia. Second Edition. RG and FJ Richardson, Victoria, Australia	[Produces spines, thorns or burrs? No] "...a robust, densely hairy annual herb to 80 cm high. Leaves (4-20 cm long) are oppositely arranged at the base, alternate up the stems, oblong to lance-shaped with irregular wavy margins."
402	2009. Azizi, M./Amini, S./Joharchi, M.R./Oroojalian, F./Baghestani, Z.. Genetic resources for allelopathic and medicinal plants from traditional Persian experience. In Marco symposium, Tsukuba, Japan (pp. 5-7).	[Allelopathic? Possibly] "Abstract In this research we studied the allelopathic activity of 56 aromatic and medicinal plants of 22 families that most of them have been used in Persian traditional medicine. The assay method was dish pack with lettuce seed. Results showed that 51 species out of 56 tested plants declined lettuce seedling growth. Ten species completely inhibited lettuce seed germination namely <i>Bunium persicum</i> , <i>Carum copticum</i> , <i>Achillea wilhelms</i> , <i>Pulicaria gnaphalodes</i> , <i>Berberis vulgar</i> var <i>asperma</i> , <i>Lavandula spica</i> , <i>Ziziphora clinopodioides</i> and <i>Ailanthus altissima</i> . Further researches need to be conducted on the detection of main volatile constituents that are responsible for this strong allelopathic activity of the mentioned plants by GC/MS and NMR techniques." [Borago officinalis exhibits some inhibitory activity in laboratory tests]
402	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Allelopathic? No evidence] "The growing plant is a good companion for strawberries, tomatoes, courgettes and most other plants[14, 201, 238]. It is said to deter Japanese beetle and tomato hornworms[238]."
403	2011. Richardson, F.J./Richardson, R.G./Shepherd, R.C.H.. Weeds of the South-East: An Identification Guide for Australia. Second Edition. RG and FJ Richardson, Victoria, Australia	[Parasitic? No] "...a robust, densely hairy annual herb to 80 cm high." [Boraginaceae]

404	1993. Fedele, V./Pizzillo, M./Claps, S./Morand-Fehr, P./Rubino, R.. Grazing behavior and diet selection of goats on native pasture in Southern Italy. <i>Small Ruminant Research</i> . 11(4): 305-322.	[Unpalatable to grazing animals? No] "Goats had a high preference for grasses, mainly <i>Lolium perenne</i> and <i>Avena barbata</i> , and, in summer, for forbs, especially <i>Daucus carota</i> , <i>Foeniculum sp.</i> and <i>Borago officinalis</i> ."
404	2003. Carpino, S./Licitra, G./Van Soest, P.J.. Selection of forage species by dairy cattle on complex Sicilian pasture. <i>Animal feed science and technology</i> . 105(1): 205-214.	[Unpalatable to grazing animals? No] "Table 3 Occurrence and distribution of selected forage species with the ratio of selected species to occurrence in 2000" [Table includes <i>Borago officinalis</i> as a forage species]
405	1993. Fedele, V./Pizzillo, M./Claps, S./Morand-Fehr, P./Rubino, R.. Grazing behavior and diet selection of goats on native pasture in Southern Italy. <i>Small Ruminant Research</i> . 11(4): 305-322.	[Toxic to animals? No evidence] "Goats had a high preference for grasses, mainly <i>Lolium perenne</i> and <i>Avena barbata</i> , and, in summer, for forbs, especially <i>Daucus carota</i> , <i>Foeniculum sp.</i> and <i>Borago officinalis</i> ."
405	2003. Carpino, S./Licitra, G./Van Soest, P.J.. Selection of forage species by dairy cattle on complex Sicilian pasture. <i>Animal feed science and technology</i> . 105(1): 205-214.	[Toxic to animals? No evidence for cattle] "Table 3 Occurrence and distribution of selected forage species with the ratio of selected species to occurrence in 2000" [Table includes <i>Borago officinalis</i> as a forage species]
405	2003. Darbyshire, S.J.. Inventory of Canadian Agricultural Weeds. Agriculture and Agri-Food Canada, Research Branch,, Ottawa, Canada	[Toxic to animals? Possibly] "poisonous to livestock" [No further evidence provided]
406	2013. Missouri Botanical Gardens. <i>Borago officinalis</i> . http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/b765/borago-officinalis.aspx [Accessed 14 June 2013]	[Host for recognized pests and pathogens? No] "No serious insect or disease problems. Powdery mildew may occur."
407	2007. DiTomaso, J.. <i>Weeds of California and Other Western States, Volume 1</i> . UCANR Publications, Oakland, CA	[Causes allergies or is otherwise toxic to humans? Potentially] "The foliage and roots of common borage also contains small quantities of toxic pyrrolizidine alkaloids, but the risk of developing toxicity problems due to the ingestion of this species appears low."
407	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Causes allergies or is otherwise toxic to humans? Potentially] "The plant, but not the oil obtained from the seeds, contains small amounts of pyrrolizidine alkaloids that can cause liver damage and liver cancer[238]. These alkaloids are present in too small a quantity to be harmful unless you make borage a major part of your diet, though people with liver problems would be wise to avoid using the leaves or flowers of this plant[K]."
407	2013. What's Invasive - DNV. common borage – <i>Borago officinalis</i> . http://www.whatsinvasive.org/species.cfm?sub=17377 [Accessed 14 June 2013]	[Causes allergies or is otherwise toxic to humans? Potentially] "The Borage seeds contain small amounts of the liver toxins. Minor side effects from borage oil can include bloating and headaches."
408	2007. Hussey, B.M.J./Keighery, G. J./Dodd, J./Lloyd, S.G./Cousens, R.D.. <i>Western Weeds. A Guide to the Weeds of Western Australia</i> . The Weed Society of Western Australia, Victoria Park, WA	[Creates a fire hazard in natural ecosystems? No evidence]
408	2011. Richardson, F.J./Richardson, R.G./Shepherd, R.C.H.. <i>Weeds of the South-East: An Identification Guide for Australia</i> . Second Edition. RG and FJ Richardson, Victoria, Australia	[Creates a fire hazard in natural ecosystems? No] "...a robust, densely hairy annual herb to 80 cm high." [No evidence, and unlikely due to herbaceous life form]
409	2009. Tucker, A.O./DeBaggio, T.. <i>The encyclopedia of herbs: a comprehensive reference to herbs of flavor and fragrance</i> . Timber Press, Portland, OR	[Is a shade tolerant plant at some stage of its life cycle? No] "Light: full sun"
409	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Is a shade tolerant plant at some stage of its life cycle? Possibly] "It can grow in semi-shade (light woodland) or no shade."
410	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Tolerates a wide range of soil conditions? Yes] "Suitable for: light (sandy), medium (loamy) and heavy (clay) soils, prefers well-drained soil and can grow in nutritionally poor soil. Suitable pH: acid, neutral and basic (alkaline) soils and can grow in very alkaline soils."
411	2011. Richardson, F.J./Richardson, R.G./Shepherd, R.C.H.. <i>Weeds of the South-East: An Identification Guide for Australia</i> . Second Edition. RG and FJ Richardson, Victoria, Australia	[Climbing or smothering growth habit? No] "...a robust, densely hairy annual herb to 80 cm high."

412	2006. WWF Australia. National list of naturalised invasive and potentially invasive garden plants. http://wwf.org.au/publications/ListInvasivePlants/	[Forms dense thickets? No evidence]
412	2007. Hussey, B.M.J./Keighery, G. J./Dodd, J./Lloyd, S.G./Cousens, R.D.. Western Weeds. A Guide to the Weeds of Western Australia. The Weed Society of Western Australia, Victoria Park, WA	[Forms dense thickets? No evidence] "It is native to the Mediterranean and is often grown in herb gardens, escaping onto wasteland near Mukinbudin and between Donnybrook and Lake Grace."
412	2011. Richardson, F.J./Richardson, R.G./Shepherd, R.C.H.. Weeds of the South-East: An Identification Guide for Australia. Second Edition. RG and FJ Richardson, Victoria, Australia	[Forms dense thickets? No evidence] "An occasional garden escape"
501	2011. Richardson, F.J./Richardson, R.G./Shepherd, R.C.H.. Weeds of the South-East: An Identification Guide for Australia. Second Edition. RG and FJ Richardson, Victoria, Australia	[Aquatic? No] "...a robust, densely hairy annual herb to 80 cm high."
502	2009. Tucker, A.O./DeBaggio, T.. The encyclopedia of herbs: a comprehensive reference to herbs of flavor and fragrance. Timber Press, Portland, OR	[Grass? No] "Family: Boraginaceae"
503	2009. Tucker, A.O./DeBaggio, T.. The encyclopedia of herbs: a comprehensive reference to herbs of flavor and fragrance. Timber Press, Portland, OR	[Nitrogen fixing woody plant? No] "Family: Boraginaceae"
504	2011. Richardson, F.J./Richardson, R.G./Shepherd, R.C.H.. Weeds of the South-East: An Identification Guide for Australia. Second Edition. RG and FJ Richardson, Victoria, Australia	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "...a robust, densely hairy annual herb to 80 cm high."
601	2013. WRA Specialist. Personal Communication.	[Evidence of substantial reproductive failure in native habitat? No] Widely naturalized around the world, with no evidence of reproductive failure
602	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Produces viable seed? Yes] "Seed - sow April/May in situ. The plants quickly develop a stout tap-root and do not transplant successfully[238]. The seed can also be sown in situ in the autumn, this will produce larger plants and earlier flowering[4]. The plant usually self-sows prolifically."
603	2000. Montaner, C./Floris, E./Alvarez, J.M.. Is self-compatibility the main breeding system in borage (<i>Borago officinalis</i> L.)?. Theoretical and Applied Genetics. 101(1-2): 185-189.	[Hybridizes naturally? No] "Abstract The polygenic postzygotic self incompatible system reported in borage (<i>Borago officinalis</i> L.) is refuted. The behaviour of pollen tubes after self- and cross-pollination, analysis of the crossability coefficient, seed set after continuous generations of self pollination and the effects of inbreeding depression in borage were studied. Evidence of self-compatibility was established. The influence of protandry in a self compatible system is also discussed." [No evidence of hybridization in this widely naturalized plant with a long history of cultivation]
604	2001. Montaner, C./Floris, E./Alvarez, J.M.. Geitonogamy: a mechanism responsible for high selfing rates in borage (<i>Borago officinalis</i> L.). Theoretical and Applied Genetics. 102(2-3): 375-378.	[Self-compatible or apomictic? Yes] "Borage, a species traditionally defined as allogamous, has revealed a high selfing rate although a mechanism of protandry has been confirmed in this plant." ... "Flowering proceeds basipetally in the inflorescence and each inflorescence develops several flowers. Two flower colours are found in borage. Wild genotypes have blue flowers whereas those cultivated in Spain have white ones. The flowers are continuously produced and mature over an extended period on time. The hermaphrodite, symmetrical, and drooped flowers rise on a long pedicel. Flower structure consists of a calyx made up of five separate green sepals; a rotate corolla with a nectary in each of the five fused petals; an erect cone of five black (brown) stamens each born on a filament with a subtending purple flange, and a green, flat, four-lobed gynoecium with four ovules of axile placentation, a short style and a flat terminal stigma (Qinn et al. 1987)."
605	2001. Montaner, C./Floris, E./Alvarez, J.M.. Geitonogamy: a mechanism responsible for high selfing rates in borage (<i>Borago officinalis</i> L.). Theoretical and Applied Genetics. 102(2-3): 375-378.	[Requires specialist pollinators? No] "Borage (<i>Borago officinalis</i> L.) is an allogamous plant with an entomophilous pollination system. Bees, mainly, attracted by nectar, take pollen grains and scatter them on to neighbouring flowers (Alvarez and Villa 1992)."
606	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Reproduction by vegetative fragmentation? No] "Seed - sow April/May in situ. The plants quickly develop a stout tap-root and do not transplant successfully[238]. The seed can also be sown in situ in the autumn, this will produce larger plants and earlier flowering[4]. The plant usually self-sows prolifically."

607	2009. Tucker, A.O./DeBaggio, T.. The encyclopedia of herbs: a comprehensive reference to herbs of flavor and fragrance. Timber Press, Portland, OR	[Minimum generative time (years)? 1] "Borage is an annual to 15 to 70 cm high."
701	2003. Darbyshire, S.J.. Inventory of Canadian Agricultural Weeds. Agriculture and Agri-Food Canada, Research Branch,, Ottawa, Canada	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Possibly Yes] "cultivated as a garden ornamental, old fields, fencerows, ditches, roadsides and disturbed areas"
701	2009. Heijting, S.S./Van Der Werf, W.W./Kropff, M.J.. Seed dispersal by forage harvester and rigid-tine cultivator in maize. Weed Research. 49: 153-163.	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Possibly, but not very far] "Harvest and tillage operations are a major factor in seed dispersal in agricultural crops. We studied the effect of harvesting and cultivation on seed dispersal in continuous maize. A suite of cultivated plant species were used as model weed species to avoid potential sampling problems." ... "The use of a cultivator after harvesting significantly increased the distance travelled in the driving direction for three species with ripe seeds during harvest. Dispersal distributions resulting from cultivator operations showed long tails, extending over the whole of the sampled area, and they were quite variable. The headlands accumulated plant debris that had been collected and dragged over the field by the cultivator. This study shows how weed biology and its interaction with machinery can facilitate dispersal of plants at the field scale." ... "Seeds that had been placed on the soil (<i>B. officinalis</i> , <i>S. marianum</i> , <i>V. sativa</i>) dispersed less far, following harvesting and cultivation, than seeds that were attached to the plant at the time of harvest (<i>S. alba</i> , <i>P. tanacetifolia</i>) (Table 3). Average dispersal distances were less than 1 m when the seeds had been placed on the soil surface and in the order of several metres when the seeds were on the plant"
702	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Propagules dispersed intentionally by people? Yes] "Borage is often grown as a culinary plant in the herb garden"
703	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Propagules likely to disperse as a produce contaminant? Unknown] "The growing plant is a good companion for strawberries, tomatoes, courgettes and most other plants[14, 201, 238]. It is said to deter Japanese beetle and tomato hornworms[238]." [It may be possible that seeds get distributed with other crop materials, although no evidence has been found]
704	2009. Tucker, A.O./DeBaggio, T.. The encyclopedia of herbs: a comprehensive reference to herbs of flavor and fragrance. Timber Press, Portland, OR	[Propagules adapted to wind dispersal? No] "Nutlets are 7 to 10 mm long, oblong to slightly egg-shaped."
705	2009. Tucker, A.O./DeBaggio, T.. The encyclopedia of herbs: a comprehensive reference to herbs of flavor and fragrance. Timber Press, Portland, OR	[Propagules water dispersed? No] "Nutlets are 7 to 10 mm long, oblong to slightly egg shaped." [No obvious adaptations for water dispersal, although relatively small seeds may possibly be moved by overland flow]
706	1988. Miller, J.S.. A Revised Treatment of Boraginaceae for Panama. Annals of the Missouri Botanical Garden. 75(2): 456-521.	[Propagules bird dispersed? "Fruits with the calyx and style persistent, the 4 nutlets obovoid, 4-6 mm long, 2-3 mm broad, finely ribbed, tuberculate at the apex." [No evidence, and not fleshy-fruited]
707	2007. Benvenuti, S.. Weed seed movement and dispersal strategies in the agricultural environment. Weed Biology and Management. 7(3): 141-157.	[Propagules dispersed by other animals (externally)? Yes] "Table 2. Prevalent dispersal strategies of some weed species" [<i>Borago officinalis</i> - Dispersal strategy = Myr - ant-dispersed]
707	2012. Bomanowska, A./Kurzac, M./Stefaniak, A.. Floristic diversity of plants spontaneously spreading in the botanical garden of the University of Łódź (Poland). Biologica Nyssana. 3(1): 1-10.	[Propagules dispersed by other animals (externally)? Yes] "Plants with seeds that have prehensile trichomes or hooks (e.g. <i>Agrimonia officinalis</i> , <i>Borago officinalis</i>) are spread around within the garden by mammals, especially by rodents, but also by house cats (own observations)."
708	1988. Miller, J.S.. A Revised Treatment of Boraginaceae for Panama. Annals of the Missouri Botanical Garden. 75(2): 456-521.	[Propagules survive passage through the gut? Unknown] "Fruits with the calyx and style persistent, the 4 nutlets obovoid, 4-6 mm long, 2 3 mm broad, finely ribbed, tuberculate at the apex" [Seeds not adapted for internal dispersal]
801	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Prolific seed production (>1000/m2)?] "The seed can also be sown in situ in the autumn, this will produce larger plants and earlier flowering[4]. The plant usually self sows prolifically."
802	2008. Royal Botanic Gardens Kew. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/	[Evidence that a persistent propagule bank is formed (>1 yr)? Possibly Yes] "Viability is halved following 8 years open storage at room temperature (Ewart, 1908); seeds can be maintained for 2-3 years in commercial storage conditions (Priestley, 1986)" [Stored under laboratory conditions]

802	2009. Dölle, M./Schmidt, W.. The relationship between soil seed bank, above-ground vegetation and disturbance intensity on old-field successional permanent plots. <i>Applied Vegetation Science</i> . 12: 415–428.	[Evidence that a persistent propagule bank is formed (>1 yr)? Possibly No] "Table A1. Soil seed bank and above-ground (AV) composition of the five disturbance groups" ... "Seed bank type is classified according to the database by Thompson et al. (1997) into three groups: 1=transient, 2=short term persistent, 3=long term persistent." [Borago officinalis - Seed bank type = 1 "transient"]
803	2008. The National Non-Food Crops Centre. Borage (<i>Borago officinalis</i>). Crop Fact Sheet. http://www.nnfcc.co.uk/publications/nnfcc-crop-factsheet-borage/at_download/file	[Well controlled by herbicides? Yes] "Effective control of borage volunteers can be achieved with herbicides in most other crops."
804	2013. Plants for a Future Database. <i>Borago officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Borago+officinalis [Accessed 14 June 2013]	[Tolerates, or benefits from, mutilation, cultivation, or fire? No] "The plants quickly develop a stout tap-root and do not transplant successfully"
805	2013. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]

Summary of Risk Traits

High Risk / Undesirable Traits

- Widely naturalized
- Can become aggressive and weedy in garden settings
- Contains small amounts of pyrrolizidine alkaloids that can cause liver damage and liver cancer
- Tolerates many soil conditions (and potentially able to exploit many different habitat types)
- Self-compatible
- Reaches maturity in under 1 year
- Spread intentionally by people and by ants, or adhering to animals
- Seeds may persist in the soil

Low Risk / Desirable Traits

- Unarmed (no spines, thorns or burrs)
- Palatable to cattle and goats
- Consumed by people
- Does not spread vegetatively
- Seeds not dispersed very far by natural means
- May be effectively controlled with herbicides