

Family: *Asteraceae*

Taxon: *Calendula officinalis*

Synonym: *Calendula officinalis* var. *prolifera* hort.

Common Name: calendula
garden marigold
marigold
ruddles
Scotch marigold

Questionnaire : current 20090513 **Assessor:** Assessor **Designation:** EVALUATE
Status: Assessor Approved **Data Entry Person:** Assessor **WRA Score 4**

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)	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	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)	
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)	y
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	y
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	
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	
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	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	y
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	n
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	y
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: EVALUATE

WRA Score 4

Supporting Data:

101	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Is the species highly domesticated? No] "...a winter bedding annual or container plant that has been cultivated for so long that its origins are unknown." [Possibly, but no evidence that cultivation has resulted in radical changes or domestication]
102	2013. WRA Specialist. Personal Communication.	NA
103	2013. WRA Specialist. Personal Communication.	NA
201	2002. World Health Organization. WHO monographs on selected medicinal plants. Vol. 2. WHO, Geneva, Switzerland	[Species suited to tropical or subtropical climate(s) 0- Low] "Indigenous to central, eastern and southern Europe. Cultivated commercially in North America, the Balkans, Eastern Europe and Germany."
201	2003. Froment, M./Worthy, M./Mastebroek, D./van Gorp, K.. A Growers Manual for Calendula officinalis L.. IENICA, www.ienica.net/usefulreports/calendulamanual.pdf	[Species suited to tropical or subtropical climate(s) 0-Low] "Calendula officinalis is well adapted to temperate climatic zones in Europe, although it is believed to have originated in the Mediterranean."
202	2003. Froment, M./Worthy, M./Mastebroek, D./van Gorp, K.. A Growers Manual for Calendula officinalis L.. IENICA, www.ienica.net/usefulreports/calendulamanual.pdf	[Quality of climate match data 2-High] "Calendula officinalis is well adapted to temperate climatic zones in Europe, although it is believed to have originated in the Mediterranean."
203	2013. Missouri Botanical Gardens. Calendula officinalis. http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/a566/calendula-officinalis.aspx [Accessed 15 June 2013]	[Broad climate suitability (environmental versatility)? Yes] "Zone: 2 to 11"
204	2003. Froment, M./Worthy, M./Mastebroek, D./van Gorp, K.. A Growers Manual for Calendula officinalis L.. IENICA, www.ienica.net/usefulreports/calendulamanual.pdf	[Native or naturalized in regions with tropical or subtropical climates? No] "Calendula officinalis is well adapted to temperate climatic zones in Europe, although it is believed to have originated in the Mediterranean."
205	2011. Wu, Z.Y./Raven, P.H./Hong, D. Y., (eds.). Flora of China Vol. 20-21 (Asteraceae). Missouri Botanical Garden and Harvard University Herbaria, Beijing & St. Louis	[Does the species have a history of repeated introductions outside its natural range? Yes] "Cultivated as an ornamental in parks and gardens of China [native origin unknown]."
301	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Naturalized beyond native range? Yes] "Wild plants occur as casuals or are locally well-established, and include a range of disc and ray colours although most have wholly orange or yellow capitula. "
301	2005. Castro, S.A./Figueroa, J.A./Muñoz-Schick, M./Jaksic, F.. Minimum residence time, biogeographical origin, & life cycle as determinants of the geographical extent of naturalized plants in continental Chile. Diversity and Distributions. 11(3): 183-191.	[Naturalized beyond native range? Yes] "Interestingly, species such as Spartium junceum , Calendula officinalis and Cardamine hirsuta still have a narrow distributional range in spite of long residence time in continental Chile (> 151 year)."
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] "Fully naturalised"
302	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Garden/amenity/disturbance weed? Possibly] A number of references cite this plant as a weed, but there was little or no information regarding negative impacts that was found
303	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Agricultural/forestry/horticultural weed? No] No evidence
304	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Environmental weed? No] No evidence

305	2005. Ruiz De Clavijo, E.. The reproductive strategies of the heterocarpic annual <i>Calendula arvensis</i> (Asteraceae). <i>Acta Oecologica</i> . 28: 119–126.	[Congeneric weed? Yes] " <i>C. arvensis</i> (Field marigold) is a self compatible annual Asteraceae (Heyn and Joel, 1983), with a wide geographic distribution: central and southern Europe, northern Africa, south-western Asia and the Macaronesian region (the Azores Islands, the Madeira Islands, the Salvage Islands, the Canary Islands and the Cape Verde Islands). It is also naturalised in other temperate regions. It is a weed that grows in cultivated fields, along roadsides and in disturbed sites on a variety of soil types." [A disturbance weed]
305	2012. Nasim, G./Shabbir, A.. Invasive weed species—a threat to sustainable agriculture. Pp. 523-556 In <i>Crop production for agricultural improvement</i> . Springer, Netherlands	[Congeneric weed? Yes] "Table 21.5 Weeds of family Asteraceae from Pakistan (Khalid 1995)" [Includes <i>Calendula arvensis</i>]
401	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. <i>Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons</i> . Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Produces spines, thorns or burrs? Yes] "Erect or ascending, annual or short lived perennial herb, sometimes somewhat woody toward base, (10)-15-50 cm tall. Stems densely clothed in short, erect, glandular hairs, usually becoming glabrous below, much branched. Basal and lower cauline lvs sparsely to moderately clothed in simple and glandular hairs, ciliate, usually narrow obovate, sometimes elliptic or ± orbicular, entire, with few minute scattered marginal teeth, or rarely remotely dentate, obtuse to acute and mucronate, apetiolate and long cuneate, 6-20 × 1.5-5 cm; upper cauline lvs similar to lower but becoming smaller, oblong to lanceolate, broad-based and often ± amplexicaul."
402	2004. Ruskowski, D./Uniewicz, K./Auguścińska, E./Janiszowska, W.. The allelopathic properties of oleanolic acid 3-O-monoglucoside secreted by roots of <i>Calendula officinalis</i> to the soil. <i>Second European Allelopathy Symposium. Abstracts 101</i> .	[Allelopathic? Possibly Yes] "The results show that 3-O-monoglucoside of oleanolic acid secreted to the soil possesses very strong allelopathic properties in relation to the dicotyledons and weaker activity to the monocotyledons."
403	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. <i>Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons</i> . Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Parasitic? No] "Erect or ascending, annual or short lived perennial herb, sometimes somewhat woody toward base..." [Asteraceae]
404	1999. Adler, B.. <i>Outwitting Deer</i> . Globe Pequot Press, Guilford, CT	[Unpalatable to grazing animals? Yes] "Plants Rarely Damaged - This is the ultimate list, a combination of deer-resistant plants from a variety of sources in a number of places" [Includes <i>Calendula officinalis</i>]
404	2010. Wade, G.L./Mengak, M.T.. <i>Deer-Tolerant Ornamental Plants. Circular 985</i> . University of Georgia Cooperative Extension, Athens, Georgia	[Unpalatable to grazing animals? Yes] "Annuals Deer Rarely Browse" [Includes <i>Calendula officinalis</i>]
405	2009. California Poison Control System. <i>Know Your Plants</i> . http://www.calpoison.org/hcp/KNOW%20YOUR%20PLANTS-plant%20list%20for%20CPCS%2009B.pdf	[Toxic to animals? No] "Table 1. – Nontoxic Plants by Common Name"
406	1999. Gilman, E.F./Howe, T.. <i>Calendula officinalis Calendula, Pot Marigold. FPS87</i> . University of Florida IFAS Extension, Gainesville, FL http://edis.ifas.ufl.edu/pdf/FP/FP08700.pdf	[Host for recognized pests and pathogens? No] "Pest resistance: long-term health usually not affected by pests"
406	2013. <i>Floridata. Calendula officinalis</i> . http://www.floridata.com/ref/c/cale_off.cfm [Accessed 15 June 2013]	[Host for recognized pests and pathogens? No] "Plant liberally in the vegetable garden to deter pests. They are good for companion planting because of the insect repelling properties"
406	2013. Missouri Botanical Gardens. <i>Calendula officinalis</i> . http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/a566/calendula-officinalis.aspx [Accessed 15 June 2013]	[Host for recognized pests and pathogens? No] "No serious insect or disease problems. Susceptible to powdery mildew. Watch for slugs and snails, particularly on young plants. Aphids and whiteflies are occasional visitors."
407	2013. Missouri Botanical Gardens. <i>Calendula officinalis</i> . http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/a566/calendula-officinalis.aspx [Accessed 15 June 2013]	[Causes allergies or is otherwise toxic to humans? No] "Although the flowers and leaves are somewhat bitter tasting, they are edible and may be added fresh or dried to soups, salads or rice dishes for both color and flavor. Aromatic, lance-shaped to oblong-obovate green leaves (to 6" long)."
407	2013. <i>Plants for a Future Database. Calendula officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Calendula+officinalis [Accessed 15 June 2013]	[Causes allergies or is otherwise toxic to humans? Possibly to sensitive individuals] "Low potential for sensitization and contact dermatitis. Possible allergies if allergic to daisy family plants. Topical use may cause rash"

408	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Creates a fire hazard in natural ecosystems? No] "A rather succulent, prostrate or erect annual (or perennial) herb to about 2' tall..." [No evidence, and unlikely due to succulent form and growth habit]
409	1999. Gilman, E.F./Howe, T.. <i>Calendula officinalis</i> Calendula, Pot Marigold. FPS87. University of Florida IFAS Extension, Gainesville, FL http://edis.ifas.ufl.edu/pdf/FP/FP08700.pdf	[Is a shade tolerant plant at some stage of its life cycle? Possibly No] "Light requirement: plant grows in full sun"
409	2013. Missouri Botanical Gardens. <i>Calendula officinalis</i> . http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/a566/calendula-officinalis.aspx [Accessed 15 June 2013]	[Is a shade tolerant plant at some stage of its life cycle?] "Sun: Full sun to part shade"
409	2013. Plants for a Future Database. <i>Calendula officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Calendula+officinalis [Accessed 15 June 2013]	[Is a shade tolerant plant at some stage of its life cycle?] "It can grow in semi-shade (light woodland) or no shade."
410	1999. Gilman, E.F./Howe, T.. <i>Calendula officinalis</i> Calendula, Pot Marigold. FPS87. University of Florida IFAS Extension, Gainesville, FL http://edis.ifas.ufl.edu/pdf/FP/FP08700.pdf	[Tolerates a wide range of soil conditions ? Yes] "Soil tolerances: clay; sand; acidic; loam"
410	2013. Plants for a Future Database. <i>Calendula officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=Calendula+officinalis [Accessed 15 June 2013]	[Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)? 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 acid and very alkaline soils." ... "An easily grown plant, it succeeds in any well-drained soil[200, 268], though it prefers a good loam and requires a sunny or at least partially sunny position[4, 15, 200, 268]. Plants flower best when they are grown in a poor soil[108]. Tolerates a pH in the range 4.5 to 8.3."
411	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Climbing or smothering growth habit? No] "Erect or ascending, annual or short lived perennial herb, sometimes somewhat woody toward base..."
412	1918. Nelson, J.C.. Further additions to the flora of western Oregon. <i>Torreyana</i> . 18(11): 220-226.	[Forms dense thickets? No] "Calendula officinalis L. A frequent escape to thickets and waste places about Salem." [No evidence of thicket formation]
412	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Forms dense thickets? No] "Wild plants occur as casuals or are locally well-established, and include a range of disc and ray colours although most have wholly orange or yellow capitula."
501	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Aquatic? No] "Waste places, rubbish dumps, coastal sites" [Terrestrial]
502	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Grass? No] Asteraceae
503	2011. Wu, Z.Y./Raven, P.H./Hong, D. Y., (eds.). Flora of China Vol. 20-21 (Asteraceae). Missouri Botanical Garden and Harvard University Herbaria, Beijing & St. Louis	[Nitrogen fixing woody plant? No] "Herbs, annual, 20–75 cm tall, usually branched from base, green, ± glandular pubescent. Basal leaves oblong-obovate or spatulate, 15–20 cm, margin entire or remotely denticulate; stem leaves oblong, oblong-lanceolate, or oblong obovate, 5–15 × 1–3 cm, ± amplexicaul, margin inconspicuously repand-denticulate, apex obtuse, rarely acute. Capitula 4–5 cm in diam.; phyllaries lanceolate or oblong-lanceolate, outer slightly longer than inner, acuminate. Ray florets yellow or orange, ca. 2 × as long as involucre, lamina up to 4–5 mm wide. Disk florets with triangular-lanceolate lobes. Achenes curved, yellowish or brownish, outer half-curved, often aculeate rostrate at apex, lateral-winged ridge irregularly rugose." [Asteraceae]

504	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "Erect or ascending, annual or short lived perennial herb, sometimes somewhat woody toward base, (10)-15-50 cm tall."
601	2013. WRA Specialist. Personal Communication.	[Evidence of substantial reproductive failure in native habitat? No] Widely cultivated, with no evidence of substantial reproductive failure
602	2013. Plants for a Future Database. <i>Calendula officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=C.alendula+officinalis [Accessed 15 June 2013]	[Produces viable seed? Yes] "When well-sited it usually self-sows freely and will maintain itself if allowed[1, 4]." ... "Propagation: Seed - sow in situ from spring to early summer and again in September. The seed germinates best in darkness and usually within 1 - 2 weeks at 21°C[138]. The plant often self-sows freely."
603	2012. Baciú, A.D./Pamfil, D./Sestras, A.F./Sestras, R.E./Mihalte, L.. The Variation of the Different Seeds Traits on F3 Hybrid Combinations of <i>Calendula</i> . Bulletin UASVM Horticulture. 69(1): 376-377.	[Hybridizes naturally? Unknown] "There were analyzed seeds obtain from 14 <i>Calendula</i> intra- and interspecific hybrid combinations." [Artificial hybrids created in genus. Unknown if natural hybridization occurs]
604	2007. Noyes, R.D.. Apomixis in the Asteraceae: diamonds in the rough. Functional Plant Science and Biotechnology. 1(2): 207-222.	[Self-compatible or apomictic? Yes] "Pullaiah (1984) cites evidence for apospory in <i>Calendula officinalis</i> L. based on a brief report, while Czapiak (1996) cites evidence for apospory in <i>Castalis</i> and <i>Dimorphotheca</i> but without original attribution. Sexual reproduction in <i>C. officinalis</i> is well documented (e.g., Godineau 1969), and most species in the genus are characterized as selfing (Heyn and Joel 1983). Apomixis does not appear to be a regular part of natural reproduction for any species in the genus."
605	2013. Plants for a Future Database. <i>Calendula officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=C.alendula+officinalis [Accessed 15 June 2013]	[Requires specialist pollinators? No] "The flowers are monoecious (individual flowers are either male or female, but both sexes can be found on the same plant) and are pollinated by Bees. It is noted for attracting wildlife. "
606	2013. Plants for a Future Database. <i>Calendula officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=C.alendula+officinalis [Accessed 15 June 2013]	[Reproduction by vegetative fragmentation? No] "Propagation: Seed - sow in situ from spring to early summer and again in September. The seed germinates best in darkness and usually within 1 - 2 weeks at 21°C[138]. The plant often self-sows freely."
607	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Minimum generative time (years)? 1] "Erect or ascending, annual or short lived perennial herb..."
701	1905. Dunn, S.T.. Alien Flora of Britain. West, Newman, and Company, London, UK	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Yes] "The common garden Marigold. A native of calcareous rocks in the Mediterranean region. It is a frequent straggler from cultivation; In fact, it is one of the most consistent and conspicuous indications of colonies of aliens resulting from the throwing out of garden rubbish."
701	2013. Plants for a Future Database. <i>Calendula officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=C.alendula+officinalis [Accessed 15 June 2013]	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Yes] "The original habitat is obscure but it is found as a garden escape on waste, cultivated and arable land and along roadsides"
702	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Propagules dispersed intentionally by people? Yes] "Marigold, or pot marigold as it is also called, is widely cultivated; ligules of cvs vary from pale yellow to deep orange with the disc wholly or partly coloured yellow, orange, brownish black or green."
702	2013. Plants for a Future Database. <i>Calendula officinalis</i> . http://www.pfaf.org/user/Plant.aspx?LatinName=C.alendula+officinalis [Accessed 15 June 2013]	[Propagules dispersed intentionally by people? Yes] "The growing plant acts as an insect deterrent[14], it reduces the soil eelworm population[24]. The flowers are used cosmetically. They can be used in skin lotions and when added to hair shampoos will lighten the hair colour[244]. The flowers are an alternative ingredient of 'Quick Return' compost activator[32]. This is a dried and powdered mixture of several herbs that can be added to a compost heap in order to speed up bacterial activity and thus shorten the time needed to make the compost[K]. A yellow dye is obtained from the boiled flowers[2, 4, 46]. An essential oil is obtained from the plant[7]. It is used rather sparingly, in view of the difficulty in obtaining it, in perfumes that have a rather sharp tang[7]. The flowers close when wet weather is likely to occur and they can therefore be used as a rough means of weather forecasting[7]."

703	1983. Kloot, P.M.. Early records of alien plants naturalised in South Australia. J. Adelaide Bot. Gard.. 6(2): 93-131.	[Propagules likely to disperse as a produce contaminant? No] "A garden escape" [No evidence that this species has become a produce contaminant]
703	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Propagules likely to disperse as a produce contaminant? No] "Wild plants occur as casuals or are locally well-established..." [No evidence that produce contamination was the vector of dispersal]
704	1998. Cromack, H.T.H./Smith, J.M.. Calendula officinalis—production potential and crop agronomy in southern England. Industrial Crops and Products. 7: 223–229.	[Propagules adapted to wind dispersal? Yes] "Seed of Calendula officinalis is composed of a mixture of winged, hooked and larval types." [Winged seed types probably gravity and wind-dispersed for short distances]
705	2005. Staples, G.W./Herbst, D.R.. A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	[Propagules water dispersed? No] "The fruit is as much as 1" long and beaked or winged." [No evidence that achenes are water dispersed]
706	2011. Wu, Z.Y./Raven, P.H./Hong, D. Y., (eds.). Flora of China Vol. 20-21 (Asteraceae). Missouri Botanical Garden and Harvard University Herbaria, Beijing & St. Louis	[Propagules bird dispersed? No] "Achenes curved, yellowish or brownish, outer half-curved, often aculeate rostrate at apex, lateral-winged ridge irregularly rugose." [Unlikely. Not fleshy-fruited]
707	2011. Wu, Z.Y./Raven, P.H./Hong, D. Y., (eds.). Flora of China Vol. 20-21 (Asteraceae). Missouri Botanical Garden and Harvard University Herbaria, Beijing & St. Louis	[Propagules dispersed by other animals (externally)? No] "Achenes curved, yellowish or brownish, outer half-curved, often aculeate rostrate at apex, lateral-winged ridge irregularly rugose." [No evidence, and no means of external attachment]
708	2013. WRA Specialist. Personal Communication.	[Propagules survive passage through the gut? Unknown] Unlikely to be internally dispersed
801	2009. Rahmani, N./Daneshian, J./Farahani, H.A.. Effects of nitrogen fertilizer and irrigation regimes on seed yield of calendula (<i>Calendula officinalis</i> L.). J. Agric. Biotech. Sustain. Dev.. 1(1): 24-28.	[Prolific seed production (>1000/m ²) Unknown] "This research was conducted in experimental field of Islamic Azad University of Takestan branch in Iran during 2006. The experimental unit was designed by achieved treatment in factorial on the basis of completely randomized block design with four replicates. The nitrogen was applied to the main plots at the rate of non-application, 30, 60 and 90 kg N ha ⁻¹ and the irrigation after 40, 80 and 120 mm water evaporation from evaporation pan assigned factorially to the subplots. The results showed that irrigation had a significant effect on seed yield, thousand seed weight, head diameter and number of seeds per head (P < 0.01) such that maximum head diameter (25.67 mm), number of seeds per head (31 seed/head), thousand seed weight (15.18 g) and seed yield (3044 kg ha ⁻¹) were achieved under irrigation after 40 mm evaporation. Nitrogen had a significant effect on all plant characteristics (P < 0.01) and highest thousand seed weight (12.66 g), seed yield (1998 kg ha ⁻¹), head diameter (23.96 mm) and number of seeds per head (29.25 seed/head) achieved after application of 90 kg N ha ⁻¹ . The results of this experiment showed that nitrogen increased the seed yield and delay of irrigation reduced seed yield of calendula significantly." [Unlikely, even when supplemented with water or nutrients]
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)? Probably Yes] "Storage Behaviour: Orthodox Storage Conditions: 28% germination following 10 years storage at room temperature (Harrington, 1972); no loss in viability following 16 years storage at 35 40% r.h. and 4°C (Bass, 1980); seeds maintained for 3-5 years in commercial storage conditions (Priestley, 1986); long-term storage under IPGRI preferred conditions at RBG Kew, WP. Oldest collection 15 years; germination change 90 to 90%, 13 years, 1 collection"
803	2002. Forcella, F./Papiernik, S.K./Gesch, R.W.. Postemergence Herbicides for Calendula. Weed Technology. 26(3): 566-569.	[Well controlled by herbicides? Yes] "A small number of mostly PPI/PRE applied herbicides are known to be safe on calendula (Cromack and Smith 1998; Froment et al. 2003). Chlorpropham, DCPA (5 chlorthalldimethyl), isoxaben, metamiltron, pronamide (5 propyzamide), propachlor, and trifluralin were consistently safe in northern Europe, whereas metazachlor and pendimethalin sometimes injured calendula. Only two POST applied herbicides for calendula were identified: asulam was consistently safe, whereas phenmedipham sometimes injured calendula. Most of these products (asulam, DCPA, isoxaben, metamiltron, metazachlor, pronamide, and propachlor) are used sparingly or not at all in the United States (Anonymous 2007a,b, 2008), and their sales have been negligible in recent years in Minnesota (Anonymous 2011). Thus, both crop tolerance and herbicide availability could present challenges to regional growers who might consider growing calendula as an alternative crop."

804	1988. Webb, C. J./Sykes, W.R./Garnock-Jones, P.J.. Flora of New Zealand, Volume IV: Naturalised pteridophytes, gymnosperms, dicotyledons. Botany Division, DSIR, Christchurch, New Zealand http://FloraSeries.LandcareResearch.co.nz	[Tolerates, or benefits from, mutilation, cultivation, or fire? No] "Erect or ascending, annual or short lived perennial herb..." [This plant relies on seeds, rather than resprouting, to persist in the environment]
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
- Broad climate suitability
- Unpalatable to deer and possibly other grazing animals
- May cause allergic reactions to susceptible individuals
- 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 possibly short distances by wind and gravity
- Often spread by discarded garden waste
- Seeds may persist in the soil

Low Risk / Desirable Traits

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