Key Words: Evaluate, Naturalized, Succulent Herb, Bee Plant, Fodder, Cover Crop

***Family:*** ***Boraginaceae***

***Taxon:*** ***Phacelia tanacetifolia***

***Synonym:*** *Phacelia tanacetifolia subvar. tenuisecta Brai* ***Common Name:*** fiddleneck
phacelia
tansy phacelia
bee phacelia

**Questionaire :** current 20090513 **Assessor:** Chuck Chimera **Designation:** EVALUATE
**Status:** Assessor Approved **Data Entry Person:** Chuck Chimera **WRA Score** 5

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| **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)** | |
| **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** | **n** |
| **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** | **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** | **n** |
| **410** | **Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)** | **y=1, n=0** | **y** |

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| **411** | **Climbing or smothering growth habit** | **y=1, n=0** | **n** |
| **412** | **Forms dense thickets** | **y=1, n=0** | |
| **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** | |
| **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** | **y** |
| **704** | **Propagules adapted to wind dispersal** | **y=1, n=-1** | **n** |
| **705** | **Propagules water dispersed** | **y=1, n=-1** | |
| **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** | **y** |
| **803** | **Well controlled by herbicides** | **y=-1, n=1** | |
| **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** 5

**Supporting Data:**

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| 101 | 1993. Halse, R.R.. Treatments from the Jepson Manual - Hydrophyllaceae. Jepson Flora Project [accessed 7/30/2012], http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?4518,4587,4703 | [Is the species highly domesticated? No] |
| 101 | 2012. Blackwell, L.R.. Wildflowers of California: A Month-By-Month Guide. University of California Press, Berkeley and Los Angeles, CA | [Is the species highly domesticated? No] |
| 102 | 2012. WRA Specialist. Personal Communication. | NA |
| 103 | 2012. WRA Specialist. Personal Communication. | NA |
| 201 | 2012. Calflora. The Calflora Database - Phacelia tanacetifolia. http://www.calflora.org/cgi-bin/species_query.cgi?where-taxon=Phacelia+tanacetifolia | [Species suited to tropical or subtropical climate(s) 0-Low] "Phacelia tanacetifolia, a dicot, is an annual herb that is native to California and is also found outside of California, but is confined to western North America." [Higher elevations of tropics would be suitable] |
| 202 | 2012. Calflora. The Calflora Database - Phacelia tanacetifolia. http://www.calflora.org/cgi-bin/species_query.cgi?where-taxon=Phacelia+tanacetifolia | [Quality of climate match data 2-High] |
| 203 | 2003. Gilbert, L.. Phacelia tanacetifolia : A brief overview of a potentially useful insectary plant and cover crop. Small Farm Success Project Fact Sheet Number 2a. USDA, http://seriousaboutcamo.typepad.com/files/phacelia_farmer_version.pdf | [Broad climate suitability (environmental versatility)? Yes] "However, this plant is being used in a wide range of climatic regions, and this illustrates its adaptability to climate and soil types." |
| 203 | 2012. Blackwell, L.R.. Wildflowers of California: A Month-By-Month Guide. University of California Press, Berkeley and Los Angeles, CA | [Broad climate suitability (environmental versatility)? Yes] "Grasslands, sandy or gravelly slopes (to 6,000 feet); found in coast ranges, Central Valley, foothills, Transverse Ranges, Peninsular Ranges, Mojave Desert." [Elevation range exceeds 1000 m, demonstrating environmental versatility] |
| 204 | 2007. Randall, R.P.. Global Compendium of Weeds - Phacelia tanacetifolia. http://www.hear.org/gcw/species/phacelia_tanacetifolia/ | [Native or naturalized in regions with tropical or subtropical climates? No] No evidence |
| 204 | 2012. Tropicos.org. Tropicos [Online Database]. Missouri Botanical Garden, http://www.tropicos.org/ | [Native or naturalized in regions with tropical or subtropical climates? No] No evidence |
| 204 | 2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl | [Native or naturalized in regions with tropical or subtropical climates? No] Naturalized in areas with temperate and Mediterranean climates |
| 205 | 2003. Petanidou, T.. Introducing plants for bee-keeping at any cost? – Assessment of Phacelia tanacetifolia as nectar source plant under xeric Mediterranean conditions. Plant Systematics and Evolution. 238: 155-168. | [Does the species have a history of repeated introductions outside its natural range? Yes] "Native to Californian drylands, chaparral and Central oak woodland, P. tanacetifolia has been naturalised throughout the western United States and frequently in Europe (Tutin 1992), whereas it has been extensively used as a nectar crop up to Australia." |
| 205 | 2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl | [Does the species have a history of repeated introductions outside its natural range? Yes] "Naturalized: AUSTRALASIA<br>Australia: Australia - New South Wales, South Australia<br>New Zealand: New Zealand<br>EUROPE<br>Southeastern Europe: Bulgaria<br>Southwestern Europe: France" |
| 301 | 2006. Domingues de Almeida, J./Freitas, H.. Exotic naturalized flora of continental Portugal – A reassessment. Botanica Complutensis. 30: 117-130. | [Naturalized beyond native range? Yes] "Table 2. Exotic vascular plant species (invasive, potentially invasive or more or less naturalized) in continental Portugal." [Includes Phacelia tanacetifolia, introduced in 1913] |
| 301 | 2006. Totland, Ø./Nielsen, A./Bjerknes, A.-L./Ohlson, M.. Effects of an Exotic Plant and Habitat Disturbance on Pollinator Visitation and Reproduction in a Boreal Forest Herb. American Journal of Botany. 93(6): 868-873. | [Naturalized beyond native range? Yes] "The herb is native to western North America, but has frequently naturalized in Europe (Tutin, 1972)." |

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| 301 | 2007. Mahon, D.J.. Canterbury naturalised vascular plant checklist. Canterbury Conservancy Department of Conservation, Christchurch, NZ | [Naturalized beyond native range? Yes] "Phacelia tanacetifolia" … "Fully naturalised" |
| 301 | 2010. Stace, C.. New Flora of the British Isles. Cambridge University Press, Cambridge, UK | [Naturalized beyond native range? Yes] "Intrd-natd; grown in gardens for ornament and small-scale in fields, for bees and as green manure, also contaminant of crop- and grass-seed, casual on tips, waste ground and among crops and new grass, rarely persistent; very scattered but increasing in BI" [Introduced and naturalized] |
| 301 | 2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl | [Naturalized beyond native range? Yes] "Naturalized: AUSTRALASIA<br>Australia: Australia - New South Wales, South Australia<br>New Zealand: New Zealand<br>EUROPE<br>Southeastern Europe: Bulgaria<br>Southwestern Europe: France" |
| 301 | 2012. Wagner, W.L./Herbst, D.R./Khan, N./Flynn, T.. Hawaiian Vascular Plant Updates: A Supplement to the Manual of the Flowering Plants of Hawai`i & Hawai`i's Ferns & Fern Allies. http://botany.si.edu/pacificislandbiodiversity/hawaianflora/supplement.htm | [Naturalized beyond native range? No evidence to date in Hawaiian Islands] |
| 301 | 2012. Western Australian Herbarium. FloraBase — The Western Australian Flora - Phacelia tanacetifolia Benth.. Department of Environment and Conservation, http://florabase.dec.wa.gov.au/browse/profile/6669 | [Naturalized beyond native range? Yes] "Naturalised Status: Alien to Western Australia" |
| 302 | 1923. Abrams, L./Ferris, R.S.. An Illustrated Flora of the Pacific States: Geraniaceae to Scrophulariaceae, geraniums to figworts. Stanford University Press, Stanford, CA | [Garden/amenity/disturbance weed? Possibly] "widely escaped in grainfields" |
| 302 | 2006. Borders, B.. Valley Flora Propagation Center Species Profiles - Phacelia tanacetifolia. CSU Stanislaus, http://esrp.csustan.edu/vfpc/profiles/PHTA.pdf | [Garden/amenity/disturbance weed? Possibly Yes] "The Rancho Santa Ana Botanic Garden reported overwhelming success with cultivating P. tanacetifolia" … "They described P. tanacetifolia as the most vigorous and aggressive of the phacelias, with the tendency to invade adjacent cultivated areas and stifle other less aggressive native plants." |
| 302 | 2006. Wildflower Information.org. Lacy Phacelia - Phacelia tanacetifolia. http://wildflowerinformation.org/Wildflower.asp?ID=73 | [Garden/amenity/disturbance weed? Potentially] "This desert species is very easy to grow, some would say too easy. It is lovely in a meadow, but can sometimes become "weedy", so use it sparingly. Give it desert-like hot conditions." |
| 302 | 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 | [Garden/amenity/disturbance weed? Possibly] "Occasional garden escape on wasteland. Also encountered occasionally in canola crops in the wheatbelt, arriving as a contaminant in crop seed." [No evidence of impacts] |
| 302 | 2011. Haines, A.. New England Wild Flower Society's Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Yale University Press, Yale, CT | [Garden/amenity/disturbance weed? Possibly] "Gardens, waste areas." |
| 303 | 2005. Olenin, S.. Invasive Aquatic Species in the Baltic States (Monograph). Klaipeda University, Klaipėda, Lithuania | [Agricultural/forestry/horticultural weed? Possibly] "Table 5. Introduced vascular plants in aquatic environments of the Baltic States" … "Phacelia tanacetifolia" … "Habitat - River banks" … "only found as weed in agricultural fields" [Impacts not described] |

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| 304 | 2006. Totland, Ø./Nielsen, A./Bjerknes, A.-L./Ohlson, M.. Effects of an Exotic Plant and Habitat Disturbance on Pollinator Visitation and Reproduction in a Boreal Forest Herb. American Journal of Botany. 93(6): 868-873. | [Environmental weed? No. Competition for pollinators does not affect female reproductive success] "The invasion of exotic species into natural habitats is considered to be a major threat to biodiversity, and many studies have examined how exotic plants directly affect native plant species through competitive interactions for abiotic resources. However, although exotics can have potentially great ecological and evolutionary consequences, very few researchers have studied the effect of exotics on the interactions between plants and their mutualistic partners, such as pollinators, and none have reported on such impacts in logged and undisturbed boreal forest ecosystems. Here we show how experimental introductions of an exotic plant species (Phacelia tanacetifolia Bentham) affect pollinator visitation and female reproductive success of a native plant (Melampyrum pratense L.) in recently disturbed (i.e., logged) and in undisturbed boreal forest habitats. The presence of Phacelia significantly increased the number of bumble bees entering plots in both habitat types. However, the exotic species had a strong negative impact on the visitation rate to the native species in both habitat types. Despite this negative impact on pollinator visitation, the exotic had no effect on female reproductive success of the native species in any habitat. Our results show that seed production may be more robust than pollinator visitation to exotic invasion, irrespective of habitat disturbance history" |
| 305 | 2007. Randall, R.P.. Global Compendium of Weeds - Index. http://www.hear.org/gcw/ | [Congeneric weed? Yes] 19 taxa listed as naturalized and/or weeds |
| 401 | 1998. Ingels, C.A.. Cover Cropping in Vineyards: A Grower's Handbook. University of California. Division of Agriculture and Natural Resources, Oakland, CA | [Produces spines, thorns or burrs? No] "Description: Stems semierect, succulent; leaves pinnately divided, finely hairy, bearing glands; inflorescence (cyme) compact, densely hairy, containing many flowers in each; flowers blue, showy." |
| 402 | 2003. Petanidou, T.. Introducing plants for bee-keeping at any cost? – Assessment of Phacelia tanacetifolia as nectar source plant under xeric Mediterranean conditions. Plant Systematics and Evolution. 238: 155-168. | [Allelopathic? No evidence] "It has been extensively … as green manure or beneficial cover crop for soil fertility and reclamation of degraded soils: Williams and Christian 1991, Fielder and Peel 1992, Stiversyoung 1998, Viaene and Abawi 1998, Jackson 2000, Brofas and Varelides 2000, Brofas et al. 2000)." |
| 402 | 2007. Farkas, Á./Zajácz, E.. Nectar Production for the Hungarian Honey Industry. The European Journal of Plant Science and Biotechnology. 1(2): 125-151. | [Allelopathic? No evidence] "A further advantage of phacelia is that it can be sown during the period of cereal harvest, which is traditionally in late June, early July in Hungary. Thus phacelia can have a dual role, supplying forage for bees and serving a useful agronomic purpose by the capture of nitrogen and covering the soil protecting it from erosive forces (Williams and Christian 1991)." |
| 403 | 2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl | [Parasitic? No evidence] Family: Boraginaceae subfamily: Hydrophylloideae. Also placed in: Hydrophyllaceae |
| 404 | 2006. Totland, Ø./Nielsen, A./Bjerknes, A.-L./Ohlson, M.. Effects of an Exotic Plant and Habitat Disturbance on Pollinator Visitation and Reproduction in a Boreal Forest Herb. American Journal of Botany. 93(6): 868-873. | [Unpalatable to grazing animals? No] "Early after the establishment of the experiment, moose grazed all the P. tanacetifolia plants in all experimental subplots in one of the disturbed forest plots, forcing us to remove the block containing this plot in the split-plot analyses." |
| 404 | 2007. Farkas, Á./Zajácz, E.. Nectar Production for the Hungarian Honey Industry. The European Journal of Plant Science and Biotechnology. 1(2): 125-151. | [Unpalatable to grazing animals? No] "It protects against soil erosion, and can be used also as fodder or soil improver, but the latter uses are not so significant in Hungary as in the case of papilionaceous plants." |
| 405 | 2007. Farkas, Á./Zajácz, E.. Nectar Production for the Hungarian Honey Industry. The European Journal of Plant Science and Biotechnology. 1(2): 125-151. | [Toxic to animals? No evidence] "It protects against soil erosion, and can be used also as fodder or soil improver, but the latter uses are not so significant in Hungary as in the case of papilionaceous plants." |
| 405 | 2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL | [Toxic to animals? No] No evidence |
| 405 | 2010. gardenguides.com. Lacy Phacelia (Tanacetifolia). http://www.gardenguides.com/taxonomy/lacy-phacelia-phacelia-tanacetifolia/ | [Toxic to animals? No] "Causes Livestock Bloating - None" |
| 406 | 2007. Farkas, Á./Zajácz, E.. Nectar Production for the Hungarian Honey Industry. The European Journal of Plant Science and Biotechnology. 1(2): 125-151. | [Host for recognized pests and pathogens? No evidence] "Other factors in its increasing popularity are that its growing expenses are low, it can be cultivated with great certainty and has no special requirements (Nagy 2002c). Phacelia has no pathogens and pests, so only little herbicide is used for weed control. Therefore it is spreading in bio-agriculture as a soil-disinfecter and green manure." |

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| 407 | 2012. Calflora. The Calflora Database - Phacelia tanacetifolia. http://www.calflora.org/cgi-bin/species_query.cgi?where-taxon=Phacelia+tanacetifolia | [Causes allergies or is otherwise toxic to humans? Possibly Yes] "Toxicity: DERMATITIS [California Poison Control System 2010]" |
| 407 | 2012. Shoot Gardening. Phacelia tanacetifolia (Fiddleneck). http://www.shootgardening.co.uk/plant/phacelia-tanacetifolia | [Causes allergies or is otherwise toxic to humans? Possibly Yes] "Toxicity: Contact with skin may cause irritation" |
| 408 | 1998. Ingels, C.A.. Cover Cropping in Vineyards: A Grower's Handbook. University of California. Division of Agriculture and Natural Resources, Oakland, CA | [Creates a fire hazard in natural ecosystems No] "It grows rapidly in the winter, forming a dense, succulent stand." [Succulent plants not likely to increase fire hazard] |
| 409 | 1998. Serrato-Valenti, G./Mariotti, M.G./Cornara, L./Corallo, A.. A Histological and Structural Study of Phacelia tanacetifolia Endosperm in Developing, Mature, and Germinating Seed. International Journal of Plant Sciences. 159(5): 753-761. | [Is a shade tolerant plant at some stage of its life cycle? No. Although light inhibits seed germination] "Recent physiological studies of P. tanacetifolia seed germination showed that either in the dark or in the light the reactivation of seed metabolism following imbibition showed the same features up to 21 h. After 21 h, light inhibited further development of these metabolic features. There is a relationship between the germination processes and treatments with butyric acid, fusicoccin, and gibberellic acid, which modify cytoplasmic pH and enzymatic activity (Cocucci et al. 1989; Espen et al. 1995; Pirovano et al. 1996)." |
| 409 | 2010. gardenguides.com. Lacy Phacelia (Tanacetifolia). http://www.gardenguides.com/taxonomy/lacy-phacelia-phacelia-tanacetifolia/ | [Is a shade tolerant plant at some stage of its life cycle? No] "Shade Tolerance - Intolerant" |
| 409 | 2012. Plants for a Future Database. Phacelia tanacetifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Phacelia+tanacetifolia | [Is a shade tolerant plant at some stage of its life cycle? No] " It cannot grow in the shade." |
| 410 | 2003. Goodwin, K./Sheley, R.. Revegetation Guidelines for Western Montana: Considering Invasive Weeds. Montana State University, Bozeman | [Tolerates a wide range of soil conditions? Yes] "Aggressive in growth, adapted to a wide range of soils. Good for erosion control." |
| 410 | 2012. Plants for a Future Database. Phacelia tanacetifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Phacelia+tanacetifolia | [Tolerates a wide range of soil conditions? Yes] "Succeeds in any moderately fertile well drained soil in a sunny position[200]. Prefers a moist soil[108]." |
| 411 | 1998. Ingels, C.A.. Cover Cropping in Vineyards: A Grower's Handbook. University of California. Division of Agriculture and Natural Resources, Oakland, CA | [Climbing or smothering growth habit? No] "Description: Stems semierect, succulent; leaves pinnately divided, finely hairy, bearing glands; inflorescence (cyme) compact, densely hairy, containing many flowers in each; flowers blue, showy." |
| 412 | 1998. Ingels, C.A.. Cover Cropping in Vineyards: A Grower's Handbook. University of California. Division of Agriculture and Natural Resources, Oakland, CA | [Forms dense thickets? Possibly] "It grows rapidly in the winter, forming a dense, succulent stand." |
| 412 | 2003. Goodwin, K./Sheley, R.. Revegetation Guidelines for Western Montana: Considering Invasive Weeds. Montana State University, Bozeman | [Forms dense thickets? Possibly] "Lacy phacelia is an aggressive native annual that may have good competitive abilities." … "Aggressive in growth, adapted to a wide range of soils. Good for erosion control." |
| 412 | 2011. Buck-Diaz, J./Evens, J.. Carrizo Plain National Monument Vegetation Classification and Mapping Project. California Native Plant Society, Sacramento CA | [Forms dense thickets? Possibly] "Phacelia tanacetifolia is seasonally dominant or co-dominant on steep, dry slopes on siltstone derived soils. A variety of other herbs such as Amsinckia tessellata, A. vernicosa, Astragalus didymocarpus, Caulanthus inflatus, Eremalche parryi, Erodium cicutarium, Salvia columbariae, Lupinus succulentus, Eriogonum elongatum are present. Stands typically on moderate to steep slopes facing southeast and southwest…" |
| 501 | 1998. Ingels, C.A.. Cover Cropping in Vineyards: A Grower's Handbook. University of California. Division of Agriculture and Natural Resources, Oakland, CA | [Aquatic? No] "Description: Stems semierect, succulent; leaves pinnately divided, finely hairy, bearing glands; inflorescence (cyme) compact, densely hairy, containing many flowers in each; flowers blue, showy." |
| 502 | 2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl | [Grass? No] Family: Boraginaceae subfamily: Hydrophylloideae. Also placed in: Hydrophyllaceae |

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| 503 | 2012. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl | [Nitrogen fixing woody plant? No] Family: Boraginaceae subfamily: Hydrophylloideae. Also placed in: Hydrophyllaceae |
| 504 | 1998. Ingels, C.A.. Cover Cropping in Vineyards: A Grower's Handbook. University of California. Division of Agriculture and Natural Resources, Oakland, CA | [Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No evidence] "Description: Stems semierect, succulent; leaves pinnately divided, finely hairy, bearing glands; inflorescence (cyme) compact, densely hairy, containing many flowers in each; flowers blue, showy." |
| 601 | 2012. Blackwell, L.R.. Wildflowers of California: A Month-By-Month Guide. University of California Press, Berkeley and Los Angeles, CA | [Evidence of substantial reproductive failure in native habitat? No] No evidence |
| 602 | 2003. Gilbert, L.. Phacelia tanacetifolia : A brief overview of a potentially useful insectary plant and cover crop. Small Farm Success Project Fact Sheet Number 2a. USDA, http://seriousaboutcamo.typepad.com/files/phacelia_farmer_version.pdf | [Produces viable seed? Yes] "Phacelia seed needs dark for good germination – bury the seed a 1/4 inch. Phacelia seed also requires cool soil temperatures for germination (although it will grow well in hot, dry soil). Research reports indicate the optimum soil temperature for germination is between 37 - 68°F (soil temperatures closely follow air temperatures). Wet or compacted soils reduce germination success. Planting phacelia thickly or with an appropriate nurse crop may be one approach to counteract possible germination difficulties under suboptimum conditions. A nurse crop such as buckwheat germinates reliably quickly and serves to protect the ground from erosion and shelter the second crop as it germinates more slowly. Suitable nurse crops when phacelia is used as an insectary planting would be quick germinating insect-friendly herbs and flowers such as borage (Borago officinalis), cosmos (Cosmos sulphureus), achillea (Achillea millefolium), and buckwheat. Planting phacelia before a rain or lightly irrigating after planting may improve germination rates." |
| 603 | 1993. Halse, R.R.. Treatments from the Jepson Manual - Hydrophyllaceae. Jepson Flora Project [accessed 7/30/2012], http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?4518,4587,4703 | [Hybridizes naturally? Unknown] "CA pers often hybridize, difficult to separate." [Genus description] |
| 604 | 2003. Petanidou, T.. Introducing plants for bee-keeping at any cost? – Assessment of Phacelia tanacetifolia as nectar source plant under xeric Mediterranean conditions. Plant Systematics and Evolution. 238: 155-168. | [Self-compatible or apomictic? Possibly Yes] "The flowers of P. tanacetifolia are homogamous, becoming receptive as soon as they open. Their life span was very short, lasting between 2.5 and 4 h, up to a maximum of 5 h. Because anthesis was not restricted in time within a day, open flowers were found all day long." |
| 604 | 2007. Farkas, Á./Zajácz, E.. Nectar Production for the Hungarian Honey Industry. The European Journal of Plant Science and Biotechnology. 1(2): 125-151. | [Self-compatible or apomictic? Possibly Yes, although outcrossing increases seed set] "Dögei (1987) claims that phacelia does not require bee pollination, but it provides an excellent honey source. On the other hand, Nagy (2002a) emphasizes the esssential role of honeybees in fertilisation of the plant. In the absence of bees, seed production is dramatically lower." |
| 604 | 2012. Plants for a Future Database. Phacelia tanacetifolia. http://www.pfaf.org/user/Plant.aspx?LatinName=Phacelia+tanacetifolia | [Self-compatible or apomictic? Possibly] "The flowers are hermaphrodite (have both male and female organs) and are pollinated by Bees." |
| 605 | 2003. Gilbert, L.. Phacelia tanacetifolia : A brief overview of a potentially useful insectary plant and cover crop. Small Farm Success Project Fact Sheet Number 2a. USDA, http://seriousaboutcamo.typepad.com/files/phacelia_farmer_version.pdf | [Requires specialist pollinators? No] "Phacelia is highly attractive to honeybees, bumblebees, and syrphid flies, and these insects are valuable pollinators. Syrphid fly larvae are voracious feeders on aphids and young caterpillars. Phacelia is also reputed to attract other beneficial insects, such as parasitic wasps and minute pirate bugs. It provides both pollen (for protein – needed for egg production) and nectar (for carbohydrates – needed for energy)." |
| 605 | 2006. Totland, Ø./Nielsen, A./Bjerknes, A.-L./Ohlson, M.. Effects of an Exotic Plant and Habitat Disturbance on Pollinator Visitation and Reproduction in a Boreal Forest Herb. American Journal of Botany. 93(6): 868-873. | [Requires specialist pollinators? No] "We used Phacelia tanacetifolia Bentham (Hydrophyllaceae) as the experimentally introduced exotic species. This species is known to be highly attractive to flower visitors and is used as a forage plant in beekeeping (Petanidou, 2003 and references therein" … "Flowers occur in coiled inflorescences that unwind as flowers open. In our study area, we observed Bombus spp. (mainly B. pratorum L. and B. lucorum L.), flies, and beetles visiting P. tanacetifolia" |
| 606 | 1997. Benson, D./McDougall, L.. Ecology of Sydney Plant Species. Part 5. Dicotyledon families Flacourtiaceae to Myrsinaceae. Cunninghamia. 5(2): 330-544. | [Reproduction by vegetative fragmentation? No] "Vegetative spread: No" |

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| 606 | 2003. Gilbert, L.. Phacelia tanacetifolia : A brief overview of a potentially useful insectary plant and cover crop. Small Farm Success Project Fact Sheet Number 2a. USDA, http://seriousaboutcamo.typepad.com/files/phacelia_farmer_version.pdf | [Reproduction by vegetative fragmentation? No evidence] "Phacelia tanacetifolia is an herbaceous, non leguminous, flowering annual in the Hydrophyllaceae family." … "Phacelia may be suitable as a winter-killed cover crop when a heavy crop residue is not needed in the spring. Research in other regions shows phacelia has the potential to produce abundant biomass and does a good job at catching excess nitrates before they leach into groundwater. Phacelia winter-kills at about 18ºF, and the residue breaks down quickly. Its use as a fall/winter cover crop may be appropriate when it will be followed by a vigorous cash crop (e.g. potatoes) in early spring." [Annual with no evidence of vegetative spread] |
| 606 | 2010. gardenguides.com. Lacy Phacelia (Tanacetifolia). http://www.gardenguides.com/taxonomy/lacy-phacelia-phacelia-tanacetifolia/ | [Reproduction by vegetative fragmentation? No] "Vegetative Spread - None" |
| 607 | 2006. Totland, Ø./Nielsen, A./Bjerknes, A.-L./Ohlson, M.. Effects of an Exotic Plant and Habitat Disturbance on Pollinator Visitation and Reproduction in a Boreal Forest Herb. American Journal of Botany. 93(6): 868-873. | [Minimum generative time (years)? 1] "Phacelia tanacetifolia is an annual herb with ca. 6-10 mm wide, open, bluish-violet flowers, and five exserted stamen" |
| 701 | 2006. Hand, R.. Supplementary Notes to the Flora of Cyprus V. Willdenowia. 36: 761-809. | [Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Probably Yes] "Phacelia tanacetifolia Benth. … Currently, the alien occurs in many places in the Troodos range in rich populations. It is certainly no casual as in many countries of Central Europe but a naturalized invasive growing often on screes and banks along roads." |
| 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)? Yes. Dispersed inadvertently by farm machinery] "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. Dispersal on the entire field was assessed by counting emerged seedlings in contiguous quadrats." … "The use of a cultivator after harvesting significantly increased the distance travelled in the driving direction for three species with ripe seeds during harvest." … "Seeds that had been placed on the soil (B. officinalis, S. marianum, V. sativa) dispersed less far, following harvesting and cultivation, than seeds that were attached to the plant at the time of harvest (S. alba, P. tanacetifolia) (Table 3)." … "The patterns (Fig. 2) show that seeds of S. alba and P. tanacetifolia were dispersed throughout the entire headland and even beyond." |
| 702 | 2003. Petanidou, T.. Introducing plants for bee-keeping at any cost? – Assessment of Phacelia tanacetifolia as nectar source plant under xeric Mediterranean conditions. Plant Systematics and Evolution. 238: 155-168. | [Propagules dispersed intentionally by people? Yes] "It has been extensively used for nectar (bee keeping, wild bee conservation in set-aside lands, as well as in pest management – mainly against aphids through hoverfly management: Williams and Christian 1991, Gathmann et al. 1994, Sengonca and Frings 1988, Bowie et al. 1995, Hickman and Wratten 1996, Williams 1997, Carreck and Williams 1997, Lovei et al. 1998, Sommaggio 1999) and for biomass (animal fodder, conservation tillage systems on erodible soils, as well as green manure or beneficial cover crop for soil fertility and reclamation of degraded soils: Williams and Christian 1991, Fielder and Peel 1992, Stiversyoung 1998, Viaene and Abawi 1998, Jackson 2000, Brofas and Varelides 2000, Brofas et al. 2000)." |
| 702 | 2006. Totland, Ø./Nielsen, A./Bjerknes, A.-L./Ohlson, M.. Effects of an Exotic Plant and Habitat Disturbance on Pollinator Visitation and Reproduction in a Boreal Forest Herb. American Journal of Botany. 93(6): 868-873. | [Propagules dispersed intentionally by people? Yes] "Because P. tanacetifolia currently is not invasive in Norway but is frequently used as a bee plant and as an ornamental in gardens, we examined the potential initial effects of its invasion into a patchily disturbed landscape." |
| 703 | 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 | [Propagules likely to disperse as a produce contaminant? Yes] "Occasional garden escape on wasteland. Also encountered occasionally in canola crops in the wheatbelt, arriving as a contaminant in crop seed." |
| 703 | 2010. Stace, C.. New Flora of the British Isles. Cambridge University Press, Cambridge, UK | [Propagules likely to disperse as a produce contaminant? Yes] "grown in gardens for ornament and small-"scale in fields, for bees and as green manure, also contaminant of crop- and grass-seed, casual on tips, waste ground and among crops and new grass, rarely persistent; very scattered but increasing in BI" |
| 704 | 1923. Abrams, L./Ferris, R.S.. An Illustrated Flora of the Pacific States: Geraniaceae to Scrophulariaceae, geraniums to figworts. Stanford University Press, Stanford, CA | [Propagules adapted to wind dispersal? No] "seeds usually 2, oblong, 2-3 mm. long, dark brown, coarsely rugose." [No adaptations to wind dispersal, although small seeds may be blown short distances in wind] |

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| 705 | 1997. Benson, D./McDougall, L.. Ecology of Sydney Plant Species. Part 5. Dicotyledon families Flacourtiaceae to Myrsinaceae. Cunninghamia. 5(2): 330-544. | [Propagules water dispersed? Possibly] "Fruit/seed: Capsule 3–4 mm long, usually with 2 greyish brown seeds" [No evidence, but seeds are small enough that they may be moved by streams or overland flow of water] |
| 706 | 1993. Halse, R.R.. Treatments from the Jepson Manual - Hydrophyllaceae. Jepson Flora Project [accessed 7/30/2012], http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?4518,4587,4703 | [Propagules bird dispersed? No] "Fruit 3–4 mm, ± ovoid, glabrous; tip puberulent to short-hairy Seeds 1–2, 2–3 mm, wrinkled, pitted" [Not fleshy-fruited] |
| 707 | 2004. Couvreur, M./Christiaen, B./Verheyen, K./Hermy, M.. Large herbivores as mobile links between isolated nature reserves through adhesive seed dispersal. Applied Vegetation Science. 7: 229-236. | [Propagules dispersed by other animals (externally)? Yes] "Table 1. Plant species identified in the fur of 201 large herbivores" [Horse: Phacelia tanacetifolia] |
| 707 | 2005. Couvreur, M.. Epizoochorous seed dispersal by large herbivores. Ph.D. thesis. Ghent University, Ghent | [Propagules dispersed by other animals (externally)? Potentially Yes] "Table 2.1 Plant species identified in the fur of 201 large herbivores" [Phacelia tanacetifolia seed collected in fur of horses] |
| 708 | 2007. Farkas, Á./Zajácz, E.. Nectar Production for the Hungarian Honey Industry. The European Journal of Plant Science and Biotechnology. 1(2): 125-151. | [Propagules survive passage through the gut? Unknown] "It protects against soil erosion, and can be used also as fodder or soil improver, but the latter uses are not so significant in Hungary as in the case of papilionaceous plants." [Possible that seeds may be ingested, but unknown if they survive passage through the guts of animals] |
| 801 | 2006. Borders, B.. Valley Flora Propagation Center Species Profiles - Phacelia tanacetifolia. CSU Stanislaus, http://esrp.csustan.edu/vfpc/profiles/PHTA.pdf | [Prolific seed production (>1000/m2)? Possibly] "Seeds per gram = 548" |
| 802 | 2003. Wratten, S.D./Lavandero, B.I./Tylianakis, J./Vattala, D./Çilgi, T./Sedcole, R.. Effects of Flowers on Parasitoid Longevity and Fecundity. New Zealand Plant Protection. 56: 239-245. | [Evidence that a persistent propagule bank is formed (>1 yr)? Presumably Yes] "Weed potential. Annual plants such as buckwheat (Fagopyrum esculentum Moench.) germinate and grow quickly but are killed by frost in most climates, so are less likely to become persistent weeds. In contrast, P. tanacetifolia (see above) produces seeds readily and can survive frosts. Its seeds can remain in the seed bank for many years and can contaminate annual and perennial crops." |
| 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)? Presumably Yes] "Storage Behaviour: Orthodox p Storage Conditions: Seeds can be stored for 4 5 years in commercial storage conditions (Priestley, 1986)" |
| 803 | 2012. WRA Specialist. Personal Communication. | [Well controlled by herbicides? Unknown] No information on herbicide efficacy or chemical control of this species |
| 804 | 2010. gardenguides.com. Lacy Phacelia (Tanacetifolia). http://www.gardenguides.com/taxonomy/lacy-phacelia-phacelia-tanacetifolia/ | [Tolerates, or benefits from, mutilation, cultivation, or fire? No] "Responds to Coppicing - No" … "Fire Resistant = No" |
| 805 | 2012. WRA Specialist. Personal Communication. | [Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown] |

**Summary of Risk Traits**

**High Risk / Undesirable Traits**

- Naturalized in Europe, Australia and New Zealand
- Broad elevation range (> 1000 m distribution)
- “Weedy” growth; often escaping cultivation
- Contact may cause skin irritation or dermatitis
- Tolerates many soil conditions (potential to invade many habitat types)
- Annual (reproductive in <1 year)
- Small seeds dispersed as a seed crop contaminant
- Seeds dispersed in fur/hair of animals
- Forms a persistent seed bank

**Low Risk / Desirable Traits**

- Unarmed
- Fodder plant
- Non-toxic to animals
- Useful as a cover crop and green manure
- Used for nectar (bee keeping, wild bee conservation)
- Used in pest management – mainly against aphids by attracting hoverflies