Stewardship Account for Branched Indian Clover

Trifolium dichotomum

Prepared for the
Garry Oak Ecosystems Recovery Team
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by
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STEWARDSHIP ACCOUNT

Trifolium dichotomum H. & A.

Species information:

Kingdom: Plantae
Subkingdom: Tracheobionta
Superdivision: Spermatophyta
Division: Magnoliophyta
Class: Magnioliopsida
Subclass: Rosidae
Order: Fabales
Family: Fabaceae
Genus: *Trifolium*
Species: *dichotomum*

Trifolium dichotomum H. & A.
Macrae's Clover
Branched Indian Clover

Synonyms:

Trifolium macraei H. & A. var. *dichotomum* (H. & A.) Brew. *ex* S. Wats.
Trifolium albopurpureum Torr. & Gray var. *dichotomum* (Hook. & Arn.) Isely*
Trifolium dichotomum Hook. & Arn. var. *turbinatum* Jepson

(from U.S.D.A. Plants Database, 2001; Douglas *et al*. 1999; * ITIS database says that this is not an accepted name, but the accepted name is *Trifolium dichotomum*)

= *Trifolium macraei* H. & A. synonyms listed below:
Trifolium dichotomum H. & A.
Trifolium macraei var. *dichotomum* Brew. *ex* Wats.
Trifolium neolagopus Lojac.
Trifolium albopurpureum var. *neolagopus*

(from Hitchcock *et al*., 1961)

As indicated above, there are discrepancies in the synonymy of this species.

Trifolium means 3-leaved, from the Latin *tri,* three and *folium,* leaf (Coombes 1995).

Description:

Trifolium dichotomum is an annual that grows 10-30 cm in length from a taproot. There are 1 to several, decumbent to erect, unbranched white-villous stems. Leaves are alternate, palmately compound, with 3 narrowly cuneate to ovate leaflets, each 5-20 mm long. The margins are finely serrate, and the tips are rounded, truncate or retuse. Stipules are papery, denticulate, 5-10 mm long, paler at the base with long-acuminate, dark green tips. The inflorescence is an axillary or terminal dense, ovate to round head, 5-15 mm wide, composed of 2-15 pea-like flowers. The flowers are white to pinkish-purple but later fade to brown. Each flower is 3-11 mm long, with an inflated banner. The involucres are glabrous, reduced and entire, or 5-7-lobed. The calyx is funnel-shaped, membranous, and up to half as long as the corolla. The calyx tube is 5-6 veined, with lanceolate, bristle-tipped teeth (Douglas *et al*., 1999). Pods are ovate, sessile or short-stalked, and contain 1-5 seeds.

Range and Known Distribution:

Trifolium dichotomum occurs in Canada on southeastern Vancouver Island and adjacent Gulf Islands and south to central California (Douglas *et al*., 1999). Hitchcock *et al*. (1961) states the range in California to be throughout much of California from the foothills of the Sierra Nevada to the coast and to northern Baja California, also in Chile.

Hitchcock *et al*. (1961) further divides the range into the varieties: *Trifolium dichotomum* var. *macraei* on Vancouver Island, on the west side of the Cascade Mountains in Washington and from coastal southern Oregon to California and in Chile. *Trifolium dichotomum* var. *albopurpureum* from west of the Cascades, in Washington and Oregon and south to Baja California. Hitchcock also states that the synonymy in this species is complex, and that the above varieties are sparsely represented in these regions.

Further discrepancies in synonymy are by Knapp and Connors (1999) who state that *Trifolium macraei* is primarily a coastal species occurring in northern and central California, as well as South America. Whereas the species *Trifolium albopupureum* var. *dichotomum* occurs in grasslands of the coast to interior from central California north to Washington.

Habitat Description:

In British Columbia this species has been collected from mesic to dry open grassy sites in the lowland zone (CDFmm, CWHxm2) (Douglas *et al*., 2002). The species is known to occur on dry, gravelly, shaly or sandy ground, open bluffs, and often from south-facing slopes, (BC Conservation Data Centre, HERB database, 2001). Some associated species are *Bromus rigidus, B. sterilis, Vulpia* sp., *Danthonia californica, Selaginella wallacei, Stipa lemmonii*, and *Trifolium microcephalum.*

The Royal British Columbia herbarium records for the Gulf Island occurrences describe the habitat as oak bluffs on south facing slopes, on shallow water shedding soils and on steep shaley cliffs. Associated species at the Saltspring Island (Vesuvius locale accession number V117379) include: *Trifolium microcephalum, T. tridentatum, Bromus sterilis, Clarkia amoena* and *Stipa lemmonni*. On North Pender Island *Trifolium dichotomum* occurred in a Garry oak stand with *Bromus rigidus, B. hordeaceus, Sellaginella wallacei, Stipa lemmonii, Trifolium tridentatum, Vulpia* sp., *Geranium molle* and *Aira caryophyllea.* (CDC HERB database, 2001).

Peck (1961) states that *Trifolium macraei* occurs on open headlands along the coast in Lincoln County, California and in South America. Gilkey (1967) says the latter species occurs in fields and hillsides. Larrison *et al*. (1974) states that *T. macraei* grows in fields and grassy, weedy hillsides in western Washington. *Trifolium albopurpureum* var. *albopurpureum* occurs in grassland, oak chaparral, pine forests and roadsides generally less than 1100 m in British Columbia to Baja California (Hickman, 1993).

The general habitats for *Trifolium dichotomum* are south facing slopes, steep banks in grass banks above the sea in shallow soil, gravel or shale. Elevation: 1 to 200 m. Nothing is known about the specific characteristics or the dynamic factors of the habitat for *Trifolium dichotomum.* No studies have been conducted on habitat availability or net trends in habitat change.

Habitat ownership of the land where *Trifolium dichotomum* is known to occur is by private landowners. No protection exists for these British Columbian sites.

Status of Species:

Global rank: G3G4
Canada Heritage Rank: N2N3
British Columbia: S2S3
California: S?
Massachusetts: SE
Oregon and Washington: SR

(from NatureServe web site)

Trifolium macraei is currently not ranked in California, although it is fairly common along the coast. (CalFlora web site).

Other related species that are threatened are *Trifolium cyathiferum* Lindl. (cup clover). This species occurs in vernally wet seepage areas and mesic to moist open, often sandy sites in the lowland, steppe and lower montane zones (BGxh1, CDFmm, CWHmm2, CWHxm1, CWHxm2, ICHdw, ICHmw3, IDFdm1, IDFxh1, PPdh1). It is considered a red-listed species and is rare in S BC; S to ID and CA. Global/Provincial Rank: G4 S1. (Douglas et al. 2001).

Trifolium dichotomum can possibly be confused with *Trifolium microdon* (thimble clover) another small annual that may occur in the same habitats.

There are no other known pharmacological, ethnobotanical or horticultural uses for *Trifolium dichotomum* (Bailey and Bailey, 1976).

Life History:

a) General - Almost no information was obtained on the biology of *Trifolium dichotomum*, most research has involved *Trifolium repens*.

b) Phenology – This is an annual species, perhaps acting as a winter annual that flowers in mid-spring to mid-summer (Larrison *et al*. 1974). Dispersal of seeds is unknown. Time to reproductive age is less than one year.
c) Pollination Biology – No research has been done on this species, but bees are the main pollinators for *Trifolium amoenum* (Knapp and Connor 1999) a closely related Californian species.
d) Reproductive ecology – annual

Turner (1993) examined the effects of water stress on reproductive characters of *Trifolium repens*. A mild water deficit was shown to alter the balance between vegetative and reproductive growth in favour of flowering. Long-term water stress caused production of inflorescences but also increased floret abortion, and premature death of whole flower heads. The number of ovules per floret was decreased by water stress but did not appear to significantly affect the numbers of seeds per floret that reached maturity.

The most striking effect of both long-term and short-term water deficit was to decrease pollen viability (measured by fluorochromatic assay). Pollen from water-stressed flower heads was not reversibly dehydrated; attempts to rehydrate pollen were not totally successful. Flower heads pollinated with pollen from water-stressed plants also set fewer seeds per floret than those pollinated with control pollen. Excess water during seed-filling produced vegetative growth at the expense of remobilization of nutrients to the developing seed. Similar events may possibly occur in *Trifolium dichotomum*, which also occurs in habitats subject to drought stress.

Knapp and Connors (1999) studied the allozymes of *T. macraei* and *T. albopurpureum* var. *dichotomum* and determined that they were either self or cross-pollinated. *T. macraei* contained less allozyme variation than either *T. amoenum* or *T. albopurpureum* var. *dichotomum*, two closely related species found near San Francisco, California. *T. macraei* was found to be almost entirely homozygous and this lack of heterozygosity indicates a mating system with a high degree of selfing (Knapp and Connors, 1999).

e) Survival – Nothing known. In eastern Washington, *Trifolium thompsonii* was found to be a dominant forb component of early seral communities. This was possibly linked to disturbance caused by wildfires that release resources (Schere *et al.*, 1996).

f) Physiology – The low form of this species maybe an adaptation to the strong winds on coastal bluffs (Knapp and Connors, 1999).

g) Dispersal – Dispersal of seeds is unknown.

h) Nutrition & Interspecific Interactions – Not known.

i) Behaviour/Adaptability – *Trifolium* seeds may remain dormant for decades (Hull, 1973 in Knapp and Connors, 1999). Transplant studies have been performed on *T. amoenum*, a closely related native annual clover from California (Knapp and Connors, 1999).

How the species is at risk:

Currently, there are eleven element occurrences of *Trifolium dichotomum* in southeastern Vancouver Island, all on the Gulf Islands and on islets off the coast of Victoria. None of these localities are protected, and are mainly on exposed bluffs above the sea, which potentially could be damaged by recreational users of these islands. This species does not occur anywhere else in Canada. There is nothing known about the susceptibility of *T. dichotomum* to disturbance or any limitations on population size.

Management Recommendations:

There are no current management policies and actions for the occurrences of *T. dichotomum*. Further study is needed on the life history, particularly on reproduction and population dynamics.

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http://137.99.27.45/journals.html

Annual Reviews of Plant Physiology: http://plant.annualreviews.org/search.dtl

Botanical Electronic News: http://www.ou.edu/cas/botany-micro/ben/ben-srch.html

CalFlora: http://www.calflora.org

California Academy of Sciences: http://www.calacademy.org/

California Native Plant Society: http://ww.cnps.org/

California Natural Diversity Database: http://www.dfg.ca.gov/whdab/html/cnddb.html

Canadian Journal of Botany (through e-journals)

Center for Urban Horticulture: http://depts.washington.edu/urbhort/

Flowering Plant Gateway: http://www.csdl.tamu.edu/FLORA/newgate/cronang.htm

Flora of North America: http://hua.huh.harvard.edu/FNA/

Integrated Taxonomic Information System (IT IS): http://ww.itis.usda.gov/

International Journal of Plant Sciences (through e-journals)

International Organization for Plant Information: http://iopi.csu.edu.au/iopi/

Internet Directory for Botany: http://www.botany.net/IDB/

IUCN Species survival commission: http://iucn.org/themes/ssc/index.htm

Jepson Flora Project: http://ucjeps.herb.berkley.edu/jeps-list.html

Missouri Botanical Garden: http://www.mobot.org/welcome.html

National Agriculture Library: http://www.nal.usda.gov/

Native Plants Journal: http://nativeplants.for.uidaho.edu/

Nature Conservancy (NBII), National Biological Information Infrastructure:
http://www.nbii.gov/search/sitemap.html

New York Botanical Garden Press (publications): http://www.nybg.org/bsci/spub/

Oregon Flora Project: http://www.oregonflora.org/index.html

Oregon Natural Heritage Program http://www.abi.org/nhp/us/or/index.htm

Oregon's Rare and Endangered plants:
http://www.orst.edu/dept/botany/herbarium/info/re:html

Oregon State University Herbarium: http://www.orst.edu/dept/botany/herbarium

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http://nmnhwww.si.edu/botany/pubs.htm

Synonymised Checklist of Vascular Flora of the United States, Canada and Greenland:
http://shanana.berkeley.edu/bonap/checklist_intro.html

University of British Columbia, Herbarium: http://www.botany.ubc.ca/herbarium/

USDA Forest Service, Rare Plants: http://www.fs.fed.us/biology

USDA NRC Plant Materials http://plant-materials.nrcs.usda.gov/

US Fish and Wildlife Threatened and Endangered species systems (TESS):
http://ecos.fws.gov/webpage/

US Fish and Wildlife Service, Endangered Species Program: http://endangered.fws.gov/

US Fish and Wildlife, journals on-line: http://www.fw.umn.edu/affiliate/journals.html

US Fish and Wildlife Service, Threatened and Endangered Plants and Animals:
http://www.fws.gov

Washington Natural Heritage Program: http://www.wa.gov/dnr/htdocs/fr/nhp/wanhp.html

Washington Rare Plant Care and Conservation: http://depts.washington.edu/rarecare/

US Parks, Species in Parks: http://ice.ucdavis.edu/nps/

Authorities Consulted/Personal Communications:

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