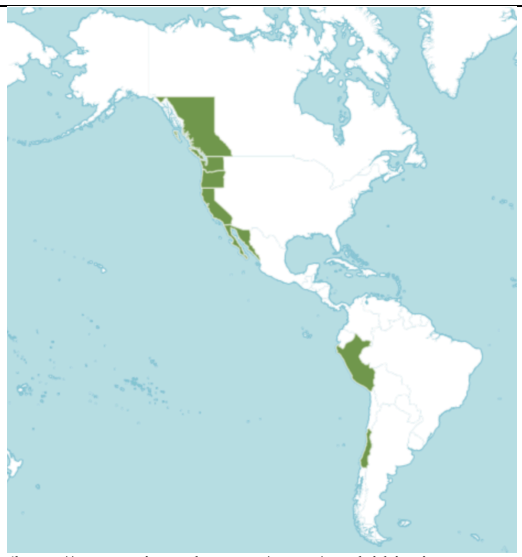
Plant Propagation Protocol for *Trifolium depauperatum*
ESRM 412 – Native Plant Production
Spring 2024


TAXONOMY	
Plant Family	
Scientific Name	*Fabaceae* Lindl.
Common Name	Pea Family
Species Scientific Name	
Scientific Name	*Trifolium depauperatum* Desv.
Varieties	• *T. depauperatum* Desv. var. *amplectens* (Torr. & A. Gray) S. Watson[1] • *T. depauperatum* Desv. var. *depauperatum*[1] • *T. depauperatum* Desv. var. *diversifolium* (Nutt.) McDermott[1] • *T. depauperatum* Desv. var. *stenophyllum* (Nutt.) McDermott[1]
Sub-species	N/A
Cultivar	N/A
Common Synonyms	N/A
Common Name(s)	Cowbag Clover, Balloon Sack Clover, Poverty Clover, Dwarf Sack Clover[1/2]
Species Code (as per USDA Plants database)	TRDE[1]
GENERAL INFORMATION	
Geographical range	Native to western North and western South America. This species can be found throughout British Columbia, Washington, Oregon, Idaho, California, Mexico, Chile, and Peru.[2]

	 (https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:30011004-2)
Ecological distribution	Common in many different areas including coastal prairies, bluffs, wet grasslands, meadows, lawns & mixed evergreen forests [2]. Tends to like heavy and dense soils.[3] However, it has also been found commonly in rocky and sparsely vegetated areas[4].
Climate and elevation range	Wet season is 1 to 8 months with annual precipitation of 12 to 119 inches on average. Elevation range has been seen to be of 0 to 4265ft. Hardiness zones can range from 8b to 10b. [2]
Local habitat and abundance	Wet lowlands, grasslands, and shrubs.[2/4] Often found with *Poaceae.* [6] Associated with *Colias eurytheme, Plebejus saepiolus, Thorybes pylades, & Zerene cesonia.*[2]
Plant strategy type / successional stage	No direct information on this. One source references this species colonizing disturbed cattle areas in grasslands.[6]
Plant characteristics	Herbaceous forb, annual; generally small. Erect to trailing plant that comes from a taproot, 5-40 cm long, with branching, glabrous or sparsely hairy.[4] Blooming occurs March through May.[3]
PROPAGATION DETAILS	
Ecotype	Catalina Island, California[5]
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)[5]
Stock Type	Deep pot 40 (40 cubic ich)[5]
Time to Grow	4 months[5]
Target Specifications	There are no size specifications. Focus on root characteristics of having firm root plug in container.[5]
Propagule Collection Instructions	Herrera and Takara (2006) collected seeds during May and June[5]. Note that this growing experiment was performed with a similar species of clover (*Trifolium willdenovi* Spreng.) which is also an annual that lives in similar costal conditions. *Trifolium depauperatum* does flower from March to May so it possible that it would have similar seed collection times. More information

	would need to be gathered about this though as there in no or experiments done on *Trifolium depauperatum.*
Propagule Processing/Propagule Characteristics	Clover heads can be taken and placed in paper bags to dry in a warm and dry room. Once dried running material through a ¼ inch screen or a US standard #5 sieve to break and release the seeds. Sift several times to get remaining material out, Herrera and Takara (2006) suggest using a Graimans brand "W" pan (5/64ths). Once seeds are cleaned, they can be stored in a refrigerator in an airtight glass container at 40 F at 40% RH. Their seeds averaged 0.13 grams per 100 seeds.[5]
Pre-Planting Propagule Treatments	Recommended 5-minute sterilization of seed coats prior to testing and sowing, this was done with 5% bleach solution. Scarify seeds by placing them in a hot water soak for 2 hours. Then place them into a 4-week cold, moist stratification at 40 F for 4 weeks. However, they found that germinations this way have ranged from 29 to 57% and they have seen higher rates with non-stratified seeds.
Growing Area Preparation / Annual Practices for Perennial Crops	The nursery used for this experiment is located on an island off the coast of southern California. Since this facility has been there (1993-2004) the maximum and minimum temperatures have been 75.4 and 46 F. There has been an average of 361 frost free days per year and an annual rainfall of 14 inches. This nursery consists of shade houses, mist propagation house, and outdoor growing areas. They also irrigate all containers in the shade houses with an overhead emitter system. While all outdoor nursery areas are watered with a drip system or by hand.[5] Seeds are directly sown into flats filled with 1 inch of special seed germination mix of 1:1 of Sunshine Professional Growing Mix and then sand on top of a 4:1:1 of peat, perlite, and organic compost. They also incorporated Osmocote 9-month time release fertilizer (14N:14P2O5:14K2O) at the rate of cup per 0.75 cubic yard of medium throughout planting.[5]
Establishment Phase Details	Seeds for this species germinated during late winter and early spring months. As mentioned earlier there may be some differences in germination due to the species difference between the experimental and the species that this protocol is for. Herrera and Takara (2006) performed their germination in the shade house where they then remained there for several weeks after. Each seed flat was water with the overhead system as needed. Seed germination took about 2 to 4 weeks after sowing.[5]
Length of Establishment Phase	On average it took 1 month[5]
Active Growth Phase	Once the seedling are well established and have had their true leaves for at least 2 weeks, they can be transplanted. Herrera and Takara (2006) used

	Deepot containers (40 cubic inches) filled with growing medium of 4:1:1 peat, perlite, and organic compost. Along with the same fertilizer mentioned above with same medium rate. Once seedlings are transplanted, they can be moved to a different shade house that has temperature variance similar to outplanting conditions. Seedlings can then remain in this shade house for several weeks to acclimate. [5]
Length of Active Growth Phase	About 3 months. [5]
Hardening Phase	None needed as the is an annual. [5]
Length of Hardening Phase	N/A
Harvesting, Storage and Shipping	N/A
Length of Storage	Not needed.
Guidelines for Outplanting / Performance on Typical Sites	Not much information was provided on guidance for outplanting or the performance. Herrera and Takara (2006) note that plants begin flowering by early May. Possibly want to outplant as soon as possible so that flowering can occur at the outplanting sites. [5]
Other Comments	Note that there is very little information of *Trifolium depauperatum.* Much of this protocol was taken from one species (*Trifolium willdenovi).* This species was chosen due to its close relation to *Trifolium depauperatum.* Along with this they also have similar growing ranges, habits, and plant characteristics.
INFORMATION SOURCES	
References	1. *USDA plants database*. USDA Plants Database. (n.d.). https://plants.usda.gov/ 2. Calflora: Information on California plants for education, research, and conservation, with data contributed by public and private institutions and individuals. [web application]. 2024. Berkeley, California:The Calflora Database [a non-profit organization]. Available: https://www.calflora.org/ (Accessed: 04/28/2024). 3. Michael A. Vincent 2023, *Trifolium depauperatum var. depauperatum*, in Jepson Flora Project (eds.) *Jepson eFlora*, Revision 12, https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=67267, accessed on April 30, 2024. 4. Klinkenberg, Brian. (Editor) 2020. *E-Flora BC: Electronic Atlas of the Plants of British Columbia*[eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver. [Accessed: 2024-04-28 5:40:25 PM] 5. Herrera, Mike; Takara, Janet. 2006. Propagation protocol for production of Container (plug) *Trifolium willdenovi* Spreng. plants Deepot 40 (40 cubic inch); Catalina Island Conservancy Avalon, California. In: Native Plant Network. URL:

	https://NativePlantNetwork.org (accessed 2024/05/01). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. 6. Funk, J. L., Hoffacker, M. K., & Matzek, V. (2014). Summer irrigation, grazing and seed addition differentially influence community composition in an invaded Serpentine Grassland. *Restoration Ecology*, *23*(2), 122–130. https://doi.org/10.1111/rec.12162
Other Sources Consulted	1. https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:30011004-2
Protocol Author	Shea M. Molsee
Date Protocol Created or Updated	(04/28/24)