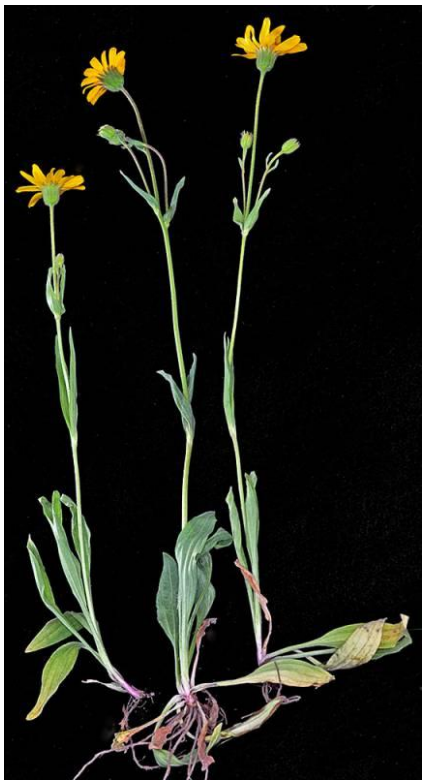
Plant Propagation Protocol for *Arnica sororia*

ESRM 412 – Native Plant Production

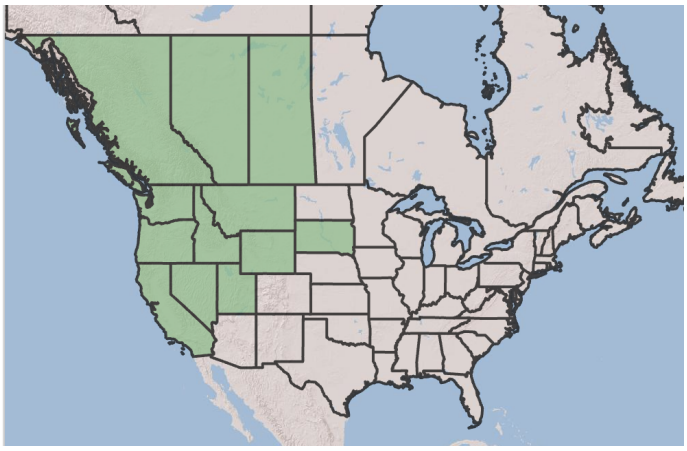
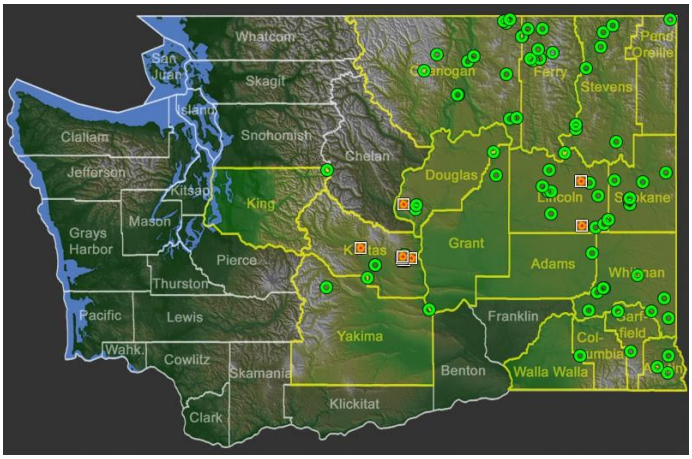
URL: https://courses.washington.edu/esrm412/protocols/*2022/ARSO2.pdf*



[1]

[2]

TAXONOMY	
Plant Family	
Scientific Name	Asteraceae/Compositae [3]
Common Name	Aster family
Species Scientific Name	
Scientific Name	*Arnica sororia* Greene
Varieties	NA
Sub-species	NA
Cultivar	NA

Common Synonym(s)	*Arnica fulgens* Pursh var. *sororia* (Green) G.W. Douglas & Ruyle-Douglas
Common Name(s)	twin arnica bunch arnica twin leopardbane Foothills arnica
Species Code	ARSO2
GENERAL INFORMATION	
Geographical range	 [3] Mainly found in CA, ID, MT, NV, OR, SD, UT, WA, WY [5] as well as Alberta, British Columbia, Saskatchewan [5]  [4]

Ecological distribution	East of Cascades crest in WA, British Columbia down to California, East to Alberta, Montana, and Wyoming [4]
Climate and elevation range	Moist shallow soils, or loam soils in prairies Low elevation prairies [4]
Local habitat and abundance	Low elevation prairies Grasslands to coniferous forest openings at mid elevation [4]
Plant strategy type / successional stage	Rhizome reproduction [6] Can grow in drier climates [7]
Plant characteristics	Forb/herb Slender tall stems with lanceolate blade like leaves (3-12 cm). Leaves found in pairs of 2-4 with smaller petioles towards the bottom of the plant. The flowers of the plant are bright yellow with orangish-yellow centers. [4] Leaves more clustered near the base [6] Flower blooms from May to July [6]
PROPAGATION DETAILS	
Ecotype	Multiple glacier valleys [8] Paradise creek drainage, Pullman WA [10]
Propagation Goal	Plants
Propagation Method	seed
Product Type	Container (plug) [8]
Stock Type	160 ml
Time to Grow	Six months [8][10]

Target Specifications	Multiple leaves with established root network [8] Tight root plug in container [10]
Propagule Collection Instructions	Using paper bags, seeds with feathery tops can be collected starting at the beginning of August. Seeds are 4-6 mm long and dark brown with a feathery white top. [8] Pappus doesn't have to be removed to plant seeds. If desired to remove the fluffy head, run seed over 10 mesh screens and separate with air columns. [10] Cleaned seeds should be stored at 40 ℉ with 40% relative humidity [10]
Propagule Processing/Propagule Characteristics	Typically 409,000 seeds per pound [8] Longevity: No available literature Germination percent: 65% [8]
Pre-Planting Propagule Treatments	Cold-moist stratify for 60 days (3℃) [8] Seeds can be cleaned by removing fluffs from top using either a screen or office clipper depending on size of batch [8] Stratification not required, but still recommended for dry stored seeds. [8] Most seeds don't require pretreatment, approximately 50% of seeds will germinate without treatment [10] Some seeds have dormancy requiring cold-moist stratification for 60 to 90 days [10]
Growing Area Preparation / Annual Practices for Perennial Crops	Grown in a greenhouse (24℃/18℃) [8] Media: Sunshine Mix #2: mix of perlite and sphagnum peat with the addition of Osmocote fertilizer [8] containers= cones Hand watering in greenhouse until moved outdoors where irrigation system used [8] Plant seeds in 10 cu. In. Ray Leach Super cell containers with Sunshine #4 in November, with seeds lightly covered with medium. Apply a thin layer of pea gravel to prevent seeds floating in water before watering conetainers thoroughly. [10]

	Place containers outside for 2-3 months to allow cold-moist stratification, then move into greenhouse post stratification [10]
Establishment Phase Details	Prefers direct seeding with light cover of medium and even moisture. [8] 1-2 weeks for stratified seeds to germinate in greenhouse [8] Move containers to greenhouse in January [10] Germination takes 7 to 15 days, but some seeds can germinate up to 6 weeks later [10]
Length of Establishment Phase	2-4 weeks [8]
Active Growth Phase	Plant needs to dry between irrigations. [8] Increased spacing for airflow between containers Fertilize with 20-20-20 liquid NPK (100ppm) weekly. [8] Water plants thoroughly every other day and fertilize once per week with water soluble fertilizer with micronutrients [10]
Length of Active Growth Phase	2 months [8] 3 months [10]
Hardening Phase	Naturally hardened by late summer or early fall. [8] Plants hit dormancy in late summer so reduce irrigation and only apply water every now and then to keep root systems viable. [8] Move plants to cold frame by end of March/early April (depending on weather) [10] Water every other day if cool weather, or every day if hot and dry [10]
Length of Hardening Phase	1-2 months [8] 2-4 weeks [10]

Harvesting, Storage and Shipping	Outplant in fall or overwintered in nursery under Microfoam sheets until spring [8] Late germinating/ not germinated seeds can be held in lath house in summer, planted outside in fall or following spring [10]
Length of Storage	5 months [8] Fall to spring (depending on late germination of seeds) [10]
Guidelines for Outplanting / Performance on Typical Sites	No literature
Other Comments	Can spread through rhizomes, meaning propagation can also occur through divisions [8] Seed production is low, prefers planting in cone containers [9]
INFORMATION SOURCES	
References	[1] Carr, Robert L. "Arnica Sororia." *Burke Herbarium Image Collection*, Burke Museum , 2013, https://biology.burke.washington.edu/herbarium/imagecollection/taxon.php?Taxon=Arnica%20sororia. Accessed 16 May 2022. [2] Bockelman, Ron. "Arnica Sororia." *Burke Herbarium Image Collection*, Burke Museum, 2011, https://biology.burke.washington.edu/herbarium/imagecollection/photo.php?Photo=wtu038643&Taxon=Arnica%20sororia&SourcePage=taxon. Accessed 16 May 2022. [3]"Arnica Sororia Greene ." *United States Department of Agriculture*, Https://Plants.usda.gov/Home/PlantProfile?Symbol=ARSO2. [4]Knoke, Don, and David Giblin. "Arnica Sororia." *Burke Herbarium Image Collection*, http://biology.burke.washington.edu/herbarium/imagecollection/taxon.php?Taxon=Arnica+sororia. [5]"Arnica Sororia." *Lady Bird Johnson Wildflower Center* , The University of Texas at Austin, 11 Dec.

	2018, https://www.wildflower.org/plants/result.php?id_plant=ARSO2. [6]"Arnica Sororia Twin Arnica." *The Jepson Herbarium*, University of California, Berkeley, https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=1148 . [7] Slichter, Paul. "Bunch Arnica, Foothills Arnica, Twin Arnica, Twin Leopardbane." *Flora and Fauna Northwest*, http://science.halleyhosting.com/nature/basin/sun/daisy/arnica/foothills.htm. [8] Luna, Tara; Dedekam, Sara. 2008. Propagation protocol for production of Container (plug) *Arnica sororia* Greene plants 160 ml (7.0 cu.in); USDI NPS - Glacier National Park West Glacier, Montana. In: Native Plant Network. URL: https://NativePlantNetwork.org (accessed 2022/05/06). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. [9] *Requirements for Selected Plant Species Appendix B* . https://www.fs.fed.us/t-d/pubs/htmlpubs/htm06232815/documents/pdf06232815dpi72pt17.pdf. [10]Skinner, David M,. 2004. Propagation protocol for production of Container (plug) *Arnica sororia* Greene plants USDA NRCS - Pullman Plant Materials Center Pullman, Washington. In: Native Plant Network. URL: https://NativePlantNetwork.org (accessed 2022/05/16). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources.
Other Sources Consulted	"Arnica Sororia Greene." *Calflora*, https://www.calflora.org/app/taxon?crn=692. Downie, Stephen R., and Keith E. Denford. "The Biosystematics of *Arnica Fulgens* and *a. Sororia*

	(Asteraceae).” *Canadian Journal of Botany*, vol. 65, no. 3, 1987, pp. 559–570., https://doi.org/10.1139/b87-072. Endress, Bryan A., et al. “Non‐Native Species Threaten the Biotic Integrity of the Largest Remnant Pacific Northwest Bunchgrass Prairie in the United States.” *Applied Vegetation Science*, vol. 23, no. 1, 2019, pp. 53–68., https://doi.org/10.1111/avsc.12464.
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