

Plant Propagation Protocol for *Frasera albicaulis*

ESRM 412 – Native Plant Production

Protocol URL: <https://courses.washington.edu/esrm412/protocols/FRAL2.pdf>

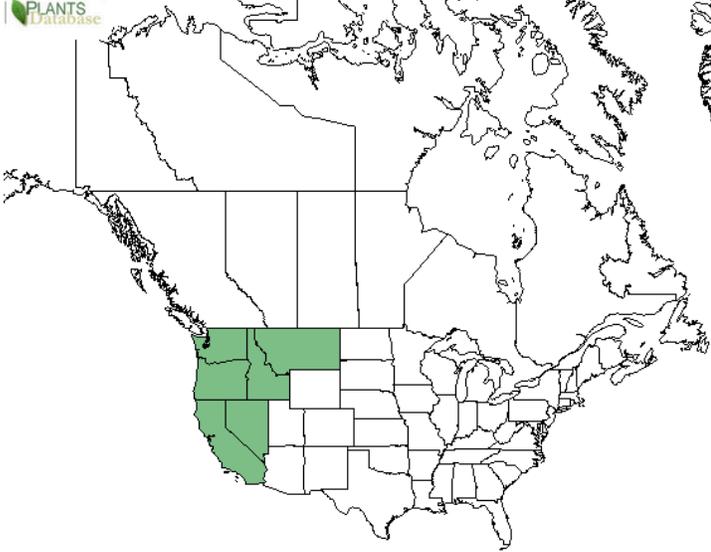


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TAXONOMY	
Plant Family	
Scientific Name	Gentianaceae [1]
Common Name	Gentian Family [1]
Species Scientific Name	
Scientific Name	<i>Frasera albicaulis</i> Douglas ex Griseb. [1]
Varieties	<i>F. albicaulis</i> var. <i>albicaulis</i> <i>F. albicaulis</i> var. <i>columbiana</i> (H. St. John) C.L. Hitchc. <i>F. albicaulis</i> var. <i>cusickii</i> (A. Gray) C.L. Hitchc. <i>F. albicaulis</i> var. <i>idahoensis</i> (H. St. John) C.L. Hitchc. <i>F. albicaulis</i> var. <i>modocensis</i> (H. St. John) N.H. Holmgren <i>F. albicaulis</i> var. <i>nitida</i> (Benth.) C.L. Hitchc. [1]
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	<i>Swertia albicaulis</i> Griseb. Kuntze [3,4]
Common Name(s)	Whitestem Frasera [1]
Species Code (as per USDA Plants database)	FRAL2 [1]
GENERAL INFORMATION	

<p>North American Distribution</p>	 <p>Map courtesy of USDA Plants Database [1]</p>
<p>Distribution in Washington State</p>	 <p>Map courtesy of USDA Plants Database [1]</p>
<p>Ecological distribution</p>	<p><i>F. albicaulis</i> is found in shrub steppe habitat and east-side forests in Washington State [3,4].</p>
<p>Climate and elevation range</p>	<p><i>F. albicaulis</i> grows at low to high elevations east of the Cascades in Washington state [4]. Found at 800-2,200m in the Intermountain West [9].</p>
<p>Local habitat and abundance</p>	<p><i>F. albicaulis</i> is locally common in areas where it is found [4]. Its local habitats are meadows, low plains, dry rocky sites, and open areas in the mountains at moderate elevations [3,4]. It is also often found on dry sagebrush slopes and flats [9].</p>
<p>Plant strategy type / successional stage</p>	<p>Information not found.</p>
<p>Plant characteristics</p>	<p><i>F. albicaulis</i> is an herbaceous perennial from a taproot</p>

	<p>[9], and often with a woody base [3]. It typically has multiple flowering stems from a basal rosette. Leaves are linear and narrow with small white margins, and are either soft with downy hairs or glabrous. Cauline leaves are oppositely arranged and shorter than basal leaves [2]. Flowers appear in dense clusters near the tops of stems and are pale to dark blue or purple, and occasionally white, often with darker mottling. Flowers are four parted with an oblong, fringed gland on each petal, and appear May - July [2,4].</p> <p><i>F. albicaulis</i> is a complex species with variation within its range. Many distinct varieties of the species are also known and some have overlapping ranges [9].</p>
PROPAGATION DETAILS - SEED	
Ecotype	--
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	--
Time to Grow	12 months [11]
Target Specifications	Information not found.
Propagule Collection Instructions	Fruits of <i>F. albicaulis</i> are an ellipsoid capsule roughly 10-15mm long [3,9]. Studies of congeners <i>F. speciosa</i> and <i>F. umpquaensis</i> have shown that flowering occurs synchronously for a population at 3-4 year intervals, so seeds may not be easily collectable in certain years [10,12]. Seeds for a related species, <i>F. umpquaensis</i> matured and were collected in September and October in the Willamette Valley [12].
Propagule Processing/Propagule Characteristics	Average 1,000 seed weight for <i>F. albicaulis</i> is 1.15656 grams. Seed storage behavior is orthodox, and seed showed 75% viability after drying to moisture content in equilibrium with 15% relative humidity and freezing for 19 days at -20°C [6].
Pre-Planting Propagule Treatments	Seeds of <i>F. albicaulis</i> were shown in one study to have deep morphophysiological dormancy, with long periods of cold stratification needed to finalize embryo growth and induce germination [8]. Testing of <i>F. albicaulis</i> seeds by Norman Deno found that 4-8 weeks of artificial cold stratification at 40°F yielded a 50% germination rate. Seeds that were placed outdoors in December and naturally stratified had a germination rate of 33% in March with 6% more the following March [5].
Growing Area Preparation / Annual Practices for Perennial Crops	<i>F. albicaulis</i> can be grown well in a mix of equal parts loam, sand, and leaf mold or compost. Plants need very

	good drainage and deep containers to accommodate their taproots [7].
Establishment Phase Details	Seeds should be sown in November for germination in February [11], or December for germination in March [5].
Length of Establishment Phase	3 months [11].
Active Growth Phase	Information not found.
Length of Active Growth Phase	5-6 months [11].
Hardening Phase	Research on related species <i>F. umpquaensis</i> found that one-year-old seedlings exposed to a 90 day period of cold had higher survival rates, more leaves, and were taller than seedlings treated with no or 30 days of cold. This indicates that seedlings could need continued cold and relatively long winters after becoming established post-germination [12].
Length of Hardening Phase	2-3 months [11].
Harvesting, Storage and Shipping	Information not found.
Length of Storage	Information not found.
Guidelines for Outplanting / Performance on Typical Sites	In a study of related species <i>F. umpquaensis</i> , survival was higher when using transplants vs. direct seeding. Exposure also had an effect on outplanting success, with higher survival for transplants in Northern exposure vs. those in Southern exposure [12].
Other Comments	--

INFORMATION SOURCES

References	<p>[1] USDA Plants Database. <i>Frasera albicaulis</i>. Retrieved from: https://plants.usda.gov/core/profile?symbol=FRAL2 Last Accessed: 13 May 2018.</p> <p>[2] Hitchcock, C. L., Cronquist, A., Ownbey M., & Thompson J. W. (1959). <i>Vascular Plants of the Pacific Northwest Part 4: Ericaceae through Campanulaceae</i>. Seattle, WA: University of Washington Press.</p> <p>[3] WTU Herbarium Image Collection. (2018). <i>Frasera albicaulis</i>. Burke Museum of Natural History and Culture. Retrieved from: http://biology.burke.washington.edu/herbarium/imagecollection.php?ID=2083 Last Accessed: 13 May 2018.</p> <p>[4] Turner, M. & Gustafson, P. (2006). <i>Wildflowers of the Pacific Northwest</i>. Portland, OR: Timber Press, Inc.</p> <p>[5] Deno, N.C. (1993). <i>Seed Germination Theory and</i></p>
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	<p><i>Practice</i> (2nd Ed.). (n.p.): Author.</p> <p>[6] Royal Botanic Gardens Kew. (2018). Seed Information Database. Version 7.1. <i>Frasera albicaulis</i> Retrieved from: http://data.kew.org/sid/SidServlet?ID=57701&Num=gX8 Last accessed: 11 May 2018.</p> <p>[7] Huxley, A. (Ed.) (1992). <i>The New Royal Horticultural Society Dictionary of Gardening Vol. II</i>. London: Macmillan Press Limited.</p> <p>[8] Baskin, C.C. & Baskin J.M. (2014). <i>Seeds: Ecology, Biogeography, and Evolution of Dormancy and Germination</i>. (2nd ed.). San Diego, CA: Academic Press (Elsevier).</p> <p>[9] Cronquist, A., Holmgren, A.H., Holmgren N.H., Reveal, J.L., Holmgren, P.K. (1984). <i>Intermountain Flora: Vascular Plants of the Intermountain West, U.S.A. Vol. 4</i>. Bronx, NY: New York Botanical Garden.</p> <p>[10] Taylor Jr., O.R. & Inouye, D. W. (1985). Synchronicity and Periodicity of Flowering in <i>Frasera speciosa</i> (Gentianaceae). <i>Ecology</i>, 66: 521-527.</p> <p>[11] Fourth Corner Nurseries, personal communication, 14 May 2018.</p> <p>[12] Giles-Johnson, D.E.L. & Thorpe, A. (2010) <i>Assessment of seedling failure in peripheral populations of Umpqua green gentian (Frasera umpquaensis)</i>. 2010 Final Report. Prepared by Institute for Applied Ecology for Eugene District BLM and Willamette National Forest.</p> <p>Matson, S. (2006). <i>Frasera albicaulis</i>. [Photographs]. Retrieved from: https://calphotos.berkeley.edu/cgi/img_query?query_src=photos_index&rel-taxon=contains&where-taxon=Frasera%20albicaulis</p>
Other Sources Consulted	<p>Kruckeberg, A. R. (1996). <i>Gardening With Native Plants of the Pacific Northwest</i>. (2nd Ed.). Seattle, WA: University of Washington Press.</p> <p>Robson, K. A., Richter, A. & Filbert, M. (2008).</p>

	<p><i>Encyclopedia of Northwest Native Plants for Gardens and Landscapes</i>. Portland, OR: Timber Press, Inc.</p> <p>Pojar, J. & MacKinnon, A. (1994.) <i>Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia and Alaska</i>. Vancouver, British Columbia: B.C. Ministry of Forests and Lone Pine Publishing.</p> <p>Pettinger, A. & Costanzo, B. (2002). <i>Native Plants in the Coastal Garden: A Guide for Gardeners in the Pacific Northwest</i>. Portland, OR: Timber Press, Inc.</p> <p>Young, J.A. & Young C.G. (1986). <i>Collecting, Processing and Germinating Seeds of Wildland Plants</i>. Portland, OR: Timber Press, Inc.</p> <p>United States Dept. of Agriculture, Forest Service. (1988). <i>Range Plant Handbook</i>. New York, NY: Dover Publications, Inc.</p>
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Date Protocol Created or Updated	05/16/2018