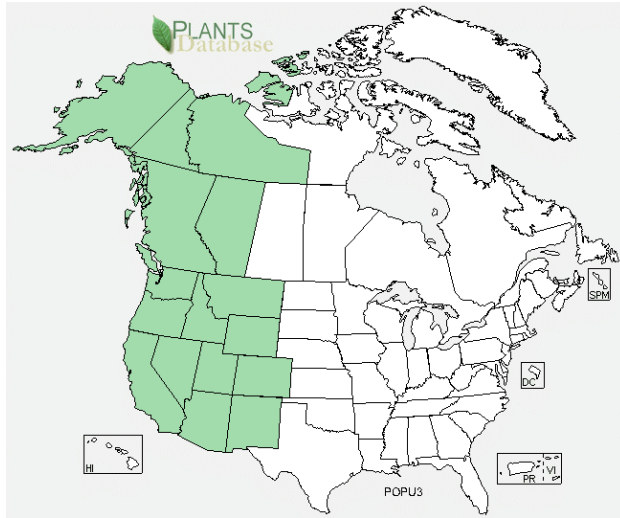
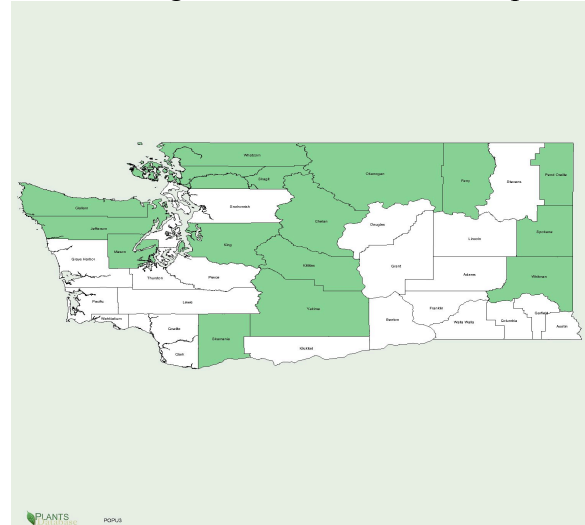


Plant Propagation Protocol for *Polemonium pulcherrimum*
 ESRM 412 – Native Plant Production

North America Distribution Map



Washington State Distribution Map



Source: USDA PLANTS Database¹⁰

TAXONOMY

Family Names	
Family Scientific Name:	Polemoniaceae
Family Common Name:	Phlox ⁶
Scientific Names	
Genus:	<i>Polemonium</i>
Species:	<i>Pulcherrimum</i>
Species Authority:	Hook ¹⁰
Variety:	N/A
Sub-species:	<i>Polemonium pulcherrimum</i> ssp. <i>delicatum</i> (Rydb.) Brand ¹⁰ <i>Polemonium pulcherrimum</i> ssp. <i>lindleyi</i> (Wherry) V.E. Grant ¹⁰ <i>Polemonium pulcherrimum</i> ssp. <i>pulcherrimum</i> (Hook) ¹⁰
Cultivar:	N/A
Authority for Variety/Sub-species:	<i>P. pulcherrimum</i> ssp. <i>pulcherrimum</i> Hook ¹⁰ <i>P. pulcherrimum</i> ssp. <i>delicatum</i> (Rydb.) Brand ¹⁰ <i>P. pulcherrimum</i> ssp. <i>lindleyi</i> (Wherry) V.E. Grant ¹⁰
Common Synonym(s)	General Synonyms of <i>Polemonium pulcherrimum</i> <i>P. californica</i> ¹⁴ <i>P. delicatum</i> ¹⁴ <i>P. humile</i> ¹⁴ <i>P. pulchelum</i> ¹⁴ <i>P. scopulinum</i> ¹⁴

	<p>Subspecies Synonyms</p> <p><i>Polemonium pulcherrimum</i> Hook. ssp. <i>delicatum</i> (Rydb.) Brand PODE4 <i>Polemonium delicatum</i> Rydb.¹¹ PODES2 <i>Polemonium delicatum</i> Rydb. ssp. <i>scopulinum</i> (Greene) Wherry¹¹ PODET <i>Polemonium delicatum</i> Rydb. ssp. <i>typicum</i> Wherry¹¹ POPUD2 <i>Polemonium pulcherrimum</i> Hook. var. <i>delicatum</i> (Rydb.) Cronquist¹¹ <i>P. delicatum</i> Rydb.; Bull.² <i>P. pulcherrimum</i> ssp. <i>delicatum</i> Brand² <i>P. pulcherrimum</i> var. <i>delicatum</i> Cronquist² <i>P. pterospermum</i> Nels. and Cockerell² <i>P. nevadense</i> Wherry² <i>P. scopulinum</i> Greene ex Rydb.²</p> <p><i>Polemonium pulcherrimum</i> Hook. ssp. <i>lindleyi</i> (Wherry) V.E. Grant POFA3 <i>Polemonium fasciculatum</i> Eastw.^{2,12} POHU2 <i>Polemonium humile</i> Lindl.^{2,12} POLI6 <i>Polemonium lindleyi</i> Wherry^{2,12} POPUL4 <i>Polemonium pulcherrimum</i> Hook. var. <i>lindleyi</i> (Wherry) J.P. Anderson^{2,12} <i>P. rotatum</i> Eastw.²</p> <p><i>Polemonium pulcherrimum</i> Hook. ssp. <i>pulcherrimum</i> POBE6 <i>Polemonium berryi</i> Eastw.¹³ POHA12 <i>Polemonium haydenii</i> A. Nelson^{2,13} POPI7 <i>Polemonium pilosum</i> (Greenm.) G.N. Jones¹³ POPUP2 <i>Polemonium pulcherrimum</i> Hook. var. <i>pilosum</i> (Greenm.) J.F. Davids.¹³ POPUP8 <i>Polemonium pulcherrimum</i> Hook. var. <i>pulcherrimum</i>¹³ POSH2 <i>Polemonium shastense</i> Baker ex Eastw.^{2,13} <i>P. caeruleum</i> var. <i>pulcherrimum</i> Hooker² <i>P. mexicanum</i> Nutt.² <i>P. parvifolium</i> Nutt. ex Rydb.² <i>P. pulcherrimum</i> ssp. <i>parvifolium</i> Brand.² <i>P. pulcherrimum</i> var. <i>parvifolium</i> Nels.² <i>P. pulcherrimum</i> f. <i>parvifolium</i> Wherry.² <i>P. haydenii</i> A. Nels.² <i>P. pulcherrimum</i> ssp. <i>parvifolium</i> var. <i>haydenii</i> Brand² <i>P. viscosum</i> var. <i>pilosum</i> Greenman² <i>P. viscosum</i> ssp. <i>pilosum</i> Piper² <i>P. pulcherrimum</i> ssp. <i>parvifolium</i> var. <i>pilosum</i> Brand² <i>P. shastense</i> f. <i>pilosum</i> Wherry² <i>P. pulcherrimum</i> ssp. <i>parvifolium</i> var. <i>berryi</i> Brand² <i>P. tevisii</i> Eastw.² <i>P. pulcherrimum</i> ssp. <i>parvifolium</i> var. <i>berryi</i> subvar. <i>shastense</i> Brand² <i>P. montrosensis</i> A. Nels.² <i>P. orbiculare</i> Gandoger² <i>P. haydeni</i> f. <i>orbiculare</i> Wherry²</p>
Common Name(s):	Jacob's-ladder, Showy Jacob's-ladder ⁸ , Blue Skunkleaf ¹⁴
Species Code:	POPU3 ¹³

GENERAL INFORMATION	
Geographical range	<i>P. pulcherrimum</i> ssp. <i>lindleyi</i> – USA (AK, ID, WA), CAN (BC, NT, YT) ¹² <i>P. pulcherrimum</i> ssp. <i>delicatum</i> – USA (AZ, CO, NM, NV, UT, WY) ¹¹ <i>P. pulcherrimum</i> ssp. <i>pulcherrimum</i> – USA (AK, CA, ID, MT, NV, OR, WA, WY), CAN (AB, BC, YT) ¹³
Ecological distribution:	Widespread cordilleran species ⁴ Grows in scattered clumps ^{14, 5} Commonly found in dry to moist, often gravelly or sandy soils, open forests, meadows, roadsides, exposed and/or grassy slopes, alpine ridges, canyon bottoms and parks ^{5, 6, 7, 14} Grows in full sun, part shade or dappled light though more common in partial shade. Only grows in full sun in moist soils ⁷ Mostly absent from the outer coast and rare on the Queen Charlotte Islands ⁶
Climate and elevation range	Found in a wide range of elevation and moisture regimes. Found at lower elevations at its northern extent though progressively higher altitudes further south. ^{6, 7} Grows in hardiness zones 3b to 9b ⁷
Local habitat and abundance	No information available
Plant strategy type	No information available
Plant characteristics	Perennial Forb General Characteristics: Grows 5-35 cm tall, possessing several erect to ascending/sprawling stems from branched, thick stem bases. Ill smelling when bruised ⁶ Leaves: Mostly basal, pinnate compound leaves (ladder like). Each leaf possess 11-25 leaflets, less than 1 cm long and 5 cm wide either opposite or offset, egg shaped to circular which are often glandular-hairy when young. ^{6, 15} Flowers: Blue (though occasionally white) with yellow centers. The flowers are bell shaped, composed of 5 petals, 7-15 mm long and as wide, fused into a tube at the base and expanding to five petal lobes. The petals are rounded at the tip and grow in crowded clusters ^{6, 7} . Flowers typically possess 1 style, and generally 3 stigmas ³ Fruits: Produces 3-chambered capsules with several seeds per chamber. Seeds become mucilaginous when moistened ⁶ Roots- Taproot, woody, extensive and underground ¹⁴
PROPAGATION DETAILS	
Propagation Goal	Plants
Propagation Method	Seeds
Product Type	Container (plug)
Stock Type:	172 ml cone-tainers
Time to Grow	6 months
Target Specifications	Stock Type: Container seedling Height: 6 to 10 true leaves, ~5 cm tall Width: Not applicable

	Root System: Firm plug in container. ⁴
Propagule Collection:	Collect seeds in late June/ early July ^{4, 14} when the capsules turn brown and begin to dehisce. Seeds are black at maturity. Collect seeds in paper bags and store in a well-ventilated drying shed prior to cleaning. ⁴
Propagule Processing	Clean seeds with a hammermill and a 1/16" screen. ⁴ Seed longevity: unknown Seed dormancy: physiological Seeds/kg: 704,000 % Purity: 100% % Germination: 75%
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	Dormancy Treatment ⁴ Cold Stratification 60 day cold moist stratification in refrigerator at 3C Place seeds in a fine mesh bag and bury in moist peat moss in ventilated containers. Note: Seeds might require after ripening (research not on <i>P. pulcherimum</i>). ¹
Growing Area Preparation / Annual Practices for Perennial Crops	For a greenhouse and outdoor nursery ⁴ Sowing Method: Direct Seeding- cover seeds with media The growing media used is 6:1:1 milled sphagnum peat moss, perlite, and vermiculite mix with Osmocote controlled release fertilizer (13N: 13P ₂ O ₅ : 13K ₂ O; 8-9 month release rate at 21°C) and Micromax fertilizer (12% S, 0.1% B, 0.5% Cu, 12% Fe, 2.5% Mn, 0.05% Mo, 1% Zn) at the rate of 1 gram of Osmocote and 0.20 gram of Micromax per 172 ml container. ⁴ Maintain greenhouse temperatures of 21-25 °C during the day and 16-18 °C at night. Hand water seedlings and keep them in the greenhouse until mid May or June or when average day temp is ~18-20°C. Move seedlings to outdoor nursery for remainder of the growing season. ⁴ Irrigate the seedlings every day in the early morning until the containers are thoroughly soaked. ⁴
Establishment Phase	Seedlings emerge 8 days after sowing ⁴ Germination was found slightly higher in other species of Polemonium in light regimes of more light hours than dark. ¹
Length of Establishment Phase:	4 weeks ⁴
Active Growth Phase:	Plants are root tight 12 weeks following germination. Plants do not produce flowers in the first year. ⁴
Length of Active Growth Phase:	12 weeks
Hardening Phase	Fertilize plants with a 10-20-20 liquid NPK at 200 ppm during August and September. Gradually reduce irrigation in September and Octobers. Give plants one final irrigation prior to winterization. ⁴
Length of	4 weeks ⁴

Hardening Phase:	
Harvesting, Storage and Shipping:	Total Time to Harvest: 6 weeks Harvest Date: June Storage Conditions: Overwinter in outdoor nursery under insulating foam and snow cover in snow prone areas. ⁴
Length of Storage	~5 months ⁴
Guidelines for Outplanting	No information available
Other Comments	Root division in the late summer has been suggested as a possible method of propagation. ⁹ No additional information about this method can be found.

INFORMATION SOURCES

References:	<p>¹ Baskin, C.C., Baskin, J.M. 1998. Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination. Academic Press: San Diego, CA</p> <p>² Grant, V. 1989. Taxonomy of the Tufted Alpine and Subalpine Polemoniaceae (Polemoniaceae). Botanical Gazette, 150(2). pp 158-169. The University of Chicago Press: Chicago, IL</p> <p>³ Jepson Flora Project: Jepson Interchange. 1993. Jepson Manual treatment for <i>Polemonium pulcherrimum</i>. (http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?5654,5916,5923). University of California, Berkeley. Accessed on April 17, 2012</p> <p>⁴ Luna, T., Evans, J., Wick, D. 2002. Propagation protocol for production of container <i>Polemonium pulcherrimum</i> Hook. plants (172 ml containers); USDI NPS - Glacier National Park, West Glacier, Montana. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 17 April 2012). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.</p> <p>⁵ Parish, R., Coupe, R., Lloyd, D. 1996. Plants of Southern Interior British Columbia. B.C. Ministry of Forests and Lone Pine Publishing: Vancouver, BC</p> <p>⁶ Pojar, J. and MacKinnon, A., eds. 1994. Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia and Alaska. B.C. Ministry of Forests and Lone Pine Publishing: Vancouver, B.C.</p> <p>⁷ Robson, K.A., Richter, A. Filber, M. 2008. Encyclopedia of Northwest Native Plants for Gardens and Landscapes. Timber Press Inc: Portland, OR</p> <p>⁸ Taylor, T.J. and Douglas, G.W. 1995. Mountain Plants of the Pacific Northwest. Mountain Press Publishing Company: Missoula, Montana.</p> <p>⁹ Thompson, P. 2005. Creative Propagation. Timber Press: Portland, OR</p> <p>¹⁰ United States Department of Agriculture - Natural Resources Conservation Service. 2011. The PLANTS Database- PLANTS Profiles - <i>Polemonium pulcherrimum</i> Hook.</p>
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	<p>(http://plants.usda.gov/java/profile?symbol=POPU3.) National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Accessed on April 17 2012.</p> <p>¹¹ United States Department of Agriculture - Natural Resources Conservation Service. 2011. The PLANTS Database- PLANTS Profiles - <i>Polemonium pulcherrimum</i> Hook. ssp. <i>delicatum</i> (Rydb.) Brand. (http://plants.usda.gov/java/profile?symbol=POPUD3-delicatum). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Accessed on April 17 2012.</p> <p>¹² United States Department of Agriculture - Natural Resources Conservation Service. 2011. The PLANTS Database- PLANTS Profiles - <i>Polemonium pulcherrimum</i> Hook. ssp. <i>lindleyi</i> (Wherry) V.E. Grant. (http://plants.usda.gov/java/profile?symbol=POPUL3). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Accessed on April 17 2012.</p> <p>¹³ United States Department of Agriculture - Natural Resources Conservation Service. 2011. The PLANTS Database- PLANTS Profiles - <i>Polemonium pulcherrimum</i> Hook. ssp. <i>pulcherrimum</i>. (http://plants.usda.gov/java/profile?symbol=POPUP3). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Accessed on April 17 2012.</p> <p>¹⁴ United States Department of Agriculture - Forest Service. 1988. Range Plant Handbook. Reprint 1988, Dover Publications, Inc.: New York, NY.</p> <p>¹⁵ WTU Herbarium Image Collection. (http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Polemonium&Species=pulcherrimum). Burke Museum of Natural History and Culture, University of Washington, Seattle, WA. Accessed on April 17, 2012.</p>
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