

**Plant Propagation Protocol for *Lupinus polycarpus* Greene**  
ESRM 412 – Native Plant Production

Protocol URL: <https://courses.washington.edu/esrm412/protocols/LUPO3.pdf>



Source: Canadian Wildflowers, 2017<sup>4</sup>.

**North American Distribution**



Symbol: LUPO3

USDA-NRCS-NGCE

Source: USDA, Plants Database, 2017<sup>18</sup>.

**Washington Distribution**



Symbol: LUPO3

USDA-NRCS-NGCE

<b>TAXONOMY</b>	
Plant Family	
Scientific Name	Fabaceae
Common Name	Pea Family
Species Scientific Name	
Scientific Name	<i>Lupinus polycarpus</i> Greene
Varieties	
Sub-species	
Cultivar	
Common Synonym(s)	<i>Lupinus micranthus</i> Douglas, non Guss.
Common Name(s)	Smallflower lupine <sup>18</sup> , small-flowered lupine <sup>9,13</sup> , field lupine <sup>9</sup>
Species Code (as per USDA Plants database)	LUPO3
<b>GENERAL INFORMATION</b>	
Geographical range	North America: BC, CA, MI, OR, and WA (Cowlitz, Grays Harbor, King, Klickitat, Mason, Pierce, Skagit, Skamania, Thurston, and Whitman) <sup>18</sup> See Distribution Maps above.
Ecological distribution	Found in open, gravelly, and sandy sites, at low elevations <sup>9, 13</sup> of interior valleys of the coastal ranges as well as “prairies” <sup>9</sup> and grasslands east of the mountains <sup>5</sup> .
Climate and elevation range	Below 1500 m <sup>12, 16</sup> in USDA Plant Hardiness Zones 5b to 9b <sup>14, 17</sup> . Prefers full sun with soil that is moist early in the year <sup>14</sup> .
Local habitat and abundance	One of the most widespread in a north-south direction of any of the annual lupines <sup>5</sup> . Found in many communities from yellow pine forest to foothill wetlands, mixed evergreen forest, etc. <sup>12</sup> Frequently found in post-fire environments <sup>19</sup> .
Plant strategy type / successional stage	Nitrogen-fixing pioneer, or early-seral, species that establishes well in disturbed areas <sup>5, 10</sup> ; as with other <i>Lupinus</i> species in the Pacific Northwest, this species plays a critical role in improving soil fertility through soil stabilization and nitrogen fixation following fires and in nutrient-poor soils <sup>19</sup> . It also persists in late successional communities like forest ecosystems <sup>12</sup> . Although it self-pollinates <sup>8</sup> , this species supports a variety of pollinators such as native bees, bumblebees, butterflies, and hummingbirds <sup>19</sup> .
Plant characteristics	This is an erect to suberect annual forb 10-45 cm tall, branched mostly at the base, with sparse appressed pubescent <sup>5, 13</sup> . Leaves are alternate, palmately

	compound with 5-8 leaflets, 1.5-4 cm long, linear to oblanceolate, glabrous or sparse pubescent above, pubescent below <sup>12, 13</sup> . Terminal small cluster of racemose inflorescence with papilionaceous flowers typical of the genus <sup>9, 13</sup> . Flowers 5-7 mm with deep blue petals; banner with white spot and purple dots; banner scarcely reflexed from wings, keel blunt <sup>7, 9, 12, 13</sup> . Flowering from April to June <sup>5</sup> . Fruit is a legume (pod) 2-3 cm long, pubescent with subappressed hairs or glabrous; seeds 4-8, approximately 3mm in diameter, dark gray to brown, usually abundantly stippled and mottled with black or brown <sup>5, 12</sup> .
<b>PROPAGATION DETAILS: Direct Seeding</b>	
Ecotype	
Propagation Goal	Plants [Information specific for <i>Lupinus polycarpus</i> is not available, so the following is based on protocols for a closely related annual <i>Lupinus</i> species of similar geographical range and ecological distribution, <i>Lupinus bicolor</i> Lind. <sup>2, 5, 9, 13, 20</sup> , as well as recommendations for <i>Lupinus</i> species in general.]
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	
Time to Grow	
Target Specifications	Seedlings with root system forming firm plug in container <sup>20</sup> .
Propagule Collection Instructions	Harvest or hand-collect the legumes in the summer as soon as they turn brown, before they dehisce, when fully mature <sup>8, 19</sup> . Because lupines have indeterminate flowering sequence and the legumes mature in the same sequence over a several weeks' period, visit the site several times during field collection. Collected seeds can be stored in paper bags at room temperature before processing <sup>19</sup> . If collecting from seed production area, 1m <sup>2</sup> of planting yields approximately 56 g seeds <sup>8</sup> (seed density not available).
Propagule Processing/Propagule Characteristics	Legumes are spread on a screen to dry and the seeds can then be extracted by flailing <sup>8</sup> . Seeds are approximately 3mm in diameter, dark gray to brown, and usually abundantly stippled and mottled with black or brown <sup>5, 12</sup> .
Pre-Planting Propagule Treatments	Seeds can be cleaned with an air screen machine <sup>1</sup> and stored in a cool, dry place <sup>14</sup> . Seed viability is about 2 years <sup>7</sup> .

	<p>Physical and physiological dormancy are noted in <i>Lupinus</i> species; hence, scarification, soaking, and stratification are recommended to initiate and/or improve germination<sup>3, 6, 8, 11, 14, 15</sup>.</p> <p>Mechanical scarification (nicking the seeds) can be done prior to soaking them in warm water for 24 hours, or until there is noticeable swelling<sup>8</sup>.</p> <p>Scarification can also be done with wet heat, by pouring hot water over the seeds and let them soak for 3 days, or until there is obvious swelling<sup>8, 14</sup>.</p> <p>Chemical scarification with concentrated sulfuric acid is also an option<sup>11, 15</sup>. Great care must be taken when handling the acid; use ceramic containers and plastic utensils; do not use metal containers or utensils. To determine the duration of acid exposure needed, apply 10 drops of sulfuric acid (10 to 12 mol/L) to 20 seeds at a time. The color of the acid changes to brownish, indicating that the acid is etching the seed coat. Expose the seeds to acid for 5 minutes, and then remove the seeds into a clean container and wash them with water a few times. Neutralize any acid residue by adding seeds to a warm baking soda solution. Soak the seeds in water overnight to determine if it imbibes water (obvious swelling). If the seeds remain hard and are not etched completely, repeat the acid treatment process with dry seeds by increasing acid exposure in 5-minute increments up to 20 minutes until an effective acid treatment time is identified<sup>11</sup>.</p> <p>Cold moist stratification has been described to improve germination of <i>Lupinus</i> species; however, stratification duration ranges from 14 to 90 days<sup>3, 8, 15</sup> and specific recommendations for <i>Lupinus polycarpus</i> are not available.</p>
Growing Area Preparation / Annual Practices for Perennial Crops	Seeds can be sown in flats or into individual containers <sup>14, 20</sup> in the fall or spring <sup>14</sup> . Potting soil <sup>20</sup> or soil-less peat-based medium (Sunshine <sup>®</sup> Mix 1) amended with micro-nutrients (Micromax <sup>®</sup> ) and a slow release fertilizer (Osmocote <sup>®</sup> 14-14-14) <sup>2</sup> can be used as growing medium.
Establishment Phase Details	In fully controlled greenhouse <sup>20</sup> .
Length of Establishment Phase	45 days <sup>20</sup>
Active Growth Phase	In fully controlled greenhouse. Seedlings in flats are transplanted 45 days after germination into individual containers containing potting mix of peat moss, fir bark, perlite, and sand <sup>20</sup> .
Length of Active Growth Phase	45 days <sup>20</sup>

Hardening Phase	
Length of Hardening Phase	
Harvesting, Storage and Shipping	
Length of Storage	
Guidelines for Outplanting / Performance on Typical Sites	Established plants at typical sites can potentially reseed themselves <sup>14</sup> .
Other Comments	This lupine species is adapted to environment where supply of phosphorus is always limiting and is very sensitive to phosphorus toxicity <sup>1</sup> . Lupines are sensitive to transplant shock and do not transplant well bare-root <sup>8, 19</sup> .
<b>INFORMATION SOURCES</b>	
References	See below
Other Sources Consulted	See below
Protocol Author	Anne-Gigi Chan
Date Protocol Created	April 16, 2017.

### References:

<sup>1</sup>Abdolzadeh, A., X. Wang, E.J. Veneklaas, and H. Lambers. 2010. Effects of phosphorus supply on growth, phosphate concentration and cluster-root formation in three *Lupinus* species. *Ann Bot.* **105**(3): 365-374. DOI: <http://dx.doi.org/10.1093/aob/mcp297>

<sup>2</sup>Bartow, Amy L. 2003. Propagation protocol for production of Container (plug) *Lupinus bicolor* Lindley plants USDA NRCS - Corvallis Plant Materials Center Corvallis, Oregon. IN: Native Plant Network. US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. Accessed April 15, 2017. <http://NativePlantNetwork.org>

<sup>3</sup>Bubel, N. 1988. *The New Seed-Starters Handbook*. Emmaus, PA: Rodale Press. pp. 318-319.

<sup>4</sup>Canadian Wildflowers. 2017 *Lupinus polycarpus*. Accessed April 10, 2017. [http://www.fleurssauvages.ca/fabaceae/lupinus\\_polycarpus.html](http://www.fleurssauvages.ca/fabaceae/lupinus_polycarpus.html)

<sup>5</sup>Dunn, D.B. and J.M. Gillett. 1966. *The Lupines of Canada and Alaska*. Ottawa, ON, Canada: Queen's Printer.

<sup>6</sup>Elliot, C.W., D.G. Fischer, and C.R. LeRoy. 2011. Germination of Three Native *Lupinus* Species in Response to Temperature. *Northwest Science*. **85**(2):403-310. DOI: <http://dx.doi.org/10.3955/046.085.0223>

<sup>7</sup>Gilkey, H.M. and L.R.J. Dennis. 2001. *Handbook of Northwestern Plants* (revised ed.). Corvallis, OR: Oregon State University Press. pp.231-234.

<sup>8</sup>Gough, R. and C. Moore-Gough. 2011. *The Complete Guide to Saving Seeds*. North Adams, MA: Storey Publishing. pp. 43, 198.

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- <sup>11</sup>Krautmann, M. Proprietor of Heritage Seedlings, Salem, OR. *Personal comm*. April 13, 2017.
- <sup>12</sup>Munz, P.A. and D.D. Keck. 1959. *A California Flora*. Los Angeles, CA: University of California Press. pp. 804, 816-817.
- <sup>13</sup>Pojar, J. & A. MacKinnon 1994. *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska*. Redmond, WA: Lone Pine Publishing. p. 196.
- <sup>14</sup>Robson, K.A., A. Richter, and M. Filbert. 2008. *Encyclopedia of Northwest Native Plants for Gardens and Landscapes*. Portland, OR: Timber Press. p. 83.
- <sup>15</sup>Russell. A. Dormancy and Germination Pre-Treatments in Willamette Valley Native Plants. *Northwest Science*. **85**(2):389-402. DOI: <http://dx.doi.org/10.3955/046.085.0222>
- <sup>16</sup>Turner, M. and P. Gustafson. 2006. *Wildflowers of the Pacific Northwest*. Portland, OR: Timber Press. p. 410.
- <sup>17</sup>USDA, Agricultural Research Service. 2012. *USDA Plant Hardiness Zone Map*. Accessed April 16, 2017. <http://planthardiness.ars.usda.gov>
- <sup>18</sup>USDA, NRCS. 2017. The PLANTS Database. National Plant Data Team, Greensboro, NC 27401-4901 USA. Accessed March 31, 2017. <http://plants.usda.gov>
- <sup>19</sup>Walker KC. 2014. Techniques for producing native seedlings for container, bareroot (plug+1), and seed increase production, including the use of Jiffy Forestry Pellets. *Native Plants Journal*. **15**(2):93-97.
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