

Plant Propagation Protocol for *Lupinus arcticus* S. Watson

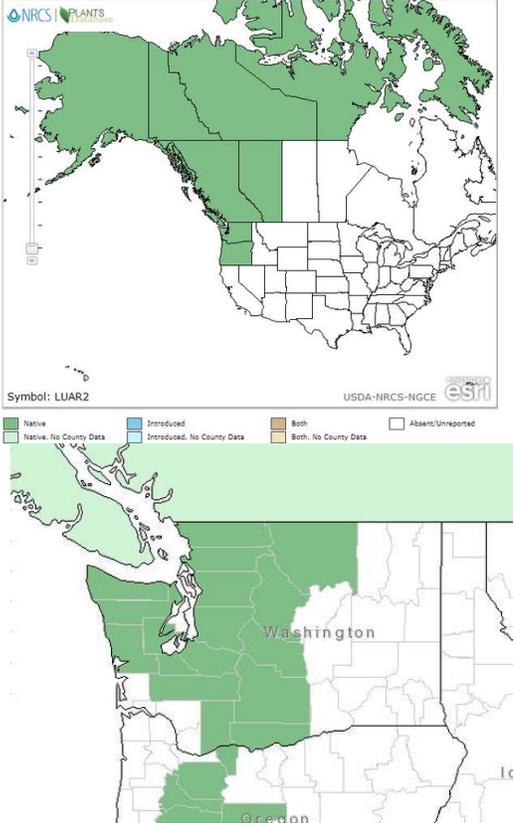
ESRM 412 – Native Plant Production

Protocol URL: <https://courses.washington.edu/esrm412/protocols/LUAR2.pdf>



[7]

TAXONOMY	
Plant Family	
Scientific Name	<i>Fabaceae</i>
Common Name	Pea family
Species Scientific Name	
Scientific Name	<i>Lupinus arcticus</i> S. Watson
Varieties	
Sub-species	<i>Lupinus arcticus</i> ssp. <i>Arcticus</i> , <i>Lupinus arcticus</i> ssp. <i>Subalpinus</i> [1]
Cultivar	
Common Synonym(s)	
Common Name(s)	Arctic Lupine
Species Code (as per USDA Plants database)	LUAR2
GENERAL INFORMATION	

<p>Geographical range</p>	 <p>[1] Found in Alaska, throughout the Northwest territories, and south to Oregon. Green coloring shows areas where <i>L. arcticus</i> is native.</p>
<p>Ecological distribution</p>	<p>Wet meadows, slopes, hummocks, mossy sedge flats,</p>
<p>Climate and elevation range</p>	<p>and tundra. Can also be found occasionally in disturbed sites such as roadsides.</p>
<p>Climate and elevation range</p>	<p>Occurs in mid-to high elevations in subalpine and alpine meadows. Prefers full sun to part shade and can survive winter temperatures as low as -30 F.</p>

Local habitat and abundance	Open slopes, forest openings, and meadows with well drained, rocky soil. Occurs in mid-to high elevation alpine ecosystems. Provides forage for hummingbirds, butterflies, and native bees. Commonly associated species include: <i>Senecio triangularis</i> (arrow-leaved groundsel), <i>Erigeron peregrinus</i> (subalpine daisy), <i>Valeriana sitchensis</i> (Sitka valerian), <i>Veratrum viride</i> (Indian hellebore), <i>Arnica</i> spp. (arnicas), <i>Pedicularis</i> spp. (louseworts), <i>Castilleja</i> spp. (paintbrushes), <i>Antennaria lanata</i> (woolly pussytoes), <i>Anemone occidentalis</i> (western pasqueflower), <i>Caltha leptosepala</i> (white marsh-marigold), <i>Heracleum lanatum</i> (cow-parsnip), <i>Erythronium grandiflorum</i> (glacier lily), <i>Ranunculus eschscholtzii</i> (subalpine buttercup), <i>R. nivalis</i> (snow buttercup), <i>Oxyria digyna</i> (mountain sorrel), and <i>Artemisia norvegica</i> ssp. <i>saxatilis</i> (mountain sagewort)
Plant strategy type / successional stage	Colonizer to late successional. Grows well on poorer soils and can sometimes be found on roadsides. Lives 3-10 years. Fixes nitrogen, improving soil for later successional species. [3]
Plant characteristics	Perennial herb with erect stems to 24 in. tall. Numerous palmately compound leaves with long petioles and racemes of dark blue flowers. Lives 3-10 years. Seeds are poisonous. [6]
PROPAGATION DETAILS	
Ecotype	Not applicable for this protocol.
Propagation Goal	Plants
Propagation Method	Seed or division.
Product Type	Container
Stock Type	Plug
Time to Grow	Information not available.
Target Specifications	At least 5 in. tall, well developed root system and even root-shoot ratio.
Propagule Collection Instructions	Flowers occur in mid-summer and seeds are produced beginning in July. Fruit is dehiscent [6], which can

	make seed collection difficult. Use a bag or bucket to collect fruits as they ripen, or collect fruit when some of the pods, usually the top ones, turn a dark black or brown. The remaining pods should be left to ripen in the sun while curing. [5] Vegetative propagation through division should be done late fall to very early spring when the plant is dormant.
Propagule Processing/Propagule Characteristics	Seeds of this species can last for many years if stored properly in a cold, dry area or frozen. Previously, a small amount of <i>L. arcticus</i> seeds found in an ancient lemming hole in 1967 were believed to be the oldest seeds in the world (~10,000 years), but modern radiocarbon dating technology has shown that the seeds were from around 1955 and contaminated the ancient holes during construction. [2]
Pre-Planting Propagule Treatments	Fresh seeds do not require treatment and be seeded directly. Stored seeds require a pre-soak to remove inhibitory chemicals. Germination occurs faster when seeds have been scarified with hot water or acid treatment [3], and cold stratified [4]. No information is currently available on how long to stratify <i>L. arcticus</i> , but since it is an alpine species, 45 days would be a starting estimate. Seeds can be sown in spring or fall.
Growing Area Preparation / Annual Practices for Perennial Crops	Media should be sandy loam, or a gravelly soil like sand-peat mix and be well-drained.
Establishment Phase Details	Germination occurs at about 20 C [4].
Length of Establishment Phase	Information unavailable.
Active Growth Phase	Water regularly. This species is not drought-tolerant. Fertilization should occur in this phase but use a fertilizer with low N. <i>L. arcticus</i> fixes nitrogen on its own.
Length of Active Growth Phase	Information unavailable.
Hardening Phase	Discontinue fertilization. Leaves will fall as the plant prepares for dormancy.
Length of Hardening Phase	Information unavailable.

Harvesting, Storage and Shipping	L. arcticus is cold-tolerant since it is adapted to alpine climates and can tolerate up to -30 F winter temperatures. Frost-heaving should be avoided as it may cause the plant to break dormancy at the wrong time.
Length of Storage	Information not available.
Guidelines for Outplanting / Performance on Typical Sites	Spot-spray herbicide to keep away competing forbs at the outplanting site. Plants are ready for outplanting when they have reached the target size and have a well-developed root ball. An even root-to-shoot ration is a good indicator [5]
Other Comments	
INFORMATION SOURCES	
References	<ol style="list-style-type: none"> 1. USDA NCRS National Plant Data Team. "Plant Profile for <i>Lupinus arcticus</i> S. Watson." <i>plants.usda.gov</i> US Department of Agriculture. Web. 20 April 2018. 2. Walker, Matt. "'10,000-year-old' Seeds Debunked." <i>news.bbc.co.uk</i> BBC Earth News, 9 July 2009. Web. 20 April 2018. 3. "<i>Lupinus arcticus</i>" <i>wildflower.org</i> Ladybird Johnson Wildflower Center Plant Database, 23 September 2016. Web. 20 April 2018. 4. Baskin, Jerry M; Baskin, Carol C. "Propagation protocol for production of Container (plug) <i>Lupinus arcticus</i> S. Wats. Plants" <i>NativePlantNetwork.org</i> US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources, 2002. Web. 20 April 2018. 5. Drumroese, R. Kasten et al. <i>Nursery Manual for Native Plants Vol. 1: Nursery Management</i>. US Department of Agriculture Forest Service, 2009. Print. 6. Aiken, S.G. et al. "Flora of the Canadian Arctic Archipelago". <i>nature.ca/aaflora/data</i> National Research Council of Canada, Ottawa, 2007. 7. Web. 20 April 2018. Le Duc, F. Alice. "Close up of an inflorescence". https://www.wildflower.org/gallery/result.php?id_image=47450 Ladybird Johnson Wildflower Center Digital Library and Image Collection. 09 August 2014. Web. 10 May 2018.

Other Sources Consulted	8. <i>eFloras.org</i> Flora of North America. Web. 20 April 2018. 9. <i>pfaf.org</i> Plants For A Future Database, 2012. Web. 20 April 2018. 10. http://biology.burke.washington.edu/herbarium/imagecollection WTU Herbarium Image Collection. Web. 10 May 2018.
Protocol Author	Kendra Potoshnik
Date Protocol Created or Updated	15 May 2018

Appendix A: Original *Lupinus arcticus* Propagation Protocol, Linda Arnoldi, 26 April 2006.

Plant Data Sheet

***Lupinus arcticus* or *Lupinus latifolius*, Arctic lupine**



<http://www.mun.ca/biology/delta/arcticf/images/b4261016.jpg>



<http://www.mun.ca/biology/delta/arcticf/images/b4261017.jpg>

Range: Throughout British Columbia, Alaska, Northwest Territories, Alberta, and Washington State.

Climate, elevation: Thrives in mid to high elevations of sub-alpine and alpine meadows. It can survive cold winters with annual averages being as low as -30 degrees Fahrenheit. Prefers full sun to partial shade.

Local occurrence (where, how common):

Below is a county map of Washington with their distribution colored in green.



http://plants.usda.gov/java/county?state_name=Washington&statefips=53&symbol=LUAR2

Habitat preferences: Well drained soil with a rocky texture. They are also found in wet meadows, tundra, mossy sedge flats, low ridges in the Arctic Islands, and grassy alpine slopes.

Plant strategy type/successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional): Early successional (pioneer), seral, and climax species. Terrestrial herbaceous perennial living 3-10 years. Fixes nitrogen, improving soil fertility. Attracts butterflies.

Associated species:

Senecio triangularis (arrow-leaved groundsel),

Erigeron peregrinus (subalpine daisy),

Valeriana sitchensis (Sitka valerian),

Veratrum viride (Indian hellebore),

Arnica spp. (arnicas),

Pedicularis spp. (louseworts),

Castilleja spp. (paintbrushes),

Antennaria lanata (woolly pussytoes),

Anemone occidentalis (western pasqueflower),
Caltha leptosepala (white marsh-marigold),
Heracleum lanatum (cow-parsnip),
Erythronium grandiflorum (glacier lily),
Ranunculus eschscholtzii (subalpine buttercup),
R. nivalis (snow buttercup),
Oxyria digyna (mountain sorrel), and
Artemisia norvegica ssp. *saxatilis* (mountain sagewort).

May be collected as: (seed, layered, divisions, etc.): Seed, or by dividing the rootball.

Collection restrictions or guidelines: Collect and sow seeds in the spring or fall. Collection dates in northwestern BC range from early July to the end of August. Seeds dehisce and can be difficult to collect. Use a bag or bucket before seeds are too ripe, or cut whole seed stock when some of the pods, usually the top ones, turn a dark black or brown. The remaining seeds will ripen in the pod under the sun while curing.

Seed germination (needs dormancy breaking?): Faster germination when using a combination of hot water or acid scarification and stratification. Presoaking is necessary to leach away inhibitory chemicals and induce germination. Direct seeding is also a possibility when done directly after collection and requires no treatment.

Seed life (can be stored, short shelf-life, long shelf-life): Seeds are long-lived in nature and subsequently have a very long shelf life when frozen. In 1967, frozen seeds found in an old lemming whole were dated to be 10,000 years old and germinated within 48 hours once optimum conditions had been met.

Recommended seed storage conditions: Keep in cool dry conditions or freeze.

Propagation recommendations (plant seeds, vegetative parts, cuttings, etc.): Plant seeds, seedlings, or divide

Soil or medium requirements: Plant seeds in a loam, sandy loam, or gravelly soil such as a sand-peat mix.

Installation form (form, potential for successful outcomes, cost): Seed, seedling, or division.

Recommended planting density: Unknown at present. Smith and Smith 2000 recommends 60-100 PLS seeds per linear meter and 75-120 cm between rows.

Care requirements after installed (water weekly, water once etc.): Does not tolerate drought. Spot spray with herbicide to keep area weed free, especially from encroaching grasses. Irrigate is possible.

Normal rate of growth or spread; lifespan: Decumbent reaching 3 inches to 1 foot with overall spread.

Sources cited:

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Close-up of inflorescence. N.W.T., Tuktoyaktuk, 21 July 1981, J.M. Gillett 18726. CAN.

Plant habit. Plants growing on dry hillside with *Castilleja*, at N.W.T., Tuktoyaktuk, 21 July 1981, J.M. Gillett 18726. CAN.

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Data compiled by Linda Arnoldi on 26, April 2006.