# *Lupinus polyphyllus* Lindl. ssp. *polyphyllus* large-leaved lupine

# Family: Fabaceae



Figure 69. Documented range of Lupinus polyphyllus in northern British Columbia.



Figure 70. Growth habit of *Lupinus polyphyllus* in cultivation.

# *Lupinus polyphyllus* Lindl. ssp. *polyphyllus* (continued)

## large-leaved lupine

### **Background Information**

Dunn (1965) reports the natural range of *Lupinus polyphyllus* extending from California into British Columbia on wet sites in areas of high rainfall with cool nights, cold winters and a fog belt. Subspecies seem to be more recognizable on drier sites. Douglas et al. (1999a) reported it found in southwestern and south-central British Columbia, less frequently northward, but as far as southeastern Alaska, and south to Idaho and California. Only one subspecies is recognized in B.C., *L.p.* ssp. *polyphyllus* (Douglas et al. 1999a).

<u>Growth Form</u>: Stems cylindrical, hollow at base, 9 - 17 leaflets per leaf, pointed at tip; bluish to violet dense cluster of pea-like flowers; mature plant size up to 150 cm tall. Forms nitrogen-fixing symbiotic root nodules with *Rhizobium* bacteria.

<u>Site Preferences</u>: Moist to mesic meadows, gravel bars, stream banks, clearings, roadsides and open forests (MacKinnon et al. 1992, Douglas et al. 1999a). Often found on heavier (i.e., more clayey) soils than *L. arcticus*.

#### **Seed Information**

Seed Size:Length: 3.83 mm (3.48 - 4.31 mm)<br/>Width: 2.67 mm (2.31 - 2.96 mm)Seeds per gram:96 (range: 71 - 140)Volume to Weight Conversion:704.7 g/L at 97.7% purityGermination Capacity:At  $30^{\circ}/20^{\circ}$  C untreated:58.3%<br/>(42% - 81%)scarified/stratified: 72.8%<br/>At  $25^{\circ}/15^{\circ}$  C untreated:(73 - 81%)<br/>stratified:67.0%<br/>(73 - 81%)The seed from pods harvested while still green had 12% lower<br/>germination then seed from fully ripened pods.

<u>Germination Speed</u>: To first germination: 7.9 days. To 50% potential: 21.5 days.



Figure 71. Seeds of *Lupinus polyphyllus*. Rule divisions are 1.0 mm.

<u>Seed Longevity</u>: In our research to date, seeds have retained their viability for two years after storage under cool dry conditions.

### **Considerations for Growing**

Techniques for Seed Production

*Seed treatment*: Scarification seems to be beneficial, but stratification for two months at 5°C was not, at least not when tested at cooler germination temperatures. Under lab conditions, scarifying the seed increases and hastens germination at both  $30^{\circ}/20^{\circ}$  C and  $25^{\circ}/15^{\circ}$  C. In untreated seeds, germination is higher when seeds are tested at  $25^{\circ}/15^{\circ}$  C. This suggests this species prefers cool temperatures to germinate, so fall planting is recommended.

*Soil considerations: Lupinus polyphyllus* can grow in clay loam, loam, sandy loam or gravelly soil. Untreated seeds germinate best in cooler soils.

# *Lupinus polyphyllus* Lindl. ssp. *polyphyllus* (continued)

# large-leaved lupine

#### (Techniques for Seed Production, continued)

*Stand establishment*: Site should be free of all weeds, especially rhizomatous grasses and other persistent species because there are currently no selective herbicides that can be used once plants are growing.

*Row spacing*: Unknown; suggest 75 to 120 cm under dryland conditions, 30 to 90 cm with good irrigation.

*Seeding density*: Unknown at present; suggest 60-100 PLS seeds per linear metre (Smith and Smith 2000),

Seeding depth: 1 cm (Pahl and Smreciu 1999).

*Stand maintenance*: Regularly cultivate rows and spot spray with herbicide to keep plot weed free; annual fertilization with low N formulations may extend the life of the plot. Voronov (1974) reports plants survived for up to four years, but seed yields decreased sharply in the third year. This finding is corroborated in our own research. Voronov (1976) also reports that inbreeding was accompanied by a marked decrease in flower number, pod set and seed yield. *Lupinus polyphyllus* is a host for a *Macrosiphum alibifrons* (lupine aphid; Cohen 1986), and seems to suffer some loss of flowers (and presumably seed yields too) as a result.

#### Harvesting and Seed Processing:

*Dates of selective harvesting* in the Bulkley Valley of northwestern B.C. range from July 17<sup>th</sup> to as late as October 16<sup>th</sup>. Timing of harvest is important as seeds dehisce very easily when ripe.

*Hand clipping*: Use sharp hand clippers. Hold the seed heads over bins placed alongside the plants being clipped or place a bag over the seed heads before clipping to minimize seed loss. Do not allow seeds to become over-ripe or pods will dehisce before harvest and you will lose many seeds. Plastic between rows is recommended so dehisced seeds can be salvaged. The preferred time for harvest is as soon as some of the pods (typically the top ones) on the flower stalk have turned dark (black or brown); one can then safely clip the entire stalk and allow the remaining seeds to ripen in the pod while curing in the sun.

Vacuum: Not recommended.

*Seed stripper*: In our experience these seeds easily dehisce when ripe, so use of a seed stripper is not recommended. However, Young and Young (1990) suggest that *Lupinus* sp. can be harvested with a seed stripper.

*Combine/thresher settings*: Two runs at 885 rpm with 4 mm gap; note that *L. polyphyllus* could not withstand the same thresher setting as *L. arcticus* (1241 rpm), suggesting it may have a softer seed coat. Remove the seed shaken loose after each batch before threshing more uncleaned seed, as cleaned seeds will crack otherwise; after threshing is completed, remove any unopened pods from the thresher and run them through once more to remove any remaining seed.

*Seed cleaning*: Put through fanning mill, using the following configuration: prescreen 4.9 mm round; top screen 4.8 mm round; bottom screen 1.2 mm square. If there are still unshelled pods and trash, put through a top screen only of 4 mm square (or use a 4 mm square hand screen), followed by use of a vacuum separator with speed set high and suction set low to remove dust and <5% of seeds. *Storage requirements:* Cool dry conditions; seeds stored in pods have lower germination (Styk 1970).

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# *Lupinus polyphyllus* Lindl. ssp. *polyphyllus* (continued)

### **Considerations for Use in Revegetation**

- *Lupinus polyphyllus* fixes nitrogen so is a valuable species on degraded sites, especially those with heavier (finer) soils; excellent tap root growth may also have value for decompacting soils.
- At low levels of phosphorus, *Lupinus polyphyllus* appears more effective than some domestic legumes at fixing nitrogen (Davis 1991).
- *Lupinus polyphyllus* seems to be suited to warmer locales and microsites, and finer soils, than *L. arcticus*.
- Potentially poisonous to animals so not recommended for use where domestic livestock can be found (Davis 1982, MacKinnon et al. 1992, Majak et al. 1994). Sheep are the most common victims, but cattle are also affected (Davis 1982).
- According to Davis (1982) and Davis and Stout (1986) certain lupines may contain the alkaloid anagyrine, which is responsible for "crooked cow disease" if ingested by pregnant cows at certain stages in their pregnancy.

Other considerations

- Some lines of *Lupinus polyphyllus* have been domesticated and selected for ornamental use throughout North America.
- *Lupinus polyphyllus* has been used for soil enrichment (plowed under as a "green manure") in Europe (Dovban 1994).
- Lupinus polyphyllus can intergrade with L. nootkatensis, L. arcticus, L. burkei and L. perennis (Dunn and Gillett 1966).

Notes