Protocol Information

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United States Department of Agriculture
Natural Resources Conservation Service

Corvallis
Plant Materials Center
Corvallis, Oregon

Family Scientific Name:	**Fabaceae**
Family Common Name:	**Legume**
Scientific Name:	***Lupinus latifolius* Lindl. ex J.G. Agardh**
Common Name:	**broadleaf lupine**
Species Code:	**LULA4**
Ecotype:	**Crater Lake National Park at 6,000 to 6,700 ft elevation; Mt Rainier National Park - 3 collections along highways on the east side of Park at elevations of 2,000 to 5,400 ft.**
General Distribution:	**Washington, Oregon, California - east to Utah and Arizona**
Propagation Goal:	**Seeds**
Propagation Method:	**Seed**
Product Type:	**Propagules (seeds, cuttings, poles, etc.)**
Stock Type:	**seed**
Time To Grow:	**1 Years**
Target Specifications:	**Clean, sound seed free of noxious weeds.**
Propagule Collection:	**Seed pods hand-stripped just as they begin to turn brown (ripened seed pods shatter very quickly); placed into cloth seed sacks and held in a cool, shaded location until they can be spread out on benches in the poly house to dry. Ripened seed will have a duller, whitish appearance; seed collected too "green" tends to shrivel on drying. Pods contain high levels of moisture initially and these collections need to be handled carefully to keep from overheating during transit. Seed pods were**

	plentiful in most years except for 2 seasons that were exceptionally warm in early spring.
Propagule Processing:	**Pods should be spread in a thin layer to dry in an area with good air flow and turned frequently; on paper or cloth to catch seed as it shatters from the drying pods. Small lots can be threshed with a geared-down hammermill; larger lots in a stationary thresher. Threshed lots air-screened with #10 round screen, medium-high air flow. Cleaned seed averaged 38,000 / lb. Germination rates have been quite variable between years as well as lots; ranging from 18% germination plus 3% hard seed to 27% germination with 42% hard seed.**
Pre-Planting Treatments:	**Scarification with a hot water (pour hot tap water over seed a few times and then allow seed to steep in water while it cools) or mechanical scarification in a seed tumbler seems to aid in germination. Even with such treatment, there will be varying levels of hard seed that remains impermeable. Scarified seed is then inoculated with *Rhizobium lupini* (available from Nitragin Corp, Wisconsin, US).**
Growing Area Preparation/ Annual Practices for Perennial Crops:	**Fine, weed-free seed bed prepared and amended with 2 lbs / ac of boron (a "standard" fertilization procedure for the heavily leached soils of the Willamette Valley of Oregon prior to seeding with legume crops).**
Establishment Phase:	**Both direct-seeding and transplanting were used for small field seed increase blocks at the PMC. Seeds direct-sown at shallow planting depth in small test plots (up to 0.2 acres) at 50 lbs/ac bulk rate. Germination will be scattered; some seedlings emerging up to 45 days after sowing. During this time, sprinkler irrigation is provided as needed to prevent soil crusting. Weed competition was a serious problem, with no selective herbicides available to control broadleaf weeds.** **Transplants were produced in 4" deep peat pots in the greenhouse starting in February (see separate protocol for plug production), and hand-transplanted in April or early May. Transplanting into mulch fabric at 36" spacing was also tried, and resulted in much better first season survival, larger**

	plants and increased seed production during the first year. However, winter survival was not high with or without mulch - it was felt that the (black) mulch fabric may have caused some mortality by raising soil temperatures around the crowns. Transplanting in non-mulched plots was on 6" within-row spacing; 36" between rows to allow mechanical cultivation for weed control.
Length of Establishment Phase:	**6 weeks**
Active Growth Phase:	**Weed control was provided with manual hoeing and weeding within rows, and, for non-mulched plots, mechanical tillage between rows. Few pest problems noted; with the exception of a heavy infestation of Lepidopteran larva (caterpillars) one year which were easily controlled with a single application of *Bacillus thuringiensis* (Bti). Powdery mildew often showed up on plants around seed ripening time or later; but did not appear to weaken plant growth or affect winter survival.**
Length of Active Growth Phase:	**March to July**
Hardening Phase:	**na**
Length of Hardening Phase:	**na**
Harvesting, Storage and Shipping:	**Seeds ripen very unevenly and the indeterminate growth habit combined with pod shatter makes it difficult to recover the majority of seeds; plants were hand harvested from the small test plots up to 4 times in June and July. Amounts collected ranged from 180 grams /0.005 acres (79.2 lbs/ac) from a first-year plot established form spring transplants, to less than 15 g/0.01 ac on a 2nd-year stand after extensive winter die-off. Much higher per-plant yields were obtained from small experimental plantings grown in mulch fabric and harvested more frequently but this would not be feasible on a production basis.**
Length of Storage:	**Some seed remains viable for several years in cool, dry storage, due in part to presence of hard seed.**
Outplanting performance on typical sites:	**Direct-seeding experimental revegetation plots at both Mount Rainier and Crater Lake have been at least moderately successful in establishing plants on amended plots (especially adding organic matter to disturbed-soil test plots, and application of straw mulch erosion control blanketing. Plots sown at the rate of 35 pure live seed / ft square in early fall resulted in 1 to 11 plants / square foot 3 years after**

initial seeding.

Other Comments: **Labor requirements for field harvesting are similar to that required for native stand collection, which may produce sufficient seed for many small to medium sized restoration projects.**

Studies on genetic adaptation were conducted and reported by David Doede, Geneticist (retired) - Gifford Pinchot, Mt Hood, and Siuslaw National Forests as part of an ongoing effort to determine how best to use this species in future reclamation / restoration projects.

The use of manufacturer and trade names in this document is for clarification only. No discrimination is intended and no endorsement is given by the USDA NRCS.

References: **Corvallis Plant Materials Center Technical Report: Plants for Woodland and Rangeland Reclamation and Erosion Control 1980 - 1997 (includes Annual Reports to Mount Rainier National Park from 1990 - 1996).**

Link, Ellen, ed. 1993. Native Plant Propagation Techniques for National Parks Interim Guide; Compiled by Rose Lake Plant Materials Center 7472 Stoll Road East Lansing, MI 48823.

Rose, Robin, C.E.C. Chachulski and D. Haase. Propagation of Pacific Northwest Native Plants 1998 Or. State Univ. Press, Corvallis, OR.

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Citation:

Trindle, Joan DC; Flessner, Theresa R. 2003. Propagation protocol for production of *Lupinus latifolius* Lindl. ex J.G. Agardh seeds (seed); USDA NRCS - Corvallis Plant Materials Center, Corvallis, Oregon. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 6 January 2010). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.