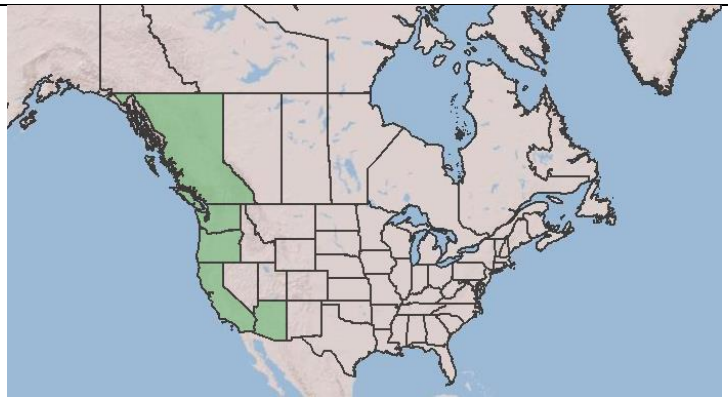
Plant Propagation Protocol for *Lupinus bicolor* L.
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/2021/LUBI.*pdf*

Figure 1: Reveal, J. L. (2018). Lupinus bicolor (Miniature lupine) | NPIN [Photograph]

TAXONOMY	
Plant Family	
Scientific Name	*Fabaceae* [13]
Common Name	Pea Family[13]
Species Scientific Name	
Scientific Name	*Lupinus bicolor* Lindley [3]
Varieties	There are no recognized varieties.[13]
Sub-species	*Lupinus bicolor* 'bicolor' Lindley *Lupinus bicolor* 'marginatus' D.B. Dunn *Lupinus bicolor* 'microphyllus' (S. Watson) D.B. Dunn *Lupinus bicolor* 'pipersmithii' (A. Heller) D.B. Dunn *Lupinus bicolor* 'tridentatus' (C.P. Sm.) D.B. Dunn *Lupinus bicolor* 'umbellatus' (Greene) D.B. Dunn [3]
Cultivar	*Lupinus bicolor* var. 'rostratus' (Eastw.) Jeps. *Lupinus bicolor* var. 'trifidus' (S. Watson) C.P. Sm. *Lupinus congdonii* (C.P. Sm.) D.B. Dunn *Lupinus polycarpus* Greene; *Lupinus rostratus* Eastw. [10]
Common Synonym(s)	No common synonyms found. [4] *May be confused with *Lupinus nanus* [10]
Common Name(s)	Miniature lupine, Bicolor lupine, Miniature Annual Lupine, Pygmy-leaved Lupine [12, 13]
Species Code (USDA database)	LUBI

GENERAL INFORMATION	
Geographical range	 ©USDA PLANTS Database  ©Turner Photographics LLC Primarily occur west of the Cascades mountain range within British Columbia, Washington, Oregon, and California. Some subspecies are present east of the Cascades and in eastern Arizona. [2]
Ecological distribution	Dry Meadow, Grasslands, West-Side Forest, East-Side Forest, Open or Disturbed Places. Found commonly in sandy ground. [4, 8, 11]
Climate and elevation range	Climate: Full sun (warm) and low moisture (dry) Elevation: Below 3000 feet elevation[12]
Local habitat and abundance	Common companion of California Poppy (*Eschscholzia californica).* Found abundantly in large, open areas with other annual wildflowers [8, 12]

Plant strategy type / successional stage	In most environments, *Lupinus bicolor* is considered a spring ephemeral, meaning it is quick to develop its stem, leaf, and flower structures and quick to return to dormancy after seed production. Ecologically, this is a likely adaption to grow during optimal conditions prior to the growth of overhead tree foliage.[7] *Lupinus bicolor* attract several species of pollinator insects – an important source of nectar for bees and serving as a host plan for Arrowhead Blue butterflies.[6]
Plant characteristics	• Annual, herbaceous[4] • Grows up to 16 inches in height • Branching root system[4] • Alternate, deciduous, palmate, with 5-12 leaflets[4] • Flowers mid-spring with blue-violet and white pea flowers in tight whorls along stalk with cone-like racemes [11, 12] • Fruit produced are small and hairy seed pods, each with about 4-8 seeds per pod [6]
PROPAGATION DETAILS: SEED	
Ecotype	Seeds were collected from Presidio, California [14] and Lane County, Oregon [1]
Propagation Goal	Plants [1, 14]
Propagation Method	Seed [1, 14]
Product Type	Container (plug) [1, 14]
Stock Type	Container – 1 gallon [4]
Time to Grow	3 months [4, 14]
Target Specifications	Two target specification are to have bright blue-violet flower color and an established root system that forms a firm plug. [1, 14]
Propagule Collection Instructions	Collect seeds from mature pods that are dark brown to block, between May 6 and May 26.[4] Pods should be collected in paper bags and placed in an open green house to dry.[1] Seeds are elliptical and should be 5 to 8 mm in diameter. [4, 6]
Propagule Processing/Propagule Characteristics	A seed density of 241 seeds/gram (or 109,316 seeds/lb). [14]
Pre-Planting Propagule Treatments	Seed cleaned with air screen machine and should be held dry and at room temperature. [1, 14] No pretreatment needed, but hot water soaking overnight or scarification may improve germination success and uniformity.[8]
Growing Area Preparation / Annual Practices for Perennial Crops	Seeds were directly sown into containers filled with Sunshine #1 (a soil-less peat-based media) amended with micro-nutrients (Micromax) and a slow-release fertilizer (Osmocote 14-14-14).[1] Containers are held in fully controlled greenhouse environment. [14]

Establishment Phase Details	Seeds germinate 45 days after sowing with a 40% germination rate. Seedlings are transplanted 45 days after germination to individual containers containing standard potting mix of peat moss, fir bark, perlite, and sand.[14]
Length of Establishment Phase	3 months [14]
Active Growth Phase	*Lupinus bicolor* is commonly outplanted after establishment phase. If maintained in nursery setting, there is not much need for added fertilizer or frequent watering.
Length of Active Growth Phase	No information found.
Hardening Phase	Fully established, the *Lupinus bicolor* is ranked in Zones 8/9 in terms of winter hardiness, meaning it can tolerate cold to 5° F [4, 8]
Length of Hardening Phase	No information found.
Harvesting, Storage and Shipping	Seedlings should be kept in low-moisture, high sunlight environments (with temperatures held between 75-85° F) [4]
Length of Storage	*Lupinus bicolor* seeds maintain viability for up to 8 months if heled in dry and room temperature conditions. The success of outplanting will be improved the sooner seedlings are outplanted.
Guidelines for Outplanting / Performance on Typical Sites	Flowering happens between the months of March-April. A fully grown *Lupinus bicolor* can be up 1.3 feet tall and 1 foot wide.[8] There is little available information about outplanting percent survival, though it is noted that because of the *Lupinus bicolor* long root system it s preferential to sow seeds directly in outplant site rather than nursery-grow and transplant which can decrease planting success rate.[6]
Other Comments	*Lupinus bicolor* is often directly sowed into the desired outplant location rather than grown in the nursery setting. At present, this species is not a regularly cultivated crop.[4] For this reason, there is little information available on the handling/management of *Lupinus bicolor* beyond the plant's establishment phase. Because *Lupinus bicolor* is a part of the legume family it is nitrogen-fixing and could prove useful in restoration projects.[6]
INFORMATION SOURCES	
References - Attached	

Protocol Author	Brenton Riddle
Date Protocol Created or Updated	05/04/2021

References

[1]Bartow, A. (2003). *Native Plant Network—Reforestation, Nurseries and Genetics Resources*. National Plant Network, Propagation Protocol Database. https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=fabaceae-lupinus-2731

[2]Giblin, D. (n.d.). *Burke Herbarium Image Collection*. Burke Herbarium Image Collection. Retrieved May 5, 2021, from https://biology.burke.washington.edu/herbarium/imagecollection/taxon.php?Taxon=Lupinus%20bicolor

[3]Integrated Taxonomic Information System (ITIS). (n.d.). *ITIS Standard Report Page: Lupinus bicolor* [On-line database]. Retrieved May 4, 2021, from https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=25966#null

[4]Krogstad, M. (2005, April 26). *Lupinus bicolor*. https://conservancy.umn.edu/bitstream/handle/11299/143407/Lupinus%20bicolor%20Marit%20Krogstad.pdf?sequence=1

[5]*Lupinus bicolor What is it. Encyclopedia*. (n.d.). En.Info-about.Ru. Retrieved May 5, 2021, from https://amp.en.info-about.ru/13286158/1/lupinus-bicolor.html

[6]*Lupinus bicolor—Puget Prairie Plants*. (n.d.). Puget Prairie Plants. Retrieved May 5, 2021, from https://wikis.evergreen.edu/pugetprairieplants/index.php/Lupinus_bicolor

[7]McCoy, B. (2020, March 16). *Wildflower Succession and Ephemerals*. https://handbookofnaturestudy.com/2020/03/wildflower-succession-and-ephemerals.html/

[8]*Miniature Lupine, Lupinus bicolor*. (n.d.). Calscape, California Native Plant Society. Retrieved May 5, 2021, from https://calscape.org/Lupinus-bicolor-()

[9]Reveal, J. L. (2018). *Lupinus bicolor (Miniature lupine) | NPIN* [Photograph]. https://www.wildflower.org/gallery/result.php?id_image=64781

[10]Sholars, T., & Riggins, R. (n.d.). *Lupinus bicolor—Miniature Lupine*. The Jepson Herbarium. Retrieved May 5, 2021, from https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=31793

[11]Turner, M. (n.d.). *Lupinus bicolor | Miniature Lupine | Wildflowers of the Pacific Northwest*. Retrieved May 5, 2021, from https://www.pnwflowers.com/flower/lupinus-bicolor

[12]TWC Staff. (2018, November 30). *Lupinus bicolor (Miniature lupine) | Native Plants of North America*. Wildfloer Center. https://www.wildflower.org/plants/result.php?id_plant=lubi

[13]USDA NRCS National Plant Data Team. (n.d.). *Lupinus bicolor Lindl.* United States Department of Agriculture, Natural Resources Conservation Service. Retrieved May 4, 2021, from https://plants.usda.gov/home/plantProfile?symbol=LUBI

[14]Young, B. (n.d.). *Native Plant Network—Reforestation, Nurseries and Genetics Resources*. Retrieved May 5, 2021, from https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=fabaceae-lupinus-636