Template - Plant Propagation Protocol
ESRM 412 – Native Plant Production
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Updated by JD Bakker on 070418

This template is modified from that available at:
http://www.nativeplantnetwork.org/network/SampleBlankForm.asp

TAXONOMY	
Family Names	
Family Scientific Name:	Campanulaceae
Family Common Name:	Harebell
Scientific Names	
Genus:	*Campanula*
Species:	*rotundifolia*
Species Authority:	L.
Variety:	Na
Sub-species:	Na
Cultivar:	Na
Authority for Variety/Sub-species:	Na
Common Synonym(s)	
Genus:	Na
Species:	Na
Species Authority:	Na
Variety:	Na
Sub-species:	Na
Cultivar:	Na
Authority for Variety/Sub-species:	Na
Common Name(s):	Common Harebell
Species Code (as per USDA Plants database):	CAMROT
GENERAL INFORMATION	
General Distribution (geographical range (states it occurs in), ecosystems, etc):	The common Harebell is found on grassy slopes, canyons, gullies, on rocky open ground and at sites near waterfalls. Found from Mexico to Washington (Pojar and MacKinnon 1994).
Climate and elevation range	Found from sea level to mid elevation, occasionally subalpine elevations (Pojar and MacKinnon).
Local habitat and abundance; may include commonly associated species	Fond mostly on prairie slopes or rocky sites in Washington (Hitchcock and Cronquist 1973).
Plant strategy type / successional stage (stress-tolerator, competitor,	A hardy plant, not a colonizer. (Hitchcock and Cronquist 1973)

weedy/colonizer, seral, late successional)	
PROPAGATION DETAILS	
Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):	NA
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Plants
Propagation Method (Options: Seed or Vegetative):	Seed
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Container (plug)
Stock Type:	116 ml conetainer
Time to Grow (from seeding until plants are ready to be outplanted):	9 Months
Target Specifications (size or characteristics of target plants to be produced):	Height: 4 to 6 true leaves, 5 cm Caliper: n/a Root System: firm plug in 116 ml container. (Wick etal 2004).
Propagule Collection (how, when, etc):	Seeds should be collected by hand when capsules begin to turn tan in color and split at the base. Seeds should be collected into paper bags (Schultz 2001).
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	Seeds are first stored in open paper bags. Once seeds are dried the are to be screened or hand rubbed clean. The seed longevity is unknown The seed dormancy is physiological dormancy Seeds/Kg: 16,000,000/kg %Purity: 100% %Germination: 20 to 47% (Baskin 1998)
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	For chemical stratification: mix seeds with an equal amount of perlite or vermiculite. Put the mixture into a zip-lock bag and seal shut. Keep in mixture for one to three months in a cool dry place, such as refrigerator. Store in cool conditions until planted (up to 3 years). (Baskin 1998)
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Propagate in Greenhouse. Keep a well ventilated environment with circulated air. Container Type: grows well in 24 cell with a 2 inch diameter (14"x8.5"x4" deep flats). Can be grown in nearly any size plug.

	Sowing Media: Use “Scotts Redi-earth Plug and Seedling Mix. Contains vermiculite, and sphagnum peat moss.” Moisten the soil with water and cover the bottom sides of the plug with newspaper to keep soil from falling out. Sow seeds by hand, about 3 seeds for each cell. Cover seeds with thin amount of moist soil (Wick etal 2004).
Establishment Phase (from seeding to germination):	Keep in green house with a moist medium from March to June. Keep green house temperatures from 60 to 65 degrees. Water so soil stays damp, using misting. No artificial light should be used.
Length of Establishment Phase:	4 weeks
Active Growth Phase (from germination until plants are no longer actively growing):	Soils no longer need to be continually moistened. Ether no additional fertilizer or a light amount of liquid 13-13-13 NPL at 100 ppm should be applied if needed. Seedlings produce 4 to 6 true leaves in a basal rosette pattern with a tight root plug, after 7 weeks. Plants may not flower in the first year (Deno 1993).
Length of Active Growth Phase:	7-8 weeks
Hardening Phase (from end of active growth phase to end of growing season; primarily related to the development of cold-hardiness and preparation for winter):	Begin reducing water in September and October. Plants may be fertilized with a 10-20-20 liquid NPK at 200 ppm. Before winter storage leach plants with clean water. Keep plants above freezing temperatures so not to frost over, with reduced sunlight to prevent leaves from scorching (Shultz 2001).
Length of Hardening Phase:	2 - 4 weeks
Harvesting, Storage and Shipping (of seedlings):	Total Time To Harvest: 9 months Harvest Date: September – October Storage Conditions: Overwinter in outdoor nursery under insulating foam cover and snow. Or in fridge held above freezing.
Length of Storage (of seedlings, between nursery and outplanting):	5 months
Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter growth, elapsed time before flowering):	Outplant from early spring to late summer. (After the last frost) (Hitchcock and Cronquist 1973).
Other Comments:	Harebell is attractive to hummingbirds. Its plugs can be very delicate and difficult to establish. Because of this most of the germinated seeds do not make it to be transplanted into the field (Schultz etal 2001).
INFORMATION SOURCES	
References:	Baskin and Baskin. Seeds: Ecology, Biogeography, and Evolution of Dormancy and Germination, , Academic Press, 1998.

	Deno, Norman. Seed Theory and Practice, Germination Penn State University, 1993. Hitchcock and Cronquist. Flora of the Pacific Northwest, 7th edition, University of Washington Press, 1973. Pojar, J; Mackinnon, A. Plants of the pacific northwest coast. Lone line publishing. 2004. Schultz, Jan; Beyer, Patty; Williams, Julie. 2001. Propagation protocol for production of container Campanula rotundifolia L. plants; Hiawatha National Forest, Marquette, Michigan. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 23 May 2007). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery. Wick, Dale; Luna, Tara; Evans, Jeff. 2004. Propagation protocol for production of container Campanula rotundifolia L. plants (116 ml conetainer); Glacier National Park, West Glacier, Montana. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 23 May 2007). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.
Other Sources Consulted (but that contained no pertinent information):	Baskin, Carol C.; Baskin, Jerry M. 2002. Propagation protocol for production of container Campanula rotundifolia L. plants; University of Kentucky, Lexington, Kentucky. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 23 May 2007). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery. Regina Lindborg, Sara A. O. Cousins, Ove Eriksson (2005) Plant species response to land use change – Campanula rotundifolia, Primula veris and Rhinanthus minor. Ecography 28 (1), 29–36.
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