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Plant Propagation Protocol for Cypripedium montanum
ESRM 412 – Native Plant Production
Spring 2008

TAXONOMY	
Family Names	
Family Scientific Name:	Orchidaceae
Family Common Name:	Orchid
Scientific Names	
Genus:	Cypripedium
Species:	montanum
Species Authority:	Douglas ex Lindl
Variety:	
Sub-species:	

Cultivar:	
Authority for Variety/Sub-species:	
Common Synonym(s) (may repeat this section multiple times as needed)	
Genus:	
Species:	
Species Authority:	
Variety:	
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common Name(s):	Mountain Lady's Slipper, Large Lady's Slipper,White Lady's Slipper , Moccasin Flower (USDA & WTU Herbarium)
Species Code (as per USDA Plants database):	CYMO2
GENERAL INFORMATION	
General Distribution (geographical range (states it occurs in), ecosystems, etc):	Alaska, Southwestern Canada, Montana, Wyoming, Idaho, Washington, Oregon, California (USDA & WTU Herbarium)
Climate and elevation range	"Dry to moist open woods, low to mid-elevations in the mountains"(WTU Herbarium). FAC to FACU (USDA)
Local habitat and abundance; may include commonly associated species	Mycorrhizal associations are essential. Mycorrhizal species required may vary during the plants lifetime. (Dougherty). For germination, parasitic dependence on mycorrhiza from the Tulasnellaceae clade is required (Shefferson). Grows in 14 counties in Washington (Chalker-Scott). Region of growth in a horshoe shape across Washington the length of the Cascades, north central Washington, and the eastern most strip of the state(WTU Herbarium).

Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	Perennial Forb/herb (USDA), old growth & mycorrhizal dependency (Shefferson)
PROPAGATION DETAILS	
Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):	
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Protocorm [from seed], or plant [rhizome sectioning] (Rasmussen)
Propagation Method (Options: Seed or Vegetative):	Seed or vegetative
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles,	Plant seed in soil near adults or a seed carrier comprised of soil taken from area with adults (Huber) or mature rhizomes in soil from adult plant vicinity (Rasmussen)

etc.))	
Stock Type:	
Time to Grow (from seeding until plants are ready to be outplanted):	Autumn (Huber)
Target Specifications (size or characteristics of target plants to be produced):	For vegetative propagation, ensure that the rhizome is at least 3 years old (Rasmussen).
Propagule Collection (how, when, etc):	Score rhizome during growing season to promote growth, then section after growing season (Rasmussen). Alternately, tease rhizomes apart (Preece). Rhizomes should be processed at the end of the growing season in late summer when foliage has died (Preece) Excise seeds “between 42 and 60 days after pollination, then decreases until 85-100 days after pollinization”(Rasmussen).
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	Seeds are nearly microscopic and easily wind blown. (Dougherty)
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	For native soil planting, ensure seeds have soil that has been in proximity of adult plants to ensure mycorrhizal association (Huber). Germination is about .1 percent without mycorrhizal association (Steele), but for investigation of asymbiotic propogation please see: Linda-Marie Rännbäck & Rasmussen
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Any transplants should be shallow with roots spread out, as deep planting is fatal (Preece) Provide about 60% shade with few competitors. Plant in vicinity of adult to accommodate mycorrhizal demand, or mixed with soil from area populated with adults. (Huber)

Establishment Phase (from seeding to germination):	About 1.5 years until plant is evident, but may be longer. (Huber)
Length of Establishment Phase:	
Active Growth Phase (from germination until plants are no longer actively growing):	
Length of Active Growth Phase:	
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):	
Length of Hardening Phase:	
Harvesting, Storage and Shipping (of seedlings):	
Length of Storage (of seedlings, between nursery and outplanting):	
Guidelines for Outplanting / Performance on Typical Sites (eg,	

percent survival, height or diameter growth, elapsed time before flowering):	
Other Comments (including collection restrictions or guidelines, if available):	Propagation is very challenging, and there is a significant risk of taxing the species.
INFORMATION SOURCES	
References (full citations):	Chalker-Scott, L. 2008. Washington's Native Orchids. MasterGardener Magazine 2(1): 37-42 Doherty, J.W. 1997. The Genus Cypripedium: a botanical and horticultural overview. North American Native Orchid Journal March 5-116. Huber, Andrew G. 2002 Mountain lady's slipper (*Cypripedium montanum*): Establishment from Seeds in Forest Openings. Native Plants Journal 3 (2) 151 Andrew G. Huber / 151 Preece, W. H. A. 2007. North American Rock Plants. Read Books. Rasmussen, HN. 1995. Terrestrial orchids. From Seed to Mycotrophic Plant. Cambridge University Press. Shefferson, Richard P., Weib, M. Kull, T. Taylor, D. 2005 High specificity generally characterizes mycorrhizal association in rare lady's slipper orchids, genus *Cypripedium* Molecular Ecology 14 (2) , 613–626 Steele W. K. 1996. Large scale seed production of North American *Cypripedium* species. In: Allen C., editor. North American Native Terrestrial Orchids: Propagation and Production. Conference Procedings. 1996 Mar 16-17; Germantown (MD): North American Native American Native Terrestrial Orchid Conference. p. 11-26. [USDA]. 2008 Apr 15. USDA home page.<http://www.plants.usda.gov/java/nameSearch?keywordquery=cypripedium+montanum&mode=sciname&submit.x=9&submit.y=13 >. Accessed 2008 Apr.

	[WTU Herbarium]. 2008 Apr 15. WTU Herbarium home <http://biology.burke.washington.edu/herbarium/imagecollection.php >. Accessed 2008 Apr.
Other Sources Consulted (but that contained no pertinent information) (full citations):	Some sources contain pertinent information but may have broadly addressed Cypripedium. Because they were not species specific or had a low representation of montanum, some caution was implemented describing propagation methods in deference to potential ecological impacts. Cotterill, Patsy. Orchids of Lakeland: A Field Guide to Lakeland Provincial Park, Provincial Recreation Area and Surrounding Region. Alberta Environment Protection. <http://www.google.com/url?sa=t&ct=res&cd=1&url=http%3A%2F%2Fwww.anpc.ab.ca%2Fassets%2FOrchid.pdf&ei=nbkFSO2zOoPOigHvgIHAAw&usg=AFQjCNEHbfzzuV5R5nc98tt5M8YgyxDLKg&sig2=9rGYIVLTo5pGwrlU1MiD1g> Accessed Apr. 2008 Morin, Nancy R. and Judy Unger. 1990. Editorial Committee Meeting. Flora of North America News. Volume 4, Numbers 2-4.March-August 1990 Oliva, Allison P. Arditti, J. A. 1984. Seed Germination of North American Orchids. II. Native California and Related Species of Aplectrum, Cypripedium, and SpiranthesSeed Germination of North American Orchids. II. Native California and Related Species of Aplectrum, Cypripedium, and Spiranthes. Botanical Gazette, Vol. 145, No. 4 (Dec., 1984), pp. 495-501 Rännbäck, Linda-Marie, Supervisor: Associate Professor Björn Salomon. Examiner: Associate Professor Li-Hua Zhu. Propagation, cultivation and breeding of terrestrial temperate orchids, with focus on *Cypripedium* spp. Dept. of Crop Science, SLU, Alnarp.< http://ex-epsilon.slu.se/archive/00001453/01/Cypripedium,_R%C3%A4nnb%C3%A4ck_070126.pdf> Accessed Apr. 2008 Shefferson, R.P., D.L. Taylor, M. Weiss, S. Garnica, M.K. McCormick, S. Adams, H.M. Gray, J.W. McFarland, T. Kull, K. Tali, T. Yukawa, T. Kawahara, K. Miyoshi, and Y.-I. Lee. 2007. The evolutionary history of mycorrhizal specificity among lady's slipper orchids. *Evolution* 61:1380-1390. Vance, Nan C. 2007. *Cypripedium montanum* Douglas ex Lindley (mountain lady's slipper): A Technical Conservation Assessment. USDA Forest Service. February 27, 2007. <http://www.google.com/url?sa=t&ct=res&cd=1&url=http%3A%2F%2Fwww.blm.gov%2For%2Fplans%2Fsurveyandmanage%2FMR%2FVascularPlant

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Date Protocol Created or Updated (MM/DD/YY):	4/15/08

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