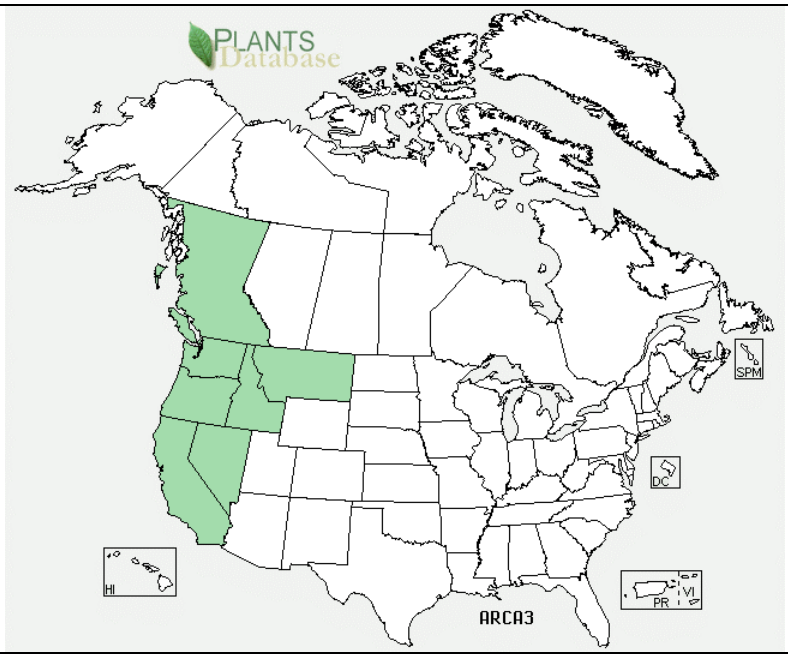
Plant Propagation Protocol for *Arceuthobium campylopodum*
ESRM 412 – Native Plant Production

TAXONOMY	
Family Names	
Family Scientific Name:	*Viscaceae*
Family Common Name:	Mistletoe
Scientific Names	
Genus:	*Arceuthobium*
Species:	*campylopodum*
Species Authority:	Englem.
Variety:	
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common Synonym(s) (include full scientific names (e.g., *Elymus glaucus* Buckley), including variety or subspecies information)	*Arceuthobium abietinum* Englem. (Lumped as same species in some sources) and *Arceuthobium americanum.* (Charters) (Parish)
Common Name(s):	Western Dwarf Mistletoe
Species Code (as per USDA Plants database):	ARCA3
GENERAL INFORMATION	
Geographical range (distribution maps for North America and Washington state)	Distribution maps for Washington state not yet available.

	
Ecological distribution (ecosystems it occurs in, etc):	Parasitic to a range of confers including, but not limited to, junipers, hemlocks, firs, spruces, and larches. Grows on stems emerging from the host's branches, generally high up in the host tree. (Pojar)
Climate and elevation range	Temperate climate at low to moderate elevation. (Hunn)
Local habitat and abundance; may include commonly associated species	Grows on high branches of conifers, most commonly associated with western hemlock (*Tsuga Heterophylla*) in America and lodgepole pine (*Pinus contorta* var. *latifolia*) in Canada. (Pojar) (Parish)
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	Parasitic on a wide range of conifer trees. (Pojar)
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)	Fleshy, perennial subshrub/shrub that grows on the branches of conifers. Generally grows inside of the host's branches until flowering hormones are triggered, after which clusters of yellowish-orange or greenish-brown segmented stems emerge from the host's swollen branch. This species is dioecious; male plants are generally more brownish and females more greenish. It is an angiosperm with a sticky seed that can either be shot out of it's protective fruit layer and flung through the air to potentially land on another tree's branches or needles, or eaten by birds and excreted onto another tree branch where it undergoes cold stratification, generally from late autumn until spring. In spring, as the seeds begin to germinate and produce root-like structures (holdfasts) that grow in the phloem and in the xylem, surviving

	off of the host's nutrients and water. (Pojar) (Parish) (Charters) (Sierra) (Koski) (Halloin)
PROPAGATION DETAILS	
Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):	Ecotype for tested *Arceuthobium campylopodum* seeds is unknown. Logically, seeds would be taken from ripe berries still attached to the A. campylopodum specimen (if time permits) or branches surrounding *A. campylopodum* specimen's growing location.
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Seeds (Baskin)
Propagation Method (Options: Seed or Vegetative):	Seed (Baskin)
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.)	Propagules (seeds, cuttings, poles, etc.)
Stock Type:	No information found for *Arceuthobium campylopodum* stock type.
Time to Grow (from seeding until plants are ready to be outplanted):	No information found for *Arceuthobium campylopodum* outplanting. *A. campylopodum* is generally removed rather than propagated.
Target Specifications (size or characteristics of target plants to be produced):	No information found for *Arceuthobium campylopodum* target specifications. *A. campylopodum* is generally removed rather than propagated.
Propagule Collection (how, when, etc):	Speculatively, one could collect seeds in late autumn by picking ripened fruits or searching for seeds on branches/needles in close proximity to *Arceuthobium campylopodum* infestations.
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	No information found for *Arceuthobium campylopodum* propagule characteristics.
Pre-Planting Propagule Treatments (cleaning, dormancy treatments,	Cold stratification is required to break physiological dormancy within *Arceuthobium campylopodum* seeds. In trials, seeds "incubated at 13.3^{o}C required 60 days to reach 64% germination"

etc):	(Baskin). In other trials, "seeds stored dry at 1.5°C for 240 days germinated to about 53 and 56% after… 16 days of incubation at 17 and 19°C, respectively" (Baskin). Seeds have a moisture content averaging about 35%. (Baskin)
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Growth of *Arceuthobium campylopodum* is most probable on trees older than 10 years and/or at least 5 to 10 feet tall. (Halloin)
Establishment Phase (from seeding to germination):	No information found for *Arceuthobium campylopodum* establishment phase.
Length of Establishment Phase:	No information found for *Arceuthobium campylopodum* length of establishment phase.
Active Growth Phase (from germination until plants are no longer actively growing):	No information found for *Arceuthobium campylopodum* active growth phase.
Length of Active Growth Phase:	No information found for *Arceuthobium campylopodum* 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):	No information found for *Arceuthobium campylopodum* hardening phase.
Length of Hardening Phase:	No information found for *Arceuthobium campylopodum* length of hardening phase.
Harvesting, Storage and Shipping (of seedlings):	No information found for *Arceuthobium campylopodum* harvesting, storage, and shipping (of seedlings).
Length of Storage (of seedlings, between nursery and outplanting):	No information found for *Arceuthobium campylopodum* length of storage (of seedlings).
Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter growth, elapsed time before flowering):	No information found for *Arceuthobium campylopodum* guidelines for outplanting/performance on typical sites, besides speculations that can be made by their existence as a parasitic species living off of the new growth (in general) of upper conifer branches. (Halloin) (Pojar)
Other Comments (including collection restrictions or guidelines, if available):	Propagation of *Arceuthobium campylopodum* by human interference is very unlikely as it is currently a common pest in forest management. Nonetheless, *A. campylopodum* is a native species that may have an unknown niche in its ecosystems, potentially allowing it to contain some future use.
INFORMATION SOURCES	
References (full citations):	Baskin, Carol C., and Jerry M. Baskin. *Seeds: Ecology,*

	Biogeography, and Evolution of Dormancy and Germination. San Diego, CA: Academic, 1998. Print. Charters, Michael L. "Southern California Wildflowers." *Wildflowers and Other Plants of Southern California*. Web. 17 Apr. 2012. <http://www.calflora.net/bloomingplants/index.html>. Halloin, Louis. "Dwarf Mistletoe Biology and Management in Southeast Region." *Department of Natural Resources, Washington*. Feb. 2003. Web. 17 Apr. 2012. <www.dnr.wa.gov/Publications/rp_fh_wadnrdwarfmistletoe.pdf>. Hunn, Eugene S., and James Selam. "P. 351." *Nch'i-wa%u0301na, "the Big River": Mid-Columbia Indians and Their Land*. Seattle: University of Washington, 1990. 351. Print. Jerome CA, Ford BA. "The Discovery of Three Genetic Races of the Dwarf Mistletoe Arceuthobium Americanum (Viscaceae) Provides Insight into the Evolution of Parasitic Angiosperms." *National Center for Biotechnology Information*. U.S. National Library of Medicine. Web. 17 Apr. 2012. <http://www.ncbi.nlm.nih.gov/pubmed/11918778>. Koski, R. D., W. R. Jacobi, and C. E. Swift. "Mistletoes in Colorado Conifers." *Colorado State University Extension*. Web. 17 Apr. 2012. <http://www.ext.colostate.edu/pubs/garden/02925.html>. Parish, Roberta, R. ,. Coupe, Dennis Lloyd, and Joe Antos. *Plants of Southern Interior British Columbia*. Vancouver, BC: Lone Pine, 1996. Print. Pojar, Jim, A. MacKinnon, and Paul B. Alaback. *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia & Alaska*. Redmond, WA: Lone Pine Pub., 1994. Print. "Sierra Nevada Lodgepole Forest Community Species List." *Native Seed Network*. Web. 17 Apr. 2012. "USDA Plants Database." *USDA Plants Database*. Web. 17 Apr. 2012. <http://plants.usda.gov/java/>.
Other Sources Consulted (but that contained no pertinent information) (full citations):	N/A

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