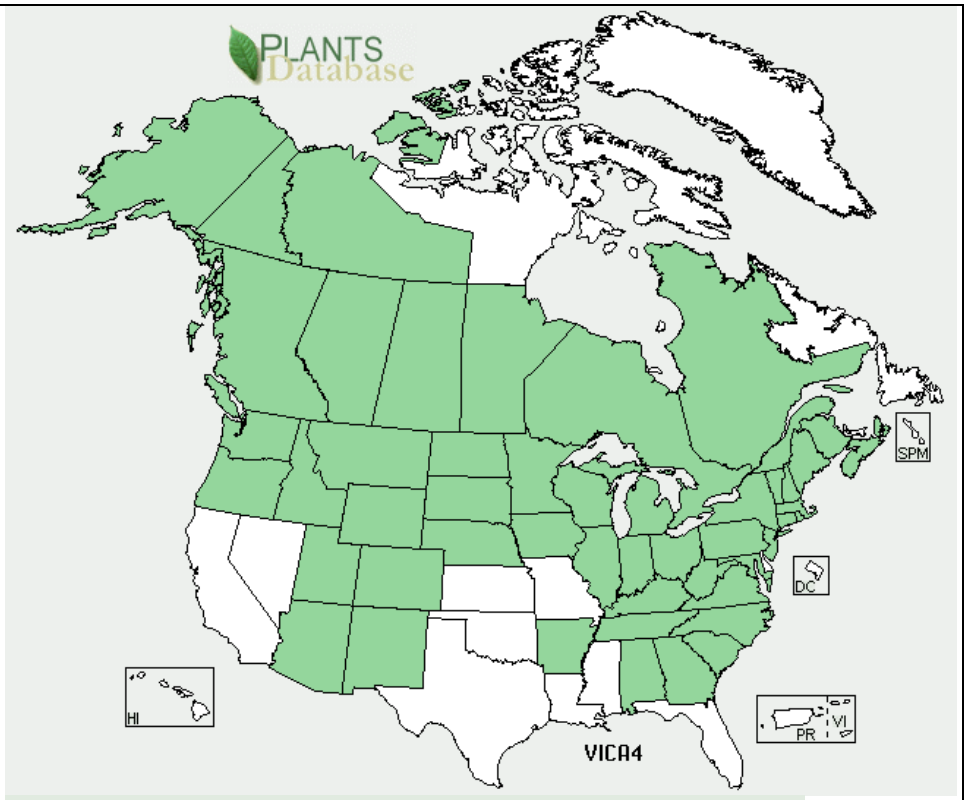
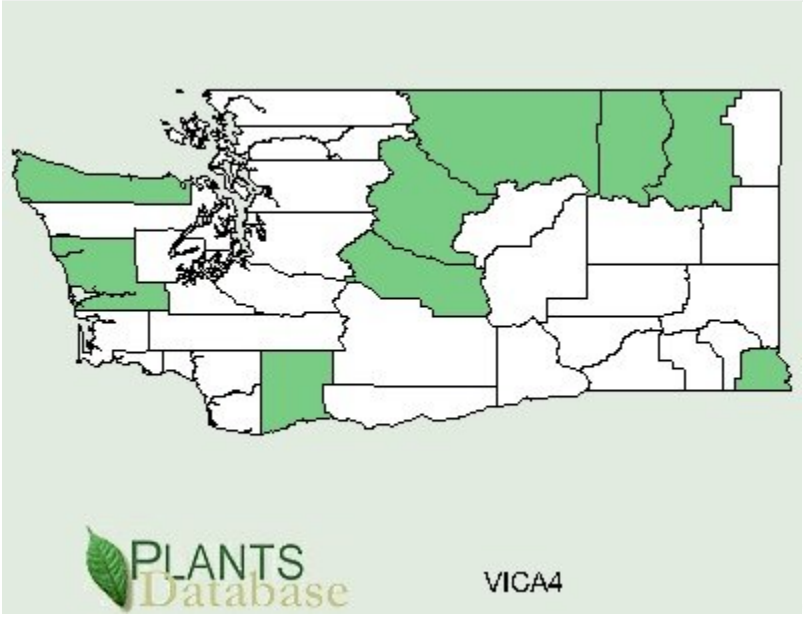
Plant Propagation Protocol for *Viola canadensis*
ESRM 412 – Native Plant Production

TAXONOMY	
Family Names	
Family Scientific Name:	Violaceae
Family Common Name:	Violet
Scientific Names	
Genus:	Viola
Species:	Canadendis
Species Authority:	L.
Variety:	*Viola canadensis* L. var. *canadensis* *Viola canadensis* L. var. *rugulos* (Greene) C.L. Hitchcock *Viola canadensis* L. var. *scariosa* Porter ex Britton *Viola canadensis* L. var. *scopulorum* A. Gray (1,8)
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	Greene, C.L Hitchcock, Porter ex Britton, A. Gray (1)
Common Synonym(s) (include full scientific names (e.g., *Elymus glaucus* Buckley), including variety or subspecies information)	*Viola canadensis* L. var. *corymbosa* Nutt. ex Torr. & A. Gray Now known as *Viola canadensis* L. var. *canadensis* *Viola canadensis* L. ssp. *rydbergii* (Greene) House Now known as *Viola canadensis* L. var. *rugulosa* (Greene) C.L. Hitchc. (1)
Common Name(s):	Canadian White Violet Tall White Violet Canada Violet (1)
Species Code (as per USDA Plants database):	VICA4 (1)
GENERAL INFORMATION	

Geographical range (distribution maps for North America and Washington state)	  (1)
Ecological distribution (ecosystems it occurs in, etc):	Usually occurs in moist to dry woodlands that are mixed (conifer and deciduous) to deciduous forests or in floodplains and clearings. (2)
Climate and elevation range	Occurs at low to mid elevations (2)
Local habitat and abundance; may	Usually found in full to partial shade in neutral to acidic soil. (2,6)

include commonly associated species	
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	Spreads asexually through rhizomes and stolens. Along with the rest of the violet family, each plants uses one of its flowers to assure pollination by inhibiting blooming and letting it self-pollinate. This can become weedy in gardens, although not in natural settings. (2)
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)	This perennial forb/herb often grows 40 cm tall. It has leafy stems. The leaves look like typical violet leaves (heart shaped) but are sharply pointed at the tip. The bilateral flowers are white with purple lines on the lower petal. (1,2,8)
PROPAGATION DETAILS	
Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):	Most of these methods were tested in the Hiwatha National Forest. (6,7)
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Plants (6)
Propagation Method (Options: Seed or Vegetative):	Seed (6) Vegetative – Little information was found on this, but I imagine by cutting the stolen, individual plants can be transplanted (9,10)
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Container plugs (6)
Stock Type:	
Time to Grow (from seeding until plants are ready to be	Once mature and season allows. (6,7)

outplanted):	
Target Specifications (size or characteristics of target plants to be produced):	
Propagule Collection (how, when, etc):	Seeds should be collected when seeds are mature, in August to October. They are in capsules which explode, making collection difficult. (6)
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	Seeds last up to 3 years after stratification in cold environment. (6)
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	Dry storage for 6 months kills all seeds. Outdoor treatment from March to April gives 12% germination. Treatments with different combinations of 3 months at 40 degrees and 3 months 70 degrees results in decreased germination rates. Other *Viola* species respond well to being treated with gibberellic acid-3. Commercial varieties of violets are not pretreated. (3,4) Propagation in the Hiawatha National forest dried the seeds for 1-2 weeks in paper bags or zip lock containers. They should be shaken to decrease opportunity for fungus to establish. These researchers found that a minimum cold-moist stratification of 3 months aids in germination. During stratification, seeds should be mixed with perlite or vermiculite. Seeds can thereafter be stored for up to 3 years in cold environment. (6)
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Grown in greenhouse, with good ventilation during the hot summer months. Seeds were grown 2 per cell, in cells that were 2 inch diameter by 4 inch deep. Seeds are sown year round because of low germination rates. Media used was Scotts' redi-earth Plug and seedling mix, which is sterile and contains vermiculite and sphagnum peat moss. (6) Other sources claim that plants can be sown in flats in a cold-frame in Autumn, and be ready for out planting the next spring. They need to be kept moist and should be separated into pots when they are mature enough. (9)
Establishment Phase (from seeding to germination):	Soil is kept damp during germination, using mist or light hose. No artificial light was used, although kept at warmest part of greenhouse. (6)
Length of Establishment Phase:	

Active Growth Phase (from germination until plants are no longer actively growing):	Trays do not need to be kept moist during active growth and should be moved to cooler areas in the greenhouse. No fertilization is needed. (6)
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):	In late spring, hardening can begin. Flats can be placed in cold-frames and be kept there until danger of frost has past, then they can be moved outdoors. (6)
Length of Hardening Phase:	Until outplanting. (6)
Harvesting, Storage and Shipping (of seedlings):	Plants can be outplanted as soon as they are mature. If they are not going to be planted between May and October, they should be stored until the next summer season. (6)
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):	These plants are found to transplant very well. (2)
Other Comments (including collection restrictions or guidelines, if available):	Lengths of phases were not included in protocol because they can be propagated at any time of the year as long as they are mature when they are outplanted. The problem with this plant is that there is such low germination rate that propagators will want to sow more seeds into containers already filled with soil. Seeds should be started, and then once germination stops, new seeds should be sown into empty cells. (6)
INFORMATION SOURCES	
References (full citations):	1. USDA Plants database. <plants.usda.gov> 2. Pojar, J., McKinnon, A. Eds. Plants of the Pacific Northwest

	Coast: Washington, Oregon, British Columbia and Alaska. British Columbia: Lone Pine Press, 1994 3. Young & Young. Seeds of Wildland Plants; Collecting, Processing and Germinating. Portland: Timber Press, 1986. 4. Seed Germination Theory and Practice. 2nd ed, Deno, Norman, Penn State University, 1993. 5. Second Supplement to Seed Germination Theory and Practice, Deno, Norman, Penn State University, 1998. 6. Schultz, Jan; Beyer, Patty; Williams, Julie. 2002. Propagation protocol for production of container *Viola canadensis* L. plants; USDA FS - Hiawatha National Forest, Marquette, Michigan. 7. Native Plant Journal <nativeplantjournal.org> 8. Hitchcock, C. Leo and Cronquist, Arthur. Flora of the Pacific Northwest. 1998. University of Washington Press. Seattle and London. 9. Plants For A Future <www.pfaf.org> 10. University of Texas at Austin <wildflower.org>
Other Sources Consulted (but that contained no pertinent information) (full citations):	Potast, Laura L., Aubry, Carol A. Nature Plant Notebook; 2nd ed. Mt. Baker-Snoqualmie National Forest, North Cascade Institute, 1997. Klinka, K., Krajina, V., Ceska, A., Scagel, A. Indicator Plants of Coastal British Columbia. Vancouver: University of British Columbia, 1989. First Supplement to Seed Germination Theory and Practice, Deno, Norman, Penn State University, 1996. Seeds: Ecology, Biogeography, and Evolution of Dormancy and Germination, Baskin and Baskin, Academic Press, 1998. National Seed Laboratory <www.fs.fed.us>
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