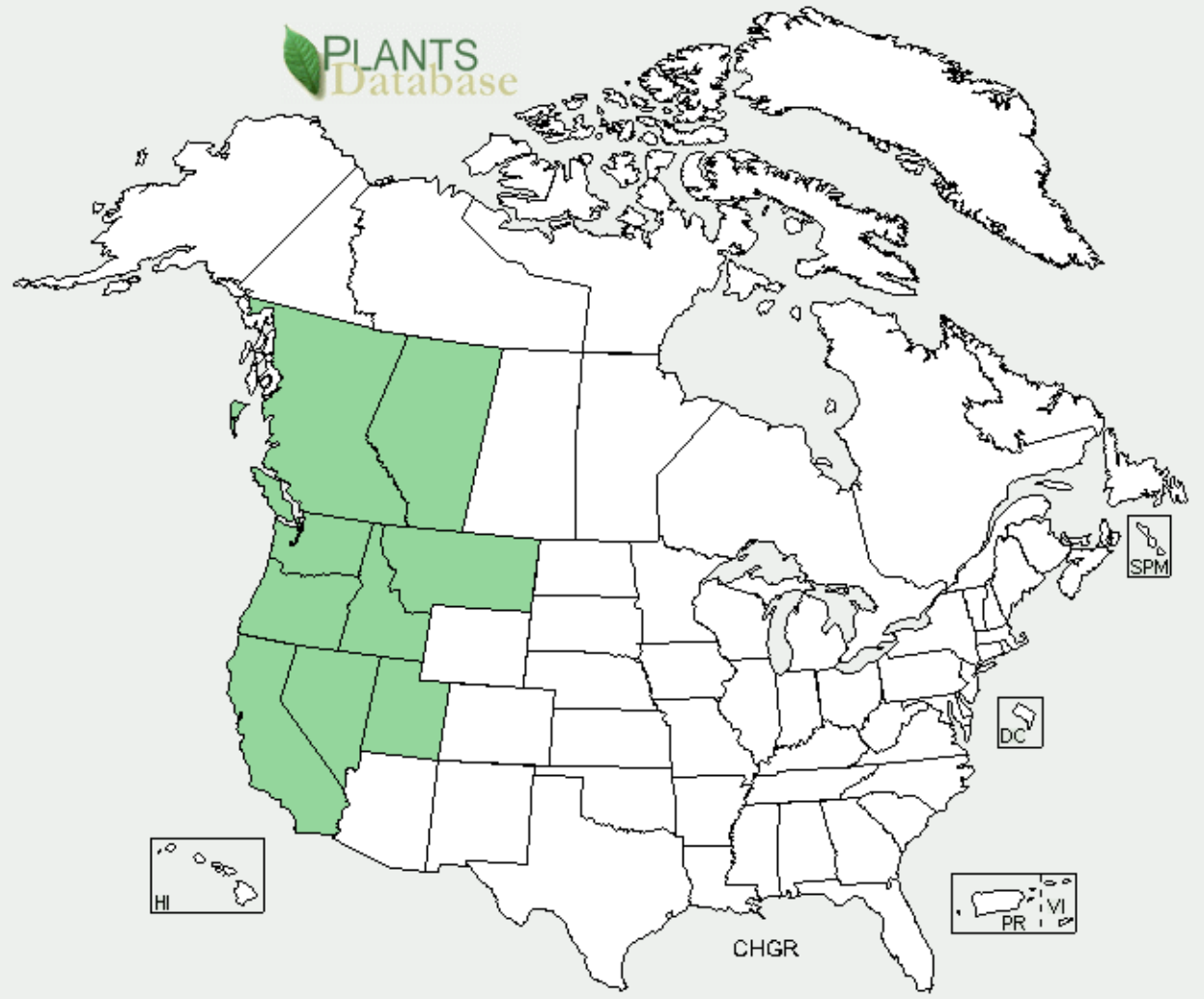
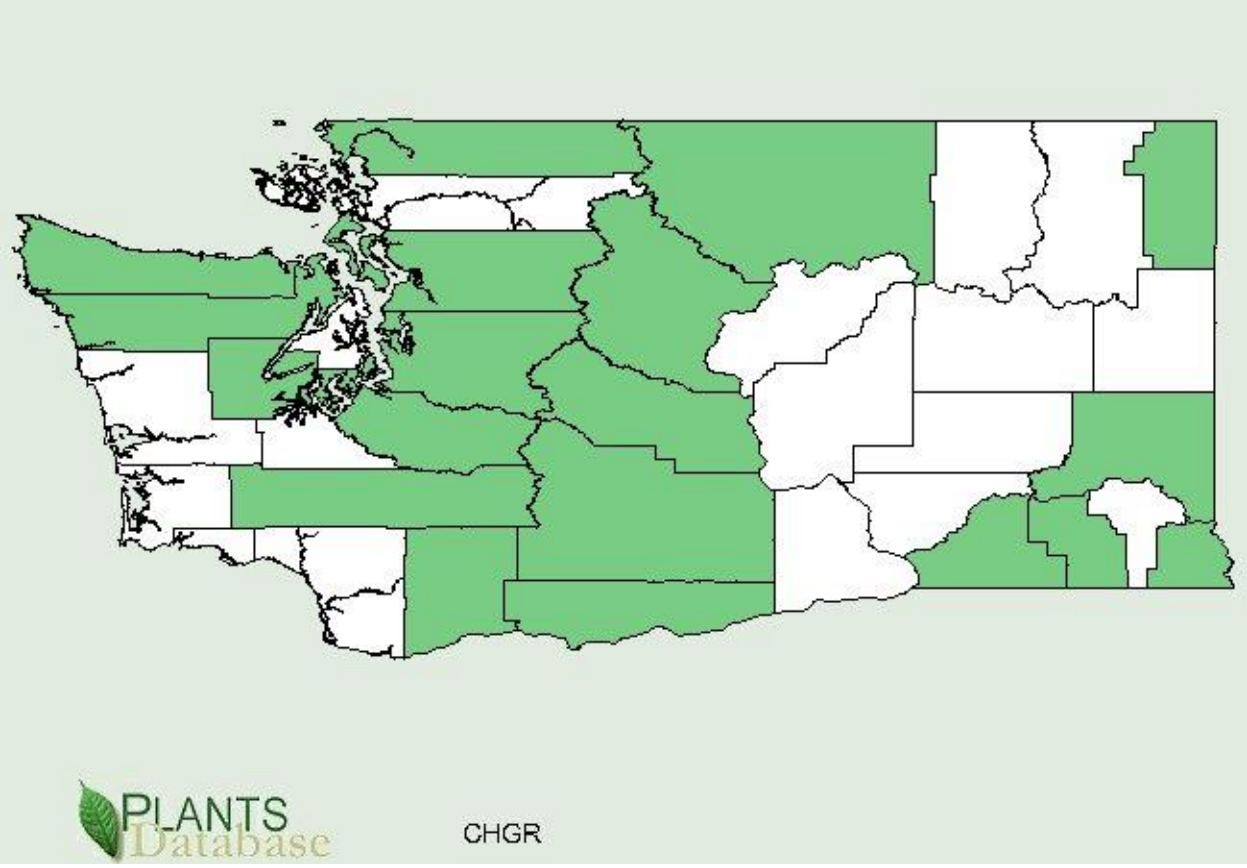
Plant Propagation Protocol for *Cheilanthes gracillima*
ESRM 412 – Native Plant Production
Protocol URL: https://courses.washington.edu/esrm412/protocols/CHGR.pdf

TAXONOMY	
Plant Family	
Scientific Name	Pteridaceae
Common Name	Maidenhair Fern family
Species Scientific Name	
Scientific Name	*Cheilanthes gracillima* D.C. Eaton
Varieties	None listed in USDA plants database at time of writing
Sub-species	None listed in USDA plants database at time of writing
Cultivar	
Common Synonym(s)	*Myriopteris gracillima* (D.C. Eaton) J. Smith
Common Name(s)	Lace lipfern
Species Code (as per USDA Plants database)	CHGR
GENERAL INFORMATION	



Above: Known *C. gracillima* distribution in the continental United States.



Distribution in Washington State. Maps from USDA Plant Database, 4/22/2014.

Ecological distribution:	*C. gracillima* is found in rocky, mountainous ecosystems of the western United States.
Climate and elevation range:	Drought and temperature (to -25 C) tolerant, found most often between 5000-7000 feet, occasionally as low as 1500 feet.
Local habitat and abundance:	Frequently located in clefts or creases of rock where small amounts of organic matter accumulate. It is relatively abundant due to its ability to survive in harsh conditions.
Plant strategy type / successional stage:	Can tolerate extreme drought and survive a wide range of temperatures. Is able to propagate with limited moisture restricted to a few months of the year.
Plant characteristics:	Fern with fronds approximately 25 cm x 8 cm with 2-pinnate, oblong-lanceolate blades. Wooly with dense hair below, sparse above. Linear sori.
PROPAGATION DETAILS	
Ecotype:	This protocol does not address a specific experiment and is based on a synthesis of information from a number of sources. However most *C. gracillima* is found in rocky,

	high elevation ecotypes.
Propagation Goal:	Viable plants.
Propagation Method:	Sporangia.
Product Type:	Container.
Time to Grow:	Gametophytes (prothallia) first appear in 3-4 weeks and should be visible as a green fuzz. The first fronds (sporophytes) should appear 6-12 weeks later.
Target Specifications:	Fully developed fronds indicate that the plant is mature and ready to be planted.
Propagule Collection Instructions:	Wild *C. gracillima* sporulate in summer-fall. The ripe sporangia should have a firm or slightly fuzzy appearance. Collect and dry. A very small quantity of sporangia will suffice to grow a large number of plants.
Propagule Processing/Propagule Characteristics:	If dried, the *C. gracillima* spores will remain viable indefinitely until moistened again. Studies have indicated a very high percentage of viability after several years when stored dry.
Pre-Planting Propagule Treatments:	To store the sporangia, dry completely and store in a sealed container at steady temperature. To re-activate, simply moisten 2-3 days before planting. Moistening the dried frond repeatedly (up to 4 times) by soaking in water then placing on a filter paper and drying may help to empty all the sporangia.
Growing Area Preparation / Annual Practices for Perennial Crops:	Moisten a dense, peaty soil, possibly covering with glass or clear plastic to keep water from evaporating. Temperature should be cool to moderate and light relatively low for germination into early establishment phase.
Establishment Phase Details:	Spores should be sown on moistened prepared soil. The prothallia will appear as green fuzz (depending on the density).
Length of Establishment Phase	3-4 weeks.
Active Growth Phase:	When the gametophytes are approximately 1/8" across, mist with non-chlorinated water to enable fertilization.
Length of Active Growth Phase:	The first fronds (sporophytes) should appear within 12 weeks of fertilization.
Hardening Phase:	In nature, the fronds would be exposed to a fall and winter that is generally wetter and colder than the rest of the year. The plant is tolerant of drought throughout the summer but depends on moisture in the winter and spring. To harden the plant, these conditions should be replicated as much as is seasonably possible.
Length of Hardening Phase	Ideally, these conditions would be replicated for 4 months prior to planting in the spring.
Harvesting, Storage and Shipping:	The seedlings should be planted before the dry season. Storage and shipping may be possible but there is little information available at the time of writing.

Guidelines for Outplanting / Performance on Typical Sites:	Planting in the early spring would be ideal. In nature, the plant produces new fronds in the spring and summer, then remains inactive until early autumn rains, when it releases the spores.
Other Comments:	One source noted that *C. gracillima* protothallia is extremely sensitive to changes in light intensity.
INFORMATION SOURCES	
References:	Specific information about *C. gracillima* obtained from: 1. *An Ecological Study of Cheilanthes gracillima*, Bulletin of the Torrey Botanical Club, Vol 50, No. 10, (Oct., 1923). 2. USDA Plant List: http://plants.usda.gov/core/profile?symbol=CHGR 3. The Hardy Fern Library: http://hardyfernlibrary.com/ferns/listSpecies.cfm?Auto=175 4. Bailey. L, 1914. The Standard Cyclopedia of Horticulture. Pp 734-735. 5. Brickell, Christopher. The American Horticultural Society Encyclopedia of Plants and Flowers. 6. Hogan, Sean, 2003. A Gardener's Encyclopedia.
Other Sources Consulted:	For general information on ferns and fern propagation: Biology of Plants, Peter H. Raven et al, 5th ed., 1992. *The Cultivation and Propagation of British Ferns*, J. W. Dyce, The British Pteridological Society, 1991.
Protocol Author	Alex Greene
Date Protocol Created or Updated	4/22/2014. Updated 6/9/2014.

*** ALL FOLLOWING PAGES ARE THE PREVIOUS PROTOCOL, FROM 2006***

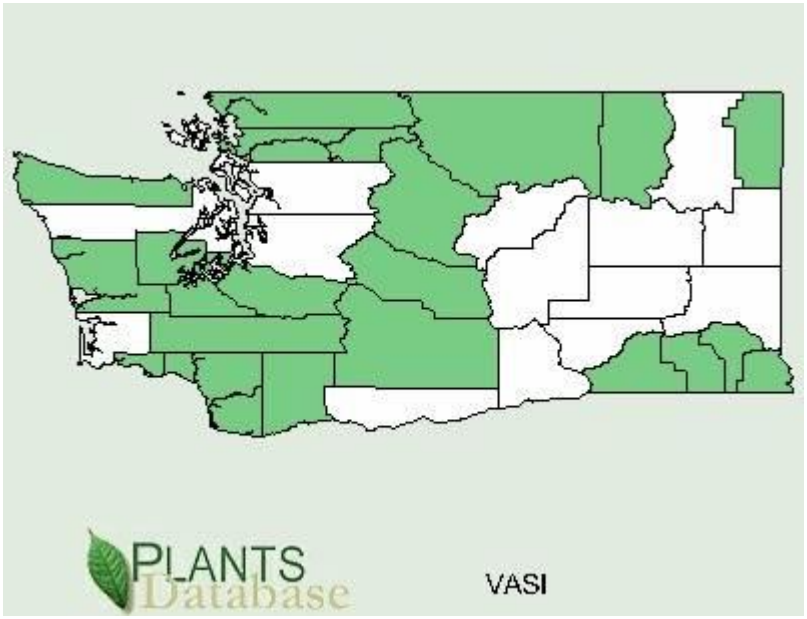
Plant Data Sheet

Species : ***Cheilanthes gracillima*, Lace Lip Fern**

Range:

Climate, elevation: Hardy to -25°C, USDA Zone 5.

Local occurrence: Counties of Washington State



Habitat preferences: Cliffs and rocky slopes, usually on igneous substrates: In drier areas in cliff crevices

Plant strategy type/successional stage: growth stage forb/herb

Associated species: Closest to *C. tomentosa*, but less divided and sparsely hairy on the upper blade surface.

May be collected as: After ripening and releasing their spores, the sporangia look fuzzy and slightly pale. Ripe sporangia have the most intense color and look firm or very slightly fuzzy. Place a portion of the fern frond having ripe sporangia in a loosely closed white paper mailing envelope and let dry at room temperature for about 2 days. Sporangia is brown to black or gray. Spores are viable for a year or more. Their viability can be extended by keeping the spores in the refrigerator (about 40ºF).

Collection restrictions or guidelines: Sporulating summer--fall

Seed germination: Sow into prepared soil. Gametophytes (prothallia) first appear usually in 2 to 4 weeks.

Seed life:short life, need to be sowed within a few days of gathering

Recommended seed storage conditions: refrigerate 40 degrees F

Propagation recommendations : Separate spores from chaff by putting the shed mixture on a paper square and tapping while tilting the paper; the spores stay behind while the chaff bounces forward. Better separation by sifting the mixture through a fine stainless steel mesh (40um openings). Use the spatula or brush to pick up or brush off spores into sowing container. Sow thinly so that crowding does not require transplanting (drop from about 2 inches a volume of spores equivalent to approximately 1/64th of an inch cubed). Be sure not to open the sowing container for more than a few seconds. Need to sow in closed container.

Soil or medium requirements: use a 50-50 mixture, by dry uncompressed volume, of Canadian peat moss (sometimes sieved through 1/8th inch screen) and washed sand having 1/16th inch grain size. Crushed perlite of the same size can be substituted for sand. Perlite has some advantages: it holds water, it reflects light, it might have less contaminants than sand and it usually crushes instead of denting or scratching.

Installation form: Plant fronds when viable

Recommended planting density: not available

Care requirements after installed: If the sowing container is sealed, no watering is necessary.. If watering is necessary, mist with distilled water; or if growth is yellow, add 1/4 strength nitrogen rich fertilizer. Gametophytes (prothallia) first appear usually in 2 to 4 weeks. The first fronds (sporophytes) appear about 6 to 12 weeks later (up to a year later for some species). Since fern fertilization requires

liquid water, Mist with distilled water when the gametophytes are about 1/8th inch across.

Normal rate of growth or spread; lifespan: not available

Sources cited:

1. Flora of North America http://www.efloras.org/flora_page.aspx?flora_id=1

2. Hardy Fern Library

http://www.hardyfernlibrary.com/ferns/listSpecies.cfm?Auto=175

3. USDA: http://plants.usda.gov/java/profile?symbol=CHGR

4. "Raising Ferns from Spores", Brian Aikins, brian@greatnorthern.net: **source of most of the propagation information, since no specific information seems to be available for this plant*

Prepared by : Maura Shelton May 25,2006