Plant Propagation Protocol for *Woodsia alpina*

ESRM 412 – Native Plant Production

URL: https://courses.washington.edu/esrm412/protocols/*2024/WOAL.pdf*

[7] Woodsia alpina (Michael D. Lee, MMDNR)

TAXONOMY	
Plant Family	
Scientific Name	Dryopteridaceae Herter [1]

Common Name	Wood fern family [1]
Species Scientific Name	
Scientific Name	Woodsia alpina (Bolton) Gray [1]
Varieties	No recognized varieties
Sub-species	No recognized sub-species
Cultivar	No recognized cultivar
Common Synonym(s)	Woodsia alpina var. bellii, Woodsia glabella var. bellii [2]
Common Name(s)	Alpine woodsia [1]
Species Code (as per USDA Plants database)	WOAL [1]
GENERAL INFORMATION	
Geographical range	Can be found in Alaska, Maine, Michigan, New York, Vermont, and in most of Canada [2].

	 [7] Distribution map of Woodsia alpina (MMDNR)
Ecological distribution	Woodsia alpina can be found on cliffs, balds, ledges, or ridges [4]. It also prefers the moist environments of ledges and partially shaded cliffs [7].
Climate and elevation range	Prefers a temperate biome [9] and has an elevation range of 1671 and 1718 m [10]
Local habitat and abundance	Woodsia alpina can be found on rock cliffs, crevices, talus, and rocky, boreal woods. It will be in area with sun to partial shade and is usually in alkaline rock formations. But it can also sometimes be found in igneous outcrops [8].
Plant strategy type /	Information not found

successional stage	
Plant characteristics	Woodsia alpina is a perennial fern that has a growth habit of forb/herb [1]. Woodsia alpina is a small fern around 20cm that has a blade lanceolate with lobed, untoothed pinnae. It has a rachis with scattered hairs and scales and the spores are born in amoeba-like clusters that have hair-like protrusions surrounding it on the pinnae underside [8].
PROPAGATION DETAILS: FROM SEED	
Ecotype	Some of the ecotypes for this propagation include Cedar/Devil's Club habitat, understory species in Glacier National and Flathead CO, MT [5]. (Using information from American alpine ladyfern)
Propagation Goal	Plants [5]
Propagation Method	Seed [5]
Product Type	Container (plug) [5]
Stock Type	800 ml container [5]
Time to Grow	1 year [5]
Target Specifications	Stock type should be in a container sporophyte, height around 30cm with mature fronds and fully developed rhizomatous root mass in the containers [5]
Propagule Collection Instructions	Ferns call for spore processing. It is important to collect fronds when the spores are tan in color. These fronds will be collected around late August and upon being collected will be taken to a room for immediate drying [5]
Propagule Processing/Prop	In a room with no air movement to prevent unnecessary spore movement, the fronds are placed surface down on butcher paper. After several days of drying the spores will be a fine dust on the paper [5]

agule Characteristics	
Pre-Planting Propagule Treatments	The spores should be collected, and surface sown in sterilized flats that have a sterile finely milled sphagnum peat moss. After watering spores with distilled water, the flats will be sealed to seal in moisture and prevent any contamination with a clear plastic wrap. For 12 hours a day the flats should sit under 60watt soft incandescent lights. After 15 days the spores should be germinated, and the germ filaments should be able to be seen with a microscope which will help to show them appearing as fine green threads on the medium surface. As the prothalli are forming it is important to maintain a constant temperature around 20-25C. Promix #1 medium should be used for the growing medium in 4.5" pots and 1-gallon containers that the sporophytes will be transplanted into [5]
Growing Area Preparation / Annual Practices for Perennial Crops	For 2 to 3 months the plants will grow in the sealed flats and then will continue their growth under greenhouse condition in temperatures of 20-25C for another 2-3 months. After that, they will be grown outdoors in a shade house for around 6 months [5]
Establishment Phase Details	After 10 to 15 days the spores will germinate and the prothalli will then continue to grow for 6 to 8 weeks. It is important that during this stage there is a thin layer of distilled water over the surface of the prothalli. Sterile conditions must also be maintained. In order to prevent any contamination, trays will be inspected for any possibilities of fungal contamination regularly. If any contamination is found then the infected portion must be removed and the trays will then be treated with highly diluted fungicide drench. This treatment should only be applied if the prothalli are well developed. After treatment the flats should be resealed and continue to water with only distilled water. Plastic may be removed upon the appearance of sporophytes [5].
Length of Establishment Phase	2 to 3 months [5]

Active Growth Phase	After 3 months of spore germination, sporophytes will start to appear. Once the plants are around 2 inches tall they can be transplanted from the flats into pots. They will establish in the greenhouse and after the establishment period will then be moved to an outdoor shade house in the late spring. At this time there will be a 13-13-13 Osmocote fertilizer applied to the plants as well as a Micromax micronutrients [5].
Length of Active Growth Phase	7 months [7]
Hardening Phase	During the hardening phase, the plants will be fertilized with 10-20-20 liquid NPK at 200 ppm. This will happen during August through September. Then, before winterization, the plants will get one last irrigation [5]
Length of Hardening Phase	2 months [5]
Harvesting, Storage and Shipping	After a year from the spores production the plants will be harvested. This will occur in September and once they are harvested, they will be stored over winter in an outdoor shade house that has a foam and snow insulation [5]
Length of Storage	5 months [5]
Guidelines for Outplanting / Performance on Typical Sites	Information not found
Other Comments	Propagation information for Woodsia alpina specifically could not be found, so it was supplemented with information from a protocol on American alpine ladyfern.
INFORMATION SOURCES	

References	[1] *USDA Plants Database*. (n.d.-b). https://plants.usda.gov/home/plantProfile?symbol=WOAL [2] *Lady Bird Johnson Wildflower Center - the University of Texas at Austin*. (n.d.-c). https://www.wildflower.org/plants/result.php?id_plant=WOAL [3] Woodsia alpina (Alpine Woodsia): Minnesota Wildflowers. (n.d.). https://minnesotawildflowers.info/fern/alpine-woodsia [4] *Woodsia alpina (northern cliff fern): Go Botany*. (n.d.). https://gobotany.nativeplanttrust.org/species/woodsia/alpina/ [5] *Dryopteridaceae (Athyrium) — reforestation, nurseries and genetics resources*. (n.d.). https://npn.rngr.net/npn/propagation/protocols/dryopteridaceae-athyrium-83/?searchterm=wood%20fern [6] Uwpress. (n.d.). https://npj.uwpress.org/content/wpnpj/5/1/5.full.pdf [7] *Woodsia Alpina : Alpine Woodsia: Rare species guide*. Minnesota Department of Natural Resources. (2023, September 20). https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PPDRY0U010 [8] *Woodsia alpina (Northern woodsia) - Michigan Natural Features Inventory*. (n.d.). https://mnfi.anr.msu.edu/species/description/15908/Woodsia-alpina [9] *Woodsia alpina (Bolton) Gray | Plants of the World Online | Kew Science*. (n.d.). Plants of the World Online. https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:17234640-1#:~:text=The%20native%20range%20of%20this,primarily%20in%20the%20temperate%20biome. [10] (PDF) independent evolutionary history between the Balkan Ranges and more northerly mountains in Campanula alpina S.L. (Campanulaceae): Genetic divergence and morphological segregation of taxa. (n.d.-a). https://www.researchgate.net/publication/260266037_Independent_evolutionary_history_between_the_Balkan_ranges_and_more_northerly_mountains_in_Campanula_alpina_sl_Campanulaceae_Genetic_divergence_and_morphological_segregation_of_taxa
Other Sources Consulted	[11] *alpine woodsia (Woodsia alpina)*. (n.d.). iNaturalist. https://www.inaturalist.org/taxa/170333-Woodsia-alpina
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or Updated	