

Plant Propagation Protocol for *Cystopteris montana*

ESRM 412 – Native Plant Production

URL: <https://courses.washington.edu/esrm412/protocols/2026/CYMO3.pdf>

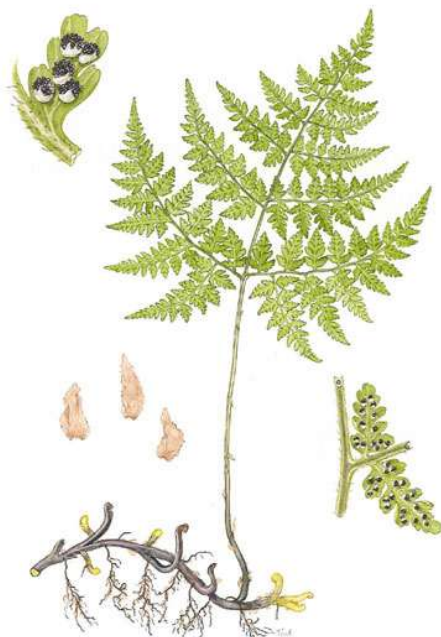
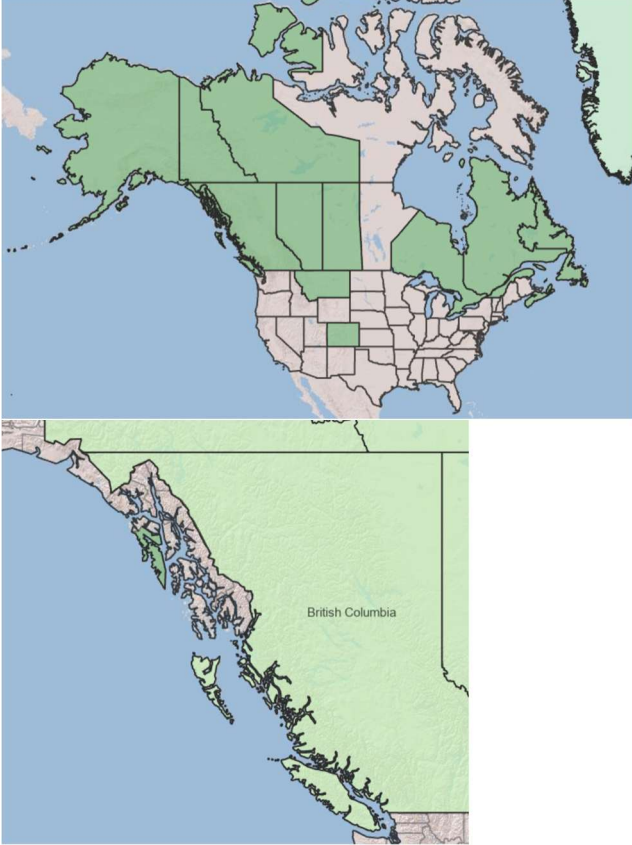


Illustration by Kirsten Tind in *Scandinavian Ferns*^[11]

TAXONOMY	
Plant Family	
Scientific Name	Dryopteridaceae Herter
Common Name	Wood fern
Species Scientific Name	
Scientific Name	<i>Cystopteris montana</i> (Lam.) Bernh. Ex Desv Full name: <i>Cystopteris montana</i> (Lamarck) Bernhardt ex Desvaux, Mém. Soc. Linn. Paris. 6(2,3): 264. 1827 ^[1]
Varieties	None
Sub-species	None
Cultivar	Not cultivated ^[10]
Common Synonym(s)	<i>Filix montana</i> (Lam.) Underw. <i>Polypodium montanum</i> Lamarck, Fl. Franç. (outdated) ^{[1][10]} <i>Athyrium montanum</i> (Lam.) Röhl. ex Spreng. <i>Aspidium montanum</i> i(Lam.) Sw.
Common Name(s)	Mountain Bladderfern
Species Code (as per USDA Plants database)	CYMO3

GENERAL INFORMATION

<p>Geographical range</p>	 <p>Image source: USDA Plants Database^[14] Green indicates <i>Cystopteris montana</i> presence in the United States and Canada. Also present in Greenland and northern Europe/Asia, including Britain, Scandinavia, and Siberia, Russia.^{[4][11]} It is a rare species in the conterminous United States.</p>
<p>Ecological distribution</p>	<p><i>Cystopteris montana</i> prefers shade and moist to wet forest. It is typically found along stream banks and on rocky slopes, and in glades.^{[10][12]}</p>
<p>Climate and elevation range</p>	<p>Elevation range: low to middle elevations.^[12]</p>
<p>Local habitat and abundance</p>	<p>This species is typically found only in its preferred environments. May prefer northern facing slopes.^[2] Most often associates with other ferns and species living in similar conditions, including Brittle Bladder Fern (<i>Cystopteris fragilis</i>) and Northern Oak Fern (<i>Gymnocarpium robertianum</i>).^{[10][11]}</p>
<p>Plant strategy type / successional stage</p>	<p>Understory species requiring shade from upper canopy plants. Intolerant to stress including full sun exposure.^{[1][5]}</p>
<p>Plant characteristics</p>	<p><i>Cystopteris montana</i> is a perennial herbaceous forb/herb.^[14] It has bipinnate, narrowly dissected leaves, and a hood-like indusium covering the sori (clusters of spores). Stems are long.^{[1][5]} Rhizomes are</p>

	long and creeping, ^[12] distinguishing the species from others in its genus.
PROPAGATION DETAILS: FROM SEED	
<p>Note that much of the information in the following sections are from sources focused on related fern species, or ferns in general. There is limited reliable information on <i>Cystopteris montana</i>. Information from sources 1, 2, 5, 12, and 14 is about <i>Cystopteris montana</i> specifically. Sources 3, and 11 include information on this species as well as similar ferns. Information from remaining sources is for closely related species.</p>	
Ecotype	N/A
Propagation Goal	Plants
Propagation Method	Seed (spores)
Product Type	Container (plug)
Stock Type	
Time to Grow	Due to the limited information regarding propagation of this species from spores, it is unclear exactly how long the process will take. Based on information from other, similar species, it could take around 12-18 months. ^{[5][6][7][9]}
Target Specifications	Plants that are 25% of full size, or large enough to be sturdy with multiple fronds and well-developed roots. ^{[4][7][9]}
Propagule Collection Instructions	<p>Spores are typically released in winter and early spring.^[5]</p> <p>There are multiple ways to collect spores from ferns:</p> <p>Method 1. Harvest fronds just before spore maturation, place between sheets of paper and let frond dry out. Paper will collect spores when released, which can continue for multiple days. Ensure that fronds are in a location without drafts or breezes.^[5]</p> <p>Method 2. Secure a clear plastic bag around a frond (still attached to the live plant) before spores are released naturally. Shake frond and bag to collect spores.^[4]</p>
Propagule Processing/Propagule Characteristics	Seed density is not a standard measurement for ferns, since they produce spores. Spores can remain viable for a several years when stored properly: in a cool, dry, airtight, container. ^[6]
Pre-Planting Propagule Treatments	If <i>Cystopteris montana</i> is growing among other species of fern or mosses and fronds may contain material from these plants, it is possible to clean the fronds to avoid collecting spores from other species before collecting spores from the desired species. Use Method 1 described above to do so. Do so by soaking or swishing harvested fronds in a 5-10% bleach solution briefly, and then rinse with water. Air dry (can be sped up by shaking water off fronds) and then place on papers. Fronds can be cleaned anytime before sowing. ^[9]
Growing Area Preparation / Annual Practices	Use moist, well-drained soil, preferably with a pH between 6.5 and 7. ^[10] Container should have a lid to maintain humidity and prevent contamination from spores from other ferns, fungi, and/or mosses.

for Perennial Crops	Both media and container should be sterilized; media can be sterilized by heating in the oven ^[9] or microwave if commercial sterilization is not available. For a small amount of media, the microwave may be most efficient. Moisten soil, place in a microwave safe container, and heat for about 90 seconds until temperature reaches 90 C° (guidelines are for a 600 watt microwave.) ^[13] Seeds should be grown in a cool greenhouse. ^[10]
Establishment Phase Details	Sow spores by tapping them off of your paper or plastic bag onto the surface of your prepared media. Place containers in indirect sunlight or under fluorescent lights. ^[9] Artificial lighting should be left on for 8-16 hours, or as long as the natural daylight is. ^[7] Temperature should remain between about 13°-23° Celsius but should fluctuate as little as possible (5 or 6 degrees of variation is acceptable). A film forming on the surface of the containers can indicate germination in the gametophyte generation. ^[9]
Length of Establishment Phase	4-14 days for film indicating germination of gametophyte to form. If germination is successful, plants will become visible and a solid mat should form in 2-5 months. ^[9]
Active Growth Phase	If containers are too crowded, some plants may be transplanted. Sterilize any instruments used for transplanting in bleach solution. Transplant entire clumps of plants into a small indent and mist with distilled water. When plants develop fronds, uncover containers. Once ferns reach at least 25% of their full size they may be separated. ^[9]
Length of Active Growth Phase	6-12 months ^[9]
Hardening Phase	Gradually introduce plants to the environmental conditions that they will be living in, such as by removing lids and humidity, allowing temperature to fluctuate more, and using natural light. ^{[7][9]}
Length of Hardening Phase	3-6 weeks (estimated by averaging time from various sources) ^{[5][7][9]}
Harvesting, Storage and Shipping	Plugs must be kept moist, so storage is not ideal. ^[1] For transportation, secure soil, place fronds between sheets of plastic or plastic bags to retain moisture, and pack between newspaper or another packing material to prevent frond breakage. ^[5]
Length of Storage	Only a few days without care ^[1]
Guidelines for Outplanting / Performance on Typical Sites	Outplanting should occur in early spring or fall. Seedlings must be planted in a site that matches the conditions preferred by the species (cool, moist but well-draining soil, shaded areas in rocky and/or forested environments). ^[1] Water after outplanting. Optional: protect new seedlings from browsing and trampling until they are established. ^[2]
Other Comments	

PROPAGATION DETAILS: VEGETATIVE	
Ecotype	N/A
Propagation Goal	Plants
Propagation Method	Vegetative: rhizome division
Product Type	Container (plug)
Stock Type	
Time to Grow	As little as 1 month, but likely at least a few months ^{[1][2]}
Target Specifications	Plants that are 25% of full size, or large enough to be sturdy with multiple well developed fronds and well-developed roots. ^[4]
Propagule Collection Instructions	For plants that are in the ground, dig up plant including as many roots as possible. For plants that are in a pot, remove plant from pot first, then separate the plant's rhizomes, ensuring that each part retains roots. ^{[4][5]} Use a knife or sharp pruners to divide plants into parts with rhizomes being at least 5cm long, and with at least one growth bud. ^[8] Untangle roots to ensure that as many roots as possible are preserved. ^[11]
Propagule Processing/Propagule Characteristics	N/A
Pre-Planting Propagule Treatments	Not necessary for rhizome separation.
Growing Area Preparation / Annual Practices for Perennial Crops	Use loamy, well-draining soil. Keep the soil moist. A mixture of peat, perlite and potting soil will be well-draining while also retaining some moisture, which meets the requirements for this step. ^{[4][5]} Plants should be grown in a cool greenhouse or garden environment. ^[10]
Establishment Phase Details	N/A
Length of Establishment Phase	N/A
Active Growth Phase	Pot separated plants. Divided sections will begin to establish new roots once they are planted. ^{[4][6][7]}
Length of Active Growth Phase	3 weeks to 2 months, depending on size and health of divided plants ^{[1][4]}
Hardening Phase	Once plants are established and have multiple sufficient fronds and established roots, they are ready to be out planted. ^[4]
Length of Hardening Phase	Variable, depending on size of divided plants and root systems at the beginning of the process. ^{[1][4]}
Harvesting, Storage and Shipping	Plugs must be kept moist, so storage is not ideal. ^[1] For transportation, secure soil, place fronds between sheets of plastic or plastic bags to

	retain moisture, and pack between newspaper or another packing material to prevent frond breakage. ^[5]
Length of Storage	Only a few days without care ^[1]
Guidelines for Outplanting / Performance on Typical Sites	Outplanting should occur in early spring or fall. Seedlings must be planted in a site that matches the conditions preferred by the species (cool, moist but well-draining soil, shaded areas in rocky and/or forested environments). ^[1] Water after outplanting. Optional: protect new seedlings from browsing and trampling until they are established. ^[2]
Other Comments	Rhizome division is the easier and more common method of propagation for many ferns, since growing ferns from spores can be quite challenging. ^[2] For this species in particular, rhizome division requires care and precision, since the rhizomes can be quite delicate. ^[1,2]
INFORMATION SOURCES	
References	<ol style="list-style-type: none"> 1. <i>Cystopteris montana</i> in <i>Flora of North America @ efloras.org</i>. (2026). Efloras.org. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=200003874 2. <i>Cystopteris montana</i> <i>Mountain Bladder Fern PFAF Plant Database</i>. (2026). Pfaf.org. https://pfaf.org/user/Plant.aspx?LatinName=Cystopteris+montana 3. Desmet, P., & Brouilet, L. (2013). Database of Vascular Plants of Canada (VASCAN): a community contributed taxonomic checklist of all vascular plants of Canada, Saint Pierre and Miquelon, and Greenland. <i>PhytoKeys</i>, 25, 55–67. https://doi.org/10.3897/phytokeys.25.3100 4. Dyce, J. (1991). <i>The Cultivation and Propagation of British Ferns</i>. British Pteridological Society. 5. EarthOne. (2023, June). How to grow <i>Cystopteris montana</i>. EarthOne. https://earthone.io/plant/cystopteris%20montana 6. Holloway, P. (1994). <i>Tips on Collecting, Processing, and Storing Fern Spores</i>. Georgeson Botanical Notes No. 17. https://www.uaf.edu/afes/places/gbg/research/files/pdfs/1994.-Holloway-ferns-ocr.pdf 7. Hoshizaki, B. J. (1975). <i>Fern Growers Manual</i>. Random House Inc. 8. <i>How to grow ferns / RHS Gardening</i>. (n.d.). Wwww.rhs.org.uk. https://www.rhs.org.uk/plants/types/ferns/growing-guide 9. Jones, J. (2016, June 15). <i>How to Grow Ferns from Spores</i>. Brooklyn Botanic Garden. https://www.bbg.org/article/growing_ferns_from_spores

	<p>10. Lellinger, D. (1985). <i>A Field Manual of the Ferns & Fern Allies of the United States & Canada</i> (p. 257). Smithsonian Institution Press.</p> <p>11. Øllgaard, B., & Tind, K. (1993). <i>Scandinavian Ferns</i>. Rhodos.</p> <p>12. Pojar, J., & MacKinnon, A. (1994). <i>Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia & Alaska</i> (p. 426). Lone Pine Publishing.</p> <p>13. <i>Sterilize Your Seed-Starting Soil The Backyard Gardener</i>. (2025, March 31). UC Agriculture and Natural Resources. https://ucanr.edu/blog/backyard-gardener/article/sterilize-your-seed-starting-soil</p> <p>14. <i>USDA Plants Database</i>. (2026). Usda.gov. https://plants.sc.egov.usda.gov/plant-profile/CYMO3</p>
Other Sources Consulted	<p>1. United States Forest Service. (1948). <i>Woody-plant seed manual</i> (U.S. Department of Agriculture Miscellaneous Publication No. 654). U.S. Government Printing Office.</p>
Protocol Author	Elsa Ackerson
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