

Plant Propagation Protocol for *Athyrium Filix-Femina*

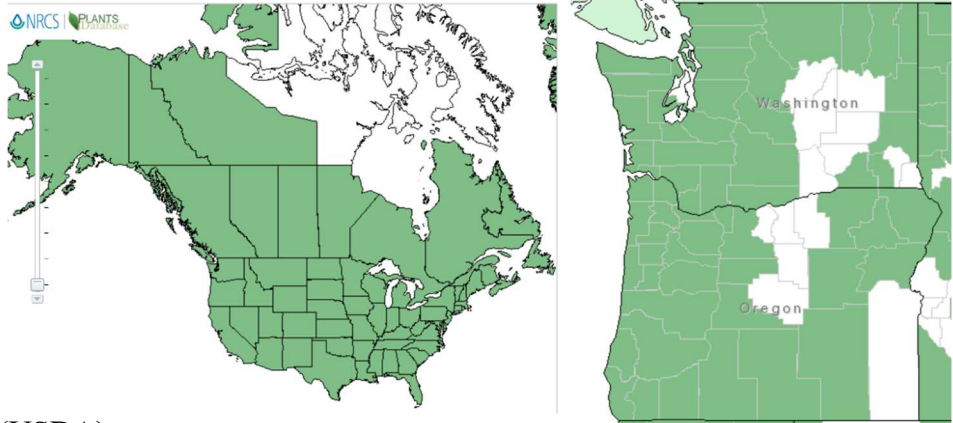
ESRM 412 – Native Plant Production

<http://courses.washington.edu/esrm412/protocols/ATFI.pdf>



TAXONOMY (USDA)	
Plant Family	
Scientific Name	Dryopteridacea
Common Name	Wood Fern Family
Species Scientific Name	
Scientific Name	<i>Athyrium Filix-Femina</i> (L.) Roth
Varieties	
Sub-species	<i>Athyrium filix-femina</i> (L.) Roth ssp. <i>angustum</i> (Willd.) R.T. Clausen <i>Athyrium filix-femina</i> (L.) Roth ssp. <i>asplenioides</i> (Michx.) Hultén <i>Athyrium filix-femina</i> (L.) Roth ssp. <i>cyclosorum</i> (Rupr.) C. Chr.
Cultivar	
Common Synonym(s)	<i>Athyrium filix-femina</i> (L.) Roth var. <i>angustum</i> (Willd.) G. Lawson <i>Athyrium filix-femina</i> (L.) Roth var. <i>michauxii</i> (Spreng.) Farw. <i>Athyrium filix-femina</i> (L.) Roth var. <i>rubellum</i> Gilbert <i>Athyrium filix-femina</i> (L.) Roth var. <i>asplenioides</i> (Michx.) Farw <i>Athyrium filix-femina</i> (L.) Roth var. <i>cyclosorum</i> (Rupr.) Ledeb. <i>Athyrium filix-femina</i> (L.) Roth var. <i>californicum</i> Butters <i>Athyrium filix-femina</i> (L.) Roth var. <i>sitchense</i> (Rupr.) Ledeb
Common Name(s)	Lady Fern, Common ladyfern, Subarctic ladyfern, Asplenium ladyfern, Southern Lady Fern, Tatting Fern
Species Code (as per USDA Plants database)	ATFI

GENERAL INFORMATION

Geographical range	 <p>(USDA).</p>
Ecological distribution	Europe, Asia, and North America in temperate and tropical regions (botany.com). It is a circumboreal species, common in moist forests, meadows, and swamps (Wick et al. 2008).
Climate and elevation range	Occurs along the coast and wet interior regions. Found mostly from lowland to mid-mountain elevation (Wick et al. 2008).
Local habitat and abundance	<i>Athyrium filix-femina</i> is usually found in moist, shady areas with acidic soil. They are common in forested areas and open meadows. Commonly grows in understory of <i>Picea glauca</i> (white spruce) and <i>Picea mariana</i> (black spruce) (Connecticut Botanical Society).
Plant strategy type / successional stage	Some early succession as it colonizes cracks in rocks and crevices between rocks. More commonly grows as a dominant species on perennially wet soil with other herbs. Very strong plant if roots are well protected and have constant water supply. Can tolerate sites that burn infrequently because if aboveground mass is killed by fire, the plant can resprout from surviving rhizomes. More tolerant of dry conditions than other ferns (Rook.org).
Plant characteristics	Forb/herb Large, feathered fronds protruding from a central point and palmately spreading. Kidney shaped sori on underside of leaves (USDA).
SEED PROPAGATION DETAILS (Wick et al. 2008).	
Ecotype	Cedar/Devil's Club habitat, understory species, Glacier National Park, Flathead CO, MT
Propagation Goal	Plants
Propagation Method	Spores
Product Type	Container (plug)
Stock Type	3 L container
Time to Grow	1 year
Target Specifications	Stock Type: Container sporophyte Size: 45 cm, 7 mature fronds Root System: Fully developed root mass that fills containers
Propagule Collection Instructions	Collect the tan spores when they emerge from their covering. Fronds are collected in late August. Spores and/or fertile fronds are collected into paper

	bags or envelopes. One plant produces about 75 million spores (Schneller, 1979).
Propagule Processing/Propagule Characteristics	Lay fronds on butcher paper in a protected area free from strong winds that could disturb them. Spores can be collected after several days of drying. In the field, fronds can simply be shaken to collect spores and allowed to dry later.
Pre-Planting Propagule Treatments	No stratification or treatments are required for spores to germinate.
Growing Area Preparation / Annual Practices for Perennial Crops	Spores should be sprinkled over peat mixture that has been sterilized. They require a covered container that allows light to pass through. The covering will keep moisture in, protect from disturbances, and prevent fungal contamination. They will germinate after 15 days of 12 hour/day illumination. The temperature must remain between 20°C and 25°C.
Establishment Phase Details	Spores germinate 10 to 15 days after sowing and continue to grow for 6 to 8 weeks. The reproductive structures antheridia (male) and archegonia (female) will begin to emerge along the margins and notch of the prothalli but are too small to see with the naked eye. When this happens, keeping the media very moist is critical. The excess water must be monitored for fungi and continued sterile practices. If fungal contamination occurs, it can be removed and treated with diluted fungicide. Once sporophytes appear, the clear plastic can be removed.
Length of Establishment Phase	2 to 3 months
Active Growth Phase	Appearance of sporophytes occurred 3 months after spore germination. Plants should be moved from flats to pots when they reach 2 inches tall. They can be transferred to humidity domes and maintained for approximately 2 months during which they develop many stems and roots. Moisture is maintained by hand watering and misting. After establishment in the greenhouse, they are moved outdoors in late spring. Plants are fertilized bi-weekly with 20-20-20 liquid NPK. Plants are roottight 8 months after germination.
Length of Active Growth Phase	8 months
Hardening Phase	In early fall, plants are fertilized with 10-20-20 liquid NPK at 200 ppm. Water plants before the dormant period.
Length of Hardening Phase	4 weeks
Harvesting, Storage and Shipping	<i>A. filix-femina</i> can be harvested after 1-1.5 years. The best time to do so is from September to March. Allow them to overwinter in outdoor shadehouse under insulation.
Length of Storage	5 months
Guidelines for Outplanting / Performance on Typical Sites	Use spacing of 18-24" in the field. Moderate to fast growth rate, ensure protection from strong wind and keep soil moist during establishment. Nursery grown plant produce spore bearing fronds 2 years after germination.

Other Comments	Plants can be kept in the nursery for up to 2 years. Root mass is extensive and rhizomatous, and quickly fills containers.
VEGETATIVE PROPAGATION DETAILS (Davis et al. 2001), (Hammen, 1990)	
Ecotype	Rhode Island
Propagation Goal	Plants
Propagation Method	Vegetative
Product Type	Container (plug)
Stock Type	1 gallon container plants
Time to Grow	18 months
Target Specifications	Height: 10-12 inches with a well-formed crown, multiple stems and fiddleheads. Root System: root ball is fibrous and firm but does not always fill out container completely.
Propagule Collection Instructions	Rhizomes are a horizontal, below-ground stem. Ferns can vegetative reproduce with these. When new plant has emerged from rhizome, remove new plant from forward growing tip.
Propagule Processing/Propagule	At least one undamaged frond must be attached to daughter plant for photosynthesis and growth. Enough root abundance required for both daughter and parent plant. In winter, ensure small green buds along rhizome before removal.
Pre-Planting Propagule Treatments	Remove daughter from parent by slicing through rhizome.
Growing Area Preparation / Annual Practices for Perennial Crops	Propagation Environment: Lab, greenhouse, outdoor shadehouse. Ensure acidic soil by using peat moss, pine needles, oak leaves, etc. Container must be large enough to hold daughter roots and allow for further growth.
Establishment Phase Details	Ensure media is kept moist immediately after planting. Root establishment may be faster with addition of root hormones.
Length of Establishment Phase	1 month
Active Growth Phase	Growing season is late spring to early fall. Lady fern is deciduous and drops its leaves in the wintertime.
Length of Active Growth Phase	8 months
Hardening Phase	Young ferns in Promix trays are exposed to open air in the greenhouse by removal of humidity domes after they have reached approximately 1-2 inches in height. Misting will help prevent dehydration of plants as they acclimate. These ferns can be transplanted into quart size containers after they reach a height of 2-3 inches. Ferns in larger containers should be moved outside to a shade house from the greenhouse in summer.
Length of Hardening Phase	4 weeks
Harvesting, Storage and Shipping	Storage Conditions: Container plants smaller than 1 gallon are stored in a cold house @ 40 F for the winter; containers are periodically watered to prevent dehydration. Gallon size containers are stored outside on weed barrier fabric and covered with 2 layers of a microfoam insulating blanket.

	The blanket is secured over plants by threading a rope over the blanket between rebar anchors on either side of a group of containers
Length of Storage	5 months
Guidelines for Outplanting / Performance on Typical Sites	Use spacing of 18-24" in the field. Moderate to fast growth rate, ensure protection from strong wind and keep soil moist during establishment.
Other Comments	Only collect daughter plants when explicit permission is given by owner or if a permit has been collected.
INFORMATION SOURCES	
References	<p>"Athyrium- Lady Fern, Painted Fern." Botany.Com. 13 Apr. 2008 <http://www.botany.com/athyrium.html>.</p> <p>"Athyrium Filix-Femina." Rook.Org. 13 Apr. 2008<http://www.rook.org/earl/bwca/nature/ferns/athyriumfil.html>.</p> <p>Davis, Kathy M.; Kujawski, Jennifer L. 2001. Propagation protocol for vegetative production of container Athyrium filix-femina plants; USDA NRCS - Beltsville National Plant Materials Center, Beltsville, Maryland. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 13 April 2008). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.</p> <p>Hammen, Susan L. 1990. Fern Propagaion. Rhode Island Wild Plant Society, Inc. Dover Publications, NY.</p> <p>"Lady Fern (Athyrium Filix-Femina)." Connecticut Botanical Society. 25 Nov.-Dec. 2005. 12 Apr. 2008 <http://www.ct-botanical-society.org/ferns/athyriumfili.html>.</p> <p>"PLANTS Profile for Athyrium Filix-Femina (Common Ladyfern)." USDA Plants. 13 Apr. 2008 <http://plants.usda.gov/java/profile?symbol=ATFI>.</p> <p>Schneller, J. J. 1979. Biosystematic Investegations on the Lady Fern (Athyrium filix-femina). Plant Systematics and Evolution. 132(4):255-277.</p> <p>"Washington Native Plant Society: Photograph of Athyrium Filix-Femina." Washington Native Plant Society. 25 Nov. 2007. 16 Apr. 2008 <http://www.wnps.org/plants/athyrium_filix-femina.html>.</p> <p>Wick, Dale; Evans, Jeff; Hosokawa, Joy; Luna, Tara. 2008. Propagation protocol for production of container Athyriumfilix-femina L. (Roth) plants (3 L container); USDI NPS -Glacier National Park, West Glacier, Montana. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 13 April 2008). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery</p>
Other Sources Consulted	<p>"Lady Fern." 15 Apr. 2008<http://greenwoodnursery.com/page.cfm/333>.</p> <p>"MrGrow.Com." 15 Apr. 2008 <http://www.mrgrow.com/>.</p> <p>Pojar, Jim and Andrew MacKinnon. 1994. Plants of the Pacific Northwest Coast Washington, Oregon British Columbia & Alaska. BC Ministry</p>

	of Forests and Lone Pine Publishing, Vancouver, British Columbia, Canada 527 p.
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