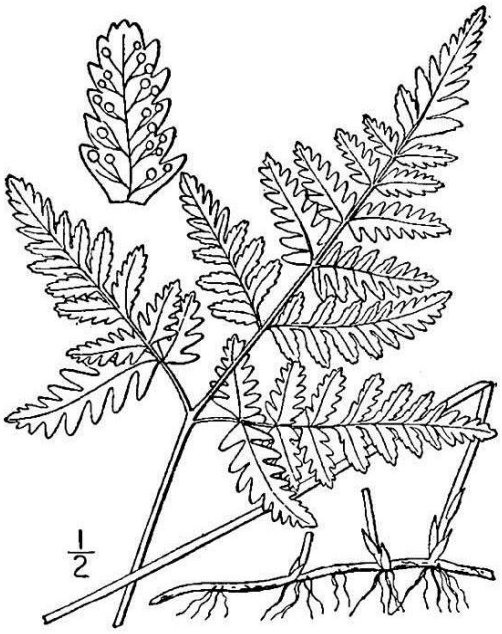
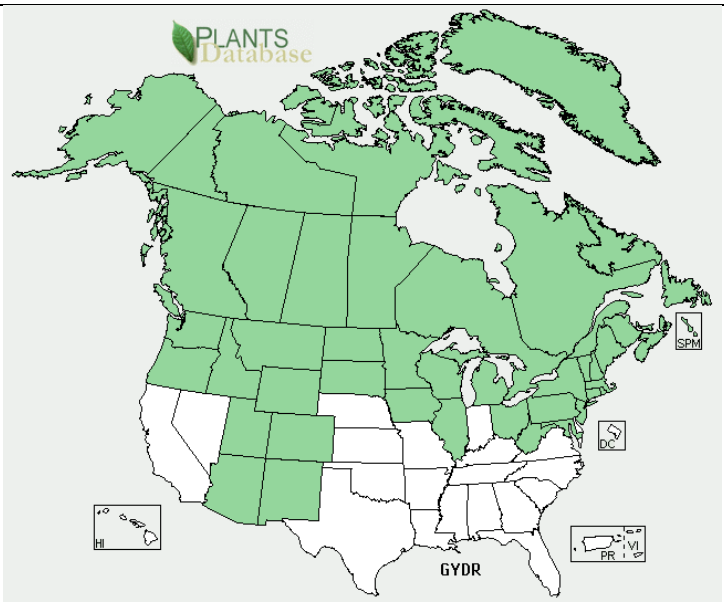
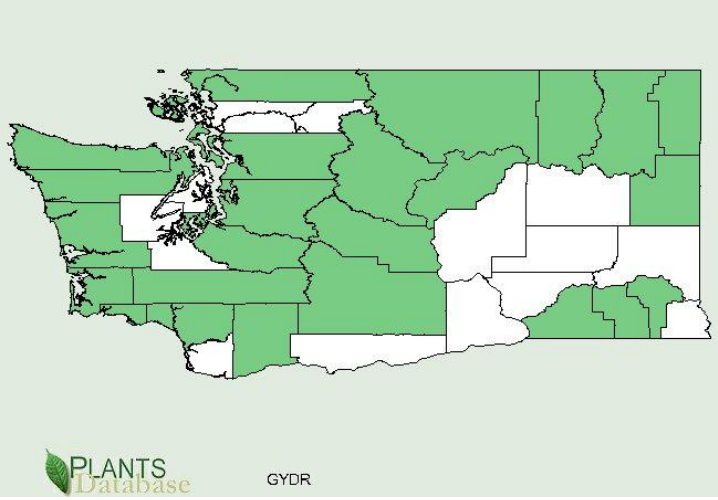
Plant Propagation Protocol for *Gymnocarpium dryopteris*
ESRM 412 – Native Plant Production



Pictures from plants.usda.gov

TAXONOMY	
Family Names	
Family Scientific Name:	Dryopteridaceae
Family Common Name:	Wood Fern Family
Scientific Names	
Genus:	*Gymnocarpium*
Species:	*dryopteris*
Species Authority:	(L.) Newman
Variety:	
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common Synonym(s) (include full scientific names (e.g., *Elymus glaucus* Buckley), including variety or subspecies information)	Dryopteris disjuncta (Ledeb.) Mort.[(1)] Dryopteris linnaeana Christens.[(1)] Phegopteris dryopteris (L.) Fee[(1)] Thelypteris dryopteris (L.) Slosson[(1)]
Common Name(s):	Western Oak Fern
Species Code (as per USDA Plants database):	GYDR
GENERAL INFORMATION	

Geographical range (distribution maps for North America and Washington state)	 
Ecological distribution (ecosystems it occurs in, etc):	Temperate cool forests, conifer or mixed, circum-boreal found in northern regions of Asia, Europe and North America.[(1)]
Climate and elevation range	Cool to temperate forests, found as far south as Virginia. [(1)]
Local habitat and abundance; may include commonly associated species	Abundant in conifer understory in Washington and other PNW states.
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	A Facultative Seral Species That can re-sprout after fire from roots. [(1)]
Plant characteristics longevity, key characteristics, etc)	Forb, can dominate understory for 100 years starting 25 to 35 years after disturbance, fire or harvest. [(1)]

PROPAGATION DETAILS	
Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):	Cedar/Devil's Club habitat, understory species, Glacier National Park, Flathead Co., MT. [(2)]
Propagation Goal:	Plants[(2)]
Propagation:	Seed[(2)]
Product :	Container (plug) [(2)]
Stock Type:	800 ml containers[(2)]
Time to Grow (from seeding until plants are ready to be outplanted):	1 year[(2)]
Target Specifications:	8cm tall, 5-7 mature fronds, fully developed rhizomatous root mass. [(2)]
Propagule Collection:	Collect fronds when spores are black. [(2)]
Propagule Processing/Propagule Characteristics:	Place fronds of butcher paper in a room with no drafts, after several days collect the spores off the paper, will look like dust. [(2)]
Pre-Planting Propagule Treatments:	Surface sow spores in flats of sterilized fine peat moss moistened with distilled water. Seal with plastic wrap to retain moisture. Place flat under 60 watt incandescent lights on a 12 hour per day cycle. Germination takes place after 15 days. Thread like germ filaments will appear as fine green threads on surface medium, can be seen with aid of a microscope. Keep between 20 and 25C. [(2)]
Growing Area Preparation / Annual Practices for Perennial Crops:	Keep sealed flats under lights for 2 to 3 months. Keep in greenhouse at 20 to 25C for 3 months, then moved to outdoor shade house for 6 months. [(2)]
Establishment Phase:	Spores germinate in 10 to 20 days. Prothalli (gametophyte) grow for 6 to 8 weeks. Keep a thin film of distilled water over the surface of the prothalli during growth to assure fertilization. During this time the reproductive structures of the prothalli can be seen under a microscope along the margins and notch of the prothalli. Sterile conditions must be maintained with removal of any media with fungal contamination. If contamination occurs treat with ¼ strength fungicide drench only if prothalli are well developed. Water with distilled water only. Once sporophytes appear remove plastic, sterile conditions are no longer necessary. [(2)]
Length of Establishment Phase:	2 to 3 months[(2)]
Active Growth Phase (from germination until plants are no longer actively growing):	Sporophytes appear at around 5 months after germination. Transplant to pots when 4cm tall. After transplants are established in a greenhouse move

	them to an outdoor shade house in the spring. Fertalize with controlled release Osmocote (13-13-13 4g) and Micromax micronutrients (2g) mixed into Promix medium per 800 ml container. Plants are root tight in containers by fall, one year after germination. [(2)]
Length of Active Growth Phase:	8 months
Hardening Phase:	Fertelize in fall with 10-20-20 liquid NPK at 200ppm in early fall. Leach pots with pater. Water before overwintering. [(2)]
Length of Hardening Phase:	4 weeks[(2)]
Harvesting, Storage and Shipping (of seedlings):	Total time to harvest is 1 year. Harvest in September. Overwinter in outdoor shade house under insulating foam and snow. [(2)]
Length of Storage (of seedlings, between nursery and outplanting):	5 months[(2)]
Guidelines for Outplanting / Performance on Typical Sites:	
Other Comments:	Division of rhizomes can also be used for propagation. Divide in early spring leaving at least one leaf shoot or bud per rhizome section, transplant into containers. [(2)]
INFORMATION SOURCES	
References (full citations):	(1) Snyder, S. A. 1993. Gymnocarpium dryopteris. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2012, May 10]) (2) Wick, Dale; Evans, Jeff.; Hosokawa, Joy.; Luna, Tara. 2008. Propagation protocol for production of container *Gymnocarpium dryopteris* (L.) Newm. plants (800 ml containers); USDI NPS - Glacier National Park, West Glacier, Montana. In: Native Plant Network. URL: http://www.nativeplantnetwork.org (accessed 11 May 2012). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery. (3) Flora of North America, FNA Vol 2Common Oak Fern. Found at: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=200003903, retrieved May, 10th, 2012.

	Please see previous version of protocol that follows.
Other Sources Consulted (but that contained no pertinent information) (full citations):	http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?403300 http://www.rook.org/earl/bwca/nature/ferns/gymnodry.html
Protocol Author (First and last name):	Amber Corfman
Date Protocol Created or Updated (MM/DD/YY):	5/16/2012

Note: This template was modified by J.D. Bakker from that available at: http://www.nativeplantnetwork.org/network/SampleBlankForm.asp

Species

Gymnocarpium dryopteris
Oak Fern

Range
Circumboreal, Alaska to Newfoundland, south to Oregon, northern Idaho, NW Montana, Saskatchewan, Manitoba, Minnesota, Iowa, Wisconsin, Michigan, Ohio, West Virginia, and Maryland

Climate, elevation
Moist forests, streambanks, and wet cliffs from lowland to mid-montane elevations
883m- 5860m

Local occurrence
Very abudant in the understory of coniferous forests throughout the Pacific Northwest

Habitat preferences
Moist to wet heavily shaded forests, rocky slopes

Plant strategy type/successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)
Facultative Seral Species

Associated species
Alaska cedar (*Chamaecyparis nootkatensis*), noble fir (*Abies procera*), lodgepole pine(*Pinus contorta*), Alaska blueberry (*Vaccinium alaskensis*), red huckleberry (*V. parviflorum*), thimbleberry (*Rubus parviflorus*), salmonberry (*R. spectabilis*), devil's club (*Oplopanax horridus*), menziesia (*Menziesia ferruginea*), salal (*Gaultheria shallon*), Oregon oxalis (*Oxalis oregana*), bunchberry (*Cornus canadensis*), false lily-of-the-valley (*Maianthemum dilatatum*), twisted stalk (*Streptopus spp*.), threeleaf foamflower (*Tiarella trifoliata*), woodnymph (*Moneses uniflora*), pioneer violet (*Viola glabrella*), western swordfern (*Polystichum munitum*), ladyfern (*Athyrium filix-femina*), bracken fern(*Pteridium aquilinum*), woodfern (*Dryopteris spp*.), stiff clubmoss (*Lycopodium annotinum)*

May be collected as:
Spores, Division

Collection restrictions or guidelines
Spore: Place spore surface down on butcher paper to collect spores. Spores will appear as a fine dust on the paper after several days of drying.
Collect spores when mature, usually from July to late August from the surface of paper and surface sow in sterilized flats filled with sterile, finely milled peat moss
Division: Can be divided in spring if the rhizome is large and the roots are well developed.

Seed germination
No dormancy breaking required

Seed life
Spore viability highly variable, usually low after 1 year

Recommended seed storage conditions
Store spores in glassine envelopes or in packets or waxed paper. Store packets at 1-4 C, in moisture-tight and air tight containers.

Propagation recommendations
Divisions: Divisions of rhizomes can be done in early spring with at least 1 leaf shoot or bud per rhizome section and transplanted into containers

Soil or medium requirements
Moist mildly acidic

Installation form
Division has the highest potential for success
Recommended planting density
About every 2ft
Care requirements after installed
Average water requirements
Normal rate of growth or spread; lifespan
Fast growing/ spreading Deciduous perennial
Sources cited
1. http://www.rook.org/earl/bwca/nature/ferns/gymnodry.html
2. E-Folra BC.
http://linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Gymnocarpium+dryopteris
3. Native Plant Nursery, Glacier National Park.
http://nativeplants.for.uidaho.edu/network/view.asp?protocol_id=91
Data compiled by
Kelly Sutton 5/23/06