

Plant Propagation Protocol for *Gymnocarpium disjunctum*

ESRM 412 – Native Plant Production

URL: <https://courses.washington.edu/esrm412/protocols/2023/GYDI2.pdf>

TAXONOMY	
Plant Family	
Scientific Name	Sources consulted for this protocol record <i>Gymnocarpium disjunctum</i> as belonging to three different families; Dryopteridaceae, ^{5,7,15} Woodsiaceae, ⁹ Cystopteridaceae ^{2,8,10,16}
Common Name	Wood Fern family, ^{7,15} Cliff Fern Family, ⁹ Fragile Fern Family ^{2,8,10,16}
Species Scientific Name	
Scientific Name	Genus: <i>Gymnocarpium</i> ^{9,15} Species: <i>disjunctum</i> ^{9,15} Species authority: (Rupr.) Ching ^{9,15}
Varieties	No Information Available
Sub-species	No Information Available
Cultivar	No Information Available
Common Synonym(s)	Dryopteris <i>disjuncta</i> (Rupr.) Morton ⁹ <i>Gymnocarpium dryopteris</i> (L.) Newman ssp. <i>disjunctum</i> (Rupr.) Sarvela ⁹ <i>Gymnocarpium dryopteris</i> (L.) Newman var. <i>disjunctum</i> (Rupr.) Ching ⁹
Common Name(s)	Pacific Oak Fern ¹⁵
Species Code (as per USDA Plants database)	GYDI2 ¹⁵
GENERAL INFORMATION	
Geographical range	<i>Gymnocarpium disjunctum</i> has a range that spans several regions in North America including Alaska, Alberta, British Columbia, Colorado, Idaho, Montana, Oregon, Washington, and Wyoming. ^{2,3,4} <i>Gymnocarpium disjunctum</i> can also be found in the former Soviet republics, like southern Kamchatka, and Sakhalin Island. ^{3,4,8,16,13}

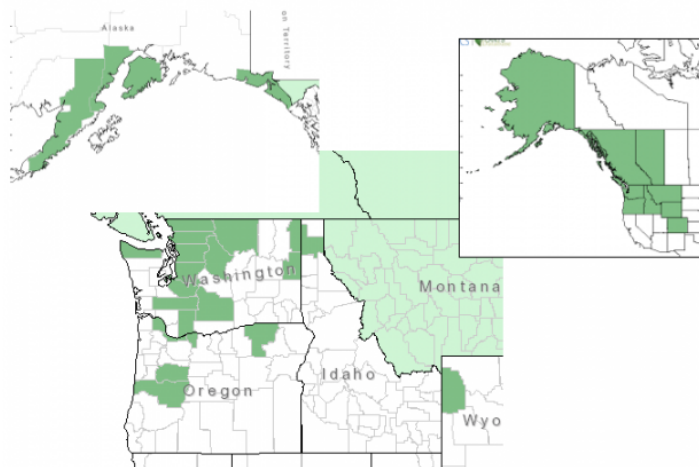


Photo courtesy of the USDA Plants Database^{7,15}

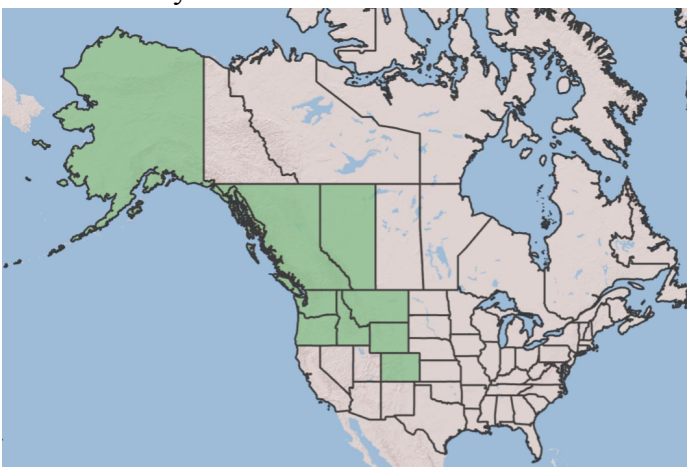


Photo courtesy of the USDA Plants Database¹⁵

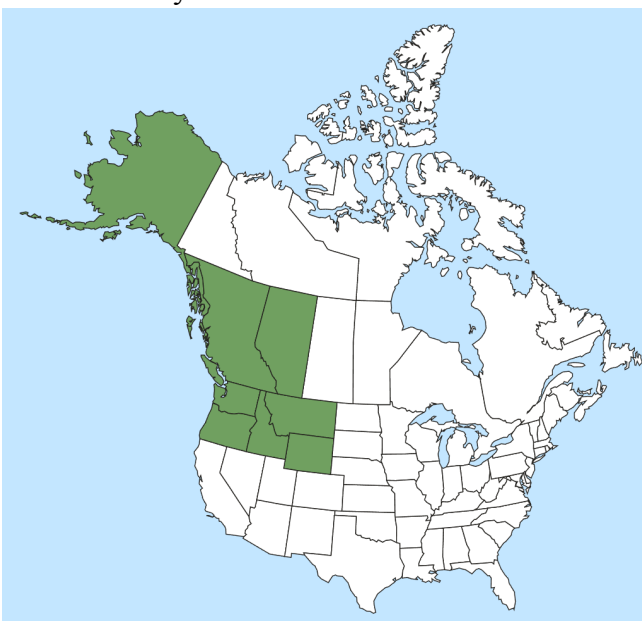
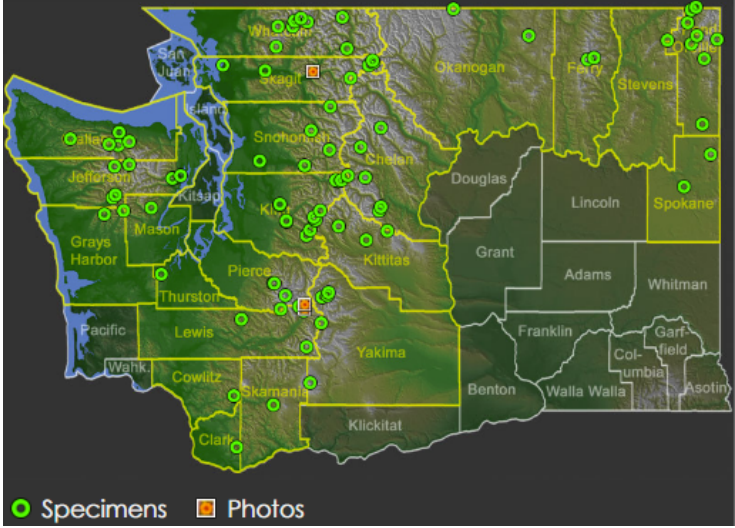


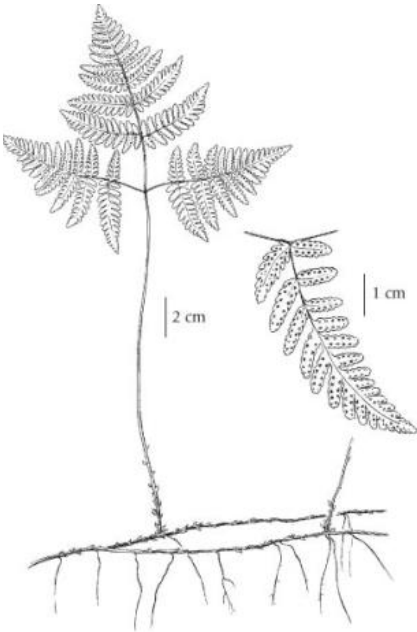


Photo courtesy of the Flora of North America website¹³

	 <p>Photo courtesy of the Burke Museum Herbarium¹⁰</p>  <p>Photo courtesy of the Global Biodiversity Information Facility^{8,16}</p>
Ecological distribution	<p><i>Gymnocarpium disjunctum</i> can be found in shady, moist woods, streambanks, and wet cliffs of the Pacific Northwest.^{3,4,5} This species is known to occur in both wetlands and non-wetlands.⁷</p>
Climate and elevation range	<p><i>Gymnocarpium disjunctum</i> thrives in habitats situated at elevations ranging from 0 to 7870 feet (0-2400 m), although other sources have suggested the range be from 1919 to 6066 feet (585-1849m).^{11,13} Information on climate preference is unavailable, but based on its range and other information available, it seems to prefer the temperate climate in the Pacific North West and areas that have high precipitation or moisture nearby.¹² Grows in hardiness zones 4 to 8.⁶</p>
Local habitat and abundance	<p>Throughout its distribution range, <i>Gymnocarpium disjunctum</i> has been observed to predominantly inhabit mixed coniferous forests based on collected samples.⁷ Streams and damp forests near mountains or wetlands are preferred, and it has been seen in fern-dominated understories.^{3,4} Spotted in proximity to species like; <i>Thuja plicata</i>, <i>Pseudotsuga menziesi</i>, <i>Athyrium felix-femina</i>, <i>Tiarella trifoliata</i>, <i>Tsuga heterophylla</i>, <i>Abies amabilis</i>, <i>Acer glabrum</i>, <i>Callitropsis nootkatensis</i>.¹⁹</p>

Plant strategy type / successional stage	There is no information available regarding <i>Gymnocarpium disjunctum</i> and its stress tolerances. Since it is an understory plant that prefers moist environments, it does not thrive in drier climates. ^{1,3}
Plant characteristics	<p>The fronds of <i>Gymnocarpium disjunctum</i> are most often born singly, they spread by rhizomes, forming large colonies.^{3,4,7} The deciduous fronds are broadly triangular, 2-3 pinnate, and hairless.^{2,5,7} Spore cases are round and uncovered.⁷</p> <p><i>Gymnocarpium disjunctum</i> is generally a larger plant than <i>Gymnocarpium dryopteris</i>, its relative, with fronds that range from 10-40 cm in length compared to the 5-25 cm long fronds of <i>Gymnocarpium dryopteris</i>.^{3,4} Additionally, <i>Gymnocarpium disjunctum</i> fern has more divided leaves and smaller spores.¹¹</p>  <p>Photo © Richie Steffen⁶</p>  <p><i>Gymnocarpium disjunctum</i></p> <p>Illustration Source: The Illustrated Flora of British Columbia^{3,4}</p>



Photos courtesy of the Burke Museum Herbarium^{10,19}

Specimen Collector: Edward P. Cliff

Collection Date: Jun 5, 1936

Elevation: 650 ft.




Photo © 2012 Robert L. Carr¹⁰

Specimen Location: U.S.A., Idaho, Latah County: Vic. Giant White Pine Campground, along Hwy 6, ca. 2 mi. S of the Benewah Countyline. Elevation: 2780 ft.

PROPAGATION DETAILS

Ecotype	No Information Available
Propagation Goal	Plants
Propagation Method	Vegetative ^{7,19}
Product Type	Container (plug)

Stock Type	
Time to Grow	No information is available on <i>Gymnocarpium disjunctum</i> 's grow time, but species in the same genus, like <i>Gymnocarpium dryopteris</i> , take roughly 1 year to be outplanted from seed. ¹⁴ More studies need to be done on this species for clearer and more accurate information. ^{8,16} <i>Gymnocarpium dryopteris</i> often gets confused or classified as <i>Gymnocarpium disjunctum</i> so information about both species can be confused with one another. ^{1,7,12}
Target Specifications	No Information Available
Propagule Collection Instructions	No information is available specifically for <i>Gymnocarpium disjunctum</i> .
Propagule Processing/Propagule Characteristics	<p>Spores 27–31^{2,5} μm. 2n = 80.⁵ No other information is available specifically for <i>Gymnocarpium disjunctum</i>.</p>  <p>Photo © 2013 G. D. Carr¹⁰ Specimen Location: U.S.A., Oregon, Clackamas County: NFD Rd. 46, at jct. with NFD Rd. 4650, 33 mi. NNE of Detroit [R.R. Halse 8925]. Elevation: 2060 ft.</p>
Pre-Planting Propagule Treatments	No Information Available
Growing Area Preparation / Annual Practices for Perennial Crops	No Information Available
Establishment Phase Details	No Information Available
Length of Establishment Phase	There is no information available specifically for <i>Gymnocarpium disjunctum</i> . A related species in the same genus takes roughly 2 to 3 months to establish, but studies are needed to confirm if <i>Gymnocarpium disjunctum</i> requires the same amount of time. ^{1,14}
Active Growth Phase	No Information Available
Length of Active Growth Phase	There is no information available specifically for <i>Gymnocarpium disjunctum</i> . A related species in the same genus has an active growth phase of 8 months, but studies are needed

	to confirm if <i>Gymnocarpium disjunctum</i> is similar to other species in its genus. ^{1,14}
Hardening Phase	No Information Available
Length of Hardening Phase	Further studies need to be done on <i>Gymnocarpium disjunctum</i> and the length of its hardening phase, so there is currently no information available this species specifically. The information that is available on the length of the hardening phase is for other species of the same genus, which suggests 8 months. ^{1,14}
Harvesting, Storage and Shipping	No Information Available
Length of Storage	5 months is the suggested length of storage time for members of the <i>Gymnocarpium</i> genus, but no information is available specifically for <i>Gymnocarpium disjunctum</i> . ^{1,14}
Guidelines for Outplanting / Performance on Typical Sites	No Information Available
Other Comments	Very limited research has been done on the species itself so there is little to know information on propagation or plant strategy. ⁹ Related species have had plenty of studies performed on them since they are more widespread across North America, but there is conflicting information regarding <i>Gymnocarpium disjunctum</i> and its relatives due to misidentification. ^{1,9}
INFORMATION SOURCES	
References	<ol style="list-style-type: none"> 1. Cody, W. J., & Britton, D. M. (1989). Ferns and fern allies of Canada. Agriculture Canada, Research Branch. 2. Cronquist, A., Hitchcock, C. L., Olmstead, R. G., Zika, P. F., Legler, B., & Giblin, D. (2018). Flora of the Pacific Northwest: An illustrated manual. University of Washington Press. 3. Douglas, G. W. (1998). Illustrated flora of british columbia. British Columbia, Ministry of Environment, Lands and Parks. 4. E-Flora BC. (n.d.). Dryopteridaceae (Wood Fern family). Electronic Atlas of the Flora of British Columbia. https://linnet.geog.ubc.ca/Atlas/Atlas.aspx?sciname=Gymnocarpium%2Bdisjunctum 5. <i>Gymnocarpium disjunctum</i>. Flora of North America. (n.d.). http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500657

	<ol style="list-style-type: none"> 6. <i>Gymnocarpium disjunctum</i>. Hardy Fern Foundation. (2019, July 15). https://hardyferns.org/ferns/gymnocarpium-disjunctum/ 7. Habitatdana, & Habitatdana. (2018, March 19). Oak Ferns, <i>gymnocarpium</i> sp.. Native Plants PNW. https://nativeplantspnw.com/pacific-oak-fern-gymnocarpium-disjunctum/ 8. Hassler, M. (2023). Checklist of Ferns and Lycophytes of the World. Catalogue of Life Checklist . https://doi.org/https://doi.org/10.48580/dfirt-3dc 9. Integrated Taxonomic Information System. (n.d.). <i>Gymnocarpium disjunctum</i> (Rupr.) Ching - Report. ITIS. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=502848#null 10. Knoke, D., & Giblin, D. (n.d.). <i>Gymnocarpium disjunctum</i>. Burke Herbarium Image Collection. https://www.burkeherbarium.org/imagecollection/taxon.php?Taxon=Gymnocarpium+disjunctum 11. Oregon State University . (n.d.). <i>Gymnocarpium disjunctum</i> (Rupr.) Ching. Oregon Flora. https://oregonflora.org/taxa/index.php?taxon=5455 12. Proudfoot, B., Fretwell, K., Cruickshank, I., & Starzomski, B. (2015). Western Oak Fern • <i>Gymnocarpium disjunctum</i>. Biodiversity of the Central Coast. https://www.centralcoastbiodiversity.org/western-oak-fern-bull-gymnocarpium-disjunctum.html 13. Pryer, K. M. (2020, November 5). <i>Gymnocarpium disjunctum</i>. Flora of North America. http://beta.floranorthamerica.org/Gymnocarpium_disjunctum 14. Reforestation, Nurseries, & Genetic Resources. (n.d.). <i>Gymnocarpium</i> (Dryopteris) - RNGR. Native Plant Network Propagation Protocol Database. https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=dryopteridaceae-gymnocarpium-91 15. United States Department of Agriculture. (n.d.). <i>Gymnocarpium disjunctum</i> (Rupr.) Ching. USDA plants database.
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	https://plants.usda.gov/home/plantProfile?symbol=GYDI2
Other Sources Consulted	<p>16. Global Biodiversity Information Facility. (n.d.). <i>Gymnocarpium disjunctum</i> (rupr.) ching. GBIF. https://www.gbif.org/species/2650845</p> <p>17. Encyclopedia of Life. (n.d.). Pacific Oakfern. EOL. https://eol.org/pages/483370/data</p> <p>18. Kew Royal Botanic Gardens. (n.d.). <i>Gymnocarpium disjunctum</i> (rupr.) Ching: Plants of the World Online: Kew Science. Plants of the World Online. https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:17440270-1#publications</p> <p>19. WTU Herbarium, B. M. (n.d.). <i>Gymnocarpium disjunctum</i> CPNWH search results. Consortium of Pacific Northwest Herbaria. https://www.pnwherbaria.org/data/</p>
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