

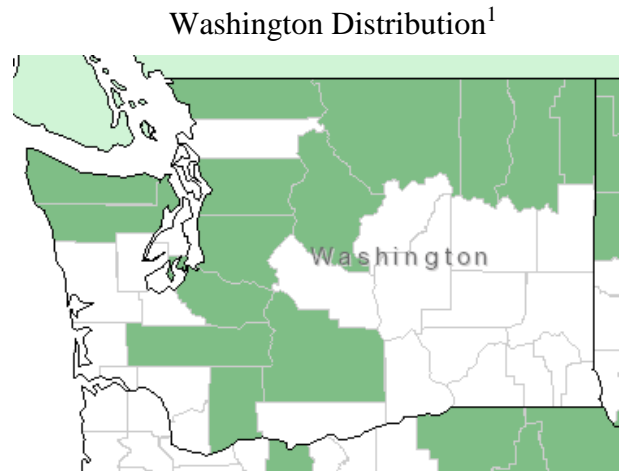
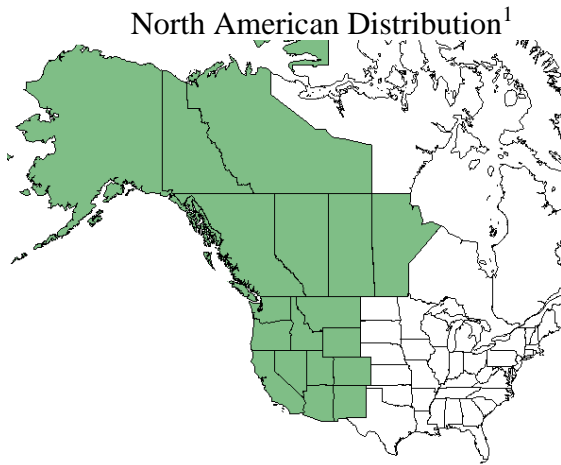
Plant Propagation Protocol for *Botrychium pinnatum* H. St. John

ESRM 412 – Native Plant Production

Protocol URL: <https://courses.washington.edu/esrm412/protocols/BOPI.pdf>



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TAXONOMY	
Plant Family	
Scientific Name	Ophioglossaceae ¹
Common Name	Adder's-tongue family ¹
Species Scientific Name	
Scientific Name	<i>Botrychium pinnatum</i> H. St. John ¹
Varieties	
Sub-species	
Cultivar	
Common Synonym(s)	<i>Botrychium boreale</i> Milde spp. <i>obtusilobum</i> (Rupr.) R.T. Clausen ^{1,3,6} <i>Botrychium boreale</i> Milde var. <i>obtusilobum</i> (Rupr.) Broun ^{1,3,6}
Common Name(s)	northern moonwort ^{1,3} , northwestern moonwort ^{2,3} , northern grapefern ³
Species Code (as per USDA Plants database)	BOPI

GENERAL INFORMATION

Geographical range	<p><i>B. pinnatum</i> is native to the western United States, Alaska, most of Canada, and Greenland^{1,11}.</p> <p>It is native to a total of 14 counties across Washington, spanning the state from east to west and north to south. It is also native to most of eastern Oregon¹.</p> <p>See maps above.</p>
Ecological distribution	<i>B. pinnatum</i> is found in moist or wet habitats and mostly open places at fairly high elevations in the mountains ⁴ .
Climate and elevation range	1770-2040 m in California ² ; 15-2075 m (average 702 m) in British Columbia ⁶
Local habitat and abundance	<i>B. pinnatum</i> can be found in lower and upper montane coniferous forests, and in meadows and seeps ² . It can grow on wet to moist grassy slopes, streambanks, roadsides, and in mossy woods, generally in the mountains ⁸ . It is most commonly associated with <i>B. lanceolatum</i> and <i>B. lunaria</i> [= <i>B. neolunaria</i>], and is often misidentified as <i>B. boreale</i> ⁵ .
Plant strategy type / successional stage	<i>B. pinnatum</i> does best in submesic to mesic soil, with an average soil moisture regime (SMR) of 3, although it has also been found in sites with SMRs of 0 (very xeric) and 7 (subhydic) ⁶ .
Plant characteristics	<p><i>B. pinnatum</i> is a fern¹, a deciduous perennial⁶, and rhizomatous herb that blooms from July to October², with leaves appearing June to August^{9,10}. It can grow to be 3-20 cm in height^{6,9,11}. Its trophophores are green and lanceolate, up to 8 cm long with up to 7 pairs of 3-5 mm long pinnae, with the lowest pairs being deeply lobed and nearly overlapping the ones above^{9,10}. Its sporophores are 2 times pinnate, and 1 to 2 times as long as the trophophores^{9,10}. Its rhizome is dark, short, and vertical, with an abundance of dark brown roots with a diameter of 1 mm or less¹².</p> <p>Like other <i>Botrychium</i> species, <i>B. pinnatum</i> has two fronds, one sterile and the other bearing spores. The sterile fronds are oblong or slightly narrowed to the tip¹², and are a bright shiny green, with numerous symmetrical lobes⁸. The vegetative and spore-bearing segments join to a common basal stem for 3-7 cm^{11,12}. Spores are produced in July. The aboveground parts of the fern may not appear every year, even though the root system is surviving underground⁸.</p>

	It differs from <i>B. boreale</i> in that its lowermost pinnae have wide, deep sinuses (rather than shallow, narrow sinuses in <i>B. boreale</i>) ⁶ .
PROPAGATION DETAILS	
No propagation protocols found for <i>Botrychium pinnatum</i> or its close relatives	
Ecotype	
Propagation Goal	
Propagation Method	
Product Type	
Stock Type	
Time to Grow	
Target Specifications	
Propagule Collection Instructions	
Propagule Processing/Propagule Characteristics	
Pre-Planting Propagule Treatments	
Growing Area Preparation / Annual Practices for Perennial Crops	
Establishment Phase Details	
Length of Establishment Phase	
Active Growth Phase	
Length of Active Growth Phase	
Hardening Phase	
Length of Hardening Phase	
Harvesting, Storage and Shipping	
Length of Storage	
Guidelines for Outplanting / Performance on Typical Sites	
Other Comments	
INFORMATION SOURCES	
References	See below
Other Sources Consulted	See below
Protocol Author	Kyra Woytek
Date Protocol Created or Updated	5/29/19

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²“CNPS Inventory Plant Detail - Botrychium Pinnatum.” *California Native Plant Society - Rare Plant Program*, 2013, www.rareplants.cnps.org/detail/1595.html.

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- ⁴“Botrychium Pinnatum.” *Burke Herbarium Image Collection*,
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- ⁶“Botrychium Pinnatum.” Edited by Brian Klinkenberg, *E-Flora BC: Electronic Atlas of the Flora of British Columbia*, 2017,
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- ⁷Batten, Ryan. “Botrychium Pinnatum; Northern Moonwort.” *CalPhotos - Photo Database*, 2011, calphotos.berkeley.edu/cgi/img_query?seq_num=364019&one=T.
- ⁸“Comprehensive Report Species - Botrychium Pinnatum.” *NatureServe Explorer*,
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- ⁹Montana Natural Heritage Program. “Northern Moonwort - Botrychium Pinnatum.” *Montana Field Guide*, fieldguide.mt.gov/speciesDetail.aspx?elcode=PPOPH010V0.
- ¹⁰“Botrychium Pinnatum.” *EFloras.org - Flora of North America*,
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- ¹¹Handley, Joy, and Bonnie Heidel. “Botrychium Pinnatum.” *Wyoming Natural Diversity Database*, 2015,
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- ¹²St. John, Harold. “Notes on Northwestern Ferns.” *American Fern Journal*, vol. 19, no. 1, 1929, pp. 11–12. *JSTOR*, www.jstor.org/stable/1543922.

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