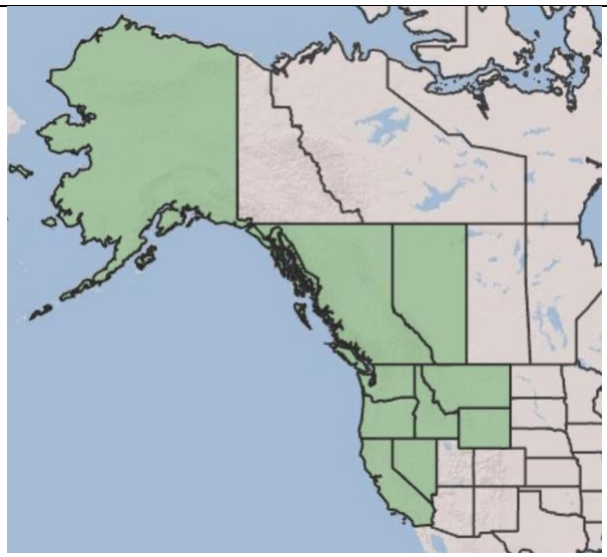
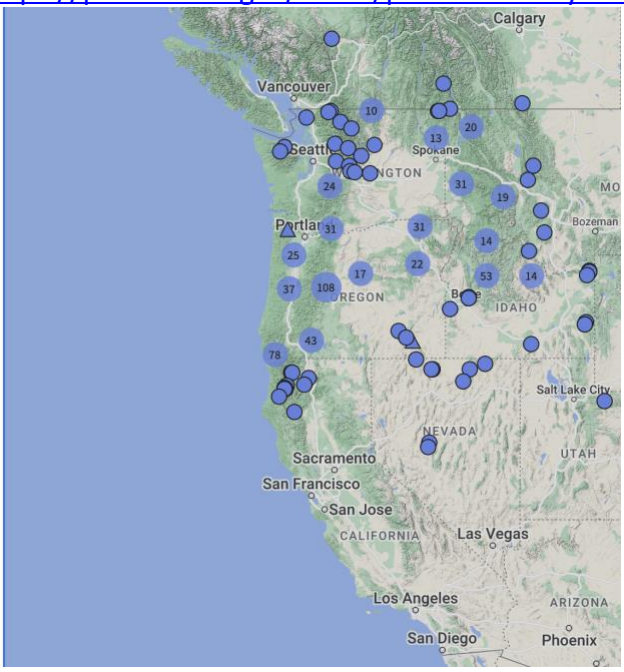
Plant Propagation Protocol for *Angelica arguta* Nutt.
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/2024/ANAR3.pdf

Photo by Tim Hagan (2002)
https://burkeherbarium.org/imagecollection/photo.php?Photo=wtu019672&Taxon=Angelica%20arguta&SourcePage=taxon

TAXONOMY	
Plant Family	
Scientific Name	Apiaceae[1]
Common Name	Carrot family[1]
Species Scientific Name	
Scientific Name	*Angelica arguta* Nutt.[1]
Varieties	No varieties found.
Sub-species	No sub-species found.
Cultivar	No cultivars found.
Common Synonym(s)	*Angelica lyallii* S. Watson[1]
Common Name(s)	Lyall's angelica[1,2,3,4], sharp-tooth angelica[2,3,4]
Species Code (as per USDA Plants database)	ANAR3[1]
GENERAL INFORMATION	

Geographical range	 USDA (2014) https://plants.usda.gov/home/plantProfile?symbol=ANAR3  Oregon Flora (2024) https://oregonflora.org/collections/map/googlemap.php?usethes=1&taxa=2765&minClusterSetting=10&gridSizeSetting=30 *Angelica arguta* Nutt. is found from southern B.C to northern California and east to southwest Alberta and south through Montana, Wyoming, Idaho, and Nevada.[2]
Ecological distribution	*Angelica* arguta Nutt. is often found in areas with moist and rich soil.[5] In Washington, it can be found on both sides of the Cascades crest.[4] It can be found in moist thickets, forest openings, swamps, streambanks, wet ditches and clearings, and flooded or ponded marshes.[6]

	Angelica arguta Nutt. is an important habitat for ground-nesting birds and mammals.[6]
Climate and elevation range	Occurs in wet places from the foothills and valleys up to mid-montane elevations.[2]
Local habitat and abundance	*Angelica arguta* Nutt. grows best in moist areas and are often found growing with Mountain hemlock, Pacific silver fir, Red alder, thimbleberry, lady fern, Sitka valerian, sedge, cow-parsnip, stinging nettle, and common horsetail.[6]
Plant strategy type / successional stage	*Angelica arguta* Nutt. is part of stable plant communities, but it also populates openings or canopy gaps. Along with this, *Angelica arguta* Nutt. is moderately shade tolerant.[6]
Plant characteristics	Robust perennial from a stout taproot. Reaches about 5-20 dm tall.[4] The leaves are yellow-green in color and are 2-3 feet long.[5] The flowers are compound umbels that grow up to 8 cm long.[4]
PROPAGATION DETAILS: FROM SEED	
Ecotype	Aspen understory, Summit, Glacier National Park in Montana, Glacier County at an elevation of 1500m.[2]
Propagation Goal	Plants[2]
Propagation Method	Seed[2]
Product Type	Container (plug)[2]
Stock Type	172 ml containers.[2]
Time to Grow	7 months[2]
Target Specifications	Height: 7 cm tall[2] 4-6 true leaves[2] Root systems: firm plug in container[2]
Propagule Collection Instructions	Seeds are hand collected in late August/early September when they are brown in color. The seeds are then easily taken from the inflorescence and are kept in paper bags in a well-ventilated drying shed during the drying process prior to cleaning.[2]
Propagule Processing/Propagule Characteristics	Seed longevity is five years in sealed containers under 1°C.[2] Seed dormancy is classified as morphological-physiological dormancy.[2] Seeds/kilogram: 154,000/kg.[2] Percent purity is 100% while percent germination ranged from 49% to 67%.[2]
Pre-Planting Propagule Treatments	Seeds were soaked in 200 mg of activated charcoal per 0.5 liter of water for 24 hours to remove inhibitors from the seed coats. Seeds were then placed in 90 day cold and moist stratification. The seeds were placed in fine mesh bags buried in moist peat moss in ventilated containers under refrigeration at 1°C to 3°C.[2]
Growing Area Preparation / Annual Practices for Perennial Crops	Growing preparation occurred in a greenhouse facility.[2] Sowing method: direct seeding or planting germinants. Seeds are surface sown or lightly covered with medium.[2] The growing medium used was 50% milled sphagnum peat, perlite, and vermiculite with Osmocote controlled release fertilizer (13N:13P_2O_5:13K_2O; eight to nine months release rate at 21°C) and Micromax fertilizer (12% S, 0.1% B, 0.5% Cu, 12% Fe, 2.5% Mn, 0.05% Mo, 1% Zn) at the rate of 1 gram of Osmocote and 0.20 grams of Micromax per 172 ml container.[2]

Establishment Phase Details	Germination occurred after 3 months of cold and moist stratification. Seeds were sown as germinants as the radicle became visible during stratification. Non-sprouted seeds germinated under fluctuating temperature of 16°C during the day for 10 hours and 13°C during the night for 14 hours. Germination was non-uniform and continued over a 30 day period.[2]
Length of Establishment Phase	8 weeks[2]
Active Growth Phase	Root and shoot development occurs rapidly following germination. 4 – 6 true leaves were evident 6 weeks after germinations. The plants were fertilized with 20-20-20 liquid NPK at 100 ppm fertilizer during the growing season, but there is no information on how often fertilization occurs. The plants had strong roots 3 months following germination. Plants would need to be potted into larger containers if held over for more than one season.[2]
Length of Active Growth Phase	16 weeks[2]
Hardening Phase	Irrigation is gradually reduced in September and October but no information is given on how much irrigation is done. The plants are also leached with clean water and fertilized using 10-20-20 liquid NPK once before winter.[2]
Length of Hardening Phase	4 weeks[2]
Harvesting, Storage and Shipping	Total time to harvest: 10 months.[2] Harvest date: September[2] Storage Conditions: overwinter in outdoor nursery under insulating foam cover and snow.[2]
Length of Storage	5 months[2]
Guidelines for Outplanting / Performance on Typical Sites	Reaches a height of 7 cm tall.[2]
Other Comments	Propagate from seeds as soon as they ripen in the fall.[5]
INFORMATION SOURCES	
References	1. United States Department of Agriculture. (n.d.). *Angelica arguta Nutt.* USDA plants database. https://plants.usda.gov/home/plantProfile?symbol=ANAR3 2. Luna, Tara; Wick, Dale; Hosokawa, Joy. 2008. Propagation protocol for production of Container (plug) *Angelica arguta* Nutt. plants 172 ml containers; USDI NPS - Glacier National Park West Glacier, Montana. In: Native Plant Network. https://NativePlantNetwork.org 3. *Angelica arguta Nutt.* Oregonflora. (n.d.). https://oregonflora.org/taxa/index.php?taxon=2765 4. Burke Museum. (n.d). *Angelica arguta*. Burke Herbarium Image Collection. https://burkeherbarium.org/imagecollection/taxon.php?Taxon=Angelica%2Barguata

	5. Brenzel, K. (2007). Bouteloua. In *Sunset Western Garden Book* (8th ed., p. 186). essay, Oxmoor House. 6. Vance, N. (2001). Angelica L. spp. In *Special Forest Products: Species Information Guide for the Pacific Northwest* (Vol. 513, pp. 25–25). essay, U.S Department of Agriculture.
Other Sources Consulted	1. Canter, A. N., York, D. A., Les, D., Tippery, N., & Razifard, H. (2012). NOTEWORTHY COLLECTION. *Madroño*, *59*(4), 230–233. http://www.jstor.org/stable/41702549 2. Lyall's Angelica — Angelica arguta. Montana Field Guide. Montana Natural Heritage Program. Retrieved on May 20, 2024, from https://FieldGuide.mt.gov/speciesDetail.aspx?elcode=PDAPI07030 3. Palmer, G. (n.d.). *Native american ethnobotany database*. Apiaceae Angelica arguta Nutt. http://naeb.brit.org/uses/search/?string=Angelica%2Barguta 4. *Integrated Taxonomic Information System - Report*. ITIS. (n.d.). https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=29435#null
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