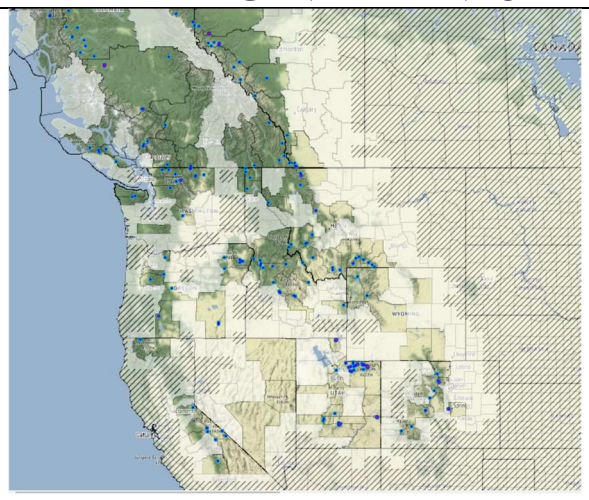
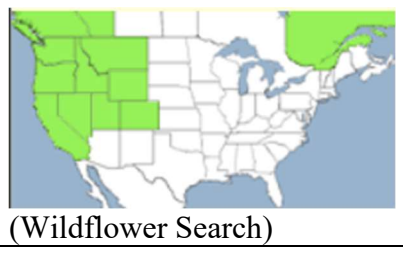
Plant Propagation Protocol for *Antennaria alpina*
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/*2023*/*ANTALP.pdf*

TAXONOMY	
Plant Family	
Scientific Name	Asteracea
Common Name	Sunflower family
Species Scientific Name	
Scientific Name	*Antennaria alpina* (L.) Gaertn
Varieties	*Antennaria alpina* (L.) Gaertn. var. *canescens*[1]
Sub-species	*
Cultivar	
Common Synonym(s)	*Antennaria atriceps* Fernald *Antennaria canescens* (Lange) Malte, Rhodora *Antennaria sornborgeri* Fernald, Rhodora *Antennaria brevistyla* Fernald, Rhodora *Antennaria boecheriana* A.E. Porsild, Bot. Tidskr *Antennaria canescens* (Lange) Malte var. *pseudoporsildii* Bocher, Meddel. *Antennaria canescens* (Lange) Malte subsp. b*oecheriana* (A.E. Porsild) A. Love *Antennaria media* Greene
Common Name(s)	Alpine pussytoes, Alpine everlasting[7]
Species Code (as per USDA Plants database)	ANTALP
GENERAL INFORMATION	
Geographical range	  (Wildflower Search)
Ecological distribution	Moist turf, meadows on cool slopes, often where snow lies late; upper subalpine, alpine.[13]
Climate and elevation range	1500-2300m[9]
Local habitat and abundance	Listed as “vulnerable” in Alaska and parts of Canada. Listed as “Apparently secure” in northern Canada and Greenland. There is no status rank for Idaho.[5]
Plant strategy type / successional stage	Alpine Pussytoes is a perennial herb. They have a self-supporting growth form.[4]
Plant characteristics	  (Wildflower search) *Antennaria alpina* is a forb that is a mat-forming perennial with a branching root crown and ascending stems to 6in. Basal leaves are white hairy and subtend clusters of small, soft, white flowerheads.[7]
PROPAGATION DETAILS **Adapted from *Antennaria (alpina)*[8], *Antennaria (alpina)*[14], and *Antennaria (media)*[12].**	

Ecotype	*Antennaria alpina* is found throughout arctic and subarctic North America and south through the Rocky Mountains in the United States at high elevations.[8]
Ecotype	Subalpine meadows, Logan Pass, 2032 m. elevation. Subalpine to alpine meadows and slopes in stony soils.[12]
Propagation Goal	Plants[8,14,12]
Propagation Method	Seed[8,14,12]
Product Type	Container (plug)[8,12]
Product Type	Propagules[14]
Stock Type	Develop technology for direct seeding of this species for high elevation habitat restoration.[14]
Stock Type	160 ml containers[12]
Time to Grow	6 months[12]
Target Specifications	Height: 2cm, multiple leaves. Root system: Firm plug in containers.[12]
Propagule Collection Instructions	Seeds are collected in late August at high elevations when achenes are easily separated from receptacle. Seeds are black at maturity. Seeds are collected in paper bags and kept in a well ventilated drying shed during the drying process and prior to cleaning.[12]
Propagule Processing/Propagule Characteristics	Seeds exhibit physiological dormancy.[8]
Propagule Processing/Propagule Characteristics	Process seed heads in a hammermill with a #8 (0.125 in diameterholes) screen. Clean processed materials over a fanning mill with light wind to remove light seed and chaff.[14]
Propagule Processing/Propagule Characteristics	Seeds are cleaned with a hammermill and fun over by an office clipper. Seed longevity is estimated for up to 5 years for this genus. Seed dormancy is classified as non dormant.[12] Seeds/kg: 14,520,000/kg % Purity: 100% % Germination: 80%
Pre-Planting Propagule Treatments	Germination occurs at 18C[8]
Pre-Planting Propagule Treatments	Seeds are placed into 80 to 150 day cold, moist stratification.[12]
Pre-Planting Propagule Treatments	In experiments, seeds were chilled in a 6-month cold moist chilling in a refrigerator maintained at 34f to 37f. The seeds were sown on germination pads in petri dishes and kept moist for the duration of the cold chill. The stratified seeds were subsequently exposed to 3 irradiance levels (full, partial, zero) in an environmental growth chamber maintained at 86f days for an 8-hour daylight photoperiod and 68f nights for 16 hours. Each treatment consisted of 5 reps of 25 seeds/rep. Germination of this species did not decrease with decreasing light intensity from full irradiance (mean 268 footcandles) to partial (mean 23 foot candles) and actually increased slightly from 65.6% to 66.4%. Germination of this species did decline substantially from full and partial irradiance to zero irradiance, with a decrease in germination to 33.6%. Seeding mortality was, however, high in the partial and zero irradiance treatments. No appreciable improvement in germination occurred after exposing the partial and zero irradiance groups to a secondary full irradiance.[14]
Growing Area Preparation / Annual Practices for Perennial Crops	Outdoor nursery growing facility. Sowing method is direct seeding. Seeds are surface sown in late fall in conetainers. Conetainers are irrigated thoroughly prior to stratification.[12]
Establishment Phase Details	*Antennaria* seedlings appear to germinate more slowly than many other forb species. Widely fluctuating temperatures during germination of this high elevation species may account for the higher fill rate of outdoor nursery sown seeds vs. greenhouse grown material.[12]
Length of Establishment Phase	4 weeks[12]
Active Growth Phase	Once seedlings are established, plants develop rapid shoot and root growth 2 to 4 weeks following germination. Plants are fertilized with 20-20-20 NPK liquid fertilizer at 100 ppm bi-weekly during the growing season. Plants are mat-forming and quickly fill containers during the rapid growth stage.[12]
Length of Active Growth Phase	8 weeks[12]
Hardening Phase	Plants are fertilized with 10-20-20 NPK liquid fertilizer at 200 ppm in early fall; pots are flushed with water, irrigation is gradually reduced through September and October.[12]
Length of Hardening Phase	4 weeks[12]
Harvesting, Storage and Shipping	Total time to harvest is 6 months. Harvesting is done in July and stored over winter in outdoor nursery under insulating foam cover and snow.[12]
Length of Storage	5 months[12]
Guidelines for Outplanting / Performance on Typical Sites	*
Other Comments	Study results indicate that a 6-month cold moist chilling is adequate to break dormancy, although the optimum amount of cold chilling was not determined. Germination is affected negatively by reduced irradiance, primarily through increased seedling mortality.[14] Additionally, there is much discrepancy of species synonyms amongst sources: *Antennaria media* is both listed as a synonym and noted to be excluded by sources.
INFORMATION SOURCES	
References	Aiken, S.G., Dallwitz, M.J., Consaul, L.L., McJannet, C.L., Boles, R.L., Argus, G.W., Gillett, J.M., Scott, P.J., Elven, R., LeBlanc, M.C., Gillespie, L.J., Brysting, A.K., Solstad, H., and

	Harris, J.G. 2007. Flora of the Canadian Arctic Archipelago: Descriptions, Illustrations, Identification, and Information Retrieval. NRC Research Press, National Research Council of Canada, Ottawa. http://nature.ca/aaflora/data, accessed May 23,2023 "Alpine Pussytoes (*Antennaria Alpina*)." Alpine Pussytoes (*Antennaria alpina*) . Accessed May 23, 2023. https://idfg.idaho.gov/species/taxa/61359. "Alpine Pussytoes (*Antennaria Alpina).*" FWS.gov. Accessed May 23, 2023. https://www.fws.gov/species/alpine-pussytoes-antennaria-alpina. "Alpine Pussytoes." EOL. Accessed May 23, 2023. https://eol.org/pages/467917. "*Antennaria alpina* - Alpine Pussytoes." NatureServe Explorer 2.0. Accessed May 23, 2023. https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.160959/Antennaria_alpina. "*Antennaria alpina*." Hortipedia. Accessed May 23, 2023. https://en.hortipedia.com/Antennaria_alpina. "*Antennaria alpina*." Lady Bird Johnson Wildflower Center . Accessed May 23, 2023. https://www.wildflower.org/plants/result.php?id_plant=ANAL4. Baskin, Jerry M.; Baskin, Carol C.. 2002. Propagation protocol for production of Container (plug) *Antennaria alpina* (L.) Gaertn. plants University of Kentucky Lexington, Kentucky. In: Native Plant Network. URL: https://NativePlantNetwork.org (accessed 2023/05/23). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. Bayer, Randal J. "*Antennaria Alpina* in Global Plants on JSTOR." Compilation Antennaria alpina. Accessed May 23, 2023. https://plants.jstor.org/compilation/Antennaria.alpina. "Flora of North America." *Antennaria Alpina* in Flora of North America. Accessed May 23, 2023. http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250066065. Linnaeus, Carolus. "*Antennaria Alpina.*" Alpine Garden Society Plant Encyclopaedia. Accessed May 23, 2023. http://encyclopaedia.alpinegardensociety.net/plants/Antennaria/alpina. Luna, Tara; Evans, Jeff; Wick, Dale; Hosokawa, Joy. 2008. Propagation protocol for production of Container (plug) *Antennaria media* Greene plants 160 ml containers; USDI NPS - Glacier National Park West Glacier, Montana. In: Native Plant Network. URL: https://NativePlantNetwork.org (accessed 2023/05/23). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. "MTNHP." Alpine Pussytoes, May 23, 2023. https://fieldguide.mt.gov/speciesDetail.aspx?elcode=PDAST0H030. Scianna, Joe. 2003. Propagation protocol for production of Propagules (seeds, cuttings, poles, etc.) *Antennaria alpina* (L.) Gaertn. plants Develop technology for direct seeding of this species for high elevation habitat restoration.; USDA NRCS - Bridger Plant Materials Center Bridger, Montana. In: Native Plant Network. URL: https://NativePlantNetwork.org (accessed 2023/05/23). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. "Wildflower Search." Alpine pussytoes. Accessed May 23, 2023. https://wildflowersearch.org/search?&PlantName=Antennaria%2Balpina.
Other Sources Consulted	
Protocol Author	Caroline Kelly
Date Protocol Created or Updated	05/21/2023