Plant Propagation Protocol for *Balsamorhiza incana*
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/2024/BAIN.pdf

State and county level maps of the range of *Balsamorhiza incana* from the USDA PLANTS database(9)

TAXONOMY	
Plant Family	
Scientific Name	Asteraceae
Common Name	Hoary Balsamroot
Species Scientific Name	
Scientific Name	*Balsamorhiza incana* Nutt.
Varieties	N/A
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	N/A
Common Name(s)	Hoary Balsamroot(5)
Species Code (as per USDA Plants database)	BAIN
GENERAL INFORMATION	
Geographical range	Southeastern Washington, northeastern Oregon, Idaho, Montana, and Wyoming(1)
Ecological distribution	Found primarily on mountainous slopes and meadows (1) and thrives in dry to moderately moist soils(2).
Climate and elevation range	3900-9200ft(5)
Local habitat and abundance	Common in sagebrush steppes alongside sagebrush(6), and alongside native prairie grasses(2)
Plant strategy type / successional stage	Does well in seral succession prairie ecosystems and some early successional forests/clearings(2)

Plant characteristics	Short herbaceous perennial forb with basal leaves growing from a single taproot. Leaves are white to grey, highly pubescent, ovate-lanceolate, and serrated(3,4).
PROPAGATION DETAILS	
Ecotype	Due to a lack of published propagation materials for *Balsamorhiza incana* this section is based off of experiments on propagating the closely related *Balsamorhiza sagittata* conducted at the university of victoria(7)
Propagation Goal	plants
Propagation Method	seed
Product Type	Container(plug)
Stock Type	
Time to Grow	5 months(7)
Target Specifications	Young seedlings in 105ml containers(7)
Propagule Collection Instructions	Mature flowerheads can be harvested from plants and seeds can be removed using a hand tumbler(8). Chaff can then be removed by air screening(8)
Propagule Processing/Propagule Characteristics	At least 5 months of storage in a dry well-ventilated room(7) and longer storage is likely possible. 90,000seeds/kg
Pre-Planting Propagule Treatments	Seeds should be planted in a moist peat based seeding media and treated with Ethrel ethephon solution prepared at 10 ml to 14.4 L water applied till media is saturated to help break dormancy(7). Seeds should be stored at 0 °C and checked daily to see if the radical and cotyledon become visible at which point they should immediately be planted(7). In previous trials and based on anecdotes from growers mold is common when cold stratifying *Balsamorhiza sagittata* and may reduce but not totally inhibit germination(7). Should mold grow on *Balsamorhiza incana* seeds care should be taken to prevent spreading to other seeds, but it still may be possible for the moldy seeds to germinate
Growing Area Preparation / Annual Practices for Perennial Crops	After germination seeds were planted into 105ml growing trays filled with moist growing media(7). Growing media was made at a ratio of one litre of Sunshine mix, one litre of screened river sand, 0.5 litres of extra perlite, and 4g lime to bring the ph to 7(7). These ratios were intended to replicate soil texture and pH of the seed collection site, so ratios may have to be adjusted to match conditions of seed collection sites.
Establishment Phase Details	Seedlings should be planted after they have already begun to germinate
Length of Establishment Phase	45 days(7)
Active Growth Phase	Plants should be kept in a greenhouse during the active growing phase(7). Seedlings were attacked pests like aphids and fungus gnats, but still managed to mature despite this(7). Care should be taken to treat these pests if they are an issue in the greenhouse.

Length of Active Growth Phase	3-4 months(7)
Hardening Phase	Seeds were moved to cold frames in early may and transplanted to their growing sites towards the end of may(7)
Length of Hardening Phase	1 month(7)
Harvesting, Storage and Shipping	Seedlings should not be stored for long periods as they are still actively growing when harvested
Length of Storage	4-5 months(7)
Guidelines for Outplanting / Performance on Typical Sites	Open sites with sufficient moisture to sustain the plants while the taproot develops will be ideal for survival of new transplants.
Other Comments	
INFORMATION SOURCES	
References	1. Don Knoke, David Giblin. *Balsamorhiza incana*. https://burkeherbarium.org/imagecollection/taxon.php?Taxon=Balsamorhiza%20incana (accessed 2024/05/20). Burke Herbarium Image Collection 2. Powell, D.C.; Johnson, C.G.; Crowe, E.A.; Wells, A.; Swanson, D.K. 2007. Potential vegetation hierarchy for the Blue Mountains section of northeastern Oregon, southeastern Washington, and west-central Idaho. Gen. Tech. Rep. PNW-GTR-709. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 87. 3. Oregon Flora. *Balsamorhiza incana* Nutt. Hoary Balsamroot. https://oregonflora.org/taxa/index.php?taxauthid=1&taxon=3225&cl=11123 (accessed 2024/05/20). Oregon State University. 4. Mark Turner. *Balsamorhiza incana* Hoary Balsamroot. https://www.pnwflowers.com/flower/balsamorhiza-incana (accessed 2024/05/20). PNW Wildflowers 5. Flora of North America. 2020. Balsamorhiza incana. https://dev.floranorthamerica.org/Balsamorhiza_incana (accessed 2024/05/20). Flora of North America 6. Montana Field Guide. Hoary Balsamroot — *Balsamorhiza incana.* https://FieldGuide.mt.gov/speciesDetail.aspx?elcode=pdast11050 (accessed 2024/05/20). Montana Natural Heritage Program. 7. Bowen, Pat; Chambers, Kimberlee J; Turner, Nancy J; Keller, Peter C. 2006. Propagation protocol for production of Container (plug) Balsamorhiza sagittata (Pursh) Nutt. plants Rancho Santa Ana Botanic Garden Davis, California. In: Native Plant Network. URL: https://NativePlantNetwork.org (accessed 2024/05/22). US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. 8. Barner, Jim. 2009. Propagation protocol for production of Propagules (seeds, cuttings, poles, etc.) *Balsamorhiza sagittata*

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Other Sources Consulted	Plants for a Future. Balsamorhiza incana – Nutt. https://pfaf.org/User/Plant.aspx?LatinName=Balsamorhiza+incana (accessed 2024/05/20). Plants for a Future Gucker, Corey L.; Shaw, Nancy L. 2018. Arrowleaf balsamroot (Balsamorhiza sagittata). https://www.blm.gov/sites/blm.gov/files/uploads/BASA3.pdf (accessed 2024/05/20). Western forbs: Biology, ecology, and use in restoration
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