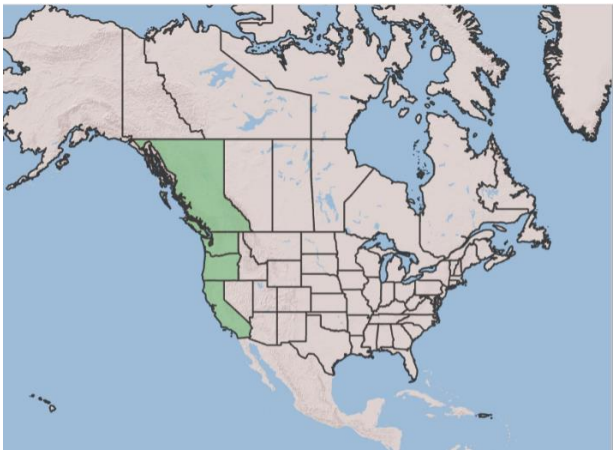
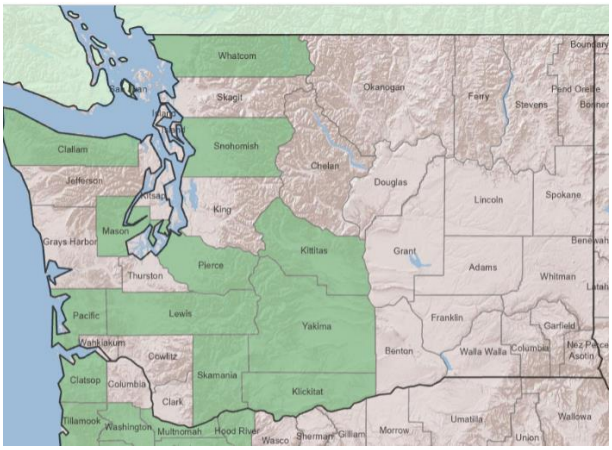
Plant Propagation Protocol for *Anemone lyallii*
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/2022/ANLY.pdf





Top: *Anemone lyallii*[5]. Bottom Left: *A. lyallii* geographic range at the state/providence level[1]. Bottom Right: *A. lyallii* geographic range at the WA county level[1].

TAXONOMY	
Plant Family	
Scientific Name	Ranunculaceae
Common Name	Buttercup family
Species Scientific Name	
Scientific Name	*Anemone lyallii* Britton
Varieties	None
Sub-species	None
Cultivar	None
Common Synonym(s)	*Anemone oligantha* Eastw. *Anemone quinquefolia* L. var. lyallii (Britton) B.L. Rob.
Common Name(s)	Little Mountain thimbleweed
Species Code (as per USDA Plants database)	ANLY
GENERAL INFORMATION	

Geographical range	USA: CA, OR, WA; Canda: B.C.[1]. See USDA maps above[1].
Ecological distribution	Found in low elevation prairies, subalpine ridges[2], and moist shaded slopes[4].
Climate and elevation range	Found at an elevation range of 200-1900m[3]. The plant can tolerate 39-61 inches of rain during a 7-9 month wet season[5]. Preferred temperature range is 45-60° F[5].
Local habitat and abundance	Prefers non-saline soil and a pH of 5.7-6.8[5].
Plant strategy type / successional stage	N/A
Plant characteristics	*A. lyallii* is a perennial[2]. Its shoots are grown from horizontal rhizomes[2]. Flowering stems range from 5-25cm tall[2]. The plant is glabrous to puberulent with three leaflets near the midpoint of the stem and a single white flower[2]. It has 12-20 stamens and numerous pistils[2]. It produces achenes, usually 3-4mm with a style 0.5mm long[2].
SEED PROPAGATION OF *ANEMONE LYALLII*[6]	
Ecotype	Bunchgrass Ridge, Willamette National Forest, Oregon (elevation of 1300-1350m).
Propagation Goal	Germinants
Propagation Method	Seed
Product Type	N/A
Stock Type	N/A
Time to Grow	N/A
Target Specifications	N/A
Propagule Collection Instructions	N/A
Propagule Processing/Propagule Characteristics	Seeds collected as they mature from mid-July to mid-August[7].
Pre-Planting Propagule Treatments	N/A
Growing Area Preparation / Annual Practices for Perennial Crops	Seedlings were germinated in a greenhouse fixed with 1000W, metal-halide lamps to provide natural light.
Establishment Phase Details	Seeds were spread in 25 cm x 25 cm germination flats at a depth of 2 cm. Flats arranged randomly on greenhouse benches. Plants are sub irrigated using a capillary-mat system. A 16 hour light and 8 hour dark photo period was provided. A remay cloth draped over a PVC frame above the bench was installed to reduced contamination by wind-dispersed seeds. Germination was monitored weekly, then biweekly. In *Anemone multifida*, a similar species found in similar geographical range, SmartCote 12-12-12 NPK can be used as a fertilizer[8].
Length of Establishment Phase	2 months

Active Growth Phase	N/A
Length of Active Growth Phase	N/A
Hardening Phase	N/A
Length of Hardening Phase	N/A
Harvesting, Storage and Shipping	N/A
Length of Storage	N/A
Guidelines for Outplanting / Performance on Typical Sites	N/A
Other Comments	N/A
SEED PROPAGATION OF *ANEMONE MULTIFIDA* USING SMOKE TREATMENT[9] (This propagation protocol was created for *Anemone multifida*, not *Anemone lyallii*. *A. multifida* is within the same genus as *A. lyallii* and occupies a similar geographic range. This protocol was included to provide methods to scarify *A. lyallii* [smoke and nitrate]).	
Ecotype	Athabasca Oil Sands Regions, northeastern Alberta
Propagation Goal	Germinants
Propagation Method	Seed
Product Type	N/A
Stock Type	N/A
Time to Grow	N/A
Target Specifications	First emerged radicle.
Propagule Collection Instructions	Seeds collected by hand when ripe between July and September.
Propagule Processing/Propagule Characteristics	N/A
Pre-Planting Propagule Treatments	Seeds were air dried at room temperature with a fan for 2 weeks before being put int dark storage in sealed mason jars at room temperature.
Growing Area Preparation / Annual Practices for Perennial Crops	Three possible treatments: solutions of smoke water, KN[O.sub.3], smoke water + KN[O.sub.3], and distilled water. Smoke water production: smoke was bubbled from a 200L steel combustion drum through 2 L of distilled water for 120 minutes. Cut hay was used as fuel. Smoke water was diluted with distilled water at a ratio of 1:20. KN[O.sub.3] solution preparation: 2g of KN[O.sub.3] was dissolved in 1000mL of distilled water. Smoke water + KN[O.sub.3] solution preparation: 2g of KN[O.sub.3] in 1000mL of 1:20 smoke water solution.
Establishment Phase Details	25 seeds were placed in dry Anchor steel blue seed germination blotter paper in clear sealable 10 cm x 10

	cm plastic germination containers. 25 mL of solution (see Growing Area Preparation) was added to the germination containers. Containers were then randomly placed in a growth chamber with the lids removed for 12 hours so that the contents could air dry. Once a week, containers were randomly moved to different locations in the growth chamber and once or twice per week seeds were watered with distilled water to keep the seeds damp. Containers were sealed after watering. The temperature in the growth chamber was set to 28°C in light for 16 hours and 15°C in dark for 8 hours. Germination rates by treatment solution: Distilled water: about 36% Smoke water: 37% Nitrate: 38% Smoke water + nitrate: 28%
Length of Establishment Phase	N/A
Active Growth Phase	N/A
Length of Active Growth Phase	N/A
Hardening Phase	N/A
Length of Hardening Phase	N/A
Harvesting, Storage and Shipping	N/A
Length of Storage	N/A
Guidelines for Outplanting / Performance on Typical Sites	N/A
Other Comments	N/A
SEED PROPAGATION OF *ANEMONE CYLINDRICA* [10] (This propagation protocol was created for *Anemone cylindrica*, not *Anemone lyallii*. *A. cylindrica* is in the same genus as *A. lyallii*. This protocol was included to provide guidelines for growth after the establishment phase).	
Ecotype	Illinois Prairie sites.
Propagation Goal	plants
Propagation Method	seed
Product Type	Container (plug)
Stock Type	1+0 container plugs
Time to Grow	7 months
Target Specifications	Height: not specified; caliper: none specified; root system: firm root plug
Propagule Collection Instructions	Collect seed by hand from nursery stock. Flowers should be planted in late June so seeds can be harvested in July and August.
Propagule Processing/Propagule Characteristics	Dry seeds after cleaning.

Pre-Planting Propagule Treatments	Seeds are damp stratified by mixing with equal parts seed and vermiculite in a damp container or plastic bag. Seeds are stored for 3-4 months in 34-36 degrees F.
Growing Area Preparation / Annual Practices for Perennial Crops	Plants are grown in a fully controlled greenhouse. 8 ounces of seed are sowed in 64 flats of Multipot #3, #4, or #6. Each flat has a volume of 6 cubic inches, 9cu. in., and 6 cu. in., respectively. Growing media is composed of sterile, Pro-Mix PGX, a 10:1 ratio of vermiculite and perlite, and 5 ounces of Osmocote 17-6-10 slow-release fertilizer per cubic foot of soil. Flats should be tapped down to prevent settling.
Establishment Phase Details	Seeds placed in the greenhouse with temperatures set to 70-80 degrees F during the day and 65-75 degrees F during the night. Water plants by hand with the gentle shower setting on the hose to prevent seeds from splashing out of the germination flats.
Length of Establishment Phase	75% germination occurs in roughly 2.5 weeks.
Active Growth Phase	Once plants have germinated, greenhouse temperatures may be gradually turned down depending on the outside temperature. Plants are soaked every morning for 20-30 minutes so foliage will not dry during the day. Plants are ready to be fertilized once true leaves appear, though be careful to make the distinction between true leaves and cotyledons. Use 50ppm of Rapid Grow or Peter's Liquid Fertilizer once a week to start. Gradually increase the rate to 200ppm, then decrease back to 50ppm before moving plants out to the shade house. To rinse fertilizer residue off the foliage, water plants for 30 seconds. Thin plants to 2 plants/cell. When foliage reaches 8-10 inches, prune plants back to 3-4 inches with scissors or sheers. Remove clipping from flats to prevent disease spread.
Length of Active Growth Phase	N/A
Hardening Phase	Move plants to the hoop house in late January to February. Irrigation rate is reduced to 50ppm and temperature is reduced to 55-60 degrees F during the day to acclimate the plants. Plants that reach 8-10 inches in the shade house will need to be pruned.
Length of Hardening Phase	N/A
Harvesting, Storage and Shipping	Flats may be unplugged in October or November if most of the tops have died down. Plugs that are not shipped during the fall may be stored for spring planting in cold rooms 40-50 degrees F. Remove dead foliage before bagging the root plugs for storage. Plants

	should be stored on plastic bags to prevent roots from drying out.
Length of Storage	4-6 months
Guidelines for Outplanting / Performance on Typical Sites	N/A
Other Comments	N/A
INFORMATION SOURCES	
References	See below
Other Sources Consulted	See below
Protocol Author	Alexandria Crabtree
Date Protocol Created or Updated	5/23/2022

References

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[3]"Anemone Lyallii ." Global Plants on JSTOR. Accessed May 20, 2022. https://plants.jstor.org/compilation/Anemone.lyallii.

[4]Simino, Scott. "Anemone Lyallii." Jepson Flora Project (eds.). Jepson eFlora. Accessed May 20, 2022. https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=13362.

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[6]Lang, Nicole L, and Charles B Halpern. "The Soil Seed Bank of a Montane Meadow: Consequences of Conifer Encroachment and Implications for Restoration." *Canadian Journal of Botany* 85, no. 6 (June 2007): 557+. https://doi.org/10.1139/B07-051.

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