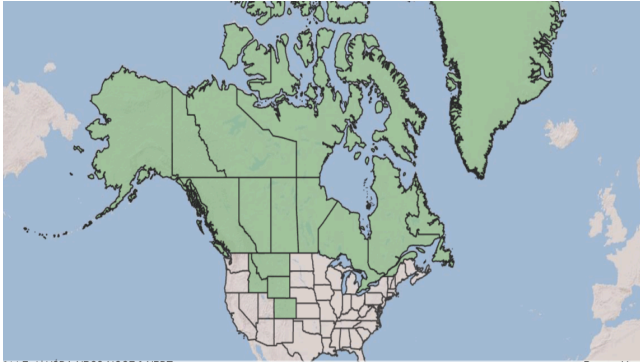


Plant Propagation Protocol for *Arnica angustifolia*

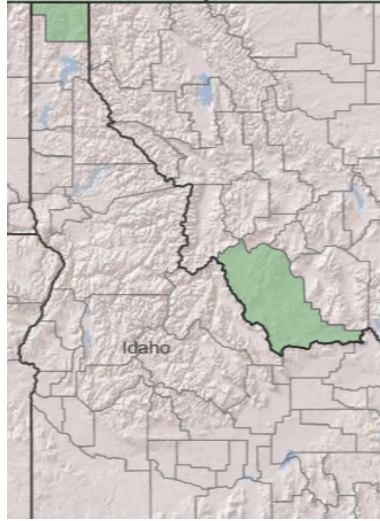
ESRM 412 - Native Plant Production

Spring 2025

North America Distribution



Idaho Distribution



Source: USDA PLANTS Database

TAXONOMY	
Plant Family	Asteraceae
Scientific Name	<i>Arnica angustifolia</i>
Common Name	Narrowleaf arnica
Species Scientific Name	<i>angustifolia</i>
Scientific Name	<i>Arnica angustifolia</i> Vahl

Varieties	<p><i>Arnica angustifolia</i> var. <i>alpina</i> (L.) I.M. Johnst.</p> <p><i>Arnica angustifolia</i> var. <i>attenuata</i> (Greene) Maguire</p> <p><i>Arnica angustifolia</i> var. <i>chamissonis</i> (Less.) Maguire</p> <p><i>Arnica angustifolia</i> var. <i>tomentosa</i> (Greene) Maguire¹⁰</p>
Sub-species	None officially recognized beyond the varieties listed.
Cultivar	None documented or named in cultivation literature
Common Synonym(s)	<i>Arnica alpina</i> (L.) Olin, <i>Arnica chamissonis</i> Less. ²
Common Name(s)	Narrowleaf arnica, northern arnica, alpine arnica
Species Code (as per USDA Plants database)	ARAN5
GENERAL INFORMATION	
Geographical range	Occurs across boreal and alpine North America including Alaska, western and northern Canada (British Columbia, Alberta, Yukon), and the northern continental U.S. including Montana, and parts of Idaho. Not documented in Washington or Oregon at the county level. Confined occurrence is visible in one Idaho county. ¹⁰ See maps above for distribution in North America and Idaho state.

Ecological distribution	Found in alpine tundra, subalpine meadows, and open coniferous forests. Prefers well-drained soils and is often found in montane or high-elevation ecosystems. ⁵
Climate and elevation range	Cold climate specialist. Found at elevations from 1,200 to 3,000 meters (approximately 3,900 to 9,800 feet). Grows in areas with cool summers, harsh winters, and relatively short growing seasons. ⁵
Local habitat and abundance	Common in alpine meadows and tundra alongside species such as <i>Dryas octopetala</i> , <i>Geum rossii</i> , <i>Carex spp.</i> , and <i>Phyllodoce empetriformis</i> . Often scattered or in isolated clumps in otherwise sparse vegetation. ⁵
Plant strategy type / successional stage	Stress-tolerant species adapted to nutrient-poor, exposed alpine environments. It typically establishes in the early to mid stages of ecological succession, especially in disturbed high-elevation soils. ^{[3][5]}
Plant characteristics	Herbaceous perennial forb. Rhizomatous, clonal growth. Yellow daisy-like composite flowers. Can live for decades in undisturbed alpine conditions. Reproduces both sexually and vegetatively. Height ranges from 10-40 cm. ^{[2][5]}

PROPAGATION DETAILS: FROM SEED

Ecotype	No experimentally derived ecotype reported; information compiled from wild-sourced populations and closely related taxa where applicable.
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	Seedlings
Time to Grow	1 growing season (~4-6 months)
Target Specifications	15-25 cm tall, healthy root system suitable for alpine outplanting. ³
Propagule Collection Instructions	Seeds should be collected in late summer to early autumn when seed heads are dry and fluffy. Collect from at least 50 individuals to maintain genetic diversity. ^{[1][7]}
Propagule Processing/Propagule Characteristics	~1 million seeds per kg. Seeds are lightweight, with moderate to short viability (~1-2 years) unless stored properly. ⁷
Pre-Planting Propagule Treatments	Cold-moist stratification for 4-6 weeks at 1-5 degrees celsius recommended to break physiological dormancy. ^{[1][9]}

Growing Area Preparation / Annual Practices for Perennial Crops	Sown into 1:1:1 peat: sand: vermiculite mixture in plug trays or pots. Bottom irrigation and moderate moisture maintained. ³
Establishment Phase Details	Germination occurs within 2-3 weeks post-stratification at 15-20 degrees celsius. Maintain moderate light. ¹
Length of Establishment Phase	3 weeks
Active Growth Phase	Thinning as needed. Fertilize with low-nitrogen formula. Increase sunlight gradually. Water moderately. ^{[3][6]}
Length of Active Growth Phase	10-12 weeks
Hardening Phase	Gradually reduce watering and lower night temperatures for cold acclimatization. Transition to outdoor conditions. ³
Length of Hardening Phase	4 weeks
Harvesting, Storage and Shipping	Harvest by lifting with the plug intact. Ship in moist medium, cool temps (<10 degrees celsius). Avoid long-term storage. ^{[3][6]}
Length of Storage	1-2 weeks at most under cool, humid conditions. ⁶
Guidelines for Outplanting / Performance on Typical Sites	Plant early in the growing season into well-drained alpine soil. 70-90% survival reported in experimental trials. First flowering typically after second year. ^{[3][6]}
Other Comments	Collection may be restricted in protected areas. Use of local seed sources strongly recommended to ensure adaptation. ^{[4][8]}

	<p>Note: Several propagation practices are adapted from closely related species such as <i>Arnica montana</i> and <i>Arnica chamissonis</i> where data specific to <i>A. angustifolia</i> is unavailable. This approach provides a biologically relevant framework for protocols in similar alpine environments.</p>
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PROPAGATION DETAILS: VEGETATIVE	
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Ecotype	No experimentally derived ecotype reported; information compiled from wild-sourced populations and closely related taxa where applicable.
Propagation Goal	Plants
Propagation Method	Vegetative
Product Type	Bareroot (field grown)
Stock Type	Clonal ramets (rhizome divisions)
Time to Grow	1 full growing season (~4-5 months)
Target Specifications	Healthy ramets with 2-4 rosettes and developed root system.
Propagule Collection Instructions	Excavate rhizome clusters in early spring or post-flowering in late summer. Ensure fragments contain root and shoot nodes. ^{[6][7]}

Propagule Processing/Propagule Characteristics	Trim to 5-10 cm, removing excess foliage. Store moist if transplanting is delayed. ⁷
Pre-Planting Propagule Treatments	Disinfect rhizomes with mild fungicide if desired. Plant within 1-2 days for best viability. ⁶
Growing Area Preparation / Annual Practices for Perennial Crops	Prepare well-drained loamy or sandy beds. Amend with organic matter. Space 15-30 cm apart. ^{[6][7]}
Establishment Phase Details	Water thoroughly after transplanting. Apply mulch for moisture retention. Monitor weekly. ⁶
Length of Establishment Phase	2-4 weeks
Active Growth Phase	Apply balanced fertilizer monthly. Control weeds and pests. Plants develop shoots and lateral roots. ⁷
Length of Active Growth Phase	8-10 weeks
Hardening Phase	Reduce water, cease fertilization. Allow plants to acclimate to seasonal conditions. ⁶
Length of Hardening Phase	4 weeks
Harvesting, Storage and Shipping	Lift with soil ball or bare-root. Wrap in a moist medium and cool pack. Ship within 1 week. ^{[6][7]}
Length of Storage	<1 week preferred, up to 2 weeks under refrigeration (2-5 degrees celsius) ⁶

Guidelines for Outplanting / Performance on Typical Sites	Plant in late spring or early fall. Flowering may begin in the first or second year. Clonal expansion can be observed after 2 years. ⁶
Other Comments	Avoid clonal propagation from single genets to maintain genetic diversity. Replanting in alpine regions may require permits. ⁷ Note: Several vegetative propagation practices in this section are adapted from closely related taxa such as <i>Arnica montana</i> and <i>Arnica chamissonis</i> due to limited data on <i>Arnica angustifolia</i> . These species share similar ecological niches, offering useful proxies for protocol development.
INFORMATION SOURCES	
References	See Below
Other Sources Consulted	See Below
Protocol Author	Nala Tillman
Date Protocol Created or Updated	05/06/25

References:

¹Balabanova, Vessela & Vitkova, Antonina & Zheleva-Dimitrova, Dimitrina. (2013).

Comparative study of germination and seed antioxidant activity of *arnica montana* L.

And *arnica chamissonis* Less. (Asteracea). *Comptes Rendus de L'Academie Bulgare des Sciences*. 66. 1261-1268.

²Downie, S. R., & Denford, K. E. (1988). TAXONOMY OF ARNICA (ASTERACEAE)

SUBGENUS ARCTICA. *Rhodora*, 90(863), 245–275.

<http://www.jstor.org/stable/23312433>

³Hagen, D. (2002). Propagation of native Arctic and alpine species with a restoration potential.

Polar Research, 21(1), 37–47. <https://doi.org/10.3402/polar.v21i1.6472>

⁴Hollmann, V., Donath, T. W., Grammel, F., Himmighofen, T., Zerahn, U., & Leyer, I. (2020).

From nutrients to competition processes: Habitat specific threats to *Arnica montana* L. populations in Hesse, Germany. *PLoS ONE*, 15(5), e0233709.

<https://doi.org/10.1371/journal.pone.0233709>

⁵Jäkäläniemi, A. (2011). Narrow climate and habitat envelope affect the survival of relict

populations of a northern *Arnica angustifolia*. *Environmental and Experimental Botany*, 72(3), 415–421. <https://doi.org/10.1016/j.envexpbot.2011.03.013>

⁶Pljevljakušić, D., Janković, T., Jelačić, S., Novaković, M., Menković, N., Beatović, D., &

Dajić-Stevanović, Z. (2013). Morphological and chemical characterization of *Arnica montana* L. under different cultivation models. *Industrial Crops and Products*, 52,

233–244. <https://doi.org/10.1016/j.indcrop.2013.10.035>

- ⁷Sugier, D., Sugier, P., & Gawlik-Dziki, U. (2013). Propagation and Introduction of *Arnica montana* L. into Cultivation: A Step to Reduce the Pressure on Endangered and High-Valued Medicinal Plant Species. *The Scientific World JOURNAL*, 2013(1).
<https://doi.org/10.1155/2013/414363>
- ⁸Sugier, P., Kołos, A., Wołkowycki, D., Sugier, D., Plak, A., & Sozinov, O. (2018). Evaluation of species inter-relations and soil conditions in *Arnica montana* L. habitats: a step towards active protection of endangered and high-valued medicinal plant species in NE Poland. *Acta Societatis Botanicorum Poloniae*, 87(3). <https://doi.org/10.5586/asbp.3592>
- ⁹Thompson, K., & Grime, J. P. (1983). A Comparative Study of Germination Responses to Diurnally-Fluctuating Temperatures. *Journal of Applied Ecology*, 20(1), 141–156.
<https://doi.org/10.2307/2403382>
- ¹⁰USDA Plants Database. (n.d.-b). <https://plants.usda.gov/plant-profile/ARAN5>. [Accessed: 5/6/2025 2:13:05 PM]
- ¹¹Vera, M., Romero, R., Rodríguez-Gutián, M. A., Barros, R. M., Real, C., & Bouza, C. (2014). Phylogeography and genetic variability of the *Arnica montana* chemotypes in NW Iberian Peninsula. *Silvae Genetica/Silvae Genetica*, 63(1–6), 293–300.
<https://doi.org/10.1515/sg-2014-0037>

Other Sources Consulted (but then contained no pertinent information):

Maurice, T., Colling, G., Muller, S., & Matthies, D. (2012). Habitat characteristics, stage structure and reproduction of colline and montane populations of the threatened species *Arnica montana*. *Plant Ecology*, *213*(5), 831–842.
<https://doi.org/10.1007/s11258-012-0045-1>

Sugier, P., Rysiak, A., Sugier, D., Winiarczyk, K., Wołkowycki, D., & Kołos, A. (2022). Differentiation and Propagation Potential of *Arnica montana* L. Achenes as a Consequence of the Morphological Diversity of Flowers and the Position of Flower Heads on the Plant. *Plants*, *11*(24), 3424. <https://doi.org/10.3390/plants11243424>