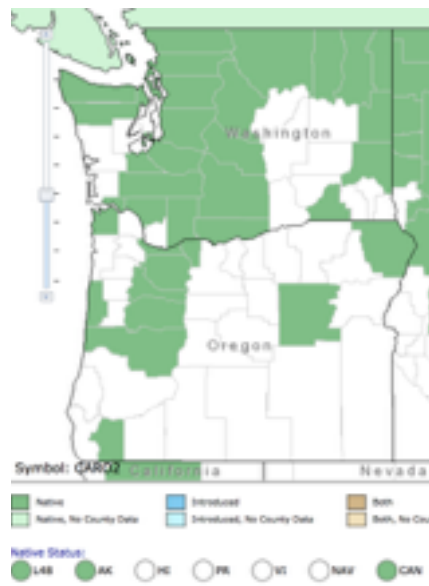


Plant Propagation Protocol for *Campanula rotundifolia*
 ESRM 412 – Native Plant Production



(Plant images source²) (Maps photo source¹)

TAXONOMY	
Plant Family	Campanulaceae ¹
Scientific Name	<i>Campanula rotundifolia</i> L. ¹
Common Name	bluebell bellflower ¹

Species Scientific Name	<i>Campanula rotundifolia</i> ¹
Scientific Name	<i>Campanula</i> L. <i>Campanula rotundifolia</i> L. ¹
Varieties	<i>Campanula alaskana</i> (A. Gray) W. Wight ex J.P. Anderson (CAAL19), <i>Campanula dubia</i> A. DC. (CADU9), <i>Campanula gieseckiana</i> Vest ex Schult. (CAGI15), <i>Campanula gieseckiana</i> Vest ex Schult. ssp. <i>groenlandica</i> (Berlin) Böcher (CAGIG4), <i>Campanula gieseckiana</i> Vest ex Schult. var. <i>arctica</i> (Lange) Böcher (CAGIA2), <i>Campanula groenlandica</i> Berlin (CAGR39), <i>Campanula heterodoxa</i> Bong. (CAHE15), <i>Campanula intercedens</i> Witasek (CAIN28), <i>Campanula petiolata</i> A. DC. (CAPE27), <i>Campanula rotundifolia</i> L. ssp. <i>groenlandica</i> (Berlin) Á. Löve & D. Löve (CAROG), <i>Campanula rotundifolia</i> L. ssp. <i>intercedens</i> (Witasek) Á. Löve & D. Löve (CAROI2), <i>Campanula rotundifolia</i> L. var. <i>alaskana</i> A. Gray (CAROA4), <i>Campanula rotundifolia</i> L. var. <i>alpina</i> Tuck. (CAROA5), <i>Campanula rotundifolia</i> L. var. <i>arctica</i> Lange (CAROA6), <i>Campanula rotundifolia</i> L. var. <i>intercedens</i> (Witasek) Farw. (CAROI), <i>Campanula rotundifolia</i> L. var. <i>lancifolia</i> Mert. & W.D.J. Koch (CAROL), <i>Campanula rotundifolia</i> L. var. <i>petiolata</i> (A. DC.) J.K. Henry (CAROP), <i>Campanula rotundifolia</i> L. var. <i>velutina</i> A. DC. (CAROV), <i>Campanula sacajaweana</i> M. Peck (CASA13) ¹
Sub-species	n/a
Cultivar	<i>Campanula rotundifolia</i>

Common Synonym(s)	<i>Campanula alaskana</i> , <i>Campanula dubia</i> , <i>Campanula gieseckiana</i> , <i>Campanula gieseckiana</i> ssp. <i>groenlandica</i> , <i>Campanula gieseckiana</i> var. <i>arctica</i> , <i>Campanula groenlandica</i> , <i>Campanula heterodoxa</i> , <i>Campanula intercedens</i> , <i>Campanula petiolata</i> , <i>Campanula rotundifolia</i> ssp. <i>groenlandica</i> , <i>Campanula rotundifolia</i> ssp. <i>intercedens</i> , <i>Campanula rotundifolia</i> var. <i>alaskana</i> , <i>Campanula rotundifolia</i> var. <i>alpina</i> , <i>Campanula rotundifolia</i> var. <i>arctica</i> , <i>Campanula rotundifolia</i> var. <i>intercedens</i> , <i>Campanula rotundifolia</i> var. <i>lancifolia</i> , <i>Campanula rotundifolia</i> var. <i>petiolata</i> , <i>Campanula rotundifolia</i> var. <i>velutina</i> , <i>Campanula sacajaweana</i> ²
Common Name(s)	Bluebell bellflower, Bluebell of Scotland, Bluebell, Harebell, Witches' Thimble ² , blue rain flowers ⁴
Species Code (as per USDA Plants database)	CARO2 ¹
GENERAL INFORMATION	
Geographical range	Appears commonly throughout North America as far North as Alaska, throughout Canada, and in most of the lower 48, with the exception of the Southeastern United States East of Texas and South of Missouri. Grows as far South as Arizona, Texas, and Northeastern Mexico. ²
Ecological distribution	Occurs in a variety of ecosystem types, including moist temperate regions, rocky mountainsides, dry meadows and prairies, open woodlands, limey cliffs, and coastal areas or beaches. Thrives in sandy, well-drained soils. ²
Climate and elevation range	Tolerant of sun, partial shade, and completely shaded growth environments. ² Preference towards cooler summer temperatures and/or partial shade during summer months, intolerant of extreme heat. ³ Grow in elevations ranging from seas-level up to 12,000 ft.

Local habitat and abundance	Grow best in large groups or clumps on natural/wildland sites. Prefers to grow underneath trees or shade-providing shrubs in warmer climates. ³
Plant strategy type / successional stage	Fast-growing and adaptable species with long-lasting flowers. ¹ Grows well in a variety of soil types and site conditions. ⁶ Variations in response to environmental conditions such as moisture and nutrient availability, and sun exposure include size/stature, texture, number of flowers and branches per stem. ⁸
Plant characteristics	<p><u>Classification:</u> Dicot, forb/herb, perennial¹</p> <p><u>Characteristics:</u> Highly adaptable to a variety of conditions, grows and self-seeds easily. Physical appearance may vary greatly depending on geographical location and growth conditions.² Require a consistent source of moisture.³</p> <p><u>Appearance:</u> Delicate flowering plant with slim, clustered but unbranched stems that may be erect or bent if overburdened, 1-3 ft in height. Rounded basal leaves wither early in the flowering season, leaving stems and blooms. Flowers are approximately 0.5 inches in length, pale to vivid blue-purple in color and hang from stems either singly or in clusters. Attached to the tip of stems, flowers have a droopy, nodding appearance.² When broken, stems and leaves emit a milky sap.⁴ Fruit grows out of the flower in a cylindrical, many-seeded nodding capsule.^{7,8}</p>

PROPAGATION DETAILS

Ecotype	n/a
Propagation Goal	Mature plants, seeds, stem cuttings
Propagation Method	Seed
Product Type	Propagules (seeds)
Stock Type	Seed
Time to Grow	At least one growing season (early spring-summer)
Target Specifications	Mature, flowering plants

Propagule Collection Instructions	Seeds may be collected manually (in Northern United States) during seeding period of late July-mid September or commercially purchased. ² Collect seed pods when they begin to split at the base, mature seeds will appear black in color. ¹⁰
Propagule Processing/Propagule Characteristics	14,400,000 seeds/lb ⁵
Pre-Planting Propagule Treatments	No required pre-treatment, seeds require light for proper germination. ² May be kept in cool storage in a nursery setting for stratification period of 30 days, or planted directly outdoors during winter or early spring. ⁵
Growing Area Preparation / Annual Practices for Perennial Crops	Seeds should be surface sown indoors (preferably), uncovered and bottom-watered for best results and most efficient growth. ² Optimal media type includes well-drained light-medium sandy or loamy soils in a neutral-alkaline pH. ⁶
Establishment Phase Details	Sow in a cold frame after an optimal 3-4 weeks of chilling (not required). Seeds may also be sown outdoors. ⁶ Seeds may be sown in a 160mL container (plug) ¹⁰
Length of Establishment Phase	Germination typically occurs after 2-4 weeks. ⁶
Active Growth Phase	Seedlings should remain in a cold frame for at least their first winter, will mature over the course of a year, but will not flower until their second season. After their first winter, seedlings may be out planted in spring or summer after the end of frost season. ⁶
Length of Active Growth Phase	Fully root after 7 weeks, full growth phase lasts 9 months. ¹⁰
Hardening Phase	As a perennial, plants will survive winter and utilize the months between growing/reproductive seasons to mature. ⁴
Length of Hardening Phase	Will not flower until after at least the second winter, but will grow to full size within one growing season. ⁴ May be harvested after 9 months. ¹⁰

Harvesting, Storage and Shipping	Seedlings may be kept in outdoor nursery plots, gardens, window boxes, and in green/hoophouses as long as needed and can be outplanted in spring-summer. ⁹
Length of Storage	0-2 years ⁶
Guidelines for Outplanting / Performance on Typical Sites	Once established, capable of self-sowing and reproducing on an outplanting site. ⁶ If necessary, hoe to control populations, especially on small-scale sites. ⁸

PROPAGATION DETAILS	
Ecotype	n/a
Propagation Goal	Mature plants, seeds, stem cuttings
Propagation Method	Vegetative - root or stem cuttings ³
Product Type	Root/stem cuttings
Stock Type	Cuttings
Time to Grow	Plant in spring. ⁶
Target Specifications	Mature, flowering plants
Propagule Collection Instructions	Make basal cuttings from a mature flower-capable plant.
Propagule Processing/Propagule Characteristics	Root or stem cutting.
Pre-Planting Propagule Treatments	Place cuttings in clean, well-drained but moist media. No prior treatment necessary. ⁶
Growing Area Preparation / Annual Practices for Perennial Crops	Cuttings should be planted in damp, sandy, well-drained growing medium. ²
Establishment Phase Details	Larger or more developed clumps may be directly outplanted to their final site, however smaller clumps should be potted and grown in a greenhouse setting. ⁶
Length of Establishment Phase	n/a (cutting)
Active Growth Phase	Harvest shoots when they have reached approximately 10-15 cm in length, with sufficiently developed underground stem. Shoots may then be placed in individual pots in a greenhouse under cool, light-shade conditions. ⁶
Length of Active Growth Phase	Several months depending on the size of the cutting.

Hardening Phase	Once root systems are strongly developed, cuttings may be outplanted in summer, or if not ready, the following spring. ⁶
Length of Hardening Phase	Plants will mature but not flower until at least the second year. ²
Harvesting, Storage and Shipping	Well-Established and rooted cuttings can be shipped and out planted at any time or stored in containers in the nursery setting. ⁶

Length of Storage	5 months ¹⁰
Guidelines for Outplanting / Performance on Typical Sites	Like seed-grown plants, cutting-grown plants perform well when outplanted, self-seeding and reproducing quickly without aid. ⁶

Harvesting, Storage and Shipping	Seedlings may be kept in outdoor nursery plots, gardens, window boxes, and in green/hoophouses as long as needed and can be outplanted in spring-summer. ⁹
Length of Storage	0-2 years ⁶
Guidelines for Outplanting / Performance on Typical Sites	Once established, capable of self-sowing and reproducing on an outplanting site. ⁶ If necessary, hoe to control populations, especially on small-scale sites. ⁸

INFORMATION SOURCES

References

¹"Campanula Rotundifolia L. - Bluebell Bellflower." Plants Profile for Campanula Rotundifolia (bluebell Bellflower). Accessed May 24, 2019. <https://plants.usda.gov/core/profile?symbol=caro2>.

²"Plant Database: Campanula Rotundifolia." Lady Bird Johnson Wildflower Center - The University of Texas at Austin. Accessed May 24, 2019. https://www.wildflower.org/plants/result.php?id_plant=caro2.

³"Campanula Rotundifolia." Campanula Rotundifolia - Plant Finder. Accessed May 24, 2019. <http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=278849&isprofile=0&>.

⁴"Plant of the Week." Harebell. Accessed May 24, 2019. https://www.fs.fed.us/wildflowers/plant-of-the-week/campanula_rotundifolia.shtml.

⁵"Campanula Rotundifolia - Harebell." Prairie Moon Nursery. Accessed May 24, 2019. <https://www.prairiemoon.com/campanula-rotundifolia-harebell-prairie-moon-nursery.html>.

⁶"Campanula Rotundifolia." Pfaf Plant Search. Accessed May 24, 2019. https://pfaf.org/user/Plant.aspx?LatinName=Campanula_rotundifolia.

⁷"Harebell (Campanula Rotundifolia)." Harebell (Campanula Rotundifolia) Species Page. Accessed May 24, 2019. http://www.bio.brandeis.edu/fieldbio/Wildflowers_Kimonis_Kramer/PAGES/HAREBELL_PAGE_FINAL.html.

⁸"Campanula Rotundifolia L." SEINet Portal Network - Campanula Rotundifolia. Accessed May 24, 2019. <http://swbiodiversity.org/seinet/taxa/index.php?taxon=2594>.

	<p>⁹"Where and How to Grow Harebell Campanula Rotundifolia Our Advice Section & Customers Meadow Pictures." MeadowMania UK. May 29, 2015. Accessed May 24, 2019. https://www.meadowmania.co.uk/news/grow-harebell-campanula-rotundifolia/.</p> <p>¹⁰"Native Plant Network." Reforestation, Nurseries and Genetics Resources. Accessed May 24, 2019. https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=campanulaceae-campanula-46&referer=wildflower.</p>
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