

Plant Propagation Protocol for *Aquilegia brevistyla*

ESRM 412 – Native Plant Production

URL: [https://courses.washington.edu/esrm412/protocols/\[2021\]/\[AQBR.pdf\]](https://courses.washington.edu/esrm412/protocols/[2021]/[AQBR.pdf])

TAXONOMY	
Plant Family	
Scientific Name	<i>Ranunculaceae</i>
Common Name	Buttercup
Species	
Scientific Name	
Scientific Name	<i>Aquilegia brevistyla</i> Hook. (USDA, 2021)
Varieties	<i>Aquilegia brevistyla</i> Hook. (USDA, 2021)
Sub-species	
Cultivar	
Common Synonym(s)	<i>Aquilegia canadensis</i> var. <i>hybrida</i> Hook. (ITIS, 2021)
Common Name(s)	Smallflower Columbine (USDA, 2021), Short-styled Columbine (Montana Field Guide, 2021).
Species Code (as per USDA Plants database)	AQBR (USDA, 2021)
GENERAL INFORMATION	
Geographical range	Ranges from Alaska southward through British Columbia, and eastwards towards Ontario. Disjunct relict populations can be found in Montana, Wyoming, and the Black Hills region of South Dakota (USFWS, 2021).
Ecological distribution	Occurs in meadows, open woodlands, shores, stream banks, and moist rock outcrops. The Black Hills population typically occurs on north-facing slopes with a cool climate (USFWS, 2021).
Climate and elevation range	Climate is considered “not evaluated, unknown, or variable,” (Meidinger et al., 2009). Elevation range from 800 to 3,500 meters (PFAF, 2021).
Local habitat and abundance	<p>Average slope gradient for this species is 31% (Klinkenberg, 2021). Found in moist, well-drained sandy or loam soils that have acidic, neutral, and basic pH values (PFAF, 2021).</p> <p>Often exists within the geographic range of several key pollinator species: <i>Bombus vagans</i> (Macior, 1968), <i>Bombus sitkensis</i> (Thorp et al., 1983), and <i>Bombus impatiens</i> (Dumesh, 2010). The plant is also a larval host to Columbine Duskywing (<i>Erynnis lucilius</i>) (Lady Bird Johnson Wildflower Center, 2010).</p> <p>The species’ conservation status is considered “secure,” (Nature Serve, 2021). However, there is a low abundance in the Black Hills (USDA, 2021).</p>
Plant strategy type /	Short-lived perennial (2-3 years). Persists in region by producing seeds prolifically throughout its lifecycle. Can easily hybridize with other

successional stage	members of the <i>Aquilegia</i> genus. Colonizes immediate region by being highly competitive for resources; inhibits the growth of other plants (UTP, 2021).
Plant characteristics	<p>Rhizomatous perennial forb/herb (USDA, 2021). Typically ranges from 20 to 80 centimeters tall. Nodding flowers with perpendicular blue sepals (12 to 20 millimeters long), pale yellow or white blades (7 to 10 millimeters long), and hooked blue spurs (5 to 8 millimeters long). Leaves are compound and are often glabrous above and either pubescent or glabrous on underside (USFWS, 2021).</p> <p>Flowers bloom from June through August and the plant produces follicles (Lady Bird Johnson Wildflower Center, 2010).</p>
PROPAGATION DETAILS	
Ecotype	
Propagation Goal	Plants, Seeds
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	1 + 0 seedlings
Time to Grow	A plantable <i>Aquilegia brevistyla</i> seedling can be produced in one growing season at a nursery. The plant will not flower until the next growing season, and will not reach full maturity until the third (Floristics, 2021).
Target Specifications	Seedlings can be outplanted from containers into the field, or transplanted into a growing bed. Need to have true leaves and be large enough to handle in order to outplant (Floristics, 2021). Can easily establish themselves once outplanted.
Propagule Collection Instructions	Can typically harvest seeds from mature plants (3 years) in mid-July, or whenever the seeds are ripe. Ripe seed pods will change in color from green to a dark brownish-yellow, and the seed pods will open and release seeds with little effort. Seeds can be collect seeds by hand by shaking the seed pods into a collection bag (Wisconsin Wonder Garden, 2019).
Propagule Processing/Propagule Characteristics	363,000 seeds per pound. After harvesting, immediately store seeds in cold, dry environment for 3 to 6 weeks (cold stratification) then immediately sow (Wisconsin Wonder Garden, 2019).
Pre-Planting Propagule Treatments	Can be immediately stored after harvesting. The plants freely self-seed, so little to no cleaning is necessary. Store in a cool, dry environment (refrigerator stratification for 3-6 weeks). Cold stratification will encourage germination so seed can be planted (Floristics, 2021).
Growing Area Preparation / Annual Practices for Perennial Crops	Following cold stratification, sow seeds into boxes with media consisting of light substrate (humus, sand, and leaf soil in equal proportions). Cover seeds with 0.11 inches of sieved soil and cover box in cloth. Store the box in a shaded area at 61 to 64 degrees Fahrenheit and mist soil with water when needed. Once sprouts emerge and form true leaves (typically occurs

	in late April or early May if sown in March), transplant the seedlings to loamy soil in individual containers (Floristics, 2021).
Establishment Phase Details	Low-maintenance plant. Readily self-establishes itself in a wide variety of soils. Wet media with a mister as necessary (Floristics, 2021).
Length of Establishment Phase	Sprouts approximately 1-2 weeks following sowing, true leaves establish after approximately one month (Floristics, 2021).
Active Growth Phase	Consider relative shading to help protect young shoots from direct sunlight. Adults are capable of growing in full sun (as well as half-shade). Plant prefers moist, but not saturated soils. Monitor planting area for weeds and remove as necessary. Fertilize the plant twice during the summer with superphosphate, potassium salt, saltpeter, and mullein (Floristics, 2021).
Length of Active Growth Phase	5 months per season (plant reaches maturity at 3 years) (Floristics, 2021)
Hardening Phase	Begins in late summer when colder nighttime temperatures emerge.
Length of Hardening Phase	3 months
Harvesting, Storage and Shipping	Hand-harvest seeds, cold stratification, and plant in following late-winter/early spring.
Length of Storage	5 months
Guidelines for Outplanting / Performance on Typical Sites	Easily establishes in a range of soil qualities. High percentage of survival. Adult plants typically ranges from 20 to 80 centimeters tall (USFWS, 2021). Flowers two years after planting and mature after three years (Floristics, 2021).
Other Comments	N/A

INFORMATION SOURCES

References	<p>“<i>Aquilegia</i> – planting and care, growing from seeds.” <i>Floristics</i>, 5 May 2021, https://floristics.info/en/garden/3344-aquilegia-planting-and-care-growing-from-seeds.html. Accessed 5 May 2021.</p> <p>“<i>Aquilegia Express</i>: Blue Columbines.” <i>U.S. Forest Service</i>, https://www.fs.fed.us/wildflowers/beauty/columbines/aquilegia_brevistyla.shtml. Accessed 5 May 2021.</p> <p>“<i>Aquilegia brevistyla</i>.” <i>Nature Serve Explorer</i>, 30 March 2021, https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.130248/Aquilegia_brevistyla. Accessed 5 May 2021.</p> <p>“<i>Aquilegia brevistyla</i>.” <i>Useful Temperate Plants</i>, http://temperate.theferns.info/plant/Aquilegia+brevistyla. Accessed 5 May 2021.</p>
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“*Aquilegia brevistyla* Hooker.” *Flora of North America*,
http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233500092.
 Accessed 5 May 2021.

“*Aquilegia brevistyla* Hook.” *ITIS Report*,
https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=18729#null. Accessed 5 May 2021.

“*Aquilegia brevistyla*.” *Lady Bird Johnson Wildflower Center*, 8 Sept. 2010, https://www.wildflower.org/plants/result.php?id_plant=AQBR. Accessed 5 May 2021.

“*Aquilegia brevistyla* – Hook.” *Plants For A Future*,
 pfaf.org/user/Plant.aspx?LatinName=Aquilegia+brevistyla. Accessed 5 May 2021.

“*Aquilegia brevistyla* Hook.” *United States Department of Agriculture: Natural Resources Conservation Service*,
<https://plants.sc.egov.usda.gov/home/plantProfile?symbol=AQBR>. Accessed 5 May 2021.

“How to Collect, Store, and Plant Columbine (*Aquilegia*) Seeds.”
Expedition Household (Wisconsin Wonder Garden) via YouTube, 14 July 2019, <https://www.youtube.com/watch?v=UsMRmXWKjac>. Accessed 5 May 2021.

Colla, S.R. and S. Dumes. “The bumble bees of southern Ontario: notes on natural history and distribution.” *Journal of the Entomological Society of Ontario*, 2010, 141: 39-68.

Klinkenberg, Brian. “Developing Ecological Frameworks for BC Vascular Plants: Analyzing BEC Plot Data.” *Electronic Atlas of the Flora of British Columbia*, (Editor) 2021,
<https://ibis.geog.ubc.ca/biodiversity/eflora/KlinkenbergBECTable.html>. Accessed 5 May 2021.

Macior, L.M. “*Bombus* (Hymenoptera, Apidae) queen foraging in relation to vernal pollination in Wisconsin.” *Ecology*, 2012, 49: 20-25.

Meidinger et al. “British Columbia plant species codes and selected attributes.” *University of British Columbia*, 2009,
https://ibis.geog.ubc.ca/biodiversity/eflora/species_list_metadata.html#Climate. Accessed 5 May 2021.

“Region 2 Sensitive Species Evaluation.” *United States Department of Agriculture*,
https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5279863.pdf. Accessed 5 May 2021.

“Short-styled Columbine – *Aquilegia brevistyla*.” *Montana Field Guides*,
<http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PDRAN05020>. Accessed 5 May 2021.

Thorp, R.W., D.S. Horning, and L.L. Dunning. “Bumble bees and cuckoo bumble bees of California (Hymenoptera: Apidae).” *Bulletin of the California Insect Survey*, 1983, 23: 1-79.

Other Sources Consulted	<p>“<i>Aquilegia Canadensis</i> L.” <i>SEINet</i>, https://swbiodiversity.org/seinet/taxa/index.php?taxauthid=1&taxon=26572&clid=4939. Accessed 5 May 2021.</p> <p>“Blue Columbina: <i>Aquilegia brevistyla</i>.” <i>AMBI Species Profile Series</i>, 2020, file:///Users/Kioko/Downloads/Aquilegia-brevistyla.pdf. Accessed 5 May 2021.</p>
Protocol Author	Kioko Soneda
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