

Scientific Name: *Anemone patens* L.

Family: Ranunculaceae

Common Names: prairie crocus, crocus anemone, pasqueflower



***Anemone patens* a. plant in flower prior to leaves expanding b. seed head with expanded leaves c. single seed (achene) with awn.**

Plant Description

Long lived perennial forb, 10 to 40 cm high with a tap root, vertical and branched rhizomes, silky hairs throughout; long stalked basal leaves appear after emergence of flowers, three times divided, the middle segment three-cleft and the lateral two-cleft, divisions further cleft into linear or lanceolate acute lobes; involucral leaves similar but sessile; solitary flowers

with pale blue to purple sepals 2 to 4 cm long, hairy on the back, no petals (Moss 1983).

Fruit: One seeded achenes born on heads (Moss 1983).
Seed: Linear-ellipsoid, 3 mm long with persistent slender styles, short-plumose, 2 to 3.5 mm long (Moss 1983).

Habitat and Distribution

Found on prairies, hillsides, dry woods, edges of gravel pits, roadsides, clearcut areas, in fescue grassland, in open grasslands and in dry open woods in montane and boreal areas. Seedling establishment and flowering is enhanced by microhabitat variation (Kalliovirta et al. 2006).

Soil: Well-drained sandy soils.

Seral Stage: Mid to late.

Distribution: Found across Alberta, north to Arctic coast and Banks Island, Northwest Territories. Alaska, Yukon, western District of Mackenzie, northern Saskatchewan, southwestern Manitoba, western Ontario south to Washington, Montana, New Mexico, Texas, Missouri, Illinois (Moss 1983).



***Anemone patens* growing in its natural habitat.**

Phenology

Flowers from April to June with leaves emerging late May and early June. Vegetative growth occurs in July. Seeds are dispersed beginning in June through the beginning of July. Seeds germinate late summer or following spring (Kalamees et al. 2005). Blooming date has advanced by two weeks since 1936 due to climate change; increasing the species susceptibility to frost damage (Beaubien and Hamann 2011).



Anemone patens plant in flower
(leaves open following flowering).

Pollination

Cross-pollinated by honeybees, andrenid bees, bumblebees and syrphid flies. Self-pollinates as well (Werner 1974).

Seed Dispersal

Animal and wind dispersed, using awn either to ride breezes or catch on passing animals.



Genetics

2n=16 (Moss 1983).

Symbiosis

Anemone patens roots are colonized by symbiotic arbuscular mycorrhizal fungi which significantly improves seedling establishment by increasing phosphorus content in plant tissues (Moora et al. 2004).



Achenes of *Anemone patens* with awn (left) and without awn (right) 2 to 3.5 mm long.

Seed Processing

Collection: Harvest by hand in early June. Remove seeds by hand, de-awning not required. Store dry in cool temperatures.

Seed Weight: 1.530 g/1,000 seeds.

1.96 g/1,000 seeds (Royal Botanic Gardens Kew 2008).

Harvest Dates: Late spring to early summer.

Cleaning: De-awn if desired. Seed is usually removed clean.

Storage Behaviour: Orthodox. Seed should be dried to low relative humidity and stored at freezing temperatures (Royal Botanic Gardens Kew 2008).

Storage: Maintain in hermetically sealed containers at freezing temperatures (Royal Botanic Gardens Kew 2008).

Longevity: Seeds are relatively short lived (Kalamees et al. 2005).



Propagation

Natural Regeneration: Seeds germinate readily and do not form a persistent seed bank (Williams and Crone 2006).

There is also branching of the vertical root system that might allow vegetative reproduction. Pasqueflower possibly produces new rosettes near the parent plant from underground rhizome (Kalliovirta et al. 2006).

Germination: No pre-treatment required. 50% to 65% germination for seeds collected in northeastern Alberta. Optimal germination temperature was found to be 18-21°C (Baskin and Baskin 2001).

Pre-treatment: Cold stratification for 60 days (Baskin and Baskin 2001).

Direct Seeding: A trial was initiated in 2008 on a reclaimed site in north-eastern Alberta. No data are as yet available.

Vegetative Propagation: 2 to 4 cm long root cuttings placed in a well-drained medium with bottom heat will initiate roots and shoots in 28 to 35 days (Currah et al. 1983).

Greenhouse Production: Best seeded as soon as seed ripens in early summer in a cold-frame for nursery production. Stored seeds can be sown in late winter. Allow 1 to 6 months for emergence. Transfer seedlings to individual pots and grow in greenhouse for one winter season. Transplant to final location in the spring (Plants for a Future, n.d.).

Aboriginal/Food Uses

Food: Poisonous if taken internally (causes vomiting, purging, tremors and collapse) (Marles et al. 2000).

Medicinal: A poultice of crushed leaves was applied externally to relieve rheumatism as a counter-irritant (Marles et al. 2000, Royer and Dickinson 1996).

Other: Called the *ears of the earth* because it seems to spring through the snow to listen for the approach of summer (Royer and Dickinson 1996). Sepals used by early settlers to make a dye for Easter eggs (Royer and Dickinson 1996).

Wildlife/Forage Usage

Wildlife: Poor forage value, low palatability, mildly toxic species due to its protoanemonin content (Tannas 2004).

Livestock: The hairs on this plant may cause irritation and impairment of the gastrointestinal tract of sheep (Budd and Best 1969, Tannas 2004).

Grazing Response: An increaser; pasqueflower has a reserve of viable dormant buds enabling the plant to initiate new branches (Kalamees et al. 2005). Dense stands of prairie crocus are often an indicator of overgrazing in pastures (Budd and Best 1969, Tannas 2004).

Reclamation Potential

Anemone patens is a valuable reclamation species. It is well adapted to disturbed habitats. Forest fires enhance the conditions for seed germination and seedling development by reducing moss and litter layer thickness and decreasing competition pressure (Kalamees et al. 2005).

Anemone patens has been successfully re-established on calcareous grassland which had seen the topsoil removed; was most successful when in conjunction with hay transfer (Kiehl and Röder 2008).

Commercial Resources

Availability: Seeds occasionally available in Alberta.

Cultivars: Some horticultural cultivars are available but are not suitable for revegetation.

Uses: Ornamental garden species.

Notes

Anemone patens is now considered endangered in Finland and is included in several national Red Lists. This is due to the closure of undergrowth vegetation caused by the cessation of cattle grazing in forests, fertilization of managed forests, planting of trees and efficient fire prevention (Kalliovirta et al. 2006).

According to research models, survival and population growth rates of *Anemone patens* were greatly reduced when growing among invasive grasses (i.e., *Bromus sp.*) compared to native grasses due to



the build-up of a heavy thatch layer (Williams and Crone 2006).

Formerly known as *Pulsatilla patens* (IT IS n.d.).

Photo Credits

Photos 1 and 2: Glen Lee, Regina, Saskatchewan.

Photo 3: Wild Rose Consulting, Inc.

Line Diagram: John Maywood, used by permission of Bruce Peel Special Collections, University of Alberta.

References

Baskin, C.C. and J.M. Baskin, 2001. Seeds – Ecology, Biogeography, and Evolution of Dormancy and Germination. Academic Press, San Diego, California, USA.

Beaubien, E. and A. Hamann, 2011. Spring flowering response to climate change between 1936 and 2006 in Alberta, Canada. *Bioscience* 61(7): 514-524.

Budd, A.C. and K.F. Best, 1969. *Anemone patens* L. var. *wolfgangiana* (Bess.) Koch. IN: Wild Plants of the Canadian Prairies. Canada Department of Agriculture, Research Branch, Ottawa, Ontario. Publication No. 983-1969. pp. 202-203.

Currah, R., A. Smreciu and M. Van Dyk, 1983. Prairie Wildflowers. An illustrated manual of species suitable for cultivation and grassland restoration. The Friends of the Devonian Botanic Garden, University of Alberta, Edmonton, Alberta. 300 pp.

ITIS (International Taxonomic Information System), n.d. *Anemone patens* L. IN: Integrated taxonomic information system on-line database.
http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=508854 [Last accessed October 7, 2013].

Kalamees, R., K. Püssä, I. Vanha-Majamaa and K. Zobel, 2005. The effects of fire and stand age on seedling establishment of *Pulsatilla patens* in a pine-dominated boreal forest. *Canadian Journal of Botany* 83: 688-693.

Kalliovirta, M., T. Ryttäri and R.K. Heikkinen, 2006. Population structure of a threatened plant, *Pulsatilla patens*, in boreal forests: Modelling relationships to overgrowth and site closure. *Biodiversity and Conservation* 15: 3095-3108.

Kiehl K. and D. Röder, 2008. Successful establishment of the Natura 2000 species *Pulsatilla patens* (L.) Mill. in newly restored calcareous grasslands. IN: 6th European conference on Ecological Restoration, September 8-12, 2008, Ghent Belgium.

Marles, R.J., C. Clavelle, L. Monteleone, N. Tays and D. Burns, 2000. Aboriginal Plant Use in Canada's northwest Boreal Forest. Natural Resources Canada and Canadian Forest Service. UBC Press, Vancouver, British Columbia. 368 pp.

Moora, M., M. Öpik, R. Sen and M. Zobel, 2004. Native arbuscular mycorrhizal fungal communities differentially influence the seedling performance of rare and common *Pulsatilla* species. *Functional Ecology* 18: 554-562.

Moss, E.H., 1983. Flora of Alberta. A manual of flowering plants, conifers, ferns, and fern allies found growing without cultivation in the province of Alberta, Canada. 2nd edition. University of Toronto Press, Toronto Ontario. pp. 275-276.

Plants for a Future, n.d. *Pulsatilla patens* – (L.)Mill. Plants For A Future, Dawlish, Devon, UK.
<http://www.pfaf.org/user/Plant.aspx?LatinName=Pulsatilla+patens> [Last accessed June 12, 2013].

Royal Botanic Gardens Kew, 2008. *Pulsatilla patens* (L.) Mill. Seed Information Database.
<http://data.kew.org/sid/SidServlet?Clade=&Order=&Family=&APG=off&Genus=Pulsatilla&Species=patens&StorBehav=0> [Last accessed June 14, 2013].



Royer, F. and R. Dickinson, 1996. Prairie Crocus, Pasque-flower *Anemone patens* L. IN: Wild Flowers of Edmonton and Central Alberta. The University of Alberta Press, Edmonton, Alberta. p. 22.

Tannas, K., 2004. Common plants of the western rangelands. Volume 3: Forbs. Olds College, Olds, Alberta and Alberta Agriculture, Food and Rural Development, Edmonton, Alberta. 505 pp.

Werner, P.A., 1974. Reproductive biology of *Pulsatilla patens* (Ranunculaceae). W.K. Kellogg Biological Station and Department of Botany and Plant Pathology, Michigan State University, East Lansing.

Williams, J.L. and E.E. Crone, 2006. The impact of invasive grasses on the population growth of *Anemone patens*, a long-lived native forb. *Ecology* 87(12): 3200-3208.

