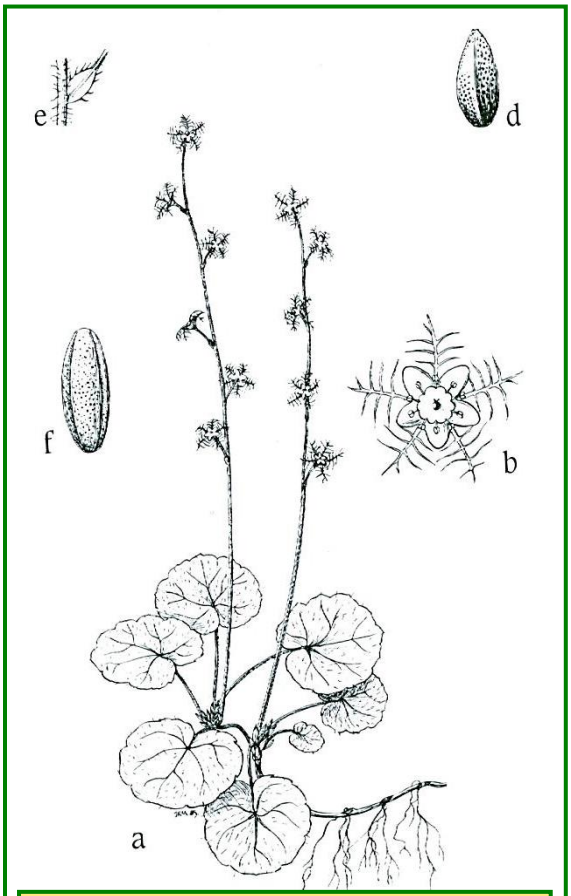
Scientific Name: *Mitella nuda* L. **Family:** *Saxifragaceae*

Common Name: bishop's cap, bare-stem bishop's-cap, miterwort, naked miterwort



***Mitella nuda* a. plant habit including inflorescence, leaves, rhizomes and roots b. flower d. seed e. bract f. pollen**

Plant Description

Erect perennial stoloniferous forb, 3 to 20 cm tall with hairy usually leafless (sometimes 1 leaf) stems; few heart to kidney-shaped leaves at base, 2 to 5 cm across, lobed with sparse stiff hairs on both surfaces; 3 to 10 tiny flowers in a raceme, pale greenish yellow with 5 petals reduced to very thin branched lobes and 5 pale green to white sepals which resemble petals; 10 stamens and 1 pistil (Johnson et al. 1995, Moss 1983).

Fruit: 2 valved greenish capsules 2 to 3 cm long (Wilkinson 1999).

Seed: Shiny black, ovoid seed with smooth surface, 1 mm long often pointed at one end (Moss 1983).

Habitat and Distribution

Found in cool shaded habitats like rich, moist forests, stream banks, wooded swamps, bogs and mossy thickets (Johnson et al. 1995, Rook 2002).

Seral Stage: Mid-successional – found under both conifer dominant (later successional) and deciduous (earlier successional) mixed-wood forests (Qian et al. 2003).

Soil: Rich forest soils (Rook 2002).

Distribution: Found throughout Canada and the northern US (USDA NRCS n.d.).

Southeastern Alaska, southern Yukon, southwestern District of Mackenzie to Hudson bay, northern Quebec, Newfoundland south to Washington, Montana, Saskatchewan, North Dakota, Great lakes, Pennsylvania (Moss 1983).

In Alberta, it is found in the north and central parts of the province (Royer and Dickinson 2007).

Phenology

Flowers bloom May to June, and fruit ripens in late summer (Rook 2002).

Pollination

By mosquitos and *Diptera sp*. (Savile 1975).

Seed Dispersal

Some seeds are ejected when seed cups open. Some fall after drying.

Genetics

2n=14 or 28 (Moss 1983).

***Mitella nuda* in flower**

Seed Processing

Collection: Seeds can be collected into paper bags in early fall when capsules and discs turn tan and are kept in a well ventilated area prior to cleaning (Evans et al. 2004).

Seed Weight: 3,600 seeds/g.

Fruit/Seed by Weight: 0.131 to 0.15 g/500 seeds.

Harvest Dates: Mid to end of July.

Cleaning: Hand cleaned (Evans et al. 2004). Shake seeds off plant, crush plant to remove any remaining seed. May be screened.

Storage Behaviour: Orthodox; seed can be safely dried to low relative humidity and stored frozen (Royal Botanic Gardens Kew 2008).

Storage: Store frozen in hermetically sealed containers (Royal Botanic Gardens Kew 2008).

Longevity: Seed has physiological dormancy (Evans et al. 2008). Seeds lose no viability after one year of dry storage.

Propagation

Natural Regeneration: *M. nuda* germinates and grows best in aspen forest litter (Ahlgren and Ahlgren 1981).

Vegetative propagules are present in understory of clearcut and partially cut mixedwood forests (Qi and Scarratt 1998).

***Mitella nuda* with ripened seeds**

Germination: After cold temperatures, 63% of seeds germinated in 64 to 98 days; 42% of seeds without refrigeration germinating in 48 to 139 days (Nichols 1934).
Pre-treatment: Seeds require no pre-treatment prior to germination.
Direct Seeding: Seed in winter (Rook 2002).

***Mitella nuda* leaf**

Nursery Production: Evans et al. (2008) used the following: pre-planting treatment of 5 month outdoor stratification, followed by direct seeding. Seeds were lightly covered with media (6:1:1 milled sphagnum peat, perlite, and vermiculite with Osmocote controlled release and Micromax fertilizers). Germination occurred in the fall following a 160 day cold-moist stratification and 120 day warm-moist stratification. Media was kept slightly moist during germination. Initial germination occurred after several days of temperatures at 12 to 16°C during the day and 0 to 10°C at night. Root and shoot development occurred rapidly following germination, and 4 to 6 true leaves were evident 3 weeks after germination. Total time to harvest was 2 years.
Vegetative Propagation: From cuttings in late summer (Rook 2002) and after disturbance such as low intensity wildfire (Lee 2004).
Established nursery stock can be increased by divisions (Evans et al. 2004).

Aboriginal/Food Uses

Food: No literature found.

Medicinal: Woods Cree used crushed leaves to treat earaches (Johnson et al. 1995, Royer and Dickinson 1996).

Reclamation Potential

Better suited to later stages of reclamation, after other species have become established, because *Mitella nuda* seeds in the soil seed bank may make use of micro gaps in the herbaceous canopy when germinating (Jankowska-Błaszczuk and Grubb 2006).

Notes

Also known as *Mitella prostrata* (ITIS n.d.).
Mitella nuda is listed as 84% intact (less occurrences than expected) in the Alberta oil sands region (Alberta Biodiversity Monitoring Institute 2014).

***Mitella nuda* seeds**

Photo Credits

Photo 1 and 2: Provided by Derek Goertz of Algoma University.
Photo 3 and 4: Wild Rose Consulting, Inc. 2010.
Line Diagram: John Maywood, used by permission of Bruce Peel Special Collections, University of Alberta.

References

Ahlgren, C.E. and I.F. Ahlgren, 1981. Some effects of different forest litters on seed germination and growth. Canadian Journal of Forest Research 11: 710-714.

Alberta Biodiversity Monitoring Institute, 2014. The status of biodiversity in the oil sands region of Alberta. Alberta Biodiversity Monitoring Institute, Edmonton, Alberta. 47 pp. http://www.abmi.ca/FileDownloadServlet?filename=The%20Status%20of%20Biodiversity%20in%20the%20Oil%20Sands%20Region%20of%20Alberta_2014_Supplemental%20Report.docx&dir=REPORTS_UPLOAD [Last accessed June 16, 2014].

Evans, J., T. Luna and D. Wick, D. 2004. Propagation protocol for production of container *Mitella nuda* L. plants (116 ml conetainers); USDI NPS - Glacier National Park, West Glacier, Montana. IN: Native Plant Network, University of Idaho, College of Natural Resources, Forest Research Nursery, Moscow, Idaho. http://www.nativeplantnetwork.org/Network/ViewProtocols.aspx?ProtocolID=208 [Last accessed June 12, 2013].

International Taxonomic Information System, n.d. *Mitella nuda* L. IN: Integrated taxonomic information system on-line database. http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=24410 [Last accessed June 12, 2013].

Jankowska-Błaszczuk, M. and P.J. Grubb, 2006. Changing perspectives on the role of the soil seed bank in northern temperate deciduous forests and in tropical lowland rain forests: parallels and contrasts. Perspectives in Plant Ecology, Evolution and Systematics 8: 3-21.

Johnson, D., L. Kershaw, A. MacKinnon and J. Pojar, 1995. Plants of the Western Boreal Forest and Aspen Parkland. Lone Pine Publishing and the Canadian Forest Service. Edmonton, Alberta. 392 pp.

Lee, P., 2004. The impact of burn intensity from wildfires on seed and vegetative banks, and emergent understory in aspen-dominated boreal forests. Canadian Journal of Botany 82: 1468-1480.

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. p. 334.

Nichols, G.E., 1934. The influence of exposure to winter temperatures upon seed germination in various native American plants. Ecology 15(4): 364-373.

Qi, M. and J.B. Scarratt, 1998. Effect of harvesting method on seed bank dynamics in a boreal mixedwood forest in northwestern Ontario. Canadian Journal of Botany 76:872-883.

Qian, H., K. Klinka, R.H. Okland, P. Krestov and G.J. Kayahara, 2003. Understorey vegetation in boreal *Picea mariana* and *Populus tremuloides* stands in British Columbia. Journal of Vegetation Science 14: 173-184.

Rook, E.J.S., 2002. *Mitella nuda* – naked miterwort. IN: Plants of the North. http://www.rook.org/earl/bwca/nature/herbs/WIP/mitellanuda.html [Accessed 8 February 2011].

Royal Botanic Gardens Kew, 2008. *Mitella nuda* L. Seed Information Database. http://data.kew.org/sid/SidServlet?ID=15653&Num=63T [Last accessed June 14, 2013].

Royer, F. and R. Dickinson, 1996. Bishop's-cap *Mitella nuda* L. IN: Wild Flowers of Edmonton and Central Alberta. The University of Alberta Press, Edmonton, Alberta. p. 98.

Royer, F. and R. Dickinson, 2007. Plants of Alberta. Lone Pine Publishing, Edmonton, Alberta. 527 pp.

Savile, D.B.O., 1975. Evolution and biogeography of Saxifragaceae with guidance from their rust parasites. Annals of the Missouri Botanical Garden 62(2): 354-361.

USDA NRCS, n.d. *Mitella nuda* L. The PLANTS Database. National Plant Data Center, Baton Rouge, Louisiana. http://plants.usda.gov/java/profile?symbol=MINU3 [Last accessed June 12, 2013].

Wilkinson, K., 1999. Wildflowers of Alberta. Lone Pine Publishing, Edmonton, Alberta. 364 pp.