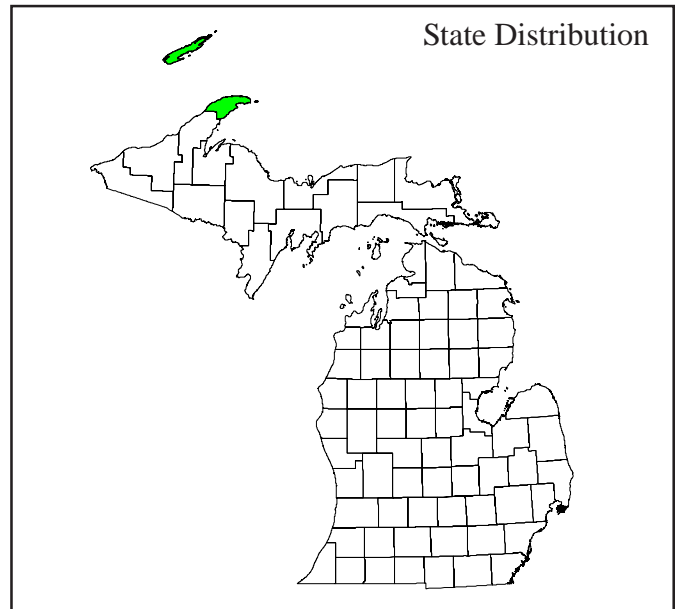
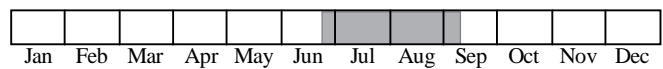


Photo by Susan R. Crispin



Best Survey Period



Status: State threatened

Global and state rank: G5/S1S2

Other common names: Bistort, serpent-grass, viviparous knotweed

Family: Polygonaceae (buckwheat family)

Synonyms: *Bistorta vivipara* (L.) Delarbre, *Bistorta vivipara* subsp. *macounii* (Small ex J.M. Macoun) Soják, *Persicaria vivipara* (L.) R. Decraene, *Polygonum viviparum* var. *macounii* (Small ex J.M. Macoun) Hultén.

Taxonomy: As now treated by Flora of North America (2005), this species has been segregated from *Polygonum* and placed in the genus *Bistorta*, applying the name noted above, which will be adopted following formal approval of the pending biennial review list.

Range: Alpine bistort is a circumpolar species of arctic-alpine habitats. In North America it is distributed from Alaska through the Northwest Territories to Quebec, ranging south in the Rocky Mountains to Arizona and New Mexico and extending to New England and the Lake Superior region in the eastern portion of its range. It is considered rare in Maine, Minnesota, New

Brunswick, New Hampshire, Nova Scotia, Saskatchewan, and Wyoming, and is classified as extirpated in Vermont (NatureServe 2007).

State distribution: This boreal species is known only from Keweenaw County, occurring locally at the tip of the Keweenaw Peninsula and more commonly in Isle Royale National Park, where it is known from approximately 20 sites throughout the island archipelago, including Hat and Passage Islands. This plant was also discovered along much of the shoreline of Manitou Island, a large island that lies about 4 miles east of the tip of the Keweenaw Peninsula in Lake Superior.

Recognition: Plants of *P. viviparum* arise from a **short, thickened rhizome that is corm-like to somewhat contorted or bent**. The stem, which ranges from ca. 10-30 cm in height and terminates in a **narrow, dense flowering spike**, is simple, erect, smooth, and bears few leaves. The lower stem leaves are long-stalked with lance-shaped to very narrow, elliptic blades; upward the leaves number no more than three, becoming reduced and stalkless. Like all other plants of the buckwheat family, the leaves have a sheathing base known as an “ocrea”. **The basal portion of the dense 3-6 cm long inflorescence is characterized by the presence of bulblets (vegetative propagules) rather than flowers**. Upward the spike bears numerous small



flowers with pinkish-white petals, ultimately developing tiny 3-angled fruits. The presence of bulblets in the inflorescence enables this species to be readily distinguished from all other *Polygonum* species in our area.

Best survey time/phenology: This species has been observed as early as late April by knowledgeable botanists, but based most observations and collections indicated that this species is best sought from approximately late June through early September.

FQI Coefficient and Wetland Category: 10, FACW

Habitat: In Michigan this arctic-alpine species typically grows in moist rock crevices and moss-covered turf in areas along Lake Superior shores, typically occurring with such boreal associates as *Trisetum spicatum* (downy oat-grass), *Primula mistassinica* (bird's-eye primrose), *Sagina nodosa* (pearlwort), *Potentilla tridentata* (three-toothed cinquefoil), *Euphrasia arctica* (American eyebright), *Carex media* (sedge), *Carex atratiformis* (sedge), *Carex capillaris* (sedge), *Selaginella selaginoides* (spikemoss), *Halenia deflexa* (spurred gentian), *Luzula parviflora* (small-flowered wood rush), and woody plants such as *Physocarpus opulifolius* (ninebark), *Thuja occidentalis* (northern white cedar), *Abies balsamea* (balsam fir), and *Alnus incana* (tag alder). *Saxifraga paniculata* (lime-encrusted saxifrage) and *S. tricuspidata* (prickly saxifrage) are two species that may also occur with alpine bistort (Given and Soper 1981). Elsewhere in its wide range the habitats include wet spruce and mixed woods along shorelines and a variety of mountain slopes in subalpine and alpine areas, alpine meadows, and all but the most xeric areas in the Arctic. Given and Soper (1981) and Polunin (1959) considered *P. viviparum* to be one of the most common, characteristic plant species of the Arctic.

Biology: Alpine bistort is a clone forming, perennial forb. The ability to produce vegetative propagules or bulblets (also referred to as bulbils) in its inflorescence enables this species to successfully propagate itself in an environment that may frequently be too harsh for sexual reproduction. Swales (1979) observed bulblets that began germinating while still attached to the parent plant, an apparent adaptation for quick establishment. As the growing season progressed, Swales found colonies of dwarfed plants producing flowering spikes consisting

mostly of bulblets. Diggle (1997) found that alpine bistort had an unusually protracted period for leaf and inflorescence development, requiring four years from the initiation of primordial organs to functional maturity, which according to Diggle is a development model that generally applies to arctic and alpine species. Diggle et al. (1998) and Bauert (1996) have documented high levels of genetic diversity in *P. viviparum*, which is unusual in that this species reproduces primarily asexually through clone formation and via bulblets. Diggle reasoned that flowering, despite being a rare event, results in the production of viable seeds sufficient for sustaining genetic diversity. *P. viviparum* has also been studied to help determine the response of arctic-alpine species to climate change, such as climate warming and increased CO₂ levels. Wookey et al. (1994) found that although alpine bistort responded markedly to the addition of nutrients, an increase in the mean growing season air temperature did not have a significant impact on vegetative parameters or the rate of photosynthesis; Starr et al. (2000) found a similar response in their study on the effects of climate warming on the phenology and physiology of the related *Polygonum bistorta*.

Conservation/management: Nearly all of Michigan's known colonies of *P. viviparum* receive protection within Isle Royale National Park and under the careful stewardship of a significant Nature Conservancy preserve near Copper Harbor. This species is best maintained by conserving shoreline habitats and their ecological processes, ensuring exposure to the necessary climatic conditions and natural dynamics of Lake Superior.

Comments: On the Keweenaw Peninsula, alpine bistort appears to flower principally in July, though plants are recognizable by late June, in contrast to the earlier emergence of plants in the Isle Royale archipelago. *P. viviparum* has been shown to be an important food source for reindeer (Staaland et al. 1983) and ptarmigan (Moss and Parkinson 1975).

Research needs: There is a considerable literature on my aspects of this species, as demonstrated in the biology section. Genetic studies of Michigan populations may assist in conservation by ascertaining if our plants maintain the same high level of genetic diversity shown elsewhere.



Related abstracts: Volcanic bedrock lakeshore, small-flowered wood rush, alpine bluegrass, squashberry

Selected references:

- Bauert, M.R. 1996. Genetic diversity and ecotypic differentiation in arctic and alpine populations of *Polygonum viviparum*. *Arctic and Alpine Research* 28: 190-195.
- Diggle, P.K. 1997. Extreme preformation in alpine *Polygonum viviparum*: an architectural and developmental analysis. *Am. J. Bot.* 84: 154-169.
- Diggle, P.K., S. Lower, and T.A. Ranker. 1998. Clonal diversity in alpine populations of *Polygonum viviparum* (Polygonaceae). *Int. J. Plant Sci.* 159: 606-615.
- Flora of North America Editorial Committee. 2005. *Flora of North America, North of Mexico. Volume 5: Magnoliophyta: Caryophyllidae, part 2.* Oxford Univ. Press. New York, NY. 656 pp.
- Given, D. R. and J. H. Soper. 1981. The Arctic-alpine element of the vascular flora at Lake Superior. *Publication in Botany No. 10.* National Museums of Canada. 70 pp.
- Hultén, E. 1958. The amphi-atlantic plants and their phytogeographical connections. *Almqvist & Wiksell, Stockholm.*
- Moss, R. and J.A. Parkinson. 1975. The digestion of bulbils (*Polygonum viviparum* L.) and berries (*Vaccinium myrtillus* L. and *Empetrum* sp.) by captive ptarmigan (*Lagopus mutus*). *Br. J. Nutr.* 33: 197-206.
- NatureServe. 2007. NatureServe Explorer: an online encyclopedia of life [web application]. Version 6.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: October 15, 2007).
- Polunin, N. 1959. *Circumpolar arctic flora.* Clarendon Press, Oxford.
- Staaland, H., I. Brattbakk, K. Ekern, and Kjetil Kildemo. 1983. Chemical composition of reindeer forage plants in Svalbard and Norway. *Holarctic Ecology* 6: 109-122.
- Starr, G. S.F. Oberbauer, and E.W. Pop. 2000. Effects of lengthened growing season and soil warming on the phenology and physiology of *Polygonum bistorta*. *Global change Biology* 6: 357-369.
- Swales, D. E. 1979. Nectaries of certain Arctic and sub-Arctic plants with notes on pollination. *Rhodora* 81:363-407.
- Voss, E. G. 1985. Michigan Flora. Part II. Dicotyledons (Saururaceae-Cornaceae). *Bull. Cranbrook Inst. Sci.* 59 and *Univ. of Michigan Herbarium.* xix + 724 pp
- Wookey, P.A., J.M. Welker, A.N. Parsons, M.C. Press, T.V. Callaghan, and J.A. Lee. 1994. Differential growth, allocation and photosynthetic responses of *Polygonum viviparum* to simulated environmental change at a high arctic polar semi-desert. *Oikos* 70: 131-139.

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