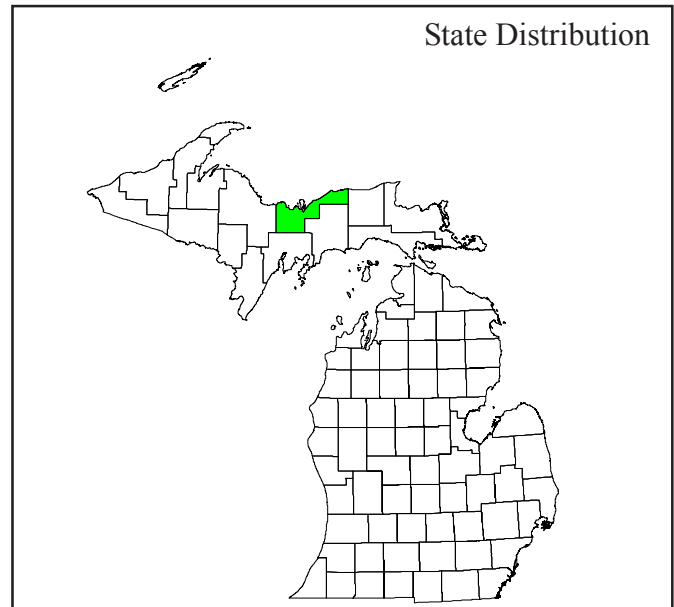
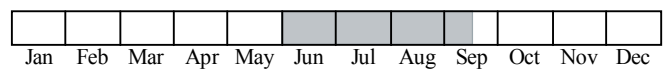


# *Botrychium acuminatum* W.H. Wagner, Jr. acute-leaved moonwort



Best Survey Period



**Legal status:** State endangered

**Global and state rank:** G1/S1

**Family:** Ophioglossaceae (adder's-tongue family)

**Other common name:** Moonwort, grapefern.

**Synonyms:** *Botrychium matricariifolium* A. Br.

**Taxonomy:** Prior to the description of this species in 1990 (Wagner and Wagner), this taxon would have been considered a form of *B. matricariifolium*, the species it is the most similar to. *B. acuminatum* was discovered at Grand Sable Dunes and subsequently documented along the north shore of Lake Superior in southern Ontario. Acute-leaved moonwort is classified as a species within *Botrychium* subgenus *Botrychium* (Wagner and Wagner 1990).

**Total range:** This extremely rare moonwort is known from relatively few locations within its very restricted global range. It is known from a single locality in Upper Michigan and from several widely scattered sites along the north shore of Lake Superior in southern Ontario. This species occurs from the eastern Upper Peninsula to the Algoma and Thunder Bay districts in

Canada, the latter areas comprising most of the known localities for this species.

**State distribution:** *Botrychium acuminatum* is restricted in Michigan to a single site in the eastern Upper Peninsula, where it is found within Pictured Rocks National Lakeshore at Grand Sable Dunes in Alger County.

**Recognition:** Acute-leaved moonwort is most similar to the common and wide-ranging daisy-leaved moonwort (*Botrychium matricariifolium*). Like many moonwort species, this tiny fern is easily overlooked, even in the thinly vegetated areas of its open sand dune habitat. The sterile portion of the aerial stem, known as the trophophore (the leaf blade), is **short-stalked to nearly stalkless**, ranging up to 7 cm in length. The trophophore is a compound leaf, with up to **six pairs of pinnae (leaflets) that are widely spaced and never overlapping**. The pinnae are narrow, 4-15 mm long and 3-5 mm wide, and are **shallowly lobed to nearly entire, with sharply pointed tips**. Trophophores (the fertile, spore-bearing portion of the leaf) are up to two times as long as the trophophore, and are once to twice divided (pinnate).

According to Wagner and Wagner (1990) *B. acuminatum* looks very similar to a "streamlined" form of *B. matricariifolium*, its common associate, and the



species it is most likely to be confused with. In contrast to *B. matricariifolium*, the pinnae are much more separated, and have much narrower lobes (to none). In overall shape, acute-leaved moonwort is linear-oblongate, with longer and distinctly pointed tips.

**Best survey time/phenology:** This species emerges about midspring, persisting until senescence by early fall. June and July are likely the primary months for seeking and identifying this moonwort.

**Habitat:** Acute-leaved moonwort occurs within a high quality perched dune landscape, where it occupies primarily the open, grassy dunes. Common flowering plant associates include such species as *Calamovilfa longifolia* (dune grass), *Ammophila breviligulata* (marram grass), *Juniperus communis* (ground juniper), *Picea glauca* (white spruce), *Prunus pumila* (sand cherry), and *Pinus banksiana* (jack pine). This species also occurs with several other botrychiums, including *B. matricariifolium* (daisy-leaved moonwort), *B. hesperium* (western moonwort), *B. lunaria* (common moonwort), *B. minganense* (mingan moonwort), and *B. campestre* (dunewort), some of which are also rare species (western moonwort, dunewort) in Michigan. Elsewhere, this species is known from dunes and grassy areas, including old fields, grassy railroad sidings, and roadside ditches (Morin et al. 1993).

**Biology:** Very little is known of the biology of this and many other moonwort species. Plants emerge in late spring, and sporangia develop and release their spores by perhaps mid to late-summer. Spores of this fern family migrate into the soil and germinate to form subterranean gametophytes, from which aerial plants (sporophytes) develop. It is possible that as in other moonwort taxa, this species may have the ability to remain dormant during droughty years. Farrar and Johnson-Groh (1990) documented the presence of gemmae in *B. campestre* as a possible adaptation to its dry habitats, but no such propagules have been found in *B. acuminatum*, which inhabits similarly dry environments.

**Conservation/management:** The principal conservation need for acute-leaved moonwort is to protect its habitat and maintain the natural dynamics of the dune landscape in Michigan. Natural disturbance regime appears to be critical to maintaining this species.

The occurrence of this moonwort in somewhat disturbed habitats elsewhere within its range may be due to regimes that emulate natural disturbance factors. The maintenance of rights-of-way along railroads and roadsides may reduce competition and provide open colonization habitats and thus constitute refugia for this species and other moonworts.

**Comments:** Acute-leaved moonwort is among numerous *Botrychium* species described by the late Dr. Warren H. Wagner, Jr. are part of his landmark research in this difficult group of pteridophytes.

**Research needs:** Principal research needs include life history studies, population monitoring, and possibly genetic studies to ascertain the structure of populations.

**Related abstracts:** Open dunes, wooded dune and swale complex, dunewort, fascicled broom-rape, goblin fern, Lake Huron tansy, Pitcher's thistle, Pumpelly's brome grass, western moonwort, dune cutworm, Lake Huron locust, piping plover, red-legged spittlebug.

#### Selected references:

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- Wagner, W.H. Jr., and F.S. Wagner. 1990. Moonworts (*Botrychium* subg. *Botrychium*) of the upper Great Lakes region, U.S.A. and Canada, with descriptions of two new species. *Contr. Univ. Mich. Herb.* 17:313-325.
- Farrar, D.R. and C.L. Johnson-Groh. 1990. Subterranean sporophytic gemmae in moonwort ferns, *Botrychium* subgenus *Botrychium*. *Amer. J.*

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