



Legal status: State threatened

Global and state rank: G5/S2

Family: Dryopteridaceae (woodfern family)

Synonyms: *Gymnocarpium dryopteris* (L.) Newm. var. *pumilum* (DC.) Boivin; *Dryopteris robertiana* (Hoffm.) C. Chr.; *Carpogymnia robertiana* (Hoffm.) Love & Love; *Polypodium robertianum* Hoffm. Deutschl. Fl.; *Phegopteris robertianum* (Hoffm.) Fee; *Thelypteris robertiana* (Hoffm.) Slosson.

Total range: Limestone oak fern is a circumboreal species that in North America occurs from southern Manitoba northeast through Ontario and Quebec to Newfoundland, ranging south to Pennsylvania, Michigan, Wisconsin, Minnesota, and Iowa.

State distribution: Limestone oak fern is known from 12 sites in seven counties in Michigan. Its distribution is mainly in the northern Lower Peninsula and the central and eastern portions of the Upper Peninsula. One disjunct population has been documented in St. Clair County. Only five of the known occurrences were found or confirmed extant since 1980, and two populations have not been observed since 1920. Recent surveys and observations, however, indicate that this species is much

more widely distributed in northern Lower Michigan, particularly in large, extensive cedar swamp complexes that provide an abundance of suitable habitat.

Recognition: Limestone oak fern fronds (leaf blades), which range from about 10-50 cm in length, are borne from long, slender, sub-surface stems (rhizomes) on **relatively long, glandular-hairy petioles (leafstalks)**. The petioles range to about 30 cm in height and are slightly scaly at the base. The **broadly triangular (deltate) leaf blade** is a compound leaf divided into individual primary segments termed pinnae (leaflets). These pinnae are similarly divided once to twice more into the ultimate segments of the leaf, which are strongly rounded and smooth-margined to slightly scalloped-toothed. **The underside of the leaf, as well as the leaf axis (rachis), are covered with short, dense, glandular hairs.** Fertile leaves produce small, round, well-spaced clusters of spores (sori) on their underside near the segment margins; these lack a covering (indusium).

The wide-ranging common oak fern, *Gymnocarpium dryopteris*, is very similar in appearance to *G. robertianum*, but can be easily distinguished owing to its **lack of glandular hairs on the petiole and blade**. From our experience, common oak fern, although highly variable in size, tends to be smaller than limestone oak



fern and lacks the pronounced, extended tips of the main leaf segments so evident in well-developed fronds of *G. robertianum*.

Best survey time/phenology: *Gymnocarpium robertianum* is recognizable whenever its foliage is present and well-developed, conservatively from about mid-June through leaf senescence. July and August are likely the best periods to seek and reliably identify this species.

Habitat: Limestone oak fern inhabits cool, rocky woods and swamps. In northern white cedar swamps, the principal habitat for this species in Michigan, it grows in cool, wet substrates, particularly in organic soils and often in areas of thick moss cover, including *Sphagnum* mosses. As indicated by the common name, this fern prefers alkaline or calcium-rich substrates, and it can also be found colonizing limestone or dolomite ledges and cliffs.



Biology: Spores (sori) are produced from June through August. The frond of this species is deciduous.

Conservation/management: To conserve this species, it is necessary to maintain its habitat. This includes maintenance of the hydrologic cycle of northern white cedar swamps as well as providing an intact canopy. The effects of timber harvesting in cedar swamps is poorly known, but it is expected that this species could experience habitat degradation through excessive clearcutting. The cycle of beaver activity within swamps is a natural disturbance feature that undoubtedly affects populations as well. Ledges and cliffs that contain limestone oak fern should not be disturbed, and are likely vulnerable to recreational activities such as rock climbing.

Comments: Hybrids between *Gymnocarpium robertianum* and other oak fern species are very rare, according to Pryer (1993). W.H. Wagner (1966) described *G. X heterosporum* as a hybrid between *G. appalachianum* and *G. robertianum*. In 1981, Sarvela described a hybrid known only from Sweden, *G. X achriosporum*. This is a hybrid between *G. dryopteris*

and *G. robertianum*. The ubiquitous common oak fern has been observed as a frequent associate of limestone oak fern, yet it seems unusual that hybrids between these two taxa occur in only one region.

Research needs: It is necessary to determine the statewide distribution of *G. robertianum*; recent work in state forest compartments indicates that this species is more widespread than previously known, although when documented, populations appear to be very localized within large cedar swamp complexes. Demographic work on populations and life history studies may also assist land managers and others in understanding how to best conserve this rare fern.

Related abstracts: Calypso orchid, ram's head orchid, round leaved orchid, red-shouldered hawk.

Selected references:

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- Lellinger, D. B. 1985. A Field Manual of the Ferns & Fern-Allies of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 385pp.
- Mickel, J.T. 1979. How to know the ferns and fern allies. Wm. C. Brown Co. Pub. Dubuque, Iowa. 229pp.
- Pryer, K. M. 1993. *Gymnocarpium*. In: Flora of North America, Vol. 2. Pteridophytes and Gymnosperms. Oxford University Press, New York. 475pp.
- Wagner, W.H. Jr. 1966. New data on North America oak ferns, *Gymnocarpium*. *Rhodora* 68:121-138.

Abstract citation:

- Choberka, E.G., M.R. Penskar, and P.J. Higman. 2001. Special plant abstract for *Gymnocarpium robertianum* (limestone oak fern). Michigan Natural Features Inventory, Lansing, MI. 2 pp.

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