

**Conservation Assessment  
for  
Engelmann's Adder's-tongue (*Ophioglossum engelmannii*)**



**USDA FOREST SERVICE, EASTERN REGION**  
November 2002

Alice Long Heikens, Ph.D.  
Franklin College

Hoosier National Forest





This Conservation Assessment was prepared to compile the published and unpublished information and serves as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject community, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

Table Of Contents

**EXECUTIVE SUMMARY.....4**  
**ACKNOWLEDGEMENTS.....4**  
**NOMENCLATURE AND TAXONOMY.....5**  
**DESCRIPTION OF SPECIES.....5**  
**HABITAT.....6**  
**LIFE HISTORY.....6**  
**DISTRIBUTION AND ABUNDANCE.....7**  
**PROTECTION STATUS.....7**  
**REFERENCES.....8**

## **EXECUTIVE SUMMARY**

Barrens and glades occur at scattered sites on the Hoosier and Shawnee National Forests, and are found widely on the Mark Twain National Forest. Expressions of the barrens community on National Forest System lands are currently recognized on the Hoosier at a few sites within the Brown County Hills and the Crawford Escarpment, and at several sites in the Crawford Uplands. On the Shawnee, barrens are found as small remnants in the Cretaceous Hills, and the Greater Shawnee Hills, Lesser Shawnee Hills, and the Illinois Ozarks have more and somewhat larger communities. Barrens and glades are often large within most of the natural divisions found on the Mark Twain.

Barrens are characterized by species of canopy trees tolerant of xeric conditions having a stunted, open-grown appearance, the dominance of native warm-season grasses and prairie forbs, and, in glades, significant exposures of bedrock. The mix of plants and animals inhabiting these sites varies with the canopy openness, internal structure of the stands, slope, aspect, and other less tangible variables. The barrens is an ecosystem, not merely a hole in the forest filled with prairie plants.

The purpose of this assessment is to bring together the best available information about this community, provide a summary of the character and distribution of barrens across the three Forests, and provide similar information about six RFSS found in this habitat. An additional purpose is to provide the background information necessary to prepare a Conservation Strategy, including management actions to conserve species discussed in this assessment.

## **ACKNOWLEDGEMENTS**

Deb Albright (Hoosier National Forest), Sybill Amelon (North Central Forest Experiment Station), Nancy Berlin (R9 Regional Office), Jody Eberly (Mark Twain National Forest), Stan French (Mark Twain National Forest), Ron Hellmich (Indiana Department of Natural Resources, Division of Nature Preserves), Henry Holman (Mammoth Cave National Park), Mike Homoya (Indiana Department of Natural Resources, Division of Nature Preserves), Garry Houf (Mark Twain National Forest - retired), Max Hutchison (The Nature Conservancy – retired), Ellen Jacquart (The Nature Conservancy – Indiana), Brian Keith (Indiana Department of Natural Resources, Division of Geological Survey), Phil Koenig, R.L. Heitzman, Dennis Kolata (Illinois State Geological Survey), Tim Nigh (Missouri Department of Natural Resources), Paul Nelson (Mark Twain National Forest), Rick Olson (Mammoth Cave National Park), James Palmer (Missouri Department of Conservation, Geological Survey), Elizabeth Raikes (Land-Between-the-Lakes), James Taylor, Debbie Seibert (Perry County Library), Beth Shimp (Shawnee National Forest), Jody Shimp (Illinois Department of Natural Resources), Tara Gibbs and Sally Weeks (Purdue University).

## NOMENCLATURE AND TAXONOMY

**Ophioglossum engelmannii** Prantl, in Ber. Deutsch Bot. Ges. 1:351. 1883. Fig. 87

Synonyms for *Ophioglossum engelmannii* include the following: *Ophioglossum vulgatum* f. *engelmannii* (Prantl) Clute, *Our Ferns in Their Haunts* 316:1901, and *Ophioglossum vulgatum* var. *engelmannii* (Prantl) Clute, *Our Ferns* 68. 1938.

Common names include Adder's-tongue fern (Mohlenbrock 1967), limestone adder's-tongue fern (Cobb 1963), and Engelmann's adder's-tongue fern (Lellinger 1985).

*Ophioglossum engelmannii* is classified as a member of the Ophioglossaceae, which is represented in the Midwest by two genera, *Ophioglossum* and *Botrychium* (Gleason and Cronquist 1991). Seven species of *Ophioglossum* are found in the United States and Canada (Flora of North America Editorial Committee 1993). *Ophioglossum* species have entire, undissected leaves, whereas *Botrychium* species have distinctly dissected leaves (Mohlenbrock 1967). Sori, the cluster of reproductive spores, typically are found on the lower surface of the fronds in most species. However, *Ophioglossum* has long fertile stalks extending past the vegetative frond(s) (Mohlenbrock 1967). The spore-producing structures are in two rows on opposite sides of the stalk tip.

## DESCRIPTION OF SPECIES

*Ophioglossum engelmannii* is a relatively inconspicuous plant since leaves may be present for only 1 to 2 months each year. Following summer or fall rains, new leaves may be produced (Palmer 1932, Flora of North America Editorial Committee 1993, Yatskievych 1999). This species is typically 5.5cm to 17cm tall (Lellinger 1985) and usually produces 1 to 2 simple, entire, elliptical, pointed, glabrous leaves 2.5 to 35cm long and 1 to 4.5cm wide (Figure 55). The leaves usually are found during April. Typically, *O. engelmannii* grows in colonies of considerable numbers. These large populations may be a result of asexual reproduction from rhizomes that extend for "considerable distances" and produce numerous individuals (Shaver 1954). For a complete species description, see Appendix IV.

Superficially, *O. engelmannii* is relatively morphologically similar to *O. vulgatum* and may, on occasion, share the same habitat. Several important characteristics, however, allow for the delineation of these two species. *Ophioglossum engelmannii* possesses the following diagnostic characteristics: small, sharp points on the fronds (apiculate fronds); the upper half of the fronds are down curving; the principle veins form large primary areoles that enclose several secondary areoles to create a net-like venation pattern as opposed to *O. vulgatum* which does not have secondary areoles; the fronds are relatively thick, almost succulent, and paler green when compared to *O. vulgatum*; and Fernald (1950) and Cobb (1963) indicated that *O. engelmannii* (10 to 20cm) is typically shorter than *O. vulgatum* (7 to 35cm); however, there is some overlap in overall plant size and in Illinois both species are described as up to 15cm tall (Mohlenbrock 1967). In addition to the plant characteristics, Mohlenbrock (1967) indicates that in Illinois *O. engelmannii* is restricted to calcareous soils and *O. vulgatum* is found on sandstone substrates.

## HABITAT

*Ophioglossum engelmannii* typically is found in a variety of habitats on calcareous soils including barrens;

limestone glades; dry limestone and dolomite prairies, savannas, and glades; and xeric limestone forests and rocky openings of upland forests on dolomite (Baskin and Baskin 1974, Fernald 1950, Flora of North America Editorial Committee 1993, Gleason 1963, Gleason and Cronquist 1991, Mohlenbrock 1967, Nelson 1987, Small 1938, Yatskievych 1999). Wherry (1926) determined that *O. engelmannii* is restricted to neutral to slightly basic soils.

Shaver (1954) indicated that *O. engelmannii* is a representative species of the cedar glades in Kentucky and Tennessee. Baskin and Baskin (1974) determined that it is most often found on open cedar glades where the soil is too shallow to support woody species, although it can be found at the edge of the glade near deciduous shrubs. On these glades it is restricted to soil that is 5 to 15cm deep, although it is most abundant in soil 10 to 15cm deep (Baskin and Baskin 1974). In the Missouri and Arkansas Ozark region, *O. engelmannii* is found on limestone ledges or glades in shallow soil that often is quite wet in spring but later becomes very dry (Baskin and Baskin 1974).

Although the species may be found in shade in Florida (St. John 1941), Ohio (Braun 1927), and Arizona (Britton 1897), it most often is found on exposed slopes or in partial shade of cedars or shrubs (Mohlenbrock and Voigt 1959, Baskin and Baskin 1974, Palmer 1932).

On the Hoosier National Forest, associates include *Quercus marilandica*, *Q. stellata*, *Sorghastrum nutans*, *Schizachyrium scoparium*, *Silphium terebinthinaceum*, and *Lespedeza virginica*.

## **LIFE HISTORY**

*Ophioglossum engelmannii* often becomes dormant with summer droughts. However, in several states it is reported to produce fronds (vegetative or fertile) following late summer or fall rains (Palmer 1932, Couch 1937, Magrath and Weedon 1972, Clausen 1938) and in west Texas, fronds only appear after infrequent rains (Zech and Manning 1996). In Florida, fronds may persist until August (St. John 1941). In Oklahoma, well-developed sporangia have been observed into late October and fronds were present until late November although freezing temperatures were experienced (Couch 1937).

In an attempt to understand these inconsistencies, Baskin and Baskin (1974) studied the species to determine factors affecting dormancy. Out of the approximately 3000 individuals studied, most had one leaf (82 percent) and only 10 percent had fertile spikes (Baskin and Baskin 1974). Although fertile fronds have been reported from Oklahoma (Couch 1937) and Kansas (Magrath and Weedon 1972) in autumn, Baskin and Baskin (1974) observed only a few late summer and autumn fronds with a small percentage of these being fertile. By the time a frond is fully expanded, a new bud has formed on the rhizome. These buds were determined to be innately dormant, i.e., physiological factors rather than environmental factors prevented growth. After these buds undergo a "conditional dormancy" they grow slowly at high temperatures if sufficient moisture is present; hence, the production of the second growth of fronds during one growing season only occurs after a short period of dormancy. After over-wintering, all of the buds are capable of growing at a relatively rapid rate over a wide range of temperatures (Baskin and Baskin 1974) allowing for all buds, regardless of when they were produced, to form fronds in the spring.

## **DISTRIBUTION AND ABUNDANCE**

*Ophioglossum engelmannii* is relatively abundant throughout much of its range in the southeast and south

central U.S. from Kansas and Virginia south to Mexico and Florida (Figure 56), but becomes more restricted as it reaches its geographic limits (Lellinger 1985). In the Midwest, disjunct populations can be found in southern Illinois and Indiana where *O. engelmannii* is rare with few known populations. Further west, such as in Arizona and Nebraska, the populations are also disjunct (Rolfsmeier et al. 2001). In Missouri, it is classified as a characteristic species for several plant communities including limestone glades, dry limestone and dolomite prairies and savannas, and xeric limestone and dolomite forests (Nelson 1987). In southern Indiana and Illinois, *O. engelmannii* is more rare and the populations tend to be smaller.

It was first discovered in Indiana in Monroe County in 1938 (Deam 1940). Decades later, additional populations were found in Harrison, Crawford, Clark, and Washington counties (Indiana Department of Natural Resources 2002). Currently, there are four extant populations on the Hoosier National Forest (HNF) all in Perry County in southern Indiana and ten additional populations in Indiana (Figure 57). The species was first discovered in 1919 in Hardin County, Illinois (Mohlenbrock and Voigt 1959). Currently, it has been reported from seven counties in southern Illinois (Ketzner and Karnes 1998) (Figure 58). In Missouri, eighteen counties in the Mark Twain National Forest have extant populations on limestone glades, barrens, and open woods (Kennedy 2001) (Figure 59). Palmer (1932) found large populations of the species, estimating that hundreds to thousands of plants, “almost as thick as grass,” covered several square meters. However, the number and size of extant populations is unknown. According to Yatskievych (1999), it is common for Missouri populations to only produce vegetative fronds.

## PROTECTION STATUS

*Ophioglossum engelmannii* is ranked as G5, indicating that it is widespread, abundant and apparently secure (NatureServe 2002).

Ranking by individual states is: Alabama (S2S3), Arizona (S1), Arkansas (S4), Florida (SR), Georgia (S2S3), Illinois (S2), Indiana (S2), Kansas (S?), Kentucky (S?), Louisiana (SR), Mississippi (SR), Missouri (SR), Nebraska (S?), New Mexico (SR), North Carolina (SR), Ohio (S2), Oklahoma (SR), Pennsylvania (S1), Tennessee (SR), Texas (SR), Virginia (S3), and West Virginia (S1).

In Indiana, *O. engelmannii* is classified as a state rare plant. In Illinois, *O. engelmannii* is listed as state imperiled (6 to 20 occurrences); however, the Illinois Heritage Database does not track the species (Illinois Department of Natural Resources 2001). *Ophioglossum engelmannii* is the most common species of *Ophioglossum* in Missouri and is found in 57 counties (Yatskievych 1999) (Figure 60). It is not state listed and, therefore, is not monitored.

## REFERENCES

- Baskin, J.M., and C.C. Baskin. 1974. Some aspects of the ecology of *Ophioglossum engelmannii* in the cedar glades of Kentucky and Tennessee. *American Fern Journal* 64:65-73.
- Braun, E.L. 1927. *Ophioglossum engelmannii* Prantl. in Ohio. *American Fern Journal* 17:138.
- Britton, E.G. 1897. A revision of the North American species of *Ophioglossum*. *Bulletin Torrey Botanical Club* 24:545-559.

- Clausen, R.T. 1938. A monograph of the Ophioglossaceae. Mem. Torrey Botanical Club 19:1-177.
- Cobb, B. 1963. A field guide to the ferns and their related families. Houghton Mifflin Company. Boston. 281 pp.
- Couch, G.C. 1937. Unusual fall growth of *Ophioglossum engelmannii*. Proceedings Oklahoma Academy of Science 17:58.
- Deam, C.C. 1940. Flora of Indiana. Department of Conservation. Indianapolis, IN. 1246 pp.
- Fernald, M.L. 1950. Gray's manual of botany, eighth ed. American Book Co. New York. 1632 pp.
- Flora of North America Editorial Committee. 1993. Flora of North America north of Mexico, Vol. II. Oxford University Press. New York. 475 pp.
- Gleason, H.A. 1963. The new Britton and Brown illustrated flora of the northeastern U. S. and Adjacent Canada, Vol. I. Hafner Publishing Co., Inc. New York. 475 pp.
- Gleason, H.A., and A. Cronquist. 1991. Manual of vascular plants of the northeastern U. S. and Adjacent Canada, second ed. The New York Botanical Garden. New York. 910 pp.
- Illinois Department of Natural Resources. 2001. Natural Heritage Database. Springfield, IL.
- Indiana Department of Natural Resources. 2002. Division of Nature Preserves Database. Indianapolis, IN.
- Kennedy, R.C. 2001. Personal Communications. University of Missouri-Columbia. Columbia, MO. January 2001.
- Ketzner, D., and J. Karnes, eds. 1998. Illinois Plant Information Network: *Ophioglossum engelmannii*. Illinois Natural History Survey. Champaign, IL, USA. Retrieved August 1, 2002.  
<http://www.fs.fed.us/ne/delaware/ilpin>
- Lellinger, D.B. 1985. A field manual of ferns and fern-allies of the U. S. and Canada. Smithsonian Institution Press. Washington, D. C. 389 pp.
- Magrath, L.K., and R.R. Weedon. 1972. A report of fall-fruited plants of *Ophioglossum engelmannii* Prantl. in eastern Kansas. American Fern Journal 62:22-23.
- Mohlenbrock, R.H. 1967. The illustrated flora of Illinois: Ferns. Southern Illinois University Press. Carbondale, IL. 191 pp.
- Mohlenbrock, R.H. 1986. Guide to the vascular flora of Illinois. Southern Illinois University Press. Carbondale, IL. 507 pp.
- Mohlenbrock, R.H., and J.W. Voigt. 1959. A flora of southern Illinois. Southern Illinois University Press.

Carbondale, IL. 390 pp.

Nelson, P.W. 1987. The terrestrial natural communities of Missouri, revised edition. Department of Natural Resources. Jefferson City, MO. 196 pp.

Olson, S. 1999. Regional forester sensitive species risk evaluation for *Ophioglossum engelmannii*. Hoosier National Forest. Tell City, IN.

Palmer, E.J. 1932. Notes on *Ophioglossum engelmannii*. *American Fern Journal* 22:43-47.

Rolfsmeier, S.B., R.B. Kaul, and D.M. Sutherland. 2001. A synopsis of the ferns and fern allies of Nebraska, with maps of their distribution. *Sida* 19:1015-1026.

Shaver, J.M. 1954. Ferns of Tennessee with the fern allies excluded. George Peabody College for Teachers. Nashville, TN. 502 pp.

Small, J.K. 1938. Ferns of the Southeastern U. S. The Science Press. Lancaster, PA. 517 pp.

St. John, E.P. 1941. Habitats and distribution of *Ophioglossum* in Florida. *American Fern Journal* 31:143-148.

Steyermark, J.A. 1963. Flora of Missouri. Iowa State University Press. Ames, IA. 1725 pp.

Wherry, E.T. 1926. Soil reaction preferences of three adder's-tongues. *American Fern Journal* 16:1-3.

Yatskievych, G. 1999. Steyermark's Flora of Missouri, Vol. I, revised ed. Missouri Botanical Garden Press. St. Louis, MO. 991 pp.

Zech, J.C., and P.R. Manning. 1996. *Ophioglossum englemannii* in Trans-Pecos, Texas. *American Fern Journal* 86:102.