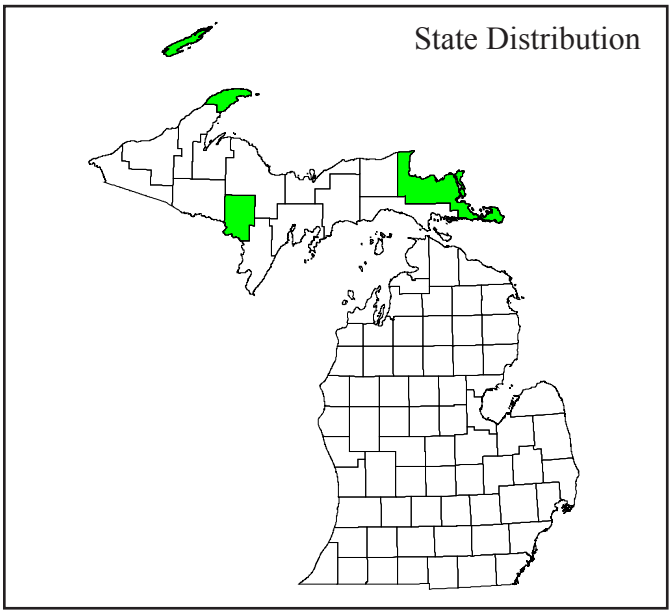
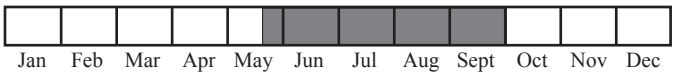
Pellaea atropurpurea (L.) Link — purple cliff brake

Photo by Susan R. Crispin



Best Survey Period



Status: State threatened

Global and state rank: G5/S2

Other common names: purple-stemmed cliff-brake, purple cliffbrake

Family: Pteridaceae (maidenhair fern family)

Synonym: *Pteris atropurpurea* L., *Pellaea atropupurea* var. *cristata* Trelease

Taxonomy: Until relatively recently, *P. atropurpurea* was considered by most authors to include *P. glabella*, which is now generally recognized as a separate species (Rigby and Britton, 1970, Pickett, 1917). Tryon (1972) suggested that this taxon may be of hybrid origin, with one putative parent a rare species of northern Mexico (*P. notabilis*) and the other now extinct. Lellinger (1985) postulates a different hybrid origin, considering *P. atropurpurea* to be derived from the tetraploid (4n) *P. glabella* and the diploid *P. ternifolia*. However, M. Windham in Flora of North America (1993), treatment author of *Pellaea*, states that the molecular data do not support Lellinger's hypothesis, and that *P. atropupurea* is a derivative of another taxon not yet determined. Further molecular studies of this difficult complex are provided by Gastony et al. (1992).

Range: Concentrated in northern Mexico and the southwestern United States, this fern extends from Guatemala north through the Rocky Mountains, the central United States, and through eastern North America. It is considered rare in Colorado, Florida, Iowa, Minnesota, Mississippi, Nebraska, New Hampshire, North Carolina, Ontario, Quebec, Rhode Island, South Carolina, Utah, Vermont, Wisconsin, and Wyoming, and is considered extirpated in Louisiana (NatureServe 2007).

State distribution: Purple cliff-brake is known only from a few modern localities in Michigan, of only eight localities known, including the Keweenaw Peninsula and locations in Dickinson and Chippewa Counties (the latter on Drummond Island). A 1905 Dickinson County locality has not been relocated. Except for one Dickinson County locality, where more than 100 clumps where observed, all colonies have been found to be relatively small, with most reported to support fewer than 20 plants.

Recognition: *Pellaea atropurpurea* grows in crowded tufts, producing dimorphic fronds (different sterile and fertile leaves) that arise from a short-creeping or ascending **rhizome with tan scales. Hairy, dark purple to black stalks** (4-20 cm long) bear elongate fronds that are 5-25 cm long and triangular in outline. The fronds are **bipinnate to nearly tripinnate** with the

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pinnae (the segments representing the first division of the frond) each bearing **2-5 pairs of oblong pinnules** (the ultimate segments of the frond). Toward the tip of the frond the pinnae become less divided, ultimately bearing a single oblong segment that may be lobed at the base. **The lateral margins of the pinnules are rolled under**, and bear the sporangia on the undersides along this margin. Sterile fronds tend to be somewhat smaller and have broader pinnae and pinnule segments. The more common, closely related species, *P. glabella* (smooth cliff-brake), which may occur with purple cliff-brake, can be distinguished by its glabrous (to sparsely hairy) brown or purple-brown leafstalks, orange-brown rhizome scales, and monomorphic fronds (similar sterile and fertile leaves) with shorter, broader pinnules.

Best survey time/phenology: This species can be reliably identified as long as foliage is present, and thus the estimated survey period is the growing season, from approximately late May through September.

FQI Coefficient and Wetland Category: 10, UPL

Habitat: Purple cliff-brake inhabits sunny--though often somewhat protected--exposures of calcareous rocks (limestone, dolomite, calcareous sandstone or conglomerate), on cliff faces, ledges, or pavement areas. Common associates include *Juniperus horizontalis* (creeping juniper), *Arctostaphylos uva-ursi* (bearberry), *Solidago spathulata* (goldenrod), and *Juniperus communis* (common juniper). Throughout its range, purple cliff-brake is a plant of sheltered or exposed ledges, cliff crevices, and rocky slopes, most often on limestone (Flora of North American 1993) and--in the heart of its range--even masonry walls and loamy forest floors (Tryon 1972). Rigby and Britton (1970) note that this species and the related *P. glabella* occur primarily on limestone or calcareous sandstone substrates.

Biology: The spores of purple cliff-brake are long-lived, and the prothallia (gametophytes) are highly drought-resistant (Pickett and Manuel 1926). This species is triploid (3n=87) throughout its range and *agamosporous*, meaning that the spores produce plants that arise asexually from buds on the gametophytes rather than from egg formation and fertilization (Wagner 1988). As a species of dry rock outcrops, *P. atropurpurea* is a desiccation-tolerant plant, and has been shown to survive drought periods for up to five years as cited by Alpert (2000).

Conservation/management: The dry, rocky habitat of this plant should be relatively stable and self-maintaining, though sensitive to human activities which might accelerate erosion of the rock (e.g., foot traffic or cliff top development). Part of one Keweenaw County population lies within a Michigan Nature Association sanctuary.

Comments: Purple cliff-brake is closely related to the lip-ferns, *Cheilanthes*, a group known for their adaptations to very xeric, or desert-like conditions.

Research needs: Status surveys are a primary need, as well as additional inventories to detect new populations.

Related abstracts: Volcanic cliff, alvar, limestone cliff, limestone lakeshore cliff, bald eagle, crested vertigo, eastern flat-whorl, land snail, merlin, peregrine falcon, downy oatgrass, encrusted saxifrage, hart's tongue fern, rock whitlow-grass, walking fern, wild-lilac, and numerous species of alvar and limestone cliff and limestone lakeshore cliff (see MNFI Rare Species Explorer for a comprehensive listing of associated species).

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