Natural Heritage & Endangered Species Program

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Massachusetts Division of Fisheries & Wildlife

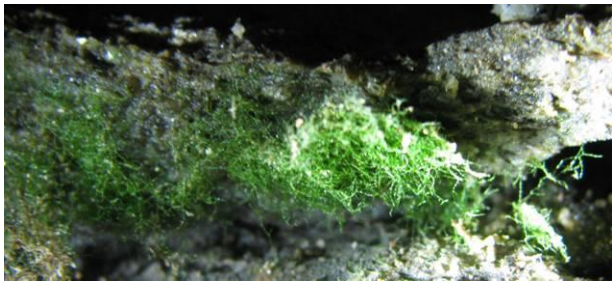
Appalachian Bristle-fern
Crepidomanes intricatum
(Farrar) Ebihara & Weakley

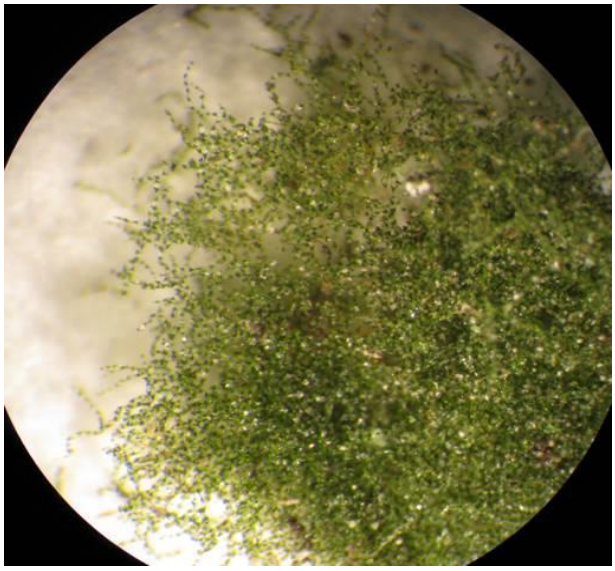
State Status: **Endangered**
Federal Status: **None**

DESCRIPTION: Appalachian Bristle-fern, a member of the largely tropical filmy fern family (Hymenophyllaceae), is an independent gametophyte that lives within crevices of rock outcrops. Made up of dense tangles of wiry filaments, this fern resembles steel wool, or a weaver's woolly "weft."

It is thought that this fern has evolved to live perpetually within the gametophyte phase of the fern life cycle, never forming a sporophyte, the leafy spore-producing phase that is most familiar to us. Recall that in other local ferns, gametophytes, which are haploid, thumbnail-sized, and heart-shaped, grow in hospitable habitats from spores released by the fern's fertile fronds; male and female sex organs (antheridia and archegonia, respectively) form within the gametophyte and release gametes (sex cells). The leafy diploid sporophyte results from fertilization. This "alternation of generations" does not occur in Appalachian Bristle-fern; the gametophyte, which is filamentous, not heart-shaped, has apparently lost its ability to produces gametes. Instead it reproduces asexually by releasing small buds called "gemmae," which are made up of two to ten cells, and are borne on stalks called "gemmifers."

Distribution in Massachusetts
1985 - 2010
Based on records in the
Natural Heritage Database





(Top) The independent gametophyte deep within a rocky crevice, illuminated by LED light, showing its "steel wool" texture and green coloration. (Bottom) A magnified view of the tangled, branched, filaments. Photos by J. Garrett (NHESP)

Other members of the filmy fern family are known from wet tropical regions of the world; named for their characteristically thin fronds, the species of this family require moist conditions to keep from desiccating. Research has shown that even under tropical conditions, Appalachian Bristle-fern gametophytes are unable to produce gametes, indicating the species is genetically incapable of sexual reproduction. One hypothesis for the

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origin of this species in the Northeast is that it is relict from the Tertiary Period (2 to 65 million years ago), in which tropical forests covered this region. As the climate cooled, fern gametophytes may have adapted, persisting in stable, rocky habitats, and eventually becoming completely asexual.

AIDS TO IDENTIFICATION: At most locations a flashlight is required to spot Appalachian Bristle-fern. A hand lens is required to verify the species identification. This species can be identified by its green mass of tangled filaments, somewhat like a coarse cleaning pad (i.e., steel wool).

HABITAT IN MASSACHUSETTS: Appalachian Bristle-fern inhabits cool, dark, crevices, cracks, and pockets, typically within rich rocky outcrops. The gametophytes are often two or more feet within a crevice, but can occupy more shallow depressions. In Massachusetts, most of the known sites are shady and moist, with at least some Eastern Hemlock (*Tsuga canadensis*) in the canopy. Additional associated plant species include Maidenhair Spleenwort (*Asplenium trichomanes*), Marginal Wood-fern (*Dryopteris marginalis*), Bulblet-fern (*Cystopteris bulbifera*), and Sugar Maple (*Acer saccharum*). Bryophyte cover ranges from very dense to very sparse. Aspect varies, but several known sites are on east-facing outcrops. The type of bedrock also varies, but tends to be circumneutral to high pH, and the species seems to be absent from the most acidic outcrops. Though literature specifies that habitat is typically not calcareous, there are two known populations in the state on marble.

RANGE: This species is known from the eastern U.S. and the Midwest, from New Hampshire and Vermont, south to Georgia and west to Illinois, Tennessee, and Alabama. Though previously thought to be globally rare, focused searches have led to the discovery of many populations throughout its range.

POPULATION STATUS IN MASSACHUSETTS: Appalachian Bristle-fern is listed under the Massachusetts Endangered Species Act (MESA) as Endangered. All listed species are legally protected from killing, collection, possession, or sale, and from activities that would destroy habitat and thus directly or indirectly cause mortality or disrupt critical behaviors. This species is currently known from Berkshire, Franklin, and Worcester Counties.

THREATS: Threats include anything that could change the dark, moist, cool environment favored by this gametophyte. Appalachian Bristle-fern lives in one of the most stable natural habitat types in the Northeast, and there are relatively few threats beyond development involving rock blasting. A more subtle threat is a loss of shading canopy cover due to tree removal or death. Hemlock woolly adelgid and hemlock scale are damaging trees in at least two known Appalachian Bristle-fern locations. Increases in sun exposure could change the microclimate (e.g., light, temperature, moisture), resulting in an inhospitable environment. As this plant does not seem to spread very rapidly, abrupt changes may be more detrimental than those that take place over a long period of time.

MANAGEMENT RECOMMENDATIONS: Maintain deep shade near known habitat locations; canopy trees should not be removed near the rocky crevices known to support Appalachian Bristle-fern. Monitor sites for tree-feeding insects, especially hemlock woolly adelgid and hemlock scale. As this species is inconspicuous and probably overlooked, additional searches in suitable habitat for undocumented populations will help elucidate its true state rarity. All active management within the habitat of a state-listed plant is subject to review under the MESA, and should be planned in close consultation with the Massachusetts Natural Heritage & Endangered Species Program.

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Updated 2019