

**Species Listing PROPOSAL Form:**  
**Listing Endangered, Threatened, and Special Concern Species in Massachusetts**

Scientific name: *Crepidomanes intricatum*

Current Listed Status (if any): **Endangered**

Common name: Weft Fern

Proposed Action:

Add the species, with the status of:

Remove the species

Change the species' status to: **Special Concern**

Change the scientific name to: \_\_\_\_\_

Change the common name to: \_\_\_\_\_

(Please justify proposed name change.)

Proponent's Name and Address:

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Association, Institution or Business represented by proponent:

Proponent's Signature:  Date Submitted: 2/24/2023

Please submit to: Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, 1 Rabbit Hill Road, Westborough, MA 01581

**Justification**

Justify the proposed change in legal status of the species by addressing each of the criteria below, as listed in the Massachusetts Endangered Species Act (MGL c. 131A) and its implementing regulations (321 CMR 10.00), and provide literature citations or other documentation wherever possible. Expand onto additional pages as needed but make sure you address all of the questions below. The burden of proof is on the proponent for a listing, delisting, or status change.

**(1) Taxonomic status. Is the species a valid taxonomic entity? Please cite scientific literature.**

Yes, *Crepidomanes intricatum* (Syn. *Trichomanes intricatum*) is a valid taxonomic entity (Haines, 2011).

**(2) Recentness of records. How recently has the species been conclusively documented within Massachusetts?**

*C. intricatum* has been conclusively documented in Massachusetts as recently as 2022 (Pers. Obs.)

**(3) Native species status. Is the species indigenous to Massachusetts?**

*C. intricatum* is regarded as being native to Massachusetts (NatureServe Explorer; Haines, 2011).

**(4) Habitat in Massachusetts. Is a population of the species supported by habitat within the state of Massachusetts?**

Yes, *C. intricatum* is known to inhabit talus slopes, ledges, and under erratics in Massachusetts. There are 29 known extant populations in Massachusetts, including 27 documented by NHESP (MA NHESP) and an additional two known by the applicant.

**(5) Federal Endangered Species Act status. Is the species listed under the federal Endangered Species Act?  
If so, what is its federal status (Endangered or Threatened)**

No, this species does not have federal status.

**(6) Rarity and geographic distribution.**

**(a) Does the species have a small number of occurrences (populations) and/or small size of populations in the state? Are there potentially undocumented occurrences in the state, and if so, is it possible to estimate the potential number of undocumented occurrences?**

The number of known populations of *C. intricatum* has significantly increased in recent years, from 10 known stations in 2012 (Flora Conservanda 2012) to the current 29 known stations. The additional 19 stations were all found between 2018 and present. Many of these populations encompass small areas around 1 square centimeter, however, it is difficult to fully assess the size of populations because the habitat of this species can be difficult to access and thoroughly survey. This habitat includes dark crevices, under talus, on ledges, and under erratics, in shaded areas or with a north facing aspect. A flashlight is generally required to observe *C. intricatum in situ*.

The Flora Conservanda 2012 lists *C. intricatum* as a Division 2, Regionally Rare Taxon. An update of the Flora Conservanda is currently in process and *C. intricatum* is being proposed to be dropped from the list entirely (Pers. Comm. Michael Piantedosi) due to the increase in the number of known populations.

There are definitely undocumented populations of *C. intricatum* in Massachusetts. I utilized available map layers (aerial imagery, topographic maps, and surficial geology maps) to conduct the *de novo* surveys which resulted in the additional 19 stations since 2018. Based on my reviews, I estimate that there are several hundred sites in Massachusetts which host suitable habitat. *C. intricatum* has been documented in Middlesex, Worcester, Hampshire, Hampden, Franklin, and Berkshire Counties. Given the habitat requirements of *C. intricatum*, it is likely that the majority of undocumented occurrences are located in these counties. Outside of Massachusetts, the applicant and colleagues (Laura Green and Grace Glynn) have located an additional 33 previously unreported stations.

The small number of known stations is likely due to the species recent discovery (Farrar 1992), atypical morphology for a vascular plant, need for a flashlight to observe *in situ*, and difficult to access habitat which is rarely frequented by botanists.

**(b) What is the extent of the species' entire geographic range, and where within this range are Massachusetts populations (center or edge of range, or peripherally isolated)? Is the species a state or regional endemic?**

*Crepidomanes intricatum* is endemic to eastern North America from Georgia North into Quebec. The Massachusetts populations lie towards the northern extent of the species distribution. Through efforts of the applicant, the known range of *C. intricatum* has been extended into Canada and Maine.

**(7) Trends.**

**(c) Is the species decreasing (or increasing) in state distribution, number of occurrences, and/or population size? What is the reproductive status of populations? Is reproductive capacity naturally low? Has any long-term trend in these factors been documented?**

The number of known populations of *C. intricatum* in Massachusetts has nearly tripled since 2018 due to concerted survey efforts by the applicant. *C. intricatum* is believed to consist of a single genetically identical individual throughout its range spreading through asexual reproduction. Its natural reproductive capacity is unknown.

No long term population trends have been established regarding the size of individual populations. Active dispersal has not yet been documented in the region.

**(8) Threats and vulnerability.**

**(d) What factors are driving a decreasing trend, or threatening reproductive status in the state? Please identify and describe any of the following threats, if present: habitat loss or degradation; predators, parasites, or competitors; species-targeted taking of individual organisms or disruption of breeding activity.**

The small number of known populations of *C. intricatum* is likely a strong underestimate of its true distribution, to its size, unusual morphology, and difficult to access habitat. *C. intricatum* habitats, especially talus slopes, are generally stable and resilient to change.

Habitat fragmentation may limit the capacity for *C. intricatum* to recruit to new sites. A subset of populations occur on rocks located under a dense canopy of *Tsuga canadensis*. It is unclear whether these populations persist because of shade produced by the rocks they are on, or if by the shade produced by *T. canadensis* foliage. The spread of hemlock woolly adelgid may threaten these populations if the latter is true. Canopy cover may also affect surface temperature which enables *C. intricatum*'s persistence.

Anthropogenic threats to *C. intricatum* may include quarrying or mining operations; clear-cutting, which could alter substrate surface temperatures and moisture; or spelunking during which people may inadvertently rub *C. intricatum* off the substrate surface.

**(e) Does the species have highly specialized habitat, resource needs, or other ecological requirements? Is dispersal ability poor?**

Yes, *C. intricatum* has specialized habitat. This habitat is locally common but rather diffuse on the landscape level. *C. intricatum* appears to require high levels of shade to persist. Shade may be a direct driver in *C. intricatum*'s establishment and persistence due to the species tolerance of light, and/or through influences on moisture and competition. *C. intricatum*'s dispersal capabilities are unknown. Given the documented presence of *C. intricatum* several hundred miles north of the southern extent of the Wisconsinian glaciation, it may be assumed that active dispersal has occurred within the past 14,000+/- years.

**Conservation goals.**

**What specific conservation goals should be met in order to change the conservation status or to remove the species from the state list? Please address goals for any or all of the following:**

- (a) State distribution, number of occurrences (populations), population levels, and/or reproductive rates**
- (b) Amount of protected habitat and/or number of protected occurrences**
- (c) Management of protected habitat and/or occurrences**

**I) Status of *C. intricatum* populations in Massachusetts**

- a) Definitely ID *C. intricatum* in Massachusetts through Genetic Testing: Identification as *C. intricatum* is presumptive and based on the absence of sporophyte life phase. Genetic testing of *C. intricatum* populations in New York State has conclusively identified these populations as *C. intricatum* (Shorter Note, American Fern Journal). Analysis of *C. intricatum* specimens from further south in the Appalachians has identified some mis-identification with other members of the Hymenophylaceae of which gametophytes cannot be distinguished from *C. intricatum* based on morphology alone (Pers. Comm Aaron Duffy PhD). A genetic analysis of *C. intricatum* populations in Massachusetts should be conducted to determine whether these are in fact *C. intricatum*, another filmy fern species, or a combination.

- b) Assess Dispersal Capacity of *C. intricatum* in Massachusetts: Conduct surveys for *C. intricatum* in anthropogenically disturbed or created sites which may host suitable habitat. These may include abandoned mines, bridges, tunnels, quarries, or building foundations, specifically those with known histories including the date of abandonment. The presence of *C. intricatum* at such a site would indicate that successful dispersal has occurred in the recent past.
- c) Determine *C. intricatum*'s Tolerance of Environmental Variables: *C. intricatum* was observed growing in Westminster as filaments growing intermixed with mosses (Pers. Obs.). This indicates that *C. intricatum* has the potential to persist in the environment outside those environments in which it has been documented. That is, *C. intricatum*'s ability to grow in low light conditions may give it a competitive advantage enabling clones to grow to sizes which are more easily detected by humans. If *C. intricatum* is tolerant of higher light conditions, it is plausible that the species could be relatively abundant in the environment, occurring as minute clones.

## II) Increase the Number of Known Populations

Conduct *de novo* surveys for additional populations in Massachusetts and document a minimum of 75 more populations throughout the state. Survey sites should be selected to account for variability in surficial geology to enable a more accurate estimate of how many sites with suitable habitat exist in the state.

## III) Protection and management of Known Stations

- a) Protect a minimum of 25 additional populations with high quality habitats on conserved lands.
- b) Given the relative stability of *C. intricatum* habitat little management will be necessary. At sites with high recreational use it may be necessary to close areas off to spelunking.

**Literature cited, additional documentation, and comments.**

Brumback, W. and J. Gerke. 2013. Flora Conservanda: New England 2012. The New England Plant Conservation Program (NEPCoP) list of plants in need of conservation. *Rhodora* 115: 313-408.

Farrar, D. 1992. *American Fern Journal*, Vol. 82, No. 2 (Apr. - Jun., 1992), pp 68-74. American Fern Society

Haines, A. 2011. *Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England*. Yale University Press, New Haven and London.

Massachusetts Natural Heritage & Endangered Species Program. February 2023. Massachusetts Division of Fisheries & Wildlife

NatureServe. 2023. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. Available <https://explorer.natureserve.org/>. (Accessed: February 23, 2023).

"SHORTER NOTE," *American Fern Journal* 112(2), 139-141, (26 April 2022).  
<https://doi.org/10.1640/0002-8444-112.2.139>