

## Species Listing PROPOSAL Form:

Listing Endangered, Threatened, and Special Concern Species in Massachusetts

Scientific name: *Linnaea borealis* ssp. *americana*

Current Listed Status (if any): Watch List

Common name: American Twinflower

**Proposed Action:**

Add the species, with the status of: SC

Remove the species

Change the species' status to: \_\_\_\_\_

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

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

(Please justify proposed name change.)

**Proponent's Name and Address:**

Karro Frost, 100 Hartwell St., West Boylston, MA 01583

Phone Number: 508-389-6390

Fax: 508-389-7890

E-mail: karro.frost@state.ma.us

Association, Institution or Business represented by proponent: NHESP

Proponent's Signature:



Date Submitted:

5/30/2014

**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. *Linnaea borealis* ssp. *americana* - (Forbes) Hulten ex Clausen is the accepted name according to Haines, 2011, and was originally published in *Rhodora* 6: 63 1904.

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

The most recent record in the NHESP database is 2009. It was observed in three towns in Worcester County since 1980 (Bertin, 2012).

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

Yes, the species is native to Massachusetts (Cullina et al. 2011)

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

Yes, the species is currently supported by habitat in Massachusetts.

**(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 has no 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?**

Number of populations MA has 8 distinct current EOs in the database. A thorough survey of herbarium records and reports has yet to be completed so additional EOs may be identified. As an example, the NHESP database has only 1 EO from Franklin County, while the Franklin County Flora group has located herbarium records from 6 towns in Franklin County, which likely represent 5 additional EOs (Bertin, pers. comm.) The species is ranked G5. Among New England states, it is S1 in CT, and is not ranked in VT, NH, RI and ME. It is ranked S4 in NY and S5 in QN, LB, KF, PE, NB and NS in Canada. It is of conservation concern (S1) in WV, PA, IA, and AZ, and is possibly extirpated (SH) in NJ IN, OH and TN (NatureServe 2014).

The population sizes of extant MA occurrences: The population sizes have not been well documented in the NHESP Watch List database and are unknown.

Likelihood of finding additional EOs: It is likely that additional EOs will be located. As mentioned above, there is likely to be additional information of potential EOs gleaned from herbarium specimens. The habitat type, cool wetlands, is common in western Massachusetts, and many areas have not been systematically surveyed, particularly in northern Berkshire, Franklin and Worcester counties.

**(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?**

The species' range includes much of North America, north of Mexico, and excluding the southeastern US. It is not a state or regional endemic.

**(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?**

State distribution: Cullina et al. 2011 lists this species as native in 9 counties across the state, though recently it has only been observed in three. The NHESP database includes current records from Worcester, Franklin and Berkshire Counties.

Number of populations: The Flora of Worcester County (Bertin 2012) documented an apparent decline of populations within that county: 10 towns pre-1980 to 3 towns post-1980. In addition, it was not relocated by Jenkins et al. at Harvard Forest. The Franklin County Flora group has not completed their surveys, however, no plants of this species have been observed since surveys started in 2010 (Hickler, pers. comm.; although Hickler did observe in Franklin Cty in 2003). Weatherbee 1996 lists it as uncommon in Berkshire County, occurring in 5 towns. The exact number of populations is unknown.

The population sizes of extant MA occurrences: The current information available does not discuss population size.

Reproductive capacity: Reproductive capacity is unknown for this species. This species reproduces by seed and vegetatively. Each flower produces a single seed.

Studies from the west coast of this species have indicated that seeds are often nonviable and the seed bank may be short lived (Howard, 1993). Both of which could be factors contributing to the decline of the species.

**(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 factors driving a decreasing trend in this species are unknown, but may include loss of habitat or over-shading by canopy species. Climate change may also be a factor in this species' decline, although it is known from much further south and west than MA (although possibly at higher elevations than historic records from MA).

Individual plants of *L. borealis* are self-incompatible, though it does spread vegetatively. This may be leading to a decrease in reproductive success as populations are too separated from each other on the landscape (Scobie & Wilcock 2008). Each flower, when fertilized, only produces one seed.

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

Gleason & Cronquist 1991 describes the habitat as "moist or dry woods and cold bogs." Weatherbee 1996 describes the habitat as "wet, cool spruce-fir forest, cool mossy woods." The dispersal ability is unknown.

**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:**

Providing data do not indicate that the threat of invasive plants (or another currently unidentified threat) to populations ranked A through CD is dramatically increasing, this species can be delisted if:

**(a) State distribution, number of occurrences (populations), population levels, and/or reproductive rates**

The number of current, distinct EOs reaches at least 30, and half are ranked BC or greater, 90% should be ranked C or greater.

**(b) Amount of protected habitat and/or number of protected occurrences**

The number of EOs completely or mostly on protected land with ranks C or greater reaches a majority (i.e., for 25 EOs, at least 13 shall be on protected land).

**(c) Management of protected habitat and/or occurrences**

No criteria set at this time.

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

- Bertin, RB, and TJ Rawinski. 2012. Vascular Flora of Worcester County, Massachusetts. Special Publication of the New England Botanical Club.
- Cullina, MD, B Connolly, B Sorrie and P Somers. 2011. The Vascular Plants of Massachusetts: A County Checklist, First Revision. MA NHESP.
- Fernald, ML. 1922. The American Variations of *Linnaea borealis*. *Rhodora*, Vol. 24, No. 286.
- Haines, A. 2011. *Flora Novae Angliae*. New England Wild Flower Society.
- Hickler, MH. 2014. Personal communication.
- Howard, JL. 1993. *Linnaea borealis*. In Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available: <http://www.fs.fed.us/database/feis/plants/forb/linbor/all.html> [accessed May, 30, 2014].
- The International Plant Names Index [web application]. 2014. Plant Name Query. Published on the Internet <http://www.ipni.org> [accessed 21 March 2014].
- Jenkins et al. 2008. The Harvard Forest Flora. Harvard Forest Paper No. 28.
- Massachusetts Natural Heritage and Endangered Species Program (NHESP). 2014. Biotics Database.
- NatureServe. 2014. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://explorer.natureserve.org>. (Accessed: February 25, 2014 ).
- Rehder, A. 1904. Preliminary Lists of New England Plants. *Rhodora*, Vol. 6, No. 63.
- Scobie, A.R. and C.C. Wilcock. 2009. Limited mate availability decreases reproductive success of fragmented populations of *Linnaea borealis*, a rare, clonal self-incompatible plant. *Annals of Botany*. Vol. 103, No. 6. pp 835-846.
- Weatherbee, PB. 1996. *Flora of Berkshire County Massachusetts*. The Berkshire Museum.