



Natural Heritage & Endangered Species Program

www.mass.gov/nhesp

Massachusetts Division of Fisheries & Wildlife

Lake Quillwort *Isoetes lacustris* L.

State Status: **Endangered**

Federal Status: **None**

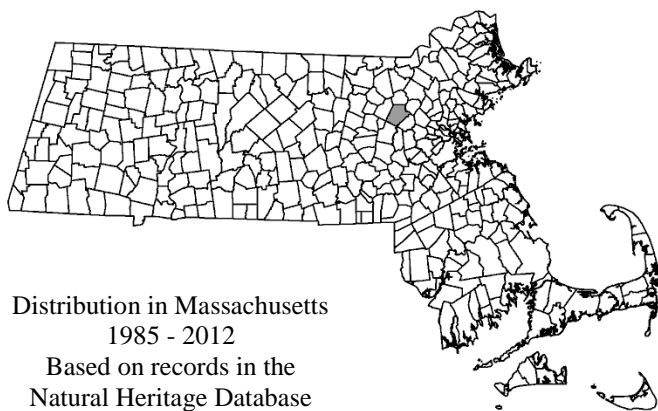
DESCRIPTION: Lake Quillwort is a perennial, aquatic, nonflowering member of the Quillwort family (Isoetaceae). This inconspicuous species lives submerged in ponds as a rosette of linear leaves (somewhat resembling chives), and reproduces via spores.

AIDS TO IDENTIFICATION: The rosette of Lake Quillwort is composed of sharply pointed leaves, 0.7 to 2 mm wide and mostly 5 to 10 cm (2–4 in.) long, occasionally reaching 20 cm. The leaves are dark green, firm, fleshy, and brittle, emerging from a very short, thick stem that is anchored in the substrate by a subterranean corm. The leaf bases of quillworts are swollen, flattened, and concave; the rosette is arranged tightly like the bracts of an artichoke. Within the swollen leaf bases are sporangia, sacs that house the male gametophyte-bearing microspores and the female megaspores. A sheath, or velum, covers the sporangia; in Lake Quillwort, the velum covers up to half of the sporangia. The megaspore of Lake Quillwort, which requires a microscope to view, is mostly covered with sharp, wavy crests, with a band (the girdle) encircling the spore that lacks ridges and is covered with tiny spines.



Lake Quillwort is an aquatic species with a rosette of leaves that have swollen bases; within the leaf bases are sporangia with microspores and megaspores. Photo by Robbin Moran.

SIMILAR SPECIES: Quillwort species are very similar in appearance and identification requires examination of the ornamentation of mature megaspores under a microscope. Several pond quillworts occur in Massachusetts. Acadian Quillwort (*I. acadensis*), also listed as Endangered, has a smooth girdle and its ridges are smooth and rounded. The megaspores of Tuckerman's Quillwort (*I. tuckermanii*) are similar in appearance to those of Lake Quillwort, but smaller. The megaspores of both Tuckerman's and Acadian Quillworts are 0.4 to 0.65 mm in diameter, averaging less than 0.6 mm, whereas those of Lake Quillwort are 0.55 to 0.75 mm, averaging more than 0.6 mm. The megaspores of the remaining three species do not have girdles. Spiny-spored Quillwort (*I. echinata*) megaspores are covered in spiny bumps; those of Engelmann's Quillwort (*I. engelmannii*) have a reticulate surface of regularly spaced ridges; and those of Riverbank



A Species of Greatest Conservation Need in the Massachusetts State Wildlife Action Plan

Massachusetts Division of Fisheries & Wildlife

1 Rabbit Hill Rd., Westborough, MA; tel: 508-389-6300; fax: 508-389-7890; www.mass.gov/dfw

Please allow the Natural Heritage & Endangered Species Program to continue to conserve the biodiversity of Massachusetts with a contribution for 'endangered wildlife conservation' on your state income tax form, as these donations comprise a significant portion of our operating budget.

www.mass.gov/nhesp

Quillwort (*I. riparia*) are covered with crowded bumps and rough crests.

POPULATION STATUS IN MASSACHUSETTS:

Lake Quillwort is listed under the Massachusetts Endangered Species Act as Endangered. All listed species are protected from killing, collecting, possessing, or sale, and from activities that would destroy habitat and thus directly or indirectly cause mortality or disrupt critical behaviors. Lake Quillwort occurs in Middlesex County, and was found historically in Hampden and Worcester Counties.

RANGE: Lake Quillwort occurs from the Northwest Territories, Saskatchewan, and Minnesota east to Newfoundland and New Jersey. Disjunct populations are found in the mountains of Tennessee and Virginia. This species also occurs in Greenland and Europe.

HABITAT: Lake Quillwort occurs in cold, clear water of lakes, ponds, and slow-moving streams. It is typically submerged one to three meters, and sometimes occurs in deeper water. At the single location in Massachusetts where it has recently been observed, it occurs at a depth of over 7 meters. Uprooted plants can sometimes be found along pond shorelines.

THREATS AND MANAGEMENT

RECOMMENDATIONS: Protection of the natural hydrological conditions, water quality, and substrate conditions in ponds supporting Lake Quillwort is needed to maintain extant populations. Altered water levels, wells, septic systems, water recreation, and invasive exotic plants are all potential threats. Lake Quillwort populations should be monitored regularly, with surveys conducted when megaspores are mature, from late July to October. All active management of rare plant populations (including invasive species removal) is subject to review under the Massachusetts Endangered Species Act, and should be planned in close consultation with the Massachusetts Natural Heritage & Endangered Species Program.

Fruiting in Massachusetts

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

REFERENCES:

Gleason, H.A., and A. Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*, 2nd edition. The New York Botanical Garden, Bronx, NY.

Haines, A. 2011. *Flora Novae Angliae – a Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England*. New England Wildflower Society, Yale Univ. Press, New Haven, CT.

Updated 2015

A Species of Greatest Conservation Need in the Massachusetts State Wildlife Action Plan

Please allow the Natural Heritage & Endangered Species Program to continue to conserve the biodiversity of Massachusetts with a contribution for 'endangered wildlife conservation' on your state income tax form, as these donations comprise a significant portion of our operating budget.